BORIS ALEJANDRO VILLAMIL RAMÍREZ

Proximity dimensions effects on innovation of footwear firms in Local Production Systems (LPS): case studies in Brazil and Colombia

São Paulo, SP, Brasil
2019

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Versão Corrigida
(Versão original encontra-se na unidade que aloja o Programa de Pós-graduação)

Tese apresentada à Escola Politécnica da Universidade de São Paulo para a obtenção do título de Doutor em Ciências

Área de Concentração:
Engenharia de Produção

Orientador:
Prof. Dr. Renato de Castro Garcia

São Paulo, SP, Brasil
2019

Este exemplar foi revisado e corrigido em relação à versão original, sob responsabilidade única do autor e com a anuência de seu orientador.

São Paulo, 12 de junho de 2019

Assinatura do autor: _____

Assinatura do orientador: _____

Catalogação-na-publicação

Villamil Ramírez, Boris Alejandro
Proximity dimensions effects on innovation of footwear firms in Local Production Systems (LPS): case studies in Brazil and Colombia / B. A. Villamil Ramírez -- versão corr. -- São Paulo, 2019.
269 p.

Tese (Doutorado) - Escola Politécnica da Universidade de São Paulo. Departamento de Engenharia de Produção.

1.Geografia da inovação 2.Desenvolvimento econômico regional 3.Desenvolvimento industrial 4.Administração de inovações tecnológicas 5.Linha de produtos I.Universidade de São Paulo. Escola Politécnica. Departamento de Engenharia de Produção II.t.

VILLAMIL RAMÍREZ, B. A. **Proximity dimensions effects on innovation of footwear firms in Local Production Systems (LPS):** case studies in Brazil and Colombia. 2019. 269 p. Tese (Doutorado em Engenharia de Produção) – Escola Politécnica da Universidade de São Paulo, Universidade de São Paulo, São Paulo, Brasil, 2019.

Aprovado em: _____

Banca Examinadora

Prof. Dr.: _____

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Prof. Dr.: _____

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Prof. Dr.: _____

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Julgamento: _____

Prof. Dr.: _____

Instituição: _____

Julgamento: _____

A todos los ángeles que Papito Dios ha dispuesto en mi camino,
para animarme, apoyarme, o sencillamente sentir su compañía:
a mis padres Hernando (ahora en el cielo) e Hilda,
a mi hermanita Clemen,
a mi familia grande, en Bogotá y en Palmira,
a mis amigos, a mis compañeros,
a mis profesores, a mis estudiantes,
a mi Universidad Nacional de Colombia,
a mi Universidade de São Paulo,
al bondadoso pueblo brasileño,
al acogedor pueblo palmirano,
a Celeste, hijita linda en descubrimiento del mundo,
a Lorenzo, bendición que la naturaleza nos trajo,
y en especial a Pili, mi hermoso ángel personal.

Por creer en mí, aunque yo mismo no lo hiciera,
por su mano siempre disponible,
en la penumbra de la noche y en la luz del día,
por sus palabras de aliento,
por sus cálidos abrazos,
por darlo todo sin esperar nada a cambio,
a todos infinitas gracias doy,
y a todos, muy merecidamente, dedico este trabajo.

ACKNOWLEDGEMENTS

To Universidad Nacional de Colombia, Universidade de São Paulo, and CAPES (in portuguese, *Coordenação de aperfeiçoamento de pessoal de nivel superior*) that provided the necessary resources and granted the necessary terms to develop this research.

To managers and members of footwear associations (in portuguese, *Sindicato da Indústria de Calçados de Jaú* –Sindicalçados Jaú– and spanish, *Unión Vallecaucana de Industria del Calzado* –Univac Cali) who contributed with their experience, information and logistical support for the gathering of information about the sector.

To businesspersons, who rather than grant an interview, sacrificed a part of their valuable time to share their experiences, fears and expectations about the engine of their livelihood and of their employees, and the reason for their professional projection.

To the *Comissão de Coordenação do Programa* (CCP) in the *Programa de Pós-Graduação em Engenharia de Produção* (PPGEP) for their support at all times (even the most difficult times) of my doctoral stay. Also to *Consejo de Facultad de Ingeniería y Administración* and to *Consejo Superior Universitario* for their support when I most needed it. To the Deans who supported me unconditionally: Luis Eduardo Ordoñez Santos, Carlos Humberto Mora Bejarano, Eliana Castro Silva, and Oscar Chaparro Anaya.

To my director Renato de Castro Garcia, PhD., that with infinite patience and sense of opportunity supported me in all the process, not only academically, but also in all dimensions I needed. I will be eternally thankful and admire his commitment. For example, to read and correct a thesis in a third language (different to his mother language and English), shows a dedication that very few are willing to assume.

To María del Pilar Ramírez Orobio, business administrator and wife, for the logistical support offered contacting all firms, convincing businesspersons (in Spanish and Portuguese), scheduling interviews, planning the routes and registering all the process.

To all the people, especially in São Paulo, Jaú, Caieiras, Osasco, that welcome us, support us and open their doors for us, making us feel at home, even when we were a thousand kilometres away from it.

To Selene Alarcón Vásquez, my head translator, who with great perseverance not only faced the translation of an academic text not of her academic area, but was very tolerant to adapt to the rhythm of my personal commitments.

To all those professionals and academics that have organized, studied, and published their research as part of the competitive development of our countries using the technological platforms we have at our disposal.

Finally, I want to give special thanks to my wife, my children, my parents, my sister, my nephew, my uncles, my cousins, my friends, my bosses, my co-workers, and my students patient, for granting me the necessary time in the role of husband, father, son, brother, uncle, nephew, cousin, friend, subordinate, co-worker and professor, and lovingly understood that my absence had a great purpose which occasionally completely absorbed me.

“Una mano

más una mano

no son dos manos;

son manos unidas.

Une tu mano

a nuestras manos

para que el mundo no esté

en pocas manos

sino en todas las manos.”

(Gonzalo Arango, Manos Unidas, 1974)

RESUMO

VILLAMIL RAMÍREZ, B. A. **Efeitos das dimensões de proximidade na inovação das empresas de calçado em Sistemas Produtivos Locais**: casos no Brasil e na Colômbia. 2019. 269 p. Tese (Doutorado em Engenharia de Produção) – Escola Politécnica da Universidade de São Paulo, Universidade de São Paulo, São Paulo, Brasil, 2019.

Com o propósito de identificar as melhores práticas para pequenas e médias empresas de manufatura nos sistemas de produção local (SPL) em sua aproximação mútua, e ter acesso ao conhecimento que poderia favorecer as suas capacidades de inovação (derramas), é estudada a correlação das dimensões de proximidade cognitiva, social, organizacional e institucional e as características da empresa (produção, inovação, experiência) com o seu crescimento (produção, empregados, vendas). São entrevistadas 53 empresas de dois SPL calçadistas (Jaú, São Paulo, Brasil e Cali, Valle, Colômbia), classificadas em dez subconjuntos intersectados (região, tipo de produto, tamanho) que se correlacionam em matrizes de coeficiente de Spearman (Rho). Conclui-se que as dimensões de proximidade não são um veículo direto para alcançar resultados de crescimento nas empresas, dado que só a proximidade cognitiva evidência correlações com todos os indicadores de crescimento, mas apenas nos SPL de carácter especializado (um tipo de produto, para um mercado único). Além disso, verificou-se que o comportamento das empresas é diverso, e que as correlações se manifestam diferenciadas se o setor é especializado ou diverso, que muda a discussão para as diferenças nos resultados dos modelos de produção.

Palavras-chave: geografia da inovação; desenvolvimento econômico regional; desenvolvimento industrial; administração de inovações tecnológicas; linha de produtos; desenvolvimento de produtos; gestão do conhecimento; administração de pequenas e médias empresas.

ABSTRACT

VILLAMIL RAMÍREZ, B. A. **Proximity dimensions effects on innovation of footwear firms in Local Production Systems (LPS):** case studies in Brazil and Colombia. 2019. 269 p. Tese (Doutorado em Engenharia de Produção) – Escola Politécnica da Universidade de São Paulo, Universidade de São Paulo, São Paulo, Brasil, 2019.

With the aim to identify the best practices for small and medium manufacture firms in local production systems (LPS) in their mutual proximity and access to knowledge that improves their innovation abilities (spillovers), the correlation of institutional, organizational, social and cognitive proximities is studied, as well as firm characteristics (production, innovation, experience) with its growth (production, employees, sales). Interviews are done to 53 footwear firms from two LPS (Jaú, São Paulo, Brazil and Cali, Valle, Colombia), classified in ten intersected subgroups (region, type of product, size) that correlate in Spearman coefficient matrixes (Rho). It concludes that proximity dimensions are not a direct vehicle to achieve growth results in firms, since only cognitive proximity evidences permanent correlations with all growth indexes, although this is only for specialized LPS (one type of product for one market). It is also found that the behaviour of firms is very varied, and correlations are differentiated whether it is a specialized or diverse sector, which moves discussion to differences in the results of production models.

Keywords: geography of innovation; regional economic development; industrial development; management of technological innovations; product line; product development; knowledge management; small and medium enterprise administration.

RESUMEN

VILLAMIL RAMÍREZ, B. A. **Efectos de las dimensiones de proximidad en la innovación de empresas de calzado en Sistemas Productivos Locales**: casos en Brasil y Colombia. 2019. 269 p. Tese (Doutorado em Engenharia de Produção) – Escola Politécnica da Universidade de São Paulo, Universidade de São Paulo, São Paulo, Brasil, 2019.

Con el propósito de identificar las mejores prácticas para pequeñas y medias empresas de manufactura en sistemas productivos locales (SPL) en su aproximación mutua y conseguir acceso a conocimiento que podría favorecer sus capacidades de innovación (desbordamientos), se estudia la correlación de las dimensiones de proximidad cognitiva, social, organizacional e institucional y las características de la empresa (producción, innovación, experiencia) con su crecimiento (producción, empleados, ventas). Se entrevistan 53 empresas de dos SPL de calzado (Jaú, São Paulo, Brasil y Cali, Valle, Colombia), clasificadas en diez subconjuntos intersectados (región, tipo de producto, tamaño) que se correlacionan en matrices de coeficiente Spearman (Rho). Se concluye que las dimensiones de proximidad no son un vehículo directo para lograr resultados de crecimiento en las empresas, dado que solo la proximidad cognitiva evidencia correlaciones sostenidas con todos los indicadores de crecimiento, aunque solo en los SPL de carácter especializado (un solo tipo de producto, para un solo mercado). Además, se encuentra que el comportamiento de las empresas es muy variado, y que las correlaciones se manifiestan diferenciadas según si es un sector especializado o diverso, lo que traslada la discusión a las diferencias en los resultados de modelos de producción.

Palabras clave: geografía de la innovación; desarrollo económico regional; desarrollo industrial; administración de innovaciones tecnológicas; línea de productos; desarrollo de productos; gestión del conocimiento; administración de pequeñas y medianas empresas.

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“Cuando se comparte dinero, queda la mitad;
cuando se comparte alimento, queda la mitad;
cuando se comparte conocimiento, queda el doble”.

(Anónimo)

INTRODUCTION

The general objective of this research is to stablish the correlation of proximity dimensions with innovation performance inside local production systems (LPS).

Complementary, first specific objective seeks to identify correlations of production characteristics, innovation ability, and experience with each proximity dimension indexes of firms with the others in LPS.

Production characteristics measures volume, efficiency, and number of employees. Innovation ability establishes innovation team, production equipment acquisition, search of new markets, innovation per year, produced unites by innovation, organizational and innovation changes. Finally, experience determines age, distance between neighbours, product price, clients outside main market, achievement of institutional benefits.

Second specific objective aims to establish correlations of firm characteristics and proximity dimensions with their outcomes three years before the interview.

At characteristics includes production, innovation and experience. Firm outcomes determines production level, employee number, and sales.

The concern underlying research objectives approach, and base of this contribution, is to inquire possibilities of innovation *spillovers* exploitation from small and medium firms inside industrial clusters of Latin America that might not benefit of knowledge present in their environment due to characteristics and dynamics of the LPS.

From theory, interest is justified by the wide discussion on proximity dimensions among firms in LPS, and how it eases achievement of high innovation levels, taking benefit of available knowledge in their environment. These opportunities have been part of the reasons to promote LPS as source of industrial development for regions. However, results are odd and some research on the subject identify development oddness when systems and characteristics are compared inside a LPS, as well as existence of diverse factors (cognitive, social, organizational and institutional) additional to physical closeness, that benefit knowledge flux.

Since the mid-1990, several authors identified knowledge flux heterogeneities in LPS and formulated hypotheses about it. Boschma (2005) made a relevant progress with a compendium theory on proximity dimensions complementarity with a variety of explanations and formulate a conceptual

framework on adequate proximity degrees for each dimension to maximise benefits. According to this theory, beyond geographical proximity, firms can widen their cognitive, social, organizational and institutional proximities, to perform interactive learning, and through this activity, tacit knowledge transmission is achieved. Proximity dimensions degrees are important to Boschma, so knowledge diffusion occurs adequately, as in general, weak proximity dimensions will not offer exchange potentials.

Even though Boschma (2005) theory presents high clarity and conceptual solidity, there are several disadvantages found when stablishing measurements to determine weakness or strength: besides Boschma, other authors have defined each proximity dimension in different ways, or describe other proximity dimension (Knoben & Oerlemans, 2006); to stablish measurements, several authors interpreted proximity dimensions definitions many ways, so, different studies measure proximity in diverse ways; due to abstraction level of proximity dimensions (knowledge, social relations, standards applications, etc.) measurement standardization has been a task that is not conclude yet. Additionally, there are few studies on organizational and institutional proximities and indexes to stablish it are poorly defined.

In this manner, this research inquires non-geographical proximity dimensions (geographical proximity is excluded), applied to LPS of Latin America. These systems are mostly conformed by small and medium manufacturers of low resources to procure innovation. That reality is constantly repeated in direct observations and referred in contact with other academics

Thereby, aiming to evaluate which would be the best practices for knowledge diffusion inside LPS, a proximity dimensions model was identified in literature, that stablishes geographic proximity is neither necessary nor sufficient to obtain interactive learning, and requires complementarity from other proximity dimensions. Taking into account this research concern and considering that by definition LPS present geographic proximity, an inquiry on other proximity dimensions is made, which some authors nominate as non-geographic proximities (Beccatini, 1990; Schmitz, 1995; Belussi, 1999; Lissoni, 2001; Lombardi, 2003; Scott, 2004; Storper & Venables, 2004; Giuliani & Bell, 2005; Boschma, 2005; Knoben & Oerlemans, 2006): cognitive, social, organizational and institutional. Aiming to identify firm characteristics and behaviour, and link them to proximity dimensions and their innovation results reflected in sales and production levels.

Aiming to identify these relationships (characteristics, proximity dimensions, innovation results) in manufacturing firms that belong to LPS in Latin American contexts, a research carry out in two different regions is developed: Jaú (São Paulo, Brazil) and Cali (Valle del Cauca, Colombia). Both regions possess

LPS of female footwear with similar challenges: high level of foreign competition, focus on owns country domestic market, constant product update demands, high use of workforce and are mostly conformed by small and medium firms.

The level of detail requires a direct collection method, and so, semi structured interview was chosen, since it permits to obtain data on each firm characteristics and results, and at the same time allows to identify the context of each answer and expectations on identified challenges. Firms approaching was done through guild (*Sindicato da Indústria de Calçados de Jaú* –Sindicalçados Jaú– and *Unión Vallecaucana de Industria del Calzado* –Univac– in Cali) with 120 associates listed for each of them. Finally, 21 face-to-face interviews were done in Jaú (September 2014) and 32 in Cali (March and April 2015).

Inquires of firms characteristics include experience, production levels, innovation source and process, public policy participation and business relationships. Regarding proximity dimensions, questions asked refer to cognitive level, social relationships, organizational capability, and development interest similarities with other firms. Finally, on innovation performance, production and sales levels variation of the last three years are identify.

Information analysis is done applying correlations in three dimensions: firm characteristics (*firm*: general index with production, innovation and experience characteristics), *proximity dimensions* index (proximity dimensions: cognitive, organizational, social and institutional proximity) and results index (*outcomes*: results on annual production, employee number, and sales of the last three years). To this three group index, two dimensions identify by interviews were added: classification by region (region: Jaú and Cali) and by manufactured type of product (type: female footwear, and non-female footwear composed by masculine, mix –masculine and female–, child footwear, sport footwear, maquila and component producers).

Industrial cluster initial definitions identify available knowledge in the environment as an enormous potential for competitive advantages construction, but diverse studies found that firms must approximate to others in order to acquire that knowledge. In addition to the approaches of objectives, the aim of this research is to provide information to establish what the best practices are for small and medium manufacturing firms to approximate to others and access that knowledge that could favour innovation abilities. Identifying and analysing proximity dimensions behaviour could suggest actions on public policy that promote proximity dimensions that benefit firms in particular and LPS in general. On this purpose are formulated project objectives: **general objective** is to stablish the correlation that proximity dimensions have with innovation performance inside LPS; **first specific objective** is to

identify correlations between firm characteristics of size, innovation ability and experience with their proximity degrees with other firms in a LPS; **the second specific** objective aims to stablish how firms characteristics and proximity dimensions are correlated with their outcomes of the last three years.

This document is divided as follows: first chapter (**Knowledge and proximity in Local Production Systems**) presents a theoretical framework, ranging from general to particular, starting from initial definitions of LPS and their subsequent growth analysis, going through knowledge characterization and tacit knowledge diffusion theories in LPS, to describe in detail proximity dimensions effects, definition and evolution.

Second chapter (**Methodology**) describes proximity dimensions research approach, measurement and indexes type of analysis. Accordingly, an empirical model is proposed, with analytical specifications and variables.

Third chapter (**Sectoral context**) presents footwear sectoral situation, from a wide view (world competitive panorama, including productive and commercial aspects, consumption, technology and trends), passing by Latin America competitive panorama, to describe Brazilian and Colombian cases in their competitive context.

Fourth chapter (**Results**) describes results obtained with interviews, classified in five main groups: total sample (53 firms), classification by region (Cali with 32 firms, Jaú with 21), and by type of product (30 female footwear producers, 23 non-female footwear producers). At the same time, each group is analysed totally and in a refined sample in which small firms, suppliers and firms that contract maquila are filtered.

Fifth chapter (**Analysis**) presents results analysis for each classification described in results chapter, applying correlations among each studied index, grouped by firms characteristics, proximity dimensions and results (measured by production and sales variation).

Sixth chapter (**Discussion**) discuss findings, analyses internal and external validity compares reference literature results, and tests hypotheses.

Finally, seventh chapter (**Conclusions and recommendations**) presents conclusions that reached this research and makes recommendations for developed knowledge application.

Pues yo, sin haber salido
de este escondrijo de América,
gracias a la Geografía
he andado por dondequiera;
les doy a ustedes razón
desde la Australia hasta Suecia,
de Canadá a Patagonia,
de Kamtschatka a Santa Helena;
conozco todos los ríos,
islas, montes, cordilleras,
puertos, lagos, mares, golfos,
archipiélagos, etcétera;
y puedo pasar de un salto
a París, Lima o Venecia
y el Océano atravesar
sin vapor, vela o barqueta,
y esto sin salir de aquí
ni gastar una peseta,
ni empolvarme en el Sahara
ni helarme en la Nueva Zembla;
ni Ser como San Cristóbal,
de cuatro varas de piernas,
ni hacer más que una intención
y ¡zas! ya estoy dondequiera.
Y como mi cuerpo no es
quien hace gracias tan buenas,
quien vuela sin tener alas
ya a un tiempo mismo se encuentra
aquí y en cualquier parte,
infiero que el alma es ésta.

(Rafael Pombo, *Dios y el alma*, n.d.)

1 KNOWLEDGE AND PROXIMITY IN LOCAL PRODUCTION SYSTEMS

The theoretical discussion is based on the idea that innovation is one of the cornerstones of the competitive development of firms, and them must constantly innovate to provide products that satisfy market needs (customers, users, competitors, pricing, etc.), firms have two ways to obtain sources of innovation: internal development (research and development and innovation, R&D&I) or learning from external actors. High investments are required for internal development, and for innovation to be sufficiently competitive within global players, requiring inaccessible capital for most firms. For small and medium firms, local competitive alternatives are based on external innovation sources, through learning and skills development based on attributes that local environment offers them. To approach the study of these innovation sources, theoretical and practical approaches are made from the beginning of 1990s, about the closeness that should exist among firms to achieve interactive (or collaborative) learning through knowledge spillovers. During the first decade (between the years 1990 and 2000), approaches focused on geographical proximity, identifying local production clusters (industrial districts, clusters, local production systems, etc., defined since the early twentieth century) as the main requirement for interactive learning. However, during the study of how knowledge diffusion within these local production systems, other proximity dimensions besides physical closeness were identified, influencing such learning. By the mid-2000s it was established that there are at least five proximity dimensions affecting interactive learning: geographic, cognitive, social, organizational and institutional; some authors define other proximity dimensions as cultural and technological, using them as similar to the first or differentiating theoretical and/or empirical ways.

On a practical level there is great difficulty on getting firms locally agglomerated interact with each other to establish a collaborative learning. Only a small part of the set is doing. In this way, and with theoretical basis of proximity dimensions (geographical, cognitive, social, organizational, institutional, cultural and technological), it would propose strategies for different proximity dimensions to encourage cooperation, because establishing in the same region is not a sufficient condition.

1.1 Local production systems (LPS) definition

Although local production clusters were a phenomenon described by chroniclers, only at the beginning of twentieth century were observed as phenomena cause by many common factors (described in detail §1.1.1). However, only at the end of the same century, local production clusters were considered by national and regional governments, and international institutions as means of consistent economic

growth, and accordingly developed and implemented strategies to encourage its creation and strengthening. At the end of twentieth century some observations started to show that actions presented unequal development, so in the search for answers many conceptual gaps on models and heterogeneity were found (§1.1.2), not only when productive clusters are compared, but also within each of them (§1.1.3).

1.1.1 Historical approach

Through civilizations history and technologies, chronicles have mention many cities and regions with outstanding abilities in manufacturing some type of product (e.g. from agricultural products transformation to armament or boats) or extraction or transformation of materials (e.g. metals, pottery, glassware, fabrics, etc.), that in most cases increased economic or politic influence; it was only until economy became a science branch and productive regions of Industrial Revolution multiply that systematic observations initiate to inquire about their development basis.

That was how Marshall (1920) stablished and explanation on what he called specialized sectors concentration in specific locations (later denominated “Marshallian districts”) by means of common causes (technically named economic externalities) condensed in three points: 1) specialized labour market in which agglomeration attracts qualified personnel, moderating salary and unemployment effects; 2) specialization economy in which a sector subdivides its production in process suppliers and intermediate services to reduce costs; and 3) technological knowledge diffusion or spillovers among sectors, originated in geographical closeness, where members social contact, closeness and confidence streamline innovation and novelties information. Even though lack of development of such observations due to increasing attention on other economic theories, decades later those observations were basis to conceptual development that finally, in 1990s, had wide impact on public policy of different regions of the world. Three main bases were Porter (1990), Krugman (1991) and Beccatini (1990).

Porter (1990) proposal have had such influence that has become practically a hegemonic standard in public policy application with focus on competitive abilities of sector and regions (Martin & Sunley, 2003). Clusters or productive concatenations as is proposed, are regional firms' agglomerations that compete with other regions through basic competitive strategies: production and distribution costs reduction to offer a cheaper product; product/service differentiation by means of offered characteristics that client may identify and consequently disposed to pay a higher price for it; or focalization, a combination of the above, that allows the production system focus in a certain market segment with differentiated attributes at an adequate cost. Clusters key abilities analysis is done

through a competitive diamond that include: entrance barriers for potential competitors, substitute product pressure, clusters internal own rivalry, and bargaining power in front of clients and suppliers. Simple language, away from theoretical complexity of local agglomerations studies, easiness of tools for competitive diamond analysis, and the enormous release campaign of this model (by own Porter (1990), and international organizations) have been, according Martin & Sunley (2003), the key of success of this proposal for LPS .

Krugman (1991) analysis proposal on geographical economy, offers a structured explanation from the theoretical point of view of spatial productive concentration in some regions in contraposition to scattered and fragmented production. Such concentration is caused in localities with initial comparative advantages (all type of resources: natural, labour, economic, political, etc.), productive advantages (increasing yield) and agglomeration competitiveness when compete with other regions, promoting new firms creation, looking to take advantage of such benefits at the same time knowledge, infrastructure, and labour market accumulation effects produce, and constitute an entrance barrier for other regions with the same type of interests. Krugman (1991) proposed model explains algebraically production concentration dynamics: firms and skilled labour force that flows from regions with lowest salaries and highest production and product costs to other regions with opposite conditions obtained by scale economies, until achieving a balance in spatial development and transportation costs. From Suzigan (2001), vision, Krugman analytic model proposes an economical spatial structure forged by two opposite forces: centripetal (linkages, transportation costs, spillovers, etc.) and centrifugal (congestion, pollution, etc.) recognizing that concentration and de-concentration factors could be influenced by forces that can be promoted by public policies and depend on their aim (concentration vs de-concentration) to favour some particular forces.

Based on industrial districts, Beccatini (1990) model relies on Marshallian districts, founded on "economic localities" composed by communities that share locality, productive sector and social network simultaneously, that authors later nominated epistemic communities[1], limited by a group of subjects that recognize as common their fundamental economic interests, which, over the time, transform themselves by internal and external interactions and act as an own government. These definitions look to stablish units and limits of economic study, focusing on subjects acting (set of people and/or firms), and not on products behaviour, transcending from production volume analysis (scale economy and factory system optimization) to individual recognition belonging that leads search

[1] Criticism of the model proposed by Beccatini (1990) is that he underestimated the absorption capacity of local agents in the regions. However, his ideas allowed Lissoni (2001) to pose the "epistemic communities".

improvement (individual and collective effort) of knowledge and apply values on quality and competitiveness, and best innovation routine adaptation. In this way, additional to organizational and material infrastructure studies, collective and individual intellectual potential inclusion, allows the development of industrial districts concept as an alternative to the growing accumulation of capital and technical progress of individual firms, aside of industrial development based on small and medium firms territorial agglomerations, encouraging plurality (firms and territories), avoiding polarization (owners vs. proletarians, private property vs. public property), while strengthening international integration and local specialization.

For Beccatini (1990), studies made from 1960 present industrial districts characteristics in opposition to traditional economic theory: 1) small and medium firms flourishing in places where large firms (public and private) decay, driving regional rent, employment and exportations growth; 2) small and medium firms agglomerations present similar technical level to the large firms it competes with; 3) agglomerations do not arise in industrial cities but in wide regions traditionally not attractive to business investment (e.g. with low infrastructure), in unattractive sectors (like manufacture), and with unsuccessful formats (small family firms). Although, key conditions are required for industrial districts with these characteristics growth: at a productive level, high cultural complexity regions, productive structure formed by small and medium producers and credit structure to finance small initiatives; and on general demand, comfort standards increase placing high variable demands of custom and differentiated products for which there will be more willing to pay. These situations, adverse to large traditional firms with standardized products and continuous process, favour the emergence, growth and strengthening of the industrial district on its commercial, technical and confidence balances, characterized by small firms versatility, but based on increase productivity earnings through multiple intern suppliers and buyers markets that develop technical and commercial abilities that might level up productive capacity of a large firm with much more versatility. These characteristics with general benefits for local population make of industrial districts a desirable model.

Schmitz (1995) found some differences in the industrial district presented by Beccatini (1990) who condensed six components in his model: 1) geographical and sectoral firms concentration; 2) small and medium firms predominance; 3) vertical breakup of operations; 4) cooperative competence; 5) sociocultural identity that eases confidence; 6) active organization of support institutions. Schmitz (1995) found in a study about footwear sector from Sinos Valley (Brazil) differences in all components (except component 1), explained by initial characteristics and development history, adapting to economic, productive, labour and commercial contexts at national and international levels. This way, even with existence of dissimilar characteristics from theoretical model of Beccatini industrial district,

benefits can be achieved organizing production by flexible specialization type, adaptable to new market requirements that demand a greater product diversity than before, in small batches, different in between, with less delivery time, neither rising prices or reducing quality, hard to face situations by large firms of massive production.

For Schmitz (1995), simultaneous presence of large firms sharing space with small and medium in similar markets (opposite situation to industrial district theory) and changes in productive system of the first ones, focusing in vertical breakup through productive cells, enabling at the same time firms flexible specialization and great grow, strengthen suppliers that benefit from small and medium firms as well. Schmitz (1995) concludes that it does not exist a unique industrial district model, but it transforms and adapts to each country and region context, as response to constantly changing conditions. Interdisciplinary study to identify variation and interactions among firms will allow understanding collective construction of competitiveness as an answer to the big uncertainty of an always changing world. Industrial district model emphasis on internal links, tend to ignore the enormous impact that external represent: Sinos Valley example, businesspersons role on productive development presented positive effects (customers attraction, design development, quality, delivery) and negative (markets lack of diversification). As a big conclusion, Schmitz (1995) highlights constant evolution and adaptation of productive systems integrated in clusters that get close and move away to industrial district theoretical model defined by Beccatini (1990) according to combined action of market requirements and/or to macroeconomic conditions (incentive policies, change, inflation control, etc.), besides regions own needs and interests.

LPS structures studied by Belussi (1999) present evolution such as: 1) production, employment and firm number decline due to competitiveness loss; 2) partial relocation of activities towards areas with lower labour costs; 3) increase in internal reconstruction through formal and informal groups, fusions, and acquisitions, causing roles expansion of medium firms with greater nesting of industrial structure, caused by international competitive pressure and costs reduction; and 4) production diversification, focus to new niche markets identification.

Belussi (1999) describes Italian LPS, based on Beccatini (1990), linking in his theory interaction with production and learning factors. LPS are define by a sectoral specialization of local economy limited to some localities, with presence of many small firms with coordinated horizontal market production (many similar producers and numerous outsourcers working for one or more producers), creating related sectors (services and manufacture) both 'upstream and downstream', turning area attractive for localization of machinery producers and specialized goods suppliers. Besides sharing sector, localizations and knowledge, these systems share inside a creation and production history (e.g.: new

firm generation; firm expansion, economy and society, set up entrepreneur matrix; workers and operators knowledge socialization; institutional models that regulate the operation). LPS coordination and government variation depend on firm characterization and its proportion in the system: craft firms, small autonomous producer, outsourcer firms, medium size firms (that sell in markets or produce as outsourcer), large producers (vertical, networks and agglomerated integration firms). These configurations are hierarchically structured with leading firms controlling the market, logistics, quality, and activate productive networks relatively stable or the existence of many overlapping productive networks with different coordination models and stable relationships.

Local development patterns defined by Belussi (1999) are 1) interfirm job division process (demand growth increases job division); 2) economic agents specialization increases scale economy and knowledge generation; and 3) knowledge accumulation in firms, making a more competitive set and reboots demand increasing process.

Porter (1990), Krugman (1991) and Beccatini (1990) offered in 1990 complementary answers to each other, with tools within reach to politicians and public policy designers that allow different regions of the world to stablish concrete actions to increase production, and consequent employment generation, and economic growth. Although, such objectives were not achieved homogenously. Studies and comparisons about the phenomena made clear that proposals did not fully covered LPS complexity and other aspects needed to deepen beyond productive and economic factors. This way, analysis describing theoretical (David, 1999), conceptual (Martin & Sunley, 2003), and scopes and methods (Scott, 2004) basis fails are described.

David (1999) criticise Krugman (1991) model approach, highlighting that reality is not homogeneous (model basis) and consequently needs to stablish a way to quantify heterogeneity of regional development effects. Besides, it must identify multiple process interacting in an agglomeration, from demand and offer sides: training and labour costs (affected by differences in qualification of linked markets, knowledge interaction spillovers, and effects on intangible inputs); changes in transport and communications costs; advantages on positive feedback of initial characteristics (infrastructure, history, spatial evolution), that without an upper limit, a unique dominant region monopolize the sector (initial elections and region selection by incoming firms would determine the dominant region); dynamic process path dependant (initial situations and taken decisions affecting regional economic status); and effects (positive and negative) of public policy on regional development, that sets competitiveness among regions in sectors widespread without reaching a predominant critical mass, pending among deconcentrated inefficiency or excessive congestion when production is concentrated.

Martin & Sunley (2003) critique that 'cluster' concept proposed by Porter (1990) at regional scale and on internal socioeconomical dynamics, make it successful and adaptable to market through consultancy, by use in a wide variety of sector and regions, due to simple language and enormous spreading of analysis tools. Another disadvantage identified by Martin & Sunley is that the term 'cluster' juxtaposes in several scales (local, regional, national, international), leaving to the creativity of the observer the detection, causing that different actors recognize different number of clusters, due to the difficulty of stablishing the extent to which a group of firms belong to the same sector or related sectors, or are co-located or the distance at which the effects of the productive agglomeration are lost (linkage among firms, knowledge dissemination, rivalry, social or business networks), or what spatial density of interactions should exist to make a cluster viable.

Conceptual, theoretical, and empirical weaknesses are facilitators of government dissemination and acceptance, and at the same time, causers making impossible to establish clusters classification (by size, composition, scope, development level, performance), performance level and competitive achievement of goals comparisons and/or determinations, especially when are public policy beneficiary. According to Porter (1990), regions (firms, sectors, regional and national business groups) compete, but, according with Martin & Sunley (2003) regions could not, since firms individually, can follow one of three generic competitive strategies (differentiation, costs reduction or focalization) criticized because they are superficial, lack of specificity, hard to measure, caused by lack of independence among them, or it does not apply universally. In relation to tools proposed by Porter (1990) for competitive analysis, Martin & Sunley (2003) stablish that competitiveness is highly complex because it depends on other economic variables of different scale (not all firms require to agglomerate, ignoring dynamics, evolution and other regional development factors), which leads to the conclusion that regions do not compete with each other as firms do, so regional competitiveness simile does not apply. Additionally, Porter (1990) theory claim on social networks, social capital and cluster competitiveness linkage, is a black box that does not explain its functioning. Social dimensions explanation that is linked to cluster production by tacit knowledge and local diffusion (due to face to face transmission, limited by trust), is criticized by authors when affirming that tacit knowledge is an obscure and insubstantial proposition, hard to identify and differentiate from explicit knowledge, and does not explain how it acts as a competitive advantage; such lack of identity produces the same competitiveness mistake, mixing up tacit knowledge application inside firms with the possibility that tacit knowledge belongs to cluster set.

Theoretical definition problems consequently derive in empirical definition problems as a lack of delimitation in cluster maps build up, and the lack of procedure definition, variable and measure

determination. This lead authors to make different measurements for diverse variables and create divergent conclusions. Martin & Sunley (2003) classified studies in two: those made from top to bottom, with information of a nation to identify sectors and productive activities linked, looking to subdivide economy in clusters; and from bottom to top, looking for clusters at a local area. Analysis of empirical studies identify with difficulty data contained in cluster (since cluster limits can surpass geographical or sectoral limits) and such data cannot be homogeneous (from a region to another or a sector to another).Trying to increase specialization (and geographical concentration) would lead to too many clusters arise to analyse. General analysis of a region supposing its composition is homogeneous is another problem. General data observations on employment, production, firms number, etc., does not allow to identify the dynamics of *spillovers*, learning, business linkage, innovation, etc., which leads to inconclusive results.

Within political consequences of worldwide decentralization trends, clusters are an ideal tool for support, promoting four development strategies: 1) cooperation network arousal and dialogue promotion among firms and organisms for information exchange, resources combination and joint problem solution, through an activity manager; 2) collective marketing based on region strengths; 3) firm service provision as financial, marketing and design advice, focusing on specialized industry, and 4) weakness identification to attract investors to fulfil supply and distribution networks voids. Even though these initiatives present improvement possibilities, Martin & Sunley (2003) question how to stablish a support limit (which firms to include and exclude), how much should productive network address backwards (suppliers) and forwards (marketers). It is a continuous tension among political desire to address as much firms as possible and effectiveness if it is directed to politic in some way. Besides, how to stablish limits in groups of promising firms when industrial development and technological change are so unpredictable, and actions could leave firms key out for the future economy. Support for more wide and diverse networks could be weak, but would have more chances to adapt. Search for clusters, even small ones, try to balance reality and regional interests (e.g. all regions want to be included in promotion policy for a productive sector expanding, even with low potential). Authors doubt of consulting firms that in short time identify weak linkage in productive networks, understand spillovers and surrounding knowledge, detect development in different sectors and are capable of anticipate to needs of firm services.

Another aspect questioned by Martin & Sunley (2003) is the search to change all sectors to “based on knowledge”, which to authors criteria is a dangerous trend hard to expand to all economic activity. Even further, authors affirm that not all sectors need promotion through clusters, and in some cases it can become an obstacle or hazard: firms performance exaggerated promotion, actually limited by

context; regional specialized economy deterioration and instability; lock-in produced by imitation within agglomerations; economy inflation and overheating due to competition effects sub estimation based on costs, pressure over labour market and real state; region departure from “less competitive” sectors affect diversity and may affect local economy and social benefits development base. Such hazards lead authors to pose that productivity promotion should be done to most firms in a region and not focus in a sector. Network formation would be proper for firm dynamics and not promoted by public policy.

Scott (2004) stablishes that study fails based up on reaches and methods of geographic economy given that, since Krugman (1991) studies are based on conditions of monopolistic competition. In this way, spatial distribution of localization is a function of labour distribution, transportation costs, demand elasticity and substitution. Model modifications have introduced variables like sectors interactions or clients and suppliers behaviour. From a geographic point of view, main criticisms come from conceptual and methodological divergences and contextual absence, which are to Scott (2004) economic fundaments (perfect competition, constant performance, division of economic activities), chosen 'arbitrarily and implausibly', which lead to neglect other causal factors and lose the ability to explain intrinsic development in regions, social relationships motivation, and regions as engines (not only holders) of economic activity. This way, even though Krugman model (as later development) offers answers on productive agglomeration (multi-regional pecuniary answers), it does not solve many other equally important aspects (cultural, technological, social, political, historical, among others) being a very partial model for explaining reality, trying to encode market process in space rather than comprehend special relationships. Multiple geography studies (in the late 1990s and early 2000s) started to identify cultural influence dynamic (management styles, labour behaviour, creativity and innovation) as a cause of economic dynamic and not as a consequence of itself.

Without attempting to come up with a single answer, Scott (2004) proposes to debate if economic activity is a cause, manifestation or consequence of cultural dynamic through: research on causal interrelation between economy and both social and cultural aspects; spatial logic exploration with business activity, learning and innovation, analysing and describing collecting and institutional activity as part of economy, society and culture interactions (at different spatial and organizational scales: firms, markets, regions, nations, etc.); study approach on social inertia (arose by economy and society relations) where individual human will transforms with difficulty lasting social structures; plus also benefiting from quantitative analysis tools of economy studies.

1.1.2 Growth analysis

Search for reasons about dissimilar growth between geographical agglomerations, even comparing close regions in similar sectors, took posterior studies to compare different aspects of agglomerations, combining economic and geographical studies that contribute with complementary answers.

Glaeser et al. (1992) compared specialization, diversity and local competence of 170 of the greatest industrial producer cities of USA, based on theoretical contradictions proposed by Marshall (1890), Arrow (1962) and Romer (1986) which combined (named after Glaeser et al. as MAR, for initials of the authors referenced) stablished a high geographical concentration, low sectoral diversity and monopoly, which originate perfect conditions of productive and industrial growth by scale economy and high level of knowledge that monopoly firms could obtain. On the other hand, Porter (1990) defer from that position, affirming that, although high geographical concentration and low sectoral diversity contribute with proper conditions to industrial and economic development, free market (in opposition to monopoly) would turn into an innovation motive force in search of productivity improvement. Finally, Jacobs (1969) stablished completely opposite conditions to MAR theory: a high diversity, at geographical concentration with low specialization and free market promote a highly productive growth due to synergic abilities offered by different industrial sectors presented in the same region. Glaeser et al. (1992) findings noticed that cities with concentrated industrial sectors grow slower, those cities in sectors with greater competence grow faster, and those who count with diverse sectors are favoured to grow; in summary, Jacob conditions were the ones that better contribute to regions growth.

Later, after almost two decades of discussion and presentation of evidences from authors about the convenience of different concentration degrees, diversity and monopoly of a region sectors, Beaudry & Schiffauerova (2009) compiled 67 studies related to MAR/Jacob dichotomy and compare their methodology (industrial sectors aggrupation, technological development level, geographic coverage) with results obtained. Evidence presented by authors, found that measurements (grade of geographic approach and sectoral grouping) and methodology characteristics (indexes construction) are the main causes of divergence in results of studies evaluated, and unresolved debate on knowledge externality on MAR/Jacobs theories. MAR effects are more susceptible to appear at a general level of sectoral grouping, while at detail level of sectoral grouping Jacobs effects tend to prevail; at medium level of sectoral grouping both effects are comparable. Authors suggest that MAR effect (specialization) is observable in wide levels of grouping, because of subsectors inclusion equivalent to diversity externality proposed by Jacobs. Comparing different detail level in sectoral grouping with detail level of geographical grouping, studies with wide levels of sectoral grouping and detail geographic grouping,

similar results are found for MAR and Jacobs externalities; the same occurs with detail sectoral grouping in wide sectoral grouping. At different levels of technological sectors (high, medium and low technology) MAR effects are found more often in low technology, equal influence of both theories for medium technology and marked advantage of effects of Jacobs at high technology sectors. Sectors life cycles were also found to be altered in different ways: in early stages predominate effects of Jacobs, while in mature stages predominate effects of MAR. Authors suggest, in their proposals on public policy, that regions with low technology industry, regional policy must have emphasis in development of a limited group of economic activities to foster innovation activities to driven greater productivity. High technology regions must focus policy on a diverse group creation for economic activities destined to increase future economic growth.

Even though economic production regionally condensed can be explain in the creation of local productive agglomerations by availability of productive resources (raw materials, infrastructure, human capital), Audretsch & Feldman (1996) focused on innovation activity at industries where knowledge spillovers are important, and could become a preponderant factor for geographical agglomeration. Inside geographical innovation concentration analysis, authors found that qualified personnel follow by R&D&I costs, are the main factors that explain innovation geographical concentration, whereas university research explains to a lesser extent this concentration. Opposite to the hypothesis of whether geographic concentration of innovation is explained specially by geographic concentration of production, results show that there is no statistically significant impact of studied factors of geographic concentration of production (natural resources, scale, transportation costs).

1.1.3 LPS growth and evolution in manufacture sectors

Following regional analysis guidelines from Romer (1986) and Krugman (1991), Scott (2004) realized an analysis of the global landscape of labour intensive and low technology sectors. Three manufacture sectors were chosen among them due to its production volume according global economy and common incidence in worldwide landscape: clothing, footwear and furniture. For Scott (2006) these sectors are found in diverse forms: from a dense network of small local firms, to the large spatially and organizational isolated firms, going through a wide amount of variations.

Most recent configuration described by Scott (2006) is a high-density network formed by small local firms that answer to production models with highly uncertainty and unviable large-scale sells. Complementary specialized links are configured to shape an enormous labour market, with positive social coordination spillovers, productive infrastructure strengthen (physical and institutional) inside agglomeration, and exchange and learning between producers. By product characteristics, there could

exist much type of agglomerations: specialized in components; oriented to low price produce massively; or focus in luxury products constantly evolving; or a combination of previous. This orientation modifies configuration and performance of productive agglomerations. On the other hand, large firms are characterized by product standardization requiring highly efficient production and scale economies. Spatial dependence of these organizations is focus in the search of low localization costs, low salaries, or tax benefits offers (like free zones).

However, for Scott (2006) this sectors manufacture is organized specially around local agglomerations for foreign trade with three type of relations: 1) direct export of finished product, typical of high value products between developed countries, although finished products of lower price are increasing their flow from less developed countries; 2) export of components among subsidiaries of the same firm, where low costs countries produce components, and subsidiaries in developed countries bring assembly, finishing, market and distribution; and 3) outsourced production with independent firms, brand owners, wholesalers or retailers in developed countries hire independent firms in low costs countries, which in an environment of declining marketing costs have adapted to meet global production standards, and buyers diminish fixed and variable costs of production management.

1.2 LPS knowledge

Since Marshall approaches in 1920 decade, and posterior development of 1990 decade on LPS, knowledge has been identified as a key source for creation, consolidation, growth and support for these systems and for such has become a study object. In this section are exposed definitions and characteristics made to apply knowledge and to development and competitive dynamic in LPS explanation, as well as how knowledge spreads in different system components.

1.2.1 Knowledge characterization

Knowledge is found in literature typified in two main groups: explicit and tacit. Explicit (or encoded) defined as the closest to information, is formal and systematic, generally accepted by a group of individuals, registered by mechanisms external to persons (physical or digital) with tangible character what makes it more easily storable and transmissible by available technologies. Conversely, tacit knowledge (or implicit) is found in persons, complete or partially unexplainable by its owner and, consequently hard to communicate verbally or visually.

From the statement of the philosopher M. Polanyi (1966) "*we can know more than we can tell*" conceptual basis was stablished to study tacit knowledge as a source of productive abilities in

individual, and acknowledgement based on habits and cultural aspects, generally of informal and unsystematic nature.

Later, Nelson & Winter (1982) theory on collective and evolutionary construction of organizational routines and its fundamental role in technological development of industrial sector and natural trajectory, gave tacit knowledge an acknowledgement as key source of innovation and value creation, setting it as articulator between search and selection of technical, economical and contextual parameters of technologies to attend a determined demand of needs.

Nonaka (1991) and Nonaka & Takeuchi (1995) popularize tacit and explicit knowledge terms inside organizations, raising a growth model for both types of knowledge through transformation actions between them: socialization (from tacit to tacit, when knowledge is share by face to face contact and through observation, imitation and practice), combination (from explicit to explicit, through compilation exercises and synthesis of information), exteriorization (from tacit to explicit, when tacit knowledge is registered, becomes tangible and permanent), and interiorization (from explicit to tacit, when tangible knowledge is absorb individually).

Maskell & Malmberg (1999) pose that tacit knowledge is related to competitiveness when they identify in the existent globalized and interconnected world, vanguard productive technologies, organizational advances, cheap labour and explicit knowledge (encoded), is easier to acquire and accumulate, even with persistent concentration of local production, answer centres in differentiation and competitiveness achieved through creation, access, and control of tacit knowledge acquired in an interactive learning process strongly influence by available abilities: resources, institutions, social and cultural structures.

For Maskell & Malmberg (1999), the best model to transmit tacit knowledge is through teacher-apprentice training: observation, imitation, correction and repetition, in other words, learning through experience. At the same time, tacit knowledge only reproduces through practice, by training (teacher-apprentice) or by problem resolution generating groups of people who share the same problems and interact to solve them, giving it a collective character (with a social context creation) to localized tacit knowledge production.

Another analysis (in this case with a vision from economy) identifies a fail source in knowledge characterization in local productive agglomerations contributed by Breschi & Lissoni (2001) who affirm that Localized Knowledge Spillovers (LKS) are a “black box”, similar to the description of Martin & Sunley (2003) with ambiguities that looks to demonstrate real interest in innovation and geography research, and at the same time avoids going deeper into its relation mechanisms, blurring efforts on

knowledge transmission economy research and leads to design of naive policies to 'correct' markets deficiencies, mistakenly believing that social benefits are localized in communities under deficiency.

For Breschi & Lissoni (2001) spatial proximity of innovation does not depend on tacit knowledge internal characteristics but on economy complex interrelations: encoded knowledge, scientific and technologic labour markets, and appropriation strategies of innovators. From three of the Marshallian basis of industrial agglomeration, the first two (specialization and labour markets) have a pecuniary character stablishing through market transactions; only the third (knowledge diffusion) has a character based on urbanization theory, where innovation opportunities are achieved in interactions between many sectors technologies, and by interactions out of the market and are accessible to all local community members. However, pecuniary and technological externalities division are lost when empirical studies are made, especially because pecuniary are underestimate and technological are overestimate.

Conversely, Gertler (2003), based on theoretical and conceptual basis from Polanyi (1966), Nelson & Winter (1982), Nonaka & Takeuchi (1995) and Maskell & Malmberg (1999) affirms that tacit knowledge is a central component for learning economy, and is determinant for innovation geography, given that learning process through interaction strengthens local over global activities. From the study on the possibility of tacit knowledge sharing in long distances, Gertler (2003) proposes that three aspects of tacit knowledge must be solved: 1) production; 2) location, identification and appropriation; 3) reproduction and interchangeability. To solve these aspects as an explanation to geography knowledge, further than tacit knowledge psychomotor and cognitive aspects, other like context, culture and institutional sustenance of economic activity must be addressed.

Regarding tacit knowledge creation, is necessary to address individual aspects (human capital qualification) with high mobility, and social (interaction and collaboration in social, organizational and cultural contexts shared), where firms, cities and regions not only train individuals, but also offers interaction, attraction and retention environments. On knowledge location, identification and appropriation, the set of individual and social aspects, attraction and retention of explicit and tacit knowledge create absorption abilities in organizations, localized in people place; the answer, again, is to promote social collaboration between individuals, where constantly doubt on cost-benefit arise. On knowledge reproduction and interchangeability, which has had emphasis in academic studies and theoretical discussion, Gertler (2003) presents two related problems: 1) closeness level of participants and type of interaction (physical, cultural, organizational) in an innovation social process requires tacit knowledge exchange; and 2) difficulties on innovation diffusion in large organizations through regional, national and cultural barriers.

Gertler (2003) proposal is to make less emphasis on tacit knowledge as experience (*know-how* acquisition) and cognitive activity, and observe with higher attention institutional context that stablishes common rules, routines, norms, customs and habits, including conventions (common languages and development, communication and knowledge interpretation rules) labour market, public institutions (some include national innovation systems), rules (regional and national), cultural membership, ideology, mutual desire and identification, which together determine innovation growth of regions. These approximations suggest that regional diffusion dynamic of tacit knowledge must inquire systematically nature and "culture" of institutional foundation of economic activity.

1.2.2 Tacit knowledge diffusion

Since Marshallian approaches in which technologic knowledge diffusion by spillovers occurs due to geographical closeness, 1990s decade theory authors stablished as a conceptual basis for their development. Although, as recognized by posterior studies (Beccatini, 1990; Belussi, 1999; Breschi & Lissoni, 2001; Gertler, 2003; Maskell & Malmberg, 1999; Schmitz, 1995), homogeneity presumption (in which only knowledge was available by geographical proximity, as if "it was in the air" acquirable for who inhabits the region) was refuted and theories were proposed where knowledge is heterogeneous and limited to certain firms, being part of a joint agreement between knowledge holders. According to this vision, classic assumption of free labour and capital circulation is not real: a mutual agreement and a comparable cognitive level are necessary between participants to be able to share knowledge. In addition, based on tacit knowledge definition and its dependence on contexts and social agreements that must exist for its creation, transmissions and exchange, conceptual basis clarifies, explaining the causes for disparity in knowledge exchange results. Many authors have described this phenomenon and suggested theoretical basis, especially at the end of the 1990s and in the first decade of the 21st century: local knowledge channels (Belussi, 1999), epistemic community (Beccatini, 1990; Lissoni, 2001), knowledge spillovers impact (Breschi & Lissoni, 2001), social context for interactive learning (Gertler, 2003), interactive learning norms (Storper & Venables, 2004) and firms role profile inside a LPS (Giuliani & Bell, 2005).

Belussi (1999) explanation about LPS growth are related to diffusion channels of technological change and technical knowledge: 1) knowledge of businesspersons and workers inside a limited space and specific sector, not considered public good by experience acquisition and direct observations, not available to those who are from outside; 2) agent spatial and social proximity, constituting an integrate system with fluid interactions and formal and institutional channels where subjects increase their learning possibilities; 3) systems reduce transaction costs related to agents uncertainty for sharing

same local traditions, productive culture, community rules and communication codes, and present less opportunism and parasitism; 4) higher levels of firms cooperation increases work division efficiency, setting up many small firms with activity specialization and better performance than a single large one; 5) speeding up technological learning due to the amount of experienced agents, encourages incremental innovation discussion, producing a fusion between extern radical innovation and local marginal incremental innovations; 6) systems characterized for its ability to defend industrial secrets, closeness between firms and working mobility, which is an own situation of a dynamic and highly competitive market that strengthens incentives to continuous innovation; and 7) encouragement to adopt innovation processes faster, originate by concentration of a technology market, in which machinery suppliers direct their strategies to endow regional firms, creating a pool of advisory firms and advance service centres that disseminate best practices.

Taking as reference industrial districts characterized by Beccatini (1990), Lissoni (2001) affirms that tacit knowledge has not been sufficient demonstrated (as it was interpreted by authors until that moment) as a strong source of innovation for local productive agglomerations. Lissoni criticism focuses in tacit knowledge requirement of an interpretation code, limited to a group of persons to be converted in explicit knowledge. Such interpretation code is dominated by an epistemic community delimited to individuals with particular interests (by needs, capacity or client requirements) willing to share and accept specific communication guidelines (code usage) and limits (knowledge areas, selection of personnel to share such knowledge). As interests and guidelines could be multiple, there could exist many epistemic communities with compositional pattern at the same district, limits, encoding strategies and specific rules of knowledge exchange that promote innovation inside industrial districts. Persistent interaction between development teams, tests teams and clients creates an informal and specific language characterized for being tacit knowledge flux, of vertical nature (in relationships between suppliers, manufacturers and clients) and almost null horizontally (between manufacturers). Besides, to greater specifications of joint development between suppliers, manufacturers and clients, greater knowledge specificity (tacit and explicit), mainly centred in confidence and mutual knowledge of participants (specially at technical level) and not much between personal and business management. Such level of specificity makes information exchange between manufacturers personnel or between personnel changing employments in firms of the same district, more useful for the rest of firms. This way, Lissoni (2001) concludes that knowledge is non-homogeneous and technological discoveries are not public, not only because of non-existing channels for horizontal divulgation, but for its specificity that makes it inapplicable to other firms. Therefore, not only technical knowledge strengthens innovation, but identification of the epistemic community (strength and actors location, inside firm, at the industrial district and between clients). Consequently,

support policies for knowledge development must focus on epistemic communities as local work networks linked to actors outside its geographic region (communication promotion, data exchange, technical knowledge access outside cluster for technics and not much for firm managers) more than to firms in particular or to districts in general.

Based on Lissoni (2001), reflexions, even affirming tacit knowledge role is not as relevant as it is presented, his observations are very similar to Gertler (2003), even not having the systematic context of the last, but centred in individuals interaction.

According to Breschi & Lissoni (2001), in a coherent way with his criticism to conceptual confusion on tacit knowledge, study of knowledge diffusion presents the following logic chain: 1) generated knowledge in innovative firms or universities is transmitted in some way to other firms; 2) knowledge spillovers is a public good and can be freely exploited by whoever invests in it; 3) spillover knowledge of tacit type, highly conceptual and contextual, hard to encode, easily transmitted face to face and used locally. Over this sequence, Breschi & Lissoni (2001) point many criticisms: first, is that methodology (based on production function), data (patent and innovation) and concepts (tacit knowledge and free information provision) are aspects mediated by market mechanisms, this means, opportunities are obtained by pecuniary means and not by knowledge; second is tacit knowledge characterization, in which it is not an intrinsic attribute, but a mean to exclude through deliberated manipulation to keep knowledge within a group not necessarily local, because knowledge can be transmitted at long distances written or oral. The third critic is made on the affirmation that spillovers are not a product of communication between firms and universities, but it is found in few people that change job and take away knowledge with them, must be encoded (turning into explicit) to be transmitted to the new firm, entering into knowledge property category, in which confidentiality contracts are evident interchange limits. Besides, regional job fixation is due more to localized knowledge than to reasons like avoiding transfer costs and risks.

Under this markets logic, studies on linkage between universities, public laboratories, private and individual firms are the base to open the black box of knowledge spillovers. Universities transmit their knowledge, more than basic science, through consulting and training services, not focused to achieve innovation opportunities, but to acquire abilities. Such transmission is not public but individualized through market mechanisms (labour and technology); this way, what is considered as unintentional spillover, are in reality deliberately regulated flux between universities and firms with appropriation mechanisms. In relation with knowledge spillovers, learning mechanisms (inverse engineering, patent divulgation, specialized journals and fairs) are not local, and it has not been demonstrated that imitation speed reduces with distance; besides, knowledge flux is more related to acceleration of

innovation appropriation strategies than with innovation opportunities. There are differences between geographical concentration and production and innovation level, concentrating production in sectors with low technological levels, showing knowledge is not homogeneous in concentrated productive sectors. Authors mention the time it takes for scientific discoveries to transform in innovations, that demonstrate university activities not necessarily generate innovation, and firms requirements of basic information does not necessarily appeal to the closest university, since interaction does not require co-localization. By last, Breschi & Lissoni (2001) affirm that agglomeration isolated firms could have some advantages: keep privacy and launch innovations earlier.

Breschi & Lissoni (2001) affirmations are a call of attention to avoid dealing with conceptual issues superficially, conceptual confusion, and get hurriedly wrong conclusions. In the 1990s geographic closeness role with knowledge exchange was overestimated, especially tacit knowledge. Even though, paths proposed by authors to research based on commercial aspects of themselves (labour market and different intellectual property contractual systems) could lead to ignore aspects like institutional or cultural contexts that would influence knowledge exchange agents formation and function.

However, papers from first half of the 2000s were a clear answer to many of the questions raised.

Lombardi (2003) presents a theory on dynamic changes inside a LPS of a competitive environment explaining how information flows from environment to the system and how knowledge structures itself in a local environment. Micro-behaviours of each relationship, generally of vertical type, produce “patterns” that define LPS cognitive configuration, and Lombardi names it as “invisible mind”, in which dynamic balance and evolutionary trajectory analysis (and its localization patterns) are done in a Darwinian way, achieving collective efficiency (competitive advantage is achieved in joint activities of agglomerated firms: collective order systems) and during fast evolution, 'systemic' entrepreneurs are fundamental in the creation of new economies of scale and scope. Factors causing LPS evolution are information and knowledge fluxes (creation and organization), in relationship between firms in a constant coordination for production problem solving (costs reduction, quality control; quality, quantity and opportunity offer). This dynamic corresponds to systemic properties and incentives coming from a competitive environment, economic activity qualities.

For Lombardi (2003) industrial districts evolve when scale static economy changes to dynamic, in the search for new competitive abilities. Such transformation, even if it is not equal for every LPS, can be summarized in three phases: 1) expansion, through accumulation and activities variation of tech-productive competences due to high interaction between local entities, competitiveness based on production increase and price reduction, and abilities to satisfy variable and fragmented demand; 2)

paralysis and transition, origins in technological and demand discontinuities in a complex and turbulent scenario due to apparition of new competitive advantage sources as internationalization affects demand, but also the supply of raw materials, semi-finished products and production technology, firms formal and informal groups growth, and LPS reorganization; and 3) resumption, based on new systemic functioning models, like diversification, products quality increase, relationship restructuring between firms, and redistribution of work and competence divisions, achieving competitive abilities different to price. This final phase requires demand "endogenization", in which productive behaviour demands dynamic and interactive information fluxes, affecting acquisition mechanisms, data processing, and strategies formulation. Based in general theory of systems, LPS knowledge dynamics with three initial variables (boundary conditions established by belonging sense, share values, entrance barriers, and relationship generation with other firms; types of interaction between components are high frequency dynamics between local agents and low frequency with external agents; and strategic information fluxes, technical productive, and costs and productivity), three types of agents arise: 1) final firms, collect and translate market signal and possess hidden information; 2) static firms, routinely producers and outsourcers; and 3) system integrators, that act in relevant functions as social a/o collective services, or public goods supply. Type of agents and information configure relationships between firms and generate a behaviour pattern looking to adapt in an environment with limited intrinsic resources, as well as norms and values of LPS. Such behaviour creates a cognitive structure explained by two base factors: an "invisible hand" as a spontaneous process that strains evolution of operative units, achieving balance in reciprocal settings, and the "hidden hand" with intentional actions, with unintentional results, that grant global stability to LPS. At the end of Lombardi (2003) study, describes "visible minds", that are complex coordination systems explicitly designed to answer to evolution pressure (faster changes in market signals) demanding differentiation strategies, market stability, productive flexibility maintenance, market strategies, production planning and programming and logistics cycles, aspects accentuated by innovation that lead process and materials become obsoletes without caring of knowledge accumulation.

Gertler (2003) stablishes that tacit knowledge can only be produce by apprentice teacher interaction, or in collective problem solving, requiring a social context (values, language and culture), mutually accepted and stablished, that answers only to its creators specific characteristics. Accordingly, tacit knowledge determines innovation geographic activity due to three characteristics: 1) difficulty for long distances transmission, 2) specificity nature for a context makes it useless for other contexts, and 3) creation nature and innovation evolution from interaction and learning (socially organized) between economic agents (firms, clients, suppliers, competitors), academics (universities, laboratories) and public institutions (technology transfer centres, development agencies).

Storper & Venables (2004), theoretical base proposes that urban productive concentrations are based on face to face contact (F2F) and presents four principal functions: 1) the most successful communication technology with high frequency, fast feedback and corporal signals addition, present to transmit uncoded information; 2) solving confidence and incentives problems through falsehoods detection and time commitments, apply mainly in meetings and encounters; 3) easies socialization and learning by loss of anonymity, possibility to judge and be judged, and acquisition of share values, present in professional groups integration; and 4) provides psychologic motivation with performance visualization, applicable to presentations. Face to face contact happens in environments of imperfect information, fast changing and is not easily encoded, which are characteristics of creative activities. Storper & Venables (2004) explanation of face to face contribution to LPS emphasizes in allowing organizations to obtain clients and suppliers (negotiations, evaluations, and relation adjustments), labour (identification), and interactions that promote technological innovation (information fluxes, qualified labour circulation allowing firms to recombine knowledge and imitate best practices) through random and informal encounter promoting interaction and creativity.

Face to face theoretical elements in a microeconomic theory focus on two axes: first one is information exchange that promotes joint project participation, achieving agreements of participants and developments with minor efforts than those done independently with information exchange fails (for creative projects are exhausting and hard to encode) will take each participant to increase their own activity when perceives the other is not making sufficient effort. The second one is high level group integration by individuals that must make an effort to stay demonstrating their talent through successful projects so they do not get excluded from the group, and that must have an adequate level of tolerance, because, if it is low, it can lose talented individuals that had a hard period, and if it is too high, might not get rid of low talented individuals. This group of actions generate high efficiency in communication; coordination and efficiency in environment of uncertainty; high performance groups, and individual motivation (by individual recognition or social sanction) that grouped provoke a buzz. However, this buzz demands workers meet frequently and share common spaces, meaning that a share location must exist with long time effects, generating strong groups in specific regions: buzz cities with networks for project management coordinated where talented people meet with disposition to collaborate, easiness to asses low cost projects, and interactive base knowledge (creative and cultural functions, commercial and financial services, science and technology research and influential power, plus becoming and attractive destiny for talented workers). Storper & Venables (2004) end up warning that co-localization has a cost (for individuals, groups, firms and society as a whole) and must always be assessed not only immediacy, but at long term: face to face process are not good or advantageous by themselves, but to the extend they achieve their objectives.

Giuliani & Bell (2005) study identifies productive knowledge flux, structure, and its determination in a LPS learning ability, from the optic of individual firm behaviour: ability to absorb external knowledge, describe initially by Cohen & Levintal (1990), to disseminate and exploit creatively shaped knowledge by learning dynamics of the sector as a whole, individual behaviour that affect collective behaviour in a LPS. Individual and collective behaviour determination of firms in LPS is due to: 1) firms with greater absorption capacity are more likely to establish links with knowledge sources outside a region; 2) links between local firms are more likely to develop between firms with greater absorption capacity and firms with different levels of ability are more likely to create different type of cognitive positions in a cluster knowledge system; and 3) knowledge system inside a group would be structured and differentiated, reflecting different "cognitive subgroups" existence.

For Giuliani & Bell (2005) firms behaviour is divided in 5 groups: 1) technological gatekeepers, high ability firms with internal and external knowledge exchange entering knowledge to the cluster; 2) active mutual exchangers, firms with lesser cognitive abilities but balanced between knowledge entrance and source; 3) mutual weak exchangers, similar to group 2 with lesser contacts inside the cluster; 4) external stars, firms with strong external links but very limited with the cluster; and 5) isolated firms, with scarce cluster linkage and external sources. This way, it is evident the cluster cognitive ability as a whole (meso-characteristic) is determined just by some firms (micro-behaviour) mainly by technological gatekeepers, active mutual exchangers and to lesser extend by mutual weak exchangers. The study did not find a relation between geographic location and its cognitive activity inside the cluster. Thus, in the conclusions is found that cognitive relationship of firms has a greater importance than its spatial proximity.

1.3 Proximity dimensions effects on LPS

Finding of multiple factors affecting knowledge flux, is clear that physical proximity by itself is not sufficient to achieve interactive learning. Due to of such diversity of observations and approaches, several authors present compilations on the subject. One of the most frequently cited (in empirical and theoretical researches) is Boschma (2005) on which proposes a wide accepted theory that unites such factors diversity in 5 proximity dimensions (geographic, cognitive, social, organizational and institutional) with different impact mode over knowledge flux, each one offering possibilities and limitations to innovation. Over this theory, and over proximity dimensions definitions and study mode identify by Knoben & Oerlemans (2006) in their literature review, more detailed research have been done to clarify impact of proximity dimensions on innovation and LPS competitiveness.

Boschma (2005) theory states that geographic proximity is either not necessary or sufficient to achieve learning and innovation between firms. With this premise two important aspect formalized for LPS study: 1) as geographic proximity is not sufficient, other proximity dimensions are required to encourage knowledge exchange between firms, presupposing the existence of more proximity dimensions; and 2) as geographic proximity is not necessary, other proximity dimensions that meet the needs of physical proximity can supplement it. Following this thought line, it can be stablished that different proximity dimensions could be supply with other strengthen, constituting a type of proximity levels for each dimension that will adapt to particular conditions of each production system, not necessarily local.

From the definitions of each proximity dimension (detailed in this sub-chapter) separately and joint, Boschma (2005) tries to understand exchange dynamic between firms and tries to isolate study factors to stablish its importance and possible interchangeability between proximity dimensions. The author affirms that weak proximities as well as excessive ones are counterproductive for exchange between firms. Consequently, besides defining each proximity dimension, Boschma (2005) presents benefits and barriers that could produce too weak or too strong proximities.

1.3.1 Geographic proximity

Since Marshall geographical proximity has been observed as competitive and innovation factor. As it was described by mentioned authors, most of regional innovation observation models attribute to physical proximity innovation possibilities of LPS. Proximity has been stablished from district (cities zones), cities, regions (set of urban agglomerations next to each other), geographic limits (by transport easiness or resources availability), or political divisions (first or second level with different names for each country). However, Martin & Sunley (2003) question proximity limits pointing the weakness of local productive agglomeration definition (and its processes), proposed by many authors, is the determination of spatial class or limit, and consequently if its processes operate in similar ways independent of the observation scale; at what distance agglomerations stop having effects (firms linkage, knowledge diffusion, rivalry, social or business networks, etc.); or at what spatial density of interactions must exist to make a productive agglomeration viable.

Even though, authors keep basing their observations on geographic proximity. Literature review by Knoben & Oerlemans (2006) found that geographic proximity is defined as territorial, spatial, local or physical proximity, and is the proximity dimension most frequently used, to the point that many authors when using the term “proximity” refer to geographical. Within the use there are three applications of geographic proximity: physical distance between firms, relative distance

(transportation time or distances), or distance perceived by consulting agents. In addition, different applications for analysis exist: distance between two interactive organizations (dyadic distance), or firms presence in a geographic unit (agglomerations).

In Boschma (2005) words, it is generally assumed that the greater the distance between agents, fewer would be the intensity of positive externalities due to difficulty to share tacit knowledge. However, different studies evidence that spatial distance is not sufficient explanation (existing geographical proximity, interactive learning does not happen) and either unnecessary (without geographic proximity existence, interactive learning does happen). Thus, different authors evidence the other proximity dimensions and territorial limits are not defining for knowledge learning and creation networks formation, even encouraging beneficial conditions for other proximity dimensions.

In a recent study, Balland, Boschma & Frenken (2015) affirm that proximity dimensions are dynamic and that, in the case of geographic, proximity dimensions change by organizations decisions on location and relocation, looking to take advantage of local knowledge networks. Such decisions must be done with previous experience information and observation, although it does not stop maintaining a certain level of uncertainty. This search for closeness drives the growth of localized knowledge network and lead other firms to search for closeness, causing an agglomeration process. However, this process present strong inertia, because spatial mobility of firms and individuals is very limited.

Try to define optimal levels of geographic proximity is a polemic task due to aspects raised by Martin & Sunley (2003). Boschma (2005) tries to solve it describing outermost: geographical proximity by defect or excess. Geographical proximity by defect does not produce those benefits of Marshallian externality and does not produce sufficient attraction levels (centripetal force) as mentioned by Krugman (1991). Geographical proximity by excess limits learning because it generates confinement and promotes high specialization, losing the ability to be adaptable to new developments. To solve excess, firms could stablish links with other entities outside their region or their own sector; however, defining spatial scale level ('local': city, region, country) depends on the analysis (creation, transfer and interactive learning) that is being done, although there are multiple levels simultaneously.

1.3.2 Cognitive proximity

As describe in previous paragraphs, geographical proximity by itself is not sufficient to take advantage of available knowledge in a LPS. Cognitive proximity is also required.

Knoben & Oerlemans (2006) define cognitive proximity as the similitude agents perceive, interpret, understand and assess the world, influenced by organizational culture, customs, norms and routines; so, to transfer and receive new knowledge, agents need similar frameworks. The term also used as relational attribute, referring to a group of people that belong to a community, although by definition, this would be more an organizational proximity.

With a slightly different sense, Boschma (2005) defines it as a similitude in competence and abilities that allow effective communication and learning (knowledge absorption); this definition is configured in a similar way to epistemic community guidelines (Beccatini, 1990; Lissoni, 2001), *buzz cities* (Storper & Venables, 2004), and individual firm abilities to absorb knowledge (Giuliani & Bell, 2005) that, together with their acts, configure their function of knowledge diffusion inside LPS and therefore its belonging to a group.

An additional definition intent is offered by Huber (2012) who stablishes four dimensions of cognitive proximity: 1) proximity with respect to a common technical language; 2) similitude in the way of thinking about technology or products; 3) similitude in terms of technical resolution of *know-what*; and 4) similitude in terms of problem solving *know-how*.

Other authors mention technological proximity as a synonym of cognitive proximity. However, for Knoben & Oerlemans (2006) it has a different definition as it is grounded on experiences and technological knowledge: tools, devices and knowledge that intervene in the productive processes and creation of new products or services. For his authors, difference between cognitive and technological proximity, is that the first one is wider and refers to the ability of efficient communication (*how* agents interact), while the second one refers to the ability to learn from one to another (*how* much potential is available). This way, possess of similar knowledge about technology will ease acquisition, actualization, development and anticipation for further developments. Besides, the same authors identify that it is defined by its absorption capacity. Thus defined, technological proximity would be closer to Boschma (2005), Giuliani & Bell (2005) and Huber (2012) cognitive proximity definition. Knoben & Oerlemans (2006), approximations of dyadic definition, technological proximity does not only base on firms ability to share knowledge, but on its ability to recognize offered opportunities by collaborators, at the same time it achieves sufficient differentiation to get profit of it and contributes with new knowledge for the LPS. Thus, the greater the difference, there will be more to learn, but also learn would be more difficult.

Balland, Boschma & Frenken (2015) name cognitive proximity dynamic as “learning”, in which agents knowledge basis change constantly according their accumulative process of specific knowledge leaning

and use of others experience. Thus, learning is a social process based on available knowledge recombination inside and outside organizations, in a co-evolutionary non-linear process between many collaborators, that tend to diminish cognitive distance in more or less voluntary ways, changing complementary knowledge configuration among them.

For Boschma (2005) in his extreme level analysis, low cognitive proximity will take a LPS to a low comprehension between agents. Conversely, excessive cognitive proximity is counterproductive because: 1) there is no difference, complementarity or novelty in knowledge for any of the parts neither increase; 2) in organizational routines would cause closure to new technologies or markets, causing a trend to conserve a successful past; 3) involuntary knowledge exchange can happened that the firm wants to preserve for itself that would make it loose competitiveness, although overall it would be a favourable spillover for the system. Effective learning by interaction can be achieve keeping some cognitive distance (limiting overlaps) and securing cognitive proximity (to ensure communication). Although, in evolved clusters, with high specialization, cognitive proximity would be difficult. Interactive learning needs absorption capacity for new ideas.

1.3.3 Social proximity

Further from the idea that knowledge is available for anyone living in a region, descriptions of Beccatini (1990), Schmitz (1995), Belussi (1999), Lissoni (2001), Lombardi (2003), Scott (2004), Storper & Venables (2004) and Giuliani & Bell (2005) stablish that a social agreement is required, in which an agent (person or organization) or group of agents accepts knowledge exchange with other asking for it, and therefore, an approximation is required beyond cognitive and geographical, for such acceptance to take place.

For Boschma (2005) economic relationships are included, and therefore affected, in social contexts, so as much socially rooted are firm relationships, learning becomes more interactive. Confidence relationships based on friendship, family relations and experience, which require commitment and lasting relationships, facilitating the exchange of tacit knowledge and is difficult to trade in markets. One of the main advantages of social proximity is that reduces risk of opportunist behaviour by agents.

Knoben & Oerlemans (2006) review found that social proximity (also mentioned as personal or rational proximity) refers to agents that share same relation space in which actions and economic results of firms are affected by dyadic relationships and by the structure of relationships in the LPS. Consequently, the study of this proximity dimension could be done in two ways: observe it belonging to a same “community” (practical, epistemic, cognitive, etc.) that focuses on group characteristics; or

similar relationships with third parts between two firms, that focuses on organization collaborative characteristics.

On the other hand, Huber (2012) intend to deepen the concept in three dimensions: knowledge of the other, grade of knowledge of the other in terms of private life in previous interaction; emotional closeness, identifying feeling of personal concern between two agents; and personal obligation, or how much commitment feels a person to help other when asking for a significant period of time.

Social proximity dynamic described by Balland, Boschma & Frenken (2015), is caused by changing context of social relationships in a LPS. Named "*decoupling*" because its dynamic of change exists by itself and can be isolated from an original context (for example, colleagues keep their relationships even after changing firms). These relationships are always present due to constant mobility of workers between organizations (universities, institutions a/o firms) along their professional careers. Other source of social exchange are inter-organization firms that promote friendship and confident between their participants.

For Boschma (2005), low social proximity will avoid generation of confidence linkage between agents, necessary for interactive learning. On the other hand, high social proximity presents at the same time positive and negative consequences: high loyalty based on emotions, rejects opportunism, especially in markets where policy and technology change continuously in to uncertainty conditions; but also blocks members, by confidence in its own development, and can deny entrance to new members and ideas. To avoid these negative consequences, firms must keep alert, open minded and flexible with rooted social relationships to lower transaction costs and ease organizational learning. Relationships between organizations can be kept formally (through contacts) with business relationships and informally (just confidence) with personal commitment relationships.

1.3.4 Organizational proximity

In addition to physical closeness, absorption capacity, similar understanding, and confidence, coordination ability between agents is another requirement identified in literature for an adequate interactive learning environment inside LPS. However, organizational proximity is one of the fewer approached proximity dimensions in theoretical discussions and empirical studies.

Knoben & Oerlemans (2006) mentioned many definitions of organizational proximity, and the most widely accepted is the one that allows agents easiness to interact by rules (explicit or implicit) and behavioural routine that share the same representations and believes systems, base of practical

communities. In its structural definition authors focus in organizational relationships characteristics, or its belonging to the same network; it dyadic definition specific relationships are observed between firms, in which organizational proximity is determined by context similitude in which members of different organizations work.

Giuliani & Bell (2005) grant enormous importance to organizational proximity, since basis of their model is the way firms interact with agents whether inside LPS, or with external agents. Even though model emphasizes in firms cognitive abilities, is clear that difference in behaviour between groups is due to organizational proximity; for example, external stars are subsidiary with high knowledge absorption capacity (that can be similar or superior to technological gatekeepers, and could have a high cognitive proximity), but a low local interaction explained by low organizational proximity that has with other local agents.

For Boschma (2005), organizational proximity is the ability for coordination between knowledge holders (inside and between firms) and is relevant for interactive learning that must be realized through relations and exchanges. Many government models exist (market, firms, network) that differ in its autonomy and control level, and these characteristics define organizational proximity grade, from organizational proximity absence, to highly hierarchical firms or networks. Organizational proximity reduces uncertainty and opportunism in new knowledge creation, securing respect to right owners and sufficient rewards for investors in new technology; plus offer network connections, knowledge feedback between participants, access to complementary information sources, promoting interactive learning.

For Balland, Boschma & Frenken (2015), organizational proximity dynamic is named “integration” process, and refers to a progressive reorganization of subsidiaries, unities, departments or institutions inside an organizational structure, becoming more evident in organizations fusion and acquisitions process.

Extreme proximity dimensions levels analysis for Boschma (2005) weak organizational proximity can increase uncertainty and opportunism, besides not producing benefits describe before (coordination ability, access to complementary knowledge). In an opposite way, an excess of organizational proximity would promote highly hierarchical structuring, promoting as well as confinement, blockages, dependency, new information access limitations, scarce feedback, and inflexibility, all these aspects opposed to the requirements of innovation. Adequate level of organizational interaction is linked to its cognitive proximity (that must be mutually complementary), allowing autonomous division with

bonds of trust. Within empirical studies consulted is noticeable a strong inclination to observe organizational proximity just at the interior of agent, and very little among them.

1.3.5 Institutional proximity

An adequate institutional environment, with existence of a wide and clear consensus about norms and conduct values, would offer to interactive learning and consequent knowledge exchange, necessary confidence for agents. Is one of the less studied empirically, even though it presents strong conceptual basis.

Within factors formulation affecting LPS development, Belussi (1999), mentions, between other factors, the reduction of transportation costs related to uncertainty since agents share same local traditions, productive culture, communitarian rules, and communication codes, that together diminish opportunism and parasitism. His empirical studies in Italian industrial districts stablish that markets spontaneous dynamic has been channelled, limited and stimulated by institutions, conceived as collective actors capable of supplying public goods of economic value or stablishing institutional models, norms and regulations that allow agents cooperative interaction. Policy as institutional environment manifestation have variated influence (positive, negative and neutral) on LPS performance; thus, what works in a region might not work for others

Nelson & Sampat (2001) define institution in a wide sense including legal and regulatory regime, governmental structures, forms that firms are organized and managed, behaviour patterns (cultural, standard, expectations), or concrete entities (e.g. ministries, universities, banks, national innovation systems, etc.). Joint and coordinated actions and interactions of all of them determine institutional context (determined by law, norms, believes, costumes, expectation and government structures, organization and transaction) of a LPS and must be articulated with technological development to obtain good performance. Based on these definitions, Nelson (2008) stablishes that institution formation is achieved through costumes, feedback reinforcement with social system that integrate with institutions, and accumulative progress in experience and diffusion. This institutionalization makes them enjoy stability, even if is hard to transform, design and control them. At the same time, institutions functions inside LPS are: support and motivation to overcome entrepreneur risks, with economic and social culture transformation; development must brake Schumpeterian circular flux of economic activity to finance new entrepreneurs needs; and labour market must transform for new firms viability.

Boschma (2005) definition about institutional proximity dimension stablishes that proximity between agents at macro level, framed in an institutional job, but differentiated in a macro institutional environment (conduct norms and values), and micro agreements (norms and values embedded in specific exchange relationships), this last included by social and organizational proximities. Institutions work as "glue" for collective actions because strengthen social cohesion, allowing sharing values, reducing uncertainty and diminish transaction costs. Formal institutions (law and rules) and informal (values, norms and cultural habits) influence actions and coordinate actors, allowing mechanisms that affect, further than economy, knowledge transference, interactive learning and innovation.

Knoben & Oerlemans (2006) literature review finds two ways to approach institutional proximity: in a general level as similitudes in institutional frames (legislative conditions, labour, business practices, accounting rules, etc.) of countries and regions, influencing formal and informal institutions; at a particular level, in organization assimilation (their own routines and norms) of such institutional frames, and is the difference between general and particular norms that determined institutional proximity grade.

Another type of definition less used in literature reviewed by Knoben & Oerlemans (2006) but complementary to institutional proximity definition is "cultural proximity", in which thinking, feeling, behaviour and symbols patterns allow interpretations of situations, and those patterns are widely accepted by a group in a determined moment which characterizes and generate some proximity dimension among its participants, and at the same time differentiate from other groups.

Institutional context dynamic is named by Balland, Boschma & Frenken (2015) as "institutionalization" and describes in a shorter form the same guidelines mentioned by Nelson (2008).

Boschma (2005) institutional proximity levels analysis stablishes that institutional environment can become a collective learning constrictor due to institutions interdependence and complementarity. Because effectiveness should be achieved by participants joint balance, institutionally looks to stay constant, and tend to blockage and local inertia. Conversely, change (proper of innovation) requires institution transformation and consequent relationships tend to unbalance all. Therefore, institutional environments tend to be rigid and do not ease new experiences or creation of new institutions require for new ideas. An effective institutional structure must be stable (diminishing uncertainty and opportunism), open (enabling opportunities for new entrepreneurs) and flexible (allowing adaptations and institutional creations). An adequate institutional environment requires power balance, avoiding large organizations and institutions to control the system for their own benefit.

“Como no estás experimentado en las cosas del mundo,
todas las cosas que tienen algo de dificultad te parecen imposibles”.

(Miguel de Cervantes Saavedra, Don Quijote de la Mancha, 1615)

2 METHODOLOGY

With general objective aiming to settle the correlation of proximity dimensions with innovation performance inside local production systems (LPS), and complementary, first specific objective seeks to identify correlations of production characteristics, innovation ability, and experience with each proximity dimension indexes of firms with the others in LPS, and the second specific objective that aims to establish correlations of firm characteristics and proximity dimensions with their outcomes three years before the interview, this quantitative research with a qualitative context was planned to observe the properties of each LPS in two different countries of Latin America. The purpose of studying two LPS seeks to identify similarities and differences in firm characteristics, their proximity dimensions and results. To do so, it is explored that they must be from the same industrial sector (labor intensive given their importance for employment generation), of similar sizes, with approaches to the domestic market.

Proximity typology theory and its complementarity were identified through literature review (Boschma, 2005) as source of heterogeneity not only for individual behaviour of each firm, but as a systemic behaviour of the set of firms (Giuliani & Bell, 2005).

Thereby, study of two LPS (female footwear production in Jau, São Paulo, Brazil and Cali, Valle del Cauca, Colombia) representative of production reality in each region, were chosen: low technology complexity, labour-intensive, with vertical work relationships prevalence and rare horizontal work relationships, conformed mostly by small and medium firms with few presence of big ones.

Two LPS belonging to the same industrial sector were choose to keep factors affecting results constant and away from unknown influences and out of observation control (E.g., technological paths affected by different acting agents, or updating cycles by differential demand requirements, portfolio updating cycles by differential demand requirement). Finally, and with the porpoise of avoiding unknown influences, local production systems focused on their own country internal market were chosen, as production for exportation demands adaptations to others countries markets that origin additional effects on actions and competitiveness and innovation mechanisms in firms. Table 1 summarizes main LPS characteristics in Jaú and Cali.

Table 1. General LPS characteristics in Jaú and Cali

Quality	Local Production System (LPS)	
	Jaú (São Paulo, Brazil)	**Cali (Valle, Colombia)**
Product type	Footwear	Footwear
Product type (detail)	Female	Female Masculine Sport footwear Child footwear
Technological complexity	Low	Low
Labor Intensity	High	High
Vertical Relationships (supplier-costumer)	Strong	Strong
Horizontal Relationships (between competitors)	Weak	Weak
Number of firms	400	357
Firms Associated	120	120
Direct employment	8000	3041
Composition	Some big Mostly medium Some small	Some big Few medium Mostly small
Technological update source	Italy Brazil	Italy Brazil China
Main Market	São Paulo metropolitan área	Cali and regional cities (Valle and Nariño)

Source: Own elaboration.

2.1 Proximity research approach

Proximity methodology review exposed many boarding ways, depending on conceptual approach, proximity type (geographical, cognitive, social, organizational, and institutional) and available information to make the research. Long before Boschma (2005) and Knoben & Oerlemans (2006) defined different types of proximity, many authors done theoretical foundation and empirical studies proving their existence. These definitions contribute to unify a conceptual set to study proximity complementary requirements demanded by LPS for knowledge spillovers. From an evolutionary perspective of knowledge areas, falsificationism process, in which theories rebut with counterexamples, or remain verified according to Popper (1934), occurred since long ago to proximity, as result of tests and rebuts towards creation and diffusion of knowledge in LPS, leading to the construction of a hard core as that describe by Lakatos (1963) in research programs.

Such development level lead research more to quantitative than to qualitative approach in last years, searching to strengthen knowledge base, and consequently, consolidate proximity measurement methodologies. However, the process is not definitive and is a source of discussion since proximity components characteristics (E.g., proximity levels and grades on knowledge, empathy, corporate culture, etc.) are concepts more easily describe qualitative than to measure quantitative. Measurement systems diversity identified through literature lead to recognize a highly conceptual dynamic not resolved on this research area, but at the same time offers a wide options range for construction of adapted indexes to production conditions of systems to be assessed.

2.1.1 Proximity measurement

Geographical proximity has been defined by physical distance, means of transport and perceptive (Knoben & Oerlemans, 2006). First two are easily measurable due to their conceptual explicitness as well as the amount of technological resources that allow assigning a number to the distance between two points, whether it is absolute or according to available means of transport infrastructure (water, land or air transport). In addition to distance determination, some authors group them by closeness, vicinity, regional level (Aguiléra, Lethiais, & Rallet, 2012; Teixeira, Santos, & Oliveira Brochado, 2008), while others fix centroids determined by geo localization to stablish the degree of proximity (Paci, Marrocu, & Usai, 2014). Finally, geographical proximity by agents' perception is hardly comparable between studies due to different spatial and logistical references for each individual.

Cognitive proximity measurement according reviewed literature has been done by three different perspectives: by comparing cognitive capacity levels, industrial or technological classification, and from agents' perception. First measurement, from firm cognitive capacity, adding and weighing up aspects like number, training and experience of personnel assigned to research, development and innovation (R&D&I) plus investment level in the same aspects (Boschma & ter Wal, 2007; Giuliani & Bell, 2005). Second measurement, in a dyadic way, especially when comparing two LPS, identifying similarities in industrial classification areas (Teixeira et al., 2008), or similarities in patent technological classification (Paci et al., 2014); this methodology approaches more to proximity measurement technologically than cognitively. The third measurement in a perceptive way, consulting agents about cognitive proximity they believe other agents have (Huber, 2012).

Social proximity measurement has recently developed and has three strategies: interaction index between agents, relationships strength perception and network analysis. First, identifying aspects that manifest the level of social interaction as a period of time that two agents hold a relationship (business relationship, joint circumscription to a third agent, joint development of projects, etc.), or the number of participants involved (Aguiléra et al., 2012). Second, asking directly to agents about relationships strength, identifying the grade of proximity to other agents, and/or characteristics such as self-knowledge, level of confidence and wellness concern (Schmitz, 1999). Third, characterizing social networks inside LPS and identifying social relationship geodesic distance (number of nodes between two agents) (Paci et al., 2014).

Organizational proximity has been limited resolved in terms of measurement due to low theoretical approach. However, three measurement methods have been identified: degree of belonging to an organizational set, organizational perception and indexes definition. The first one tries to stablish the

type of relationship between two organizations, this is, degree of belonging to the same business group, or if are both associated to the same type of organization (Usai, Marrocu, & Paci, 2015). Second one asks firms if physical proximity has facilitated the relationships between firms (Aguiléra et al., 2012). The third one examines aspects as number of interorganizational collaborators in R&D&I projects (Paci et al., 2014).

Even though institutional proximity references aspects like law, cultures and behaviours, by definition, is the one with less measurement typologies and scarce studies. In general, institutional proximity is dyadic measured, studying two or more LPS, and define if two agents belong to a same region politically limited (country, province, locality) and therefore are ruled by same law, culture and habits, or belong to a sector, allowing to filter similar behaviour (Aguiléra et al., 2012; Knoben & Oerlemans, 2006; Teixeira et al., 2008). Though its applicability making comparisons between two systems, this type of measurement completely controverts the base of conceptual discussion that demonstrates that agents' behaviour and habits within a LPS are heterogeneous and therefore not applicable to intern studies.

2.1.2 Analysis models for proximity indexes

Aiming to correlate proximity indexes, Boschma & TerWal (2007) and Gebreeyesus & Mohnen (2013) analysed proximity issues for footwear firms, case study an European and a African country, offering measuring and analysis alternatives between two edges of productive evolution, with common sectoral dynamics.

Additionally, Huber (2012) study on hardware and software industry, and Paci, Marrocu & Usai (2014) comparing industrial dynamics from 276 European regions, even though both approaches are distant from footwear, they addressed a systematic treatment of proximity factors from which one can obtain relevant references to indexes construction for the present study.

Boschma & TerWal (2007) made observations on Barletta district (south of Italy), LPS conformed by small and medium enterprises of casual injected sole footwear for *lower market spheres*. The authors grouped data on *network position*, firm characteristics and *innovative performance*. Made analysis include correlations between firm features and its network position using Kruskal-Wallis and Kendall tau-b, network position and innovation performance using Kruskal-Wallis, and firm features correlation with innovation performance using Kendall tau-b method.

Gebreeyesus & Mohnen (2013) studied innovation performance in a footwear cluster at Addis Ababa (capital of Ethiopia). Firms, mostly informal, that emerged due to international competition (especially chinese) by means of innovation efforts. Authors rate innovation performance (dependent variable) by two stages least square method (2SLS), and independent variables grouped by 1) network (commercial and knowledge exchange, type of relationship), 2) knowledge absorption capacity, and, 3) other firm features (antiquity, entrepreneur years in business, ethnic group, business, bargaining power).

Huber (2012) case, studying hardware and software industry in Cambridge (Cambridgeshire, England), approaches theoretically and methodologically to spatial, social and cognitive proximities, dividing (in four dimensions) and comparing them together. The four dimensions of cognitive proximity were measured consulting firms about their perceptions using a Likert scale, and individual results were averaged to obtain a cognitive proximity index. The same treatment was applied to three dimensions of social proximity to obtain a unified index. Each dimension and index were compared with Spearman correlation coefficient (ρ, rho).

Paci, Marrocu & Usai (2014) analysed proximity dimensions on innovation capacity in 276 European regions and they estimated a knowledge production function that has exogenous variables as R&D&I and human capital. This is how proximity factors (geographical, technological, social and organizational) correlate between regions measuring dyadic pair of regions with innovation production capacity. *Spatial autoregressive* (SAR) model was used to make estimations.

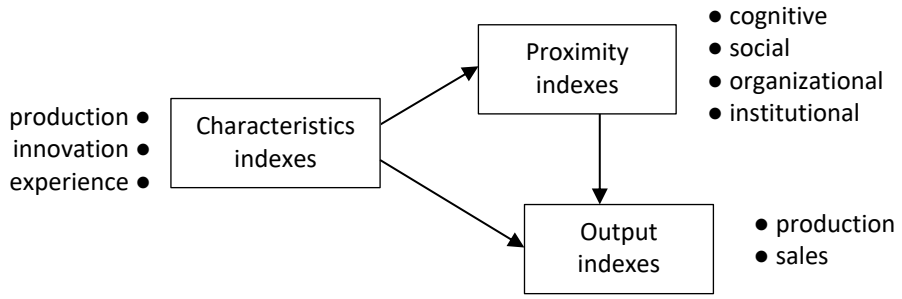
2.2 Empirical model approach

Based on methodological and theoretical references, and aiming to identify proximity factors that promote innovation on small and medium enterprises in LPS through knowledge interaction, an empirical model of a quantitative nature is proposed, to collect information directly, through personal consultation to over 15% of firms that make up each LPS (average reference for a study), by means of structured interviews. Direct structured interviews allow identifying quantitative features as well as concerns and expectations from the interviewed offering a wide and contextualized set of answers.

Figure 1 represents research purposes to identify how firms' feature correlate with proximity indexes and innovation performance. Firms has set of features: 1) production, 2) innovation, 3) public policy participation, 4) experience, and 5) business relationships. Proximity indexes to stablish are non-geographical, as by definition, LPS share territory, and variation is present in other type of proximity: 1) cognitive, 2) social, 3) organizational, and 4) institutional. Performance indexes are grouped in two

dimensions: 1) production and 2) sales. Model base is analytic specification as depending on data analysis, its measure must correspond to such analysis.

Figure 1. Innovation, proximity and firm indexes correlation



Source: Own elaboration.

2.3 Analytical specification

Based on mentioned authors and adapted to concerns and LPS characteristics intend to study, a condensed estimation model is presented in Table 2, Table 3 and Table 4.

Table 2. Firm features and proximities relation

	Cognitive proximity	Organizational proximity	Institutional proximity	Social proximity
Production size				
Innovation investment				
Experience				

Source: Own elaboration.

Table 2: dependent variables are proximities and independent variables are dimensions of firm features.

Table 3. Proximity dimensions and innovation performance relation

	Production performance	Sales performance
Cognitive proximity		
Organizational proximity		
Institutional proximity		
Social proximity		

Source: Own elaboration.

Table 3 relates proximities to innovation performance indexes (production and sales).

Table 4. Firm features and innovation performance relation

	Production performance	Sales performance
Production size		
Innovation investment		
Experience		

Source: Own elaboration.

Table 4 relates firm characterization dimensions to performance indexes of production and sales.

2.4 Variables specification

Tables presented in this section were created for measure variables specification aiming to answer a theoretical issue (corresponding to each row). For each variable, literature was consulted and a construct was developed, as it is an explanation that justifies hypothesis, and a question and measurement indexes were built consequently.

2.4.1 Base characterization

Production dimension (Table 5, rows 1 to 3) quantifies annual production level in terms of product quantity, amount of personnel, and type of product, last one with a qualitative approach.

Innovation dimension (Table 5, rows 4 to 10) is characterized through several indexes of activity diversity that strengthen innovation, recent developed products portfolio behaviour, latest usage of new materials, machinery installation, organizational changes, entry into new markets, and innovation structure, the latter identifying if the firm has an area dedicated to innovation, the number of people working in it, its dedication and training level.

Participation dimension (Table 5, row 11) aims to stablish if a firm has received support from public policy programs that strengthen innovation capacity and the type of support.

Table 5. Firm features variables

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
Production dimension					
1. Pair of shoes annual production	Boschma & TerWal, 2007	Basis for stablishing innovation performance of processes	1A. The greater production volume, the greater amount of processes innovation	What is the number of pair of shoes produced last year?	Number of pair of shoes produced last year
2. Employee number	Boschma & TerWal, 2007	Basis for stablishing product innovation performance	2A. The greater employee number, the greater product innovation	What is the average number of employee last year?	Employee number

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
3. Type of product	-	Comparison between sale price levels and firm innovation output	3A. The greater average sale price, the greater firm innovation	What type of product has the firm? What is the average sale price?	Average sale price
Innovation dimension					
4. Innovation diversity	Gebreeyesus & Mohnen, 2013	Innovation activities diversity	4A. Innovation activities diversity represents a greater innovation level	Have you carried out activities to strengthen innovation?[2]	Amount of activities
5. Product innovation	Gebreeyesus & Mohnen, 2013	Increase in product diversity	5A. Launch of new products represents a greater level of innovation	How many new products have launched in the last three years? How many keeps producing? How obtains information about design trends?	Number (relative to total products produce by the firm)
6. Product innovation	Boschma & TerWal, 2007	Product innovation magnitude measurement	6A. New materials incorporation represents a greater level of innovation	How many new materials have used in the last three years?	Number
7. Process innovation	Boschma & TerWal, 2007	New machinery installed is an evidence of process innovation	7A. The greater amount of machinery, the greater level of innovation	How many machines have installed in the last three years?	Number
8. Organizational innovation	Schumpeter, 1912	Innovation diversity support	8A. A firm with recent organizational changes presents an increase innovation performance	Have you made organizational changes in the last three years? Which ones?	Number
9. Market innovation	Schumpeter, 1912	Innovation diversity support	9A. A firm with diverse markets has greater innovation performance	Have you entered new markets in the last three years? Which ones?	Number
10. Innovation structure	-	Trained personnel assigned to innovation affects firm innovation performance	10A. The greater innovation team strength, the greater innovation performance	Does the firm possess and area for innovation (product a/o process)? How many people is involved? What is their dedication of each one? What is the training of that staff?	No: 0 Yes: Formula[3]
Participation dimension					
11. Participation in public policy programs	Giuliani & Bell, 2005 Schmitz, 1999	Identification of the participation of firms in public policy	11A. Participation in support programs is related to high institutional and social proximity	Have you been recipient of public support programs of innovation activities? Which ones?	Number

[2] Options: quality improvement, design improvement, machinery investment, increase in product diversity, staff training.

[3] $\sum_i (P_i * D_i * F_i)$; *P*=Number of persons; *D*=Time dedication of each one (full time, partial time); *F*=1 if person has high scholar education; 2 if the person has undergraduate degree; 3 if the person has undergraduate degree in specific area; +0.5 if the person has more than three years of experience; +0.5 if the person has experience working with other firms.

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
Experience dimension					
12. Firm antique	Boschma & TerWal, 2007 Gebreeyesus & Mohnen, 2013	Innovation capacity is related to firm antique	12A. A greater amount of years eases management. Too many years will encourage status quo maintenance	How many years has been the firm producing footwear?	Number of years
13. Manager experience in the sector	Gebreeyesus & Mohnen, 2013	Innovation capacity is related to manager experience	13A. Greater experience of the businessperson would ease firm management. Too many years would favour the status quo	How many years the manager has been working in the sector?	Number of years
Relationships dimension					
14. Firms with business relationships	Lissoni, 2001 Giuliani & Bell, 2005	Vertical relationships (clients and suppliers) are sources of information for innovation	14A. A greater number of business relationships increases firm information flux	What is the actual number of suppliers? How many are local? What is the actual number of clients? How many are local?	Number
15. Firms with innovation relationships	Giuliani & Bell, 2005 Gebreeyesus & Mohnen, 2013	Innovation knowledge relations are source of innovation capacity	15A. A greater number of relations with innovation information, increases firm innovation capacity	Have you exchange information and/or experiences for improvement with other firms in the last three years? How many firms? Are changes in your firm based on information exchange?	Number

Source: Own elaboration.

Experience dimension (Table 5, rows 12 and 13) aims to stablish firms antiquity (in years) and founder previous experience.

Finally, relationship dimension (Table 5, rows 14 and 15) stablishes business relationships inquiring about number of suppliers and customers, in addition to their location (internal or external to the LPS), and the amount of information and experiences exchange with other firms.

2.4.2 Proximity indexes

Cognitive proximity measurement (Table 6, rows 1 to 5), as Huber (2012) study, is realize by index, based on the four dimensions average, measured on Likert scale from 1 to 7: technical language, process and product thinking, know-what and know-how.

Social proximity (Table 6, rows 6 to 8) is also measured by a Likert scale from 1 to 7 and aims to identify different dimensions stablished by Huber (2012) and used by Gebreeyesus & Mohnen (2013) too.

Organizational proximity (Table 6, row 9) is an index constructed by this research that aims to stablish and identify, from innovation projects ensemble with other organizations, its antique and roles, the degree of proximity firms presents when are grouped with others.

Institutional proximity (Table 6, row 10) is an index constructed based on a similarity matrix that compares four themes of interest for chosen firms from ten options. Paci, Marrocu & Usai (2014) produce a similar index between two regions, comparing technological classification areas patent belong to.

Table 6. Proximity features variables

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
Physical proximity					
0. Average physical distance of 20% of closets firms	Observations of agglomeration in the region	Physical proximity inside LPS facilitates interaction	0B. Firms located in an industrial district in a region have more interaction than those who are not.	What is the address?	$\frac{\sum_{i=1}^{20} dist_i}{20}$ (Km)
Cognitive proximity					
1. Communication easiness	Huber, 2012	Communication easiness is the basis to cognitive proximity	1B. Greater communication is an evidence of greater cognitive proximity	How easy is to communicate to other firms' source of knowledge?	Likert scale
2. Technical language	Lissoni, 2001 Huber, 2012	Cognitive proximity is evident trough technical language similarity	2B. A greater similarity in technical language is an evidence of greater innovation intensity	How different is your technical language from those other firms you collaborate with?	Likert scale
3. Production technologies	Lissoni, 2001 Huber, 2012	Cognitive proximity is evident in production technologies used by firms	3B. Firms production technology with similarity present a greater cognitive interaction	How different is your production technology from those other firms you collaborate with?	Likert scale
4. Product applications	Lissoni, 2001 Huber, 2012	Cognitive proximity is evident in product innovation methodologies similarity	4B. Firms with greater product innovation technologies similarity present greater cognitive interaction	How different are your ways to innovate in products from other firms you collaborate with?	Likert scale
5. Technical Knowledge	Lissoni, 2001 Huber, 2012	Cognitive proximity is evident in technical knowledge application	5B. A greater similarity in technical knowledge application evidences a greater innovation intensity	How different is technical knowledge of innovation personnel from the other firms you collaborate with?	Likert scale

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
Social Proximity					
6. Personal knowledge	Huber, 2012 Gebreeyesus & Mohnen, 2013	Acknowledge of other activities different from labour	6B. Previous acknowledge level is the basis to improve interaction	What type of relationships holds with other firms' employees? (Family, friendship, common projects, neighbours, others)	
7. Welfare concern	Huber, 2012	Emotional connection to other collaborative firms	7B. Grade of concern is basis to good relationships	What is the grade of concern about people who exchange information and/or experiences of improvement with you?	Likert scale
8. Help commitment	Huber, 2012	Reciprocal commitment	8B. Commitment grade evidences relationship grade	How committed do you feel to help half day of work?	Likert scale
Organizational Proximity					
9. Management ability in joint innovation	Boschma, 2005 Knoben & Oerlemans, 2006	Participation and management in joint projects are an evidence of organizational proximity	9B. Participation and management of projects are an evidence of greater organizational proximity	Have you join product and/or process innovation projects in the last five years? How many? What role did you play?	Formula[4]
Institutional Proximity					
10. Interest similarity in firm development issues	In an indirect way from Paci, Marrocu & Usai, 2014	Comparison of development interests present in firms	10B. A greater institutional proximity would present similar interest with collaborators	Select 4 of the main areas of interest from the list that the firm has been developing on the last year[5]	Coincidence number (1.2.3.4)

Source: Own elaboration.

2.4.3 Innovation performance

Boschma & TerWal (2007) and Gebreeyesus & Mohnen (2013) aimed to identify innovation performance. Here are presented condense in two facets: innovation results on production and sales,

[4] $\sum_{i=1}^{n} \frac{Projects_i}{Antiquity(years)} * \frac{Role_i}{\log(employee)}$; *Role*=1: manager; *Role*=0.5: participant.

[5] Options: marketing channels; market diversification; product diversification; productive efficiency; knowledge management; market intelligence; internationalization; logistics; new technologies; quality; others.

supposing this characteristics dynamics (increase, conservation, decrease) are based on innovation effectiveness.

Production dimension (Table 7, rows 1 and 2) identifies production level dynamics and employee number hold by a firm in the last three years.

In the same way, sales dimension (Table 7, rows 3 and 4), identifies sales dynamics in the last three years, plus sales percentage from recent developed products.

Table 7. Characterization of innovation performance variables

Theoretical issues	Source	Constructor	Hypothesis	Questions	Index
Production dimension					
1. Production variation	Boschma & TerWal, 2007	Innovation process efficiency	1C. The greater production volume, the greater innovation process	How has been the variation in number of pair of shoes produced in the last three years?	Increase, decrease, maintenance
2. Employee number variation	Boschma & TerWal, 2007	Products innovation efficiency	2C. The greater employee number, the greater amount of product innovation	How has been the variation in employee number the firm has had in the last three years?	Increase, decrease, maintenance
Sales dimension					
3. Sales segment by innovation	Boschma & TerWal, 2007	Innovation efficiency on sales volume	3C. A greater sales percentage of new products in total sales volume represents greater innovation efficiency	How many sales percentage of last year corresponds to the new product models developed in the last three years?	new products /total products
4. Sales variation		Innovation efficiency on sales volume	4C. Sales volume variation is related to firm innovation levels	How was sales variation in the last three years?	Increase, decrease, maintenance

Source: Own elaboration.

2.4.4 Interview questionnaire

Interview questionnaire is elaborated based on questions build up. Questionnaire should be done in two languages: Portuguese for Jaú firms (Appendix A – Firm questionnaire (Jaú), p.259) and Spanish for Cali firms (Appendix B – Firm questionnaire (Cali), p.263). As this study aims to ask the same questions to firms from both regions, sequence and numeration is the same for both versions. Questionnaire has five sections so interviewed senses a logical sequence.

Section 1 (**Interviewed identification**) characterizes and identifies the degree of knowledge of the firm and production, innovation, and organizational relationships issues. Section 2 (**Firm identification**) identifies actual production levels, firm antiquity and location. Section 3 (**Production**, questions 1 to

12) asks about products characteristics like typology, price, number of pieces produced, production variation, worker number and sales, and activities focused on productive and organizational improvement; at the end of this section (question 12) a ten options list is presented to the interviewed, and is asked to choose four of the principal improvement activities with major emphasis performed by the firm. Section 4 (**Innovation**, questions 13 to 20) examine product portfolio composition, its renewal methods, product development mechanisms, and design area conformation (in case there is one), with its personnel description. Section 5 (**Organization relationships**, questions 21 to 34) characterize firm business and support network and the impact the network has on the organization

2.5 Sectors selection

For Scott (2006) the importance of labour-intensive and low-technology sectors (such as clothing, footwear and furniture manufacturing, characterized by economic size and wide incidence in most regions of world) lies on it impact on local development, national economic grow and world trade, turning them into engines of growth, development and fair trade in countries with low and high salaries. Scott also states that alike sectors were fundamental for world economy reconstruction after World War II, role underestimated by analysts since they have also been characterized by low wages, low job qualification and labour exploitation; but it can be also identify case oriented to fashion markets with more lucrative opportunities. Finally, in labour-intensive, low-technology sectors characterization, Scott describes a trend to conform networking organizations, as the dense local agglomeration of producers and their growing participation in international subcontracting agreements for the production of parts and components.

Based on this thesis interest to identify innovation process of manufacturing sectors and aiming to answer theoretical requirements for knowledge and proximity themes in LPS discuss on chapter 1, two productive sets with the same business activities (footwear) were choose, similar in size, but in different contexts due to their location in different south American countries, although having many common characteristics, cultural differences, labour markets, world trade, local and national productive infrastructure, public policies, among others, differentiate them in key aspects like size diversity of firms, markets, and production technologies, etc.

Selected SPL Jaú (Sao Paulo, Brazil) and Cali (Valle del Cauca, Colombia) main characteristics are described in the results chapter (§4.3).

Footwear industry in the city of Jaú (SP, Brazil), with a population of 141,703 inhabitants in 2014, 687 km² surface, and a density of 191 hab/km². GDP per capita of US$ 9,546 (in 2012) and represents el 0.055% of Brazilian GDP.

Footwear industry in the city of Cali (Valle del Cauca, Colombia), the third biggest city of the country, with a population of 2.37 million in 2015 (4.9% of national population), a surface of 560 km² and population density of 4,231 hab/km². GDP per capita of US$ 4,540 (in 2012) and represents 5.1% of Colombian GDP. Cali metropolitan area includes cities of Jamundí, Palmira and Yumbo, that add up to 2.91 million (6.04% Colombian population), and represent approximately 11% economic contribution of the country in terms of establishments, employed personnel, gross production and consumption and added value.

2.6 Information survey

For the survey of information, the initial approach was to conduct a direct interview to footwear firms in Jau and Cali. Setting off from the business associations board of directors for each region (*Sindicato da Indústria de Calçados de Jaú* –Sindicalçados Jaú– and *Unión Vallecaucana de Industria del Calzado* –Univac– in Cali) to decide on which firms to conduct the interview. Univac directory (Cali) include members from other cities and rural areas, raw materials producers (tanneries), leather goods manufacturers (belts, wallets, clothing, etc.), and merchants, a situation that is not presented in Sindicalçados (Jaú). Only footwear manufacturers of Cali urban area were selected from Univac directory. A total of 120 firms were obtained in each directory, identifying an equal universe size in each case. The goal was to achieve a sample of 40 firms in each city to have up to 33% of firms interviewed.

A priori, logistic considerations from Jaú include two trips of two and five days, respectively. First trip allows allocating and interviewing first members from administrative staff of Sindicalçados. A list was provided as well as access by web page. On the second trip, seven interviews per day were done (±1 depending of the distance between firms) to a final of 35 interviews in five days. A second interviewer was available in case simultaneous interviews were arranged.

In Cali is possible to make more visits, but distance between firms limit interviews to five per day (±1) with a single interviewer. After eight days, 40 programmed interviews could be done. Choosing randomly from the list and performing phone communication to schedule interviews (one per each firm) with general or production manager until achieving de ideal of 40 interviews in each region. Random selection is done to avoid biases of size or location within the city.

However, in practice it was not possible to count on the targeted number of firms to interview, despite the fact that two weeks were spent in each city to schedule phone appointments and 72 firms were contacted in Jaú and 79 in Cali. The main reason for not being able to schedule more interviews was the continuous denial from businesspersons: some clarified directly that they did not grant interviews for academic researches, and others argued the lack of time available to be able to grant the interview on requested dates. To achieve scheduling (or have negative or delaying responses), some firms were phoned up to six times in different times and dates to be able to consult with the employer about their agenda possibilities. Finally, only 21 interviews were granted in Jaú (equivalent to 17.5% of the total footwear and components firms associated to Sindicalçados), and 32 in Cali (26.7% of the total footwear and components firms of the urban area of Cali associated to Univac).

All interviews were face-to-face and located in the production plant. The form applied in Jaú is presented in Appendix A and the one applied in Cali in Appendix B. The interview is structured conducted with specific questions. However, during it development, interviewees expanded their responses and offered a broader frame of causes and motivations of firm characteristics and results, which allowed to contextualize results and analysis qualitatively, as presented in the following chapters.

In Jaú, interviews with firms had an average duration of 28:45 (28 minutes, 45 seconds) and a standard deviation (SD) of 13:12. The total record[6] was slightly over 9 hours (09:06:15), with a maximum of 75:45 and a minimum of 15:07. Interviews were made from September 15th to 19th, 2014 (consecutive days). In Cali, the interviews[7] had an average duration of 32:15 and SD of 16:35. Total record was slightly over 16 hours (16:39:40), with a maximum of 72:14 and a minimum of 08:15. Interviews were done on March 12th, 13th, 16th, 21st, 24th and 26th, and April 11st and 14th, 2015.

[6] Two firms at Jau deny interview recording. Data on interview duration include 19 out of 21 firms.

[7] One firm in Cali deny interview recording. Data on interview duration include 31 out of 32 firms.

“Minha terra tem palmeiras,
onde canta o Sabiá;
as aves, que aqui gorjeiam,
não gorjeiam como lá.

Nosso céu tem mais estrelas,
nossas várzeas têm mais flores,
nossos bosques têm mais vida,
nossa vida mais amores”.

(Gonçalves Dias, Canção do Exílio, 1843)

“A lo lejos se ve mi pueblo natal,
no veo la santa hora de estar allá;
se vienen a mi mente bellos recuerdos,
infancia alegre que yo nunca olvidaré.

Luces de esperma en el fondo se divisan,
titilantes igual que estrellas en el cielo;
y el ruido incesante del viejo trapiche,
sustento eterno de todos mis abuelos.

¡Ya vamos llegando!, me estoy acercando;
no puedo evitar que los ojos se me agüen”.

(Jairo Varela Martínez, Mi pueblo natal, 1991)

3 SECTORAL CONTEXT

Description of each LPS (Jau and Cali) is characterized by their configuration and productive context (location in a productive chain) and business (clients and suppliers relationships, national and foreign competence, sector situation in each country). Finally, referenced main trends in product innovation, process, and markets of footwear industry of the world.

3.1 Global competitive landscape of the footwear industry

China is established as the indisputable leader of footwear production and commercialization of in the world. Deepening in the subject it is noticeable that even though China has a highly productive and commercial level, not necessarily determines competitiveness.

Competitiveness can be achieved from costs reduction, an increase of added value, or a combination of both to focus on a market niche. It is clear that focus simultaneously on three is an impossible task, because each strategy demands taking decisions that affect others possibility (trade-off), even though large firms developed product portfolio with differentiated approaches by competitiveness (e.g.: economic line, and other lines with prices higher than purchasing power). When this analysis is done and aspects like production, trade, consumption and technology are observed, with influence to the footwear industry worldwide, new analysis elements and competitiveness strategies arise from countries that could be important to take into account as a comparative aspect. Therefore, to have a more complete vision, the competitive panorama is divided into productive, trading, consumption and technological aspects that affect footwear industry worldwide.

Footwear manufacture, due to process quantity and quality (time-consuming from raw materials preparation to parts assembly to achieve pairs of different sizes) to keep up with functionality and aesthetics, requires a large amount of skilled labour, and since the industrial revolution, when the sector started to industrialize, it has identified an intense labour. These characteristics made that, as well as other sectors with intense labour, they adapt constantly to technological, productive, trading and consumption conditions, not only for final products but also for raw materials and semi-finished products, reconfiguring constantly.

3.1.1 Production

Labour for footwear production demands not only large quantity of workers but workers skilled for their tasks (skills focus to productivity, more than high qualification offering product differentiation), and it is the reason for manufacture high costs and final price, and the search for minimizing this cost has been a constant for the sector (Boër & Dulio, 2007).

Thus, since globalization process started in the final decades of the 20th century, production plants were delocalized from developed countries towards China, Korea, Hong Kong, Indonesia, Taiwan and Brazil, representing labour lower costs and less strict environmental regulation for fur processing. Such delocalization, lead developing countries to focus on intensive massive labour product, while developed countries (Spain, Italy and Portugal) focus on brand differentiated product, design and material, taking advantage of personalization technologies that enable manufacture of high added value products at low production scales, turning them in design and technology leaders (Departamento Nacional de Planeación, 2004).

Scott (2006) also mentions a lot of academic studies describing, since the early 1990s, job flow demanding few skills from developed countries, with high salaries (the U.S.A. and Western Europe), towards less developed countries with lower salaries (especially Asia and Latin America). Changes are facilitated by product low transportation cost, as is the case of footwear and clothing. According to Boër & Dulio (2007) information , in 1989 production was very balanced in terms of volume between Far East (55%) and West (Europe and America), but in 2003 leadership was taken by Asia (especially China). Since 2007, with trends identified by authors (Boër & Dulio, 2007; Scott, 2006) and 2013 recent data, trends have not modified, even with slow but constant increment of labour costs in Asian countries, higher application of trading rights and anti-dumping measures applied from European and American countries to Chinese and neighbouring countries.

Last decades intense competition among footwear manufacturers has lead traditional firms to divide production process into many steps, and to translate the most expensive to regions where more benefits are obtained, forcing them to outsource increasingly, boosting outsourcing stages, and always looking for cheaper places to produce. This situation has led to the transformation of old local and regional groups in world networks, interregional and international, demanding complex organizations that not all have been able to handle (Boër & Dulio, 2007). The second effect of this competence, presented by the same authors, has been market diversification impulse, especially the most expensive product, with high-quality requirements that must be kept, allowing traditional firms to focus on other competitive aspects different to price, as quality, service and flexibility.

Footwear industry has answered to globalization phenomenon and outsourcing production delocalization possibilities, in its endogenous (more demanding consumers, requesting higher quality at competitive prices, a natural consequence of competitive processes) and exogenous factors (competitors from other countries that are able to develop similar products at better prices), looking to keep up with its competitive position, transferring labour intensive phases to countries with lower salaries. Although this has generated a "Caravan" process, while increasing skill labour in a country and adoption of better technology, costs increase, causing a new transfer to other countries that, again, have lower salaries (Boër & Dulio, 2007).

However, direct observation through case studies from academic references (Boschma & ter Wal, 2007; Gebreeyesus & Mohnen, 2013; Schmitz, 1995; Scott, 2006) plus indirect guild references and sectoral studies (Acicam, 2014; Apiccaps, 2012), no matter what grade of country development, growth or decrease situation, firms are generally concentrated geographically. To Scott, agglomeration explanation is based on closeness to metropolitan areas or to a regional specialization of productive competences, while for less developed countries, agglomeration is based on infrastructure limitations.

This study identified that, for both sectors assessed, origin of geographic concentration was due to mutually feedback causes: market opportunity to count with a metropolis that acquires its products, and available knowledge to whom would like to learn trades related to the sector, from production or marketing, to design answering functional or aesthetic requirements.

At the worldwide level, different consulted studies, two undisputed leaders emerge in the productive aspect of the footwear sector: China and Italy. According to Scott (2006), they are also leaders of clothing and furniture. For both countries, production is geographically concentrated: in Italy, agglomerations are in the Northeast region and centre (Lombardy, Veneto, Marche, Emilia Romagna, Tuscany, Campania and Puglia). In China, it is located in the provinces of the east coast (Guangdong, Fujian, Zhejiang and Shandong).

Footwear production is mainly measured in two ways: by the number of pairs produced and by value (generally in dollars) they represent. Most studies emphasize in the pair of shoes account given the difficulty to obtain comparable money value between countries. For this aspect, in 2011, the continent with the greatest pair of shoe production (Table 8) was Asia, with 88.8%, leaving the marginal production for South America (5.4%), Europe (3.5%) and North America (1.6%). An approximate calculation of production value comes multiplying mean export price by production volume in pair of shoes, assuming production value is homogeneous for internal and external consumption. Among the

ten countries with the biggest production level worldwide (Table 9), seven are Asian, one is South American, one is North American and one is European.

Table 8. World production by continent

Continent	Pairs (millions)	%	USD (millions)	%
Africa	140	0.7	1.870	1.2
Asia	17.667	88.8	113.347	74.1
Europe	702	3.5	19.571	12.8
North America*	313	1.6	5.590	3.7
Oceania	4	0.0	87	0.1
South America	1.075	5.4	12.515	8.2
TOTAL WORLD	**19.901**	**100.0**	**152.980**	**100.0**

Source: Apiccaps, 2012. * Include Central America.

At a country level (Table 9), footwear production distribution presents clear hegemony, not only because only one country (China) produces two thirds of world production measured by the pair of shoes (64.8%) and third part measured by value (32.6%), and because among five main producers reach 87.5%, leaving a marginal 12.5% for the rest of 62 countries, referenced by Apiccaps (2012) After China, India occupies second place with a ninth part of world total (11.1%). In the third, and fourth and fifth place with very similar production is Brazil (4.12%), Vietnam (4.05%) and Indonesia (3.52%). With a much smaller production, less than half of Indonesia, Pakistan occupies sixth place (1.50%), followed by México (1.28%), Thailand (1.23%), Italy (1.05%) and Turkey (0.94%).

Table 9. Top ten ranking of footwear production by pairs

World			Production (millions)				Production/	Population	Consumption
Rank	Country	Cont.	Pairs	%	USD	%	Consumption	(millions)	per capita
1	China	Asia	12.888	64.8	49.897	32.6	4.67	1.359.8	2.0
2	India	Asia	2.209	11.1	27.779	18.2	1.00	1.205.6	1.8
3	Brazil	S. Amer.	819	4.1	9.393	6.1	1.11	195.2	3.8
4	Vietnam	Asia	805	4.1	13.051	8.5	5.92	89.0	1.5
5	Indonesia	Asia	700	3.5	10.966	7.2	1.33	240.7	2.2
6	Pakistan	Asia	299	1.5	4.111	2.7	0.97	173.1	1.8
7	Mexico	N. Amer.	254	1.3	4.745	3.1	0.85	117.9	2.5
8	Thailand	Asia	245	1.2	1.562	1.0	1.53	66.4	2.4
9	Italy	Europe	208	1.1	9.424	6.2	0.62	60.5	5.6
10	Turkey	Asia	188	0.9	805	0.5	1.27	72.1	2.1

Source: Calculated with Apiccaps (2012) and United Nations (2012) data. Population estimated in 2010. Word Ranking by value: China, India, Vietnam, Indonesia, Italy, Brazil, Mexico, Pakistan, Japan (2.3%), Spain (1.4%); Thailand is 13 and Turkey 16.

Most texts consulted establish Chinese hegemony of footwear production, and this is true when number of pairs produced are compared. However, worldwide total production participation does not establish by itself countries competitive abilities. When production, population, internal consumption, internal and external levels, and sale prices are compared, other strategies emerged that will be described below. In addition, as indicated by Scott (2006), labour by itself does not high export rates: it requires a certain level of infrastructure investment and entrepreneur culture consolidation; besides,

countries receiving investment to convert in producers, must have stable governments, tolerance and opening to foreign capital, and disciplined labour.

Table 10. Footwear exports, imports, production and consumption by country

		USD (millions)				Pairs (millions)			
Country	**Continent**	**Exports**	**Imports**	***Production**	***Consumption**	**Exports**	**Imports**	**Production**	**Consumption**
Albania	Europe	181	31	121	60	12	8	8	4
Argentina	S. America	27	395	1593	1877	2	23	118	139
Australia	Oceania	45	1333	68	2993	2	132	3	133
Austria	Europe	931	1596	67	1629	28	75	2	49
Belgium	Europe	4172	2322	20	443	207	195	1	22
Bosnia Herzegovina	Europe	244	95	244	133	11	6	11	6
BRAZIL	**S. America**	**1296**	**428**	**9393**	**8487**	**113**	**34**	**819**	**740**
Bulgaria	Europe	177	98	204	272	13	18	15	20
Canada	N. America	224	2089	149	2987	12	164	8	160
Chile	S. America	135	925	42	424	35	134	11	110
China	Asia	39374	1289	49897	10689	10170	43	12888	2761
COLOMBIA	**S. America**	**34**	**477**	**901**	**1955**	**2**	**64**	**53**	**115**
Costa Rica	N. America*	1	130	0	0	0	13	4	17
Croatia	Europe	160	189	400	920	4	18	10	23
Czech Rep.	Europe	570	790	45	1587	51	188	4	142
Denmark	Europe	747	989	306	1222	22	49	9	36
Ecuador	S. America	37	118	278	333	4	10	30	36
Egypt	Africa	14	94	686	812	1	10	49	58
Estonia	Europe	69	95	46	115	3	5	2	5
Finland	Europe	156	384	208	1144	3	22	4	22
France	Europe	2409	6506	723	12768	80	480	24	424
Germany	Europe	4392	8717	702	9735	194	593	31	430
Greece	Europe	80	588	24	464	10	65	3	58
Guatemala	N. America*	34	115	357	493	2	11	21	29
Hong Kong	Asia	5317	4850	15	940	362	425	1	64
Hungary	Europe	385	299	316	330	28	29	23	24
India	Asia	1421	149	27779	27691	113	106	2209	2202
Indonesia	Asia	3227	184	10966	8240	206	32	700	526
Ireland	Europe	78	448	10	302	8	38	1	31
Israel	Asia	49	413	74	1029	2	42	3	42
Italy	Europe	10376	5662	9424	15224	229	358	208	336
Japan	Asia	45	5062	3555	31365	1	619	79	697
Korea, Republic	Asia	144	1536	80	1776	9	116	5	111
Latvia	Europe	34	94	68	238	1	6	2	7
Lithuania	Europe	41	121	14	109	3	10	1	8
Luxembourg	Europe	86	150	0	172	1	4	0	2
Malaysia	Asia	201	259	441	454	31	33	68	70
Mexico	N. America	411	718	4745	5586	22	68	254	299
Netherlands	Europe	2933	3465	21	2133	143	245	1	104
New Zealand	Oceania	38	242	19	418	2	23	1	22
Norway	Europe	20	721	20	520	1	26	1	26
Pakistan	Asia	110	73	4111	4235	8	16	299	308
Panama	N. America*	1130	1153	11	78	102	108	1	7
Paraguay	S. America	0	112	0	0	0	15	2	17
Peru	S. America	22	255	308	535	3	34	42	73
Philippines	Asia	11	138	290	711	3	118	79	194
Poland	Europe	543	1070	446	1504	39	115	32	108
Portugal	Europe	2091	606	1962	1641	65	56	61	51
Romania	Europe	1391	343	1074	1440	57	73	44	59
Russian Federation	Europe	30	3940	260	1510	6	256	52	302
Saudi Arabia	Asia	7	433	602	889	1	43	86	127
Serbia	Europe	162	164	81	243	8	16	4	12
Singapore	Asia	284	560	122	517	28	67	12	51
Slovakia	Europe	1122	604	268	317	92	97	22	26
Slovenia	Europe	151	214	38	189	8	16	2	10
South Africa	Africa	33	905	517	2739	3	206	47	249
Spain	Europe	2870	2977	2075	7020	130	354	94	318
Sweden	Europe	262	949	29	1194	9	49	1	41

Switzerland	Europe	274	1402	69	3973	4	61	1	58
Thailand	Asia	899	220	1562	1020	141	56	245	160
Tunisia	Africa	409	18	667	273	27	2	44	18
Turkey	Asia	398	816	805	633	93	52	188	148
Ukraine	Europe	118	284	0	165	13	51	23	61
United Arab Emirates	Asia	228	678	209	554	76	131	0	55
United Kingdom	Europe	1400	5169	80	5918	88	455	5	372
USA	N. America	1023	23245	328	29497	78	2302	25	2249
Vietnam	Asia	5123	25	13051	2205	316	2	805	136

Source: Apiccaps, 2012. *Calculated: numbers of pairs multiplied by pair exported price.

When production of a country is divided over apparent consumption (obtained by adding the number of pairs produced in the country with the imported and subtracting the exported) it is found that among ten of the largest world producers of footwear, only six produce above their internal needs (with ratios greater than 1); in the case of India and Pakistan, their production and consumption are very similar, and in the case of Mexico and Italy they produce less than they consume. Only China and Vietnam produce much more than they consume.

When comparing footwear production of the greatest world producers with their population and consumption per capita, in the case of India, Brazil and Pakistan, it is evident that high productive participation is related to the supply of internal market, situation confirmed when international trade quantities are compared (of world export quantities in Table 10, India represents 1.4%, Brazil 1.3% and Pakistan 0.1%, placing them in 12th, 15th and 44th positions, respectively). Thailand and Turkey present superior productions than internal consumption (53% and 27%, respectively), but participation in world exports (0.9% and 0.4%) are far away from first places (positions 20th and 26th). Even though Mexico has similar levels from the above two cases in its participation in world export (0.4%, 24th position), production is below internal demand.

China, Vietnam, Indonesia and Italy cases are remarkable, not only because they are located among first 10 producers (Table 9), but because are among the 10 first world exporters (Table 12), even though their competitive strategies are different.

China and Vietnam focus on a massive production because, as it was mentioned, production is superior to internal demand (4.7 and 5.9 times, respectively). However, China focuses on low added value products, with an average price per pair (USD 3.8) close to half average of world price (USD 7.4), while Vietnam has an average price per pair of more than the double (USD 16.2) of the world average. This difference is evident in its exports ratios over imports, which are 30.6 times for China and 204.9 for Vietnam.

Even though Italy produces below its internal demand (0.62 times), is the second world exporter by value with 10.3%, and its quotient between export value over imports is 1.8, meaning it exports almost

twice what it imports, a strategy based on the high added value of its export product, with an increasing average of USD 45.3 per pair for 2011 (Table 15).

Indonesia with a superior production 33% to internal demand, has an equally high place in world export participation (3.2%, position 7), price per pair (USD 15.7) in the same fringe of Vietnam and a quotient between export and import of 17.5 times.

3.1.2 Commerce

Consistent on world production, Asian international trade is of great global domain (Table 11). However, values are not so absolute, since as it has been analysed, production value id affected by added value, measured here by average export price per pair of shoes. Also, in commercial analysis, emerge a group of countries that count with low production and consumption levels, but record high import and export rates. Data observation (Table 10) with those characteristics shows countries like Panama, Hong Kong, Belgium, Netherlands and Austria, which constitute ports of entry and exit of products for their respective regions.

Comparing Table 8 and Table 11, it is found that even though Asia is a leader in production and export, its values are not so convincing for the second aspect (production: 88.8% of total pairs produced worldwide; exportation: 56.6% of world exports value, of which three quarters leave the continent). Through data is possible to identify two causes for this situation: first due to export low added value (especially due to the price per pair of shoes from China that represent most of Asia exports), and second due to enormous internal Asian market, that, even with low consumption per capita, has an enormous population demanding the product.

Table 11. International trade by continent

	USD (millions)				Pairs (millions)				Exports (value)	
Continent	Exports	%	Imports	%	Exports	%	Imports	%	Extra-continent	Intra-continent
Africa	456	0.5	1017	1.0	31	0.2	218	2.3	22%	78%
Asia	56838	56.6	16685	16.6	11560	85.4	1901	20.5	75%	25%
Europe	38655	38.5	51082	50.8	1571	11.6	4037	43.5	17%	83%
N. America	2823	2.8	27450	27.3	216	1.6	2666	28.7	46%	54%
Oceania	83	0.1	1575	1.6	4	0.0	155	1.7	47%	53%
S. America	1551	1.5	2710	2.7	159	1.2	314	3.4	57%	43%
WORLD	**100406**	**100.0**	**100519**	**100.0**	**13541**	**100.0**	**9291**	**100.0**	**51%**	**49%**

Source: Apiccaps, 2012.

Europe is the second biggest exporter (38.5% of total export value worldwide) with a much smaller production (3.5% of total pairs produced worldwide). Data allows to identify four causes for this difference: first, high added value for its products, representing value for each exported pair, locating

them among the highest prices in the world, if compare with greatest world exporters (Table 15); the second one, the high intracontinental exports index (83% of exported value); the third is that, three of five countries with the highest commercial fluxes and low consumption and production are European (Belgium, Netherlands and Austria); and fourth, Europeans present a high footwear consumption (Table 17 and Table 18).

Most export are among Asia and Europe with 95.1%, leaving marginal indexes for the rest of assessed continents. For importations situation balances a bit more. Even though Europe possess the greatest index of continental imports, with practically half of the world importations (50.8%), North America is located in second place with a fourth part (27.3%) and Asia with a sixth part (16.6%)

To finish world commerce analysis by continents, this would not be complete without taking into account flux destiny from each continent. This, even Europe has an enormous worldwide import and export index, its impact on the rest of the continents is relatively low (17%), leaving Asia as the great producer and exporter, since 56.6% of its world exports, is destined 75% to other continents, and 85% of the total imports come from other countries from the same continent, and North America as the big client that other continents serve.

Table 12. Top ten ranking of footwear international exports

		USD (millions)			Pairs (millions)			Export	Exports/
Country	**Continent**	**Exports**	**%**	**Rank**	**Exports**	**%**	**Rank**	**Price**	**Imports**
China	Asia	39374	39.2	1	10170	75.1	1	3.9	30.55
Italy	Europe	10376	10.3	2	229	1.7	4	45.3	1.83
Hong Kong	Asia	5317	5.3	3	362	2.7	2	14.7	1.10
Vietnam	Asia	5123	5.1	4	316	2.3	3	16.2	204.92
Germany	Europe	4392	4.4	5	194	1.4	7	22.6	0.50
Belgium	Europe	4172	4.2	6	207	1.5	5	20.2	1.80
Indonesia	Asia	3227	3.2	7	206	1.5	6	15.7	17.54
Netherlands	Europe	2933	2.9	8	143	1.1	8	20.5	0.85
Spain	Europe	2870	2.9	9	130	1.0	10	22.1	0.96
France	Europe	2409	2.4	10	80	0.6	17	30.1	0.37
Thailand	Asia	899	0.9	20	141	1.0	9	6.4	30.55

Source: Calculated with Apiccaps (2012) data.

Analysing data at country level (Table 12), China counts with the highest world export index, measured by value (39.2%) and in pair number (75.1%). Such disparity explained, by the low price per pair China charges for its product, placing it near half of world average.

An opposite situation presents Italy, second world export by footwear value, positioning with a 10.3%, while mean production measured by pair of shoes is only 1.7% (fourth in world rank); such situation is explained again by pair value, and for Italy is located in more than six times the world average, that at

the same time is the highest among main world exporters, situation funded in technological changes that allow customizing manufacture product at small scales.

As it was mentioned, Hong Kong presents high international trade index (third place in export and seventh in import), if compared by productive levels (56th place) and consume (32nd place), locating it just as an important commercial country.

Vietnam and Indonesia are large exporters, due to their high productive level, locating them among the five biggest world producers, and due to its export products added values, close to the double of the world average and even four times higher than its neighbours.

Germany, Spain and France, in 5th, 9th and 10th places are among biggest world exporters, presenting high importations levels (2nd, 10th and 3rd places) and medium production level (26th, 12th and 29th places). However, it cannot be affirmed that these are countries of product passage, since internal markets (7th, 11th and 8th places) have strengthened internal production allowing them to contribute adding value to their product, with values closed to threefold world average, and in the case of France, four times higher. In addition, its trade balance is negative, especially for Germany and France, which are only surpassed by Japan and the United States in this item.

Belgium and Netherlands export level, in 6th and 8th places, respectively, are characterized largely by international trade level if production positions (56th and 57th) and consumption (52nd and 59th) are compared.

Finally, though Thailand is the ninth pair of shoes world exporter, export value is positioned in 20th place, due to its low product price that is below world average.

Between 2011 and 2013, little changes in world ranking for the main 15 exporters occurred (Table 15). Countries kept their place, except for Hong Kong and Belgium that went down, replaced by Vietnam and Germany, and Brazil that came out of the top 15, replaced by the United States coming from 18th place. Most countries kept or lost participation percentage in exports, except for Vietnam (from 5.1% in 2011 to 8.4% in 2013), India (from 1.4% to 1.9%), United Kingdom (from 1.4% to 1.6%) and China (from 39.2% to 40.4%).

When greatest exporters of 2011 (Table 12) are compared with greatest importers (Table 13) five European countries are identified (Italy, Germany, France, the Netherlands and Spain), that as it was mentioned, high commercial flux inside Europe, explains in big part this situation. Hong Kong also appears, recognized commercially worldwide for being intermediary of Chinese manufacturers export.

Countries with highest importation level that do not appear on lists of greatest exporters are United States (ranked 1st with 23.1% of imports), United Kingdom (ranked 5th with 5.1%), Japan (ranked 6th with 6.0%) and Russia (ranked 8th with 3.9%).

When countries import ranking is observed in Table 13 whether is measured by value or volume, the ten main importers are the same, even with the different order due to average price that each one pays. Japan has the lowest place by value in relation to the volume by presenting the lowest price among importers, and Italy has a higher place by value than by volume due to the high price it pays.

Table 13. Top ten ranking of footwear international imports

		USD (millions)			Pairs (millions)			Import	Exports/
Country	**Continent**	**Imports**	**%**	**Rank**	**Imports**	**%**	**Rank**	**Price**	**Imports**
USA	N. America	23245	23.1	1	2302	24.8	1	10.1	0.04
Germany	Europe	8717	8.7	2	593	6.4	3	14.7	0.50
France	Europe	6506	6.5	3	480	5.2	4	13.6	0.37
Italy	Europe	5662	5.6	4	358	3.9	7	15.8	1.83
U. Kingdom	Europe	5169	5.1	5	455	4.9	5	11.4	0.27
Japan	Asia	5062	5.0	6	619	6.7	2	8.2	0.01
Hong Kong	Asia	4850	4.8	7	425	4.6	6	11.4	1.10
Russia	Europe	3940	3.9	8	256	2.8	9	15.4	0.01
Netherlands	Europe	3465	3.5	9	245	2.6	10	14.1	0.85
Spain	Europe	2977	3.0	10	354	3.8	8	8.4	0.96

Source: Calculated with Apiccaps (2012) data.

The U.S.A. is the world footwear main client, with the greatest level of imports by value as by pair of shoes and the greater negative trade balance (four times higher than the second is) and the second highest level of consumption in the world, in addition to its low level of production. Even though Boër & Dulio (2007) point at USA politics since 1960 was to become a shoe consumer almost completely eliminating import taxes, going from a production of 600 million pairs of shoes to less than 50 million in few years, causing the loss of 250.000 jobs, it is considered that changes were funded in footwear manufacturer costs reduction. This, any attempt to regulate footwear global commerce represents a resounding rejection by the United States, which mainly benefits China (in 2004, USA acquired 83.5% of its shoes from China).

On the other hand, low production, high internal footwear consumption, and relatively high export made by the United Kingdom convert it in the fifth greatest world importer.

Japan and Russia cases pose similar characteristics: high importation (6th and 8th places), high consumption by pairs (5th and 13th places), medium production levels (14th and 19th places), and low export (50th and 59th places).

In Table 14 is possible to identify exports evolution between 2010 and 2013 by value (USD), volume (pair of shoes) and average price for each pair and type. Although, it could be affirmed that normal oscillation occurs in international trade, a significant increase (32.4%) in registered value between 2010 (USD 90.777 millions) and 2013 (USD 120.156 millions), due mainly by leather footwear, rubber and plastic, increase in export volume and increase in average price (26.5% rubber and plastic footwear, and 22.7% leather footwear).

Table 14. Footwear World Exports by Type 2010-2013

	USD (10^9)				Pairs (10^9)				Avg. Price (USD/Pair)			
Type	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Waterproof	1.1	1.3	1.1	1.3	0.2	0.2	0.1	0.2	6.5	5.6	7.6	7.1
	1%	1%	1%	1%	1%	2%	1%	1%				
Rubber & Plastic	24.0	29.0	25.3	33.4	7.1	7.7	6.9	7.9	3.4	3.8	3.7	4.3
	26%	27%	26%	28%	56%	57%	55%	57%				
Leather	45.4	52.2	41.5	54.4	2.1	2.2	1.8	2.1	21.6	23.7	23.5	26.5
	50%	49%	43%	45%	17%	16%	14%	15%				
Textile	9.5	11.9	13.5	16.5	2.1	2.3	2.4	2.7	4.5	5.2	5.6	6.1
	10%	11%	14%	14%	17%	17%	19%	20%				
Other	4.0	4.5	8.2	6.1	1.2	1.0	1.2	0.9	3.3	4.4	6.7	6.6
	4%	4%	8%	5%	9%	7%	10%	7%				
Parts	6.7	8.4	7.2	8.4	0.7*	0.8*	0.6*	0.6*	10.3†	11.2†	12.6†	13.8†
	7%	8%	7%	7%								
TOTAL	**90.8**	**107.4**	**96.8**	**120.2**	**13.4**	**14.2**	**13.0**	**14.4**	**6.6**	**7.4**	**7.2**	**8.1**
	100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**				

Source: Calculated based on United Nations (2014) data. * Kilograms (10^9). † USD/kg. Shaded area is not included in TOTAL.

Analysis of the global commercial landscape of the footwear industry continues with main exporter prices behaviour (Table 15). Although greatest export process has it Luxembourg (USD 86.0), Switzerland (USD 68.5) and Finland (USD 52.0), their world impact is relatively low due to exports equivalent to 0.1%, 0.3% and 0.2% and 45th, 29th and 39th places, respectively, from world ranking, and could be interpreted as the competitive approach of these countries for specialized product directed to specific niche. For such reason, Table 15 lists average export sales price limited to the first 15 footwear exporters of 2013. Brazil is included since was part of the first 15 in 2011.

According to Apiccaps (2012, 2014), among 15th biggest footwear exporters, Italy obtains the greatest added value by product, an average of USD 48.8, representing a significant increase (7.7%) compared to the value on 2011, although it has lost participation in world exports, it retains its second place as the largest exporter. Followed by Portugal (USD 31.0) that lost price and decrease export participation, staying in 11th place. France (USD 30.8) that have maintained a similar range of prices with Portugal and export participation staying in 10th place. Between USD 20.0 and USD 25.0 locate countries like Romania, Belgium, Germany, Spain, Indonesia and the Netherlands; in this group is important to highlight Indonesia as the first non-European country with high prices, and that is increasing in price (USD 21.1, an increase of 34.8% compared to 2011), preserving its participation in global market. The

rest of the countries have oscillating prices from USD 13.0 to USD 15.5, except for China with a price of USD 4.55 per pair of shoes, dominating export first place in 2013 with 40.4%of the world total.

Table 15. Average export price (2011 and 2013) among the top 15 world exporters

		Exports 2013 (USD)			Exports 2011 (USD)			Price Variation
Country	**Continent**	**%**	**Rank**	**Price**	**%**	**Rank**	**Price**	**2011-2013 (%)**
Italy	Europe	9.0	2	48.78	10.3	2	45.31	7.7
Portugal	Europe	1.9	11	31.01	2.1	11	32.17	-3.6
France	Europe	2.3	10	30.78	2.4	10	30.11	2.2
Romania	Europe	1.1	14	24.75	1.4	14	24.40	1.4
Belgium	Europe	3.9	5	23.89	4.2	6	20.15	18.5
Germany	Europe	3.7	6	23.73	4.4	5	22.64	4.8
Spain	Europe	2.6	9	21.70	2.9	9	22.08	-1.7
Indonesia	Asia	3.2	7	21.12	3.2	7	15.67	34.8
Netherlands	Europe	2.7	8	20.51	2.9	8	20.51	0.0
Hong Kong	Asia	4.1	4	15.46	5.3	3	14.69	5.3
Vietnam	Asia	8.4	3	15.44	5.1	4	16.21	-4.8
USA	N. America	1.0	15	14.11	1.0	18	13.12	7.5
India	Asia	1.9	12	13.14	1.4	12	12.58	4.5
United Kingdom	Europe	1.6	13	13.02	1.4	13	15.91	-18.2
Brazil	S. America	0.5*	-	11.42*	1.3	15	11.47	-0.4
China	Asia	40.4	1	4.55	39.2	1	3.87	17.5

Source: Calculated on Apiccaps (2012, 2014) data. *Estimated with United Nations (2014) data.

For a detailed analysis of China competitiveness by price, an observation grouping type of footwear can be done. For Apiccaps (2012) footwear is classified into five types: waterproof, rubber and plastic, leather, textile, and others. In all types, China is the main supplier, characterized not only for being the biggest exporter by volume (pair of shoes) and by value (USD), but also for having the lowest price, e.g.: rubber and plastic footwear, price (USD 2.7) is less than half of the second cheapest supplier among 10 main exporters (Brazil, USD 5.7) and less than a quarter of the average price (USD 11.8) of the other nine. And for all other types of footwear the situation is similar: waterproof footwear USD 6.4 from China vs. USD 12.6 average of following nine main exporters constitutes half the price; third part of leather footwear (USD 12.2 vs. USD 36.1); and in textile footwear is a fourth part (USD 3.8 vs. USD 16.6).

To contextualize price variation in Table 15, according to Apiccaps (2012), in the last decade, average export price for each pair of shoes has passes from USD 5.82 in 2003 to USD 8.27 in 2013. However, the increase has not been stable: between 2003 and 2006 it kept a relatively stable price, that rise in 2008 up to USD 7.34 and decrease in 2010 to USD 6.66, to finally recover in 2011 to USD 7.41. This way, between 2011 and 2013, exports average price increase 11.6%, driven mainly by price increase in 17.5% of price per unit of Chinese export that represented 40.4% of world total.

In relation to the average importation price (Table 13), the global average price is USD 10.8. The highest values are held by Luxembourg (USD 37.5), China (USD 30.0) and Norway (USD 27.7), although

these markets are small compared to global market (0.04%, 0.46%, 0.28%, respectively, locates them in 65th, 37th and 46th places). China imports could be directed to high purchasing power niches, situation inferred by its large population, low importation quantity, and the high price paid.

Among ten largest footwear importers, measured by value, prices oscillate between USD 8.2 paid by Japan, and USD 15.8 paid by Italy, though the last not necessarily could be inferred to be internal consumption due to high export values (measured by volume, value, and price).

According to Boër & Dulio (2007), an enormous situation has affected world footwear distribution: strong presence of clothing firms that integrate to the footwear industry. These firms are an oligopoly with several types of products (clothing, shoes, and accessories), exploiting scale economies and cover distribution, marketing and brand construction activities. This phenomenon has produced distribution concentration, changes in production systems and markets globalization, that as production delocalization, lead to process control loss by the manufacturer in aspects like design, branding, market and distribution. Thus, based on Boër & Dulio (2007) and index reviewed, high international trade index (import and export) could be explained for European countries and to lesser extent the USA, and differences in export and import prices since in these countries is where the phenomenon of fashion firms has greater diffusion.

3.1.3 Consumption

The amount of analysis made on international trade, with available values (USD) and exports volume (pair of shoes), was not possible to replicate in consumption, since data available for production and consumption are only by volume (in pair of shoes) and not by value (Table 10). The reason for this situation is that data on international trade is available from only one source (United Nations, 2014), while production data comes from diverse sources (one from each country listed by Apiccaps, that generally is from the own producer guild) and there is no standardization to make comparisons. Apparent consumption (by pair of shoes) of each country is calculated by adding intern production, imports and subtracting exports.

According to Boër & Dulio (2007), analysis, between 1993 and 2003 world consumption of footwear growth (3.2%) was just above population growth, mainly driven by acquisitive power increase in developing countries and by USA. This phenomenon modified consumption behaviour of regions during this period as it is described in Table 16.

Table 16. Consumption regions of the world (2003)

Continent	Consumption 2003 Millions of pairs	%	Growth 1993-2003
Western Europe	1841	10.87	0.36
Eastern Europe	960	5.66	0.85
Middle East	757	4.47	3.25
Africa	786	4.64	1.07
Asia Pacific	9326	55.05	5.00
North America	2429	14.34	2.09
Latin America	842	4.97	0.93
WORLD	**16940**	**100.00**	**3.21**

Source: WFC (2005) *apud* Boër & Dulio (2007).

Following numbers correspond to calculations based on information provided by Apiccaps (2012) with available data from 2011. Differences with Boër & Dulio (2007) are due to different sources and because Apiccaps (2012) does not include all countries by region, what modifies the total sums. For that reason, could be mistakenly inferred that in 2003 more pairs of shoes were consumed (16940, Table 16) than in 2011 (15320, total from Table 17).

Table 17. World consumption by continent in 2011

Continent	Consumption Millions of pairs	%	Population Millions	%	Consumption per capita
Africa	325	2.1	1031.1	14.9	0.32
Asia	7652	49.9	4165.4	60.2	1.84
Europe	3197	20.9	740.3	10.7	4.32
North America	2761	18.0	548.7	7.9	5.03
Oceania	155	1.0	36.7	0.5	4.22
South America	1230	8.0	394.0	5.7	3.12
WORLD	**15320**	**100.0**	**6916.2**	**100.0**	**2.22**

Source: Calculated with Apiccaps (2012) and United Nations (2014) data. Population estimated in 2010.

List of world consumption by continent (Table 17), identifies Asia as the biggest footwear consumer (49.9%), followed by Europe (20.9%), North America (18.0%) and South America (8.0%). When consumption is compared with population, Asian high index is explained mainly by its numerous population (60.2%), with annual consumption per capita (1.84), slightly below the world average (2.22). However, European and North American consumption is well above population average, especially by high consumption per capita (Europe: 4.32; North America: 5.03) compared to the world average, explained by its high acquisitive power. Even though none European country appears among six main consumers (Table 18), second consumption place by continent it is because among the first fifteen countries, six countries are European (Germany, France, United Kingdom, Italy, Spain and Russia).

Africa is an opposite case to previous describe situation: with 14.9% of the population, only counts with 2.1% of world consumption, and consumption per capita of 0.32 (almost one-seventh of the world per capita consumption) which is a reflection of the low acquisitive power.

Consumption by country (Table 18) among biggest 10 amount to 70.1% of world total and 53.6% of world population. Three main consumers are China (18.0%), USA (14.7%) and India (14.4%), with a population equivalent to 41.6%, that represent 47.1% of world footwear consumption. Countries on 4th and 10th places, with population of 12.0% consume 23.0%, leaving 29.9% of consumption to other countries.

Table 18. Top ten ranking of footwear consumption by pairs

World Ranking	Country	Continent	Pairs (millions)		Production/ Consumption	Population		Consumption per capita
			Consumption	%		Millions	%	
1	China	Asia	2761	18.0	4.67	1359.8	19.7	2.0
2	USA	N. America	2249	14.7	0.01	312.2	4.5	7.2
3	India	Asia	2202	14.4	1.00	1205.6	17.4	1.8
4	Brazil	S. America	740	4.8	1.11	195.2	2.8	3.8
5	Japan	Asia	697	4.6	0.11	127.4	1.8	5.5
6	Indonesia	Asia	526	3.4	1.33	240.7	3.5	2.2
7	Germany	Europe	430	2.8	0.07	83.0	1.2	5.2
8	France	Europe	424	2.8	0.06	63.2	0.9	6.7
9	U.K.	Europe	372	2.4	0.01	62.1	0.9	6.0
10	Italy	Europe	336	2.2	0.62	60.5	0.9	5.6
	Total Top 10		**10737**	**70.1**		**3709.7**	**53.6**	

Source: Calculated with Apiccaps (2012) and United Nations (2014) data. Population estimated in 2010.

Only 3 of 10 countries with the biggest world consumption present per capita consumption equal or below the world average (China, India e Indonesia), while only 4 have equal or superior productions to their consumption (China, India, Brazil e Indonesia), with production/consumption relation greater than 1.00. In addition to Italy (relation of 0.62), other countries produce only very low quantities in relation to their consumption, which makes them big importers (Table 13): main six importers appear in a list of the 10 biggest consumers, all with a production/consumption relation below 1.00.

The most significant case is the USA, with a population equivalent to 4.5% of world population, but a consumption of 14.7%, meaning a per capita consumption of 7.2, more than thrice world average. This is a highly attractive market due to its low production level, though an average price paid by importations is not significantly high (USD 10.1).

3.1.4 Technology

In the footware industry, world technology trends analysis focus on barely technical aspects and not on innovation centres and their contributions to competitiveness for beneficiaries. Search for information about world technology market gets confused with other types of technologies (applied to clothing or furniture in more specific cases), then, to obtain information for the addressed subject is a task beyond possibilities.

In this way, references of technological contributions and trends, related to competitiveness, are brief. Few related references point at technology, but neither their origin nor development trajectories.

The abstract presented by *Departamento Nacional de Planeación de Colombia* (2004), cites three trends with significant impact on studied sectors: 1) increase use of leather substitute materials (synthetic for toecap manufacture) and polyurethane for sole; 2) changes in production process with direct injection of toecaps, and machinery optimization for traditional production; and 3) computer-aided manufacturing and design allows greater production flexibility to attend demands, especially for female market, characterized by dynamism, constant changes in models and design trends. This last point is also pointed by Boër & Dulio (2007) affirming that during last 40 years wide information and communication technologies (ICT) adoption have contributed to increasing product quality (by means of control) and flexible production.

In a similar way, Garcia et al. (2010), identify 5 technological trends affecting competitive dynamics of footwear sector: 1) new material, especially plastic with joint development to chemical industry to improve user comfort and shoe functions; 2) product, design, fashion, and custom development, shortening lifetime of product line and forces increase in speed and flexibility of productive process; 3) electronic interface, done by productive process implementation by means of machinery and tools to customize and, in addition, test advance to implement electronic functions in shoes; 4) normalization, looks to attend requirements of buyers in search of size, models and comfort standardization, also to give a more sustainable response, through environmental impact reduction in a product life; and 5) global production, market and distribution chain organization, that demands normalization, coordination with strong utilization of information and communication technologies.

Through field interviews, made to businesspersons from Jaú (Sao Paulo, Brazil) and Cali (Valle del Cauca, Colombia) three main sources of technological innovation were identify: Italy, Brazil and China. For the first case, there is unanimous recognition, especially for largest firms, about the contributions Italian technology offers to their productive abilities, in terms of volume and quality. On the other hand, medium firms recognize the contribution from Brazilian technologies to increase their productive ability and reference trips to fairs to Brazil for acquisition of new technology. By last, there is an increasing curiosity for Chinese technology, nevertheless, negative experiences with incoming materials from this country made businesspersons cautious in acquiring this technology, that might be the most economical option, but that may affect the productivity and quality goals sought. Unfortunately, it was not possible to deepen in this aspect because it was not the focus of this research.

3.1.5 Trends and Projections

Garcia et al. (2010), established that critical factors for competitive growth of textile and footwear sectors, by their common characteristics are: 1) innovation abilities and product differentiation mainly through design; 2) productive process improvement, related to modernization and rationalization, as well as increase at scales and production level, looking for productivity increase and costs reduction; and 3) development of promotion, trade and distribution activities, looking to strengthen brand and sales channels. This group of factors determine investment decisions, which are combined in different ways depending on the paths of productivity evolution, productive abilities in a specific place and moment and competitive aimed objectives.

To identify trends in a sector, a sample of concerns and actual themes is possible to refer to the *5th World Footwear Congress*[8] performed on November, 2014 in México, and count with participation of 682 assistants from 32 countries. Three general themes were 1) global consumers, 2) access to markets and 3) footwear manufacture.

First theme, on global consumers treated actual world footwear consumption, segmentation strategies, and consumer catchment: strategies of a comfortable, customize, ecological, healthy and fashionable product. Finally, discussion subject of the round table about strategies adoption by firms to answer to consumers changing tastes and aspirations.

Access to markets theme, challenges, opportunities and ethical environment of international trade in a globalized market were presented. Related to distribution channels, identification and evolution was addressed: stores, branches, franchises, direct sales, e-commerce, etc. Round table discussion treated about the future trends and fairs evolutions.

Third and last theme about footwear manufacture addressed many aspects: Where is footwear being manufacture and where will be manufacture in 2030?, access to raw materials; technology, new products materials and process; norms and standards for footwear sector; and social and corporative responsibility. Final round table focus on strategies and real criteria discussion for delocalization of production in different regions of the world.

With observed themes, concerns are identified about production localization (because of labour costs minimization) and alternatives on globalized commercial exchange of added value from technology to

[8] http://www.worldfootwearcongressleon2014.com/ [Retrieved July 4, 2015]

raw materials, parts, components, services and products commercialization. Production and commercial exchange have consequences, which as themes they were reflected addressing ethics, environmental impacts and social-corporative responsibility.

On second place, there is an enormous concern about control and government for footwear markets: from distribution chains to sales to final consumer, and how taste trends affect all productive and distribution chain.

3.2 Competitive panorama in Latin America

To address the competitive panorama in Latin America, production, consumption and commerce of countries reported by Apiccaps (2012); are review in detail; here is use the same classification this report uses, dividing north and south, including Centro America in the north, to detail data from Centro American countries that have very different behaviour of that from countries in the north (USA and Canada).

It should also be noted that sum of population, and in consequence per capita consumption, in North and South America presented in Table 19 and Table 20 have differences with total data on Table 17, since United Nations, source of information for population, includes all countries, while Apiccaps only takes into account countries that represent importance for any of their aspects (production, commerce and consumption) for footwear sector. Table 19 and Table 20 only add countries listed in them.

Table 19. Exports, Imports, Production and Consumption in North America 2011

	USD (millions)		Pairs (millions)				Population	Cons.
Country	**Exports**	**Imports**	**Exports**	**Imports**	**Prod.**	**Cons.**	**(millions)**	**per capita**
Canada	224	2089	12	164	8	160	34.1	4.7
	[33]	[12]	[34]	[14]	[40]	[17]		
Mexico	411	718	22	68	254	299	117.9	2.5
	[24]	[27]	[30]	[26]	[7]	[14]		
USA	1023	23245	78	2302	25	2249	312.2	7.2
	[18]	[1]	[18]	[1]	[28]	[2]		
Costa Rica*	1	130	0	13	4	17	4.7	3.6
	[66]	[54]	[66]	[56]	[44]	[57]		
Guatemala*	34	115	2	11	21	29	14.3	2.0
	[55]	[57]	[54]	[57]	[33]	[47]		
Panama*	1130	1153	102	108	1	7	3.7	1.9
	[16]	[18]	[13]	[21]	[56]	[62]		
TOTAL NORTH AMERICA	**2823**	**27450**	**216**	**2666**	**313**	**2761**	**486.9**	**5.7**

Source: Calculated based on Apiccaps (2012) and United Nations (2012) data. Population estimated in 2010. World ranking position in square brackets []. * Countries in Central America.

On Table 19 complete data for Mexico, Costa Rica, Guatemala and Panama, which represent similar indexes to countries listed in Table 20.

Table 20. Exports, Imports, Production and Consumption in South America, 2011

Country	USD (millions)		Pairs (millions)				Pop.	Cons.
	Exports	Imports	Exports	Imports	Prod.	Cons.	(millions)	per capita
Argentina	27 [60]	395 [38]	2 [54]	23 [47]	118 [11]	139 [21]	40.4	3.4
Brazil	**1296 [15]**	**428 [36]**	**113 [11]**	**34 [41]**	**819 [3]**	**740 [4]**	**195.2**	**3.8**
Chile	135 [42]	925 [22]	35 [24]	134 [15]	11 [36]	110 [27]	17.2	6.4
Colombia	**34 [55]**	**477 [33]**	**2 [54]**	**64 [29]**	**53 [18]**	**115 [25]**	**46.4**	**2.5**
Ecuador	37 [54]	118 [56]	4 [45]	10 [58]	30 [27]	36 [44]	15.0	2.4
Paraguay	0 [67]	112 [58]	0 [66]	15 [55]	2 [51]	17 [57]	6.5	2.6
Peru	22 [61]	255 [44]	3 [48]	34 [41]	42 [24]	73 [30]	29.3	2.5
TOTAL SOUTH AMERICA	**1551**	**2710**	**159**	**314**	**1075**	**1230**	**350.0**	**3.5**

Source: Calculated based on Apiccaps (2012) and United Nations (2012) data. Population estimated in 2010. World ranking position in square brackets [].

According to Apiccaps (2012), data, South America was responsible for 5.4% of world footwear production (Table 8). However, most production from South America is produced in Brazil with 76.2% of the total, on second place is Argentina with 11.0% and third place Colombia producing 4.9%. Brazilian hegemony is also evident comparing it worldwide, since the country places third in footwear production volume, while Argentina is on 11th place and Colombia in 18th. Thus, comparing, production from the rest of South American countries is marginal (7.9% of the South American total). Is important to highlight Mexican production, since is equivalent to 1.3% of the world total, locating it on 7th place among countries with greatest production level.

In terms of international trade, index show low levels, compared with other region standards. South American exports correspond to 1.5% by value and 1.2% by volume of world total. In 2011, Brazil was on 11th place in terms of volume, however, in 2013 (Apiccaps, 2014) was not among 15 main exporters. Export index reflect very distant positions in relation to leaders, for volume as for value. Mexican case presented a modest place of international trade if compared with its production level: 30th place in export by volume, and 24th in exports by value, evidence of its 7th place in production dedicated to internal market, similar situation of Brazil.

In terms of imports, low index is present at world level, except for Chile that even having the smallest population of South America, is on 15th place with greatest footwear importations by volume of the world, doubling second on the list (Colombia). This situation could have two causes acting simultaneously: one, high consumption level per capita, close to levels of developed countries

(comparable to France and superior to United Kingdom, Italy, Japan and Germany); and second, high export index relative to other south American countries (except Brazil).

Interregional and extraregional South American trade, according with Apiccaps (2012) for 2011, 57% of its exports were from countries located outside South America and 43% for countries of the region. At world export level, between 2001 and 2011 South America went from having 2.6% to 1.1% in terms of volume and from 4.0% to 1.5% in terms of value, demonstrating a clear competitive decline respect to other continents. As a reference, in the Asian case, which is the one that has increased its indexes the most, went from 78% to 84% in volume, and from 49% to 57% in value, while other continents, diminish their index, much more moderately. South American index present greater decline among all regions analysed by Apiccaps (2012). Index diminish in South American allows to inferred a loss of product added value, evidenced by more pronounce decline of exported value than volume.

Finally, Latin American analysis of international trade, is important to highlight Panama case, with the smallest population among listed countries in the continent (3.7%), presents one of the lowest production levels as well as lowest total consumption (7 million of pairs) and also the lowest per capita consumption (1.9 annual pair per person) locating it in last places of the world ranking in terms of production and consumption. However, international trade index, of importation as export, measured by volume and value, place it among world leading. This way, Panama constitutes the main regional footwear intermediary, above the rest of the countries (surpassed only by Brazil).

Latin America by consumption aspect has per capita levels close to world average (2.2), except for Guatemala (2.0) and Panama (1.9) place below, and Chile (6.4), Brazil (3.8) Costa Rica (3.6) and Argentina (3.4) with very superior consumptions. Compared to per capita consumption by each continent (Table 17), Latin America consumption per capita is on a very good situation (3.1) compared to Africa (0.3) and Asia (1.8), two regions place below, and not far from Oceania (4.2), Europe (4.3) and North America (5.0) that surpass it.

At technological level, by its low productive level, it can be established that manufacturers are users of technology developed by world sector leaders: Italy, China and Brazil. The last, as consequence of its production volume and strong impulse for technological update at middle of the 1990 (Costa, 2010), has the leadership in Latin America. According to the guild webpage of technology producer firms for footwear sector, firms located in Novo Hamburgo (Rio Grande do Sul) region and close municipalities, have specialized lines from small to large firms, and highlight the development of automation as a source of speed, precision and interaction for production of quality footwear with high productivity

(Abrameq, 2015). In the last century, Brazilian machines have been exported especially to Latin America.

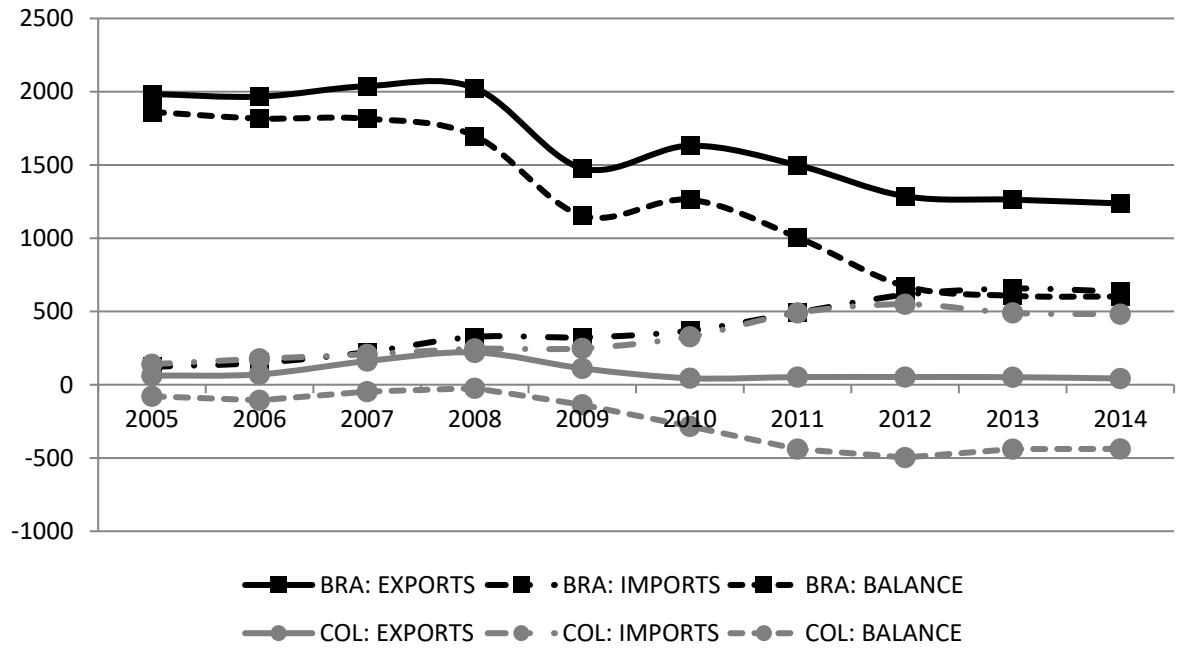
3.3 Studied footwear sectors competitive context by country

Posterior analysis of chosen sectors (footwear industry in Jaú and Cali), there is a following presentation of main characteristics of the respective national context.

According to World Economic Forum Global Competitiveness Report (WEB) 2014-2015, Brazil is in 57th place and Colombia in 66th among 144 studied economies in the report (Schwab & Sala-i-Martin, 2014).

Brazil falls down from place 48th in 2012 to 57th in 2015, due to recent macroeconomic recession and financial access hardening, with consequences for other aspects (institutional functioning, government efficiency, corruption, confidence in politicians, decrease of transport infrastructure and education growth, together with a fairly closed economy to foreign competition); among Brazil strengths, are business community sophistication and innovation excellence.

Figure 2. Footwear Colombian and Brazilian Trade: 2005-2014



Source: United Nations (2014). Data in USD millions.

Colombia goes up to 66th place after many years of staying in 69th place, due to technological adoption increase, and development of transport infrastructure, even though it has a lot to improve. Thus, as last years, the country keeps its macroeconomic conditions stable, a sophisticated financial system for

regional standards, a good market size, and high level of linkage in secondary and tertiary education, although it must improve in terms of education quality, national innovation system robustness, institutional strength and fight against corruption.

Comparing footwear foreign trade index between Brazil and Colombia (Figure 2), is notable the enormous difference between import, export and commercial balance levels. The biggest difference is present among export: in 2005 Brazil exported 32 times more than Colombia, and in 2014, difference was 29 times. This relation has not change even when export level of both countries has reduced practically to half, in ten years (2005-2010).

Even if Brazilian population is more than 4 times Colombian population, and consumption level is more than 6 times, import level (measured in millions of USD) is almost similar since 2012 (Figure 2).

According to Apiccaps (2012), data, Brazil is constituted by 2011 as one of the main exporters (measure by pair and USD), though, as describe before, index is decreasing in this aspect (Table 21). However, at a world level, production and consumption levels are important and locate it in first places (3rd and 4th, respectively), even with low per capita consumption compared with main world consumers (Table 18). In summary, Brazil is a great producer and great consumer, with decreasing levels of international trade, turning it in a footwear self-consumer. On the two last columns of Table 21, this situation confirmed, showing it only imports 1/20 part and produces 1/10 additional part of what it consumes.

Table 21. Exports, Imports, Production and Consumption in Brazil and Colombia, 2011

	USD (millions)		Pairs (millions)				Pop.	Cons.	Imports /	Prod./
Country	Exports	Imports	Exports	Imports	Prod.	Cons.	(millions)	per capita	Cons.	Cons.
Brazil	1296 [15]	428 [36]	113 [11]	34 [41]	819 [3]	740 [4]	195.2	3.8	.05	1.11
Colombia	34 [55]	477 [33]	2 [54]	64 [29]	53 [18]	115 [25]	46.4	2.5	.56	0.46

Source: Calculated based on Apiccaps (2012) and United Nations (2012) data. Population estimated in 2010. World ranking position in square brackets [].

On the other hand, Colombia has very low levels of international trade (Table 21). Its exportation level is very low, not only compared with other countries (54th place by pair number, and 55th in USD), but respect its production (close to 1/25 of the total). At Latin American level is also among the lowest exporters (Table 20). Thus, its consumption level is above its production (almost double it), and its import complement this lack, to the point it surpasses its production. From 115 million of pairs consume in 2011, 53 million were produced by the country, and 64 million were imported, leaving only 2 million to export. Import level makes it second greatest Latin American importer, only after Chile that has the greatest per capita consumption of the region.

This difference described in this subchapter, analysing competitive context of each country (Brazil and Colombia) and their sectors evolution to reach the index values.

3.3.1 Brazilian competitive context

Productive decentralization trends globally realize since 1960s looking to diminish production cost associated to labour, Brazil started to produce mostly to foreign markets (Garcia et al., 2010; Schmitz, 1995). As observed in Table 22, Brazilian export growth in 1970 and 1980 decades increase accelerated, multiplying more than 33 times in only 15 years (between 1970 and 1985).

Table 22. Footwear Brazilian Exportations by volume and value, 1970-2005

Year	Pairs (millions)	USD (millions)	USD/Pairs
1970	4	8	2.0
1975	35	165	4.7
1980	49	387	7.9
1985	133	907	6.8
1990	143	1107	7.7
1995	138	1414	10.2
2000	163	1547	9.5
2005	189	1886	10.0

Source: (Costa, 2010).

American footwear producers search for sources of cheaper production, took foreign labour search with sufficient volume to supply internal American market. By searching they found that Brazil count with firms that meet this requirements, and a business alliance was created between consumer from USA and producers from Brazil with mutual benefits: production costs were reduce for footwear consume in USA, and Brazilian firms got a market that grew exponentially in the last decades of 20th century. Growth based mainly on productive policy in Brazil (especially at states level) and regional opportunities of labour availability, low capital requirement for the productive expansion characteristic of the sector. It developed mainly in some regions of Rio Grande do Sul and São Paulo due to previous presence of firms founded by European emigrants who knew the job and had raw material availability (especially leather) at low prices.

Between 1996 and 2006 this sector is responsible for employment of 182 thousand and 312 thousand, half of them in Rio Grande do Sul, a fifth part in Sao Paulo, and an increasing number in Ceará, Bahia and Paraíba.

This growth was based on what Schmitz (1995) identified as high firms growth of Taylorism/Fordism type with high production of big batches of the same product and an enormous impact that external links mean to the sector through export agents that had positive impact for growth (clients attraction,

design development, quality, delivery) but also had negative impacts (lack of markets diversification, process specialization and not brand creation, lack of knowledge of distribution chains). These factors allow to establish that were more important American firms actions that had control over distribution and commercialization chain, than Brazilian that limit to production.

On the 1990s, Brazilian footwear exports stabilized due to Asiatic production expansion (described in section §3.1.1), in which Brazilian industry was strongly affected by products focused on the same competitive base: low production cost and labour volume. On labour cost, monthly average of a Vietnam worker at the mid of 2000s was USD 100, USD 120 in China, USD 165 in Indonesia, USD 188 in Thailand, USD 190 in Taiwan, and USD 295 in Brazil (Machado, 2007). Many authors argue additionally that the appreciation of the exchange rate produced in the hyperinflation of the 1980s (Schmitz, 1995) and stabilization actions promoted by local government on 1990s (Costa, 2010) subtract competitiveness to Brazilian export competing by cost. Marine transport cost diminishes by infrastructure increase (ships, ports, trucks) contributed to the entry of low price product from Asia to global markets.

Trying to give and answer, Brazilian production for export has move internally to states with cheaper labour (Costa, 2010; Garcia et al., 2010): Ceará, Bahia, Paraiba and Minas Gerais, that had an export level jointed (by value in USD) of 1.0% in 1996 and in 2006 ascended to 19.3% of Brazilian total. For main exporter states, Rio Grande do Sul participation diminish from 88.6% in 1996 to 67.6% in 2006 and Sao Paulo went from 9.5% to 11.3% practically keeping its level. In addition, other firms from Rio Grande do Sul have transfer part of their production a/o distribution chain outside Brazil, especially to Asia and other Latin American countries. Thus, firms transfer has diminished wage of workers of the sector: in 1995, 18% of workers got one minimal salary and a half, and 10% earn more than five minimal salaries; in 2006, 62% of workers earn one minimal salary and a half, and only 3.4% earn more than five minimal salaries (Costa, 2010). Firms transfer and creation of new projects in Brazil northeast is attributed according to Garcia et al. (2010), to low labour costs, fiscal incentives and more favourable financial conditions, federal and state public policy, and at the beginning of transfer, to flexibility in hiring practices of workers focused on production.

At the end of the 2000s, studies affirmed that Brazilian production was strongly internationally rooted. Even though, there are two different positions on money exchange factor influence (BRL and USD compared values) on the exporter ability of the sector. Costa (2010) affirms that rooting ranges in relation to money exchange variation. Opposite to ranging, Garcia et al. (2010), manifest that observations in 1990s, decrease value of BRL correlation did not increase exporter level that governmental authorities expected.

However, observing data from 2006 and 2011 drop of export level and rise in import can be identify, simultaneously there is a significant increase in BRL value (Table 23).

Table 23. Exports, Imports, Production and Consumption in Brazil: 2006 and 2011

	USD (millions)		Pairs (millions)				Pop.	Cons.	Exports/	BRL/
Year	Exports	Imports	Exports	Imports	Prod.	Cons.	(millions)	per capita	Prod.	USD
2006	2139 [a]	153 [a]	180 [b]	19 [b]	796 [b]	635 [b]	190.7 [c]	3.3	22.6%	2.18
2011	1560 [a]	543 [a]	113 [d]	34 [d]	819 [d]	740 [d]	200.5 [c]	3.7	13.8%	1.67
Diff.	579↓	390↑	67↓	15↑	23↑	105↑	9.8↑	0.4↑	8.8%↓	0.51↓

Source: [a] United Nations (2014); [b] Garcia et al. (2010); [c] United Nations (2012); [d] Apiccaps (2012).

Between 2006 and 2011 footwear sector increased production by 3%, imports by 79% in pair number and 255% in USD, diminished exports by 37% in pair number and 27% in USD, and apparent consumption increase by 17%. This way, the sector decreases its exports level from 22.6% in 2006 to 13.8% in 2011 compared to its production by pairs, and shows a clear focus on internal market, situation also reflected when comparing production, international trade and consumption index from other countries (Table 9, Table 12 and Table 18). Thus, considerably increase of import (practically double it) production has not diminished, and consumption volume has increase 7 times more than external acquisition. Even though, Brazilian footwear production sector has not had a strong presence in international trade currently, this does not stop it from being an important production actor, as it was described in §3.1 and §3.2.

Table 24. Footwear Brazilian Exportations (Quantity) by Type: 2006, 2007, 2010, 2011

Type	2006 [a]	2007 [a]	2010 [b]	2011 [b]
Rubber & Plastic	43	50	71	73
Leather	49	42	25	22
Textile	7	7	3	4
Other	1	1	1	1
Total	100	100	100	100

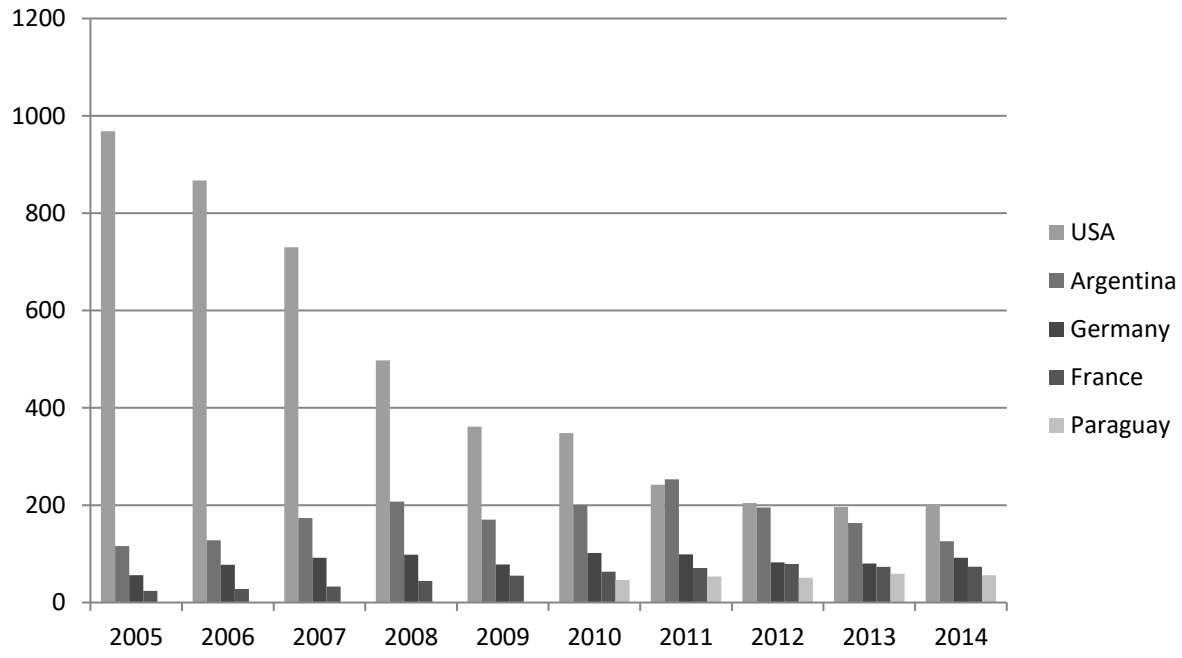
Source: [a] Abicalçados *apud* Garcia et al. (2010); [b] Apiccaps (2011, 2012).

Another important change in Brazilian footwear export is type of product evolution (Table 24). In 2006 and 2007, according to data presented by Garcia et al. (2010), of total exports by volume, practically most production was leather, followed closely by rubber and plastic products, leaving marginal levels to textile and others. In 2010 and 2011, reality was so different, when nearly three quarter of exported pair of shoes are made in rubber and plastic, while only a fourth part is made in leather, with decreasing index. This situation reduces export value (in USD) since average value of rubber and plastic footwear was USD 3.7 and leather was USD 23.8, according global price for 2011 (Apiccaps, 2012). Brazilian products in 2007 had average prices of USD 3.8 in plastic, and USD 16.3 in leather (Garcia et al., 2010).

Another significant change in exports has been modification on buyer countries along last decade. In Figure 3 it is possible to identify footwear export decrease between 2005 and 2014 is related to USA

purchase diminish of the product, even though it keeps being the main buyer and went from acquiring 50% of export value to only 16%. Decrease was notorious long time ago, since in 2000 acquired 70% (Garcia et al., 2010). Client diversification attempt has not been very effective: United Kingdom was the second main client in 2005, acquired USD 180 million, equivalent to 9% of exports, and in 2014 went to 12th place with less than USD 25 million purchased in footwear, with a 2% equivalent to total exports. Italy went from acquiring 2% of total export in 2004 to 7% between 2008 and 2010, but later diminish its orders until reaching similar levels (1%) in 2014. The unique significant decrease in Latin America was from Mexico that went from 4th place as best client (3.8% in 2004) to 25th place (1.0% in 2014) buying only a sixth part of what it bought.

Figure 3. Footwear Brazilian Exportations by Country: 2005-2014



Source: United Nations (2014). Data in USD millions.

Countries like Argentina, Germany and France has risen imports to become, next to USA, four main buyers of Brazilian footwear. From Latin American and Caribbean countries, Brazilian footwear purchases also begin to flourish: from 16% of total exports (5% Argentina, 11% remaining countries) in 2004, went to acquire 39% (14% Argentina, 25% remaining countries) in 2013. Most outstanding countries besides Argentina, were Paraguay (4.7%), Bolivia (3.7%), Chile (3.5%), Colombia (3.4%) and Peru (2.8%) that were among 10 main buyers. In the case of Ecuador, Uruguay, Dominican Republic and Mexico, with percentage ranging between 1.1 and 1.5, located among 20 of the best buyers. Many of these countries multiply purchases as the case of Paraguay (4 times), Bolivia (10 times), Colombia (4 times) and Peru (3.5 times). Chile and Ecuador grew marginally their purchases to Brazil.

Table 25. Footwear Brazilian Exports by Type 2011-2014

	USD (millions)				Pairs (millions)				Avg. Price (USD/Pair)			
Type	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
Waterproof	4.7 0%	4.1 0%	4.1 0%	4.1 0%	0.5 0%	0.4 0%	0.7 1%	0.6 0%	10.0	11.0	5.5	7.5
Rubber & Plastic	475.1 32%	476.6 37%	485.5 38%	498.5 40%	83.0 73%	89.5 79%	97.7 79%	105.8 82%	5.7	5.3	5.0	4.7
Leather	736.0 49%	544.5 42%	514.9 41%	491.3 40%	24.4 22%	18.6 16%	17.9 15%	17.2 13%	30.1	29.3	28.8	28.5
Textile	64.1 4%	55.8 4%	81.0 6%	64.7 5%	4.0 4%	4.0 4%	6.1 5%	5.5 4%	16.1	14.0	13.3	11.8
Other	16.5 1%	11.9 1%	9.8 1%	8.6 1%	1.1 1%	0.8 1%	0.5 0%	0.5 0%	15.4	15.5	18.2	18.8
Parts	202.5 14%	193.4 15%	168.0 13%	170.4 14%	11*	10*	9*	9*	18.3†	19.1†	18.6†	18.6†
TOTAL	**1499** **100%**	**1287** **100%**	**1263** **100%**	**1238** **100%**	**113** **100%**	**113** **100%**	**123** **100%**	**130** **100%**	**11.5**	**9.6**	**8.9**	**8.2**

Source: Calculated based on United Nations (2014) data. * Kilograms (millions). † USD/kg. Shaded area is not included in TOTAL.

Brazilian footwear exports are classified in Table 25 by type of material, between 2011 and 2014 by value (millions of USD), pair number and average price. Brazilian footwear industry export similar values of footwear made in leather as rubber and plastic, even though leather footwear is decreasing, and rubber and plastic footwear is increasing, for both cases in value, as in percentage of exported total. By pair number, volume of export for rubber and plastic footwear is increasing (27.5%), while leather footwear is decreasing (-29.5%). This change could be a consequence of changes of market targets that has Brazilian footwear industry, focusing on the neighbours that as it was mentioned in Table 20 have low footwear consumption levels.

Footwear industry participation in global production chains can be observed, since average of reviewed years, 14% of exported value corresponds to footwear parts and components. World footwear export (Table 14), only 7% of total value (USD) corresponds to this item, and that is why Brazil has a high participation. If it is compared to Brazilian imports of parts and components (Table 27), in which imports represent 14%, a high integration of Brazilian footwear industry in global production chains is observed, although no significant variation is perceived.

Exports decline (by value and pairs) has been described, highlighting mainly leather footwear export declined, not sufficient to make up for increase on export of rubber and plastic footwear. Proportionally, Brazilian industry increasingly exports rubber and plastic footwear, and less leather footwear, keeping marginal proportions for the rest types of footwear; increase of low price product exports, greatly affects the total value of exports. Another important observation is the loss of value of products (average unit price), that goes against world trend, describe in Table 14. In this way, while

the increase in the unit value in the exporting countries increased 22.7% between 2011 and 2013, Brazilian industry decrease 28.7% in the same years.

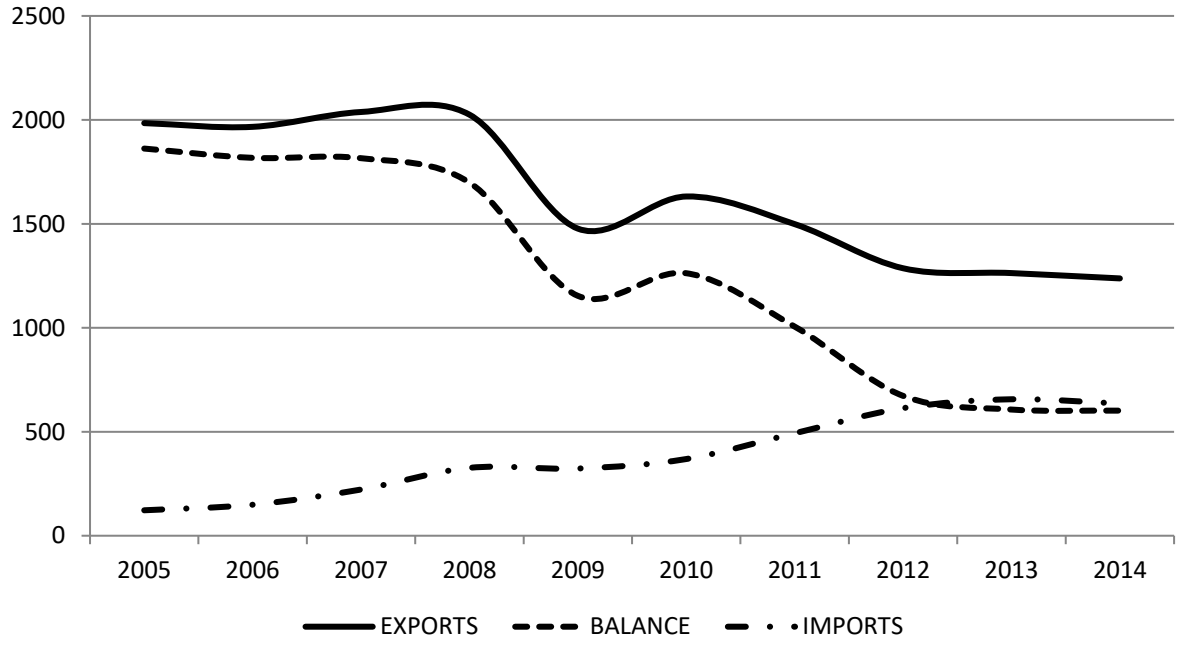
This situation mainly obeys to a trend and to conjectural situation. The trend is the enormous growth of Asian footwear firms, that monopolized a big part of global production index (88.8% of total pairs and 74.1% of value, see Table 7) and export (85.4% by pairs and 56.6% by value, of which 75% corresponds to delivery to other continents). The conjectural situation is the economic drop of USA in 2008.

Competitive response has been, as mentioned previously, internal transfer of production to regions with fewer salaries, even though is coherent with low price competition but not with added value. But also, and after USA economic drop 2008, the biggest client of Brazilian footwear industry (situation presented in Figure 3, although the decline had started years ago), firms started to strengthen big scale production, a phenomena Garcia et al. (2010) and Costa (2010), were already describing, intern market orientation (that is growing not only by inhabitants number, but also due to per capita consumption), regional markets conquest (specially South American), productive restructuring and technological update of 1990s and 2000s.

Increase of internal Latin American market is a result of a strategy describe by Garcia et al. (2010) and is similar to what has been done by internal market: manage own products, brands and market channels without big international buyers presence that characterize export to other markets, which additionally grants Brazilian export firms a greater margin of profitability. Another competitive strategy of Brazilian firms has been specialized product offer with minor volumes in countries of many continents, allowing balancing market size, obtaining greater economic benefits by pair of shoes, and achieving a greater power by direct business relationship.

Garcia et al. (2010) identify three base competitive factors of Brazilian firms exports: 1) high cost/benefit (quality/price) relation development that grant a great production ability with high quality at acceptable prices; 2) production ability to customer needs, that grant firms great capacity of increasing innovation through try and failure, to enable producible of diverse products requested by costumers; and 3) process flexibility, allowing firms not only to produce with high quality and adapting to clients request, but to produce a great variety of products without losing productive efficiency nor capacity of compliance in the terms. These characteristics were achieved not only by technological updating and increase productive ability, but also with labour training, organization innovation and production management. Another consequence has been vertical integration that has lead firms to face from design to distribution and brand licensing.

Figure 4. Footwear Brazilian Balance of Trade: 2005-2014



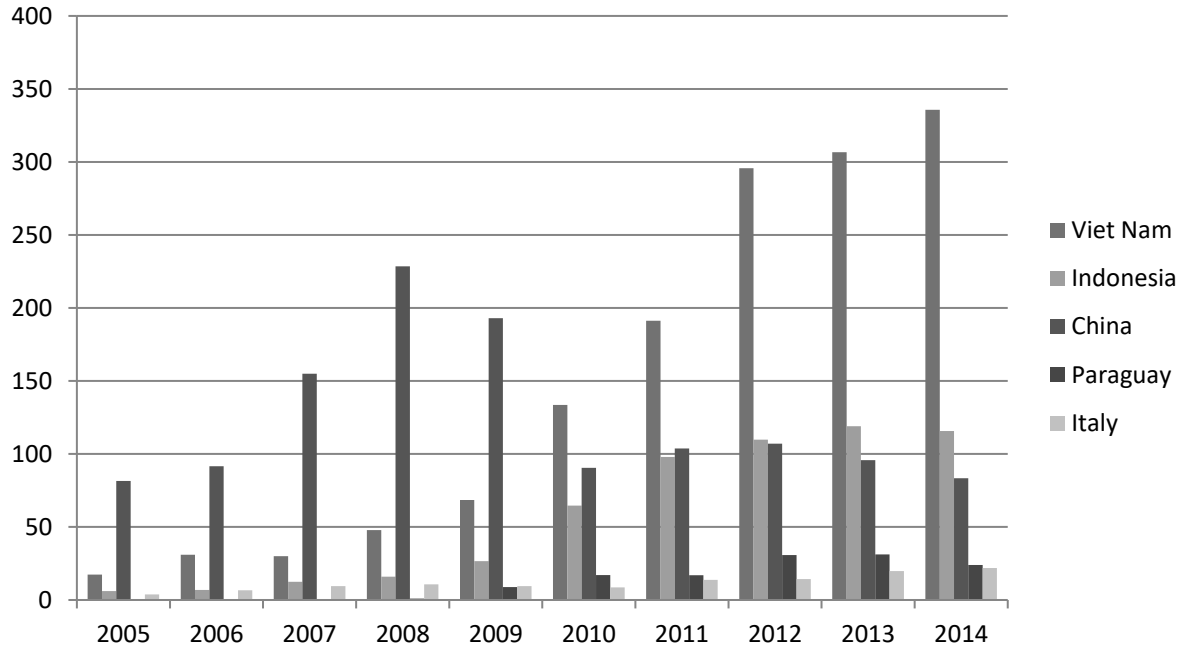
Source: United Nations (2014). Data in USD millions.

Relating to imports, growth has been remarkable, since in 2005 and 2014 value in USD multiply more than 5 times. Even though, trade balance remains positive although declining. In 2005 exports value were 16 times greater than imports, while in 2012 to 2014 relation was minor to 2, reason why trade balance was minor than import level (Figure 4).

Imports analysis by countries (Figure 5), although at the beginning China was the main supplier, with significant increase by value coincident with imports increase until 2008 and a slight decrease in 2009 (caused by world economic situation) that represented near to two third parts of total purchases, since 2010 Vietnam has consolidated as the main supplier of footwear for Brazil, getting to supply more than half of total value of imports, increasing more than 20 times its value, displacing China to a second place with a value equivalent to 13% in 2014 (although in the period kept sales value). This change was motivated by protection measures against imports of Chinese footwear in 2009, not only changing main supplier, changing China by Vietnam and Indonesia, but making firms to start import of footwear parts and ensemble them in Brazil.

Another country consolidated since 2010, with lower performance, has been Indonesia, who went for supplying 5% in 2005 to 18% in 2014 (multiplying sales by 20). Paraguay was the 4th greatest footwear suppliers of Brazil in 2014 with 4% of imported total, value that has been rising since 2008, year when United Nations (2014) , report started to appear, and corresponds to the advertise of different Brazilian firms to invest in Paraguay.

Figure 5. Footwear Brazilian Importations by Country: 2005-2014



Source: United Nations (2014). Data in USD millions.

Overall, five main footwear exporter countries to Brazil in 2014 represent 91% of total acquired value (Vietnam 53%, Indonesia 18%, China 13%, Paraguay 4%, Italy 3%), leaving marginal levels for the rest of the countries, among this appear Argentina, Cambodia and Thailand, representing each value between 1% and 2% of total purchases by value (USD). Other 46 countries that appear registered by United Nations do not achieve to supply individually more than 1% of footwear import total values to Brazil.

Table 26. Footwear Brazilian Imports by Type 2007 and 2014

	2007 [a]					2014 [b]				
Type	Value (USD millions)		Pairs (millions)		Avg. Price (USD)	Value (USD millions)		Pairs (millions)		Avg. Price (USD)
Injection	1.0	0.5%	0.3	1.0%	3.3	1.4	0.2%	0.3	0.8%	4.7
Plastic	81.1	38.7%	12.6	44.1%	6.4	98.2	17.5%	7.7	20.9%	12.8
Leather	52.2	24.9%	2.7	9.4%	19.3	97.1	17.3%	4.5	12.2%	21.6
Textile	63.1	30.1%	7.5	26.2%	8.4	357.4	63.7%	20.8	56.4%	17.2
Other	12.0	5.7%	5.5	19.2%	2.2	7.1	1.3%	3.6	9.8%	2.0
Total	**209.5**	**100%**	**28.7**	**100%**	**7.3**	**561.2**	**100%**	**39.2**	**100%**	**15.2**

Source: [a] Abicalçados *apud* Garcia et al. (2010); [b] Abicalçados (2017).

Data compared between 2007 and 2014 (Table 26) presents an increase of 37% by total number of imported pairs, while increase by value is 168%. Disparity is caused mainly by increase of average price by each footwear type double in injected products, plastics and textiles. Even there were changes in imported type of product, influence on disparity are marginal, since textile footwear increase proportionally, and plastic diminishes to similar prices.

Table 27. Footwear Brazilian Imports by Type 2011-2014

	USD (millions)				Pairs (millions)				Avg. Price (USD/Pair)			
Type	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
Waterproof	7.2	8.3	4.6	1.4	1.6	1.4	0.7	0.3	4.6	6.1	7.0	4.9
	1%	1%	1%	0%	5%	4%	2%	1%				
Rubber & plastic	169.2	159.0	137.0	98.2	13.4	10.2	10.1	7.7	12.7	15.6	13.6	12.8
	34%	26%	21%	15%	39%	29%	26%	21%				
Leather	101.5	94.5	107.4	97.1	5.0	4.4	4.8	4.4	20.3	21.3	22.3	21.9
	21%	15%	16%	15%	15%	12%	12%	12%				
Textile	139.3	234.2	313.4	357.4	9.7	14.2	19.1	20.8	14.4	16.5	16.4	17.2
	28%	38%	48%	56%	28%	40%	49%	56%				
Other	10.6	12.6	10.0	7.1	4.4	5.5	4.5	3.6	2.4	2.3	2.3	2.0
	2%	2%	2%	1%	13%	15%	11%	10%				
Parts	65.1	105.1	84.0	74.7	5.0*	7.6*	5.7*	5.1*	13.1†	13.8†	14.8†	14.7†
	13%	17%	13%	12%								
TOTAL	**493**	**614**	**656**	**636**	**34.0**	**35.6**	**39.2**	**36.8**	**12.6**	**14.3**	**14.6**	**15.3**
	100%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**				

Source: Calculated based on United Nations (2014) data. * Kilograms (millions). † USD/kg. Shaded area is not included in TOTAL.

In the same way as in Figure 5, Table 27 evidences an increase of footwear imports, by value (USD), volume (pairs) and average unit price (USD/pair). Analysing footwear by type of material, is remarkable import reduction of rubber and plastic (-42% in USD) and increase in textile (157% in USD). Is also remarkable market dynamic of shoe parts, spatially comparing values of import (12% in 2014) and export (14% in 2014).

Even with location that have been done mostly by largest firms (Costa, 2010; Garcia et al., 2010), medium and small firms do not have the same options as do not count with infrastructure and productive agglomeration benefits that have regions where already exist and has not been created in northeast states. In this way, even large states like Rio Grande do Sul and Sao Paulo keep having big importance in Brazilian footwear production.

At Sao Paulo production volume in order are Franca regions (30 thousand formal employments, 1.7 thousand firms and average of 17.6 employees/firm), Birigui (17 thousand formal employments, 270 firms and average of 62.9 employees/firm) and finally Jaú (8 thousand formal employments, 400 firms and average of 20 employees/firm), the last where small firms predominate and a strong specialization on female footwear (Garcia et al., 2010).

3.3.2 Colombian competitive context

Studies of Colombian footwear sector are scarce, since it has not represented a significant production volume, and has developed mainly to fulfil intern consumption [9], and is the reason why footwear sector is analysed jointed to other three interdependent chains: raw leather production, fur processing in tannery, leather goods production, and finally saddler and footwear. Unique identify references about industrialization process date back to 1930 and 1940 decades, when Croydon (subsidiary of the Canadian firm) implements footwear production with rubber outsole with Canadian and Swiss technology.

Since 1990s decade, with imports release, competence with foreign product focus in production cost reduction by Colombian firms, that even though took firms to closure and reduction of installed capacity for others, looking for outsourcing alternatives and product optimization. Additionally, on the same decade and with same globalization process, large world producers (France, Italy, China and Brazil) started to acquire a large amount of leather that risen international price and caused scarcity for national manufacturers, situation that affected national industrial productivity and competitively.

Table 28. Exports, Imports, Production and Consumption in Colombia: 2010 and 2011

	USD (millions)		Pairs (millions)				Pop.	Cons.	Exports/
Year	Exports	Imports	Exports	Imports	Prod.	Cons.	(millions)	per capita	Prod.
2010	28 [a]	319 [a]	2 [a]	29 [a]	48 [a]	75 [a]	45.9 [c]	1.6	4.2%
2011	34 [b]	477 [b]	2 [b]	64 [b]	53 [b]	115 [b]	46.4 [c]	2.5	3.8%
Diff.	6↓	158↑	0→	35↑	5↑	40↑	1.0↑	0.9↑	0.4%↓

Source: [a] Apiccaps (2011); [b] Apiccaps (2012); [c] United Nations (2012).

Leather sector participation in Colombia for 2013 was 0.27% of national GDP, 2.17% of manufacture GDP and 0.6% of national employment. Recognizing the facts has made national government to promote actions to strengthen the sector: mixed tariffs, competitive improvement projects, fight to reduce contraband, and search for raw materials availability (Propaís, 2013).

Due to the disappointing indexes of the sector at the beginning of 2010 decade, Colombian government from 2013 implemented import tariffs for clothing and footwear (decree 074 of 2013 and 456 of 2014 from *Ministerio de Comercio, Industria y Turismo*, MINCIT) which in addition to a 10% tax, to avoid under invoicing, pairs with prices below USD 7 paid an additional USD 5, and those who were over USD 7 paid USD 1.75. First measure had effect over a year, and two for the second (finalize in March of 2016). Although footwear businesspersons express optimism (according to press reports),

[9] Only 4% of Colombian production was exported in 2011 (Table 28) compared with 14% exported by Brazil in the same year (Table 23).

doubt exist about efficiency of the measure, since massive imports were identified prior to the entry into force of the measure, and its convenience, for protectionism critics in terms of loss of competitiveness and product quality, at the same time as an increase in products prices for the consumer.

According to the Productive Transformation Programme[10] (PTP, attached entity to *Ministerio de Comercio, Industria y Turismo* and *Bancóldex*) and based on Chamber of Commerce registry from cities, for 2013 footwear and leather goods sector grouped 13 thousand firms for supplies and transformation and 15 thousand marketers in 28 of 32 states of the country. Of total (28 thousand firms), 27% correspond to transformation, for an approximately of 7.5 thousand firms. From these, 38% are located in Bogotá and its surroundings (central region of the country), 33% in Santander and Norte de Santander (Northwest region of the country), 12% in Valle del Cauca and Colombian coffee region (900 firms approximately) with productive centres located a maximum of 4 hours with each other by road. By type of product, the PTP (Acicam, Fedecuero, & Universidad del Rosario, 2013), identified 22 thousand of footwear firms, of which 85.6% produce leather footwear, giving a marginal value to the percentage of production volume for other types of footwear.

According to *Encuesta Anual Manufacturera* (EAM del DANE) of 2012, footwear manufacture contributes with 2.1% to employment, even though it presents high informality, since temporal personnel represents 4.5% of national total and only 1.3% of permanent remunerate personnel reflected as formal employment. Finally, it presents a low level of national added value (0.6%) compared to sectors with similar levels of employment contribution, like metal, paper, cardboard, machinery and graphic printing, that present much lower levels of informality, but on the other hand have superior investment actives. Closest sectors by indexes to footwear manufacture are metallic products and machinery with national production added value of 50% superior to footwear (0.97% and 0.93%, respectively). Even though, is remarkable that from all sectors compared, footwear is the one that less actives demand (0.31% footwear, 0.75% metallic, 0.68% machinery). These economic sector characteristics, added to relatively high level of temporal personnel level (in 2012, Colombia had an unemployment rate of 10.4%), makes viable creation of firms of diverse size, that require low capital investment, but intensive labour. The small firm number identifies, that coherent with interviews,

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10 https://www.ptp.com.co/documentos/PLAN%20DE%20NEGOCIOS%20CUERO%20CALZADO%20Y%20MARROQUINER%C3%8DA_VF.pdf [Retrieved June 11, 2015]

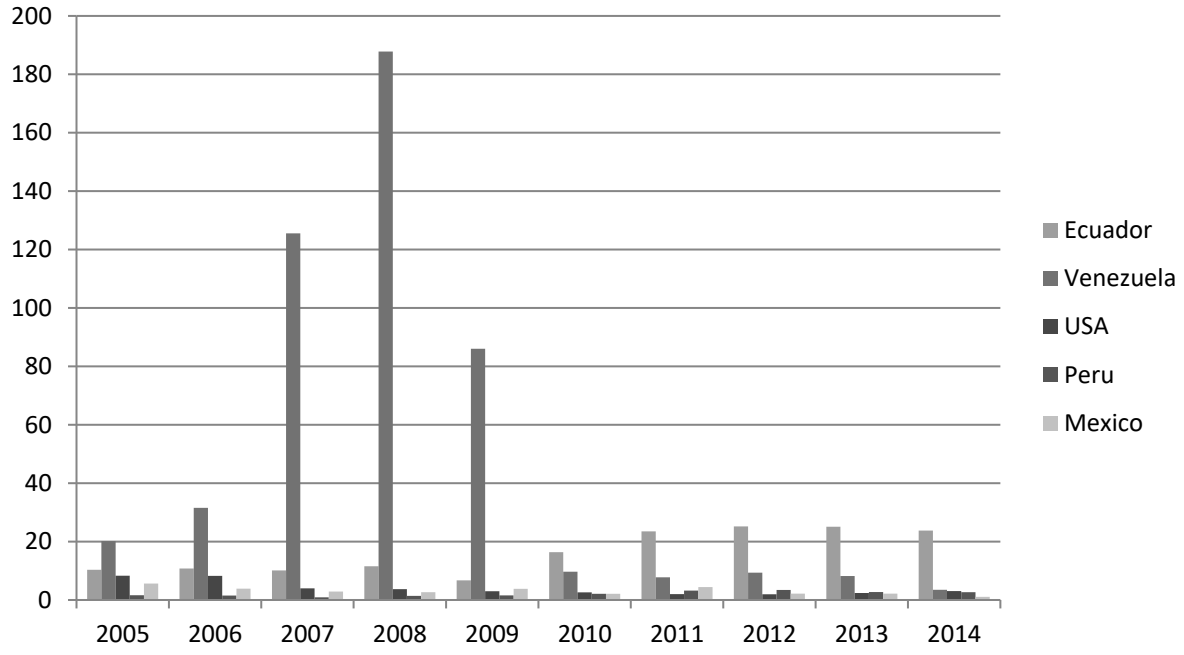
businesspersons affirmed that firms foundation was due to knowledge they possess and the relatively low investment required.

However, even with its identify low productivity, national government, in recent years is interested in taking advantage of installed infrastructure and knowledge in different regions of the country to increase mean sector competitiveness by means if relatively low investment, ensuring growth and increase of employment. Government interest for footwear production is supported by added value growth of footwear manufacture, calculate by PTP (Acicam et al., 2013) in 183.250 million COP in 2000 to 476.067 million COP in 2011 (average annual growth of 9.1%). In 2013, actual government and institutional support, contributing with financial, logistics, educational and research resources, together with footwear, leather and leather goods guild, elaborated PTP (Acicam et al., 2013) in which visions were proposed for 5 years term (2018, 2023, 2028) formulating action plans in 1) sectoral strengthen, promotion and innovation; 2) norm and regulatory framework; 3) human capital; and 4) infrastructure and sustainability. This plan proposes intern market recovery and sufficient strengthening to increase Latin American exports with countries already commerce with (plan for 2018), take advantage of commercial agreements (TLC) especially with USA and Europe (plan for 2023), and position as the thirds Latin American producer with a 12% participation of regional export (plan for 2028).

Although, at interviewing (after more than a year plan was formulated) businesspersons did not manifest lack of recognition for planned activities. Although a detailed activities review can recognize individual ways each actor is realizing the activities that tend to improve competitive strategies, coherent with abilities (financial and technical), such as production and waste management, technological update, among others.

At exports, Colombia evidences an enormous productive capacity, but low competitiveness Figure 6 presents export volume and the countries to which it is exported, evidencing the vast majority was for one only market, Venezuela, although international policy issues between the two countries closed trading affecting in big manner Colombian footwear sector. The only market that present growth is Ecuadorian (between 2009 and 2014), although with small volume if compared to maximum reached with Venezuelan.

Figure 6. Footwear Colombian Exportations by Country: 2005-2014



Source: United Nations (2014). Data in USD millions.

Export by type of product (Table 29), shows leather products as most representatives by economic value and pair number, followed by rubber and plastic. Is interesting the economic value that represent footwear parts export, meaning the important presence in global productive chains, although assessed years present decrease.

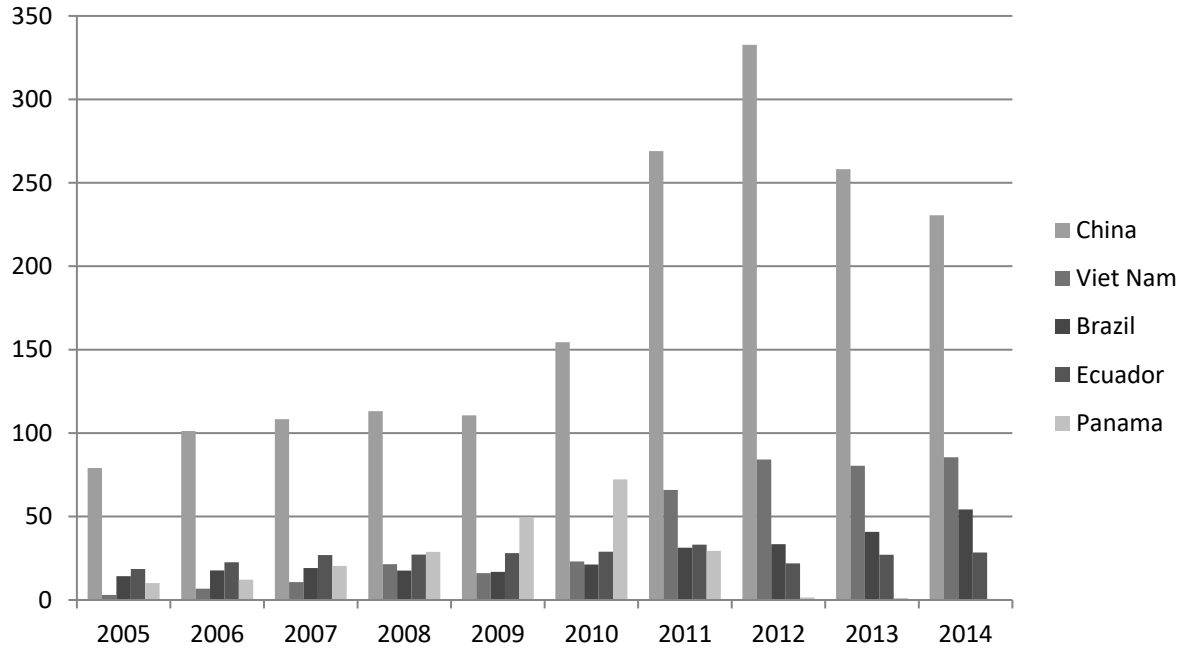
Table 29. Footwear Colombian Exports by Type 2011-2014

	USD (millions)				Pairs (millions)				Avg. Price (USD/Pair)			
Type	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
Waterproof	1.1 2%	2.7 5%	3.3 6%	3.0 7%	.14 6%	.34 15%	.31 15%	.30 14%	8.4	8.1	10.5	10.2
Rubber & Plastic	8.6 17%	7.8 15%	6.6 13%	6.8 16%	.92 41%	.81 36%	.68 34%	.70 34%	9.3	9.6	9.7	9.8
Leather	20.2 39%	19.8 38%	20.1 39%	15.8 37%	.81 36%	.75 33%	.75 37%	.81 40%	24.9	26.5	27.0	19.5
Textile	3.9 7%	3.1 6%	2.2 4%	2.2 5%	.36 16%	.28 13%	.24 12%	.19 9%	10.8	10.8	9.3	11.5
Other	0.4 1%	0.7 1%	0.7 1%	0.9 2%	.05 2%	.07 3%	.04 2%	.05 2%	9.1	10.2	15.9	17.9
Parts	17.9 34%	18.5 35%	18.6 36%	14.0 33%	1.7*	1.9*	1.7*	1.5*	10.6†	9.9†	11.2†	9.5†
TOTAL	**52.2** **100%**	**52.6** **100%**	**51.6** **100%**	**42.8** **100%**	**2.28** **100%**	**2.25** **100%**	**2.03** **100%**	**2.05** **100%**	**15.0**	**15.1**	**16.3**	**14.1**

Source: Calculated based on United Nations (2014) data. * Kilograms (millions). † USD/kg. Shaded area is not included in TOTAL.

Related to import (Figure 7), China is the biggest supplier, follow by Vietnam, Brazil and Ecuador. Due to measures adopted by Colombian government for custom control in 2011 (p.114), Panama has decrease drastically its export to Colombia.

Figure 7. Footwear Colombian Importations by Country: 2005-2014



Source: United Nations (2014). Data in USD millions.

By type of product (Table 30), most import (by value and volume) are of rubber and plastic products. In second place, is textile footwear, and on third place is leather footwear. Footwear parts import represents a very little value.

Table 30. Footwear Colombian Imports by Type 2011-2014

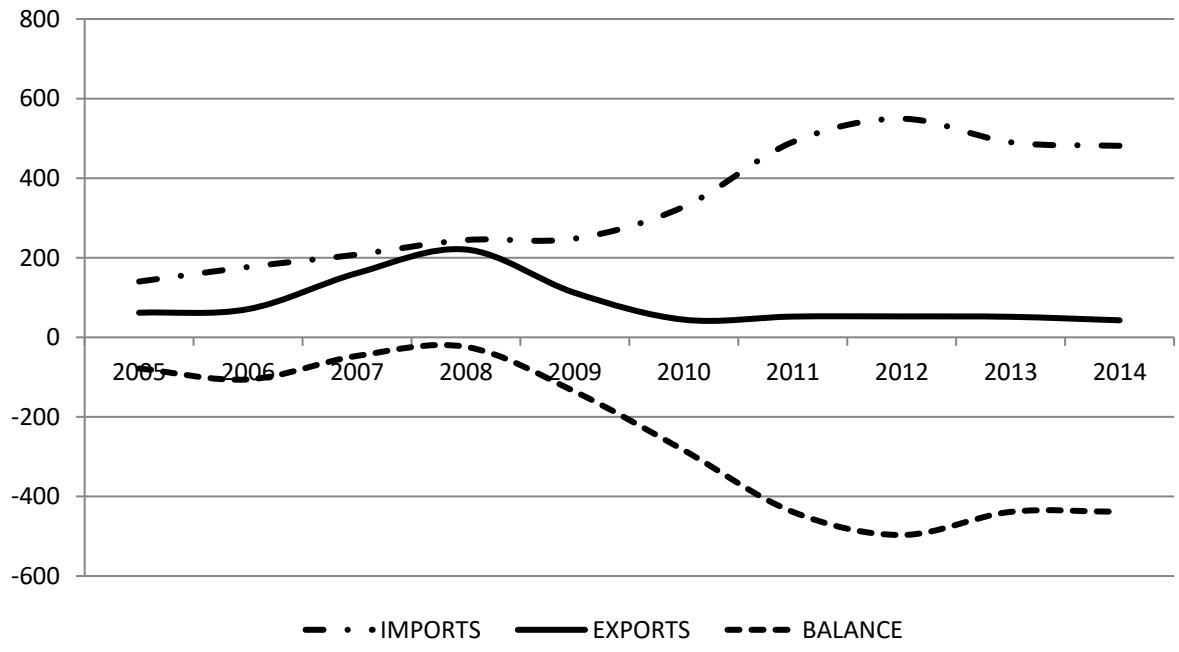
	USD (millions)				Pairs (millions)				Avg. Price (USD/Pair)			
Type	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
Waterproof	21.4 4%	13.9 3%	13.3 3%	14.2 3%	5.4 8%	3.4 4%	3.4 6%	3.2 6%	3.9	4.1	3.9	4.4
Rubber & Plastic	199.0 41%	239.5 44%	190.8 39%	177.7 37%	35.2 55%	46.2 60%	33.8 56%	30.3 53%	5.6	5.2	5.6	5.9
Leather	136.0 28%	136.7 25%	134.0 27%	131.8 27%	5.4 8%	5.8 8%	5.6 9%	5.6 10%	25.3	23.7	23.7	23.7
Textile	119.9 24%	142.6 26%	138.5 28%	142.5 30%	17.7 28%	20.6 27%	16.7 28%	17.8 31%	6.8	6.9	8.3	8.0
Other	1.2 0%	2.0 0%	1.7 0%	1.7 0%	0.4 1%	0.7 1%	0.4 1%	0.1 0%	3.3	3.1	4.8	13.1
Parts	13.4 3%	14.7 3%	11.9 2%	13.5 3%	1.9*	2.0*	1.4*	1.8*	6.9†	7.4†	8.5†	7.5†
TOTAL	**491** **100%**	**549** **100%**	**490** **100%**	**481** **100%**	**64.1** **100%**	**76.6** **100%**	**59.9** **100%**	**57.0** **100%**	**7.5**	**7.0**	**8.0**	**8.2**

Source: Calculated based on United Nations (2014) data. * Kilograms (millions). † USD/kg. Shaded area is not included in TOTAL.

Colombia has a negative balance on trade since 1990s. As observed in Figure 8 , midst of 2000s decade was close to zero, but loosing markets as show on graphics, its negative balance increase, as coincidence for loosing export and significant increase of import (more than double between 2009 and 2012) with a tendency to stabilize.

Sectoral reports at the end of the year made by Acicam (2014) informs that production index (4.9%), total sales (6.2%), intern market sales (7.9%) and employment (6.8%) have had a positive behaviour. According to the same report, footwear and components exports have diminish 17%, compared to its value in USD between 2014 and 2013, due to sales decrease in Mexico, Ecuador and Venezuela. Imports presented a decrease of 1.8% between 2014 and 2013, although compared to values of 2014 and 2012 decrease is equivalent to 17.2% reflecting import measures adopted by Colombian government (and has affected purchase in China, that are being partially replaced for Vietnam).

Figure 8. Footwear Colombian Balance of Trade: 2005-2014



Source: United Nations (2014). Data in USD millions.

At the internal level, footwear productive chain is composed by 22053 firms (Table 31), from this, a fifth part is dedicated to transformation, and are the ones that greater added value reach (according to PTP in 2011 represent 69.4% from total manufacturing). This means that only 4455 firms (22.2%) are dedicated to footwear production and 2735 (12.4%) to materials production.

Table 31. Colombian footwear productive chain

	22.053 firms (100%)	
Supplies provider (21.1%)	**Transformation (20.2%)**	**Marketing (58.7%)**
▪ Manufacture of leather raw materials (3.8%) ▪ Manufacture of textile raw materials (0.6%) ▪ Manufacture of other raw materials and supplies (6.8%) ▪ Manufacture of leather footwear parts (1.2%) ▪ Wholesale of raw materials and supplies (7.1%) ▪ Retail of raw material and supplies (1.5%)	▪ Manufacture of leather footwear for gentlemen (1.0%) ▪ Manufacture of leather footwear for ladies (1.7%) ▪ Manufacture of leather footwear for kids (0.2%) ▪ Manufacture of sportive leather footwear (0.7%) ▪ Manufacture of other type of leather footwear (13.6%) ▪ Manufacture of footwear in other materials (2.9%)	▪ Footwear retail trade (53.3%) ▪ Footwear wholesale trade (5.4%)

Source: Productive transformation programme (2013).

By internal consumption distribution, the biggest is represents by Bogota (24.3%), followed by Medellin (15.5%), Cali (9.31%) and Barranquilla (4.9%). Distribution by product, male footwear is 57%, female is 30% and child and infant is 13%.

From 4459 producer firms in Colombia, 4033 are located in four zones mainly: 1) Bogota and Cundinamarca with 1674 firms, 2) Santander (Santander and Norte de Santander) with 1463, 3) Valle del Cauca and coffee region (Risaralda, Quindío and Caldas) with 549 firms and 4) Antioquia with 347.

Sector importance in Valle del Cauca and coffee region is evident since it concentrates 14% (4266 firms) out of the total firms that produce and commerce leather, footwear and leather goods chain, although 93% are micro and 5% small firms, leaving only 2% to medium and large firms. From total firms, 19.3% are dedicated to products transformation (12.6% leather footwear manufacture, 0.8% other footwear different to leather and 5.8% to other leather articles). There are in Cali 357 registered firms in the city Chamber of Commerce as footwear manufacturers.

By 2013, Valle del Cauca acquired 19% of total footwear national import (Acicam, 2014). As a region, Valle del Cauca had a bilateral negative trade balance in 2012 and 2013 with USD 2.283 million from exports and USD 4.551 million from imports (and a balance of USD -2.267 millions) for 2012, and USD 2112 million from exports and USD 4500 million from imports (and a balance of USD -2388 millions) for 2013, showing a trend to exports decrease and imports stabilization. For 2014, trade balance increase to USD -3035.

From export value, 35% goes to Ecuador, 26% for USA, 22% distributes between Peru, Venezuela, Mexico, South Korea, United Kingdom and the rest 17% to other destinations. However, from manufactured products, 20% corresponds to soles and heels made of rubber and plastic, 12% to leather footwear, 9% to rubber and plastic footwear, 4% to insoles, and 3% to textile footwear. Imports come mainly from China (62%), Ecuador (14%), Vietnam (9%), Brazil (4%), Thailand and Indonesia (2% each) and 95% corresponds to footwear (mainly rubber or plastic, textile and leather)

By last, PTP analysis (Acicam et al., 2013), shows that Valle del Cauca presents the best national level of product quality and competitiveness index, with a high capacity for employment creation. In competitive aspects has a high level in costs calculation, sales calculation, and needs to improve information technologies, process and product engineering, environment and quality management.

“He decidido enfrentar la realidad,
así que apenas se ponga linda me avisan”.

(Joaquín Salvador Lavado Tejón, Toda Mafalda, 1993)

“Ay, alma mía, hermoso es el planeta,
lleno de pipas por la mano conducidas en el humo,
de llaves, de saleros, en fin,
todo lo que se hizo por la mano del hombre, toda cosa:
las curvas del zapato,
el tejido, el nuevo nacimiento del oro sin la sangre,
los anteojos, los clavos, las escobas,
los relojes, las brújulas, las monedas,
la suave suavidad de las sillas”.

(Pablo Neruda, Oda a las cosas, 1954)

4 RESULTS

This chapter presents the studied characteristics of interviewed firms. Starting with an explanation about decomposition of total sample by regions (Jaú and Cali) and products (female and non-female footwear), as well as a debugging mean to homogenize samples, ending with an explanation on the grade of intersection among them (§4.1). Afterwards, firms characteristics, proximity dimensions and results, of total firm samples (§4.2), samples by region (§4.3) and by type of product (§4.4) are presented.

4.1 Samples grouping

Aiming to ease results presentation and analysis (§5), from total interviewed firms sample (N_{total}=53) five groups are initially made and identified at the top of Table 32. **First** group corresponds to total sample; **second** and **third** groups to regional classification, Jaú ($N_{Jaú}$=21) and Cali (N'_{Cali}=32), respectively, as it was described in methodology; **fourth** and **fifth** groups arise from product typology (female and non-female footwear production), and they are identified when comparing firms characteristics at the interview. Female footwear firms related to the fourth group include firms that exclusively produce that footwear type (N_{fem}=30). The fifth group denominated non-female footwear (N_{nofem}=23), includes masculine footwear, mixed (one part of the production is female footwear and another is masculine), child and sports footwear, maquila firms or components producers.

During data compilation, observed characteristics of some firms significantly modify production volume and performance (production/workers) trends of the majority. Analysis of those differences allows identifying firm differentiation (approximately 30% of the total sample). In this way and aiming to compare most homogeneous characteristics among firms, without distortion that might produce firms with big differences, analysis is done with ten samples (see chapter 5) five samples with characteristics described in previous paragraph, and five filtered samples. In this document, to differentiate samples non-filtered and filtered, this last one is identify with prime symbol (').

Therefore, the **sixth** group corresponds to the total sample in which component producers, firms with less than five employees or firms that use maquila as part of their production are subtracted (N'_{total}=38). **Seventh** and **eighth** groups are firms from Jaú ($N'_{Jaú}$=15) and Cali (N'_{Cali}=23), respectively, to which also component producers were subtracted, as well as those that involve maquila or have microenterprise scale. The **ninth** group is composed by female footwear firms to which

microenterprises and maquila were subtracted (N'_{fem}=25). The **tenth** group of non-female footwear producers exclusively which also microenterprises, component producers and maquila are subtracted (N'_{nofem}=13). Detailed information on firm characteristics and number of subtractions are shown at the bottom of Table 32.

Table 32. Grouping definition

Identification	N° firms	Description
Total	53	Complete sample of interviewed firms.
Jaú	21	Total interviewed firms from Jaú (SP, Brazil).
Cali	32	Total interviewed firms from Cali (Valle del Cauca, Colombia).
Female footwear (Female)	30	Total of female footwear producer firms (17 from Jaú and 13 from Cali).
Non-female footwear (nofemale)	23	Total of firms not producing exclusively female footwear (4 from Jaú and 19 from Cali), and produce male footwear, mix (female and masculine), child, sport, outsource production service (maquila) or component producers.
Total filtered (Total')	38	Component producers are subtracted (six), with small firm scale with less than five employees (five), or others that outsource most of their production or work as maquila (four). Corresponds to 71.7% of total sample.
Jaú filtered (Jaú')	15	Group of firms from Jaú to which component producers (three) are subtracted, that work with outsourcing and maquila (two), or microenterprise scale (one). Corresponds to 71.4% of Jaú complete sample.
Cali filtered (Cali')	23	Group of firms from Cali to which microenterprise scale (four) are subtracted, component producers (three), and others that work with outsource or maquila (two). Corresponds to 71.9% of Cali complete sample.
Filtered female footwear (Female')	25	Group of female footwear producer firms to which are subtracted microenterprise (three) and other that work with outsource or maquila (two). Corresponds to 83.3% of female footwear producer complete sample.
Filtered non-female footwear (nofemale')	13	Group of firms that do not produce exclusively female footwear to which are subtracted component producers (six), microenterprise (two) and others that work with outsource and maquila (two). Firms in this group produce masculine footwear, mix (female and masculine), child and sport. In this group one firm is from Jaú and 12 are from Cali. Corresponds to 56.6% of non-female footwear producers complete sample.

Source: Own elaboration.

Firms that stand after refining are selected for possessing characteristics of the majority. Firms subtracted after refining are: 1) component producers, characterized by high product volume, low unit price, and one component specialization (only heels, soles, insole, etc.); 2) firms that outsource large part of their production, serve third parts or total maquila of products, have high product volume with a relative low number of workers, and 3) micro firms with up to five employers and answer to handcraft logic in which low productive efficiency compensate handmade added value and the value recognize by clients.

In total sample and regional classification, filtered sample is only 72% of complete sample, while female footwear sample is 83% and non-female footwear is only 56.5%, by effect of component producers that are classified as non-female but are filtered in the sample.

Table 33 presents subdivision by each sample characteristics. Thus, from Jaú sample of 21 firms, 17 are female footwear producers and four are non-female footwear producers (one child footwear producer and three component producer); or a complete sample of non-female (nofemale.23) contains five male footwear producers, five mix producers, three child producers, two sportive

producers, one maquila producers and seven component producers, while filtered sample of non-female footwear (nofemale'.13) contains four male producers, five mixed footwear, two child and two sportive.

Table 33. Sample grouping characterization by region and type of product

Total					Filtered'				
Jaú 21	Jau.Female			17	**Jaú' 15**	Jau.Female'			14
	Jau.Nofemale	4	Jau.Child	1		Jau.Nofemale'	1	Jau.Child'	1
			Jau.Components	3				Jau.Components'	0
Cali 32	Cali.Female			13	**Cali' 23**	Cali.Female'			11
	Cali.Nofemale	19	Cali.Male	5		Cali.Nofemale'	12 [52.2]	Cali.Male'	4
			Cali.Mix	5				Cali.Mix'	5
			Cali.Child	2				Cali.Child'	1
			Cali.Sport	2				Cali.Sport'	2
			Cali.Maquila	1				Cali.Maquila'	0
			Cali.Components	4				Cali.Components'	0
Jaú + Cali	**Female**			**30**	Jaú' + Cali'	**Female'**			**25**
	nofemale	**23**	Male	5		**nofemale'**	**13**	Male'	4
			Mix	5				Mix'	5
			Child	3				Child'	2
			Sport	2				Sport'	2
			Maquila	1				Maquila'	0
			Components	7				Components'	0
TOTAL				**53**	TOTAL'				38

Source: Own elaboration.

Further from subdivision establishment, is necessary to identify the intersection level among samples. Thus, Table 34 presents the number of cases that belong to one and other groups, and intersection percentage that allows stablishing how much a sample on a column influence a sample on a row. This way is possible to observe that total sample (53 firms) is composed by 39.6% of Jaú firms and 60.4% of Cali firms in regional classification, 56.6% of female footwear producers and 43.4% of non-female footwear producers. Another example is sample filtered of Jaú composition, with 93.3% of female footwear and only 6.6% of non-female footwear, while filtered sample from Cali has 47.8% of female footwear producers and 52.2% of non-female footwear producers.

In the following tables (Table 35 to Table 41) data obtained from interviews of different samples (total, region, and product) are condensed, and questionnaires are available in Appendix A (in Portuguese) and Appendix B (in Spanish). All interviews are structured in the same way: data are grouped in three main areas: firm characteristics (production, innovation, institutional use, experience, and business relationships), proximity dimension (cognitive, organizational, social and institutional) and performance (production and sales), whose conversions at scales are argued in the §2.4. On the left are data obtained in the complete sample and on the right filtered sample, where each index is identified with the prime symbol (‘). The number of answers are presented by each group of data, the mean *($\bar{x}$)*, standard deviation *(SD, σ)*, minimum value *(min),* maximum value *(max),* and median *(M_e).*

SD, minimum and maximum values are an evidence of data variability, as median manifest a trend, due to heterogeneity (especially from size) of consulted firms. The inclusion of these indexes is due to big differences among sample[11].

Table 34. Number of cases in group intersections

∩	TOTAL (53)	Jaú (21)	Cali (32)	Female (30)	Not female (23)	TOTAL' (38)	Jaú' (15)	Cali' (23)	Female' (25)	Not female' (13)
TOTAL (53)	-	21 [39.6]	32 [60.4]	30 [56.6]	23 [43.4]	38 [71.7]	15 [28.3]	23 [43.4]	25 [47.2]	13 [24.5]
Jaú (21)	21 [100]	-	0 [0]	17 [81.0]	4 [19.0]	15 [71.4]	15 [71.4]	0 [0]	14 [66.6]	1 [4.8]
Cali (32)	32 [100]	0 [0]	-	13 [40.6]	19 [59.4]	23 [71.9]	0 [0]	23 [71.9]	11 [34.4]	12 [37.5]
Female (30)	30 [100]	17 [56.6]	13 [43.3]	-	0 [0]	25 [83.3]	14 [46.6]	11 [36.6]	25 [83.3]	0 [0]
Not female (23)	23 [100]	4 [17.4]	19 [82.6]	0 [0]	-	13 [56.5]	1 [4.3]	12 [52.2]	0 [0]	13 [56.5]
TOTAL' (38)	38 [100]	15 [39.5]	23 [60.5]	25 [65.8]	13 [34.2]	-	15 [39.5]	23 [60.5]	25 [65.8]	13 [34.2]
Jaú' (15)	15 [100]	15 [100]	0 [0]	14 [93.3]	1 [6.6]	15 [100]	-	0 [0]	14 [93.3]	1 [6.6]
Cali' (23)	23 [100]	0 [0]	23 [100]	11 [47.8]	12 [52.2]	23 [100]	0 [0]	-	11 [47.8]	12 [52.2]
Female' (25)	25 [100]	14 [56.0]	11 [44.0]	25 [100]	0 [0]	25 [100]	14 [56.0]	11 [44.0]	-	0 [0]
Not female' (13)	13 [100]	1 [7.7]	12 [92.3]	0 [0]	13 [100]	13 [100]	1 [7.7]	12 [92.3]	0 [0]	-

Note: Values among square brackets [] correspond to the percentage of the corresponding row title value
Source: Own elaboration.

4.2 Total sample characterization

This subsection presents results from the total sample by its characteristics (§4.2.1), proximity dimension (§4.2.2) and recent variation from production and sales (§4.2.3), based on presented data in Table 33.

[11] Some indexes, especially of production, have values that differ among firms samples, by simultaneous presence of microenterprises and large firms. Mean is altered specially by large firms, located too far away from general range. E.g., mean number of employees from total sample (N_{total}=53) is $\bar{x}$=70.5, with a range from *min*=2 to *max*=950. First quartile is *Q1*=11.7; second quartile (median) is M_e=*Q2*=18; third quartile *Q3*=50. In this case, mean is located above Q3. Mean calculated without including 10% of largest firms (n_1=950, n_2=550, n_3=300, n_4=240, n_5=200, $\Sigma^1{}_5$=2240), sum 60% of all employees added to the sample (Σ_T=3374) and decreases less than a half ($\bar{x}^1{}_5$=31.1). Median represents a closer trend of firms size.

Total sample, meaning the total of interviewed firms, is 53, composed of 21 firms from Jaú and 32 from Cali, and 30 female footwear firms and 23 non-female footwear firms. The filtered sample of 38 firms, has 15 firms from Jaú and 23 from Cali, 25 of female footwear and 13 of non-female footwear (Table 33 and Table 34).

4.2.1 Firms characteristics

For production characteristics (Table 35), the mean **number of employees** is $\bar{x}$=70.5 ((in the filtered sample is $\bar{x}'$=91.0) minimum of two and maximum of 950 (filtered sample has seven and 950, respectively). Range amplitude and SD magnitude (σ=153.9 and σ'=177.8) and the difference among mean and median (M_e=18; M_e'=25.46), manifest great diversity among firms' sizes; this situation is also evidenced in annual value of production, in which even in filtered sample (that does not include production with less than 5 employees), largest production is 491 times the smallest, and mean triplicate the median. In total, the 53 firms report 3734 employees. In filtered sample 3458 are reported (92.6% of total reported) in 38 firms. Two biggest firms by employee number have 40.2% of total reported, and five biggest have 60%.

Annual production value , measured by product value per unit number, has a total of USD 199.7 million among 51 firms that reported data (168.5 among 37 firms from filtered sample), obtaining a mean of USD 3.9 million per firm ($\bar{x}'$=4.6). However, both samples evidence heterogeneity by range (*min*=0.006; *min'*=0.06; *max*=*max'*=29.48) and SD (σ=6.24; σ'=6.86). Median reflects a different reality than that of the mean, with a production slightly superior to one million (M_e=1.12) and one and a half in filtered sample (M_e'=1.57). Two largest firms, represent 26.8% of total reported production and the five biggest 47.7%.

In terms of production performance, measured by **mean annual production per employee**, a mean of USD 59 thousand (very similar among total and filtered sample) and SD of more than USD 6 thousand (σ=48.1; σ'=33.9), even with different traits in complete sample (*min*=0.83; *max*=232.83) and filtered sample (*min'*=8.84; *max'*=165.97). Data collection shows that high values do not relate to employee number, and identifying production type shows that firms who outsource production, or are outsourcers, have high apparent production levels, by having high production level (product number multiplied by unit price) with low employee number (information only includes own employees, unknowing employee number from outsourcers). Due to these production model differences, outsourcers are not included in filtered sample.

Table 35. Total sample indexes

			TOTAL (53)						TOTAL' (38)					
Dimensions	**Characteristic**	**Index**	**Mean**	**σ**	**Min**	**Max**	**M_e**	**N**	**Mean'**	**σ'**	**Min'**	**Max'**	**M_e'**	**N'**
Firm	production	n° employees	70.45	153.94	2	950	18	53	90.99	177.8	7	950	25.46	38
		annual production*	3.91	6.24	.006	29.48	1.12	51	4.55	6.86	.06	29.48	1.57	37
		output/employee**	59.32	48.12	.83	232.83	50.21	51	58.74	33.85	8.84	165.97	53.35	37
	innovation	equipment addition	5.37	8.07	0	50	3	52	6.38	9.14	0	50	4	37
		innovation staff	7.48	12.16	0	60.5	4	52	9.22	14	0	60.5	4.25	37
		products/innovation***	1.89	5.68	.02	36	.48	43	.82	1.06	.07	6	.48	33
		innovations/year	210.14	290.73	0	1500	98	46	243.46	322.46	0	1500	110	34
		new markets	.38	.49	0	1	0	52	.43	.5	0	1	0	37
		organization changes	.37	.49	0	1	0	49	.44	.5	0	1	0	36
		production changes	.58	.5	0	1	1	45	.5	.51	0	1	.5	32
	experience	age	18.26	13.16	1	70	18	53	18.97	13.55	1	70	17.5	38
		neighbourhood dist.	1.04	.65	.23	2.96	.98	53	1.09	.68	.23	2.96	1.02	38
		product price	21.04	18.12	.41	108.92	17.15	51	25.15	19.21	5.07	108.92	20.15	37
		outside costumers	32.68	40.54	0	100	4.75	52	19.61	31.61	0	100	1.75	38
		institutional benefits	.34	.41	0	1	0	51	.38	.41	0	1	.5	38
Proximity Dimensions	cognitive proximity	mean	4.05	.6	2.67	5	4.1	31	4.15	.57	3	5	4.1	21
	organizational proximity	project index	.07	.23	0	1	0	52	.07	.23	0	1	0	37
		interaction	6.03	15.45	0	100	2.75	52	3.46	4.96	0	20	2.25	38
		interaction application	.48	.5	0	1	0	52	.45	.5	0	1	0	38
	social proximity	mean	3.75	.92	1.5	5	4	31	3.52	.97	1.5	5	3.5	21
	institutional proximity	comparative index	.59	.09	.37	.72	.59	53	.59	.09	.37	.72	.58	38
Outcomes	production performance	Δ production (%)	-.83	51.8	-75	233	0	49	5.34	53.66	-60	233	0	37
		Δ employees (%)	-3.79	46.69	-68	200	0	52	-2.13	38.17	-61	100	0	38
	sales performance	Δ sales (%)	-2.26	49.3	-75	233	0	50	3.32	50.61	-60	233	0	38

Notes: * PPP, in million dollars (USD). ** PPP, in thousand dollars (USD). *** Thousand products per innovation.
Source: Own elaboration.

Innovation characteristics show enormous indexes variation among interviewed firms. Aspects like new production equipment addition, innovation team strength (measured by quantity, training degree and dedication of personnel that executes innovation activities, §2.4.1), number of units produced per innovation and number of annual innovations, have wide range values, with mean close to fewer values (almost all cases with *min*=0) and SD above mean (in case of product/innovation value is almost four times) and means that duplicate or triplicate the median. These indexes are bigger in refines sample, except for innovation product number, indicating a more frequent innovation renewal (respect to production velocity) than in complete sample.

Firms **acquired production equipment** with a mean of $\bar{x}$=5.37 ($\bar{x}'$=6.38), even median is M_e=3 (M_e'=4), ranging from none acquired equipment (*min*=*min'*=0) to *max*=*max'*=50. **Innovation team** strength has a mean of $\bar{x}$=7.48 and $\bar{x}'$=9.22 (M_e=4; M_e'=4.25), produce $\bar{x}$=1.89 ($\bar{x}'$=0.82) thousand **units per**

innovation, ranging from 0 to *max*=*max'*=36 [12]. Innovation frequency has a mean of $\bar{x}$=210 ($\bar{x}'$=243.5) **annual innovation** with wide annual ranges (*min*=*min'*=0, *max*=*max'*=1500) and a median equivalent to almost half of the mean (M_e=98; M_e'=110)[13].

Following innovation indexes, **entrance to new markets** and **organizational changes**, have similar behaviour in complete and filtered samples: close to 40% enter new markets. On the question about **production changes**, 58% of the total sample changed, while only half (50%) of filtered sample made changes.

Firms experience have a wide **age** ranging from one to 70 years and a mean of 18 years ($\bar{x}$=18.26; $\bar{x}'$=18.97; M_e=18; M_e'=17.5). **Neighbour distance** (closest 20 firms), presents an index mean distance of $\bar{x}$=1.04 km ($\bar{x}'$=1.09, M_e=0.98; *Me'*=1.02) among 20 closest producers with range of nearly 3 km (*min*=*min'*=0.23; *max*=*max'*=2.93), showing firms concentration that justify its representations as regional productive unit inside the same city.

Product Price (measure in USD) has also big differences among firms (*min*=0.41; *max*=108.92; *max*/*min*=265.5), even though, excluding component manufacturers and outsourcers, diminishes range (*min'*=5.07; *max'*=108.9; *max'*/*min'*=21.5). For both samples, median is below mean, not too far (M_e=17.2; M_e'=20.2).

To end with firm characteristics presentation, **external client** percentage, outside the main market for each city (for Jaú is Sao Paulo and for Cali is the city itself), ranging from 0 when there are no clients in main market, to 100 when only have clients there. Differences in the complete and filtered samples are significant by mean ($\bar{x}$=32.7; $\bar{x}'$=19.6) and SD (σ=40.5; σ'=31.6), pointing that filtered sample market diversification is more important at the interview, and if is compared with the result from search of new markets on innovation questions, it tends to increase diversification. Component suppliers' inclusion is more important to unfiltered sample since it focuses on local markets. By looking at the

[12] Results do not include out of the range single data: 56.47 compared with second (36.0) and the following (*n*=44). The value increases difference when is about female footwear producer firms that must permanently update products, and greater values in this index are reached by component producers with massive production; the following female footwear producer firm has a value of 1.76 [*n*=26]. Reviewing details from interview, this is a firm with high production volume that considers new products as production lines. This is the reason to remove results and analysis in chapter 5 (p.160). This change affects results for total sample (Table 35 p.130), firms from Jaú (Table 37 p.137) and female footwear firms (Table 40 p.149) with their respective filtered samples, for indexes of produced units per innovation (products/innovation) and innovations per year (innovations/year).

[13] Ibid.

median (M_e=4.75; M_e'=1.75), almost half of the firms are focusing on external markets. Interviewed firms **institutional benefits** use is relatively low with 34% (38% for filtered sample).

4.2.2 Firms proximity

Cognitive proximity, that measures interviewed perception through questions on communication easiness and technical language similarity, production technologies, ways to make new products and technical knowledge (see Table 6, p.76, rows 1 a 5), spresents wide ranges of the mean (*min*=2.67; *min'*=3; *max*=*max'*=5). Mean, median and SD presentation ($\bar{x}$=4.05; M_e=4.1; σ=0.6; $\bar{x}'$=4.15; M_e'=4.1; σ'=0.57), for communication easiness is assess as easy (grade 1 very hard; grade 5 very easy), and language, technologies, ways to make new products and technical knowledge are similar (score 1, very different; score 5 very similar) to other firms that interact, even with greater easiness and similitude to filtered sample.

Both cognitive and social proximities in interview design are only answered by firms that hold knowledge exchange since questions are based on the characterization of this relation. This is the reason why, from 53 interviewed firms, only 31 (58.5%) are assessed for their cognitive and social proximities. It also happened to refines sample: from 38 interviewed firms, only 21 (55.3%) are assessed.

Organizational proximity presents different results from three indexes established for this study (see Table 6, p.76, row 9). The management index of **joint projects** with other firms (established by innovation projects performed in the last 5 years and its participation role)[14] manifests low innovation management with other firms in complete and filtered sample ($\bar{x}$=$\bar{x}'$=0.07), as a product of a high quantity of firms without projects of this nature. Only five from 53 interviewed firms in the total sample and 37 in the filtered sample, manifest realizing some sort of joint innovation with other organization[15].

In terms of number of firms with which each firm has **knowledge exchange**, the total sample has better indexes than filtered sample ($\bar{x}$=6.03, M_e=2.75; $\bar{x}'$=3.46; M_e'=2.25). This index includes two firms (from 52 that answer the question) with excessively high data: one with 100 and another with 50 (third and

[14] Presented results do not include out of range single data: 2.88 compared to second (1.00) and the following [*n*=53] in which only six firms have higher values than zero (0). This is the reason to remove results and analysis in chapter 5 (p.160). This change affects results for total sample (Table 35 p.130), firms from Jaú (Table 37 p.138) and female footwear firms (Table 40 p.149) with their respective filtered samples, for project index.

[15] Ibid.

fourth highest index is 20 and the fifth is 10), that change indexes significantly ($\bar{x}$=3.27; M_e=2.25) leaving them similar to the filtered sample ($\bar{x}'$=3.46; M_e=2.25) where these type of sectors are not included. However, for statistical analysis all data are kept, since both firms (one in Jaú and another in Cali) are outsourcers of custom sole manufacturer, and its clients are footwear manufacturers with whom hold constant knowledge exchange and become -*active mutual exchangers*, according to Giuliani & Bell (2005) definition-, and therefore key actors in knowledge flux for their corresponding sectors.

Table 36. Areas of greatest interest among businesspersons, from complete and filtered sample

Index	Total		Total'	
	Quant.	%	Quant.	%
marketing channels	**24**	45.3	**20**	52.6
market diversification	**13**	24.5	**10**	26.3
product diversification	**37**	69.8	**27**	71.1
productive efficiency	**38**	71.7	**27**	71.1
knowledge management	**16**	30.2	**9**	23.7
market intelligence	**6**	11.3	**5**	13.2
internationalization	**1**	1.9	**0**	0.0
logistics	**9**	17.0	**6**	15.8
new technologies	**14**	26.4	**10**	26.3
quality	**47**	88.7	**33**	86.8
TOTAL	**53**		**38**	

Source: Own elaboration.

Knowledge application as results of interaction, complete sample 48% (N_{total}=52)[16] and filtered sample 45% (N'_{total}=38) use supplied information from firms with whom it exchanges.

Social proximity, outcome from questions about partners concern and commitments (see Table 6, p.76, row 6 to 8), presents wide ranges (*min*=*min'*=1.5; *max*=*max'*=5) with means ($\bar{x}$=3.75; $\bar{x}'$=3.52), median (M_e=4; M_e'=3.5) and SD (σ=0.92; σ'=0.97) showing a medium to high concern (score 1 low concern; score 5 high concern), and medium to high commitment (score 1 low commitment; score 5 high commitment). Filtered sample shows fewer concern and commitment than complete sample.

Institutional proximity, obtained from the question about their main concerns among many issues, similar results are obtained from complete and filtered sample (*min*=*min'*=0.37; *max*=*max'*=0.72; $\bar{x}$=$\bar{x}'$=0.59; M_e=M_e'=0.59; σ=σ'=0.09). Similarity index of concern among each interviewed firm, respect to others interviewed in the same LPS, varied from 0.37 to 0.72, being 0 absolute difference (all have

[16] One firm did not answer the question.

different concerns) and 1 absolute similitude (all have the same concerns), with a mean of 0.59 and little variation, reflecting more coincidence than difference.

Table 36 lists the number of firms that manifest interest in each item stablished by this study. Among complete and filtered samples is possible to notice similar concerns: quality, product diversification, productive efficiency and to a lesser extent, market channels. A unique evident difference is that market channels manifest a greater interest in filtered sample, while knowledge management in total sample.

4.2.3 Recent production and sales variation.

In terms of innovation performance (defined on §2.4.3 p.77), defined as production difference from the last three years, measured by the number of units produced annually and the number of workers, and sales difference[17], presents mean trend to decrease, close to 0, with a wide range of answers and diversity. The filtered sample has also wide variety, although mean has a positive trend to increase in production and sales, even if it is negative for the employee number, assuming is looking for increasing efficiency, reflecting applied filter to firms with a low number of employees (Table 32 p.124).

However, looking at weighted production, sales, and employee number change indexes, some positive increase is present: production level close to 11.6%, employee number in 6.1%, and sales level in 9%. From 47 firms that offer sufficient data to calculate production level changes, 13 has positive growth, 15 has not grown and 19 has negative growth. By employee number, 12 firms grew, 17 kept their level and 23 diminished. By sales volume, 11 firms increased, 18 kept it and 19 diminished.

Changes in production level (measured by pair of shoes produced), in percentage, ranging from *min*=-75 (at the moment of the interview were producing fourth part of what they produced three years ago) to *max*=233 (producing more than the double they produced three years ago) with mean of $\bar{x}$=-0.83, median M_e =0 and SD σ=51.8, which demonstrate wide variety, although the trend to keep a constant production level. Filtered sample ranged less (*min'*=-60; *max'*=233), with greater variation (σ'=53.66) and mean with positive value ($\bar{x}'$=5.34), which is explained by component producer firms filter with low employee number with no satisfying results for studied period.

[17] Question based on row three from Table 7 (p.73), aimed to identify sales percentage related developed products in the last three years, is removed since most interviewees did not have information to answer at the moment of the interview.

Changes in employee number, ranges and variation are wide (*min*=-68; *min'*=-61; *max*=200; *max'*=100; σ=46.69; σ'=38.17), although means have negative trends close to zero ($\bar{x}$=-3.79; $\bar{x}'$=-2.13), same as median (M_e=M_e'=0).

Sales level difference ranged and varied similarly to production difference (*min*=-75; *max*=233; *min'*=-60; *max'*=233; σ=49.3; σ'=50.61), even though it has lower means ($\bar{x}$=-2.26; $\bar{x}'$=3.32) and median equal to zero (M_e=M_e'=0).

4.3 Regional characterization of samples: Jaú and Cali

Before starting to show indexes, results from previously identify sectors at interviews are presented. Differences among both sectors start from the city context each one belongs. By the number of inhabitants, Cali is 17 times larger than Jaú (2.37 million in Cali and 0.14 million in Jaú) and has a denser urban structure (4231 inh./km² in Cali and 191 inh./km² in Jaú). In terms of population and economic importance for its respective country, Cali is greater than Jaú: 4.9% of Colombian population lives in Cali (third biggest city of Colombia) and 0.07% of Brazilian population lives in Jaú (200° biggest municipality of Brazil), while 5.1% of Colombian GDP is produced in Cali and 0.055% of Brazilian GDP is produced in Jaú. Cali´s metropolitan area has an economic influence that doubles GDP with only 20% of population increase. Meanwhile, Jaú has a GDP per capita greater than Cali: USD 9.546 in Jaú, and USD 4.540 GDP (data from 2012).

Due to Sao Paulo micro-region footwear market size (13.8 million, 11.2 million in the city, 2010), many municipalities of Sao Paulo state specialized in one type of product: Franca in masculine footwear, Birigui in child footwear, and Jaú in female footwear. Cali footwear market attends production from the city itself highly concentrated in town (Obrero neighbourhood) and firms dispersed in the whole city. Product typology from each sector highly differs, as presented in Table 32: highly homogeneous in Jaú (17 of 21 interviewed firms produce female footwear) but lower in Cali (from 32 interviewed firms, only 13 are female footwear producers, five male footwear producers and five produced both). §4.4 is posed in this find, studying sample differences by product typology: female footwear producers (N_{fem}=30; N'_{nofem}=25), and other footwear producers (N_{fem}=23; N'_{nofem}=13).

Consulted databases in Jaú and Cali have the same size and are provided by regional associations. Due to logistics, only 21(17.5%) firms are interviewed in Jaú (September 2014), while 32 (26.7%) interviews are done in Cali (March 2015). Samples presentation by region addresses results by firms interviewed in Jaú, follow by firms interviewed in Cali, making a comparison among both cities, divided by established dimensions in methodology: characteristics of firm, proximity dimensions and results.

From 21 interviewed firms in Jaú, 17 (81%) produce female footwear, three (14.3%) produce components, and one (4.8%) produce child footwear. In filtered sample, with only 15 firms, 14 (93.3%) produce female footwear and only one (6.7%) child footwear. Indexes obtained from interviewed firms are listed in Table 37.

Table 37. Jaú firms indexes

			JAÚ (21)						JAÚ' (15)					
Dimensions	**Characteristic**	**Index**	**Mean**	**σ**	**Min**	**Max**	**M_e**	**N**	**Mean'**	**σ'**	**Min'**	**Max'**	**M_e'**	**N'**
Firm	production	n° employees	78.38	82.53	2	300	39	21	97.8	89.89	16	300	50	15
		annual production*	6.92	7.29	.03	29.48	4.02	20	7.81	7.83	1.17	29.48	4.97	15
		output/employee**	82.84	48.51	14.47	232.83	73	20	78.98	22.44	42.89	122.81	73.1	15
	innovation	equipment addition	8.1	11.91	0	50	4	20	9.43	13.85	0	50	4.5	14
		innovation staff	9.49	13.62	.5	60.5	5.25	20	11.84	15.72	.75	60.5	6.38	14
		products/innovation***	1.57	2.94	.15	12	.88	15	0.71	.54	.15	1.76	.61	12
		innovations/year	422.5	362.31	33	1500	350	16	492.5	389.5	33	1500	475	12
		new markets	.25	.44	0	1	0	20	.36	.5	0	1	0	14
		organization changes	.35	.49	0	1	0	17	.38	.51	0	1	0	13
		production changes	.92	.28	0	1	1	13	.89	.33	0	1	1	9
	experience	age	16.38	12.79	1	46	15	21	17.27	12.85	1	46	17	15
		neighbourhood dist.	.93	.31	.47	1.44	.97	21	.97	.34	.47	1.44	1.11	15
		product price	18.93	9.41	.56	33.22	20.57	20	22.13	7.14	11.57	33.22	21.43	15
		outside costumers	13.25	31.94	0	92.86	0	21	.38	.74	0	2.5	0	15
		institutional benefits	.45	.35	0	1	.5	21	.57	.32	0	1	.5	15
Proximity Dimensions	cognitive proximity	mean	4.09	.32	3.5	4.7	4.1	13	4.17	.3	3.8	4.7	4.1	9
	organizational proximity	project index	.09	.27	0	.9	0	20	.06	.24	0	.88	0	14
		interaction	8.05	21.88	0	100	3	20	3.2	3.51	0	12	3	15
		interaction application	.5	.51	0	1	.5	20	.47	.52	0	1	0	15
	social proximity	mean	3.79	.86	2	5	4	13	3.61	.97	2	5	3.75	9
	institutional proximity	comparative index	.63	.07	.51	.72	.62	21	.63	.08	.51	.72	.64	15
Outcomes	production performance	Δ production (%)	.18	63.53	-71	233	0	20	8.3	67.14	-50	233	0	15
		Δ employees (%)	-9.33	37.05	-68	50	0	21	-1.6	38.37	-61	50	0	15
	sales performance	Δ sales (%)	-2.6	62.43	-71	233	0	20	4.6	66.19	-60	233	0	15

Notes: *PPP, in million dollar (USD). **PPP, in thousand dollar (USD). *** Thousand products per innovation.
Source: Own elaboration.

From 32 firms interviewed in Cali, 13 (61.9%) produce only female footwear, five (15.6%) male footwear, five (15.6%) both, four (12.5%) produce components, two (6.3%) child footwear, two (6.3%) sport footwear, and one (3.1%) process outsource. Filtered sample from Cali, with 23 firms, 11 (47.8%) produce female footwear, five (21.7%) both female and male, four (17.4%) only male, two (8.7%) sports footwear, and one (4.3%) child footwear. Obtained results of interviewed firms from Cali are listed in Table 38.

Table 38. Cali firms indexes

			CALI (32)						CALI' (23)					
Dimensions	**Characteristic**	**Index**	**Mean**	**σ**	**Min**	**Max**	**M_e**	**N**	**Mean'**	**σ'**	**Min'**	**Max'**	**M_e'**	**N'**
Firm	production	n° employees	65.25	187.85	3	950	14	32	86.55	219.02	7	950	15	23
		annual production*	1.98	4.63	.006	23.94	.52	31	2.33	5.2	.06	23.94	.61	22
		output/employee**	44.14	41.97	.83	193.43	35.04	31	44.94	33.7	8.84	165.97	37.24	22
	innovation	equipment addition	3.66	3.52	0	14	3	32	4.52	3.72	0	14	3	23
		innovation staff	6.22	11.2	0	52.5	2.63	32	7.63	12.94	0	52.5	3.5	23
		products/innovation***	2.06	6.75	.02	36	.47	28	.88	1.28	.07	6	.48	21
		innovations/year	96.88	158.46	0	797.5	34	30	107.61	170.77	0	797.5	43	22
		new markets	.47	.51	0	1	0	32	.48	.51	0	1	0	23
		organization changes	.38	.49	0	1	0	32	.48	.51	0	1	0	23
		production changes	.44	.5	0	1	0	32	.35	.49	0	1	0	23
	experience	age	19.5	13.45	2	70	19	32	20.09	14.15	5	70	18	23
		neighbourhood dist.	1.1	.79	.23	2.96	.98	32	1.16	.83	.23	2.96	.98	23
		product price	22.4	22.05	.41	108.92	15.96	31	27.22	24.25	5.07	108.92	16.98	22
		outside costumers	45.85	40.87	0	100	33.33	31	32.16	35.54	0	100	18.75	23
		institutional benefits	.27	.43	0	1	0	30	.26	.42	0	1	0	23
Proximity Dimensions	cognitive proximity	mean	4.02	.74	2.67	5	4	18	4.14	.73	3	5	4.3	12
	organizational proximity	project index	.05	.19	0	1	0	32	.07	.22	0	1	0	23
		interaction	4.77	9.67	0	50	2.25	32	3.63	5.79	0	20	2	23
		interaction application	.47	.51	0	1	0	32	.43	.51	0	1	0	23
	social proximity	mean	3.72	.98	1.5	5	3.88	18	3.46	1	1.5	5	3.25	12
	institutional proximity	comparative index	.56	.09	.37	.71	.57	32	.56	.09	.37	.71	.55	23
Outcomes	production performance	Δ production (%)	-1.52	43.12	-75	100	0	29	3.31	43.82	-60	100	0	22
		Δ employees (%)	-.03	52.49	-63	200	0	31	-2.48	38.9	-50	100	0	23
	sales performance	Δ sales (%)	-2.03	39.4	-75	100	0	30	2.48	38.96	-60	100	0	23

Notes: *PPP, in million dollar (USD). **PPP, in thousand dollar (USD). *** Thousand products per innovation.
Source: Own elaboration.

4.3.1 Firms characteristics by region

In terms of productive characteristics, **employee number** of interviewed firms from Jaú are larger than Cali, in complete sample ($\bar{x}_{Jaú}$=78.4; $\bar{x}_{Cali}$=65.3) as well as filtered sample ($\bar{x}'_{Jaú}$=97.8; $\bar{x}'_{Cali}$=86.6), even though firms size limits are different in each region ($max_{Jaú}$=$max'_{Jaú}$=300; max_{Cali}=max'_{Cali}=950)[18]. Mean are higher in Jaú than Cali (twice to thrice) for both samples ($M_{e.Jaú}$=39, $M_e'_{Jaú}$=50; $M_{e.Cali}$=14; $M_e'_{Cali}$=15). This indexes and obtained data review established that there is more heterogeneity in Jaú than Cali firms. In filtered sample, the largest firm from Jaú is 19 times the smallest, while in Cali is 136 times. SD also shows this situation ($\sigma_{Jaú}$=82.5; $\sigma_{Jaú}'$=89, 9; σ_{Cali}=187.9; σ_{Cali}'=219). From total employee

[18] Jaú interviewees showed limit size of employee number. When this situation was consulted, businesspersons affirmed that it was due to tax progressiveness: it was preferable to have two subsidiary firms specialized by type of product (e.g., type of material) than only one large firms. No subsidiary firms were identify in Cali.

registered by interviews (3734), 44.1% belongs to Jaú and 55.9% to Cali, even though interviewed firms were 21 (39.6%) in Jaú and 32 (60.4%) in Cali.

Mean Jaú **annual production value** triple Cali value, in complete as filtered sample, as Jaú firms produce an annual mean of USD 6.92 million and Cali firms USD 1.98 million, as for filtered samples comparison is very similar ($\bar{x}'_{Jaú}$=7.8; $\bar{x}'_{Cali}$=2.3). Difference is greater for medians that allows to identify difference among both regions ($M_{e.Jaú}$=4.02, $M_e'_{Jaú}$=4.97; $M_{e.Cali}$=0.52; $M_e'_{Cali}$=0.61). Even though SD is greater in Jaú than Cali, there is greater heterogeneity in Cali since its values double exceed their means, while being very similar in Jaú ($\sigma_{Jaú}$=7.3; $\sigma_{Jaú}'$=7.8; σ_{Cali}=4.6; σ_{Cali}'=5.2). Heterogeneity is evident by difference of filtered samples extremes (without small firms presence): the largest firm in Jaú is 25 times the smallest, while in Cali the largest is 400 times the smallest. Even removing extreme values, mean for Jaú, without two of the largest firms is 5.1 (4.7 in filtered sample) and in Cali, without the largest firm (that triple the second[19]) is 1.24 in total and filtered sample. From total calculated production, 69.3% corresponds to Jaú firms and 30.7% to Cali firms.

Mean **annual production per employee** in Cali is half of Jaú ($\bar{x}_{Jaú}$=82.8; $\bar{x}_{Cali}$=44.1; $\bar{x}'_{Jaú}$=79; $\bar{x}'_{Cali}$=44.9), as well as their median ($M_{e.Jaú}$=73; $M_{e.Cali}$=35; $M_e'_{Jaú}$=73.1; $M_e'_{Cali}$=37.2). High heterogeneity in Jaú complete sample (SD close to half the mean), is close to the middle in filtered sample when outsourcing firms are filtered ($max_{Jaú}/min_{Jaú}$=16 times; $max'_{Jaú}/min'_{Jaú}$=3 times). In Cali, SD is similar to mean and descends by 25% in filtered sample. Ranges also reduce drastically (max_{Cali}/min_{Cali}=233 times; max'_{Cali}/min'_{Cali}=19 times) but even though, range difference is superior to Jaú.

Production indexes (employee number, annual production and employee performance) evidence that Jaú firms are mostly medium with few large and small firms. In Cali, most firms are small with presence of few large. An evidence of this affirmation is supported by employee number and by observation of quartile: first quartile of Jaú firms (five firms) has 62.9% of employees, while Cali only has for the first quartile (eight firms) 87.6% of total registered employees. In terms of production, Jaú first quartile produces 59.5% of total produced value, while Cali first quartile produces 87.2%.

Innovation characteristics for Jaú have higher indexes than Cali (for complete and filtered samples), equipment acquisition, innovation personnel size and quality, number of produced units per innovation, number of annual innovations and production changes, pointing greater strength of

[19] By employee number, the largest interviewed firm from Cali has 950 employees and 550 the second. The first one delivered complete production level data and the second did not, changing data global behaviour and affecting comparisons among firms.

Brazilian cluster. However, data analysis reveal some particularities, which are described with more detail for each index behaviour in the following lines.

Mean **equipment acquisition** in Jaú is more than the double than in Cali ($\bar{x}_{Jaú}$=8.1; $\bar{x}_{Cali}$=3.7; $\bar{x}'_{Jaú}$=9.4; $\bar{x}'_{Cali}$=4.5) showing a more robust and modern infrastructure in Jaú. Even though, when median are compared there is not such big difference ($M_{e.Jaú}$=4; $M_e'_{Jaú}$=4.5; $M_{e.Cali}$=$M_e'_{Cali}$=3). By data review, three firms of Jaú (presented in filtered sample) that made production technological update (acquired 50, 25 and 20 units of equipment), and without them, acquisition mean lows to 3.9, locating this index very close to Cali mean that does not account with firms in this situation.

In addition to last index, bigger **changes in production** of the last three years are evident in Jaú firms. A vast majority of firms made changes in production ($\bar{x}_{Jaú}$=0.92; $\bar{x}'_{Jaú}$=0.89), but this situation does not replicate in Cali ($\bar{x}_{Cali}$=0.44; $\bar{x}'_{Cali}$=0.35).

Innovation equipment size and strength (based on number of participants, experience, formation, and dedication), presents greater results in Jaú than in Cali ($\bar{x}_{Jaú}$=9.5; $\bar{x}_{Cali}$=6.2; $\bar{x}'_{Jaú}$=11.8; $\bar{x}'_{Cali}$=7.6). Data distribution shows for Jaú a firm with a high index for this aspect ($max_{Jaú}$=$max'_{Jaú}$=60.5) follow by two with ranges close to a third part (23 and 24.5). Other Jaú firms are located with a range among 0.5 and 10 with a mean between 4.81 (4.13 in filtered sample). In Cali, two firms identified with high values (52.5 and 42), leaving for the rest a range between 0 and 11.5 and a mean of 3.48 (3.52 in filtered sample), leaves two samples with similar values. Large firms with robust innovation teams, manifest by interviews, having very low information exchange with other producers, and some relationships in especifc aspects (components) with suppliers.

By number of **annual innovations**, mean is greater in Jaú than Cali ($\bar{x}_{Jaú}$=422.5; $\bar{x}_{Cali}$=96.9; $\bar{x}'_{Jaú}$=492.5; $\bar{x}'_{Cali}$=107.6). Medians also evidence this difference ($M_{e.Jaú}$=300; $M_e'_{Jaú}$=450; $M_{e.Cali}$=34; $M_e'_{Cali}$=43) where Jaú produces ten times more the number if innovations per product by year than Cali. Even removing high extreme values (one in Jaú and one in Cali), the difference among complete and filtered samples for Jaú and Cali are large. This is due to high innovation consistency of medium firms from Jaú that do not reflect the sample from Cali.

Number of units produced per innovation index, Jaú and Cali levels are similar, although higher in Cali complete ($\bar{x}_{Jaú}$=1.57; $\bar{x}_{Cali}$=2.1) and filtered sample ($\bar{x}'_{Jaú}$=0.71; $\bar{x}'_{Cali}$=0.9). Filtered samples are reduced to half of total samples due mainly to take out of production data from component producers in both cities. In medians, difference is reduced ($M_{e.Jaú}$=0.9; $M_e'_{Jaú}$=0.6; $M_{e.Cali}$=$M_e'_{Cali}$=0.5). For Jaú, this situation is interpreted as less innovation realization in relation to their production or because its high production volumes do not require too many changes as required for Cali firms. Another relevant

factor is results diversity: in Jaú, from 150 to 12000 innovation units ($min_{Jaú}$=$min'_{Jaú}$=0.15; $max_{Jaú}$=12; $max'_{Jaú}$=1.76) and in Cali, from 70 to 6000 in filtered sample (does not include outsourcing or component producers).

Innovation indexes, higher for Cali than Jaú, are due to new entrance to markets, and changes in the organization that are usually explained by demand in new markets (sales and distribution force adaptation, mainly).

New markets entrance in the last three years ($\bar{x}_{Jaú}$=0.25; $\bar{x}_{Cali}$=0.47; $\bar{x}'_{Jaú}$=0.36; $\bar{x}'_{Cali}$=0.48) is evidenced greater dynamism in Cali, although Jaú firms from filtered sample present better behaviour in this aspect. 5 of 21 interviewed firms in Jaú, manifest entrance to new markets, while Cali has 15 from 32.

Query on **organizational changes** shows better performance from Cali firms of filtered sample than other samples ($\bar{x}_{Jaú}$=0.35; $\bar{x}_{Cali}$=0.38; $\bar{x}'_{Jaú}$=0.38; $\bar{x}'_{Cali}$=0.48). Organizational changes respond to new markets entrance demand.

These values show that innovation index is greater in Jaú than in Cali, for process as for product. Cali only has an advantage over Jaú on markets expansion, and their consequence organization adaptation[20].

Also for Cali, indexes range amplitude and effects on means and SD on productive characteristics and innovation, are due to two type of firms presence at the extremes of the sample: at minimal, firms function as small workshops registered as guild partners (where list was obtained), and at maximum, two of the largest firms with markets internationally and all around the country, also registered as guild partners, but participate directing and approaching policies as leaders of one of the largest Colombian productive core.

Aspects from firms experience, the mean **age** of Jaú firms is 17 years ($\bar{x}_{Jaú}$=16.4; $\bar{x}'_{Jaú}$=17.3) ranging from 1 to 46 years; in Cali mean is 20 years ($\bar{x}_{Cali}$=19.5; $\bar{x}'_{Cali}$=2.1) ranging from 2 to 70 years. Although data distribution is similar for both cities, the proportion of Jaú firms with less than 10 years is slightly greater than Cali, with larger firms.

Distance to closest firms are very similar for both cities ($\bar{x}_{Jaú}$=0.93; $\bar{x}_{Cali}$=1.1; $\bar{x}'_{Jaú}$=0.97; $\bar{x}'_{Cali}$=1.2) even with difference size and distribution of firms in both cities (presence of production districts in Jaú and

[20] When interviewees were asked about area of organizational changes, most answer it is on sales section as response to new markets entrance.

absence of them in Cali), although range ($min_{Jaú}$=$min'_{Jaú}$=0.47; $max_{Jaú}$=$max'_{Jaú}$=1.44; min_{Cali}=min'_{Cali}=0.23; max_{Cali}=max'_{Cali}=2.96) and SD ($\sigma_{Jaú}$=0.31; σ_{Cali}=0.79; $\sigma'_{Jaú}$=0.34; σ'_{Cali}=0.83) evidence that difference.

Mean **product price** equivalent in dollars (PPP: purchasing power parity), is greater in Cali than Jaú, and greater among filtered than complete samples ($\bar{x}_{Jaú}$=18.9; $\bar{x}_{Cali}$=22.4; $\bar{x}'_{Jaú}$=22.1; $\bar{x}'_{Cali}$=27.2). Greater values in Cali are explained by the greater presence of firms that do not produce female footwear (see Table 33 p.125) and tend to have higher prices. At the same time, the greater values in filtered samples are due to applied filter to component producers with low unitary prices compared to the price of complete product. Although the difference in prices could be due to 1) the greater productive efficiency of firms; 2) greater ability to produce added value footwear; 3) less competitive environment, allowing higher prices. For the first hypothesis, according to previously analysed data (see *annual production per employee*, p.136), there is less productivity in Cali, and is less probably this is the cause. Therefore, it could be established that the cause is number 2, with greater materials quality, or number 3, with a less demanding environment that distinguishes mainly male and child footwear.

Main market **external clients** percentage (for Jaú the metropolitan area of Sao Paulo and for Cali, the city itself), is greater for Cali, being slightly less for filtered sample ($\bar{x}_{Cali}$=45.9; $\bar{x}'_{Cali}$=32.2). Interviewed firms from Jaú have a lower percentage, especially firms from filtered sample, that manifest almost complete dependence on main market ($\bar{x}_{Jaú}$=13.3; $\bar{x}'_{Jaú}$=0.4). The drastic difference between Jaú firms its due to the elimination of three firms with the percentage of most clients outside the main region (two component producers and one outsourcer).

Interviews also identify in Jaú more **institutional benefits** than in Cali ($\bar{x}_{Jaú}$=0.45; $\bar{x}_{Cali}$=0.27; $\bar{x}'_{Jaú}$=0.57; $\bar{x}'_{Cali}$=0.42), with a greater proportion of firms in filtered sample. Inquiring on this situation at some firms, interviewed manifest to ignore in some cases the process, and in other cases the demanding conditions that are imposed on firms to access benefits, which discourage use.

4.3.2 Firms proximities by region

Cognitive proximity presents similar mean among firms of both cities ($\bar{x}_{Jaú}$=4.1; $\bar{x}_{Cali}$=4; $\bar{x}'_{Jaú}$=4.2; $\bar{x}'_{Cali}$=4.1), although SD show greater diversity in Cali ($\sigma_{Jaú}$=0.32; σ_{Cali}=0.74; $\sigma'_{Jaú}$=0.3; σ'_{Cali}=0.73), means point easiness in communication, and language, technology, ways of making new products and technical knowledge similarities with the rest of firms they communicate, situation that describes in most of Jaú firms. Many firms in Cali manifest communication difficulties, causing index variation.

Organizational proximity indexes present some differences among the two cities. For **joint project** index, both cities present low joint innovation project participation ($\bar{x}_{Jaú}$=0.09; $\bar{x}_{Cali}$=0.05; $\bar{x}'_{Jaú}$=0.06; $\bar{x}'_{Cali}$=0.07). In Jaú, only two of 21 consulted firms have some sort of joint work on innovation and for Cali only three of 32, each of them with lower values than the ones from Jaú. It is possible that this index could be more perceptible in a qualitative type of study.

Knowledge exchange shows that the amount of firms in Jaú that interacts with the interviewed is greater ($\bar{x}_{Jaú}$=8.1; $\bar{x}_{Cali}$=4.8). Although, filtered sample inverts this and reduces the difference ($\bar{x}'_{Jaú}$=3.2; $\bar{x}'_{Cali}$=3.6). It could be attributed to firms that accept interviews to this study that are more open to cooperation with other firms, so there is selection bias, being a valid comparison since both regions have applied the same. Difference among complete and filtered sample in both cities, due to applied filter to footwear firms (mainly sole producers), exchange information and knowledge with all of their clients and modify range ($min_{Jaú}$=$min'_{Jaú}$=min_{Cali}=min'_{Cali}=0; $max_{Jaú}$=100; $max'_{Jaú}$=12; max_{Cali}=50; max'_{Cali}=20).

Of 13 firms that exchange information in Jaú, only ten made **knowledge application as a product of changes in productive and organizational exchange**. In Cali, of 18 firms that made changes, only 15 had organizational changes based on exchange. In this way, less than half of all interviewed firms (47.6% in Jaú and 46.9% in Cali) have done changes due to information exchange with other firms. Calculations on firms that change organizationally in Jaú only relates to five firms on average ($\bar{x}_{Jaú}$=5.08; $\bar{x}'_{Jaú}$=5.33) and in Cali, with six on average in complete sample and seven in filtered sample ($\bar{x}_{Cali}$=6.03; $\bar{x}'_{Cali}$=6.96).

Social proximity means ($\bar{x}_{Jaú}$=3.8; $\bar{x}_{Cali}$=3.7; $\bar{x}'_{Jaú}$=3.6; $\bar{x}'_{Cali}$=3.5) and SD ($\sigma_{Jaú}$=0.86; $\sigma'_{Jaú}$=0.97; σ_{Cali}=0.92; σ'_{Cali}=0.97) are similar for both regions. However, a little less concern is expressed with the interacting firms of filtered samples, and in Cali with respect to Jaú. Variation of SD is similar for all samples.

Institutional proximity index ($\bar{x}_{Jaú}$=$\bar{x}'_{Jaú}$=0.63; $\bar{x}_{Cali}$=$\bar{x}'_{Cali}$=0.56) shows that firms in Jaú tend to share concerns with their pairs, while Cali firms have diverse concerns, as it is shown too by SD ($\sigma_{Jaú}$=0.07; $\sigma'_{Jaú}$=0.08; σ_{Cali}=σ'_{Cali}=0.09). There is also consistency among complete and filtered samples, pointing a homogeneous behaviour for both samples in each city.

Institutional proximity index based in concerns (Table 39) for each sample with regional classification, present high interest on quality, product diversification, productive efficiency and market channels. Also, Jaú firms have a greater concern than Cali firms on quality, productive efficiency, markets channels, markets intelligence, technology update, and logistics (for the last, filtered sample presents lesser concern). These greater concerns might be due to greater participation of local institutions,

increasing its relevance (see *institutional benefits* p.139). On its part, Cali has greater concern on product diversification and knowledge management.

Table 39. Areas of greatest interest for businesspersons in samples by region

Index	Jaú		Jaú'		Cali		Cali'	
	Quant.	%	Quant.	%	Quant.	%	Quant.	%
marketing channels	**11**	52.4	**9**	60.0	**13**	40.6	**11**	47.8
market diversification	**5**	23.8	**4**	26.7	**8**	25.0	**6**	26.1
product diversification	**14**	66.7	**10**	66.7	**23**	71.9	**17**	73.9
productive efficiency	**17**	81.0	**12**	80.0	**21**	65.6	**15**	65.2
knowledge management	**4**	19.0	**3**	20.0	**12**	37.5	**6**	26.1
market intelligence	**3**	14.3	**3**	20.0	**3**	9.4	**2**	8.7
internationalization	**0**	0.0	**0**	0.0	**1**	3.1	**0**	0.0
logistics	**5**	23.8	**2**	13.3	**4**	12.5	**4**	17.4
new technologies	**7**	33.3	**5**	33.3	**7**	21.9	**5**	21.7
quality	**20**	95.2	**14**	93.3	**27**	84.4	**19**	82.6
TOTAL	**21**		**15**		**32**		**23**	

Source: Own elaboration.

4.3.3 Production and sales recent variation by region

Production and sales results of interviewed firms from the last three years, calculated almost the same as last indexes, reveal nearly null growth. However, if production variation is weighted with registered production levels in firms' characteristics, there are much larger growths.

Changes in production level for the last three years show a slight average increase in Jaú (0.18%) and for Cali a slight decrease (-1.52%). For this analysis, Jaú shows better growth index especially for filtered sample ($\bar{x}_{Jaú}$=0.2; $\bar{x}'_{Jaú}$=8.3), while Cali shows low production for complete sample, and increase in filtered sample ($\bar{x}_{Cali}$=-1.5; $\bar{x}'_{Cali}$=3.3).

When numbers of changes in production levels are weighted with production levels from firms initial description (this means with their size), Jaú presents a 7% growth in complete sample (19 firms) and 6.3% in filtered sample (15 firms). Cali growth was 22% in total sample (28 firms) and 24.6% in filtered sample (21 firms).

Although, growth due to particular circumstances of some firms does not represent the reality of the whole: in Jaú, only three firms represent 17.1% growth from the whole number, meaning that without them growth would have been negative: -10.2%; only three firms from Cali represent 25.8% growth, meaning that without them growth would also have been negative: -3.8%.

Changes in employee number reduction happened in both cities, especially in Jaú complete sample, with a lesser degree in filtered sample ($\bar{x}_{Jaú}$=-9.3; $\bar{x}'_{Jaú}$=-1.6). In complete sample, Cali is keeping employee number and is a little reduced in filtered sample ($\bar{x}_{Cali}$=-0.03; $\bar{x}'_{Cali}$=-2.5).

Numbers weighted with firm size (measured by employee number), employee number in Jaú increase 6.4%, although, concentrated in three firms that contribute 19.6% to the sector; the other firms obtain negative growth: -13.2%. Employee number in Cali increase 5.9%; although, without the two biggest firms (one firm represent an increase of 11.8% and other firm decreases of 8.7%) growth was only 2.7%.

Sales level difference in complete samples diminish means ($\bar{x}_{Jaú}$=-2.6; $\bar{x}_{Cali}$=-2) and growth in filtered sample ($\bar{x}'_{Jaú}$=4.6; $\bar{x}'_{Cali}$=2.5). For weighted results, Jaú present 3.3% growth, but removing the only two firms that register growth, sales drop is -9.3%. For the whole sector in Cali, weighted increase is 21.8%, although only three firms increase 25.8%, leaving a negative growth of 4% for the rest of them.

Indexes widespread decrease has aroused feelings of pessimism among the interviewed, especially from Jaú where 5 of 21 firms reported increase production; drops reported (8 firms) values among -20% and -71%; in Cali, only 8 of 32 reported growth, drop reported (13 firms) among -15% and -75%. A similar situation is found when inquiring about changes in employee number or sales level. Although, Cali firms were optimistic since production levels were fewer three years before, and on the last year they were recovering because of regulations applied to imports that increased national footwear demand. Conversely, Jaú firms were on a period of crisis at the time of the interview.

4.4 Sample characterization by type of product: female and non-female

In addition to regional division identify in the methodological design of this research, through interviews it identifies a large difference among firms with different type of products, as well as the frequency change of product is done (much more frequent for female footwear producers respect to producers of other types of footwear), approach to market target diversity (female footwear producers tend to attend only their main market, while others concern is to diversify their market), or product price (greater for firms that produce types different to female). These preliminary observations allow proposing an additional division to characterize type of product (Table 33, p.125): female footwear producers (30 firms in complete sample and 25 in filtered sample) and non-female footwear producers (23 in total sample and 13 in filtered sample).

As presented in Table 34 (p.126), from 30 exclusive female footwear producers, 17 (57%) are from Jaú and 13 (43%) from Cali. In filtered sample, from 25 firms, 14 (56%) are from Jaú and 11 (44%) from Cali. This distribution allows approaching difference in observations without and overrepresentation of any of the two cities. Results from interviews are presented in Table 40.

Table 40. Female footwear producers sample indexes

			FEMALE (30)						FEMALE' (25)					
Dimensions	**Characteristic**	**Index**	**Mean**	**σ**	**Min**	**Max**	**M_e**	**N**	**Mean'**	**σ'**	**Min'**	**Max'**	**M_e'**	**N'**
Firm	production	n° employees	77.22	116.5	2	550	31	30	88.02	124.52	7	550	35	25
		annual production *	4.94	6.73	.02	29.48	1.72	29	5.17	7.05	.06	29.48	1.84	24
		output/employee**	66.37	47.75	6.29	232.83	55.55	29	61.63	29.75	8.84	122.81	57.02	24
	innovation	equipment addition	6.43	10.03	0	50	3	30	7.04	10.73	0	50	3	25
		innovation staff	9	14.43	.5	60.5	4	29	10.19	15.57	.75	60.5	4.75	24
		products/innovation***	.61	.52	.02	1.76	.39	26	.57	.48	.07	1.76	.39	22
		innovations/year	323.79	341.22	2	1500	207.5	26	338.48	364	18	1500	187.5	22
		new markets	.41	.5	0	1	0	29	.46	.51	0	1	0	24
		organization changes	.3	.47	0	1	0	27	.35	.49	0	1	0	23
		production changes	.67	.48	0	1	1	24	.65	.49	0	1	1	20
	experience	age	18.67	14.65	2	70	17.5	30	19.48	14.73	2	70	18	25
		neighbourhood dist.	1.08	.63	.23	2.96	1.03	30	1.06	.63	.23	2.96	1.11	25
		product price	20.66	9.56	5.07	50.15	19.76	29	21.67	9.99	5.07	50.15	20.2	24
		outside costumers	19.04	32.47	0	100	.38	29	17.93	30.27	0	100	.38	25
		institutional benefits	.45	.4	0	1	.5	30	.48	.39	0	1	.5	25
Proximity Dimensions	cognitive proximity	mean	4.05	.41	3.4	5	4.1	17	4.1	.42	3.4	5	4.1	13
	organizational proximity	project index	.04	.17	0	.88	0	29	.05	.19	0	.88	0	24
		interaction	2.66	3.26	0	12	2	29	2.72	3.44	0	12	2	25
		interaction application	.48	.51	0	1	0	29	.44	.51	0	1	0	25
	social proximity	mean	3.69	.85	2	5	4	17	3.46	.81	2	4.5	3.5	13
	institutional proximity	comparative index	.59	.09	.4	.72	.59	30	.59	.09	.4	.72	.58	25
Outcomes	production performance	Δ production (%)	1.52	52.79	-50	233	0	28	1.77	55.26	-50	233	0	24
		Δ employees (%)	-10.62	34.75	-68	50	0	29	-8.32	35.18	-61	50	0	25
	sales performance	Δ sales (%)	.41	50.75	-60	233	0	29	.48	52.89	-60	233	0	25

Notes: *PPP, in million dollar (USD). **PPP, in thousand dollar (USD). *** Thousand products per innovation.
Source: Own elaboration.

Unlike female footwear producers, products diversity of firms that not only produce female footwear (23 non-female firms) is wide (Table 33, p.125): seven (30%) produce components, five (22%) produce only masculine footwear, five (22%) produce masculine and female, three (13%) child footwear, two (9%) sports footwear, and one (4%) was an outsourcer. By regional classification, 19 (83%) are from Cali, and four (17%) from Jaú, showing a clear overrepresentation from Cali in the sample. Filtered sample (13 firms), was diverse by type of product: five (39%) masculine and female producers, four (31%) producers of only masculine footwear, two (15%) producers of child footwear, and two (15%)

sports footwear. Only one firm (child footwear producer) is from Jaú (8%), leaving most of filtered sample to Cali (92%). Results from interviews are presented in Table 41.

4.4.1 Firm characteristics by type of product

Indexes observations (Table 40 and Table 41) evidence a relative homogeneity among firms that produce female footwear and heterogeneity among non-female footwear producers. In some aspects, differences are very significant among complete and filtered sample from non-female footwear producers (almost a third part of indexes, differences are over 50%), while female footwear producers indexes do not change much (not over 20%). Comparisons could be done among filtered samples, although, as it is pointed on Table 34 , this group is mostly composed by Cali firms (12 from Cali 92% and one from Jaú 8%). To continue with comparisons, relationships analysis among both groups indexes (female and non-female footwear producers) with their respective two samples (complete and filtered) is done.

Starting with production characteristic, **employee number** has higher numbers in filtered samples, due to subtraction of small workshops, although with greater effect in the case of non-female footwear due to subtraction of more firms (five of female footwear and ten of non-female footwear). This way, for complete samples there is a bigger average number of employees in female footwear producer firms ($\bar{x}_{fem}$=77.2; $\bar{x}_{nofem}$=61.6), while filtered samples there is a bigger number of employees in non-female footwear producer firms ($\bar{x}'_{fem}$=88; $\bar{x}'_{nofem}$=96.7). Besides, there is more variability for non-female footwear producer firms (σ_{fem}=116.5; σ_{nofem}=194.9; σ'_{fem}=124.5; σ'_{nofem}=257.69), especially for filtered sample. Although, medians for both type of firms and both type of samples (avoiding deviation by presence of much differentiated firms indexes), a bigger number of employees in female footwear producer firms ($M_{e.fem}$=31; $M_e'_{fem}$=35) than in non-female footwear producers ($M_{e.nofem}$=15; $M_e'_{nofem}$=15.2) are observed. Therefore, non-female footwear producer firms are identified for having fewer employees, with presence of a few with a large number of employees (max_{fem}=max'_{fem}=550; max_{nofem}=max'_{nofem}=950).

Annual production value measured in million dollars (PPP: purchasing power parity) is, on average bigger for female footwear producers than to non-female producers, also showing a greater index for filtered samples ($\bar{x}_{fem}$=4.9; $\bar{x}_{nofem}$=2.6; $\bar{x}'_{fem}$=5.2; $\bar{x}'_{nofem}$=3.4). This situation is more evident for the median, where female footwear ($M_{e.fem}$=1.7; $M_e'_{fem}$=1.8) is more than the double of non-female footwear ($M_{e.nofem}$=0.5; $M_e'_{nofem}$=0.8). There is greater homogeneity in female footwear producer firms if SD is observed, compared with the rest, with respect to average size but not for absolute value

(σ_{fem}=6.7; σ'_{fem}=7.1; σ_{nofem}=5.4; σ'_{nofem}=6.6) and the relationship of production size of largest firms respect to the smallest (max_{fem}/min_{fem}=37; max'_{fem}/min'_{fem}=14; max_{nofem}/min_{nofem}=3990; $max'_{nofem}/min'_{nofem}$=184).

Table 41. Female and non-female footwear producers sample indexes

			NO FEMALE (23)						NO FEMALE' (13)					
Dimensions	**Characteristic**	**Index**	**Mean**	**σ**	**Min**	**Max**	**M_e**	**N**	**Mean'**	**σ'**	**Min'**	**Max'**	**M_e'**	**N'**
Firm	production	n° employees	61.63	194.88	3	950	15	23	96.69	257.69	10	950	15.17	13
		annual production*	2.55	5.39	.006	23.94	.54	22	3.41	6.6	.13	23.94	.75	13
		output/employee**	50.03	48.1	.83	193.43	36.94	22	53.4	41.14	13.06	165.97	39.44	13
	innovation	equipment addition	3.91	3.94	0	14	3.5	22	5	4.37	0	14	4	12
		innovation staff	5.55	8.42	0	42	4	23	7.44	10.85	0	42	4	13
		products/innovation***	3.84	8.8	.04	36	.75	17	1.3	1.66	.07	6	.75	11
		innovations/year	62.4	79.6	0	300	31.5	20	69.25	88.5	0	300	31.5	12
		new markets	.35	.49	0	1	0	23	.38	.51	0	1	0	13
		organization changes	.45	.51	0	1	0	22	.62	.51	0	1	1	13
		production changes	.48	.51	0	1	0	21	.25	.45	0	1	0	12
	experience	age	17.74	11.23	1	39	19	23	18	11.42	1	39	14	13
		neighbourhood dist.	.97	.67	.24	2.65	.97	23	1.13	.79	.24	2.65	.98	13
		product price	21.54	25.67	.41	108.92	13.8	22	31.59	29.1	11.14	108.92	19.6	13
		outside costumers	49.87	43.75	0	100	33.33	23	22.85	35.08	0	100	5.33	13
		institutional benefits	.19	.37	0	1	0	21	.19	.38	0	1	0	13
Proximity Dimensions	cognitive proximity	mean	4.05	.78	2.67	5	4.05	14	4.23	.78	3	5	4.66	8
	organizational proximity	project index	.1	.28	0	1	0	23	.1	.29	0	1	0	13
		interaction	10.28	22.44	0	100	3	23	4.88	6.99	0	20	3	13
		interaction application	.48	.51	0	1	0	23	.46	.52	0	1	0	13
	social proximity	mean	3.82	1.03	1.5	5	4	14	3.63	1.24	1.5	5	3.38	8
	institutional proximity	comparative index	.58	.09	.37	.71	.59	23	.58	.1	.37	.71	.58	13
Outcomes	production performance	Δ production (%)	-3.96	51.57	-75	100	0	21	11.92	52.09	-60	100	0	13
		Δ employees (%)	4.83	58.11	-63	200	0	23	9.77	42.23	-50	100	0	13
	sales performance	Δ sales (%)	-5.95	48.2	-75	100	0	21	8.77	47.49	-60	100	0	13

Notes: *PPP, in million dollar (USD). **PPP, in thousand dollar (USD). *** Thousand products per innovation.
Source: Own elaboration.

Female footwear producers also evidence greater **annual production per employee**, having a higher index ($\bar{x}_{fem}$=66.4; $\bar{x}_{nofem}$=50; $\bar{x}'_{fem}$=61.6; $\bar{x}'_{nofem}$=53.4) with differences close to 10%. Observing median, female footwear producer firms also present superiority ($M_{e.fem}$=55.6; $M_e'_{fem}$=57; $M_{e.nofem}$=36.9; $M_e'_{nofem}$=39.4). Homogeneity is similar for both samples and for each classification, excepting filtered sample of female footwear producer firms with more homogeneity (σ_{fem}=47.8; σ'_{fem}=29.8; σ_{nofem}=48.1; σ'_{nofem}=41.1).

Innovation aspects of female footwear producers present bigger mean for acquisition of production equipment, size and strength of innovation team, quantity of innovations per year, new markets entrance and changes in production, that same indexes as non-female footwear producer firms. Innovation aspects that have bigger mean in non-female footwear producers are number of product per innovation (making of less innovation in relation to their production level), and organizational changes.

Average **equipment acquisition**, is slightly above 50% for female footwear producers ($\bar{x}_{fem}$=6.4; $\bar{x}'_{fem}$=7) and bigger than non-female footwear ($\bar{x}_{nofem}$=3.9; $\bar{x}'_{nofem}$=5). Although, for female footwear producers, three firms sum up to half of the equipment acquired in the last three years (50, 25 and 20 due to firm creation or brand renewal, which is a situation not reflected on non-female footwear producers), and increases mean significantly; without these firms mean low to a similar level of non-female footwear producers. Observing the median, values are close with a slightly advantage for non-female footwear producers ($M_{e.fem}$=$M_e'_{fem}$=3; $M_{e.nofem}$=3.5; $M_e'_{nofem}$=4).

Innovation team size and qualification mean are superior for female footwear producers due to presence of four large firms (three in Jaú and one in Cali) that account with large product design department (indexes of 60.5; 52.5; 24.5; and 23.0). Only two female footwear producer firms (from Cali) surpass by ten this index (42 and 11.5). Mean are almost 50% bigger in female footwear producer firms ($\bar{x}_{fem}$=9; $\bar{x}'_{fem}$=10.2; $\bar{x}_{nofem}$=5.6; $\bar{x}'_{nofem}$=7.4). This index also presents wide range for all samples, from inexistence of someone with product innovation functions or a person with little experience and qualification, with half time dedication (min_{fem}=0.5; min'_{fem}=0.8; min_{nofem}=min'_{nofem}=0) to teams with many professionals with whole time dedicated to product innovation (max_{fem}=max'_{fem}=60.5; max_{nofem}=max'_{nofem}=42). Median are the same for all samples, except for filtered sample of female footwear producers ($M_{e.fem}$=$M_e'_{fem}$=$M_{e.nofem}$=4; $M_e'_{fem}$=4.8); a value of four points at close to two qualified persons dedicated full time to innovation.

For the number of **produced units per innovation**, non-female footwear producer firms have an enormous difference in its complete sample in relation to the rest of groupings, due to inclusion of component producers that produce a high number of units based on a single innovation. ($\bar{x}_{fem}$=0.61; $\bar{x}'_{fem}$=0.57; $\bar{x}_{nofem}$=3.84; $\bar{x}'_{nofem}$=1.3). Even excluding this sample, its noticeable that non-female footwear producers do not make as frequent innovation as female footwear producers (index duplicates non-female over female footwear producers, meaning that these last must innovate doubly faster), this situation is also evident in median ($M_{e.fem}$=$M_e'_{fem}$=0.39; $M_{e.nofem}$=$M_e'_{nofem}$=0.75).

As consequence of greater annual production level from female footwear producer firms, and greater innovation frequency in relation to their production, **annual mean number of innovations** of female footwear producers fivefold the same index to non-female footwear producer firms, in complete and filtered samples ($\bar{x}_{fem}$=323.8; $\bar{x}'_{fem}$=338.5; $\bar{x}_{nofem}$=62.4; $\bar{x}'_{nofem}$=69.3). Similar situation is observed from comparison of median ($M_{e.fem}$=207.5; $M_e'_{fem}$=187.5; $M_{e.nofem}$=$M_e'_{nofem}$=31.5).

Female footwear producer firms entered more to **new markets** than non-female footwear producer firms ($\bar{x}_{fem}$=0.41; $\bar{x}_{nofem}$=0.35; $\bar{x}'_{fem}$=0.46; $\bar{x}'_{nofem}$=0.38)

Conversely, **organizational changes** are more frequent in non-female footwear producer firms ($\bar{x}_{fem}$=0.3; $\bar{x}'_{fem}$=0.35; $\bar{x}_{nofem}$=0.45; $\bar{x}'_{nofem}$=0.62), that increase for filtered sample, since from 13 firms of the sample, eight change due to production and market growth and adaptation.

Production changes for female footwear producer firms manifest greater dynamism than non-female footwear producer firms ($\bar{x}_{fem}$=0.67; $\bar{x}'_{fem}$=0.65; $\bar{x}_{nofem}$=0.48; $\bar{x}'_{nofem}$=0.25). Filtered sample for non-female footwear producer firms tends to keep unalterable production systems. An abrupt index decrease in relation to complete sample respond to component producers and outsourcers filter that must constantly update technology to adapt to trends change (demanded flexibility by producer clients).

For experience characteristics, mean firms **age** is similar for both type of products in complete and filtered samples ($\bar{x}_{fem}$=18.7; $\bar{x}'_{fem}$=19.5; $\bar{x}_{nofem}$=17.7; $\bar{x}'_{nofem}$=18). Median also get close to these values, except for filtered sample of non-female footwear producer firms with fewer age ($M_{e.fem}$=17.5; $M_e'_{fem}$=18; $M_{e.nofem}$=19; $M_e'_{nofem}$=14).

Neighbour joining (closest 20) is similar for both groups with average distance of 1 kilometre, and ranges of 250 meters for closest firms from 2.5 to 3 kilometre for the farthest ($\bar{x}_{fem}$=1.08; $\bar{x}_{nofem}$=0.97; $\bar{x}'_{fem}$=1.06; $\bar{x}'_{nofem}$=1.13).

Product prices with mean close to 20 USD are observed, except for filtered sample of non-female footwear producer firms ($\bar{x}_{fem}$=20.7; $\bar{x}_{nofem}$=21.5; $\bar{x}'_{fem}$=21.7; $\bar{x}'_{nofem}$=31.6). Increase of mean price for non-female footwear producer firms respond to component producers subtraction for having a unit value of product lower than finished footwear (min_{nofem}=0.4; min'_{nofem}=11.1). Among non-female footwear producer are many long lasting leather footwear producers, especially masculine, sports, and child footwear, with materials that do not use female footwear producer (min_{fem}=min'_{fem}=5.1; max_{fem}=max'_{fem}=50.2; max_{nofem}=max'_{nofem}=108.9). Median also tends to 20 USD, except in non-female

footwear producer complete sample ($M_{e.fem}$=19.8; $M_e'_{fem}$=20.2; $M_{e.nofem}$=13.8; $M_e'_{nofem}$=19.6) by presence of component producers with very low unit values.

Percentage of **external clients** to main market presents a big difference among female footwear producers and the rest of firms for complete samples ($\bar{x}_{fem}$=19; $\bar{x}_{nofem}$=49.9) and tend to 20% in filtered samples ($\bar{x}'_{fem}$=17.9; $\bar{x}'_{nofem}$=22.9). Although, median presentation ($M_{e.fem}$=$M_e'_{fem}$=0.4) shows that almost all firms focus their production on the main market. In the case of non-female footwear producer difference among median of total and filtered samples ($M_{e.nofem}$=33.3; $M_e'_{nofem}$=5.3) is given by component producers and outsourcers with strong presence of markets in other cities.

Institutional profit index shows a greater search for support among female footwear producers than non-female footwear producers ($\bar{x}_{fem}$=0.45; $\bar{x}'_{fem}$=0.48; $\bar{x}_{nofem}$=$\bar{x}'_{nofem}$=0.19).

4.4.2 Firms proximity by type of product

In terms of **cognitive proximity**, values are slightly superior to 4 ($\bar{x}_{fem}$=$\bar{x}_{nofem}$=4.05; $\bar{x}'_{fem}$=4.1; $\bar{x}'_{nofem}$=4.23), and slightly higher in filtered sample of non-female footwear producers, representing similar level of knowledge, good communication and similar product development methods with firms that interchange information of those interviewed firms for all type of samples. Index increase for filtered sample of non-female footwear producers is due to removal of small firms with low index for this aspect.

Organizational proximity has three indexes: joint innovation projects index, number of firms with whom interact and firms that have changed based on interaction. First index stablishes number of **joint innovation projects** with other firms, antiquity and role, and shows a low mean value for all samples ($\bar{x}_{fem}$=0.04; $\bar{x}'_{fem}$=0.05; $\bar{x}_{nofem}$=$\bar{x}'_{nofem}$=0.1). Only two of 29 firms from complete sample of female footwear producers (the same 2 of 24 from filtered sample) and two out of 23 from complete sample of non-female footwear producers (also two out of 13 in filtered sample) present an index higher than zero (0), showing a scarce joint innovation among firms in the last five years.

Number of firms with which each female footwear producers **exchange knowledge** have lower values than non-female footwear producers ($\bar{x}_{fem}$=$\bar{x}'_{fem}$=2.7; $\bar{x}_{nofem}$=10.3; $\bar{x}'_{nofem}$=4.9). Highest index for non-female footwear producers in complete sample responds to high interaction with component producers not included in filtered sample; even without these firms, interaction level is high compared with female footwear producers, situation also present in median comparison ($M_{e.fem}$=$M_e'_{fem}$=2; $M_{e.nofem}$=$M_e'_{nofem}$=3).

From complete samples, 48% of producer firms of both type of footwear have made organizational and/or productive changes **applying knowledge produced by interaction** with pair firms ($\bar{x}_{fem}$=$\bar{x}_{nofem}$=0.48). For filtered samples percentage diminishes ($\bar{x}'_{fem}$=0.44; $\bar{x}'_{nofem}$=0.46), due to removal of small firms trying to adapt to competence and interaction is important for them.

Social proximity has index close to 3.5 ($\bar{x}_{fem}$=3.69; $\bar{x}_{nofem}$=3.46; $\bar{x}'_{fem}$=3.82; $\bar{x}'_{nofem}$=3.63) pointing a regular to good interest in pairs, and similar disposition to support needs of others. Mean and median analysis ($M_{e.fem}$=4; $M_e'_{fem}$=3.5; $M_{e.nofem}$=4; $M_e'_{nofem}$=3.4), from filtered samples present a lower level of social proximity, since filtered small firms among both samples have higher social relationships with pairs than large firms that are kept in filtered samples.

Table 42. Greatest interest areas by businessperson by type of product

Index	female		female'		nofemale		nofemale'	
	Quant.	%	Quant.	%	Quant.	%	Quant.	%
marketing channels	**13**	43.3	**11**	44.0	**11**	47.8	**9**	69.2
market diversification	**7**	23.3	**6**	24.0	**6**	26.1	**4**	30.8
product diversification	**20**	66.7	**17**	68.0	**17**	73.9	**10**	76.9
productive efficiency	**22**	73.3	**19**	76.0	**16**	69.6	**8**	61.5
knowledge management	**8**	26.7	**6**	24.0	**8**	34.8	**3**	23.1
market intelligence	**5**	16.7	**5**	20.0	**1**	4.3	**0**	0.0
internationalization	**0**	0.0	**0**	0.0	**1**	4.3	**0**	0.0
logistics	**7**	23.3	**5**	20.0	**2**	8.7	**1**	7.7
new technologies	**10**	33.3	**7**	28.0	**4**	17.4	**3**	23.1
quality	**27**	90.0	**22**	88.0	**20**	87.0	**11**	84.6
TOTAL	**30**		**25**		**23**		**13**	

Source: Own elaboration.

Institutional proximity has equal mean in complete and filtered samples, being slightly higher for female footwear producer firms, which represents more similitude in these firms than in non-female footwear producers ($\bar{x}_{fem}$=$\bar{x}'_{fem}$=0.59; $\bar{x}_{nofem}$=$\bar{x}'_{nofem}$=0.58), what also means that female footwear producer firms share more similar concerns among themselves than producers of other type of footwear.

Among areas of greatest interest by businesspersons in classified samples by type of product (Table 42), quality is the largest, followed by product diversification, productive efficiency and market channels. Female footwear producer firms have higher concern, in relation to other types of footwear producers, in quality, productive efficiency, market intelligence, logistics, and technological update, while non-female footwear producer firms are concern on market channels (specially for filtered sample), product diversification and knowledge management.

4.4.3 Recent variation of production and sales by type of product

In terms of results, some indexes are contradictories. For female footwear producer firms, production and sales has risen while personnel have decreased, for the last three years. In complete sample of non-female footwear producer firms occurs the opposite: production and sales level decrease and at the same time personnel rise up. Filtered sample of non-female footwear producer firms is the only one where normal behaviour is observed, as production and sales growth are accompanied by personnel growth in similar proportions.

Changes in production level from three last years of female footwear producers have small growth ($\bar{x}_{fem}$=1.5; $\bar{x}'_{fem}$=1.8) with wide variation range (min_{fem}=min'_{fem}=-50; max_{fem}=max'_{fem}=233) and median equal to zero ($M_{e\cdot\text{fem}}$=$M_e{}'_{fem}$=0). When results are weighted with production levels, firms joint growth for female footwear producers is 7.3%. Although, only three firms out of 27 are responsible of 16.6% growth from the total, leaving 1.6% to other firms that manifest growth, 11 that do not registered changes and 10 with joint negative growth of -10.8%. Filtered sample has 5.9% growth, with 12.5% for two of the biggest firms.

Non-female footwear producer firms average growth for production level is negative for complete sample and positive in filtered sample ($\bar{x}_{nofem}$=-4; $\bar{x}'_{nofem}$=11.9), with minor variation than female footwear producers (min_{nofem}=-75; min'_{nofem}=-60; max_{nofem}=max'_{nofem}=100). With the weighted values, growth is 22.4% for 20 grouped firms in total sample. The three biggest growths are responsible of 28.1% and -5.2% for two biggest decreases.

Employee number change level mean has a significant decrease for female footwear producers ($\bar{x}_{fem}$=-10.6; $\bar{x}'_{fem}$=-8.3), with wide diversity of situations (min_{fem}=-68; min'_{fem}=-60; max_{fem}=max'_{fem}=50). Weighted index decrease -3.4% (-1.8% for filtered sample). Three firms are responsible of 13.9% growth from total and two for -11.3% decrease.

Conversely, non-female footwear producers have positive mean index ($\bar{x}_{nofem}$=4.8; $\bar{x}'_{nofem}$=9.8), with greater variation (min_{nofem}=-63; min'_{nofem}=-50; max_{nofem}=200; max'_{nofem}=100). Weighted index joint growth is 22.2%, although the largest interviewed firm is responsible for the weighted growth of 17.4%.

Difference in sales level, female footwear producers mean rise slightly ($\bar{x}_{fem}$=0.4; $\bar{x}'_{fem}$=0.5), with wide range that grows more than thrice (max_{fem}=max'_{fem}=233) and decreases less than half (min_{fem}=min'_{fem}=-60). Weighted sample joint growth is 3.8% (2.3% in filtered sample), although two of the biggest firms growth contribute with 12.2%.

Difference among complete and filtered sample and their changes in sales level for non-female footwear producers ($\bar{x}_{nofem}$=-6; $\bar{x}'_{nofem}$=8.8) are explained basically by filter applied to small firms (in three cases changes are -75%, -67% and 0%) showing significant decrease, and from supply producers (three from five report a decrease of -71%, -50% and -20%). Range, if wide, (max_{nofem}=max'_{nofem}=100; min_{nofem}=-75; min'_{nofem}=-60), is not as wide as female footwear producers, even when firms are much more heterogeneous in type and production size. Sales changes in weighted sample present a significant rise of 22.1% in total sample and 27.3% in filtered sample, although it focusses on three firms responsible for 28.1% of present growth in the two samples. Difference among two samples is due to two large supplies producers that reports a significant sales reduction (responsible of -5.3% of total sales).

“Al ver tan gran abundancia de estrellas
di en pensar de qué manera podría medir la distancia entre ellas,
y la encontré pronto”.

(Galileo Galilei, Sidereus Nuncius, 1610)

5 ANALYSIS

This chapter presents correlation among firm indexes groups in three dimensions: firm characteristics (general indexes with production characteristics, innovation and experience), proximity dimensions indexes (cognitive, organizational, social, institutional) and outcomes indexes (results for annual production variation, employee number and sales of the last three years), as it is proposed in the methodology chapter (§2.3 p.72).

To these three index group, two dimensions identified in results presentation are added (§4.1 p.123): classification by region (Jaú and Cali) and by type of manufacture product (female and non-female footwear, the last composed by masculine and female, child, sport, maquila and component producers).

Table 43. Classification of correlation among dimensions

	firm	proximities	outcomes	type	region
firm	**§5.6.1 Correlations among firms characteristics**	~§5.1 Firms characteristics and proximity dimensions correlation	~§5.3 Correlations among firms characteristics and sales and production variation	~§5.6.2 Correlations among firm characteristics with types of product and region	
proximity dimensions	**§5.1 Firms characteristics and proximity dimensions correlation**	**§5.4 Correlations among proximity dimensions**	~§5.2 Correlations among proximity dimensions and sales and production variation	~§5.6.3 Correlations among proximity dimensions and production/sales variation with type of product and region	
outcomes	**§5.3 Correlations among firms characteristics and sales and production variation**	**§5.2 Correlations among proximity dimensions and sales and production variation**	**§5.5 Correlations among sales and production variation indexes**		
type	**§5.6.2 Correlations among firm characteristics with types of product and region**	**§5.6.3 Correlations among proximity dimensions and production/sales variation with type of product and region**		Not apply	
region					

Source: Own elaboration.

To facilitate correlation presentation, Table 43 is done as cross-matrix with five dimensions and a total group of correlations that can be obtained. Intersections allow identifying six correlation groups:

1) Correlation between firms characteristics and their levels of each proximity dimension, that are analysed in §5.1;

2) Correlation between levels of each proximity dimension and variation of production index, employee number and sales in the last three years, that are detail in §5.2;

3) Correlation between firms characteristics and production, employees and sales variation, presented in §5.3;

4) Correlation among mentioned proximity dimensions indexes, described in §5.4;

5) Correlations between production and sales variation indexes in §5.5; and

6) Other correlations that include region analysis and indexes of type of product with characteristics, proximity dimensions, results and those produced among firm characteristics showed in §5.6.

Correlations are applied with Spearman correlation coefficient, in a similar way as Huber (2012), research, which establishes statistical dependence among two continuous random variables. Due the type of data obtained, Spearman correlation is recommended over Pearson correlation, since in data set are identify cases with extreme values (due to heterogeneity of interviewed firms), absence of a normal distribution and absence of effect of measure units when continuous variables are converted to ordinal scale (Martínez Ortega, Tuya Pendás, Martínez Ortega, Pérez Abreu, & Canovas, 2009). Correlation coefficient varies among -1 (perfect negative correlation) and +1 (perfect positive correlation), with a value of zero (0) when there is no correlation.

Another value to take into account is significance, commonly given by statistical software with correlation value, that represents probability of the result to be product of random. The lower its value, the stronger is correlation evidence. Common values to establish significance level are 0.05 and 0.01.

It is also important to clarify that correlation among two variables does not determine causation among them (variable A is not necessarily cause of variable B, neither B of A). In fact, correlation between A and B has the same correlation and significance value as correlation between B and A. Correlation between A and B could even be due to a third causality factor not established in this research (e.g., C could cause A and B, creating correlation between A and B).

Analysis of results is done with IBM SPSS Statistics 22 (Statistical software for social science), for data filtered (in each one of ten samples) and correlation application that identifies, for each pair of data to compare, coefficient (ρ, Rho), statistical significance (sig.) and number of comparisons (N).

Correlation compilation is presented from Table 44 to Table 61, and shows existent correlations between each described index for each one of ten samples where 53 interviewed firms are classified as it is presented in §4.1 (Table 32, p.124): Total (*TOTAL.53*, N_{total}=53), Total filtered (*TOTAL'.38*, N'_{total}=38), Jaú (*Jaú.21*, $N_{Jaú}$=21), Jaú filtered (*Jaú'.15*, $N'_{Jaú}$=15), Cali (*Cali.32*, N_{Cali}=32), Cali filtered (*Cali.23*, N'_{Cali}=23), female footwear producers (*fem.30*, N'_{fem}=30), female footwear producers filtered (*fem'.25*, N'_{fem}=25), non-female footwear producers (*nofem.23*, N_{nofem}=23), and non-female footwear producers filtered (*nofem'.13*, N'_{nofem}=13).

Besides data identification with double asterisk (** significance level .010) and one asterisk (* significance level .050), provided by SPSS, is apply to cells of results group (Rho, Significance and N) dark grey to significance fewer than .050 and light grey plus cross (†) to identify correlation with significance level among .050 and .100.

After, section (§5.7) compiles correlation grade obtained by each index with the rest of the indexes, establishing usefulness for this research and its purposes.

The present chapter ends with a final section (§5.8) comparing correlations of homogeneous (Jaú, female footwear), with heterogeneous groups (Cali, non-female footwear).

5.1 Firms characteristics and proximity dimensions correlation

The following sections present firms characteristics analysis (classified by production: employee number, annual production in dollars, annual production per employee; innovation: equipment acquisition, innovation team strength, produced units per innovation, innovations per year, new markets, organizational changes, production changes; and experience: age, distance from neighbours in kilometres, product price, clients outside main market percentage, institutional benefits profit) with each proximity dimension assessed (cognitive, organizational, social and institutional).

5.1.1 Correlations among characteristics and cognitive proximity

Correlation between characteristics and cognitive proximity index (Table 44), established by average from five questions on the subject (Table 6 p.76) have a correlation with a significance of .1 among firms that profit of institutional benefits only for Jaú firms.

Identification of Jaú correlation could establish the existence of a trend among firms with greater cognitive proximity to look for contact with institutions that support firms, although results show that firms that look for institutional support are greater in the filtered sample (p.139: *institutional benefits*). In Cali, there is no correlation due to communication difficulties with pairs that present interviewed firms (p.139: *Cognitive proximity*) and scarce institutional benefits participation (p.139). Besides Jaú firms, this behaviour is observed in non-female footwear producers, although the correlation level is fewer with significance level of .1, it is slightly superior to critical correlation value. However, filtered sample from Jaú is below correlation critical value (rejected hypothesis) and complete sample is on the limit, so is not possible to reject or accept the correlation.

Table 44. Correlations among characteristics and cognitive proximity

		Firm Characteristics														
		Production			Innovation							Experience				
COGNITIVE PROXIMITY		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	.037	-.020	-.007	.144	-.020	-.135	-.039	.022	.138	-.262	.015	.161	.202	-.167	.235
	Sig.	.843	.913	.972	.449	.917	.510	.849	.908	.467	.206	.938	.387	.276	.379	.203
	N	31	31	31	30	31	26	27	31	30	25	31	31	31	30	31
Jaú (21)	Rho	.373	.307	.213	.096	.191	.096	-.142	.417	-.271		.254	.533†	.519†	-.069	**.581***
	Sig.	.209	.308	.485	.768	.532	.779	.678	.156	.395		.401	.061	.069	.823	**.037**
	N	13	13	13	12	13	11	11	13	12	7	13	13	13	13	**13**
Cali (32)	Rho	.010	-.150	-.173	.217	-.120	-.034	.080	-.137	.220	-.346	-.021	.041	.145	-.164	.172
	Sig.	.969	.552	.493	.387	.636	.904	.769	.589	.380	.160	.935	.870	.566	.530	.496
	N	18	18	18	18	18	15	16	18	18	18	18	18	18	17	18
Female (30)	Rho	.256	.227	.145	.026	.287	.424	-.054	-.012	-.279	-.221	.312	.094	-.062	.176	.202
	Sig.	.320	.381	.578	.922	.264	.115	.849	.963	.295	.467	.223	.721	.812	.514	.437
	N	17	17	17	17	17	15	15	17	16	13	17	17	17	16	17
Not female (23)	Rho	.204	-.128	-.185	.219	-.320	**-.611**	.161	-.036	.356	-.344	-.124	-.015	.474†	-.418	.467†
	Sig.	.483	.663	.526	.473	.264	**.046**	.616	.904	.212	.274	.673	.958	.087	.137	.092
	N	14	14	14	13	14	**11**	12	14	14	12	14	14	14	14	14
TOTAL' (38)	Rho	-.279	-.289	-.120	-.094	-.187	-.022	-.330	.095	.000	-.098	-.183	.176	-.134	-.069	.120
	Sig.	.220	.204	.605	.693	.418	.927	.167	.683	1.000	.709	.426	.445	.563	.766	.605
	N	21	21	21	20	21	19	19	21	21	17	21	21	21	21	21
Jaú' (15)	Rho	.134	-.126	-.521	.006	-.114	.647	-.240	.414	-.218		-.050	.412	.287	.147	.583†
	Sig.	.730	.747	.150	.989	.769	.083	.568	.268	.573		.897	.271	.454	.705	.100
	N	9	9	9	8	9	8	8	9	9	5	9	9	9	9	9
Cali' (23)	Rho	-.212	-.224	.028	-.069	-.142	-.021	-.244	-.128	-.048	-.123	-.102	.070	-.105	-.147	.113
	Sig.	.509	.484	.931	.831	.659	.952	.469	.691	.881	.704	.752	.829	.745	.648	.727
	N	12	12	12	12	12	11	11	12	12	12	12	12	12	12	12
Female' (25)	Rho	.003	-.105	-.303	-.188	.028	.474	-.274	.104	-.446	-.191	.048	.072	-.171	.148	.406
	Sig.	.993	.733	.314	.539	.929	.120	.389	.736	.127	.598	.875	.816	.576	.629	.169
	N	13	13	13	13	13	12	12	13	13	10	13	13	13	13	13
Not female' (13)	Rho	.066	-.024	.156	-.073	-.169	-.432	.000	-.220	.170	.000	-.145	-.252	-.072	-.392	.166
	Sig.	.876	.955	.713	.877	.690	.333	1.000	.601	.687	1.000	.733	.548	.866	.337	.695
	N	8	8	8	7	8	7	7	8	8	7	8	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Other correlations identified with cognitive proximity, although with level of significance between .05 and .10, found for product price in Jaú firms and non-female footwear producer firms (in filtered samples), that could indicate that firms from those samples have greater cognitive proximity, as the products have greater sale price.

Overall, correlation results with mean correlation significance among .05 and .10 observed among cognitive proximity, with price, distance and institutional benefit profit in Jaú, may be due to productive districts presence (city zones planned to group location of footwear producer firms) that propitiate information flux among firms.

5.1.2 Correlations among firms characteristics and organizational proximity

First correlation analysis between firm characteristics and organizational proximity is made with joint project index (Table 45), showing significant correlation of .066 and .086 for three characteristics (negative for employee efficiency and innovation staff strength, and positive for number of produced units per innovation) and in three groups of different samples: non-female footwear producers complete sample and filtered sample for female and non-female producers.

Table 45. Correlations among firms characteristics and organizational proximity

		Firm Characteristics														
		Production			Innovation							Experience				
ORGANIZATIONAL PROXIMITY		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	.067	.025	-.105	.051	-.058	.198	.008	.024	.151	-.051	-.036	-.023	-.077	.094	-.042
	Sig.	.638	.861	.466	.724	.684	.210	.959	.867	.300	.744	.801	.871	.595	.511	.772
	N	52	50	50	51	51	42	45	51	49	44	52	52	50	51	50
Jaú (21)	Rho	-.217	-.263	-.145	.106	-.270	.188	-.205	-.177	.135	.091	-.340	-.256	-.208	.201	-.201
	Sig.	.359	.276	.554	.665	.263	.521	.463	.469	.607	.779	.142	.275	.393	.395	.395
	N	20	19	19	19	19	14	15	19	17	12	20	20	19	20	20
Cali (32)	Rho	.217	.163	-.040	-.025	.083	.195	.103	.141	.180	-.081	.168	.064	-.015	-.032	.040
	Sig.	.232	.381	.829	.891	.653	.319	.586	.442	.325	.660	.358	.726	.938	.866	.834
	N	32	31	31	32	32	28	30	32	32	32	32	32	31	31	30
Female (30)	Rho	.044	.055	.159	.095	-.286	-.098	.059	.051	.115	-.084	-.085	.155	.296	-.045	.202
	Sig.	.822	.780	.418	.623	.140	.641	.780	.798	.569	.702	.662	.423	.126	.822	.293
	N	29	28	28	29	28	25	25	28	27	23	29	29	28	28	29
Not female (23)	Rho	.011	-.044	-.311	.020	.211	.455	.064	.012	.145	.000	.039	-.154	-.245	.145	-.225
	Sig.	.960	.844	.159	.929	.333	.066	.788	.958	.521	1.000	.861	.484	.272	.511	.326
	N	23	22	22	22	23	17	20	23	22	21	23	23	22	23	21
TOTAL' (38)	Rho	.069	.054	-.094	-.022	-.152	.145	-.001	.070	.020	.000	.078	.045	-.066	.113	-.007
	Sig.	.685	.752	.587	.900	.376	.430	.997	.687	.909	1.000	.648	.790	.703	.506	.969
	N	37	36	36	36	36	32	33	36	36	31	37	37	36	37	37
Jaú' (15)	Rho	-.034	-.034	.241	.156	-.464	-.200	.000	-.192	-.228	.143	-.172	-.034	.035	-.172	-.077
	Sig.	.907	.907	.407	.610	.110	.555	1.000	.529	.453	.736	.557	.907	.907	.556	.793
	N	14	14	14	13	13	11	11	13	13	8	14	14	14	14	14
Cali' (23)	Rho	.153	.118	-.122	-.121	.040	.250	.049	.168	.123	-.035	.213	.060	-.141	.077	.048
	Sig.	.485	.600	.589	.583	.857	.274	.828	.443	.575	.873	.329	.786	.531	.728	.828
	N	23	22	22	23	23	21	22	23	23	23	23	23	22	23	23
Female' (25)	Rho	.015	.053	.194	.073	-.365†	-.102	.048	.027	.084	-.075	-.136	.185	.283	-.056	.200
	Sig.	.945	.812	.375	.734	.086	.660	.835	.903	.702	.761	.526	.387	.191	.794	.348
	N	24	23	23	24	23	21	21	23	23	19	24	24	23	24	24
Not female' (13)	Rho	-.022	-.052	-.524†	-.114	.192	.499	-.048	.134	-.134	.214	.325	-.166	-.411	.266	-.231
	Sig.	.943	.865	.066	.724	.529	.118	.881	.662	.662	.504	.279	.588	.163	.380	.448
	N	13	13	13	12	13	11	12	13	13	12	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

The number of units per innovation and organizational proximity of complete sample of non-female footwear producer firms reflects the presence of large producers interacting with suppliers or clients

to develop joint innovation, but this is not evident for other producers, a reason why low correlation has greater significance in filtered sample that does not include supplies producers. Negative correlation with significance of .05 to .10 between innovation staff size and organizational proximity responds to two small firms that have look to develop a joint work with other small firms to open new markets, so this is a consequence of those firms that for not having sufficient resources for innovation, look to make projects with external agents. Finally, negative correlation between organizational proximity and productive efficiency in filtered sample of non-female footwear producers occurs due to masculine footwear businesspersons with high sale prices are renitent to undertake joint projects (situation due to their participation in markets with more stable projects), while large producers with less efficiency (family-owned firms from Cali with low efficiency compared with another of the same size), look to make projects with others.

Correlation analysis between firm characteristics and the number of firms with whom exchange information and/or knowledge (Table 46), allow to identify negative correlation with significance level lower than 0.05 for product price, for all firms, for Cali firms and for non-female footwear producers (for all cases of complete and filtered samples). Data review shows that especially for Cali firms, compose mainly by non-female footwear producers (19 of 23 in complete sample and 12 of 13 in filtered sample; Table 32 p.124), as lower the unitary product price, especially in filtered samples, interaction is easier, while more expensive footwear producers have lower interaction.

Type of product diversity in these groupings (p.147: *Product prices*) creates a clearly differentiable scale (where firm can cooperate with others that are not direct rivals), situation that neither reflects in Jaú or female footwear producer firms that, for their high level of competence and continuous reference update, forces to compete in narrower ranges of product price.

Other correlations are found in efficiency interaction (annual production per employee) with other non-female footwear producer firms in filtered sample with negative correlation and significance level of 0.014 and others with greater significance in non-filtered sample and filtered sample from Cali. Again, heterogeneity of non-female footwear filtered sample (p.145: *annual production per employee*) allows to identifying a wide and observable scale with which correlation is identified.

A number of interactions in Cali firms present positive correlation with new markets entrance, a situation neither present in Jaú (probably due to the low, *New markets entrance*, p.138) or in samples by type of product. Filtered sample presents a lower value by removal of one supply producer with high interaction level that has a strategic plan to expand to other markets. Other correlations, with

weaker significances, are identified in annual production (for female footwear producers), equipment acquisition (for firms in Jaú) and production changes (complete sample).

Table 46. Correlations among firms characteristics and number of interactions

		Firm Characteristics														
		Production			Innovation							Experience				
INTERACTION		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	.016	.043	-.081	.011	.094	.274	.042	.189	.129	.257†	.173	-.031	**-.351***	.143	-.090
	Sig.	.909	.769	.578	.940	.511	.079	.786	.184	.384	.093	.221	.825	**.012**	.318	.535
	N	52	50	50	51	51	42	45	51	48	44	52	52	**50**	51	50
Jaú (21)	Rho	.022	.306	.152	.388†	.235	**.685**	-.169	-.190	.357	.319	.227	.063	-.176	.315	-.004
	Sig.	.928	.203	.534	.100	.334	**.007**	.546	.437	.174	.312	.337	.791	.471	.176	.986
	N	20	19	19	19	19	**14**	15	19	16	12	20	20	19	20	20
Cali (32)	Rho	-.043	-.087	-.230	-.268	-.042	.056	-.074	**.433***	.037	.253	.141	-.096	**-.492****	.120	-.176
	Sig.	.813	.641	.214	.137	.819	.777	.699	**.013**	.843	.162	.441	.602	**.005**	.520	.352
	N	32	31	31	32	32	28	30	**32**	32	32	32	32	**31**	31	30
Female (30)	Rho	.166	.318†	.218	.155	.215	.309	.100	.103	.093	.212	.239	-.134	-.191	.053	.252
	Sig.	.391	.100	.266	.421	.271	.133	.633	.603	.652	.332	.212	.489	.332	.788	.188
	N	29	28 (✓)	28	29	28	25	25	28	26	23	29	29	28	28	29
Not female (23)	Rho	-.071	-.244	-.410†	-.112	-.061	.246	.135	.331	.118	.357	.046	.061	**-.442***	.150	-.316
	Sig.	.749	.273	.058	.620	.781	.342	.570	.123	.600	.112	.836	.783	**.040**	.493	.163
	N	23	22	22	22	23	17	20	23	22	21	23	23	**22**	23	21
TOTAL' (38)	Rho	.028	.064	-.138	-.011	.073	.202	.128	.195	.073	.193	.128	.041	**-.438****	.146	-.017
	Sig.	.865	.708	.417	.949	.668	.259	.472	.248	.673	.290	.443	.805	**.007**	.382	.919
	N	38	37	37	37	37	33	34	37	36	32	38	38	**37**	38	38
Jaú' (15)	Rho	.289	.400	.165	.340	.384	**.614**	.075	-.152	.237	.359	.330	.165	-.214	.210	.293
	Sig.	.296	.139	.557	.234	.175	**.034**	.816	.604	.435	.342	.230	.557	.444	.453	.289
	N	15	15	15	14	14	**12**	12	14	13	9	15	15	15	15	15
Cali' (23)	Rho	-.146	-.176	-.376†	-.278	-.156	-.023	.173	.396†	.028	.182	-.026	-.068	**-.579****	.172	-.216
	Sig.	.506	.433	.084	.200	.478	.921	.443	.061	.900	.405	.906	.758	**.005**	.431	.322
	N	23	22	22	23	23	21	22	23	23	23	23	23	**22**	23	23
Female' (25)	Rho	.119	.263	.154	.178	.188	.211	.093	.108	.079	.126	.205	-.086	-.244	.103	.229
	Sig.	.572	.214	.472	.394	.378	.345	.681	.615	.720	.595	.326	.684	.252	.623	.270
	N	25	24	24	25	24	22	22	24	23	20	25	25	24	25	25
Not female' (13)	Rho	-.076	-.307	**-.661***	-.344	-.183	.244	.263	.437	.044	.464	-.034	.187	**-.644***	.148	-.283
	Sig.	.806	.308	**.014**	.274	.549	.470	.410	.136	.887	.128	.912	.540	**.017**	.629	.349
	N	13	13	**13**	12	13	11	12	13	13	12	13	13	**13**	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Analysis of information and knowledge application resulting from interaction (Table 47), identified correlations with entrance to new markets in total samples (complete and filtered) and filtered sample from Cali. As previous analysis (p.138: *New markets entrance*), data observation identify that firms in Cali look to explore external markets, in which is necessary thirds references to answer properly to new customers.

Table 47. Correlations among firms characteristics and knowledge application

		Firm Characteristics														
		Production			Innovation							Experience				
APPLICATION INTERACTION		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	-.146	-.202	-.098	.000	-.082	-.077	.012	.311†	.013	-.129	-.274	.078	.326†	-.010	.182
	Sig.	.433	.286	.606	1.000	.660	.715	.952	.089	.948	.540	.135	.678	.079	.959	.326
	N	31	30	30	30	31	25	27	31	29	25	31	31	30	30	31
Jaú (21)	Rho	.049	-.130	-.065	-.168	.318	.406	.075	.300	-.043		-.244	.171	.390	-.180	.184
	Sig.	.874	.688	.841	.601	.290	.244	.828	.319	.900		.421	.576	.210	.557	.548
	N	13	12	12	12	13	10	11	13	11	7	13	13	12	13	13
Cali (32)	Rho	-.072	-.187	-.101	.161	-.302	-.341	.052	.316	.051	-.100	-.389	.101	.330	.189	.275
	Sig.	.776	.458	.691	.524	.222	.213	.848	.201	.841	.693	.110	.691	.180	.466	.269
	N	18	18	18	18	18	15	16	18	18	18	18	18	18	17	18
Female (30)	Rho	-.185	-.246	-.246	.000	-.062	.034	-.172	.378	-.139	-.174	-.246	.123	.410	.231	.087
	Sig.	.494	.358	.358	1.000	.821	.907	.557	.149	.622	.588	.358	.650	.114	.407	.748
	N	16	16	16	16	16	14	14	16	15	12	16	16	16	15	16
Not female (23)	Rho	-.122	-.238	-.108	-.080	-.087	-.112	-.089	.262	.174	-.184	-.315	.000	.194	.070	.236
	Sig.	.664	.414	.713	.785	.757	.743	.772	.346	.552	.546	.253	1.000	.506	.804	.397
	N	15	14	14	14	15	11	13	15	14	13	15	15	14	15	15
TOTAL' (38)	Rho	-.231	-.220	.060	.011	-.080	-.158	-.026	.509*	-.023	-.074	-.472*	.240	.501*	.132	.130
	Sig.	.314	.337	.796	.963	.730	.518	.915	.019	.921	.778	.031	.294	.021	.569	.575
	N	21	21	21	20	21	19	19	21	21	17	21	21	21	21	21
Jaú' (15)	Rho	.104	.000	.000	.000	.261	.412	.082	.378	-.060		-.311	.414	.728*	-.113	.231
	Sig.	.791	1.000	1.000	1.000	.498	.310	.846	.316	.879		.416	.268	.026	.771	.549
	N	9	9	9	8	9	8	8	9	9	5	9	9	9	9	9
Cali' (23)	Rho	-.196	-.130	.389	-.033	-.098	-.448	-.149	.632*	.000	-.076	-.652*	.259	.389	.389	.256
	Sig.	.542	.688	.212	.919	.763	.167	.661	.027	1.000	.815	.021	.416	.212	.212	.422
	N	12	12	12	12	12	11	11	12	12	12	12	12	12	12	12
Female' (25)	Rho	-.143	-.228	-.285	.000	-.029	.044	-.131	.461	-.101	-.218	-.228	.171	.513†	.260	.122
	Sig.	.642	.454	.345	1.000	.926	.893	.685	.113	.742	.545	.453	.577	.073	.391	.692
	N	13	13	13	13	13	12	12	13	13	10	13	13	13	13	13
Not female' (13)	Rho	-.127	-.126	.378	-.081	.000	-.316	-.158	.577	.149	-.091	-.760*	.504	.504	.127	.218
	Sig.	.765	.766	.356	.864	1.000	.490	.735	.134	.725	.846	.028	.203	.203	.765	.604
	N	8	8	8	7	8	7	7	8	8	7	8	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Also, correlation with significance level fewer than .05 between age and knowledge application in total filtered samples, from Cali and non-female footwear producers that could be identify as newest firms look for new ideas from their pairs and implement them, while the oldest, even they share knowledge with others, do not implement changes based on this exchange. Samples on which correlation locates are producers with heterogeneous characteristics that do not make them direct competence.

Finally, positive correlations are identify with product price in total sample, from Jaú and female footwear producers (especially in filtered samples), samples that tend to homogeneity, on which is identify that firms with the lowest prices do not apply changes, although they share information, that could suppose that those firms focus their strategy on low price and not on product differentiation.

5.1.3 Correlations among firms characteristics and social proximity

Among diverse correlation analysis between proximity dimensions and firm characteristics, social proximity (Table 48) presents the greatest number of correlations and is the entrance to new markets mostly found. Identified correlations present significance level of 0.05, and are found in total sample, in Cali and in non-female footwear producers (in three cases in their complete and filtered samples). However, comparing the values to each other, non-female footwear firms present greater significance (especially in filtered sample).

Table 48. Correlations among firms characteristics and social proximity

		Firm Characteristics														
		Production			Innovation							Experience				
SOCIAL PROXIMITY		n° employees	annual production	output /employee	equipment addition	innovation staff	products /innovation	innovations /year	new markets	organization changes	production changes	age	neighbourhood distance	product price	outside costumers	institutional benefits
TOTAL (53)	Rho	-.279	-.323†	-.122	.075	-.080	.011	-.344†	.438*	-.075	-.060	-.416*	.211	.012	.137	.122
	Sig.	.128	.076	.514	.695	.667	.959	.079	.014	.692	.775	.020	.256	.950	.469	.514
	N	31	31	31	30	31	26	27	31	30	25	31	31	31	30	31
Jaú (21)	Rho	-.513†	-.524†	-.114	-.032	-.409	.005	-.405	.346	-.074		-.654*	.241	.270	-.064	-.437
	Sig.	.073	.066	.710	.921	.165	.989	.217	.246	.819		.015	.427	.373	.836	.135
	N	13	13	13	12	13	11	11	13	12	7	13	13	13	13	13
Cali (32)	Rho	-.216	-.397	-.203	.140	.095	.042	-.452†	.577*	-.100	-.098	-.214	.232	-.085	.416†	.396
	Sig.	.388	.103	.419	.580	.709	.883	.078	.012	.692	.698	.394	.355	.738	.097	.103
	N	18	18	18	18	18	15	16	18	18	18	18	18	18	17	18
Female (30)	Rho	-.354	-.370	-.230	-.069	-.277	.121	-.222	.109	-.544*	-.050	-.405	.002	.061	-.056	.001
	Sig.	.164	.144	.375	.792	.281	.667	.426	.677	.029	.872	.107	.992	.817	.838	.996
	N	17	17	17	17	17	15	15	17	16	13	17	17	17	16	17
Not female (23)	Rho	.038	-.029	.121	.233	.184	-.105	-.160	.777**	.362	-.100	-.510†	.419	.141	.162	.567*
	Sig.	.897	.921	.680	.444	.528	.759	.620	.001	.204	.757	.063	.136	.630	.579	.035
	N	14	14	14	13	14	11	12	14	14	12	14	14	14	14	14
TOTAL' (38)	Rho	-.163	-.230	-.039	.141	-.005	.058	-.121	.516*	-.103	-.123	-.389†	.437*	.056	.182	.081
	Sig.	.480	.316	.866	.553	.983	.813	.621	.017	.656	.638	.081	.048	.808	.429	.727
	N	21	21	21	20	21	19	19	21	21	17	21	21	21	21	21
Jaú' (15)	Rho	-.400	-.417	.033	.000	-.202	.048	-.357	.548	.000		-.717*	.533	.703*	-.055	-.280
	Sig.	.286	.265	.932	1.000	.603	.911	.385	.127	1.000		.030	.139	.035	.889	.466
	N	9	9	9	8	9	8	8	9	9	5	9	9	9	9	9
Cali' (23)	Rho	-.190	-.491	-.292	.195	-.005	.028	-.179	.599*	-.197	-.299	-.090	.370	-.470	.541†	.209
	Sig.	.554	.105	.357	.544	.987	.936	.598	.039	.540	.345	.782	.236	.123	.069	.515
	N	12	12	12	12	12	11	11	12	12	12	12	12	12	12	12
Female' (25)	Rho	-.091	-.113	-.041	.100	.075	.173	-.060	.228	-.489†	-.191	-.194	.158	.274	.121	.089
	Sig.	.766	.712	.893	.746	.808	.591	.853	.453	.090	.597	.526	.607	.365	.695	.774
	N	13	13	13	13	13	12	12	13	13	10	13	13	13	13	13
Not female' (13)	Rho	-.148	-.135	.086	.075	-.167	.018	.036	.900**	.290	-.150	-.611	.884**	.025	.377	.510
	Sig.	.726	.750	.840	.872	.693	.969	.938	.002	.485	.749	.107	.004	.954	.358	.196
	N	8	8	8	7	8	7	7	8	8	7	8	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).

Source: Own elaboration.

Negative correlation with significance of 0.1 among age and social proximity present, with the higher significance level of Jaú also present for complete samples (may be due to the greatest proportion of firms younger than 10 years, p.138: *age*), which evidence that through time firms stop being interested in collaboration with pairs.

Correlation among distance from neighbours and social proximity is identified, with .004 significance in filtered sample of non-female footwear producers, and .05 significance in total filtered sample, even when non-significant differences are present in complete and filtered samples (pp.129,147: *Neighbour distance*).

Other correlations are found among complete and filtered samples of female footwear producers between organizational changes and social proximity, due to high upgrading incidence in these issues for firms (p.147: *organizational changes*) and size related debugging (p.149: *Social proximity*). Another correlation in complete and filtered samples in Cali firms is present among the percentage of external clients from main markets and social proximity, proving the existence of a support network to attend those differentiated markets (p.139: *external clients*).

Significant correlation among product price and social proximity is also identified, in Jaú filtered sample (sig. .035) and non-female complete sample among institutional benefits profit and social proximity (sig. .035). Finally, social proximity correlations are identified with .05 and 0.10 significance among Jaú annual production and all firms (although with non-reflection on filtered samples), and with employee number from Jaú.

5.1.4 Correlations among firms characteristics and institutional proximity

Institutional proximity is the analysed proximity dimension that less correlation shows when is compared with firms characteristics (Table 49). Positive correlation with .05 significance is identify in filtered sample (sig. .55) among annual production value and annual production of female footwear producers, proving that firms increase concern similitude as annual production value arise. Although this quality is not presented in the other samples, behaviour is more homogeneous among female footwear producers than other groups (pp.136,144: *Annual production value*).

Another positive correlation with .05 and .10 significance is found in total filtered sample and female footwear among the annual number of innovations and institutional proximity, in which firms with the highest innovation index present similar concerns. Finally, other correlations are identified, with .05 and .10 significance, among employee number and product price, with institutional proximity in

filtered sample of female footwear, proving a clear trend to show correlations just in firms with homogeneous characteristics since female footwear producers are much more homogeneous than non-female footwear producers (§4.4.1).

Table 49. Correlations among firms characteristics and institutional proximity

		Firm Characteristics														
		Production			Innovation							Experience				
INSTITUTIONAL PROXIMITY		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
	Rho	.168	.143	.136	.019	.158	.001	.241	-.007	.039	.023	-.141	.013	.198	-.105	.225
TOTAL (53)	Sig.	.229	.317	.343	.893	.264	.995	.106	.963	.791	.883	.313	.929	.163	.460	.112
	N	53	51	51	52	52	43	46	52	49	45	53	53	51	52	51
	Rho	.175	.143	-.048	.117	.363	-.346	.181	.141	-.315	.117	.100	.127	.268	.367	.076
Jaú (21)	Sig.	.449	.548	.840	.625	.115	.206	.502	.553	.217	.703	.665	.584	.253	.102	.743
	N	21	20	20	20	20	15	16	20	17	13	21	21	20	21	21
	Rho	-.008	-.102	-.002	-.185	-.010	.039	-.014	.051	.221	-.267	-.195	.050	.085	-.035	.159
Cali (32)	Sig.	.965	.586	.991	.310	.955	.843	.943	.782	.225	.140	.284	.785	.648	.853	.401
	N	32	31	31	32	32	28	30	32	32	32	32	32	31	31	30
	Rho	.301	.373*	.301	.135	.249	.077	.313	-.063	-.141	.192	.016	.157	.298	-.178	.251
Female (30)	Sig.	.106	.046	.112	.478	.193	.707	.119	.746	.484	.369	.934	.407	.116	.356	.182
	N	30	29	29	30	29	26	26	29	27	24	30	30	29	29	30
	Rho	-.059	-.185	-.066	-.113	.017	-.160	.117	.069	.259	-.205	-.332	-.145	.077	.084	.080
Not female (23)	Sig.	.789	.409	.772	.618	.939	.540	.624	.755	.244	.373	.122	.508	.734	.704	.730
	N	23	22	22	22	23	17	20	23	22	21	23	23	22	23	21
	Rho	.198	.172	.168	.007	.164	-.077	.316†	.015	-.024	.108	-.058	.148	.208	-.159	.150
TOTAL' (38)	Sig.	.232	.308	.321	.968	.331	.672	.068	.928	.888	.555	.731	.376	.216	.342	.368
	N	38	37	37	37	37	33	34	37	36	32	38	38	37	38	38
	Rho	.081	-.009	-.347	.159	.238	-.480	.159	.186	-.447	.277	-.086	.173	.329	.439	-.004
Jaú' (15)	Sig.	.775	.975	.205	.588	.414	.114	.622	.524	.125	.470	.760	.539	.231	.102	.988
	N	15	15	15	14	14	12	12	14	13	9	15	15	15	15	15
	Rho	.106	-.049	.062	-.203	.058	.129	.143	.007	.237	-.249	.057	.195	-.008	-.123	.002
Cali' (23)	Sig.	.632	.830	.783	.353	.794	.576	.527	.976	.276	.253	.796	.373	.970	.577	.993
	N	23	22	22	23	23	21	22	23	23	23	23	23	22	23	23
	Rho	.345†	.397†	.296	.227	.266	.007	.383†	-.048	-.131	.137	-.030	.242	.346†	-.243	.252
Female' (25)	Sig.	.091	.055	.161	.275	.210	.974	.078	.822	.551	.565	.889	.244	.098	.241	.225
	N	25	24	24	25	24	22	22	24	23	20	25	25	24	25	25
	Rho	-.167	-.355	-.096	-.336	-.142	-.305	.252	.148	.169	.000	-.083	.036	.008	.134	-.104
Not female' (13)	Sig.	.585	.234	.754	.285	.644	.361	.429	.629	.580	1.000	.788	.908	.979	.663	.734
	N	13	13	13	12	13	11	12	13	13	12	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

5.2 Correlations among proximity dimensions and sales and production variation

Correlation analysis among levels of each proximity dimension and results, expressed in sales and production variation of firms, is accomplished by comparing each result with each proximity dimension index studied.

Table 50. Correlations among proximity dimensions and changes in production level

Δ PRODUCTION		Proximity Dimensions					
		cognitive proximity	organizational proximity	interaction	application interaction	social proximity	institutional proximity
TOTAL (53)	Rho	.360†	.083	.149	-.060	.208	.219
	Sig.	.060	.575	.313	.760	.287	.131
	N	28	48	48	28	28	49
Jaú (21)	Rho	.286	.398†	.125	.239	-.147	.396†
	Sig.	.367	.091	.610	.455	.649	.084
	N	12	19	19	12	12	20
Cali (32)	Rho	.314	-.086	.154	-.226	.299	.200
	Sig.	.237	.657	.424	.399	.261	.299
	N	16	29	29	16	16	29
Female (30)	Rho	.443†	.199	.281	.000	-.136	.324†
	Sig.	.098	.319	.155	1.000	.629	.092
	N	15	27	27	14	15	28
Not female (23)	Rho	.311	-.027	.073	-.099	.477†	.141
	Sig.	.302	.908	.754	.737	.099	.543
	N	13	21	21	14	13	21
TOTAL' (38)	Rho	.499*	.059	.195	-.112	.112	.153
	Sig.	.025	.730	.249	.638	.639	.366
	N	20	36	37	20	20	37
Jaú' (15)	Rho	.497	.465†	.164	-.113	-.201	.378
	Sig.	.173	.093	.560	.771	.604	.165
	N	9	14	15	9	9	15
Cali' (23)	Rho	.432	-.144	.221	-.150	.197	.026
	Sig.	.184	.522	.323	.659	.561	.907
	N	11	22	22	11	11	22
Female' (25)	Rho	.636*	.229	.245	-.034	-.199	.291
	Sig.	.026	.292	.249	.917	.534	.168
	N	12	23	24	12	12	24
Not female' (13)	Rho	.270	-.202	.148	-.129	.340	-.039
	Sig.	.518	.508	.628	.761	.410	.900
	N	8	13	13	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

5.2.1 Correlations among proximity dimensions and changes in production level

Correlations analysis among changes in production level and each proximity dimension index (Table 50), is more significant for cognitive proximity correlations in total sample and in female footwear firms, but have greater emphasis in filtered samples, proving that firms with greater cognitive proximity tend to have better production elevation results, with more emphasis for female footwear producers. Possible causes for this correlation are not identified for female footwear since it neither manifest differences with non-female footwear producers and *cognitive proximity* (p.148) or *Changes in production level* (p.150).

Correlations with significance over .09 identified for complete and filtered samples in Jaú firms, among production changes and organizational proximity, as the product of high index for production elevation and number of joint projects that one of the biggest firms in the region has, plus elevated growth.

Table 51. Correlations among proximity dimensions and changes in employee number

		Proximity Dimensions					
Δ EMPLOYEES		**cognitive proximity**	**organizational proximity**	**interaction**	**application interaction**	**social proximity**	**institutional proximity**
TOTAL (53)	Rho	.349†	-.058	.141	-.034	.187	.065
	Sig.	.059	.685	.325	.858	.322	.648
	N	30	51	51	30	30	52
Jaú (21)	Rho	.200	.179	.054	.303	-.058	.119
	Sig.	.512	.450	.820	.314	.852	.608
	N	13	20	20	13	13	21
Cali (32)	Rho	.374	-.227	.213	-.238	.305	.072
	Sig.	.139	.219	.250	.358	.233	.702
	N	17	31	31	17	17	31
Female (30)	Rho	.432†	-.087	.173	.023	-.039	.122
	Sig.	.095	.660	.379	.935	.885	.530
	N	16	28	28	15	16	29
Not female (23)	Rho	.289	-.065	.089	-.053	.477†	.072
	Sig.	.317	.768	.685	.850	.085	.745
	N	14	23	23	15	14	23
TOTAL' (38)	Rho	**.471***	-.155	.200	-.072	.072	.081
	Sig.	**.031**	.359	.228	.757	.756	.630
	N	**21**	37	38	21	21	38
Jaú' (15)	Rho	.592†	.072	.211	.107	-.052	.242
	Sig.	.093	.807	.451	.784	.895	.385
	N	9	14	15	9	9	15
Cali' (23)	Rho	.414	-.306	.193	-.165	.096	-.050
	Sig.	.181	.156	.377	.608	.766	.822
	N	12	23	23	12	12	23
Female' (25)	Rho	**.659***	-.110	.219	.029	-.030	.179
	Sig.	**.014**	.610	.292	.925	.923	.392
	N	**13**	24	25	13	13	25
Not female' (13)	Rho	.134	-.216	.085	-.067	.320	-.008
	Sig.	.752	.479	.783	.875	.439	.978
	N	8	13	13	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

There is also significance over .08 among production level changes and institutional proximity in Jaú and female footwear producers that show higher similitude among them compared to other regions and type of products studied (pp.140,149: *Institutional proximity*). Correlations present low significance in filtered samples, although results are similar to complete samples. By last, a correlation with significance .099 is found among production differential and social proximity in complete sample of non-female footwear producer firms.

5.2.2 Correlations among proximity dimensions and changes in employee number

Presentation of correlations among proximity dimensions index and changes in employee number for the last three years (Table 51) has a clear presence of correlations in cognitive proximity column for the total sample, and female footwear producers sample, with greater significance in filtered samples.

Results comparisons for *Cognitive proximity* among regions (p.140) and type of product (p.149) are not showing significant differences among samples, therefore, is not possible to establish an explanation on the presence of these correlations. These differences are neither identified among complete and filtered samples from total interviews (p.130). However, through data observation there can be an explanation to this difference, for a pair of firms with the highest employee reduction (places 51 and 52 from ranking) and present a good level of cognitive proximity (places 11 and 14, respectively), that are filtered, the first for being a workshop (with less than five employees) and the second for having as maquila a great part of its production.

Finally, a moderate significant correlation in non-female footwear producer complete sample is identified, among social proximity and changes in employee number that shows greater social proximity among firms that present greater employee growth, and less social proximity for firms that keep or reduce their staff. For other proximity dimension indexes (organizational, interaction, knowledge application, institutional) there is not significant correlation below .1.Correlations among proximity dimensions and changes in sales level

Correlation analysis among changes in sales level and proximity dimension index (Table 52) identify correlation with cognitive, organizational and social proximity, as well as knowledge application, fruit of the relationship with other firms. Correlation of interaction with other firms index, and institutional proximity have all significance over 0.10, therefore are not included in this analysis.

For correlations with cognitive proximity, the greatest significance (sig. .033) is present in total filtered sample. With a fewer significance correlation in total complete sample (sig. .063) and in filtered sample of female footwear producers (sig. .071) are identify. Difference in correlation and significance is not identified with results since both are very similar among analyse samples (pp.130,139,148: *cognitive proximity*). Observing data allows identifying three firms with good cognitive proximity level, but with a great decrease in sales that are not in filtered samples and would explain better a greater significance in front of non-filtered samples.

Correlation among organizational proximity and changes in sales level is identified only in Jaú samples (complete and filtered) with medium significances and moderate correlation. In results, joint project

index presents a low value, with results that differ from zero in very few cases (p.140: *joint project*). Correlation could be explained by a great increase in sales of one firm that manifest high organizational proximity.

Table 52. Correlations among proximity dimensions and changes in sales level

		Proximity Dimensions					
Δ SALES		**cognitive proximity**	**organizational proximity**	**interaction**	**application interaction**	**social proximity**	**institutional proximity**
TOTAL (53)	Rho	.349†	.086	.099	.016	.316†	.168
	Sig.	.063	.556	.500	.935	.095	.244
	N	29	49	49	29	29	50
Jaú (21)	Rho	.086	.410†	.047	**.597***	.297	.318
	Sig.	.791	.081	.849	**.040**	.348	.172
	N	12	19	19	**12**	12	20
Cali (32)	Rho	.320	-.089	.128	-.269	.258	.147
	Sig.	.210	.639	.502	.296	.318	.438
	N	17	30	30	17	17	30
Female (30)	Rho	.361	.174	.175	.308	.185	.213
	Sig.	.170	.375	.372	.265	.492	.267
	N	16	28	28	15	16	29
Not female (23)	Rho	.308	-.001	.040	-.138	.429	.098
	Sig.	.306	.996	.863	.638	.144	.672
	N	13	21	21	14	13	21
TOTAL' (38)	Rho	**.466***	.066	.132	.000	.237	.066
	Sig.	**.033**	.700	.428	1.000	.301	.695
	N	**21**	37	38	21	21	38
Jaú' (15)	Rho	.184	.495†	.050	.425	.342	.229
	Sig.	.635	.072	.859	.254	.367	.411
	N	9	14	15	9	9	15
Cali' (23)	Rho	.385	-.146	.164	-.231	.111	-.053
	Sig.	.216	.505	.454	.471	.732	.811
	N	12	23	23	12	12	23
Female' (25)	Rho	.516†	.197	.150	.292	.164	.160
	Sig.	.071	.355	.473	.332	.592	.445
	N	13	24	25	13	13	25
Not female' (13)	Rho	.221	-.149	.074	-.258	.226	-.144
	Sig.	.599	.626	.810	.537	.590	.639
	N	8	13	13	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Another correlation is found in knowledge application as a product of interaction with other firms and in social proximity. Knowledge application is identified only in complete sample of Jaú (sig. .04), even when firm number is the lowest among other samples by region (p.140: *knowledge application as a product of changes in productive and* organizational exchange). Through data observation, is noticeable that from nine firms that applied changes, only one increase sales, seven had no increases and just one manifest a decrease; in three firms that apply no change, no one grew, one had no change

in sales level, and two manifest decreases. Correlation among changes in sales and social proximity has a weak significance in total sample (.095), showing a low index for social proximity in firms that decrease sales the most. In firms that had no changes, social proximity levels are heterogeneous.

5.3 Correlations among firms characteristics and sales and production variation

Like the previous subchapter, the analysis is done with a comparison of production variation (number of pair produced, number of employees) and sales with each firm characteristic (classified by production, innovation, and experience). However, this analysis establishes behaviours not directly associated with proximity dimensions but identifies correlations established by innovation management since the late 1980s: innovation resources investment (production technology upgrade, research, and development investment, technological surveillance, etc.) that allows obtaining better competitive results in the medium and long term.

5.3.1 Correlations among firm characteristics and changes in production level

Correlation analysis among firm characteristics and production level changes (Table 53) shows that production characteristics are not related to production changes.

Correlation is find in innovation characteristics, especially in equipment acquisition (technological upgrade) and organizational changes. Equipment acquisition has correlation with high significance (below .02) in five of ten studied samples, and one sample with significance of .07. Greatest significance is identified in filtered sample from Jaú and filtered total sample of firms; Jaú sample has the highest equipment acquisition (p.137: *equipment acquisition*) compared to sample by region and could have a greater number of levels to correlate with production difference. Through data observation there is a trend to acquire more equipment as production increases, although there are cases in which production increased without equipment acquisition; opposite to this, firms that most lowered production level, tend to acquire few or none equipment, except one case that acquires many equips and even though decreased to half its production.

Correlation with organizational change presents four correlations with good significance and one with moderate significance, as a reflection of a trend to make changes among firms that presented a main increase in production and not to make changes between firms with most significant decrease. The highest significance is found in non-filtered samples from Cali and non-female footwear. Even when relationships of organizational changes are identified to adapt to new markets entrance in Cali (p.138:

organizational changes), there is only evidence of correlation in complete sample of non-female footwear producers, that present lower index than other analysed samples (p.147: *new markets*).

Table 53. Correlations among firm characteristics and changes in production level

		Firm Characteristics														
		Production			Innovation							Experience				
Δ PRODUCTION		**n° employees**	**annual production output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	.162	.170	.100	.344*	.101	.025	.040	.226	.262†	-.006	-.141	.293*	.141	.030	-.015
	Sig.	.266	.253	.505	.017	.493	.878	.800	.123	.083	.970	.335	.041	.344	.840	.922
	N	49	47	47	48	48	39	42	48	45	42	49	49	47	49	48
Jaú (21)	Rho	.232	.158	.033	.355	.104	-.064	.127	.045	-.165	.000	.181	.297	.251	.138	.307
	Sig.	.325	.517	.892	.136	.672	.828	.651	.855	.541	1.000	.444	.203	.300	.561	.188
	N	20	19	19	19	19	14	15	19	16	13	20	20	19	20	20
Cali (32)	Rho	.280	.274	.195	.342†	.174	.039	.156	.310	.499**	.008	-.449*	.339†	.105	-.025	-.207
	Sig.	.142	.158	.321	.070	.366	.854	.438	.102	.006	.966	.015	.072	.594	.896	.290
	N	29	28	28	29	29	25	27	29	29	29	29	29	28	29	28
Female (30)	Rho	-.018	.060	.012	.132	-.115	.036	-.075	-.051	-.178	.150	-.028	.336†	.035	.333†	.069
	Sig.	.927	.767	.954	.505	.567	.867	.727	.800	.394	.505	.887	.080	.864	.084	.727
	N	28	27	27	28	27	24	24	27	25	22	28	28	27	28	28
Not female (23)	Rho	.338	.243	.167	.548*	.349	-.039	.317	.520*	.656**	-.200	-.315	.267	.358	-.220	-.195
	Sig.	.134	.302	.482	.012	.121	.891	.200	.016	.002	.398	.164	.243	.121	.339	.411
	N	21	20	20	20	21	15	18	21	20	20	21	21	20	21	20
TOTAL' (38)	Rho	.162	.179	.059	.473**	-.115	.082	.068	.111	.167	.219	-.185	.463**	-.007	.245	-.188
	Sig.	.338	.295	.732	.004	.503	.655	.706	.521	.337	.236	.274	.004	.968	.145	.265
	N	37	36	36	36	36	32	33	36	35	31	37	37	36	37	37
Jaú' (15)	Rho	.101	.061	-.101	.667**	-.327	-.093	-.142	-.077	-.391	.139	.125	.507†	.186	.582*	.154
	Sig.	.719	.829	.719	.009	.254	.773	.660	.794	.186	.721	.656	.054	.506	.023	.584
	N	15	15	15	14	14	12	12	14	13	9	15	15	15	15	15
Cali' (23)	Rho	.246	.232	.081	.327	-.043	.125	.191	.204	.471*	.203	-.416†	.444*	-.094	.157	-.417†
	Sig.	.269	.312	.728	.138	.849	.600	.408	.364	.027	.365	.054	.039	.685	.485	.054
	N	22	21	21	22	22	20	21	22	22	22	22	22	21	22	22
Female' (25)	Rho	-.033	.058	.054	.333	-.249	.079	-.141	-.041	-.221	.191	-.072	.403†	.103	.296	.012
	Sig.	.880	.792	.808	.112	.252	.733	.543	.853	.322	.433	.737	.051	.641	.160	.957
	N	24	23	23	24	23	21	21	23	22	19	24	24	23	24	24
Not female' (13)	Rho	.469	.227	.022	.586*	.058	-.028	.599*	.425	.595*	.335	-.367	.580*	.006	.277	-.472
	Sig.	.106	.457	.943	.045	.850	.936	.040	.148	.032	.287	.218	.038	.986	.359	.103
	N	13	13	13	12	13	11	12	13	13	12	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Finally, innovation characteristics present a good significant correlation in number of innovations per year in filtered sample of non-female footwear producers, even though mean and median are very low (p.147: *annual mean number of innovations*), proving these firms could increase their production with some adjustments.

Experience characteristics present correlation below 0.1, for distance from neighbours average. Greatest significance is obtained by total filtered sample, even when results (p.129: *Neighbour*

distance) values have not much difference from the other samples. In samples by region, Cali presents higher significances, with the greatest heterogeneity in this aspect (p.138: *Distance to closest firms*). Through data observation, the greatest production drop occurs in firms that are more concentrated, while the largest increase occurs in firms with heterogeneous distances.

Other correlations are identified for age, although only for Cali (negative correlation, sig. .015 in complete sample and .054 in filtered sample), that has a greater data dispersion as described in results (p.138: *age*). Observing data, there is a trend to keep production or diminish the oldest firms. Firms that present growth has a heterogeneous age range.

Correlation with clients outside main market index, present a significance of .023 in filtered sample from Jaú since indexes of greatest production tend to be given by firms with greatest index of external clients. Correlation in complete sample of female footwear producers (sig. .084), presents heterogeneous data, although greatest production decrease occurred in firms that had no external clients.

A last negative correlation (sig. .054) is registered for institutional benefits profit index of filtered sample from Cali, in which firms that look for institutional support the most, are the ones that lowered production the most.

5.3.2 Correlations among firm characteristics and employee number level changes

Correlation analysis among firm characteristics and employee number level changes in the last three years (Table 54), present for production characteristics only three correlations, with moderate significances, in employee number for samples from Cali (complete sample) and non-female footwear producers (complete and filtered samples), establishing that large firms tend to increase more employee number than small firms.

Innovation characteristics have positive correlations among increase in employee number and amount of acquired equipment, with moderate and high significances, especially in total sample (complete and filtered) and filtered samples. In other words, equipment acquisition is positive and moderately correlated, although highly significant, with increase in firm personnel.

Besides, there are also correlations identified with significance below .1 for organizational changes, with greater significance for firms in Cali and non-female footwear (in all cases for both samples). From 18 firms that made changes, seven increase production, six kept it and five decrease it. Proportion

changes in firms that did not make changes: from 31, four increased, ten kept it, and ten decrease production.

Table 54. Correlations among firm characteristics and employee number level changes

		Firm Characteristics														
		Production			Innovation							Experience				
Δ EMPLOYEES		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
	Rho	.150	.110	-.012	.360**	.132	.047	-.042	.130	.274†	-.027	-.098	.329*	.080	-.007	-.037
TOTAL (53)	Sig.	.290	.446	.936	.009	.355	.768	.782	.362	.060	.860	.489	.017	.580	.961	.800
	N	52	50	50	51	51	42	45	51	48	44	52	52	50	52	50
	Rho	.180	-.006	-.320	.420†	.037	.009	-.106	.041	-.026	-.118	.013	.413†	.112	.241	.231
Jaú (21)	Sig.	.434	.979	.169	.065	.877	.974	.696	.863	.921	.702	.956	.063	.639	.293	.313
	N	21	20	20	20	20	15	16	20	17	13	21	21	20	21	21
	Rho	.323†	.265	.150	.335†	.267	.047	.113	.161	.427	.037	-.242	.324†	.108	-.206	-.201
Cali (32)	Sig.	.076	.156	.430	.065	.147	.816	.560	.385	.016	.843	.189	.075	.570	.266	.295
	N	31	30	30	31	31	27	29	31	31	31	31	31	30	31	29
	Rho	.033	.020	-.091	.261	-.031	.085	-.106	-.078	-.063	.084	-.034	.381*	-.016	.189	-.010
Female (30)	Sig.	.865	.921	.644	.172	.877	.686	.613	.691	.762	.704	.861	.041	.935	.326	.959
	N	29	28	28	29	28	25	25	28	26	23	29	29	28	29	29
	Rho	.391†	.273	.098	.444*	.343	-.094	.181	.419*	.585**	-.127	-.208	.340	.295	-.349	.015
Not female (23)	Sig.	.065	.220	.666	.039	.109	.719	.446	.047	.004	.583	.340	.112	.183	.103	.947
	N	23	22	22	22	23	17	20	23	22	21	23	23	22	23	21
	Rho	.184	.191	.051	.504**	-.019	.252	.001	-.055	.184	.161	-.084	.440**	-.028	.136	-.210
TOTAL' (38)	Sig.	.268	.257	.766	.001	.911	.156	.995	.748	.283	.378	.616	.006	.867	.414	.206
	N	38	37	37	37	37	33	34	37	36	32	38	38	37	38	38
	Rho	.214	.171	-.156	.706**	-.156	.270	-.314	-.115	-.175	.072	.229	.508†	.094	.707**	.068
Jaú' (15)	Sig.	.443	.542	.578	.005	.594	.395	.320	.696	.568	.854	.412	.053	.740	.003	.809
	N	15	15	15	14	14	12	12	14	13	9	15	15	15	15	15
	Rho	.264	.254	.115	.315	.035	.231	.118	-.053	.393†	.168	-.323	.401†	-.101	-.107	-.445*
Cali' (23)	Sig.	.224	.254	.611	.143	.874	.313	.602	.809	.064	.445	.132	.058	.656	.628	.033
	N	23	22	22	23	23	21	22	23	23	23	23	23	22	23	23
	Rho	.118	.162	.102	.403*	-.009	.326	-.097	-.129	-.091	.222	.068	.380†	.014	.165	-.050
Female' (25)	Sig.	.575	.448	.634	.046	.966	.138	.668	.548	.680	.348	.746	.061	.949	.432	.813
	N	25	24	24	25	24	22	22	24	23	20	25	25	24	25	25
	Rho	.545†	.254	.023	.678*	-.008	.110	.520†	.217	.565*	.284	-.341	.599*	-.006	.069	-.364
Not female' (13)	Sig.	.054	.402	.942	.015	.978	.747	.083	.476	.044	.371	.254	.030	.985	.823	.221
	N	13	13	13	12	13	11	12	13	13	12	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Finally, there is a correlation (sig. .083) among increase in employee number and number of innovations per year in filtered sample of non-female footwear producers. Maybe due to low innovation level present in this sample (p.147: *annual mean number of innovations*), joint trends are identified for increase personnel and annual innovations indexes when firms make a greater amount of changes, although this situation does not reflect on complete sample, due to maquila and supply producers changing this situation.

Correlation among experience characteristics and employee number changes registered a constant presence (nine of ten) of correlations with moderate significances and good ones for distance from closest firms. Total firm samples (complete and filtered) present greater significances. It is to notice the difference among female footwear filtered and complete sample: complete sample has weak significance, while filtered sample presents greater significance. From all firms, the ones that had an increase in employee number (twelve) had a mean of 1.32, the ones that kept their personnel size (seventeen) had a mean of 1.12, and the ones that decrease (twenty three) had a mean of 0.83 proving that firms that are concentrated tend to decrease their personnel.

5.3.3 Correlations among firm characteristics and changes in sales level

Analysing firms characteristics with changes in sales level (Table 55), allowed noticing little correlation with production characteristics. There is only one correlation with significance below to 0.1 (sig. .055) with employee number in non-female filtered sample where is noticeable that firms with greater employee number tend to grow, while the smallest suffer sales decrease.

In innovation characteristics, there can identify correlations among sales variation and equipment acquisition, entrance to new markets and organizational changes. There are other correlations (with significance below .1) in only one sample for innovation team strength and innovations per year.

The greatest significance for equipment acquisition correlation is identified in total samples and non-female footwear producers. Through total data observation is seen that some firms acquired very few equipment but increase their sales though, even just a little; while firms that decrease sales have little acquisition of equipment (also with exceptions). However, firms that acquired more equipment manifest sales stability. The weakest significance is present in Cali and female footwear producer samples since described exceptions correspond to these samples.

Greatest correlations in organizational changes are found in Cali and non-female footwear producer samples, particularly in non-filtered samples. In these groups, most firms that increase sales made organizational changes, while those that kept or decreased their level, had no changes. In the other samples, results are heterogeneous and do not show correlation.

Experience characteristics greatest significances are identified on age (only in Cali with negative correlation) and in distance from neighbours (in filtered samples from total sample, from Jaú and non-female footwear producers). Negative correlation in Cali evidences that firms with the greatest

increase in sales have an average of 15 years, while the ones that kept (19 years) or decrease sales (26 years) has the greater average.

Table 55. Correlations among firms characteristics and changes in sales level

		Firm Characteristics														
		Production			Innovation							Experience				
Δ SALES		**n° employees**	**annual production**	**output /employee**	**equipment addition**	**innovation staff**	**products /innovation**	**innovations /year**	**new markets**	**organization changes**	**production changes**	**age**	**neighbourhood distance**	**product price**	**outside costumers**	**institutional benefits**
TOTAL (53)	Rho	.101	.115	.083	**.328***	.082	.083	-.010	.242†	**.322***	-.025	-.217	.232	.147	.044	-.098
	Sig.	.484	.436	.576	**.021**	.576	.611	.949	.094	**.029**	.873	.129	.104	.318	.762	.503
	N	50	48	48	**49**	49	40	43	49	**46**	43	50	50	48	50	49
Jaú (21)	Rho	.126	.068	.193	.410†	.039	.054	-.027	.095	.000	-.122	.048	.280	.281	-.066	.110
	Sig.	.598	.781	.429	.081	.875	.856	.923	.700	1.000	.692	.841	.232	.244	.781	.645
	N	20	19	19	19	19	14	15	19	16	13	20	20	19	20	20
Cali (32)	Rho	.234	.261	.186	.343†	.177	.094	.102	.308†	**.484****	-.004	**-.456***	.256	.142	.004	-.176
	Sig.	.213	.172	.335	.063	.348	.648	.607	.098	**.007**	.984	**.011**	.171	.461	.983	.362
	N	30	29	29	30	30	26	28	30	**30**	30	**30**	30	29	30	29
Female (30)	Rho	-.127	-.065	-.010	.093	-.206	.138	-.158	.024	-.047	.131	-.192	.254	-.006	.303	-.111
	Sig.	.511	.743	.961	.630	.293	.511	.450	.903	.820	.550	.319	.184	.976	.110	.567
	N	29	28	28	29	28	25	25	28	26	23	29	29	28	29	29
Not female (23)	Rho	.349	.279	.179	**.580****	.404†	.059	.248	**.471***	**.656***	-.269	-.284	.220	.408†	-.221	-.173
	Sig.	.121	.233	.451	**.007**	.070	.836	.321	**.031**	**.002**	.251	.213	.339	.074	.336	.466
	N	21	20	20	**20**	21	15	18	**21**	**20**	20	21	21	20	21	20
TOTAL' (38)	Rho	.098	.125	.055	**.459****	-.122	.177	.005	.145	.251	.219	-.280†	**.379***	-.007	.244	-.312†
	Sig.	.560	.462	.744	**.004**	.472	.323	.976	.390	.140	.228	.088	**.019**	.965	.140	.057
	N	38	37	37	**37**	37	33	34	37	36	32	38	**38**	37	38	38
Jaú' (15)	Rho	-.068	-.032	.205	**.781****	-.373	.037	-.374	.022	-.138	-.081	-.056	**.516***	.263	.156	-.099
	Sig.	.808	.909	.463	**.001**	.189	.908	.230	.942	.653	.835	.842	**.049**	.343	.579	.726
	N	15	15	15	**14**	14	12	12	14	13	9	15	**15**	15	15	15
Cali' (23)	Rho	.196	.236	.095	.329	-.020	.223	.148	.212	**.450***	.208	**-.420***	.334	-.049	.187	-.390†
	Sig.	.370	.291	.673	.125	.929	.331	.511	.332	**.031**	.340	**.046**	.119	.829	.393	.066
	N	23	22	22	23	23	21	22	23	**23**	23	**23**	23	22	23	23
Female' (25)	Rho	-.147	-.070	.041	.302	-.314	.222	-.240	.058	-.057	.185	-.261	.297	.052	.255	-.173
	Sig.	.484	.746	.848	.142	.134	.322	.281	.787	.795	.436	.207	.150	.809	.218	.407
	N	25	24	24	25	24	22	22	24	23	20	25	25	24	25	25
Not female' (13)	Rho	.544†	.359	.088	**.692***	.177	.183	.542†	.340	**.595***	.223	-.289	.519†	.066	.244	-.472
	Sig.	.055	.228	.774	**.013**	.563	.589	.069	.256	**.032**	.485	.338	.069	.830	.422	.103
	N	13	13	13	**12**	13	11	12	13	**13**	12	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Unlike analysis with changes in production level and employees, distance from neighbours does not present much correlation with changes in sales level. Correlation in Jaú (sig. .049) identifies minor physical distance among firms that manifest sales drop than others. In total filtered sample, fifteen firms that drop sales had an average of 0.9 km from neighbours, fifteen that kept it had an average of 1.1 km and those that increased (eight), an average of 1.5.

5.4 Correlations among proximity dimensions

This subchapter studies identified correlations among each proximity dimension compared to each established group. This comparison allows identifying relationships that present each proximity dimension with each other and establish the relevance that each one presents with respect to the others.

5.4.1 Correlations among proximity dimensions and cognitive proximity

Table 56 evidences negative correlations with high significance among cognitive and organizational proximities, except for Jaú and female footwear samples.

Through data observation is noticeable that firms with greater organizational proximity index (only four out of 31 have values that differ from zero in total sample) manifest lesser cognitive proximity. This negative correlation could identify that firms that make joint projects with other organizations are more conscious of the cognitive difference of their pairs, opposite to firms that little develop joint projects that, even sharing information and experiences with other organizations, treats particular issues of common interest (sales, distribution channels, suppliers access, market trends, etc.). For the case of Jaú firms, only one of 13 of them manifest making innovation with other firms, thus not identifying correlation among two indexes, similar situation to female footwear sample (one of 17).

Analysis among cognitive proximity and number of firms with which each producer interacts is identified with negative correlation only for non-female footwear producers sample. Although through data observation it is noticed that firms with more interaction manifest lower cognitive proximity, such trend does not keep any longer for the rest of them, therefore other correlations have significance above .1. Non-female footwear sample manifest correlation with significance of .023 since three of the biggest firms with greater interaction are supply producers that are included in complete sample but not in filtered (sig. .076). There is no evidence of correlation with significance below .1 for the other proximity dimensions.

Table 56. Correlations among proximity dimensions and cognitive proximity

COGNITIVE PROXIMITY		Proximity Dimensions					
		cognitive proximity	organizational proximity	interaction	application interaction	social proximity	institutional proximity
TOTAL (53)	Rho	1.000	**-.516****	-.152	.202	.166	.069
	Sig.		**.003**	.421	.284	.373	.711
	N	31	**31**	30	30	31	31
Jaú (21)	Rho	1.000	-.465	-.061	.326	.081	.307
	Sig.		.109	.850	.302	.792	.307
	N	13	13	12	12	13	13
Cali (32)	Rho	1.000	**-.548***	-.226	.216	.112	-.040
	Sig.		**.019**	.368	.389	.657	.873
	N	18	**18**	18	18	18	18
Female (30)	Rho	1.000	-.385	.415	.206	.016	.130
	Sig.		.127	.110	.444	.951	.620
	N	17	17	16	16	17	17
Not female (23)	Rho	1.000	**-.586***	**-.599***	.217	.136	.032
	Sig.		**.028**	**.023**	.457	.643	.913
	N	14	**14**	**14**	14	14	14
TOTAL' (38)	Rho	1.000	**-.608****	-.217	.150	.292	.061
	Sig.		**.003**	.345	.515	.199	.793
	N	21	**21**	21	21	21	21
Jaú' (15)	Rho	1.000		-.082	.574	.412	.227
	Sig.			.835	.106	.271	.556
	N	9	9	9	9	9	9
Cali' (23)	Rho	1.000	**-.754****	-.356	-.032	.148	-.040
	Sig.		**.005**	.257	.920	.646	.901
	N	12	**12**	12	12	12	12
Female' (25)	Rho	1.000	-.465	.216	.315	.364	.115
	Sig.		.110	.479	.295	.222	.708
	N	13	13	13	13	13	13
Not female' (13)	Rho	1.000	**-.768***	-.659†	-.127	-.167	-.096
	Sig.		**.026**	.076	.765	.693	.821
	N	8	**8**	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

5.4.2 Correlations among proximity dimensions and organizational proximity

Organizational proximity correlation presented on Table 57, identified negative correlations for cognitive proximity with high significance as it is evidenced in last paragraph, except in samples (filtered and non-filtered) from Jaú and female footwear.

However, there are also correlations with high significance with number of firms with which each one interacts in Cali and non-female footwear producer samples. Total data observation does not show relationships patterns. Samples from Cali and non-female footwear producer have firms with a trend

to interact more and to make joint projects, but this is not a generalized situation. There is no evidence of correlation with significance below .1 with other proximity dimensions.

Table 57. Correlations among proximity dimensions and organizational proximity

ORGANIZATIONAL PROXIMITY		Proximity Dimensions					
		cognitive proximity	organizational proximity	interaction	application interaction	social proximity	institutional proximity
TOTAL (53)	Rho	**-.516****	1.000	.198	-.031	-.180	.129
	Sig.	**.003**		.164	.867	.333	.363
	N	**31**	52	51	31	31	52
Jaú (21)	Rho	-.465	1.000	-.012	.158	.039	.001
	Sig.	.109		.962	.606	.899	.995
	N	13	20	19	13	13	20
Cali (32)	Rho	**-.548***	1.000	.327†	-.155	-.263	.171
	Sig.	**.019**		.067	.540	.292	.348
	N	**18**	32	32	18	18	32
Female (30)	Rho	-.385	1.000	-.148	.098	-.232	.208
	Sig.	.127		.451	.719	.371	.279
	N	17	29	28	16	17	29
Not female (23)	Rho	**-.586***	1.000	**.467***	-.025	-.203	.084
	Sig.	**.028**		**.025**	.930	.487	.704
	N	**14**	23	**23**	15	14	23
TOTAL' (38)	Rho	**-.608****	1.000	.193	-.115	-.135	.107
	Sig.	**.003**		.252	.619	.560	.530
	N	**21**	37	37	21	21	37
Jaú' (15)	Rho		1.000	-.318			-.035
	Sig.			.267			.906
	N	9	14	14	9	9	14
Cali' (23)	Rho	**-.754****	1.000	**.432***	-.170	-.107	.189
	Sig.	**.005**		**.040**	.597	.740	.387
	N	**12**	23	**23**	12	12	23
Female' (25)	Rho	-.465	1.000	-.155	.123	-.194	.234
	Sig.	.110		.469	.689	.525	.270
	N	13	24	24	13	13	24
Not female' (13)	Rho	**-.768***	1.000	**.645***	-.247	-.096	-.079
	Sig.	**.026**		**.017**	.555	.820	.798
	N	**8**	13	**13**	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Correlation presentation among interaction index (number of firm each one interacts with) and other proximity dimensions, registered in Table 58, is possible to identify correlations with all other index, except with institutional proximity.

Four negative correlations are present with significance below .1 with interaction application, although just for non-filtered samples. Through data observation is noticeable that three firms with greater interaction (values that multiply mean more than ten times) apply changes neither in production or

organization; two of them are component producers and one is a large mix (female and non-female) footwear producer with high commitment to support small firms.

Table 58. Correlations among proximity dimensions and interaction level

		Proximity Dimensions					
INTERACTION		**cognitive proximity**	**organizational proximity**	**interaction**	**application interaction**	**social proximity**	**institutional proximity**
TOTAL (53)	Rho	-.152	.198	1.000	**-.497****	-.200	.089
	Sig.	.421	.164		**.004**	.290	.530
	N	30	51	52	**31**	30	52
Jaú (21)	Rho	-.061	-.012	1.000	**-.621***	**-.584***	.029
	Sig.	.850	.962		**.023**	**.046**	.902
	N	12	19	20	**13**	**12**	20
Cali (32)	Rho	-.226	.327†	1.000	-.449†	.024	.078
	Sig.	.368	.067		.062	.925	.671
	N	18	32	32	18	18	32
Female (30)	Rho	.415	-.148	1.000	-.374	**-.554***	.116
	Sig.	.110	.451		.154	**.026**	.550
	N	16	28	29	16	**16**	29
Not female (23)	Rho	**-.599***	**.467***	1.000	**-.529***	.196	.143
	Sig.	**.023**	**.025**		**.043**	.501	.515
	N	**14**	**23**	23	**15**	14	23
TOTAL' (38)	Rho	-.217	.193	1.000	-.363	-.093	.064
	Sig.	.345	.252		.106	.688	.703
	N	21	37	38	21	21	38
Jaú' (15)	Rho	-.082	-.318	1.000	-.529	-.553	-.053
	Sig.	.835	.267		.143	.122	.851
	N	9	14	15	9	9	15
Cali' (23)	Rho	-.356	**.432***	1.000	-.326	.242	.132
	Sig.	.257	**.040**		.302	.449	.548
	N	12	**23**	23	12	12	23
Female' (25)	Rho	.216	-.155	1.000	-.345	-.403	.062
	Sig.	.479	.469		.249	.172	.767
	N	13	24	25	13	13	25
Not female' (13)	Rho	-.659†	**.645***	1.000	-.257	.475	.132
	Sig.	.076	**.017**		.540	.234	.667
	N	8	**13**	13	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Organizational proximity correlations are identified in Cali and non-female samples. For both cases, two of three firms that made joint projects, also interact with a great number of firms.

There is also negative correlation with cognitive proximity in non-female footwear producers (in filtered and complete samples), and social proximity in Jaú and female footwear complete samples. Cognitive proximity correlations of non-female footwear are noticeable that firms with fewer cognitive proximity index have greater quantity of pairs to exchange information with, while those having greater cognitive proximity index exchange knowledge with fewer firms, proving that exchange is focus

in relationship quality rather than quantity. A similar situation occurs in Jaú and female footwear producer firms (although just for non-filtered samples) with high social proximity index.

Table 59. Correlations among proximity dimensions and level of interaction application

APPLICATION INTERACTION		Proximity Dimensions					
		cognitive proximity	organizational proximity	interaction	application interaction	social proximity	institutional proximity
TOTAL (53)	Rho	.202	-.031	**-.497****	1.000	.355†	.050
	Sig.	.284	.867	**.004**		.054	.788
	N	30	31	**31**	31	30	31
Jaú (21)	Rho	.326	.158	**-.621***	1.000	**.652***	.173
	Sig.	.302	.606	**.023**		**.021**	.571
	N	12	13	**13**	13	**12**	13
Cali (32)	Rho	.216	-.155	-.449†	1.000	.146	.014
	Sig.	.389	.540	.062		.564	.955
	N	18	18	18	18	18	18
Female (30)	Rho	.206	.098	-.374	1.000	**.557***	.103
	Sig.	.444	.719	.154		**.025**	.703
	N	16	16	16	16	**16**	16
Not female (23)	Rho	.217	-.025	**-.529***	1.000	.242	-.070
	Sig.	.457	.930	**.043**		.404	.805
	N	14	15	**15**	15	14	15
TOTAL' (38)	Rho	.150	-.115	-.363	1.000	**.495***	.171
	Sig.	.515	.619	.106		**.023**	.460
	N	21	21	21	21	**21**	21
Jaú' (15)	Rho	.574		-.529	1.000	**.725***	.264
	Sig.	.106		.143		**.027**	.492
	N	9	9	9	9	**9**	9
Cali' (23)	Rho	-.032	-.170	-.326	1.000	.264	.130
	Sig.	.920	.597	.302		.407	.688
	N	12	12	12	12	12	12
Female' (25)	Rho	.315	.123	-.345	1.000	**.602***	.086
	Sig.	.295	.689	.249		**.029**	.780
	N	13	13	13	13	**13**	13
Not female' (13)	Rho	-.127	-.247	-.257	1.000	.390	.252
	Sig.	.765	.555	.540		.340	.547
	N	8	8	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

Correlation analysis among interaction, which is a dichotomise index, with other proximity dimensions (Table 59), have six correlations with significance below than .1 (five fewer than .05) with social proximity, and four correlations with significance below .1 in non-filtered samples from interaction. These last are analysed in Table 58. There is no identification of correlation with other proximity dimensions.

For social proximity, correlations are positive and are found in complete and filtered samples of all firms, from Jaú and female footwear producers. All correlations, except in non-filtered sample of all firms (sig. .054), have significances among .02 and .03. Through data observation, is noticeable that from 30 identified correlations, five are from firms that do not apply knowledge exchange with other firms and have the lowest levels of social proximity. Jaú and female footwear significances increase due to social proximity indexes of firms that do not apply that type of knowledge are the lowest of the sample.

Table 60. Correlations among proximity dimensions and social proximity

		Proximity Dimensions					
SOCIAL PROXIMITY		**cognitive proximity**	**organizational proximity**	**interaction**	**application interaction**	**social proximity**	**institutional proximity**
TOTAL (53)	Rho	.166	-.180	-.200	.355†	1.000	.191
	Sig.	.373	.333	.290	.054		.302
	N	31	31	30	30	31	31
Jaú (21)	Rho	.081	.039	**-.584***	**.652***	1.000	-.006
	Sig.	.792	.899	**.046**	**.021**		.985
	N	13	13	**12**	**12**	13	13
Cali (32)	Rho	.112	-.263	.024	.146	1.000	.318
	Sig.	.657	.292	.925	.564		.199
	N	18	18	18	18	18	18
Female (30)	Rho	.016	-.232	**-.554***	**.557***	1.000	.189
	Sig.	.951	.371	**.026**	**.025**		.467
	N	17	17	**16**	**16**	17	17
Not female (23)	Rho	.136	-.203	.196	.242	1.000	.295
	Sig.	.643	.487	.501	.404		.305
	N	14	14	14	14	14	14
TOTAL' (38)	Rho	.292	-.135	-.093	**.495***	1.000	.272
	Sig.	.199	.560	.688	**.023**		.232
	N	21	21	21	**21**	21	21
Jaú' (15)	Rho	.412		-.553	**.725***	1.000	.230
	Sig.	.271		.122	**.027**		.552
	N	9	9	9	**9**	9	9
Cali' (23)	Rho	.148	-.107	.242	.264	1.000	.321
	Sig.	.646	.740	.449	.407		.309
	N	12	12	12	12	12	12
Female' (25)	Rho	.364	-.194	-.403	**.602***	1.000	.308
	Sig.	.222	.525	.172	**.029**		.306
	N	13	13	13	**13**	13	13
Not female' (13)	Rho	-.167	-.096	.475	.390	1.000	.344
	Sig.	.693	.820	.234	.340		.404
	N	8	8	8	8	8	8

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

5.4.3 Correlations among proximity dimensions and social proximity

Social proximity analysis with other proximity dimensions (Table 60), identifies correlations only with the index of the number of firms with which each firms interacts and interaction application. For other proximity dimensions there is no correlation identify with significance below .1.

Table 61. Correlations among proximity dimensions and institutional proximity

		Proximity Dimensions					
INSTITUTIONAL PROXIMITY		**cognitive proximity**	**organizational proximity**	**interaction**	**application interaction**	**social proximity**	**institutional proximity**
TOTAL (53)	Rho	.069	.129	.089	.050	.191	1.000
	Sig.	.711	.363	.530	.788	.302	
	N	31	52	52	31	31	53
Jaú (21)	Rho	.307	.001	.029	.173	-.006	1.000
	Sig.	.307	.995	.902	.571	.985	
	N	13	20	20	13	13	21
Cali (32)	Rho	-.040	.171	.078	.014	.318	1.000
	Sig.	.873	.348	.671	.955	.199	
	N	18	32	32	18	18	32
Female (30)	Rho	.130	.208	.116	.103	.189	1.000
	Sig.	.620	.279	.550	.703	.467	
	N	17	29	29	16	17	30
Not female (23)	Rho	.032	.084	.143	-.070	.295	1.000
	Sig.	.913	.704	.515	.805	.305	
	N	14	23	23	15	14	23
TOTAL' (38)	Rho	.061	.107	.064	.171	.272	1.000
	Sig.	.793	.530	.703	.460	.232	
	N	21	37	38	21	21	38
Jaú' (15)	Rho	.227	-.035	-.053	.264	.230	1.000
	Sig.	.556	.906	.851	.492	.552	
	N	9	14	15	9	9	15
Cali' (23)	Rho	-.040	.189	.132	.130	.321	1.000
	Sig.	.901	.387	.548	.688	.309	
	N	12	23	23	12	12	23
Female' (25)	Rho	.115	.234	.062	.086	.308	1.000
	Sig.	.708	.270	.767	.780	.306	
	N	13	24	25	13	13	25
Not female' (13)	Rho	-.096	-.079	.132	.252	.344	1.000
	Sig.	.821	.798	.667	.547	.404	
	N	8	13	13	8	8	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

As it is described previously, correlation among social proximity and interaction application, is established because firms that do not apply changes as product of interaction with other firms have at the same time the lowest social proximity index, it means that they interact with other firms but have lower concern for others wellbeing and have less commitment than those that apply changes. Correlation with number of firms that interact is negative because firms that interact mostly have

fewer social proximity, this means as bigger the number of firms each one interact with, it concerns less for its interlocutors.

5.4.4 Correlations among proximity dimensions and institutional proximity

Analysis presented in Table 61, does not prove a correlation among institutional proximity and other proximity dimensions. In the study done, this is the only index that does not present correlations with significances below .1 with another proximity dimension.

5.5 Correlations among sales and production variation indexes

Correlation among sales production variation indexes themselves (Table 62), has highly significant values (as expected) most of them equal to .000. Correlation could be classified in three groups, since results are repeated it in table: 1) changes in production with changes in employee number, 2) changes in production with changes in sales, and 3) changes in employee number with changes in sales.

First group, in which correlations are identify among production changes and employee number, all significance is .000 proving non-mistake and all groups show positive correlation among .711 and .909. Through data observation, from thirteen firms that manifest growth in production, one kept its employees, one decrease it (started to maquila) and eleven increase employee number. Fifteen firms that kept their production level, twelve also kept its employees, one increase it and two decrease it. Finally, from 21 that decrease production, only three kept its employee and the rest decrease.

In the second group, production changes correlations with sale changes showed a significance of .000 except for filtered sample in Jaú with a significance of .006. Correlation values go from .674 to .986. Data observation from total sample, all situations are similar to those described in previous paragraph, where there are exceptions among production growth and in this case sales growth. Although, due to filtered sample size of Jaú firms (15), exceptions weighted more, explaining the difference in significance.

Finally, third group of analysed correlations among employee number and changes in sales, found eight different significances with a value of .000 and to different significances: Jaú complete sample (sig. .022) and its filtered sample (sig. .068). Besides, correlation levels present lower values (among .483 and .905) than two previous groups. Data observation notices results heterogeneity: from 11 firms that increase sales, two decrease employees, one kept it and eight increase it; from 18 that kept sales level, three decrease employees, three increase it and twelve kept it; and from 21 that decrease sales, one

increase its personnel, three kept it and 17 decrease it. In Jaú, firms that kept sales level, or decrease it a little, tried to keep personnel increase, that would explain mostly the fewer level of correlation among these two variables.

Table 62. Correlations among sales and production variation indexes

		Δ production		Δ employees		Δ sales	
		Δ employees	Δ sales	Δ production	Δ sales	Δ production	Δ employees
TOTAL (53)	Rho	.834	.938	.834	.739	.938	.739
	Sig.	.000	.000	.000	.000	.000	.000
	N	49	49	49	50	49	50
Jaú (21)	Rho	.711	.828	.711	.508	.828	.508
	Sig.	.000	.000	.000	.022	.000	.022
	N	20	20	20	20	20	20
Cali (32)	Rho	.890	.984	.890	.864	.984	.864
	Sig.	.000	.000	.000	.000	.000	.000
	N	29	29	29	30	29	30
Female (30)	Rho	.812	.829	.812	.615	.829	.615
	Sig.	.000	.000	.000	.000	.000	.000
	N	28	28	28	29	28	29
Not female (23)	Rho	.909	.986	.909	.905	.986	.905
	Sig.	.000	.000	.000	.000	.000	.000
	N	21	21	21	21	21	21
TOTAL' (38)	Rho	.849	.902	.849	.715	.902	.715
	Sig.	.000	.000	.000	.000	.000	.000
	N	37	37	37	38	37	38
Jaú' (15)	Rho	.803	.674**	.803	.483†	.674**	.483†
	Sig.	.000	.006	.000	.068	.006	.068
	N	15	15	15	15	15	15
Cali' (23)	Rho	.852	.977	.852	.826	.977	.826
	Sig.	.000	.000	.000	.000	.000	.000
	N	22	22	22	23	22	23
Female' (25)	Rho	.862	.790	.862	.647	.790	.647
	Sig.	.000	.000	.000	.000	.000	.000
	N	24	24	24	25	24	25
Not female' (13)	Rho	.909	.967	.909	.898	.967	.898
	Sig.	.000	.000	.000	.000	.000	.000
	N	13	13	13	13	13	13

Notes: ** Correlation is significant at level 0.01 (2-tailed). * Correlation is significant at level 0.05 (2-tailed). † Correlation is significant at level 0.1 (2-tailed).
Source: Own elaboration.

5.6 Other correlations

Besides established correlations in methodology (§2.2), this subsection presents other correlations as consequence of observed results (§4.4). Table 43, proves these correlations: by region classification (Jaú and Cali) and by product (female and non-female footwear producers). In the first section (§5.6.1)

characteristics correlation (production, innovation, experience) among firms. Second section (§5.6.2) presents correlation among firms characteristics with product typology and region (Jaú and Cali). Finally, third section (§5.6.3), presents correlations among proximity dimensions and sales and product variation, with types of product (female and non-female footwear) and region (Jaú and Cali).

Due to the amount of correlations, Table 63 to Table 65 presents and abbreviated version, that indicates correlation range Rho (not a numeric value), significance level as a sign and number of cases in which correlation applies (N). According to Martínez Ortega et al. (2009), Rho among 0 and .25 is scarce or null and is presented as empty cells; Rho among .25 and .50 is weak and presented abbreviated as wk; values among .50 and .75 represent a moderate correlation, abbreviated as md; and between .76 and 1 represents strong correlation, presented as strg. Significance level is pointed, as is usual in SPSS, with double asterisk (**) for values below .01; with asterisk (*) values below .05; and this study adds a cross (†) to significance below .1; significance above .1 is presented as empty cells.

Non-applicable correlations are presented with a tilde symbol (~). Cases in which correlation does not apply are: 1) when same index crosses in the matrix; 2) when exclusive pairs of samples as female footwear producers cross with non-female footwear producers, and 3) when indexes pairs to compare are not sufficient (SPSS presents it as empty significance). Rows that only present non-applicable correlations or significances greater than .1 are removed. When some indexes groups only presented empty cells, only the title is kept, as for example correlation among maquila with characteristics in Table 64.

As analysis by region, firms have a dichotomic index (belong to Jaú or Cali), their correlation are equal by value, significance and number of cases, but in the opposite direction. This way, in §5.6.2 and §5.6.3, regional analysis is made in one of two regions proving that the other one is the same but opposite.

5.6.1 Correlations among firms characteristics

Correlation observation among different results (Table 63), allows to observe six correlation zones: 1) correlation among production characteristics (top left zone); 2) among innovation and production (central top); 3) among production and experience (top right); 4) innovation itself (centre); 5) among innovation and experience (right centre); and 6) experience itself (bottom right). The other zones are a reflect of previous.

Table 63. Correlations among firm characteristics

		Firm Characteristics														
		Production			Innovation							Experience				
		n° employees	annual production	output /employee	equipment addition	innovation staff	products /innovation	innovations /year	new markets	organization changes	production changes	age	neighbourhood distance	product price	outside costumers	institutional benefits
n° employees	TOTAL.53	~	strg**.51	md**.51	wk**.52	md**.52	wk*.43	md**.46		wk**.49	wk*.45	wk**.53		wk*.51	-md**.52	wk†.51
	Jaú.21	~	strg**.20			md*.20		strg**.16				md**.21				wk*.21
	Cali.32	~	strg**.31	wk*.31	md**.32	md**.32	wk*.28	wk**.30		md**.32		wk*.32			-md**.31	
	fem.30	~	strg**.29	md**.29	wk*.30	md**.29	md**.26	strg**.26		wk†.27	md**.24	md**.30		wk†.29	-wk**.29	wk†.30
	nofem.23	~	strg**.22	wk*.22	md**.22	md*.23		md**.20		md**.22				wk†.22	-md**.23	
	TOTAL'.38	~	strg**.37	wk**.37	wk**.37	md**.37	wk*.33	md**.34		wk†.36	md**.32	wk*.38			-wk**.38	
	Jaú'.15	~	strg**.15					strg**.12	-md*.14			md**.15				
	Cali'.23	~	md**.22		md**.23	md**.23	wk†.21	md**.22		md**.23	wk†.23	wk*.23			-wk*.23	
	fem'.25	~	strg**.24	md**.24	wk†.25	md**.24	wk*.22	strg**.22			md**.20	md**.25			-md**.25	wk†.25
	nofem'.13	~	md**.13		strg**.12			md**.12		md**.13	md†.12					
Production: annual production	TOTAL.53	strg**.51	~	strg**.51	wk**.50	md**.50	wk*.42	md**.44		wk†.48	wk*.43	wk*.51		wk**.51	-md**.50	
	Jaú.21	strg**.20	~	md*.20		md*.19		md**.15	-wk†.19			md**.20				
	Cali.32	strg**.31	~	strg**.31	md**.31	md**.31	wk*.27	wk*.29		wk**.31				wk*.31	-md**.30	
	fem.30	strg**.29	~	strg**.29	wk†.29	md**.28	md**.25	strg**.25	-wk*.28		md**.23	md**.29		wk†.29	-md**.28	
	nofem.23	strg**.22	~	strg**.22	wk*.21	md**.22	wk†.17	wk†.19						wk†.22	-md**.22	
	TOTAL'.38	strg**.37	~	md**.37	wk**.36	md**.36	wk†.32	md**.33	-wk†.36		md**.31			wk*.37	-wk**.37	
	Jaú'.15	strg**.15	~			wk†.14		strg**.12	-md**.14			md*.15				
	Cali'.23	md**.22	~	md**.22	md**.22	md**.22		md*.21		md*.22				md**.22	-wk*.22	
	fem'.25	strg**.24	~	strg**.24		md**.23	wk†.21	strg**.21	-wk*.23		md**.19	wk†.24			-md**.24	
	nofem'.13	md**.13	~	md**.13	md*.12	md**.13								md**.13		
output /employee	TOTAL.53	md**.51	strg**.51	~	wk†.50	md**.50	wk†.42	md**.44						wk**.51	-md**.50	
	Jaú.21		md*.20	~										wk†.20		
	Cali.32	wk*.31	strg**.31	~		md**.31								wk*.31	-wk*.30	
	fem.30	md**.29	strg**.29	~		md**.28	wk†.25	strg**.25	-wk†.28	wk*.26	wk*.23			wk*.29	-md**.28	
	nofem.23	wk*.22	strg**.22	~		md*.22								wk†.22	-wk†.22	
	TOTAL'.38	wk**.37	md**.37	~		wk**.36		md**.33						md**.37	-wk**.37	
	Jaú'.15			~						md**.13						-wk†.15
	Cali'.23		md**.22	~		wk†.22								strg**.22		
	fem'.25	md**.24	strg**.24	~		md**.23		strg**.21		wk*.22	wk*.19			wk*.24	-md**.24	
	nofem'.13		md**.13	~										strg**.13		
Innovation: equipment addition	TOTAL.53	wk**.52	wk**.50	wk†.50	~	wk*.51		wk*.45		wk*.48				wk**.50	-wk*.51	
	Jaú.21				~								md**.20			
	Cali.32	md**.32	md**.31		~	md**.32		wk*.30		md**.32				wk*.31	-wk**.31	
	fem.30	wk*.30	wk†.29		~							wk†.30				
	nofem.23	md**.22	wk*.21		~			wk*.19		md**.21				md**.21	-wk*.22	
	TOTAL'.38	wk**.37	wk**.36		~						wk†.32					
	Jaú'.15				~								md**.14		md*.14	
	Cali'.23	md**.23	md**.22		~	md*.23		wk†.22		wk*.23						
	fem'.25	wk†.25			~						wk†.20	wk†.25				
	nofem'.13	strg**.12	md*.12		~					md†.12						
innovation staff	TOTAL.53	md**.52	md**.50	md**.50	wk*.51	~	wk†.43	md**.46		wk**.48		wk**.52		wk**.50	-wk**.51	
	Jaú.21	md*.20	md*.19			~		md**.16				wk†.20				wk†.20
	Cali.32	md**.32	md**.31	md**.31	md**.32	~	wk†.28	wk*.30		md**.32		wk*.32		wk*.31	-wk*.31	
	fem.30	md**.29	md**.28	md**.28		~	wk†.26	strg**.26		wk*.26		md**.29		wk*.28	-wk*.28	
	nofem.23	md*.23	md**.22	md*.22		~				md*.22				wk*.22		
	TOTAL'.38	md**.37	md**.36	wk**.36		~	wk*.33	md**.34		wk*.35	wk†.32	wk*.37		wk**.36	-wk*.37	
	Jaú'.15		wk†.14			~		md*.12								
	Cali'.23	md**.23	md**.22	wk†.22	md*.23	~	wk†.21	wk*.22		md*.23		wk*.23		md*.22	-wk†.23	
	fem'.25	md**.24	md**.23	md**.23		~		strg**.22		wk*.22	wk†.20	wk*.24		wk†.23	-md**.24	
	nofem'.13		md**.13			~				md†.13				md*.13		
products /innovation	TOTAL.53	wk*.43	wk*.42	wk†.42		wk†.43	~					wk†.43				
	Jaú.21						~							-md*.15		
	Cali.32	wk*.28	wk*.27			wk†.28	~									
	fem.30	md**.26	md**.25	wk†.25		wk†.26	~					md**.26				
	TOTAL'.38		wk†.17				~					wk*.33				
	Cali'.23	wk†.21				wk†.21	~									
	fem'.25	wk*.22	wk†.21				~					md**.22				
innovations /year	TOTAL.53	md**.46	md**.44	md**.44	wk*.45	md**.46		~			wk**.41			wk*.44	-md**.45	
	Jaú.21	strg**.16	md**.15			md**.16		~								
	Cali.32	wk**.30	wk*.29		wk*.30	wk*.30		~		wk*.30					-wk*.29	
	fem.30	strg**.26	strg**.25	strg**.25		strg**.26		~	-wk†.26		wk*.23			wk*.25	-md**.25	
	nofem.23	md**.20	wk†.19		wk*.19			~		md*.19	wk†.18					
	TOTAL'.38	md**.34	md**.33	md**.33		md**.34		~			md**.30			wk†.33	-md**.34	
	Jaú'.15	strg**.12	strg**.12			md*.12		~	-md†.12							
	Cali'.23	md**.22	md*.21		wk†.22	wk*.22		~		md**.22	md**.22				-wk†.22	
	fem'.25	strg**.22	strg**.21	strg**.21		strg**.22		~			md**.19			wk*.21	-md**.22	
	nofem'.13	md**.12						~		md**.12	strg**.11					
new markets	Jau.21		-wk†.19						~				wk†.20			wk†.20
	fem.30		-wk*.28	-wk†.28				-wk†.26	~							wk†.29
	TOTAL'.38		-wk†.36						~				wk†.37		wk*.37	
	Jaú'.15	-md*.14	-md**.14					-md†.12	~			-wk†.14				
	Cali'.23								~						wk*.23	

		Firm Characteristics													
		Production			Innovation							Experience			
		n° employees	annual production	output /employee	equipment addition	innovation staff	products /innovation	innovations /year	new markets	organization changes	production changes	age	neighbourhood distance	product price	outside costumers	institutional benefits
	fem'.25		-wk*.23						~							
	nofem'.13								~				md**.13		wk†.13	
organization changes	TOTAL.53	wk**.49	wk†.48		wk*.48	wk**.48				~				wk†.48	-wk†.48	
	Cali.32	md**.32	wk**.31		md**.32	md**.32		wk*.30		~				wk*.31	-wk**.31	
	fem.30	wk†.27		wk*.26		wk*.26				~						
	nofem.23	md**.22			md**.21	md*.22		md*.19		~				wk*.22	-wk*.22	
	TOTAL'.38	wk†.36				wk*.35				~						
	Jaú'.15			md**.13						~	~				-md†.13	
	Cali'.23	md**.23	md*.22		wk*.23	md*.23		md**.22		~	wk†.23				-wk†.23	
	fem'.25			wk*.22		wk*.22				~						
	nofem'.13	md**.13			md†.12	md†.13		md**.12		~						
production changes	TOTAL.53	wk*.45	wk*.43					wk**.41			~					
	fem.30	md**.24	md**.23	wk*.23				wk*.23			~				-wk†.23	
	nofem.23							wk†.18			~			-md*.20		
	TOTAL'.38	md**.32	md**.31		wk†.32	wk†.32		md**.30			~				-wk†.32	
	Cali'.23	wk†.23						md**.22		wk†.23	~					
	fem'.25	md**.20	md**.19	wk*.19	wk†.20	wk†.20		md**.19			~					
	nofem'.13	md†.12						strg**.11			~					
Experience: age	TOTAL.53	wk**.53	wk*.51			wk**.52	wk†.43					~				
	Jaú.21	md**.21	md**.20			wk†.20						~				wk*.21
	Cali.32	wk*.32				wk*.32						~				
	fem.30	md**.30	md**.29		wk†.30	md**.29	md**.26					~				wk†.30
	TOTAL'.38	wk*.38				wk*.37	wk*.33					~				
	Jaú'.15	md**.15	md*.15						-wk†.14			~				wk†.15
	Cali'.23	wk*.23				wk*.23						~				
	fem'.25	md**.25	wk†.24		wk†.25	wk*.24	md**.22					~				wk*.25
Experience: neighbourhood distance	Jaú.21				md**.20				wk†.20				~	wk*.20		
	fem.30												~	wk†.29		
	TOTAL'.38								wk†.37				~			
	Jaú'.15				md**.14								~	wk†.15		
	fem'.25												~	wk*.24		
	nofem'.13								md**.13				~			
Experience: product price	TOTAL.53	wk*.51	wk**.51	wk**.51	wk**.50	wk**.50		wk*.44		wk†.48				~	-wk**.50	
	Jaú.21			wk†.20			-md*.15						wk*.20	~		
	Cali.32		wk*.31	wk*.31	wk*.31	wk*.31				wk*.31				~	-wk*.30	
	fem.30	wk†.29	wk†.29	wk*.29		wk*.28		wk*.25					wk†.29	~		
	nofem.23	wk†.22	wk†.22	wk†.22	md**.21	wk*.22				wk*.22	-md*.20			~	-wk*.22	
	TOTAL'.38		wk*.37	md**.37		wk**.36		wk†.33						~		
	Jaú'.15												wk†.15	~		
	Cali'.23		md**.22	strg**.22		md*.22								~		
	fem'.25			wk*.24		wk†.23		wk*.21					wk*.24	~		
	nofem'.13		md**.13	strg**.13		md*.13								~		
Experience: outside costumers	TOTAL.53	-md**.52	-md**.50	-md**.50	-wk*.51	-wk**.51		-md**.45		-wk†.48				-wk**.50	~	-wk**.50
	Cali.32	-md**.31	-md**.30	-wk*.30	-wk**.31	-wk*.31		-wk*.29		-wk**.31				-wk*.30	~	
	fem.30	-wk**.29	-md**.28	-md**.28		-wk*.28		-md**.25			-wk†.23				~	
	nofem.23	-md**.23	-md**.22	-wk†.22	-wk*.22					-wk*.22				-wk*.22	~	-wk†.21
	TOTAL'.38	-wk**.38	-wk**.37	-wk**.37		-wk*.37		-md**.34	wk*.37		-wk†.32				~	-wk**.38
	Jaú'.15				md*.14					-md†.13					~	
	Cali'.23	-wk*.23	-wk*.22			-wk†.23		-wk†.22	wk*.23	-wk†.23					~	
	fem'.25	-md**.25	-md**.24	-md**.24		-md**.24		-md**.22							~	
	nofem'.13								wk†.13						~	-md*.13
Experience: institutional benefits	TOTAL.53	wk†.51													-wk**.50	~
	Jaú.21	wk*.21				wk†.20			wk†.20			wk*.21				~
	fem.30	wk†.30							wk†.29			wk†.30				~
	nofem.23														-wk†.21	~
	TOTAL'.38														-wk**.38	~
	Jaú'.15			-wk†.15								wk†.15				~
	fem'.25	wk†.25										wk*.25				~
	nofem'.13														-md*.13	~

Notes: [-] Rho correlation is negative. [*strg*] Rho correlation is between 0.76 and 1.00. [*md*] Rho correlation is among 0.51 and 0.75. [*wk*] Rho correlation is among 0.26 and 0.50. [**] Correlation is significant in level 0.01 (2-tailed). [*] Correlation is significant in level 0.05 (2-tailed). [†] Correlation is significant in level 0.1 (2-tailed). The number represents cases taken into account in relation (N). [~] Rho correlation does not apply. Rho correlations below 0.25 and significances above 0.1 are presented as empty cells. Rows with empty cells or non-applicable correlations are skipped.
Source: Own elaboration.

First zone (bottom left), **correlations among production characteristics themselves,** manifest a high correlation number (25 of 30 possible, equivalent to 83%; 13 strong, 9 moderate, 3 weak and 5 without correlation). Strongest correlations in most samples with high significance (.05), occurred especially

among annual production and employee number, and less among annual production and average production per employee. Correlations among employee number and production per employee manifest weak correlations that could interpret that bigger firms are not necessarily more efficient.

Second zone (top centre), **correlations among innovation and production** are from moderate to weak (110 of 210 possible, equivalent to 52%; 10 strong, 56 moderate, 44 weak and 100 without correlation), although with significance of .05 in most of them. Equipment acquisition presents moderate to weak correlation with employee number and annual production in which it can be identified that equipment acquisition is due partially to firm size, but is not determinant; does not show significant correlations with production per employee, therefore equipment acquisition is not related to firm efficiency. Innovation team strength presents moderate correlations with high significances especially with employee number and annual production, and to a lesser extent with production per employee, representing a trend to relate firm size to innovation team strength, but no with its efficiency. Quantity of manufactured units per innovation presents mostly weak correlations and just in half of observed samples. Innovation number per year presents mostly moderate correlations, although in presence of strong and a few weak, especially in relation to size (employee number and annual production) proving that larger firms produce more innovation per year, in relation with efficiency, most efficient firms (especially female footwear) present correlation to innovation per year. Entrance to new markets presents weak negative correlation with medium significance that focuses in annual production, pointing a light trend of small firms to search new markets, and for the largest to keep it. Organizational changes present medium to weak correlations, with greater concentration in employee number that manifest a trend of firms to upgrade organization by virtue of personnel size. A similar situation is observed in correlation among changes in production plant and size characteristics.

High strength and correlation frequency among production and innovation (except with the entrance to new markets) are consistent with 1990s literature that focuses on innovation management that establishes strong relationships of competitive and innovation ability.

Third zone (top right), presents medium, weak or absent **correlation among production and experience,** with significance above .1 (57 of 150 possible, equivalent to 38%; 2 strong, 22 moderate, 33 weak and 93 without correlation). Strongest correlations are identified among firms that have most clients outside its main market, and a negative correlation is evident, in which the smaller the size of the firm, the greater the trend to have its customers outside the main market. Other identified correlations are among product price with annual production and production per employee. In relation to price, there is some noticeable trend of firms with lower productive level to have lower product price, a non-similar situation among firms with higher prices. In case of productive efficiency (value of

production per employee) in filtered samples, a greater price is observed for firms that are more efficient. Besides, moderate and weak correlations are identified among firm age and size characteristics; proving that the older a firm is, greater its size and more evident in employee number than in production value, although many exceptions are presented. Finally, a few weak correlations are observed with medium significance among firms that obtain institutional benefits and employee number.

Frequency and strength of correlations among production and experience, allow identifying the importance of indexes like age, product price, and external clients percentage.

Fourth zone (centre) **correlations among innovation characteristics itself,** present results absence of the majority, and weak or moderate correlations (51 of 210 possible, equivalent to 24%; 3 strong, 20 moderate, 28 weak and 159 without correlation). Greatest correlation frequency, in presence of medium correlation (among strong and weak) and among innovation team strength with the number of innovation per year, and changes in organization, and among annual innovation with changes in production. Correlation among innovation team strength and innovation per year presents a trend for the strongest team to make a greater number of innovations, and this correlation is stronger for female footwear samples. Correlation among team strength and organizational changes presents in data from firms that have stronger innovation teams, which have made organizational changes more recently, while those who have weaker teams, have not done changes. Finally, firms with recent production changes, present more innovation per year.

In these correlations, the importance of innovation team strength and number of innovations per year is identified. To a lesser extent, a frequent correlation in organizational changes, production plant, and equipment acquisition is observed. Finally, few correlations are observed with indexes for number of produced units per innovation and entrance to new markets.

Fifth zone (right centre), **correlations among innovation and experience** are scarce and those present are mostly weak, with some of them moderate (68 of 350 possible, equivalent to 19%; 0 strong, 18 moderate, 50 weak and 282 without correlation). Moderate correlations more frequent are found among innovations per year and percentage of clients outside main market (negative correlation), among innovation team strength and product price, and among units produced per innovation and firm age. Other cases with high frequency of weak correlations are found among equipment acquisition and percentage of clients outside the main market (negative correlation in three cases and one

positive)[21], among innovation team strength with firm age and percentage of clients outside main market (the last one with negative correlation), among innovations per year and product price, and among firms with organizational changes and percentage of clients outside main market (negative correlation). The rest is found mostly without correlation and some with less than three correlations in ten samples.

Finally, in the sixth zone (bottom right) **correlations of experience indexes among selves** are very few, and existent are weak, with few cases of moderate correlations (15 of 100 possible, equivalent to 15%; 0 strong, 1 moderate, 14 weak and 85 without correlation). More frequent correlations (with three or four cases in ten) are age and institutional benefits profit, among distance from neighbours and product price, and among clients outside the main market percentage with product price (negative correlation) and with institutional benefits profits (negative correlation).

5.6.2 Correlations among firm characteristics with types of product and region

Correlation among firm characteristics, with product typology and classification by region (Table 64), looks to identify firm strengths and/or weakness according to its classification, which is if it is possible to establish if a firm from a determined region or by producing a certain type of footwear, has characteristics that stand out.

Correlation among characteristics and regions are more frequent and strong, especially for production indexes (size and efficiency). At innovation indexes, the greatest strength is achieving in number of innovations per year (with moderate correlation), strength of innovation team and changes in production (with weak correlation for the last two), with high frequency. Experience indexes identify just one moderate and frequent correlation, which corresponds to clients outside the main market, and another weak and less frequent with institutional benefits profit.

In relation to type of product, female footwear producer firms present correlations only in non-filtered and total filtered samples. The strongest and more frequent is found in innovations per year, and the weakest is related to the number of produced units per innovation.

[21] General data review shows that firms with less acquired equipment, tend to have most of their clients outside LPS main market, consistent with low competitiveness and focus on captive markets. Opposite review, with positive correlation, is observed in filtered sample from Jaú, where three firms that acquired most equipment, have a percentage of clients (very little compared with the other samples) outside the main market, while those that do not have clients outside the main market, did not acquire equipment o acquired just a few.

Table 64. Correlations among firm characteristics with types of product and region

			Firm Characteristics														
			Production			Innovation						Experience					
			n° employees	annual production	output /employee	equipment addition	innovation staff	products /innovation	innovations /year	new markets	organization changes	production changes	age	neighbourhood distance	product price	outside costumers	institutional benefits
fem	**fem**	TOTAL.53	wk†.53	wk†.51	wk†.51			-wk†.43	md**.46							-wk**.52	wk*.51
		Jaú.21	wk*.21	wk*.20				-wk†.15	md**.16				wk*.21			-wk*.21	
		Cali.32						-wk*.28	wk†.30								
		TOTAL'.38						-wk†.33	wk**.34			wk*.32			wk*.38		
nofemale	male footwear	TOTAL.53						wk†.43				-wk**.45			wk*.51		-wk†.51
		Cali.32		wk†.31	md**.31			wk*.28				-wk*.32			wk*.31		
		nofem.23			md**.22							-md*.21			md*.22		
		TOTAL'.38			wk*.37							-wk*.32			wk**.37	wk†.38	-wk*.38
		Cali'.23		wk*.22	md**.22										md**.22		
		nofem'.13		md†.13	strg**.13										strg**.13		
	male & fem	TOTAL.53									wk*.49						
		Cali.32					wk†.32				wk*.32						
		nofem.23									wk†.22						
		TOTAL'.38			-wk*.37						wk†.36						
		nofem'.13			-md†.13												
	child	Jaú.21				~				wk†.20			-wk†.21				
		Cali.32				-wk†.32							wk*.32				
	sports	TOTAL'.38					-wk†.37										
		nofem'.13					-md†.13										
	maquila																
	components	TOTAL.53						wk†.43							-wk**.51	wk**.52	
		Jaú.21	-wk†.21		-wk†.20				-wk†.16						-md*.20	md**.21	
		Cali.32													-wk*.31		
		nofem.23	~	~	~	~	~	~	~			wk*.21			-md**.22		
	nofem	TOTAL.53	-wk†.53	-wk†.51	-wk†.51			wk†.43	-md**.46							wk**.52	-wk*.51
		Jaú.21	-wk*.21	-wk*.20				wk†.15	-md**.16				-wk*.21			wk*.21	
		Cali.32						Wk*.28	-wk†.30								
		TOTAL'.38						wk†.33	-wk**.34			-wk*.32					-wk*.38
region	**Jaú firm**	TOTAL.53	wk**.53	md**.51	md**.51		wk†.52		md**.46			wk**.45				-md**.52	wk*.51
		fem.30	md**.30	md**.29	md**.29		wk*.29		md**.26	-wk*.29		wk*.24				-md**.29	
		nofem.23											-wk*.23				
		TOTAL'.38	md**.38	md**.37	md**.37		wk†.37		md**.34			wk**.32				-md**.38	wk**.38
		fem'.25	md**.25	strg**.24	md**.24		wk†.24		md**.22			wk*.20				-md**.25	
	Cali firm	TOTAL.53	-wk**.53	-md**.51	-md**.51		-wk†.52		-md**.46			-wk**.45				md**.52	-wk*.51
		fem.30	-md**.30	-md**.29	-md**.29		-wk*.29		-md**.26	wk*.29		-wk*.24				md**.29	
		nofem.23											wk*.23				
		TOTAL'.38	-md**.38	-md**.37	-md**.37		-wk†.37		-md**.34			-wk**.32				md**.38	-wk**.38
		fem'.25	-md**.25	-strg**.24	-md**.24		-wk†.24		-md**.22			-wk*.20				md**.25	

Notes: [-] Rho correlation is negative. [*strg*] Rho correlation is between 0.76 and 1.00. [*md*] Rho correlation is among 0.51 and 0.75. [*wk*] Rho correlation is among 0.26 and 0.50. [**] Correlation is significant in level 0.01 (2-tailed). [*] Correlation is significant in level 0.05 (2-tailed). [†] Correlation is significant in level 0.1 (2-tailed). The number represents cases taken into account in relation (N). [~] Rho correlation does not apply. Rho correlations below 0.25 and significances above 0.1 are presented as empty cells. Rows with empty cells or non-applicable correlations are skipped.
Source: Own elaboration.

Masculine footwear producers present strong and frequent correlation with efficiency indexes (production value per employee), product price and changes in production. Female and non-female footwear producers present some weak correlation with organizational changes index. Component producers present negative correlation with product price, even though they are moderate and weak. Child footwear producers, sport and maquila no present frequent correlations.

5.6.3 Correlations among proximity dimensions and production/sales variation with type of product and region

Correlation analysis among firm classification (by type of product and region) and changes in production and sales level in the last three years (Table 65), presents less correlations, while existent are weak and/or infrequent among analysed samples.

Table 65. Correlations among proximity dimensions and performance with type of product and region

			Proximity Dimensions						Outcomes		
			cognitive proximity	organizational proximity	interaction	app.changes	social proximity	institutional proximity	Δ production	Δ employees	Δ sales
fem	**fem**	Jaú.21							wk†.20		
nofemale	male	TOTAL.53			-wk†.52						
		Cali.32			-wk†.32						
		nofem.23			-md*.23						
		nofem'.13			-md†.13						
	male & female	TOTAL.53		wk*.52							
		Cali.32		wk**.32							
		nofem.23		wk*.23							
		TOTAL'.38		wk*.37							
		Cali'.23		wk*.23	wk†.23						
		nofem'.13		md†.13							
	children	TOTAL.53	wk*.31								
		TOTAL'.38	wk†.21								
		Cali'.23				-md*.12					
	sports										
	maquila										
	compon.	TOTAL.53			wk*.52						
		Jaú.21							-md*.20		-wk*.20
		Cali.32			wk*.32						
		nofem.23			wk*.23						
	nofem	Jaú.21							-wk†.20		
region	**Jau**	TOTAL.53						wk*.53			
		fem.30						wk*.30			
		TOTAL'.38						wk*.38			
		fem'.25						wk*.25			
	Cali	TOTAL.53						-wk*.53			
		fem.30						-wk*.30			
		TOTAL'.38						-wk*.38			
		fem'.25						-wk*.25			

Notes: [-] Rho correlation is negative. [*strg*] Rho correlation is between 0.76 and 1.00. [*md*] Rho correlation is among 0.51 and 0.75. [*wk*] Rho correlation is among 0.26 and 0.50. [**] Correlation is significant in level 0.01 (2-tailed). [*] Correlation is significant in level 0.05 (2-tailed). [†] Correlation is significant in level 0.1 (2-tailed). The number represents cases taken into account in relation (N). [~] Rho correlation does not apply. Rho correlations below 0.25 and significances above 0.1 are presented as empty cells. Rows with empty cells or non-applicable correlations are skipped.
Source: Own elaboration.

Correlations among type of product and proximity dimensions, show a high frequency and weak correlation among mixed (female and non-female) footwear producers and organizational proximity, in which two producers from five that compound the sample, present an index above zero, while 47 left that produce another type of product only three have an index above zero. Another with less

frequency and correlation among negative and moderate is identified among masculine footwear producers and interaction level (number of firms with which exchange information), proving that, from five masculine footwear producers, only one interaction is made (although of low level) and the other four do not make any information or knowledge exchange.

Correlations among region and proximity dimensions are present (positive for Jaú and negative for Cali) with institutional proximity, although only in total samples (complete and filtered) and female footwear producers, where a greater institutional proximity for firms in Jaú is noticed.

Correlations among production changes, employees and sales with type of product and region are isolated, mostly weak and of low frequency.

5.7 Correlations analysis among proximity dimensions and production and sales variation

With the intention of studying in detail main indexes of this research (proximity dimensions and production and sales changes), a compilation is made from each to establish correlation frequency. This way, a compilation of correlations is presented in Table 44 to Table 62 on which, following Martínez Ortega et al. (2009), scale, Rho among .25 and .50 are described as weak, among .50 and .75 as moderate, and among .76 and 1 as strong.

5.7.1 Identification of correlations for each proximity dimension

Cognitive proximity index, established by five questions on the subject (communication easiness, technical language similitude, production technology similitude, product innovation methodology similitude, technical knowledge similitude), does not present correlations with significance below .1 Table 66 with production indexes, therefore establishing null correlations. Innovation indexes have only two moderate correlations with significance .1, both with produced units per innovations, with contradictory results: correlation in one sample is positive and the other one is negative. For experience characteristics, six correlations are identified: one weak with distance, two with product price (one weak and one moderate) and three with institutional benefits profit (one weak and two moderate).

For each proximity dimension indexes, six negative correlations are identified with joint project index (four moderate and two strong) and two moderate (negative correlations too) with interaction level. Twelve negative correlations with sales and product variation are identified among weak (eight) and moderate (four).

Table 66. Correlations with cognitive proximity

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 44	-	-	-	**-**
		annual production	Table 44	-	-	-	**-**
		output/employee	Table 44	-	-	-	**-**
	innovation	equipment addition	Table 44	-	-	-	**-**
		innovation staff	Table 44	-	-	-	**-**
		products/innovation	Table 44	-	2**	-	**2****
		innovations/year	Table 44	-	-	-	**-**
		new markets	Table 44	-	-	-	**-**
		organization changes	Table 44	-	-	-	**-**
		production changes	Table 44	-	-	-	**-**
	experience	age	Table 44	-	-	-	**-**
		neighbourhood dist.	Table 44	1	-	-	**1**
		product price	Table 44	1	1	-	**2**
		outside costumers	Table 44	-	-	-	**-**
		institutional benefits	Table 44	1	2	-	**3**
	TOTAL FIRM CHARACTERISTICS			**3**	**5****	**-**	**8****
Proximity Dimensions	cognitive proximity	mean	N/A	N/A	N/A	N/A	**N/A**
	organizational proximity	project index	Table 57	-	4*	2*	**6***
		interaction	Table 58	-	2*	-	**2***
		interaction application	Table 59	-	-	-	**-**
	social proximity	mean	Table 60	-	-	-	**-**
	institutional proximity	comparative index	Table 61	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**-**	**6***	**2***	**8***
Outcomes	production performance	Δ production (%)	Table 50	3	1	-	**4**
		Δ employees (%)	Table 51	3	2	-	**5**
	sales performance	Δ sales (%)	Table 52	2	1	-	**3**
	TOTAL OUTCOMES			**8**	**4**	**-**	**12**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Although cognitive proximity present low frequency and strength with firm characteristics and the other proximity dimensions (the last with negative correlation), when compared with the other proximity dimensions is the one that most frequency presents in relation to results.

These frequencies point that cognitive proximity does not relate with firms characteristics, but are key to obtain production, employee and sales growth.

Frequency and strength of correlations with organizational proximity (Table 67), presents few correlation (17 in total), focusing greater frequency and strength with cognitive proximity (six negative) and interaction level (four).

Table 67. Correlations with organizational proximity

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 45	-	-	-	**-**
		annual production	Table 45	-	-	-	**-**
		output/employee	Table 45	-	1*	-	**1***
	innovation	equipment addition	Table 45	-	-	-	**-**
		innovation staff	Table 45	1*	-	-	**1***
		products/innovation	Table 45	1	-	-	**1**
		innovations/year	Table 45	-	-	-	**-**
		new markets	Table 45	-	-	-	**-**
		organization changes	Table 45	-	-	-	**-**
		production changes	Table 45	-	-	-	**-**
	experience	age	Table 45	-	-	-	**-**
		neighbourhood dist.	Table 45	-	-	-	**-**
		product price	Table 45	-	-	-	**-**
		outside costumers	Table 45	-	-	-	**-**
		institutional benefits	Table 45	-	-	-	**-**
	TOTAL FIRM CHARACTERISTICS			**2****	**1***	**-**	**3****
Proximity Dimensions	cognitive proximity	mean	Table 56	-	4*	2*	**6***
	organizational proximity	project index	N/A	N/A	N/A	N/A	**N/A**
		interaction	Table 58	3	1	-	**4**
		interaction application	Table 59	-	-	-	**-**
	social proximity	mean	Table 60	-	-	-	**-**
	institutional proximity	comparative index	Table 61	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**3**	**5****	**2***	**10****
Outcomes	production performance	Δ production (%)	Table 50	2	-	-	**2**
		Δ employees (%)	Table 51	-	-	-	**-**
	sales performance	Δ sales (%)	Table 52	2	-	-	**2**
	TOTAL OUTCOMES			**4**	**-**	**-**	**4**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

These low frequencies manifest that organizational proximity (measured by the number of recent innovation projects, and role accomplished by firm) represents very low impact on firm growth results, and at the same time prove that firm characteristics have little influence on it.

Correlation with interaction level index (Table 68), established by the number of firms it interacts with, manifests a weak and moderate correlations level with production characteristics (present in four samples), innovation (six samples) and experience (six samples of product price).

Table 68. Correlations with interaction level

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 46	-	-	-	**-**
		annual production	Table 46	1	-	-	**1**
		output/employee	Table 46	2*	1*	-	**3***
	innovation	equipment addition	Table 46	-	-	-	**-**
		innovation staff	Table 46	-	-	-	**-**
		products/innovation	Table 46	1	2	-	**3**
		innovations/year	Table 46	-	-	-	**-**
		new markets	Table 46	2	-	-	**2**
		organization changes	Table 46	-	-	-	**-**
		production changes	Table 46	1	-	-	**1**
	experience	age	Table 46	-	-	-	**-**
		neighbourhood dist.	Table 46	-	-	-	**-**
		product price	Table 46	4*	2*	-	**6***
		outside costumers	Table 46	-	-	-	**-**
		institutional benefits	Table 46	-	-	-	**-**
	TOTAL FIRM CHARACTERISTICS			**11****	**5****	**-**	**16****
Proximity Dimensions	cognitive proximity	mean	Table 56	-	2*	-	**2***
	organizational proximity	project index	Table 57	3	1	-	**4**
		interaction	N/A	N/A	N/A	N/A	**N/A**
		interaction application	Table 59	2*	2*	-	**4***
	social proximity	mean	Table 60	-	2*	-	**2***
	institutional proximity	comparative index	Table 61	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**5****	**7****	**-**	**12****
Outcomes	production performance	Δ production (%)	Table 50	-	-	-	**-**
		Δ employees (%)	Table 51	-	-	-	**-**
	sales performance	Δ sales (%)	Table 52	-	-	-	**-**
	TOTAL OUTCOMES			**-**	**-**	**-**	**-**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Good frequency level is also observed with weak correlations (five) and moderate (seven), with other proximity dimensions. With growth indexes, there are not identified correlations.

These correlations identify aspects like productive efficiency (production per employee) and innovation (produced units per innovation and entrance to new markets), that affect significantly interaction proximity index. At the same time is evident that negative correlation relative frequency (eight of twelve) with the other proximity dimensions, transforms it into a negative catalyser of relationships with the others. In this research, the greatest the number of firms it interacts with, the lesser cognitive proximity would be, as knowledge application product of interactions and the lesser social proximity.

Table 69. Correlations with change application level

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 47	-	-	-	**-**
		annual production	Table 47	-	-	-	**-**
		output/employee	Table 47	-	-	-	**-**
	innovation	equipment addition	Table 47	-	-	-	**-**
		innovation staff	Table 47	-	-	-	**-**
		products/innovation	Table 47	-	-	-	**-**
		innovations/year	Table 47	-	-	-	**-**
		new markets	Table 47	1	2	-	**3**
		organization changes	Table 47	-	-	-	**-**
		production changes	Table 47	-	-	-	**-**
	experience	age	Table 47	1*	1*	1*	**3***
		neighbourhood dist.	Table 47	-	-	-	**-**
		product price	Table 47	1	3	-	**4**
		outside costumers	Table 47	-	-	-	**-**
		institutional benefits	Table 47	-	-	-	**-**
	TOTAL FIRM CHARACTERISTICS			**3****	**6****	**1***	**10****
Proximity Dimensions	cognitive proximity	mean	Table 56	-	-	-	**-**
	organizational proximity	project index	Table 57	-	-	-	**-**
		interaction	Table 58	2*	2*	-	**4***
		interaction application	N/A	N/A	N/A	N/A	**N/A**
	social proximity	mean	Table 60	2	4	-	**6**
	institutional proximity	comparative index	Table 61	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**4****	**6****	**-**	**10****
Outcomes	production performance	Δ production (%)	Table 50	-	-	-	**-**
		Δ employees (%)	Table 51	-	-	-	**-**
	sales performance	Δ sales (%)	Table 52	-	1	-	**1**
	TOTAL OUTCOMES			**-**	**1**	**-**	**1**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Correlations identified on changes application (compiled on Table 69), have moderate frequencies, divided among firm characteristics (especially experience) and the other proximity dimensions. Only one correlation is identified with firm sale change, and it is the minimal impact on firms growth indexes.

The frequency of social proximity correlations (Table 70) is greater than the other studied indexes (35 correlations). Focus mainly on firms innovation characteristics (ten), experience (eleven) and the other proximity dimensions (eight), leaving marginal frequencies for production and results (three correlation each).

Based on these findings, is possible to establish that smaller firms, with fewer employees and low annual production, fewer innovations per year, without organizational changes, and especially low age, have greater social proximity (established by the degree of concern and commitment with

interlocutors). Although, social proximity have a marginal impact on firms growth results, even if they are more inclined to perform the application of knowledge product of interaction.

Table 70. Correlations with social proximity

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 48	-	1*	-	**1***
		annual production	Table 48	1*	1*	-	**2***
		output/employee	Table 48	-	-	-	**-**
	innovation	equipment addition	Table 48	-	-	-	**-**
		innovation staff	Table 48	-	-	-	**-**
		products/innovation	Table 48	-	-	-	**-**
		innovations/year	Table 48	2*	-	-	**2***
		new markets	Table 48	1	3	2	**6**
		organization changes	Table 48	1*	1*	-	**2***
		production changes	Table 48	-	-	-	**-**
	experience	age	Table 48	2*	3*	-	**5***
		neighbourhood dist.	Table 48	1	-	1	**2**
		product price	Table 48	-	1	-	**1**
		outside costumers	Table 48	1	1	-	**2**
		institutional benefits	Table 48	-	1	-	**1**
	TOTAL FIRM CHARACTERISTICS			**9****	**12****	**3**	**24****
Proximity Dimensions	cognitive proximity	mean	Table 56	-	-	-	**-**
	organizational proximity	project index	Table 57	-	-	-	**-**
		interaction	Table 58	-	2*	-	**2***
		interaction application	Table 59	2	4	-	**6**
	social proximity	mean	N/A	N/A	N/A	N/A	**N/A**
	institutional proximity	comparative index	Table 61	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**2**	**6****	**-**	**8****
Outcomes	production performance	Δ production (%)	Table 50	1	-	-	**1**
		Δ employees (%)	Table 51	1	-	-	**1**
	sales performance	Δ sales (%)	Table 52	1	-	-	**1**
	TOTAL OUTCOMES			**3**	**-**	**-**	**3**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Finally, correlation frequency with institutional proximity (Table 71), presents just a few correlations, and existent are weak, being an index low related to firm size, number of innovations per year and production growth. Institutional proximity is the only proximity dimension that does not manifest correlations with the others.

Condensed correlation frequency (Table 72) looks represent correlations among firm indexes, proximity dimensions and results proposed in Figure 1 (p.72): to observe what correlation identifies among each index and index of each proximity dimension, and at the same time, how each proximity dimension correlates with growth indexes. Although, later, a representation of the direct correlation

between indexes and growth is made (Table 76, p.203), here we can identify the indirect correlation between each index and growth results of firms.

Table 71. Correlations with institutional proximity

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 49	1	-	-	**1**
		annual production	Table 49	2	-	-	**2**
		output/employee	Table 49	-	-	-	**-**
	innovation	equipment addition	Table 49	-	-	-	**-**
		innovation staff	Table 49	-	-	-	**-**
		products/innovation	Table 49	-	-	-	**-**
		innovations/year	Table 49	2	-	-	**2**
		new markets	Table 49	-	-	-	**-**
		organization changes	Table 49	-	-	-	**-**
		production changes	Table 49	-	-	-	**-**
	experience	age	Table 49	-	-	-	**-**
		neighbourhood dist.	Table 49	-	-	-	**-**
		product price	Table 49	1	-	-	**1**
		outside costumers	Table 49	-	-	-	**-**
		institutional benefits	Table 49	-	-	-	**-**
	TOTAL FIRM CHARACTERISTICS			**6**	**-**	**-**	**6**
Proximity Dimensions	cognitive proximity	mean	Table 56	-	-	-	**-**
	organizational proximity	project index	Table 57	-	-	-	**-**
		interaction	Table 58	-	-	-	**-**
		interaction application	Table 59	-	-	-	**-**
	social proximity	mean	Table 60	-	-	-	**-**
	institutional proximity	comparative index	N/A	N/A	N/A	N/A	**N/A**
	TOTAL PROXIMITY DIMENSIONS			**-**	**-**	**-**	**-**
Outcomes	production performance	Δ production (%)	Table 50	2	-	-	**2**
		Δ employees (%)	Table 51	-	-	-	**-**
	sales performance	Δ sales (%)	Table 52	-	-	-	**-**
	TOTAL OUTCOMES			**2**	**-**	**-**	**2**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Correlations among each index and proximity dimensions presented mixed effects: positive correlation on some dimensions and negative on others, identified on table with double asterisk (**). E.g., firms that produce high unit volume per innovation, have negative effects on cognitive proximity, but positive on organizational proximity and interaction levels. If these results cross with firms growth indexes, is noticeable that cognitive proximity has the highest influence on growth indexes (especially on employee number and production), while level of interaction does not correlate with this growth, and would be desirable to have fewer units produce per innovation, to correlate with an increase in cognitive proximity and at the same time positive correlate with growth indexes.

Table 72. Correlations frequency with each proximity dimension

Dimensions	Characteristic	Index	cognitive proximity	organizational proximity	interaction	interaction application	social proximity	institutional proximity	TOTAL
			Table 66	Table 67	Table 68	Table 69	Table 70	Table 71	
Firm	production	n° employees	-	-	-	-	1*	1	**2****
		annual production	-	-	1	-	2*	2	**5****
		output/employee	-	1*	3*	-	-	-	**4***
	innovation	equipment addition	-	-	-	-	-	-	
		innovation staff	-	1*	-	-	-	-	**1***
		products/innovation	2**	1	3	-	-	-	**6****
		innovations/year	-	-	-	-	2*	2	**4****
		new markets	-	-	2	3	6	-	**11**
		organization changes	-	-	-	-	2*	-	**2***
		production changes	-	-	1	-	-	-	**1**
	experience	age	-	-	-	3*	5*	-	**8***
		neighbourhood dist.	1	-	-	-	2	-	**3**
		product price	2	-	6*	4	1	1	**14****
		outside costumers	-	-	-	-	2	-	**2**
		institutional benefits	3	-	-	-	1	-	**4**
	TOTAL FIRM CHARACTERISTICS		**8****	**3****	**16****	**10****	**24****	**6**	**67****
Proximity Dimensions	cognitive proximity	mean	N/A	6*	2*	-	-	-	**8***
	organizational proximity	project index	6*	N/A	4	-	-	-	**10****
		interaction	2*	4	N/A	4*	2*	-	**12****
		interaction application	-	-	4*	N/A	6	-	**10****
	social proximity	mean	-	-	2*	6	N/A	-	**8****
	institutional proximity	comparative index	-	-	-	-	-	N/A	**-**
	TOTAL PROXIMITY DIMENSIONS		**8***	**10****	**12****	**10****	**8****	**-**	**24****
Outcomes	production performance	Δ production (%)	4	2	-	-	1	2	**9**
		Δ employees (%)	5	-	-	-	1	-	**6**
	sales performance	Δ sales (%)	3	2	-	1	1	-	**7**
	TOTAL OUTCOMES		**12**	**4**	**-**	**1**	**3**	**2**	**22**

Notes: * Negative correlations. ** Negative and positive correlations.
Source: Own elaboration.

Production indexes are low correlated to proximity dimensions, except annual production that has low frequencies with social and institutional proximity. Negative correlation with social proximity and positive correlation with growth (although with low frequency) allow establishing certain trend of firms with lower production to have more social proximity and greater indirect growth.

Innovation indexes, by their frequency (*f*=6), only have one remarkable correlation: among entrance to new markets and social proximity, that has at the same time a positive correlation with low frequency with growth indexes.

Experience indexes have remarkable correlation with age and product price. For age, youngest firms have greater social proximity and apply knowledge, but both proximity dimensions have few correlations with growth. Similar situation with product price, that without concern of positive or negative correlation, has low frequency with results.

Proximity dimension correlations originate great ambiguity grade: cognitive proximity, which has the most positive correlation with growth indexes, is negatively correlated with organizational proximity and with interaction level, which in the first case has a positive correlation with firm growth indexes. Besides, negative correlation among project index and cognitive proximity takes to establish that, indirectly, this index affects growth negatively. Other cases of this type of correlations are the negatives for interaction level, especially with cognitive and social proximity, which implies that indirectly correlates negatively with firm growth.

Finally, on Table 72 two groups are observed with similitude in the way they relate with grouped indexes by characteristic. First is cognitive and organizational proximity, although the first has better indexes. The second group presents at interaction level, knowledge application as a product of interaction and social proximity, although the last is the one with better indexes. Institutional proximity, if well has similar projection with social proximity correlations, most of them are opposite: positive for institutional and negative in social.

5.7.2 Correlations identification for sales and production variation indexes

As noticed in §5.5 where correlations are analysed among sales and production variation index, there are frequent and strong correlations among the three indexes (production changes, employee number changes and sales changes), therefore, correlation analysis focuses on characteristics and proximity dimensions, although when tables are presented complete (including correlation results among growth indexes).

From 53 to 55 identified correlations with each growth index, 20 (of 20 possible) belong to correlation with other two growth indexes, leaving for analysis from 33 to 35 correlations, which is good, if it is compared with each proximity dimension growth indexes frequency (§5.7.1).

Correlation among changes in production level with the other indexes (Table 73), frequency focuses on innovation (13 correlations), experience (13 correlations), and proximity dimensions (nine correlations). Assuming that, without caring on firm size, firms that acquire new equipment, make

organizational changes, are younger, physically more distanced from neighbours, have more correlation with growth.

Table 73. Correlations with change in production level

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 53	-	-	-	**-**
		annual production	Table 53	-	-	-	**-**
		output/employee	Table 53	-	-	-	**-**
	innovation	equipment addition	Table 53	3	3	-	**6**
		innovation staff	Table 53	-	-	-	**-**
		products/innovation	Table 53	-	-	-	**-**
		innovations/year	Table 53	-	1	-	**1**
		new markets	Table 53	-	1	-	**1**
		organization changes	Table 53	3	2	-	**5**
		production changes	Table 53	-	-	-	**-**
	experience	age	Table 53	2*	-	-	**2***
		neighbourhood dist.	Table 53	6	2	-	**8**
		product price	Table 53	-	-	-	**-**
		outside costumers	Table 53	1	1	-	**2**
		institutional benefits	Table 53	1*	-	-	**1***
	TOTAL FIRM CHARACTERISTICS			**16****	**10**	**-**	**26****
Proximity Dimensions	cognitive proximity	mean	Table 50	3	1	-	**4**
	organizational proximity	project index	Table 50	2	-	-	**2**
		interaction	Table 50	-	-	-	**-**
		interaction application	Table 50	-	-	-	**-**
	social proximity	mean	Table 50	1	-	-	**1**
	institutional proximity	comparative index	Table 50	2	-	-	**2**
	TOTAL PROXIMITY DIMENSIONS			**8**	**1**	**-**	**9**
Outcomes	production performance	Δ production (%)	Table 62	N/A	N/A	N/A	**N/A**
		Δ employees (%)	Table 62	-	1	9	**10**
	sales performance	Δ sales (%)	Table 62	-	1	9	**10**
	TOTAL OUTCOMES			**-**	**2**	**18**	**20**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

They are also identified as indexes that support productive growth to cognitive proximity, and to a lesser extent to the execution of joint innovation projects with other firms. Correlations found with employee number changes (Table 74), three are in production characteristics, 15 in innovation, 11 in experience and 6 in proximity dimensions.

This way, firms with a greater number of employees, are the ones that more equipment acquired, make organizational changes, are more distant from neighbours, and have greater cognitive than pairs, have greater growth of employee number. Other factors that could influence are the number of innovations per year, entrance to new markets, the presence of clients outside the main market, social proximity and avoid the search for institutional benefits (since this correlates negatively).

Table 74. Correlations with changes in employee number

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 54	2	1	-	**3**
		annual production	Table 54	-	-	-	**-**
		output/employee	Table 54	-	-	-	**-**
	innovation	equipment addition	Table 54	5	3	-	**8**
		innovation staff	Table 54	-	-	-	**-**
		products/innovation	Table 54	-	-	-	**-**
		innovations/year	Table 54	-	1	-	**1**
		new markets	Table 54	1	-	-	**1**
		organization changes	Table 54	3	2	-	**5**
		production changes	Table 54	-	-	-	**-**
	experience	age	Table 54	-	-	-	**-**
		neighbourhood dist.	Table 54	7	2	-	**9**
		product price	Table 54	-	-	-	**-**
		outside costumers	Table 54	-	1	-	**1**
		institutional benefits	Table 54	1*	-	-	**1***
	TOTAL FIRM CHARACTERISTICS			**19****	**10**	**-**	**29****
Proximity Dimensions	cognitive proximity	mean	Table 51	3	2	-	**5**
	organizational proximity	project index	Table 51	-	-	-	**-**
		interaction	Table 51	-	-	-	**-**
		interaction application	Table 51	-	-	-	**-**
	social proximity	mean	Table 51	1	-	-	**1**
	institutional proximity	comparative index	Table 51	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**4**	**2**	**-**	**6**
Outcomes	production performance	Δ production (%)	Table 62	-	1	9	**10**
		Δ employees (%)	Table 62	N/A	N/A	N/A	**N/A**
	sales performance	Δ sales (%)	Table 62	1	5	4	**10**
	TOTAL OUTCOMES			**1**	**6**	**13**	**20**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

For correlations with sales change index (Table 75), other correlations are identified for innovation characteristics (16), experience (9), proximity dimensions (7) and production (1). This way, firms that acquired more equipment, made organizational changes, are younger are more distant from neighbours, have greater cognitive proximity, and greater sales increase. In a less significant way, entrance to new markets, joint projects participation and those that look less for institutional benefits, also contribute to sales increase.

Table 75. Correlations with changes in sales level

Dimensions	Characteristic	Index	Table	Weak	Moderate	Strong	Total
Firm	production	n° employees	Table 55	-	1	-	**1**
		annual production	Table 55	-	-	-	**-**
		output/employee	Table 55	-	-	-	**-**
	innovation	equipment addition	Table 55	4	2	1	**7**
		innovation staff	Table 55	1	-	-	**1**
		products/innovation	Table 55	-	-	-	**-**
		innovations/year	Table 55	1	-	-	**1**
		new markets	Table 55	2	-	-	**2**
		organization changes	Table 55	3	2	-	**5**
		production changes	Table 55	-	-	-	**-**
	experience	age	Table 55	3*	-	-	**3***
		neighbourhood dist.	Table 55	1	2	-	**3**
		product price	Table 55	1	-	-	**1**
		outside costumers	Table 55	-	-	-	**-**
		institutional benefits	Table 55	2*	-	-	**2***
	TOTAL FIRM CHARACTERISTICS			**18****	**7**	**1**	**26****
Proximity Dimensions	cognitive proximity	mean	Table 52	2	1	-	**3**
	organizational proximity	project index	Table 52	2	-	-	**2**
		interaction	Table 52	-	-	-	**-**
		interaction application	Table 52	-	1	-	**1**
	social proximity	mean	Table 52	1	-	-	**1**
	institutional proximity	comparative index	Table 52	-	-	-	**-**
	TOTAL PROXIMITY DIMENSIONS			**5**	**2**	**-**	**7**
Outcomes	production performance	Δ production (%)	Table 62	-	1	9	**10**
		Δ employees (%)	Table 62	1	5	4	**10**
	sales performance	Δ sales (%)	Table 62	N/A	N/A	N/A	**N/A**
	TOTAL OUTCOMES			**1**	**6**	**13**	**20**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

Although production level changes, employee number, and sales present high correlation and much similitude is found, differences in frequency are identified, that affect each result (Table 76). Among similar results are found equipment acquisition, organizational changes and cognitive proximity. The most significant difference is distance from neighbours, that for production changes and number of employees presents a high frequency (8 and 9, respectively), while for sales is much less (3). There are also differences in correlation frequency with employee number (0 in production, 3 in employees, and 1 in sales), age (2 production, 0 employees, and 3 sales), external clients (2 production, 1 employees, 0 sales), cognitive proximity (2 production, 0 employees, 2 sales), and institutional proximity (2 production, 0 in employees and sales).

Table 76. Correlations frequency in production and sales changes

Dimensions	Characteristic	Index	Δ Production	Δ Employees	Δ Sales	TOTAL
			Table 73	Table 74	Table 75	
Firm	production	n° employees	-	3	1	**4**
		annual production	-	-	-	**-**
		output/employee	-	-	-	**-**
	innovation	equipment addition	6	8	7	**21**
		innovation staff	-	-	1	**1**
		products/innovation	-	-	-	**-**
		innovations/year	1	1	1	**3**
		new markets	1	1	2	**4**
		organization changes	5	5	5	**15**
		production changes	-	-	-	**-**
	experience	age	2*	-	3*	**5***
		neighbourhood dist.	8	9	3	**20**
		product price	-	-	1	**1**
		outside costumers	2	1	-	**3**
		institutional benefits	1*	1*	2*	**4***
	TOTAL FIRM CHARACTERISTICS		**26****	**29****	**26****	**81****
Proximity Dimensions	cognitive proximity	mean	4	5	3	**12**
	organizational proximity	project index	2	-	2	**4**
		interaction	-	-	-	**-**
		interaction application	-	-	1	**1**
	social proximity	mean	1	1	1	**3**
	institutional proximity	comparative index	2	-	-	**2**
	TOTAL PROXIMITY DIMENSIONS		**9**	**6**	**7**	**22**
Outcomes	production performance	Δ production (%)	N/A	10	10	**20**
		Δ employees (%)	10	N/A	10	**20**
	sales performance	Δ sales (%)	10	10	N/A	**20**
	TOTAL OUTCOMES		**20**	**20**	**20**	**30**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=10.
Source: Own elaboration.

5.8 Correlation among homogeneous and heterogeneous groups

As presented in results (§4), and correlation analysis from §5.1 to §5.6 present in this analysis chapter, firms with homogeneous behaviours are identified, both in complete and filtered sample from Jaú, and complete and filtered of female footwear producer sample, since firms behaviour from this grouping towards oriented specialization to the same type of product is coherent with MAR theory (Marshall, 1890; Arrow, 1962; Romer, 1986; Glaeser et al., 1992), §1.1.2 , p.46.

Firms with heterogeneous behaviour included complete and filtered samples from Cali, and complete and filtered samples of non-female footwear producers, due to product variety (masculine, mixed,

child and sports footwear), theoretical situation described by Jacobs (1969), also described in §1.1.2 , p.46.

Table 77. Correlations frequency for each proximity dimension (homogeneous samples)

Dimensions	Characteristic	Index	cognitive proximity	organizational proximity	interaction	interaction application	social proximity	institutional proximity	TOTAL
Firm	production	n° employees	-	-	-	-	1*	1	**2****
		annual production	-	-	1	-	1*	2	**4****
		output/employee	-	-	-	-	-	-	**-**
	innovation	equipment addition	-	-	1	-	-	-	**1**
		innovation staff	-	1*	-	-	-	-	**1***
		products/innovation	1	-	2	-	-	-	**3**
		innovations/year	-	-	-	-	-	1	**1**
		new markets	-	-	-	-	-	-	**-**
		organization changes	-	-	-	-	2*	-	**2***
		production changes	-	-	-	-	-	-	
	experience	age	-	-	-	-	2*	-	**2***
		neighbourhood dist.	1	-	-	-	-	-	**1**
		product price	1	-	-	2	1	1	**5**
		outside costumers	-	-	-	-	-	-	
		institutional benefits	2	-	-	-	-	-	**2**
	TOTAL FIRM CHARACTERISTICS		**5**	**1***	**4**	**2**	**7****	**5**	**24****
Proximity Dimensions	cognitive proximity	mean	N/A	-	-	-	-	-	
	organizational proximity	project index	-	N/A	-	-	-	-	
		interaction	-	-	N/A	1*	2*	-	**3***
		interaction application	-	-	1*	N/A	4	-	**5****
	social proximity	mean	-	-	2*	4	N/A	-	**6****
	institutional proximity	comparative index	-	-	-	-	-	N/A	
	TOTAL PROXIMITY DIMENSIONS		**-**	**-**	**3***	**5****	**6****	**-**	**7****
Outcomes	production performance	Δ production (%)	2	2	-	-	-	2	**6**
		Δ employees (%)	3	-	-	-	-	-	**3**
	sales performance	Δ sales (%)	1	2	-	1	-	-	**4**
	TOTAL OUTCOMES		**6**	**4**	**-**	**1**	**-**	**2**	**13**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

5.8.1 Homogeneous groupings

Table 77 presents proximity dimension frequencies that belonged to homogeneous behaviour groupings (complete and filtered samples from Jaú and female footwear producers) described by Glaeser et al. (1992) as MAR theory (by Marshall, 1890; Arrow, 1962; and Romer, 1986), filtered based on data obtained in Table 72 (p.198). In the same way Table 78 presents the correlation among changes

in production and sales for the same groupings based on Table 76 (p.203). Frequency correlation tables of homogeneous behaviour have a maximum of four ($f.max_{homog}$=4), since they only include four groupings, different from total analysis tables that presented a maximum frequency of ten. ($f.max_{total}$=10).

Table 78. Correlations frequency for changes in production and sales level (homogeneous samples)

Dimensions	Characteristic	Index	Δ Production	Δ Employees	Δ Sales	Total
Firm	production	n° employees	-	-	-	
		annual production	-	-	-	
		output/employee	-	-	-	
	innovation	equipment addition	1	3	2	**6**
		innovation staff	-	-	-	
		products/innovation	-	-	-	
		innovations/year	-	-	-	
		new markets	-	-	-	
		organization changes	-	-	-	
		production changes	-	-	-	
	experience	age	-	-	-	
		neighbourhood dist.	3	4	1	**8**
		product price	-	-	-	
		outside costumers	2	1	-	**3**
		institutional benefits	-	-	-	
	TOTAL FIRMS CHARACTERISTICS		**6**	**8**	**3**	**17**
Outcomes	production performance	Δ production (%)	N/A	4	4	**8**
		Δ employees (%)	4	N/A	4	**8**
	sales performance	Δ sales (%)	4	4	N/A	**8**
	TOTAL OUTCOMES		**8**	**8**	**8**	**12**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

Proximity dimension analysis found that social, cognitive and institutional proximities have the greatest correlation with firm characteristics, although their individual frequency does not surpass both groupings neither reflect in the same characteristics index. E.g., product price is the only index that has a correlation with cognitive, social and institutional proximity, but with a frequency equal to one (1), meaning that only one correlation is identified in each grouping for each case. Cognitive and institutional proximities only have positive correlations, while social proximity presents mostly negative correlations.

Correlations among proximity dimensions and results (changes in production and sales) present its greatest correlations for cognitive proximity, especially for employee changes and to lesser extend to for production and sales changes. Correlations among proximity dimension indexes evidenced very low frequency, and only knowledge applications stands out by pairs interaction with social proximity,

proving that only when exists trust and confidence among pairs, changes implement towards the knowledge source of interaction.

Correlation among results (changes in production and sales level) and firm characteristics are all positive, with focus on equipment acquisition, mean distance from closest neighbours and presence of clients outside the main market of LPS.

Table 79. Correlations frequency for each proximity dimension (heterogeneous samples)

Dimensions	Characteristic	Index	cognitive proximity	organizational proximity	interaction	interaction application	social proximity	institutional proximity	TOTAL
Firm	production	n° employees	-	-	-	-	-	-	**-**
		annual production	-	-	-	-	-	-	**-**
		output/employee	-	1*	3*	-	-	-	**4***
	innovation	equipment addition	-	-	-	-	-	-	**-**
		innovation staff	-	-	-	-	-	-	**-**
		products/innovation	1*	1	-	-	-	-	**2****
		innovations/year	-	-	-	-	1*	-	**1***
		new markets	-	-	2	1	4	-	**7**
		organization changes	-	-	-	-	-	-	**-**
		production changes	-	-	-	-	-	-	**-**
	experience	age	-	-	-	2*	1*	-	**3***
		neighbourhood dist.	-	-	-	-	1	-	**1**
		product price	1	-	4*	-	-	-	**5****
		outside costumers	-	-	-	-	2	-	**2**
		institutional benefits	1	-	-	-	1	-	**2**
	TOTAL FIRM CHARACTERISTICS		**3****	**2****	**9****	**3****	**10****	**-**	**27****
Proximity Dimensions	cognitive proximity	mean	N/A	4*	2*	-	-	-	**6***
	organizational proximity	project index	4*	N/A	4	-	-	-	**8****
		interaction	2*	4	N/A	2*	-	-	**8****
		interaction application	-	-	2*	N/A	-	-	**2***
	social proximity	mean	-	-	-	-	N/A	-	**-**
	institutional proximity	comparative index	-	-	-	-	-	N/A	**-**
	TOTAL PROXIMITY DIMENSIONS		**6***	**8****	**8****	**2***	**-**	**-**	**12****
Outcomes	production performance	Δ production (%)	-	-	-	-	1	-	**1**
		Δ employees (%)	-	-	-	-	1	-	**1**
	sales performance	Δ sales (%)	-	-	-	-	-	-	
	TOTAL OUTCOMES		**-**	**-**	**-**	**-**	**2**	**-**	**2**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

5.8.2 Heterogeneous grouping

Table 79 presents proximity dimension correlation frequencies of grouping with heterogeneous behaviour (complete and filtered samples from Cali and non-female footwear producers), described by Jacobs (1969), and filtered based on data shown in Table 72 (p.198). In the same way, Table 80 presents correlation for changes in production and sales for the same groupings based on Table 76 (p.203). Correlation frequencies for homogeneous behaviour groups have a maximum of four ($f.max_{heterog}$=4), since it only includes four groups, different from total analysis tables that present a maximum frequency of ten ($f.max_{total}$=10). When frequency is shown as negative, all correlations were identified as negative.

Table 80. Correlations frequency for sales and production changes (heterogeneous samples)

Dimensions	Characteristic	Index	Δ Production	Δ Employees	Δ Sales	Total
Firm	production	n° employees	-	3	1	**4**
		annual production	-	-	-	**-**
		output/employee	-	-	-	**-**
	innovation	equipment addition	3	3	3	**9**
		innovation staff	-	-	1	**1**
		products/innovation	-	-	-	**-**
		innovations/year	1	1	1	**3**
		new markets	1	1	2	**4**
		organization changes	4	4	4	**12**
		production changes	-	-	-	**-**
	experience	age	2*	-	2*	**4***
		neighbourhood dist.	3	3	1	**7**
		product price	-	-	1	**1**
		outside costumers	-	-	-	**-**
		institutional benefits	1*	1*	1*	**3***
	TOTAL FIRM CHARACTERISTICS		**15****	**16****	**17****	**48****
Outcomes	production performance	Δ production (%)	N/A	4	4	**8**
		Δ employees (%)	4	N/A	4	**8**
	sales performance	Δ sales (%)	4	4	N/A	**8**
	TOTAL OUTCOMES		**8**	**8**	**8**	**12**

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

Proximity dimensions analysis presents social proximity and the number of firms it interacts with, as the ones that more correlation evidence present, although some are positive and others are negative (most are negative in interaction and most are positive for social proximity). Among characteristics that evidence greatest frequencies are entrance to new markets (four positive correlations with social proximity and two for number of firms it interacts with), product price (four negatives for number of firms it interacts with and one for cognitive proximity) and performance (three negatives for number of firms it interacts with and one with organizational proximity).

Correlation among proximity dimensions and results (changes in sales and production level), stand out that heterogeneous samples only exhibit two correlations with the minimal frequency (*f*=1) among social proximity and results and none correlations with pairs.

Correlation among proximity indexes is concentrated (10 to 12 identified) among cognitive proximity, joint project index and the number of pairs each firm interacts with. Correlation frequency among cognitive proximity and joint innovation projects has the negative maximum (*f*=-4) and among firms it interacts with and joint innovation project index has the positive maximum (*f*=4).

For correlation among results (changes in production and sales level) and firm characteristics, organizational changes (*f*=4 in all results), equipment acquisitions (*f*=3 in all results), and distance from closest neighbours stand out. To lesser extent are those correlations with firm size (measured by employee number), entrance to new markets, firm age (negative correlations), innovations per year and search for institutional profits.

“El digerir, no el comer,
es lo que al cuerpo aprovecha,
y el alma, cuerpo invisible,
tiene que seguir tal regla”.

(Rafael Pombo, El niño y el buey, 1873)

6 DISCUSSION

Chapter for discussion is divided in five sections: 1) objectives recapitulation, 2) internal validity, 3) external validity, 4) comparison among results and literature, and 5) hypothesis contrast. Objectives recapitulation (§6.1), reviews aims of research, and the base for discussion in this chapter. Internal validity (§6.2), shows an approach to identified aspects that determine confidence level inside the research, obtained data quality, and the difficulties and instruments in data collection and analysis that affect negatively this research. In addition, contrast methods and validation of information are presented, as well as ways to overcome limitations. External validity (§6.3), explains arguments that allowed to establish the grade of application of obtained results in other local production systems (LPS). Comparison of results with literature (§6.4), relates identified differences and coincidences among previous research as is confronted with result obtained, and causes that justify differences are proposed. Finally, hypothesis contrast (§6.5), presents the level of acceptance of initial hypotheses and future work is proposed.

6.1 Objectives and purposes recapitulation

As it is determined in first chapters, **main objective** of this research is to establish correlations of proximity dimensions with innovation performance inside LPS. Complementary, first **specific objective** looks to identify correlations between size, innovation ability and experience of firms, with each proximity dimension with other firms in a LPS. Finally, **second specific objective,** looks to stablish correlations between firm characteristics and proximity dimensions with their outcomes three years before the interview.

This research funds on the purpose to search possibilities of *spillovers* profitability that small and medium firms located in industrial agglomerations without sufficient resources (economical, human or technical) have to achieve high level innovation, especially in productive sectors of intensive labour. Also looks to identify the level of profitability that firms with greater resources can make with local externalities.

6.2 Internal validity

To discuss internal validity of this research, described process in methodology, identified results and data analysis, are review here.

When information is collected and context of each sector is examined, some circumstances are identified that create controversial situations in the analysis. Differences as macroeconomic trends of each country (in Brazil positive indexes fell, while in Colombia increase), institutional support for productive sectors (in Brazil it is much more evolved than in Colombia) and existence of Colombian imports conditions that prevent footwear entrance below USD 5.00, that encourage general internal sales increase of footwear producers and suppliers.

On the other hand, information is collected through direct interviews to footwear producer firms in city of Jaú (September 2014) and Cali (March 2015). To establish which firms to apply the interview, two directories of firm associations for each region are obtained (*Sindicato da Indústria de Calçados de Jaú* –Sindicalçados Jaú– and *Unión Vallecaucana de Industria del Calzado* –Univac– in Cali) that account with 120 firms each and are randomly called until most interviews are obtained due to logistical limitations (ideally 40 for each region, but practically only 21 in Jaú and 32 in Cali are conceded). Contact method begins to have its first bias, since it depends on businesspersons will to concede interviews, and those who deny generally do it for not consider it useful (unnecessary waste of time), and consider their firm is small or few organized[22]. In this way, firms that agree to grant the interview are those that supposed themselves to have a better index.

At the moment of the interview it is observed that some firms tried to adjust answers to look more productive, efficient or innovative. Therefore, to obtain more truthful information, interviews look for answer details, that in many occasions are rectified by businesspersons themselves.

Data digitization is supported by completed questionnaires of the interviewer and audio of the interview, whose recording is authorized by 20 of 21 interviewers in Jaú and 31 of 32 in Cali; for the ones that did not authorized recordings, at the end of the interview and outside of the facilities, a recording is done trying to repeat answers of the businesspersons to avoid greater loss of information. Data digitization has additional filters, of information agreement, with firms database, and in comparison with indexes of other interviewed, so some answers are deleted (notes 12 [p.126], 13 [p.129], 14 [p.130], and 15 [p.130]).

Firms classification for results presentation and posterior analysis, and even though the methodology only poses a general analysis and their specific analysis by region, there are some differences and particularities of firms that take to raise more classifications (Table 32 p.124): total sample, filtered

[22] Gather perception from interviews of firms that allowed a wider dialogue beyond basic questionnaire.

sample (by component producers, micro firms, maquilas), group by region (Jaú and Cali) and by type of product (female and non-female footwear), for a total of ten samples by index. The aim of these groups is to identify if specific characteristic of some firms are affected according index and/or correlation to other, as is effectively detailed in results chapter.

For analysis, Spearman correlation use is based on data order rather than value, as occurs with Pearson correlation, due to results heterogeneity consistency in both regions. In practice, Spearman correlation is used in qualitative research and when data set is below 100. In this research, number of available interviews (53) and qualification of main indexes, plus firms heterogeneity (from small workshops with less than five employees, to large footwear exporters, going through diverse product typologies), the most appropriate is to use the Spearman correlation method.

Indexes comparison (24 in total) with all other, throws a total of 300 comparisons (24+23+22+…+3+2+1), that multiply by ten samples produces 3000 correlations in total. To organize all these correlations and guarantee adequate approach of the aims of the research, indexes are classified in three large groups (nominated in this research as dimensions): firm generalities, proximity dimensions and growth outcomes. Each dimension is divided by groups of characteristics and each group by indexes (firm: production [3 index], innovation [7], experience [5]; proximity dimensions: cognitive [1], organizational [3], social [1], institutional [1]; results: production performance [2], sales performance [1]). Afterwards, the analysis is cross classified among each dimension, and the correlation results of samples characterization by region and type are added, to complete a 4x4 matrix (Table 43 p.153). This matrix allows to identify six correlations groups: 1) correlation among firms characteristics and their levels in each proximity dimension; 2) correlations among levels of each proximity dimension and variation in production indexes, employee number and sales during the last three years; 3) correlation among firms characteristics and production, employees and sales variation; 4) correlation among proximity dimensions; 5) correlation among sales and product variation index; and 6) other correlation including region analysis and type of product with characteristics, proximity dimensions, and results characteristics, and with the ones that are produced among firms characteristics.

During analysis, main indexes correlations (proximity dimensions and growth, applicable to the first five groups described in previous paragraph) are presented with correlation value (Rho), significance level and number of pairs compared. Significance below 0.1 is highlighted with symbols and shaded to facilitate the description of the correlations found. Correlations with other indexes (characteristics, typology and region) are presented with strength characterization, significance and pairs included in correlation. These last correlations allow identifying adequate value measure, since many correlations

are identified among firm size and innovation, which have been included in technological management literature since 1980s. Each analysis section compares each data set with each firm classification (region, product typology, filtering) to identify behaviour patterns.

Besides, to establish indexes validity and their correlations, analysis carried out among self-firm dimensions (firm characteristics [§5.6.1 p.183], proximity dimensions [§5.4, p.174], and results [§5.5, p.180]), allow to identify indexes validity among themselves, since it allows to compare correlation levels and frequencies for each index, and identify fails or redundancies in measurements, as describe in each analysis.

Each step of the process allows establishing high reliability of data, since identified inconsistencies forced constantly data review and correlation application, which in turn leads to repeat processes several times to correct fails, that in few cases are about filtered.

6.3 External validity

This study has the purpose of generating some lessons learned that could be replicated in other similar studies and other contexts. Therefore, one of the biggest challenges is to propose a methodology that assure a significant possibility to generalize local production systems (LPS) that produce massive production goods for internal markets, labour intensive (fundamental characteristic for employee level) and that are located in Latin America. However, because of the depth of information register for each firm, a direct data catching methodology is chosen, that block a statistically representative sample to confirm that obtained results would be equivalent in other sectoral or regional contexts. Although, described generalization, is funded in the possibility that results and analysis applied in this research are useful to guide further studies

To solve search of generalization, manufacture sector selection supports on Scott (2006) that presents importance of economic activity of intensive labour and low technology sector, fundamental for development of some cities. For Scott, three of the manufacture sectors that most contribute to world production and marketing volume, are the textile, footwear and furniture. Footwear LPS are chosen in Jaú (SP, Brazil) and Cali (Valle del Cauca, Colombia), with which is possible to make comparisons due the number of firms, and simultaneous presence of small and large producers, besides, productive infrastructure network needed for their development (supply producers, traders, and guilds), generic characteristics also described by Scott. A difference in productive structure given by the presence of leather goods producers is marginal in Jaú, while more frequent in Cali, although this type of

interviewed firms are not included. Nevertheless, some of the interviewed firms, besides footwear, produce female purses and accessories.

LPS selection allows to identify different and at the same time similar behaviours in terms of proximity dimensions. At the same time, through interview, is possible to establish causes of such behaviours. Besides, comparison of each sectoral context allows identifying coincidence and political or cultural trend differences that explain behaviours.

From contextualization is possible to observe that LPS in Latin American have their origin with European migrants at the end of the XIX and the first half of XX century, that identified productive development possibilities, with a demand satisfied by handcraft (Schmitz, 1995). Physical and commercial access difficulties, added to protectionism policies through high import taxes to develop intern productive sectors, allowed firms growth, network creation and finally LPS strength, to attend the regional market, not even the national. However, since 1970s, international commercial flux of manufacture products started, allowing some countries to increase in exports, setting a new competitive system that consolidate in Latin America 1990s, in which there is no longer competition among neighbours of the same city but with LPS of other countries or regions. Producers approach to compete with price, since new markets differentiation or exploration has few resources to strengthen, took many firms to close, and to the constant cycle of firms creation with little lifetime in the market that still exists.

Public policies focus approach to copy successful models from other regions (initially North American and European, and Asiatic more recently), aiming to increase economical production and diminish unemployment, and looking to adapt more to particular circumstances of Latin America, but still do not adjust completely, and have not given sufficient to answer to importations of cheaper products and/or products with added value in their internal market, or to conquer external markets monopolized by Asian products, and among whom growth dynamics are notice as a measure of overcoming transportation gaps and world international trade.

Among interviews to heads of the sectoral union, reference documents or by means of the interview, there is no evidence of direct contact between both studied sectors. There is mutual unawareness of another studied region. The only sources of direct match are production equipment, and raw material and accessories sources: largest firms from both sectors manifested to acquire equipment in Rio Grande do Sul (Brazil), although firms in Cali have an additional supplier among other international options (North American, European and Asian), while there is one main supplier in Jaú.

However, as presented in results, many similitudes exists between both LPS regardless of the type of product they make. Setting of productive structure is very similar, with presence of large firms, simultaneously with small and medium producers that learned trade in the first firms and then became independent. Proportion makes the difference for this aspect: most firms in Jaú are medium (52% firms analysed have among 15 and 50 employees), while in Cali, smallest firms proportion is larger (69% firms analysed have 15 or less employees). Also for both cities, a wide structure of maquila exists, without association, but are referenced by interviewed. Supplies producers have two spotlights: one is large massive production, and the other provides customization services for insoles and soles. Although, culturally there is more distrust in Colombia than in Brazil (as an example of this, is the free availability of Jaú firms list[23], while in Cali, is only delivered under a confidentiality commitment), that is noticeable by interviews in relationship with pairs (*social proximity* [p.140] and *number of interactions* [p.140]) for both LPS. Academic trajectory of interviewees evidences that, for small and medium firms, people have low business training, and in many cases do not have technical formation for footwear manufacture, therefore, they depend enormously on spillovers (qualified workers hiring) and on guild support (technical and management update courses). Businesspersons concerns are very similar in quality, productive efficiency, product diversification, and marketing channels interests.

From differences among analysed regions, it is possible to confirm that are funded on two main issues: institutional and market structure. Concerning institutional issues, Brazil possess more solid industrial policies (although for interviewees are not sufficient) than Colombia, that evidence in the search for institutional support are evident (much more noticeable in Jaú than Cali), and organization by productive districts, present, organized and relatively recent in Jaú footwear sector, that have been promoted by local government and practically non-existent in Cali, product of productive dynamic and not of historically held public policies.

Regarding market structure, each one has its own conditions: metropolitan area of São Paulo for Jaú and metropolitan area of Cali for producers in the city itself. In the first case, footwear market of São Paulo is supply by several cities, each one specialized by its footwear type, in which Jaú focus on female footwear (17 of 21 interviewed firms produce female footwear, 3 produce components for female footwear, and only one produce child footwear). In Cali, the own city provides all footwear types, although mostly female (13 of 32 interviewed firms produce female footwear) also produce masculine footwear (5), different types (5), child (2), sportive (2), components (4) and a maquila that services different footwear types (1). There are other conditions of national structure: Jaú has the tradition to

[23] http://az545403.vo.msecnd.net/sindicalcadosjau/2015/05/relacao_de_associados-2015.pdf

supply different female footwear markets, which now have been diminished by entrance of new producers from northeast estates. In case of Cali, two productive centre (Santander and Bogotá) have traditionally supplied other regions of the country, therefore, only few firm (the largest from Cali) have national presence. There is a trend of medium firms to supply Colombian pacific markets, which traditionally have a strong presence of suppliers from Ecuador that became uncompetitive.

Difference of type of product origins other evidenced consequences on indexes, especially on innovation: while masculine, sport, and child footwear present slow changes over the time, female footwear must update constantly, answering to seasons changes, generally as product of international fashion trends. In the case of Jaú, dynamics of changes is remarkable, since seasonal changes are determinant to temperature and climatological changes among trimesters, while Cali has a stable climate, and temperature variation along the year is minimal (always warm). For firms with national markets, there is a similar situation: climate is stable along the year and does not change much due to seasons.

Indexes that present wide difference are on innovation area: production equipment, innovation team upgrade (quantity of assigned personnel and grades), number of innovations per year and changes in production, in which Jaú firms present higher indexes compared to Cali firms.

Similitude and differences contrast allows establishing which are homogeneous behaviour among both regions and among different type of product and that could be generalized to other LPS.

An aspect that could affect results generalization are particular situations that each sector is living at the moment of the interview (Jaú in September of 2014 and Cali in March of 2015). While importing manufacture (furniture, clothing and footwear) is growing for Latin American countries, each country has proposed differenced strategies to carry on with the situation. Colombia specific case, since 2013, fix an ad valorem tariff of 10% plus a specific tariff of 5 USD per gross kilogram to textile and footwear products,[24] which have effect until 2016 (withdrawn by ruling of the World Trade Organization, WTO), with huge effect on imports level that allowed producers (footwear and supplies) to have more competitive prices and higher profit margins. This way, in this research, Cali particular characteristics are affected with production level, employee number and sales increase by context situations, in which producers have few influence. This way, and as is described in results, in Jaú it is perceived during

[24] Decree 456 of 2014. *Ministerio de Comercio, Industria y Turismo de la República de Colombia*. Available in: http://www.mincit.gov.co/documentos/340/descargar.php?idFile=4320

interviews a pessimist environment of loss of competitiveness, while Cali has an optimistic environment.

Table 81 Correlations with most frequent proximity indexes

Index A (proximity)	Index B	Dim/Characteristic	Correlations (f)	Weak	Moderate	Strong
cognitive proximity	project index	proximity dimension	6*		4*	2*
social proximity	new markets	innovation	6	1	3	2
interaction application	social proximity	proximity dimension	6	2	4	
interaction	product price	experience	6*	4*	2*	
social proximity	age	experience	5*	2*	3*	
cognitive proximity	Δ employees	performance	5	3	2	
interaction application	product price	experience	4	1	3	
interaction	interaction application	proximity dimension	4*	2*	2*	
cognitive proximity	Δ production	performance	4	3	1	
project index	interaction	proximity dimension	4	3	1	
interaction application	age	experience	3*	1*	1*	1*
cognitive proximity	institutional benefits	experience	3	1	2	
interaction	products/innovation	innovation	3	1	2	
interaction application	new markets	innovation	3	1	2	
cognitive proximity	Δ sales	performance	3	2	1	
interaction	output/employee	production	3*	2*	1*	
social proximity	neighbourhood dist.	experience	2	1		1
cognitive proximity	products/innovation	innovation	2**		2**	
cognitive proximity	interaction	proximity dimension	2*		2*	
interaction	social proximity	proximity dimension	2*		2*	
cognitive proximity	product price	experience	2	1	1	
social proximity	annual production	production	2*	1*	1*	
social proximity	organization changes	innovation	2*	1*	1*	
social proximity	outside costumers	experience	2	1	1	
project index	Δ production	performance	2	2		
project index	Δ sales	performance	2	2		
interaction	new markets	innovation	2	2		
social proximity	innovations/year	innovation	2*	2*		
institutional proximity	annual production	production	2	2		
institutional proximity	innovations/year	innovation	2	2		
institutional proximity	Δ production	performance	2	2		

Notes: * Negative correlations. ** Negative and positive correlations. Correlations with frequency *f*=1 are not included: project index - output/employee*; interaction application - Δ sales; social proximity - n° employees*; social proximity - product price; social proximity - institutional benefits; cognitive proximity - neighbourhood dist.; project index - innovation staff*; project index - products/innovation; interaction - annual production; interaction - production changes; social proximity - Δ production; social proximity - Δ employees; social proximity - Δ sales; institutional proximity - n° employees; institutional proximity - product price.
Source: Own elaboration.

On the other hand, correlation identified among indexes may contribute to generalization grade of results to other LPS. Different divisions of interviews depending on the region they belong to, type of product and firm characteristics, that originated ten different samples (§4.1, p.123), allowed identifying correlations consistency. Presence of six or more correlations on Table 81 (correlation frequency with proximity dimensions index) and Table 82 (correlation frequency with sales and

production change index) prove that correlations present more in filtered than in non-filtered samples (five in each case), by region (four samples), or by type of product (also 4 samples), what makes them pretty consistent.

Indexes for each proximity dimension (Table 81), have only four correlations presence in six samples: cognitive proximity with project index, social proximity with entrance to new markets, interaction application with social proximity, and interaction level with product price.

Table 82. Most frequent correlation among production and sales changes indexes

Index A (performance)	Index B	Dim/Characteristic	Correlations (f)	Weak	Moderate	Strong
Δ production	Δ employees	performance	10		1	9
Δ production	Δ sales	performance	10		1	9
Δ employees	Δ sales	performance	10	1	5	4
Δ employees	neighbourhood dist.	experience	9	7	2	
Δ employees	equipment addition	innovation	8	5	3	
Δ production	neighbourhood dist.	experience	8	6	2	
Δ sales	equipment addition	innovation	7	4	2	1
Δ production	equipment addition	innovation	6	3	3	
Δ production	organization changes	innovation	5	3	2	
Δ employees	organization changes	innovation	5	3	2	
Δ employees	cognitive proximity	proximity dimension	5	3	2	
Δ sales	organization changes	innovation	5	3	2	
Δ production	cognitive proximity	proximity dimension	4	3	1	
Δ sales	neighbourhood dist.	experience	3	1	2	
Δ employees	n° employees	production	3	2	1	
Δ sales	cognitive proximity	proximity dimension	3	2	1	
Δ sales	age	experience	3*	3*		
Δ production	outside costumers	experience	2	1	1	
Δ production	age	experience	2*	2*		
Δ production	project index	proximity dimension	2	2		
Δ production	institutional proximity	proximity dimension	2	2		
Δ sales	new markets	innovation	2	2		
Δ sales	institutional benefits	experience	2*	2*		
Δ sales	project index	proximity dimension	2	2		

Notes: * Negative correlations. *Correlations with frequency *f*=1 are not included: Δ production - innovations/year; Δ production - new markets; Δ employees - innovations/year; Δ employees - outside costumers; Δ sales - n° employees; Δ sales - interaction application; Δ production - institutional benefits*; Δ production - social proximity; Δ employees - new markets; Δ employees - institutional benefits*; Δ employees - social proximity; Δ sales - innovation staff; Δ sales - innovations/year; Δ sales - product price; Δ sales - social proximity.
Source: Own elaboration.

Correlation frequency of four or five are probably generalizable, since level or surpass minimal application frequency by region and/or type of product. In this level are correlations: social proximity with age, cognitive proximity with changes in employee number, interaction application with product price, level of interaction with knowledge application as product of interaction, cognitive proximity with changes in production, and finally, projects index with interaction.

Correlations with changes in production and sales indexes (Table 82), present frequencies higher than innovation. Most frequencies are found among own result indexes, representative of high relation among production changes, employee number and sales. With values equal or superior to 6, correlations are among changes in employee number with distance from neighbours (9), changes in employee number with equipment acquisition (8), changes in production level with distance from neighbours (8), changes in sales level with equipment acquisition (7), and changes in production level with equipment acquisition (6). This way, a greater distance from neighbours (decentralization of location) and production equipment acquisition, become the greatest contributors to increase production and employee number.

Correlation with frequencies among four and five, are changes in employee number with organizational changes (5) and cognitive proximity (5); organizational changes with production level changes (5) and changes in sales level (5); and production changes with cognitive proximity (4). Although, these high correlation frequencies are not statistically representative to be considered generalizable, show research possibilities in other regional and sectoral context, since they identify relationships among observed phenomena.

Another main aspect in this type of analysis, is the level of coincidences with authors that have write on the issue using other regions as models, and look to establish the level of commitment of Boschma (2005), affirmations, that is discuss in the following section.

6.4 Literature results comparison

As describe in theoretical framework, there are multiple factors that affect knowledge flux. From Marshallian approach, efforts have been done to keep in the same region (and later in districts) local production to promote productive systems in which converge producers and suppliers, accompanied from logistic, and sales and distribution systems, taking advantage of the synergy of the systems and knowledge spillovers. However, many authors at the end of XX and beginning of XXI century, observed that not all firms localized in the same region, are part of the same regional productive system

Boschma (2005) proposes a theory in which establishes that geographical proximity is neither necessary nor sufficient to achieve learning and innovation among firms. With this premise, Boschma develops two postulations: as geographical proximity is not sufficient, other proximity dimensions are required to encourage knowledge exchange among firms, and, as geographical proximity is not necessary, can be supply by other proximity dimensions that supply physical closeness needs. From these postulations, Boschma proposes that five proximity dimensions exist that strengthen knowledge

flux in LPS: geographical, cognitive, social, organizational and institutional. Diverse authors have based on these proposals to deepen and study in different regions proximity dimensions and knowledge flux that will be presented in the following sections.

6.4.1 Physical proximity

Although the term used by Boschma (2005) is geographical proximity, defined by Marshall since 1920, understanding Local Production System (LPS) as a unit, this research approaches to physical proximity, understood as the distance among productive units inside a cluster. The aim to study physical proximity inside each LPS is to identify structures or differentiated behaviours, in a similar way as those identified by Giuliani & Bell (2005), associated to knowledge flux depending on its role activity, proving that cognitive ability of a cluster is determined by individual behaviours of each unit.

To solve the question on the definition of Martin & Sunley (2003) about limits of local productive agglomeration, this research establishes that the limit is the urban zone of each city, given than associated producers are identified to a guild in rural zones (tanneries in Cali) or in close cities (Jaú and Cali), that are not included for interview selection.

By the size of both regions (according to associates list, 120 footwear or component producer firms located in urban zone of each city), and following many definitions identify by Knoben & Oerlemans (2006), mean distance is calculated (in kilometres) straight line (by coordinates obtained with each firm address with the Google maps service) of 20 of the closest firms to each unit (of population total), and the index is classified as a characteristic for the firm, grouping indexes by experience.

Regarding total firms groups, it is identified that mean distance is one kilometre away, a little closer in Jaú (0.93 in complete and 0.97 in filtered sample) than in Cali (1.1 in complete and 1.16 in filtered sample). Correlation analysis identified with social proximity with very low frequency (*f*=2, Table 48, p.161) and cognitive proximity (*f*=1, Table 44, p.156), and with high frequencies with changes in production level (6 weak and 2 moderate, Table 73, p.200), number of employees (7 weak and 2 moderate, Table 74, p.201), and sales (1 weak and 2 moderate, Table 75, p.202). Correlation analysis among characteristics (Table 63, p.184), physical distance is correlated to equipment acquisition with low frequency (*f*=2), entrance to new markets (*f*=3) and product price (*f*=4).

High positive correlation among physical distance and changes in production level, sales and employee number, prove that firms that locate in places that are more crowded have lower performance, while the most distanced from neighbours have better performance. This results in authors previous to

Boschma (2005) would be contradictory since it is supposed that the greater physical proximity, greater would be to share tacit knowledge. However, is necessary to take care with this affirmation, since firms in Cali that are more distant among them, enjoyed tariff benefits (see footnote 24, p.217).

However, Boschma (2005) himself, proposes that excess of geographical proximity limits learning because generates confinement, promotes high specialization, and both loss the ability to new development adaptation. Results prove this confinement with low frequencies with proximity dimensions (in particular with social proximity: *f*=2, Table 48, p.161, with moderate correlation and another strong in filtered samples from total of firms and from non-female footwear), in which regions proximity is not observed. Boschma proposal is to establish links out of the region, which are identify here with external client indexes, search for new markets, and equipment acquisition (when firms are questioned for the origin of new machinery). In case of productive pairs, firms that collaborate with pairs in other regions are not detected. New machinery acquisition does not present lasting collaborations (that are important sources of knowledge), only sales services.

Correlations with external clients to main market, showed very low frequency, only with social proximity of Cali samples [*f*=2] and with production increase [*f*=2], and number of employees [*f*=1]. Compared to other characterization indexes (Table 63, p.184), level of external clients is correlated with high frequency (more than 5) with number of employees (negative correlation), annual production (negative correlation), annual production per employee (negative correlation), innovation team strength (negative correlation), and innovations per year (negative correlation); medium frequencies are identified (among 4 and 5) with equipment acquisition (negative correlation), organizational changes (negative correlation) and institutional benefits profit (negative correlation). All these negative correlations point that larger and efficient firms, with better innovation characteristics, tend to stay in main market and medium and small are the ones that have external clients. Although, according to Giuliani & Bell (2005) relationship to external sources of LPS are important to integrate and distribute new knowledge (*technological gatekeepers*), in this research firms that interact intensively with clients and at the same time relate to other firms, are not identified.

Entrance to new markets is more frequent in Cali than in Jaú, and in female than non-female footwear producer firms. Correlation is identified with level of interaction (*f*=2), knowledge application product of interaction (*f*=3), social proximity (*f*=6), production level changes (*f*=1), employee number changes (*f*=1), and sales changes (*f*=3), with negative correlation in annual production (*f*=5).

6.4.2 Cognitive Proximity

This research follows Boschma (2005), definition, in which cognitive proximity is similar at competence and abilities that allows effective communication and learning, it means, easiness to transfer and absorb knowledge, and uses Huber (2012) procedure to measure it, which establishes four dimensions for this proximity: technical language, product and technology concept, technical resolution terms of *know-what*, and problems resolution terms of *know-how.*

Hypothesis that firms with greater cognitive proximity have greater innovation indexes, without intend to establish causality principles (if best innovation indexes produce greater cognitive proximity, or opposite, if cognitive proximity improves innovation indexes), only has one contradictory correlation (in *f*=2, one is positive and another negative), for innovation indexes (Table 44, p.156 and Table 66, p.192) therefore, practically, there is no evidence for such hypothesis. Also, none correlation is found with production characteristics: for firm size, in literature there is no evidence of correlation with cognitive proximity; neither correlations are identified with efficiency (production per employee), therefore it cannot be confirm that efficiency is achieved with technical or methodological similarity of technological development of firms with their pairs. Finally, only few correlation among cognitive proximity with experience characteristics are identified (distance from neighbours *f*=1, product price *f*=2, institutional benefits profit *f*=3).

With other proximity dimensions, negative correlation is found with organizational proximity (with firms that developed innovation projects with others, and interaction level) proving that the greater cognitive proximity, less organizational proximity, it means that as the most easiness of knowledge flux with other firms, and more identify with the ways to develop products and produce from others, less joint projects would do and less would be the number of interaction firms. Finally, no correlation is identified with other proximity dimensions (neither social nor institutional: Table 66, p.192).

This results contradict literature proposals (Beccatini, 1990; Boschma, 2005; Giuliani & Bell, 2005; Huber, 2012; Lissoni, 2001; Storper & Venables, 2004) that fund their theories on the idea that firms good communication abilities and high cognitive proximity, would be keys to knowledge exchange with pairs. However, according with this research evidence, firms that have greater levels of cognitive proximity, relate less with other firms. It should be remembered that the interview asked firms for how many firms relates to and then proceeds to qualify the relation (origin of cognitive proximity indexes). This way, it is identified that firms with greater cognitive proximity (that properly relate to others), only do it with few firms, this means, their trust is on few pairs. Conversely, firms that interact with

large numbers, understand less with those pair that interact with (especially because they make innovation projects jointed, or to a lesser extent, because only exchange knowledge).

Concerning to changes in production and sales level, cognitive proximity is identified to correlate with medium frequency with changes in production level (annual production volume *f*=4; employee number *f*=5) and sales (*f*=3), that is why this proximity dimension effect is low on growth indexes.

Negative correlations with number of firms that interact with, and positive results of firms that have a properly cognitive proximity level, allow to conclude that more is not necessarily the best.

6.4.3 Organizational proximity

According with literature revision, and especially with Knoben & Oerlemans (2006), research, organizational proximity represents the ability to coordinate among agents to achieve an adequate interactive learning environment in LPS. Thereby, in this research, organizational proximity is approach from three index: 1) project index, that establishes number of projects executed in the last years and firms role in their; 2) interaction level, that inquiries on number of firms it interacts; and 3) interaction application, that questions if acquired knowledge in interaction is applied to the firm.

In first index, results presented on Table 67 (p.193), of correlation identified in project index with firms characteristics are low: in production, only one negative correlation (value of annual production per employee); in innovation, correlation is present in strength of innovation team (*f*=1; negative) and number of produced units per innovation (*f*=1). Organizational proximity presents optimal correlation levels with the other two proximity dimensions (*f*=6; negatives), and number of interaction firms (*f*=4). These last correlations are present in Cali and in non-female footwear producers. Finally, firms growth indexes present correlation with changes in production (*f*=2) and sales (*f*=2) level.

In second index, regarding correlation with number interaction firms (Table 68, p.194), many are identify with production characteristics: with annual production (*f*=1), and with employee results (*f*=3, negative), proving slightly that small firms with lesser productivity tend to interact with a greater number of firms. Correlations with innovation indexes identify: produced units per innovation (*f*=3), entrance to new markets (*f*=2), production changes (*f*=1); in the first case, it is about supply producers, which highly interact with clients and produce large amount of units per innovation. Experience indexes only have correlation with product price (*f*=6, negative), as product of two characteristics: component producers that have low price per unit, small and low efficient firms that offer low added value to their products.

In third index, correlation of interaction level (number of interaction firms) with other proximity dimension, present correlations with cognitive proximity (*f*=2, negative), with project index (*f*=4), interaction application (*f*=4, negative) and social proximity (*f*=2, negative). There are no correlations with results on production and sale changes. These results prove that again that more is not necessarily better, because firms that most interact have negative correlation with cognitive proximity, and it is related to communication and understanding ability. Moreover, interaction application, that should be a natural consequence of knowledge exchange, in which firms that most interact should apply more knowledge, present a negative correlation among these two index.

Correlations with changes application product of interaction is scarce (Table 69, p.195) Firm characteristics do not present correlations with production indexes, few correlation with innovation (new markets, *f*=3) and with experience, there are correlations with firms age (*f*=3, negative) and with product price (*f*=4). With other proximity dimensions correlations are identified with interaction level (*f*=4; negative) and with social proximity (*f*=6). With firm growth indexes there is a moderate correlation with sales increase (*f*=1).

These evidences point that firms that enter to new markets and have the highest product price, are more disposed to implement changes recommended by their pairs, and that younger firms are the ones that make the changes. Frequent correlation with social proximity proves that changes application is done by firms with high concern and commitment with pair with whom interact with.

Regarding authors, identified evidence relates Giuliani & Bell (2005) concepts of specific roles accomplishment of individual behaviours of firms, although there is no evidence of interacting components inside the system. Regarding to Boschma (2005), theory, lack of evidence can be related to organizational proximity weakness that might increase damage in knowledge exchange by increase of uncertainty and opportunism, which consequently affect coordination ability and access to complementary knowledge. Interviews that extend beyond the form, when businesspersons are questioned for the reasons for non-exchange of knowledge with other firms (close to 60% of firms do it, being lower the percentage in filtered samples and female footwear producers) or why they do not make joint projects, lack of confidence is mentioned, mainly due to lack of commitment of others when joint innovation experience is undertake.

6.4.4 Social proximity

According to Boschma (2005), social agreement and confidence relationships are the basis for knowledge flux. In this research, and based on Huber (2012) social proximity level is established on concern for pair wellness and commitment to support the other.

Evidence obtained in this research (Table 70, p.196) point that younger firms are more committed and concern for their pairs, while older firms loss that concern and commitment, even, the oldest ones never acquired it (age *f*=5, negative correlation). High correlations frequency among social proximity and entrance to new markets (*f*=6) points that firms entering new unexplored territories are also more concern and committed to their pairs. Besides frequent correlation with interaction application (*f*=6) is identified, establishing that not only exists concern and commitment to pairs, but also trust sufficient to apply share knowledge. Finally, low correlation with production and growth indexes are identified, that point at social proximity as indifferent to size, to efficiency, or to recent firm growths.

According to Boschma (2005) conclusions, in which low social proximity origins weakness among agents, is evidenced through results comparison, especially for product grouping (see Table 40 p.143, Table 41 p.145 and analysis p.149) where lower indexes are observed in female footwear firms, especially in filtered samples. Those firms present less correlations for contact with external organization (Table 48 p.161), although, they present greater confidence with firms with which they exchange information (Table 60 p.179). These results affirm Boschma ideas on lockage and isolation, at the same time of specialization.

6.4.5 Institutional proximity

Adequate institutional environment where consensus exist on standards and behaviour values are vital for knowledge exchange, according to Boschma (2005) and Knoben & Oerlemans (2006). Due to term amplitude and theories proposed by many authors (Belussi, 1999; Nelson, 2008; Nelson & Sampat, 2001), none authors are identified to analyse institutional proximity inside a LPS, and therefore no methods are established to obtain a level. This way, based directly on Paci, Marrocu & Usai (2014), definition, development areas of interest are compared among firms, in which interviewee is questioned for more emphasis topics of the organization in the last year. [25]. However, identified

[25] Ibid 5, p.65. Options: marketing channels; market diversification; product diversification; productive efficiency; knowledge management; market intelligence; internationalization; logistics; new technologies; quality; others.

correlations with institutional proximity (Table 71, p.197) evidenced scarce relationships with production, innovation, experience, the other proximity dimensions, and growth.

Starting from the hypothesis that belonging to the same gremial association with a good career (Sindicalçados Jaú, and Univac Cali) is possible to achieve high institutional proximity levels, as established by several authors(Belussi, 1999; Nelson, 2008; Nelson & Sampat, 2001), However, interviews show that businesspersons link to guilds aiming to get marginal profit (slightly larger than the investment, e.g.: updates, participation in fairs in the city or logistical support at fairs held in other cities), more than a true sense of belonging and collective construction of a LPS.

Obtained results contradict Belussi (1999) who describes that sectoral specialization with share origin produces an interactive knowledge system (entrepreneurship matrix, knowledge socialization among workers and employees) with a hierarchical structure that varies depending on firm proportion and characterization (handcraft firms, small producers, sub-hiring firms, medium-sized firms, large firms, etc.). Although, it is not possible to find such hierarchy in this research, since subsets producers existence is small and only present in maquilas. If well, in this research total and refined samples (not including maquilas, small-sized firms or supply producers) are analysed for each region and type of product, institutional proximity result is very similar in all samples (Table 35, p.128; Table 37, p.134; Table 38, p.135; Table 40, p.143; Table 41, p.145), except in Jaú that presents a slightly higher index, but does not show correlation (correlations are more evident for female footwear: Table 49 p.163).

6.5 Hypothesis contrast

To solve objectives, tables are made to discuss theoretical questions, main source of discussion, the construct, hypothesis, questions and index construction (§2.4, p.73). This section establish the grade of proposed hypothesis acceptance or rejection, using tables: the first one characterizes firms (Table 5, p.73), second one establishes the level of each proximity dimension (Table 6, p.76) and the third presents recent firms growth outcomes (Table 7, p.78).

Later, tables are made in which each hypothesis presents its evaluation (accepted, partially accepted, rejected or not evaluated). One hypothesis is accepted when all their assumptions are corroborated. Partially acceptation occurs when only some parts of the hypothesis present evidence of acceptation. A hypothesis is rejected when its arguments or the relation among them are not accepted. Finally, non-evaluation occurs when it is not possible to collect evidence to evaluate. All evaluations are presented linked to its respective evidence (made along the document), as well as its cause. Later, each hypothesis is discussed with the authors it is based.

6.5.1 Firms characterization hypothesis

For initial firm characterizations, 15 hypothesis are proposed (Table 5, p.73), from which three are accepted, two are partially accepted, five are rejected and five are not evaluated, according to collected evidence presented in Table 83.

Table 83. Firm characteristics hypotheses acceptance/rejection

Hypothesis	Evaluation	Evidence	Observation
1A. The greater production volume, the greater amount of processes innovation	Accepted	Table 63, p.184	Annual production presents moderate correlations among innovation team, and from moderate to weak with equipment acquisition, units produced per innovation, innovation per year, and changes in production.
2A. The greater employee number, the greater product innovation	Accepted	Table 63, p.184	Employee number presents moderate correlations with innovation team, and from moderate to weak with equipment acquisition, produced units per innovation, innovations per year, organizational changes and changes in production.
3A. The greater average sale price, the greater firm innovation	Rejected	Table 63, p.184	Most correlations are weak, and they focus on the innovation team. The other indexes have less than four and mostly weak correlations.
4A. Innovation activities diversity represents a greater innovation level	Not evaluated	-	Most of the interviewees answered affirmatively, so it was not possible to use the information. Possible question mistakenly asked.
5A. Launch of new products represents a greater level of innovation	Not evaluated	-	Businesspersons did not have the information available to answer this question.
6A. New materials incorporation represents a greater level of innovation	Not evaluated	-	Answers are ambiguous since the meaning of “new material” was not the same for all interviewees. Possible question mistakenly asked.
7A. The greater amount of machinery, the greater level of innovation	Rejected	Table 63, p.184	Correlations among equipment acquisition and other innovation indexes are weak and infrequent.
8A. A firm with recent organizational changes presents an increase innovation performance	Accepted	Table 76, p.203	Organizational changes present positive correlation with changes in annual production, number of employees and sales levels (*f*=5 for three cases).
9A. A firm with diverse markets has greater innovation performance	Partially accepted	Table 76, p.203	Correlation frequency among entrance to new markets and number of external clients with changes in annual production, number of employees and sales levels are very low.
10A. The greater innovation team strength, the greater innovation performance	Rejected	Table 76, p.203	No correlations are identified among the strength of the innovation team and changes in annual production, number of employees and sales levels.

Hypothesis	Evaluation	Evidence	Observation
11A. Participation in support programs is related to high institutional and social proximity	Rejected	Table 72, p.198	Correlations among participation in institutional profit programs and social and institutional proximity are very low or non-existents.
12A. A greater amount of years eases management. Too many years will encourage status quo maintenance	Partially accepted	Table 72, p.198; Table 76, p.203	No management indexes were defined therefore is not possible to correlate. However, correlations among age and indexes of proximity dimensions and growth show negative correlations with interaction application, social proximity, and with production and sales growth.
13A. Greater experience of the businessperson would ease firm management. Too many years would favour the status quo	Not evaluated	-	Ambiguous answers were obtained due to functional differences among as workers and as manager experiences, so this index is not included in the analyses.
14A. A greater number of business relationships increases firm information flux	Not evaluated	-	Interviewees stated that they do not have exact quantities to answer the questions associated with the hypothesis.
15A. A greater number of relations with innovation information, increases firm innovation capacity	Rejected	Table 46, p.159	The number of interactions with other firms shows low correlation frequency with number of units produced per innovation, equipment acquisition, entrance to new markets and changes in production indexes. There are no correlations with strength of the innovation team, innovations per year nor organizational changes indexes.

Source: Own elaboration.

Hypothesis 1A, which proposes that as greater the production volume, greater the amount on innovation in processes, based on observations from Barletta district, Italy (Boschma & ter Wal, 2007), footwear producer, is accepted by identified correlations. A second observation, not generalized, but present only in two samples (total and Jaú) is the negative correlation with social proximity, which could point that firms with greater production volume have less concerns and commitment with others. Opposite to this, positive correlation among two samples of female footwear (complete and refined), establish that firms with greater production volume, have similar concerns, although this finding could be due to their product homogeneity.

Based on Boschma & TerWal (2007) observations, **hypothesis 2A** is proposed, which establishes that, the greater the amount of employees, greater the amount of product innovations, for which evidence is collected in this research. Employee number index, correlated to proximity dimensions, presents a very low frequency, and is not possible to corroborate a hypothesis. Growth index presents correlation with increase in employee number from Cali complete sample and female footwear complete and refined samples (Table 54, p.171).

Hypothesis 8A, based on economic analysis of Schumpeter (1912), proposes that a firm with recent organizational changes presents increase of innovation performance, is accepted based on positive correlation with rise in production, employee number and sales, although negative correlation is identified with social proximity index.

Hypothesis 9A, supported on (1912), argumentation, on which a firm with greatest markets variety tends to obtain the greatest innovation performance, presents very low correlation frequency in this research. For entrance to new markets, only two weak positive correlations are found with sales increase (Table 55, p.173), in most heterogeneous samples (Cali complete sample and non-female footwear) and for the case of main market external clients, two positive correlations are found too (one weak and one moderate) present in most homogeneous samples (complete female footwear samples and refined sample from Jaú).

Hypothesis 12A, based on observations convergence in European (Boschma & ter Wal, 2007) and African (Gebreeyesus & Mohnen, 2013), sectoral footwear producers, establishes that the younger the firm is, the easier the management would be, while too many years would led to *statu quo*; therefore is partially accepted, since a negative correlation with interaction application, social proximity and production and sales increase is observed, which means second part of the hypothesis is accomplished (too many years led to *statu quo*). This hypothesis is partially accepted since there is no evidence for the first part.

Hypothesis 3A establishes that the greater the products mean sales price, greater is its innovation grade, and is funded on the idea that a high price product, has greater added value product of innovation. This hypothesis is rejected. From qualitative observation is possible to argue that this result is ought to its material value (mainly leather) which has tradition and market recognition, opposite to innovation ideals based on continuous change and client needs adaptation. However, product price is the characteristic with most correlation frequency with proximity dimensions (Table 72, p.198), especially a negative correlation with interaction level, that could propose a hypothesis on lesser the mean product price of a firm, greater is the need to look for relationship with other firms. Also, the fact that correlation is not present in Jaú and female footwear producer samples (Table 46, p.159), characterized by their homogeneity, points that firms look to relate with producers that do not represent direct competition. Other frequent correlations are product price with knowledge application product of interaction, more evident in homogeneous refined Jaú and female footwear samples (Table 47, p.160), and could propose a hypothesis on most homogeneous firms grouping, firms with greater added value apply more knowledge obtained from their pairs.

Hypothesis 7A, founded on Boschma & TerWal (2007) argument, is used in interviews to fix firms innovation processes level, establishes that the greater amount of acquired machinery, greater is the innovation level. However, with evidence gathered in this research, this index (acquired machinery) does not strongly and frequently correlate with other innovation index, and therefore is rejected.

Grounded on the idea that firms that have stronger innovation teams (with greater number of people, more dedication and more training), also growth more; **hypothesis 10A** proposes that, the greater the strength of the innovation team, greater is the innovation performance. In 30 possible correlations, only one positive weak was found with sales growth (Table 55, p.173). Although, in Jaú generalized negative growth is observed during the interviews, and in Cali, positive growth by circumstances beyond the LPS, as it is observed that in some firms, especially the largest, the potential of product innovation teams is not being tapped, and in some small firms, tapping some talented individuals very good results are achieve. These observations could be the cause to reject hypothesis 10A. This issue deserves a deeper analysis to establish innovation team performances, observation of their organization, methodologies, and implementation that productive organizations made of their results.

Hypothesis 11A, grounded on the idea of collective efficiency described by Schmitz (1999) and knowledge flux of Giuliani & Bell (2005), in which supports programs participation is related to high institutional and social proximity, in this research presents very low or non-existent correlations to institutional support programs. There is only moderate correlation with complete non-female footwear sample (Table 48, p.161) and none with institutional proximity (Table 49, p.163). Although in Cali, low participation of businesspersons in programs is generalized, due to difficulties to participate and a history of low obtained results, it should be observed correlation with other samples, but it does not happen. Correlation with social proximity presents diverse behaviours among those who look for institutional support: some show low commitment and empathy with pairs, but always look for their own benefit, and other are always looking to participate in every proposed program. Related to institutional proximity, lack of correlations with other indexes is more frequent, therefore, it is proposed that having similar concerns and belong to the same association is not sufficient to participate in collective efficiency.

Based on Giuliani & Bell (2005) proposal of cognitive structure and Gebreeyesus & Mohnen (2013) observed behaviours in which firms with multiple interactions are knowledge transmitters and therefore vital for systemic behaviour of innovation for LPS, **hypothesis 15A** establishes that the greater the number of information for innovation relationships, more increases innovation ability for firms, it means a firm is not only a knowledge transmitter, but also taps them. This hypothesis questions interviewers about number of firms they have exchange information in the last three years

and compares their answers with innovation characteristics. This hypothesis is rejected since correlation have very low frequency.

The reason to obtain this results is due to firms that interact the most, are inefficient (showing negative correlation among interaction and results by employee), have low product price and low cognitive and social proximity (Table 68, p.194). Affirming this behaviour is attributable to firms that are looking for competitive development with foreign ideas, that constantly change production and organization without finding solutions to their problems (inefficiency, low added value), without securing knowledge and methodologies (reason for low cognitive proximity) and low concern in their pairs (low social proximity). This leads to a lack of correlation among interaction and growth level. The unique index that can support the original hypothesis of consulted authors is that firms with high interaction levels, also present good levels of organizational proximity, as it is established based on joint projects elaboration with other organizations, key activities for flux or knowledge strength Affirming this behaviour is attributable to firms that are looking for competitive development with foreign ideas, that constantly change production and organization without finding solutions to their problems (inefficiency, low added value), without securing knowledge and methodologies (reason for low cognitive proximity) and low concern in their pairs (low social proximity). This leads to a lack of correlation among interaction and growth level. The unique index that can support the original hypothesis of consulted authors is that firms with high interaction levels, also present good levels of organizational proximity, as it is established based on joint projects elaboration with other organizations, key activities for flux or knowledge strength (Storper & Venables, 2004).

6.5.2 Proximity dimensions hypothesis

Proximity dimension index initially proposed eleven hypothesis (Table 6, p.76), of which two are accepted, three are partially accepted, four are rejected and two are not evaluated, according to evidence presented in Table 84.

Table 84. Proximity characterization variables

Hypothesis	Evaluation	Evidence	Observation
0B. Firms located in an industrial district in a region have more interaction than those who are not.	Rejected	Table 46, p.159	There is no evidence of correlation among distance from neighbours and level of interaction indexes.
1B. Greater communication is an evidence of greater cognitive proximity	Not evaluated	-	Communication easiness is a component for calculation of cognitive proximity index.

Hypothesis	Evaluation	Evidence	Observation
2B. A greater similarity in technical language is an evidence of greater innovation intensity	Rejected	Table 66, p.192	Technical language is included within the cognitive proximity index, which does not show correlation with innovation indexes.
3B. Firms production technology with similarity present a greater cognitive interaction	Partially accepted	Table 56, p.175	Similar productive technologies are included in the cognitive proximity index that correlates with the level of interaction only in non-feminine footwear firm sample.
4B. Firms with greater product innovation technologies similarity present greater cognitive interaction	Partially accepted	Table 56, p.175	The similarity of innovation methodology is included in the cognitive proximity index that correlates with the level of interaction only in the sample of non-female footwear firms.
5B. A greater similarity in technical knowledge application evidences a greater innovation intensity	Rejected	Table 66, p.192	Similarity in application of technical knowledge is included in the cognitive proximity index, which does not show correlation with innovation indexes.
6B. Previous acknowledge level is the basis to improve interaction	Not evaluated	-	No analysis method was defined for the question: What type of relationship do you have with the people assigned to the firms with which you collaborate? (Family; Friendship; Joint projects; Neighbours; others)
7B. Grade of concern is basis to good relationships	Accepted	Table 60, p.179	Personal concern is part of the social proximity index that shows frequent correlation with application of knowledge product of interaction with other firms.
8B. Commitment grade evidences relationship grade	Accepted	Table 60, p.179	The degree of commitment is part of the social proximity index that shows frequent correlation with application of knowledge product of interaction with other firms.
9B. Participation and management of projects are an evidence of greater organizational proximity	Partially accepted	Table 57, p.176	Organizational proximity was assessed in three indexes: participation in projects, level of interaction and knowledge application. The first index is frequently correlated with level of interaction, but there is no evidence of correlation with knowledge application.
10B. A greater institutional proximity would present similar interest with collaborators	Rejected	Table 61, p.180	Institutional proximity index does not show correlation with any other proximity dimension.

Source: Own elaboration.

Based on Huber (2012), **hypothesis 7B** is proposed, establishing that personal concern grade is the base of a good relationship. In the same way, **hypothesis 8B** establishes that the grade of commitment is related to the grade of relationship. In this research, as well as Huber (2012), personal concern is averaged with commitment to obtain social proximity. Results match since strong correlations are found among social proximity and interaction application, proving relationship quality because it trusts

knowledge gather by communication with other organization. However, correlations have greater strength in homogeneous environments (Jaú and female footwear, greater index in refined samples). On the other side, number of firms with which interacts present negative and low frequency correlations (*f*=2), that could manifest that firms trust more in a limited number of firms.

Supported by productive technologies and production innovation methodologies similitude described by Lissoni (2001) and Huber (2012), **hypothesis 3B** is proposed: "firms with similar production technologies present greater cognitive interaction" and **hypothesis 4B**: "the greater product innovation methodology similitude, greater cognitive interaction". For the two hypothesis, both indexes are included in cognitive proximity index, together with three index as is done in Huber (2012) methodology. Cognitive proximity correlation with interaction index (number of firms it relates with), negative correlations are identified only with non-female footwear, this is, in most heterogeneous samples. This behaviour cause since female footwear firms, unlike other footwear producers, produce similar products among them and point to same markets (proving this by low amount of external clients), in which other producers are direct competitors, and therefore tend to have few knowledge exchange with pairs (see Table 40 p.143, Table 41 p.145, and observations p.148). Besides, no correlations are found among knowledge application and cognitive proximity (Table 56, p.175).

Hypothesis 9B, based on Boschma (2005) and Knoben & Oerlemans (2006) definitions on organizational proximity, establishes that projects participation and management are evidence of greater organizational proximity. This hypothesis is partially accepted since three of the index with which organizational proximity is measured (project participation, interaction level and knowledge application), correlate frequently the first with the second, while does not present correlation with the third. Correlations among project participation and interaction are only present in more heterogeneous samples (complete and refined samples of Cali, and non-female footwear). Therefore, it can be established that firms that interact the most, at the same time make more joint projects, but not necessarily apply acquired knowledge. Two reasons can be pose for this behaviour: first, firms look to relate to firms that are not direct competitors (produce a different type of footwear) and second, at the moment of implementing must make adaptations of its own product and production system, considering that firms do not directly apply acquired knowledge from others.

Regarding rejected **hypothesis, 0B** establishes that firms located in industrial districts inside a region tend to interact more than other that are not, based on discussions posed since Marshall. However, criticism done by Martin & Sunley(2003) on cluster definition, and other terms to refer to LPS, attempt to establish if physical distance among production units have some sort of influence on the level of interaction with pairs, establishing the average distance of 20 of the closest firms (gathering

coordinates in map and calculating distance as hypotenuse of a triangle rectangle). Evidence does not reflect correlation among average physical distance with neighbours and number of interactions. Regarding other proximity dimensions (Table 72, p.198), physical distance presents low frequency (*f*=1 with cognitive proximity, and *f*=2 with social proximity; *f*=0 for other proximity dimensions), therefore is not possible to establish a hypothesis about. Opposite, a good quantity of frequencies with positive correlation with firms growth are present (Table 76, p.203), especially with production and employee number, being able to establish that performance is not based on knowledge flux product of proximity dimensions but in other aspects as logistics that is related to physical distance.

Based on Lissoni (2001) description of the need of a code for interpretation of tacit knowledge, and cognitive dimensions of Huber (2012), propose of **hypothesis 2B** and **5B** establish that a greater similitude of technical language and application of technical knowledge, evidence greater innovation intensity, it means, that comprehension of technical knowledge and acknowledgement of similar technical applications used from pairs, leads to greater innovation intensity. As well as done by Huber (2012), cognitive proximity in this research is gather from several dimensions average including technical language similitude and application of technical knowledge. In this research hypothesis 2B and 5B are rejected because gather evidence does not identify correlation among cognitive proximity and innovation index. In the same way, review of correlation among cognitive proximity and other proximity dimensions (Table 66, p.192) shows unexpected results: negative correlation with project index and interaction. As explained before, (§6.4.2 p.223), these results can be read as if firms that interact with less firm, comprehend and recognize more easily with them. However, positive and frequent correlation with production growth and employee number, that in any case pushes technical comprehension with pairs as important.

Finally, **hypothesis 10B**, based indirectly on Paci, Marrocu & Usai (2014), methodology, which looks to compare development interest among firms, and proposes greater institutional proximity, presents interest similitude among collaborators, is rejected since institutional proximity index does not correlate with any other proximity dimension. In general, institutional proximity correlation with production, innovation, experience, proximity dimensions and growth indexes, showed very low frequency (*f*=8), compared with other proximity dimensions (Table 72, p.198), being less than half of proximity with the second lowest frequency (organizational proximity, *f*=17). For growth results, institutional proximity only has two weak positive correlations with production growth (Table 50, p.164) that do not allow generalization to pose a correlation hypothesis.

In this way, two possible causes for this result are pose: 1) used index is not adequate to measure institutional proximity; and/or 2) institutional proximity in selected samples is very homogeneous to

establish correlations with any other index. For the first cause, it is noticeable that, even though institutional proximity is defined and described by many authors (Belussi, 1999; Boschma, 2005; Knoben & Oerlemans, 2006; Nelson, 2008; Nelson & Sampat, 2001), only one research defines a methodology to identify institutional proximity index (Paci et al., 2014) although is made for analysis among many LPS and not inside, which is the aim of this research, therefore, method homologation to examine institutional proximity inside a LPS is not appropriate. For the second cause, index values are among 0.37 and 0.72, with a mean and median of 0.59 and standard deviation of 0.09 (Table 35, p.128) inside a theoretical range among zero (0: complete difference among actors) and one (1: complete equality among actor), there is a range wide sufficient to establish correlations, especially for Spearman method that is based on values ordering.

6.5.3 Production and sales variation hypothesis

For firms growth indexes, four hypothesis are originally proposed (Table 7, p.78), of which only two are partially accepted, one rejected and one not evaluated, according to evidence presented in Table 85.

Table 85. Characterization variables for innovation performance

Hypothesis	Evaluation	Evidence	Observation
1C. The greater production volume, the greater innovation process	Partially accepted	Table 53, p.169	Positive correlations among percentage increase production with equipment acquisition and organizational changes are evidenced; there are not correlations with changes in production.
2C. The greater employee number, the greater amount of product innovation	Partially accepted	Table 54, p.171; Table 63, p.184	No correlation is found among percentage increase in employee number and number of innovations per year. However, there are frequent (*f*=10), strong (*f*=4) and moderate (*f*=5) correlations among number of employees and number of innovations per year.
3C. A greater sales percentage of new products in total sales volume represents greater innovation efficiency	Not evaluated	-	Interviewees did not have information to answer the question: “How much of sales percentage in the last year relates to new product models of the last three years?”
4C. Sales volume variation is related to firm innovation levels	Partially accepted	Table 55, p.173	Variation in sales is frequently correlated with equipment acquisition and organizational changes, and to a lesser extent with entrance to new markets. No frequent correlations are identified with strength of the innovation team, units produced per innovation, innovations per year, nor changes in production.

Source: Own elaboration.

Hypothesis 1C, based on Boschma & TerWal (2007), findings, establish that, the higher the production volume, higher the amount of innovation in processes, and it is accepted partially since there are correlations with three of two innovation index related to production processes of this research. Those who evidence correlation are equipment acquisition (*f*=6) and organizational changes (*f*=5), and the one that does not evidence correlation has production changes (*f*=0). Boschma & TerWal (2007), research found that process innovation is established by the number of technicians included in adaptation and innovation processes, that in this research are equivalent to innovation team strength (index affected by number of people assigned, besides training, experience and dedication), and no correlation is found with this index. Difference could be due to clearness in assignation of Barletta productive system to employee functions, while in Jaú and Cali, employees have many more assigned functions, and it is not possible to measure them with the calculation formula establish in this research (note 3, p.74). Besides high correlation with other firm growth indexes (Table 76, p.203), production growth is positively and frequently correlated to average distance of closest firms, and with cognitive proximity, and that is why physical proximity should be encourage (industrial districts) and knowledge exchange.

Hypothesis 2C, based on Boschma & TerWal (2007) observations, establishes that the increase in employees is associated to the amount of product innovations, and is partially accepted since in this research a weak correlation (with very low frequency, *f*=1) among increase in employee number and product innovations per year; Boschma & TerWal (2007) claim that new materials adoption must be review by the number of employees to avoid underestimation of innovation performance of small firms, it means that grow the most and increase their employees, and should have correlation with innovation index. However, although there is no significant correlation among the number of innovations per year and increase in employee number, frequent correlations are identified among employee number and innovation index: equipment acquisition (*f*=8), innovation team strength (*f*=8), produced units per innovation (*f*=5), innovations per year (*f*=10), organizational changes (*f*=7) and production changes (*f*=6). A similar behaviour is obtain with annual production volume. However, when is compared with productivity (annual production volume per employee), correlations with innovation are only present for innovation team strength (*f*=7) and number of innovations per year (*f*=4) that resembles Boschma & TerWal (2007) research.

Finally, **hypothesis 4C**, funded in general innovation association, establishes that sales volume variation is related to firm innovation levels, and is accepted partially in this research, since frequent correlation are found in two innovation indexes, less frequent correlations in one index and very low or absent correlations with four indexes. Higher frequency and strength correlation are identify with

equipment acquisitions (*f*=7) and organizational changes (*f*=5), and less frequency with entrance to new markets (*f*=3). Low frequencies, together with weak correlations, are found with innovation team strength (*f*=1), and number of innovation per year (*f*=1), while correlation with produced units per innovation and production changes are absent (*f*=0).

Other findings, that are not included in the hypotheses, are correlation with indexes associated with firm experience, with low frequency correlations, evidence negative correlations with age (youngest firms have a slightly trend to increase sales) and institutional benefits profit (maybe firms with problems look for more support).

“Los niños habían de recordar por el resto de su vida
la augusta solemnidad con que su padre se sentó a la cabecera de la mesa,
temblando de fiebre, devastado por la prolongada vigilia
y por el encono de su imaginación,
y les reveló su descubrimiento.

-La tierra es redonda como una naranja.

Úrsula perdió la paciencia.
«Si has de volverte loco, vuélvete tú solo -gritó-.
Pero no trates de inculcar a los niños tus ideas de gitano»”.

(Gabriel García Márquez, Cien años de soledad, 1967)

7 CONCLUSIONS AND RECOMMENDATIONS

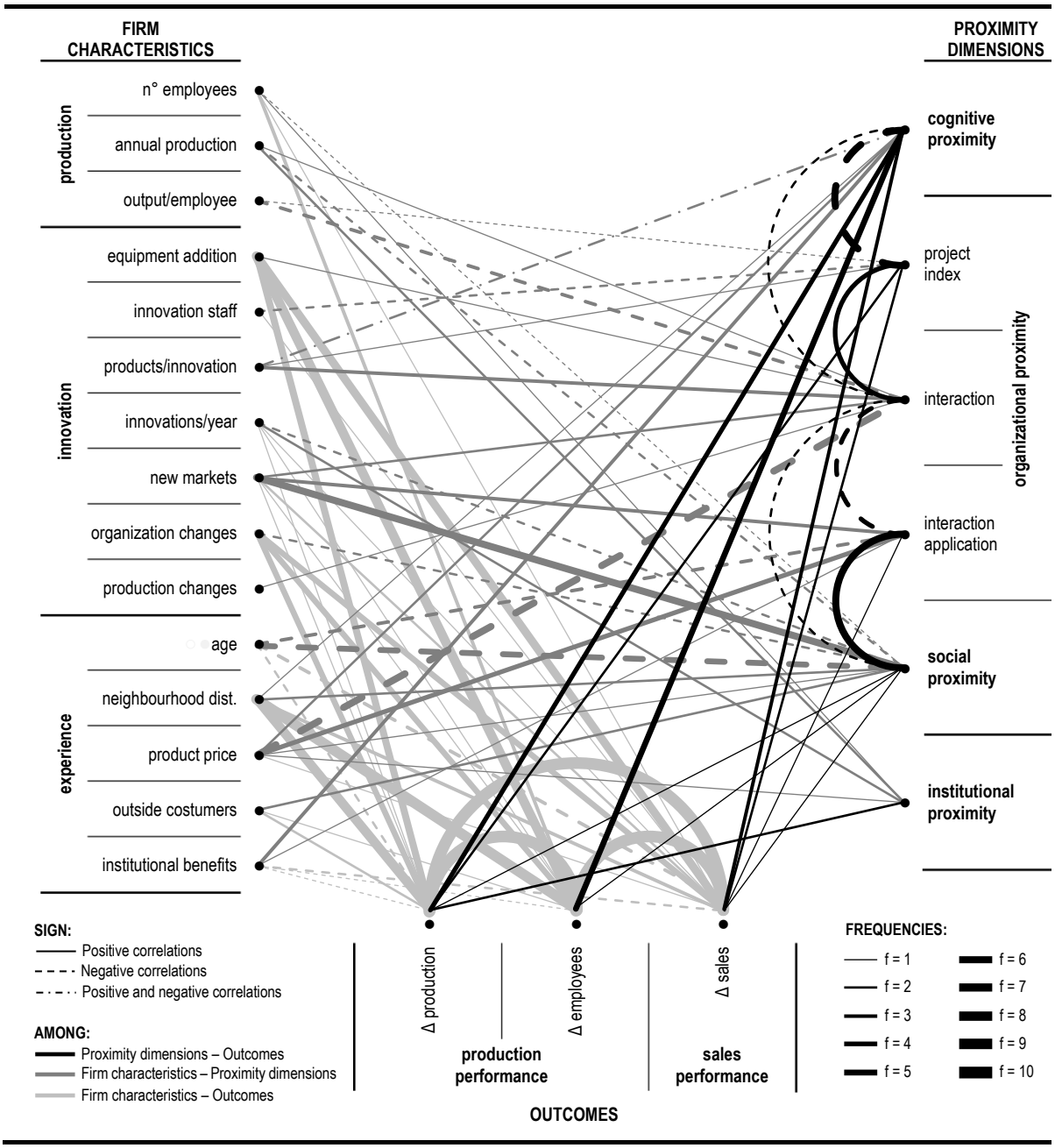
Starting from the general hypothesis that supports the objectives of this research (general objective: to stablish the correlation of proximity dimensions with innovation performance inside LPS) that firm characteristics of size, innovation and experience are correlated with each proximity dimension indexes (cognitive, organizational, social, institutional), and at the same time, the same indexes correlate with growth, 53 footwear firms were interviewed at Jaú (São Paulo, Brazil) and Cali (Valle del Cauca, Colombia) and two guild representatives (Sindicalçados in Jaú and Univac in Cali), that allowed collected information comparison.

To stablish the grade of the relationship, not only correlation among indexes is applied in total sample to stand whether there is or not correlation, but also ten samples are defined to classify firms according to their characteristics (city, type of product, firm size and outsourcing grade of productive activities) and to stablish a correlation grade. Initially, five samples are obtained: total sample (N_{total}=53), Jaú ($N_{Jaú}$=21) and Cali (N_{Cali}=32); female footwear producers (N_{fem}=30), and non-female footwear producers (masculine, mix–masculine and female–, child, sportive, components, and maquila service providers; N_{nofem}=23). The last five samples correspond to the previous five first filtered, to which approximately 30% of firms are subtracted due to presentation of differences in their indexes (component producers, have less than five employees, or use maquila as part of production). Therefore, the following samples are obtained: total filtered (N'=38), Jaú filtered ($N'_{Jaú}$=15), Cali filtered (N'_{Cali}=23), female filtered (N'_{fem}=25), non-female filtered (N'_{nofem}=13).

Correlation frequency synthesis among the total ten samples is presented in Figure 9 (data obtained from Table 72, p.198 and Table 76, p.203). Correlation frequency is observed (from f=1 in which there is only one correlation among ten analysed samples, to f=10 in which correlation among indexes presents in all analysed samples) as well as sign (positive correlations with continuous line, negative correlations with short lines and mix correlations with short dotted line).

Figure 9 includes three ranges of colour to classify each objective: general objective (to stablish correlation among proximity dimensions and innovation performance) presented in black; the first specific objective (correlation among firm characteristics and proximity dimensions) distinguished in medium grey and the second specific objective (relation among firm characteristics and results) presented in light grey.

Figure 9. Correlation frequency among firm characteristics, proximity dimensions, and production and sales level changes (total sample).

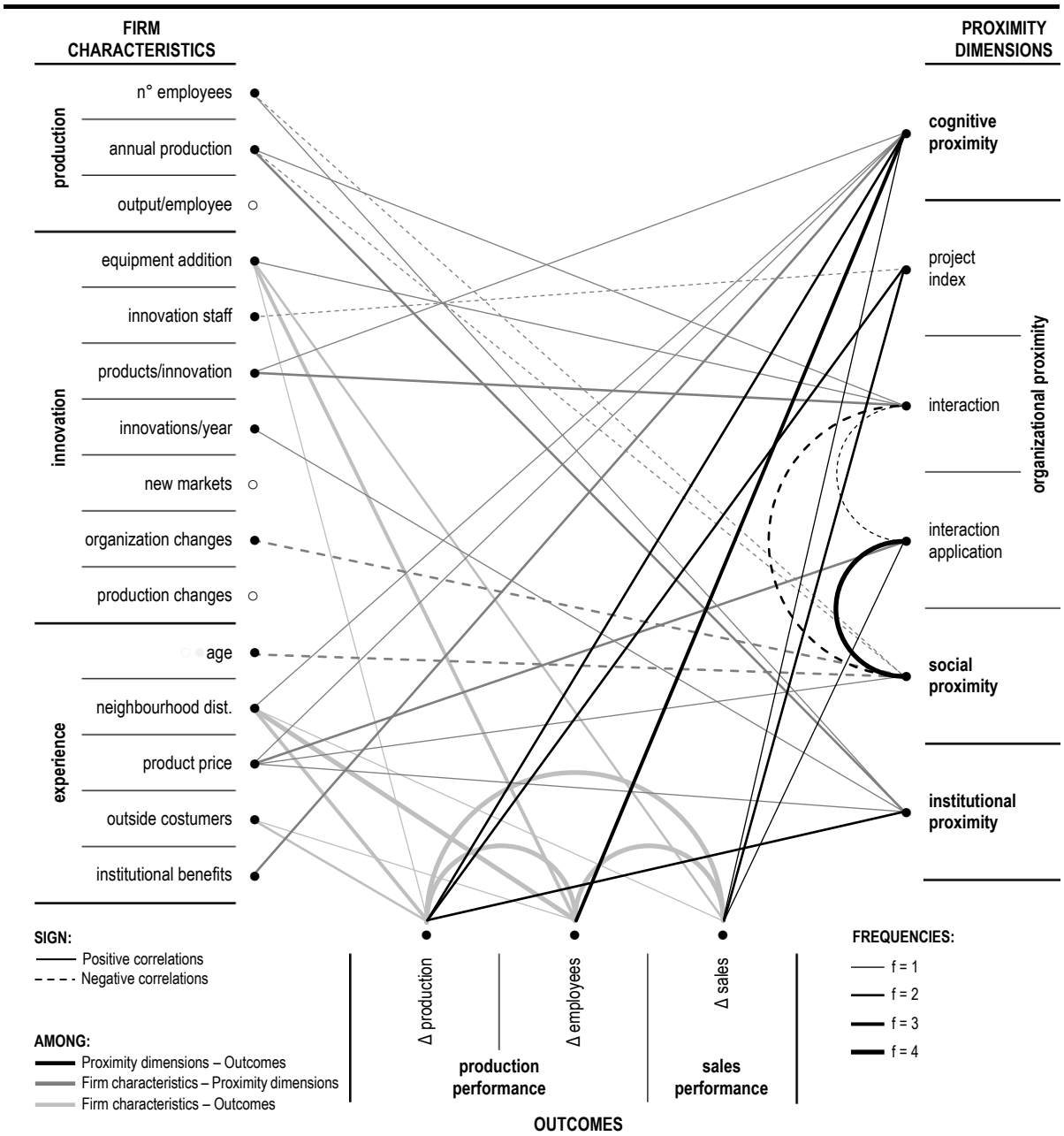


Source: Own elaboration.

Although graphic synthesis represents high information density, is evident that correlations among proximity dimensions and results (changes in production level, employee number or sales) are lower than expected. There is correlation for the three results only for cognitive and social proximity, although the last one with very low frequency. From a maximum of 30 (ten correlations with three result index), cognitive proximity obtained 12 correlations, and social proximity three. Organizational proximity presents four correlations (only with production and sales changes).

Firms that make projects with other firms, present correlations with production and sales changes (there is no correlation with employee number). Finally, knowledge application product of information exchange with pairs is correlated with changes in sales, and institutional proximity correlates with changes in production. Number of firms with which exchanges are done do not manifest any correlation with firm results.

Figure 10. Correlation frequency among firm characteristics, proximity dimensions and production and sales level changes (homogeneous samples: Jaú, female footwear).

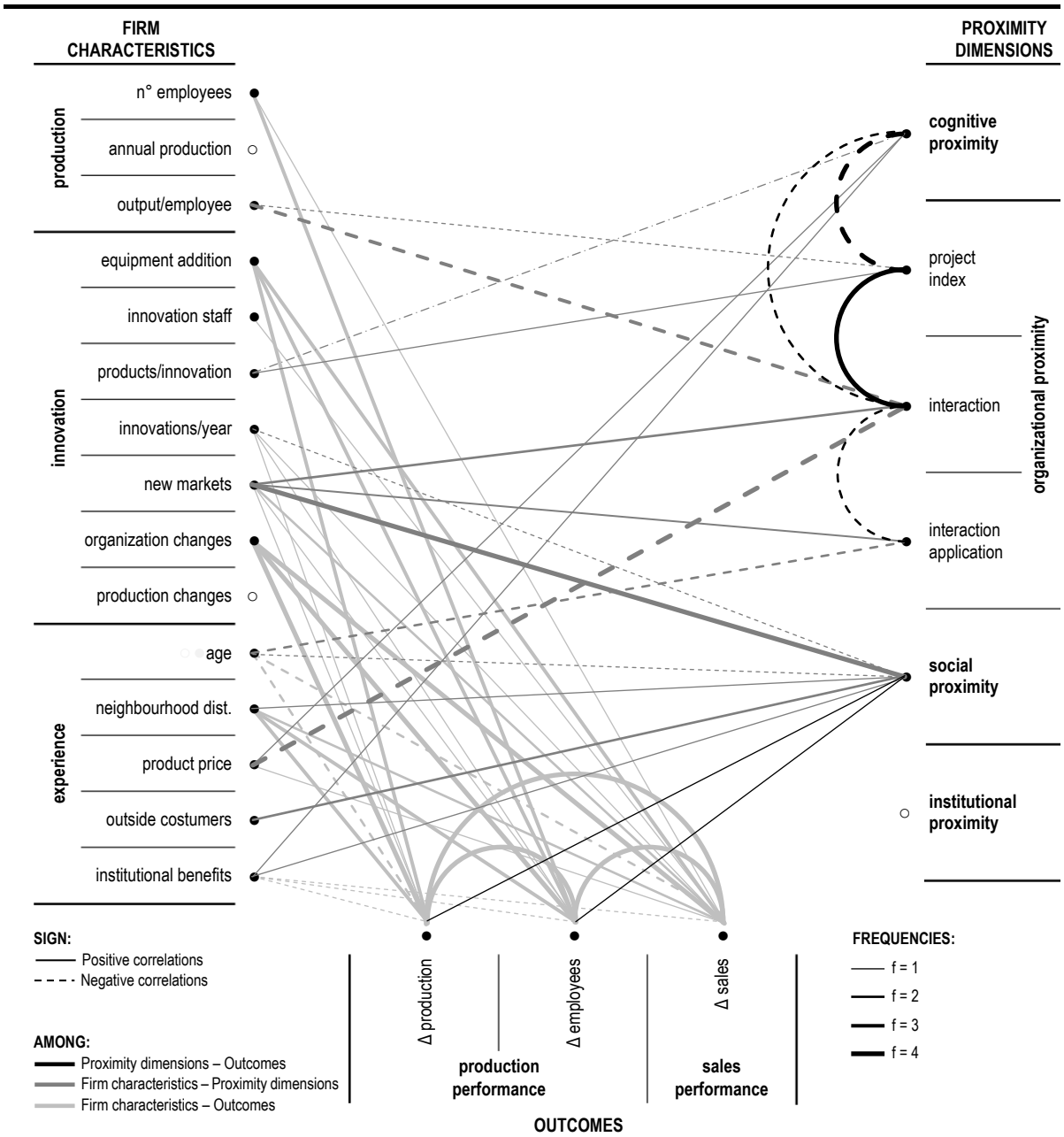


Source: Own elaboration.

The first specific objective, that aims to identify relationships among firm characteristics and proximity dimensions, shows that correlations are not as frequent as expected (Table 72, p.198). Three

production characteristics (that identify size and efficiency) present few correlations to proximity dimensions. From seven innovation indexes, only two present some frequencies: entrance to new markets and product per innovation. From five experience indexes, two have correlation frequencies: negative for age (show greater index for proximity dimensions in younger firms), positive and negative for product price (negative for interaction and positive with almost all the rest).

Figure 11. Correlation frequency among firm characteristics, proximity dimensions and production and sales level changes (heterogeneous samples: Cali, non-female footwear).



Source: Own elaboration.

The second specific objective, that aims to compare firm characteristics to recent growth, shows much more correlations to it than to proximity dimensions (Table 76, p.203). Outstand by their frequency correlations found with equipment acquisition, organizational changes and distance from neighbours.

Besides, proximity dimension indexes correlate frequently among them, although with positive and negative results. Institutional proximity shows neither correlation to other proximity dimensions or to firm characteristics. While firm results show an opposite situation: correlation present the greatest frequency (*f*=10) among them.

However, as shown along results, analysis and discussion chapters, among firm groups some differentiated behaviours are present. Thus, results are filtered: firms with homogeneous behaviour (defined by Marshall, 1890; Arrow, 1962; Romer, 1986; Glaeser et al., 1992) in Figure 10 data from Table 77, p.204 and Table 78, p.205), and heterogeneous behaviour (defined by Jacobs, 1969) in Figure 11 (data from Table 79, p.206 and Table 80, p.207).

Presentation of both figures shows different trends among them.

The first big difference is that homogeneous samples show practically all correlations among proximity dimensions and firm results, while heterogeneous samples show scarce correlation. With these facts, general objective of this research that aims to identify correlation among proximity dimensions and firm results, it can be affirmed that this correlation only manifests in homogeneous behaviour samples, where has greater frequency with cognitive proximity (measured in this research by easiness in communication with pairs, technical language similitude, productive technologies, product innovation methods and technical knowledge applications), with alliances to execute joint projects (joint innovation projects manage ability), and to lesser extend knowledge application product of interaction and institutional proximity (similar concern of pairs in the same regions). Social proximity (concern for pair wellbeing and commitment to help them when need it) and the number of pairs they interact with do not have any correlation.

In an opposite way, heterogeneous samples evidence only two correlations, with frequency of one (*f*=1) among social proximity and results (production level and employee number changes).

In relation to correlation among firm characteristics and proximity dimensions, homogeneous samples (described by MAR theory) and heterogeneous (described by Jacobs) match by similar frequency in the number of correlations with social proximity (the greatest in both cases) and the number of firms it interacts with.

Thus, to synthesize findings that support objectives conclusions for this research, global results are not shown (total sample), or groupings characterization that were shown in results (§4.1, p.123: complete samples and filtered from total sample, Jaú, Cali, female footwear and non-female footwear) and analysis chapters (§5, p.153), but in homogeneous and heterogeneous samples, that allows a more coherent presentation to cited literature (§1, p.37). This way Table 86 presents correlation frequencies differences among firm results and proximity dimensions, to answer general objective of this research: to stablish correlations of proximity dimensions with innovation performance. Table 87 gathers frequency differences of correlation among proximity dimensions and firm characteristics, to answer the first specific objective: to identify correlations of firm characteristics and proximity dimensions with their outcomes in the last three years. Finally, Table 88 joins up correlation frequency differences among firm results and their characteristics, to answer the second specific objective: to relate firm characteristics with its results.

Table 86. Correlations frequency among changes in production and sales levels and proximity dimensions (classified by homogeneous and heterogeneous samples)

Index		homogeneous samples Table 77			heterogeneous samples Table 79			Observations
		Δ Production	Δ Employees	Δ Sales	Δ Production	Δ Employees	Δ Sales	
cognitive proximity		2	3	1	-	-	-	Cognitive proximity of homogeneous samples, a high correlation frequency (*f*=3) is identify with the increase in employee number, and to lesser extend with increase of production (*f*=2) and changes in sales (*f*=1). Heterogeneous samples do not evidence correlations.
organizational proximity	project index	2	-	2	-	-	-	Development of joint innovation projects evidences mild frequency with increase of production (*f*=2) and sales (*f*=2). Heterogeneous samples do not evidence correlations.
	interaction	-	-	-	-	-	-	No correlations are identified in any of the samples.
	interaction application	-	-	1	-	-	-	Changes based on knowledge exchange with pairs evidence low frequency (*f*=1) with sales increase in homogeneous samples. Heterogeneous samples do not evidence correlations.
social proximity		-	-	-	1	1	-	Increase in production and employee number correlates with social proximity in heterogeneous samples. Homogeneous samples do not evidence correlations.
institutional proximity		2	-	-	-	-	-	Among institutional proximity and increase production correlations are identify in homogeneous samples (*f*=2). Heterogeneous samples do not evidence correlations.
TOTAL		**6**	**3**	**4**	**1**	**1**	**-**	All correlations are positive. Most correlations are found in homogeneous samples (13 of 15).

Note: Maximum frequency is f_{max}=4.
Source: Own elaboration.

In relation to correlation among proximity dimension and firm results (general objective: Table 86) all identify correlations are positive, it means that in all cases, the greater the proximity index, greater is the result on firm growth (in terms of production, employee number and sales), which is a coherent result to the hypothesis which was intended to demonstrate. However, most correlations identified are found in homogeneous samples (13 of 15: 86.7%), especially for increase in production and to lesser extend for sales and employee number increase, situation that points out that proximity dimensions only have a significant effect on LPS with homogeneous behaviour (specialized in few types

of product), while those with heterogeneous behaviour (diverse and surrounded by other type of sectors) only have few correlations with social proximity.

Table 87. Correlations frequency among proximity dimensions and firm characteristics (classified by homogeneous and heterogeneous samples)

	Index	homogeneous samples Table 77						heterogeneous samples Table 79						Observations
		cognitive proximity	organizational proximity	interaction	interaction application	social proximity	institutional proximity	cognitive proximity	organizational proximity	interaction	interaction application	social proximity	institutional proximity	
production	n° employees	-	-	-	-	1*	1	-	-	-	-	-	-	In homogeneous samples, the largest firms show greater institutional proximity, while the smaller firms show greater social proximity. Heterogeneous samples do not evidence correlations.
production	annual production	-	-	1	-	1*	2	-	-	-	-	-	-	
production	output/ employee	-	-	-	-	-	-	-	1*	3*	-	-	-	In heterogeneous samples, firms with less performance interact more often with other firms and execute more joint projects with pairs. Homogeneous samples do not evidence correlations.
innovation	equipment addition	-	-	1	-	-	-	-	-	-	-	-	-	In homogeneous samples, only one correlation is identified among equipment acquisitions and number of pairs it interacts with. Heterogeneous samples do not show correlations.
innovation	innovation staff	-	1*	-	-	-	-	-	-	-	-	-	-	In homogeneous samples, only one correlation is identified among strength of innovation team and innovation projects with pairs. Heterogeneous samples do not show correlations.
innovation	products/ innovation	1	-	2	-	-	-	1*	1	-	-	-	-	The number of products produced per innovation shows positive correlations with cognitive proximity and with number of pairs it interacts with in homogeneous samples. For heterogeneous samples, there is a negative correlation with cognitive proximity and positive with joint innovation projects.
innovation	innovations/ year	-	-	-	-	-	1	-	-	-	-	1*	-	The number of innovations per year is identified with a positive correlation with institutional proximity in homogeneous samples and a negative with social proximity in heterogeneous samples.
innovation	new markets	-	-	-	-	-	-	-	-	2	1	4	-	Entrance to new markets shows, in heterogeneous samples, positive correlation in social proximity (in all samples) and with number of pair it interacts with (*f*=2) and knowledge application product of interaction. Homogeneous samples do not evidence correlations.
innovation	organization changes	-	-	-	-	2*	-	-	-	-	-	-	-	In homogeneous samples, firms that have done organizational changes show less social proximity with pairs. Heterogeneous samples do not evidence correlations.
innovation	production changes	-	-	-	-	-	-	-	-	-	-	-	-	No correlations are identified in any of the samples.
experience	age	-	-	-	-	2*	-	-	-	-	2*	1*	-	In both samples (homogeneous and heterogeneous), young firms have greater social proximity (concern and commitment for pairs).
experience	neighbourh. distance	1	-	-	-	-	-	-	-	-	-	1	-	Distance from neighbours evidences positive correlations with cognitive proximity in homogeneous samples and with social proximity in heterogeneous samples.
experience	product price	1	-	-	2	1	1	1	-	4*	-	-	-	Firms with the more expensive products show a positive correlation with cognitive proximity (in both samples) and with social and institutional proximities (in homogeneous samples). Knowledge application product of interaction shows correlation with greater frequency (*f*=2) in homogeneous samples. In all heterogeneous samples, a negative correlation is identified with the number of pairs it interacts with.
experience	outside costumers	-	-	-	-	-	-	-	-	-	-	2	-	Presence of clients outside main market shows correlation in heterogeneous samples with social proximity. Homogeneous samples do not show correlations.
experience	institutional benefits	2	-	-	-	-	-	1	-	-	-	1	-	Search for institutional profit shows correlations with cognitive proximity in homogeneous samples (*f*=2) and heterogeneous (*f*=1). In heterogeneous samples, one correlation is identified with social proximity.
TOTAL		**5**	**1***	**4**	**2**	**7****	**5**	**3****	**2****	**9****	**3****	**10****	**-**	In heterogeneous samples, correlations with proximity dimensions are negative with some characteristics and positive with other. In homogeneous samples, correlations remain positive for all characteristics, except for social proximity (six of seven negative correlations) and joint innovation projects index (one negative correlation).

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

Besides, not all proximity dimensions have similar frequency. Cognitive proximity shows the greatest correlation frequency with results (in particular with increase in employee number). Second place is for firms that execute joint innovation projects with other firms that evidence correlations for growth with production and sales. Other outstanding factor is interaction (number of firms it exchange information and knowledge with) which does not show correlation with any of two samples grouping, even when it was supposed that the greater the interaction, greater the results, proving that is more important the quality than the quantity of relationships.

Correlations among fifteen firm characteristics with proximity dimensions (first specific objective: Table 87), are different among both samples (e.g. entrance to new markets is the more frequent characteristic for heterogeneous samples, while homogeneous samples do not show any correlation), and in some occasions, present opposite sign: while correlations are mostly positive in homogeneous samples (70.8%), these are less prevalent in heterogeneous samples (51.9%). However, the number of correlations are similar in both cases: 24 and 27 total correlations for homogeneous and heterogeneous samples, respectively.

Another identified behaviour strongly differentiated among homogeneous and heterogeneous samples is: while heterogeneous samples have positive and negative correlations in all cases for each proximity dimension (e.g. social proximity only has six positive correlations and four negative; and the number of firms it interacts with has seven negative and two positive correlations), in four of six indexes correlations are totally positive in homogeneous samples (exceptions for organizational proximity with one negative correlation, and social proximity which had six of seven negative correlations).

Correlations among firm characteristics and growth results (second specific objective: Table 88), four significant situations are identified: the first, that most correlations are positive (58 of 65: 89.2%), in which only age and acquisition of institutional profits are negative, with low frequency in heterogeneous samples; the second finding is that most correlations are found in heterogeneous samples (48 of 65: 73.8%); the third, that from fifteen characteristics, only two (equipment acquisition and distance from neighbours) show correlations in both samples groupings (homogeneous and heterogeneous); and the fourth, that several studied characteristics do not show any correlation (annual production, performance per employee, products per innovation, and production changes) or scarce correlations (one correlation: strength of innovation team, product price; three correlations: innovations per year, presence of clients outside main market, and acquisition of institutional profit).

Characteristics with greater frequency were equipment acquisition (fifteen correlations, with nine from heterogeneous samples), distance from neighbours (fifteen correlations, eight in homogeneous samples), and organizational changes (twelve correlations, all in heterogeneous samples). For the rest, which obtained less than four in correlation frequency (four correlations: employee number, entrance to new markets, age; three correlations: innovations per year, clients outside main market, acquisition of institutional profit; one correlation: strength of innovation team, product price).

Table 88. Correlations frequency among changes in production and sales levels and firm characteristics (classified by homogeneous and heterogeneous samples)

	Index	homogeneous samples Table 78			heterogeneous samples Table 80			Observations
		Δ Production	Δ Employees	Δ Sales	Δ Production	Δ Employees	Δ Sales	
production	n° employees	-	-	-	-	3	1	In heterogeneous samples, firms with greater number of employees tend to grow more and increase their sales. Homogeneous samples do not evidence correlations.
production	annual production	-	-	-	-	-	-	No correlations are identified in any of the samples.
production	output/ employee	-	-	-	-	-	-	No correlations are identified in any of the samples.
innovation	equipment addition	1	3	2	3	3	3	Equipment acquisition for production facility evidence high correlation frequency in heterogeneous samples and medium frequency in homogeneous samples.
innovation	innovation staff	-	-	-	-	-	1	Strength of innovation team only shows correlation with sales increase in heterogeneous samples. Homogeneous samples do not evidence correlations.
innovation	products/ innovation	-	-	-	-	-	-	No correlations are identified in any of the samples.
innovation	innovations/ year	-	-	-	1	1	1	Number of innovations per year evidence a correlation with each index measured in heterogeneous samples: increase of production, employees and sales. Homogeneous samples do not evidence correlations.
innovation	new markets	-	-	-	1	1	2	In heterogeneous samples, entrance to new markets shows low correlation frequencies for increase in production and employee number, and medium correlation frequencies with increase in sales. Homogeneous samples do not evidence correlations.
innovation	organization changes	-	-	-	4	4	4	Total heterogeneous samples show correlations with organizational changes for all firm results increase. Homogeneous samples do not evidence correlations.
innovation	production changes	-	-	-	-	-	-	No correlations are identified in any of the samples.
experience	age	-	-	-	2*	-	2*	In heterogeneous samples, medium negative correlation frequencies are identified among firm age and production and sales increase. Homogeneous samples do not evidence correlations.
experience	neighbourh. distance	3	4	1	3	3	1	Distance from neighbours evidences high correlations with sales increase and employee number in both homogeneous and heterogeneous samples. For sales increase, frequency is low.
experience	product price	-	-	-	-	-	1	Product price only shows correlation with increase in sales in heterogeneous samples. Homogeneous samples do not evidence correlations.
experience	outside costumers	2	1	-	-	-	-	In homogeneous samples, presence of clients outside main market evidences medium and low correlation with production changes and employee number. Heterogeneous samples do not evidence correlations.
experience	institutional benefits	-	-	-	1*	1*	1*	In heterogeneous samples, acquisition of institutional profit shows low negative correlation frequency (f=1) with increase in production, employee number and sales. Homogeneous samples do not evidence correlations.
	TOTAL	**6**	**8**	**3**	**15****	**16****	**17****	Correlations among firm characteristics and their results converge in heterogeneous samples (48 of 65). Most correlations for all samples were positive (except for age and acquisition of institutional profit).

Notes: * Negative correlations. ** Negative and positive correlations. Maximum frequency is f_{max}=4.
Source: Own elaboration.

Before making recommendations over results, is important to highlight that although correlations among proximity dimensions and firm growth have low frequency (slightly higher than cognitive proximity in homogeneous samples; Table 86), some firm characteristics show much more correlation with growth (in equipment acquisition and distance from neighbours, in both samples groupings: Table 88), which is confirm by scarce correlations and lack of consistence (positive and negative results, uneven frequencies) among proximity dimensions and firm characteristics (Table 87).

Based on evidences, it can be concluded that proximity dimensions are not a direct vehicle to achieve firm growth, since only cognitive proximity shows persistent correlations with al growth indexes, just for homogeneous samples, while that same proximity shows fewer correlation with studied characteristics. In other words, although some characteristics show good correlations with proximity dimensions, finally the only proximity dimension that relates to effects on growth is cognitive proximity (measured in this research by communication easiness with pairs and by similitude on the technical language, knowledge and production, and similitude on creation of new products); and any firm characteristic that correlates frequently and positively with cognitive proximity (in any of the samples groupings).

These evidences differ from Boschma (2005) approach, since frequent correlations are expected among proximity dimensions and firms grow. Even, though in this study it was expected to find correlation among proximity dimensions and firm characteristics (aiming to stablish incentive policies for characteristics that strengthen proximity and consequently growth), it is found that firms behaviour is so heterogeneous and that correlations are found according to sectoral characteristics, if it is a specialized (homogeneous) or diverse (heterogeneous) sector, which returns to the discussion of the differences in the model proposed by MAR theory (Glaeser et al., 1992) and Jacobs (1969).

From an academic point of view, this research recommends that increasing the number of cases of similar research is important, to increase correlation certainty (ρ, Spearman Rho), especially by the subdivision that can be done later to classify the findings. However, is not an easy issue, due to logistic and financial difficulties for interviewing a larger number of businesspersons, and to confidence barriers, since each appointment is an arduous activity that requires follow-up and perseverance.

It can be considered that comparison of two similar LPS by productive sector (footwear) and size (120 firms associated in a city), but located in different countries (Colombia and Brazil) with different characterization (one sector specialized in female footwear in a small town with 0.14 million inhabitants, and another with product diversity, immerse in a metropolis with 2.37 million inhabitants), are research strength that allow to point at uneven behaviour along different samples, but is necessary

to increase number of assessed firms so correlation application (especially of smallest samples) has sufficient data to develop a model. Although no correlation was left undone for lack of data (24 indexes compared each, in 10 samples, for 3000 correlations in total), surely, evidence could adjust to more available data.

Another subject that might adjust identified correlations (or their shortage), especially those done with proximity dimensions, are the measurements. Although each one is based on authors that have found some correlations (except for institutional proximity and joint project index), such research was done in other LPS types, oriented to services providers, or with a larger technological base, that obeys to have greater formation level (staff training) than the identified in manufacturer LPS. Although this research focus on manufacturer LPS, due to its relevance in employee levels of countries of medium technological development, for being labour intensives, of low technological level and low infrastructure requirements, footwear was chosen as the behaviour of example, although is important to apply this type of research to other sectors of this type that were identified by Scott (2004): clothing and furniture.

To end with academic recommendations, this type of research is generally based on firm natural behaviour observation, it means that it is identified without previous activity, how it behaves under determined circumstances. However, aiming to implement sectoral development strategies at a general level, and to business at a particular level, it could start by making research with experimental methods, to observe behavioural changes of firms when they are under the incentives of change in relation to their proximity dimensions: interlocution with a greater number of pairs, suppliers and clients, as well as greater product innovation and joint process levels, and greater concern and commitment levels with others. These researches requires a lot of work, initially by behavioural inertia of businesspersons, who, in interviews express the most to be satisfied with their relationships levels with others, and therefore is necessary to do many activities that modify uncertainty and help to overcome bad experiences, that most firms base their few (or null) relationships. Besides, when changes are going to be measure, complexity of the research is greater, due to existence of more than one group to assess, and must take into account that some firms might leave actions at different stages of the development of the research.

In relation to public policy recommendations, this research offers basis to clarify why some changes work and other do not work: behaviour is not even, although is about firm with similar characteristics. Even behaviour can be opposite depending of sectoral characterization (specialized or diversify), such as evidenced in Table 86 to Table 88. That is the reason why is relevant to recognize the firm type (homogeneous or heterogeneous behaviour) that is identified in this research by type of product and

approach to market that presents, since its determination will alter the type of incentive needed to set what could or could not work, in terms of production, innovation, experience and proximity dimensions to achieve growth changes of firms (production level, employee number and sales volume).

Another usual idea, to support large firms that would have major growth, is not evident in this research, since correlations among firm size and production and sales growth are slightly frequent, and it is why generalized incentives are recommended without caring about firm size.

Finally, it can be mentioned as firm recommendations that, although few relationships among proximity dimensions and firm growth are evident, it is important to exchange knowledge among firms, identify communication channels, to stablish a common technical language, to know about their production technologies, innovation methods and technical knowledge. Making exchange with lots of firms is not really important, but having a good relationship (in terms of knowledge, confidence, concern or mutual commitment) with some of them and developing of joint innovation projects.

At individual level, equipment acquisition to update production, to keep a distance greater than one kilometre with main production centres (districts or neighbourhoods according the regions where interviews were developed) and apply organizational adjustments, were firm characteristics that most correlate with the greatest growth (increase of production, employee number and sales).

“Somos enanos,
pero enanos subidos sobre los
hombros de aquellos gigantes,
y aunque pequeños,
a veces logramos ver más allá de su horizonte”.

(Umberto Eco, El nombre de la rosa, 1980)

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APPENDIX A – FIRM QUESTIONNAIRE (JAÚ)

ESCOLA POLITÉCNICA DA UNIVERSIDADE DE SÃO PAULO

DEPARTAMENTO DE ENGENHARIA DE PRODUÇÃO

PESQUISA SOBRE PROXIMIDADES ENTRE AS EMPRESAS PARA A INOVAÇÃO (JAÚ, SP, BRASIL)

Realização entrevista: Data: ____ / ____ / ____ Hora Inicio: ____:____ Hora Final: ____:____

IDENTIFICAÇÃO DE ENTREVISTADO

Nome: _____

Cargo: _____ Tempo de empresa: _____

Formação: _____

Atividades anteriores: _____ (ligadas?)

IDENTIFICAÇÃO DA EMPRESA

Nome: _____

Número funcionários#: _____ (médio no ano)

Data fundação: _____ Inicio produção de calçado: _____

Experiência do empresário: _____ (anos)

Endereço: _____

Bairro: _____ CEP: _____ Tel.: _____

PRODUÇÃO

1. Quais são os tipos de produtos da empresa? _____
2. Qual o preço de venda médio?$ _____
3. Quantos pares de sapatos foram produzidos no último ano?# _____ (media mês, semana, dia)
4. Qual foi a variação da produção nos últimos três anos?% _____ (↗→↘)
5. Qual foi a variação do número de funcionários na empresa nos últimos três anos?% _____ (↗→↘)
6. Qual foi a variação nas vendas nos últimos três anos?% _____ (↗→↘)
7. A empresa realizou alguma(s) das seguintes atividades nos últimos três anos?

   □ Fortalecimento da qualidade □ Melhoria do design

   □ Investimento em máquinas □ Aumento na variedade de produtos

   □ Capacitações de funcionários □ Outras _____
8. Quantas máquinas novas a empresa instalou nos últimos três anos?# _____
9. A empresa realizou mudanças organizacionais nos últimos três anos? Quais? _____

   _____
10. A empresa começou a produzir para novos mercados nos últimos três anos? Quais? _____

    _____
11. Quantos novos materiais a empresa usou nos últimos três anos?# _____ Quais? _____

12 --►

INOVAÇÃO

13. Quantos produtos novos foram lançaram nos últimos três anos?# _____

14. Quantos desses produtos ainda são produzidos atualmente?# _____

15. Qual a porcentagem de vendas do último ano que corresponde aos novos produtos?% _____

16. Como a empresa obtém informações sobre as tendências no design? _____

_____

17. A empresa tem uma área de inovação? _____ produto? _____ processo? _____

18. Quantas pessoas trabalham nessa área? _____ (# e dedicação de cada)

19. Qual é o nível de formação delas? Até ensino médio# _____ superior# _____ +na área# _____

20. Qual é a experiência delas em inovação? +3 anos# _____ Em outras empresas# _____

RELAÕES ORGANIZACIONAIS

21. Qual é o numero atual de empresas fornecedoras?# _____ Quantas são locais?# _____

22. Qual é o número atual de empresas clientes?# _____ Quantas são locais?# _____

23. Nos últimos três anos a empresa trocou informações e/ou experiências com outras empresas procurando melhorar a sua produção ou o seu produto? Com quantas?# _____

    Quais?[3] _____

24. As mudanças na sua empresa basearam-se nessas trocas de informações/experiências? _____

_____

25. É fácil ou difícil se comunicar com as empresas com as quais a empresa trocou informações/experiências?
    muito difícil [1] [2] [3] [4] [5] muito fácil

26. A linguagem técnica entre empresas é diferente? muito parecido (m.p.) [1] [2] [3] [4] [5] muito diferente (m.d.)

27. As suas tecnologias produtivas são diferentes das outras empresas? (m.p.) [1] [2] [3] [4] [5] (m.d.)

28. As suas maneiras de fazer novos produtos são diferentes das outras empresas? (m.p.) [1] [2] [3] [4] [5] (m.d.)

29. Os conhecimentos técnicos dos funcionários são diferentes comparados com os conhecimentos das outras empresas?
    (m.p.) [1] [2] [3] [4] [5] (m.d.)

30. Quão grande é a sua preocupação pelo bem-estar das pessoas com as que têm trocado informações / experiências de melhorias? muito pouca preocupação [1] [2] [3] [4] [5] muita preocupação

31. Se uma pessoa de outra empresa que já colaborou com você pede a sua ajuda durante a metade de um dia da sua jornada de trabalho, o quanto você se sente comprometido em ajudá-la? muito pouco [1] [2] [3] [4] [5] muito comprometido

32. Qual é o tipo de relacionamento que você possui com as pessoas que trabalham nas empresas com as quais têm colaborado? □ familiar; □ amizade; □ projetos conjuntos; □ vizinhança; □ outros _____

33. A empresa se beneficiou de programas de apoio público em atividades de inovação? Quais (atividades e instituições)? __

_____

_____

34. Participou conjuntamente com outras organizações em projetos de inovação de produto/processo nos últimos cinco anos? Em quantos?# _____ Há quantos anos?# _____ Qual o seu papel (coordenador ou participante)? _____

_____

12. Selecione na lista a seguir as quatro principais áreas de interesse desenvolvidas pela empresa no último ano:

□ canais de comercialização
□ diversificação de mercados
□ diversificação de produtos
□ eficiência produtiva
□ gestão de conhecimento
□ inteligência de mercados
□ internacionalização
□ logística
□ novas tecnologias
□ qualidade
□ outras? quais? _____

APPENDIX B – FIRM QUESTIONNAIRE (CALI)

ESCOLA POLITÉCNICA DA UNIVERSIDADE DE SÃO PAULO
DEPARTAMENTO DE ENGENHARIA DE PRODUÇÃO

UNIVERSIDAD NACIONAL DE COLOMBIA
FACULTAD DE INGENIERÍA Y ADMINISTRACIÓN

INVESTIGACIÓN SOBRE PROXIMIDADES ENTRE LAS EMPRESAS PARA LA INNOVACIÓN (CALI, VALLE, COLOMBIA)

Realización entrevista: Día: ____ / ____ / ____ Hora Inicio: ____:____ Hora Final: ____:____

IDENTIFICACIÓN DEL ENTREVISTADO

Nombre: _____

Cargo: _____ Tiempo en la empresa: _____

Formación: _____

Actividades anteriores: _____ (¿relacionadas?)

IDENTIFICACIÓN DE LA EMPRESA

Nombre: _____

Número empleados#: _____ (promedio en el año)

Año fundación: _____ Inicio producción de calzado: _____

Experiencia del empresario: _____ (años)

Dirección: _____

Barrio: _____ Tel.: _____

PRODUCCIÓN

1. ¿Cuáles son los tipos de productos de la empresa? _____
2. ¿Cuál es el precio de venta promedio?$ _____
3. ¿Cuántos pares de zapatos fueron producidos en el último año?# _____(promedio mes, semana, día)
4. ¿Cuánta era la producción hace tres años?# _____ (↗→↘)
5. ¿Cuál era el número de empleados hace tres años?# _____ (↗→↘)
6. ¿Cuál fue la variación de ventas en los últimos tres años?% _____ (↗→↘)
7. La empresa ha realizado alguna(s) de las siguientes actividades en los últimos tres años?

   □ Fortalecimiento de la calidad □ Mejoras del diseño

   □ Inversiones en máquinas □ Aumento en la variedad de productos

   □ Capacitaciones de empleados □ Otras _____
8. ¿Cuántas máquinas nuevas la empresa instaló en los últimos tres años?# _____
9. ¿La empresa realizó cambios organizacionales en los últimos tres años? ¿Cuáles? _____

   _____
10. ¿La empresa comenzó a producir para nuevos mercados en los últimos tres años? ¿Cuáles? _____

    _____
11. ¿Cuántos nuevos materiales usó la empresa en los últimos tres años?# _____ ¿Cuáles? _____

INNOVACIÓN

13. ¿Cuántos productos nuevos fueron lanzados en los últimos tres años?# _____

14. ¿Cuántos de esos productos son producidos actualmente?# _____

15. ¿Cuál es el porcentaje de ventas en el último año que corresponde a los nuevos productos?% _____

16. ¿La empresa como obtiene información sobre tendencias en diseño? _____

_____

17. ¿La empresa tiene área de innovación? _____ ¿en producto? _____ ¿en proceso? _____

18. ¿Cuántas personas trabajan en esa área? _____ (# y dedicación de cada una)

19. ¿Cuál es el nivel de formación de ellas? Hasta secundaria # _____ superior# _____ +en el área# _____

20. ¿Cuál es la experiencia de ellas en innovación? +3 años# _____ En otras empresas# _____

RELACIONES ORGANIZACIONALES

21. ¿Cuál es el número de empresas proveedoras?# _____ ¿Cuántas son locales?# _____

22. ¿Cuál es el número de empresas clientes?# _____ ¿Cuántas son locales?# _____

23. ¿En los últimos tres años la empresa intercambió informaciones o experiencias con otras empresas buscando mejorar su producción o su producto? ¿Con cuántas?# _____

    ¿Cuáles? [3] _____

24. ¿Los cambios en su empresa se han basado en esos intercambios de informaciones/experiencias? _____

_____

25. ¿Es fácil o difícil comunicarse con las empresas con las cuales la empresa intercambió informaciones/experiencias?
    muy difícil [1] [2] [3] [4] [5] muy fácil

26. ¿El lenguaje técnico entre empresas es diferente o parecido? muy diferente (m.d.) [1] [2] [3] [4] [5] muy parecido (m.p.)

27. ¿Sus tecnologías productivas son diferentes o parecidas de las otras empresas? (m.d.) [1] [2] [3] [4] [5] (m.p.)

28. ¿Sus maneras de hacer nuevos productos son diferentes o parecidas de las otras empresas? (m.d.) [1] [2] [3] [4] [5] (m.p.)

29. ¿Los conocimientos técnicos de los empleados son diferentes o parecidos comparados con los conocimientos de las otras empresas? (m.d.) [1] [2] [3] [4] [5] (m.p.)

30. ¿Qué tan grande es su preocupación por el bienestar de las personas con las que ha intercambiado informaciones/experiencias de mejoras? muy poca preocupación [1] [2] [3] [4] [5] mucha preocupación

31. ¿Si una persona de otra empresa que colaboró con usted pide su ayuda durante medio día de su trabajo, qué tan comprometido se siente en ayudarla? muy poco [1] [2] [3] [4] [5] muy comprometido

32. ¿Cuál es la relación que usted posee con las personas de otras empresas con las que ha colaborado?
    □ familiar; □ amistad; □ proyectos conjuntos; □ vecinos; □ otros _____

33. ¿Se ha beneficiado de programas de apoyo público en actividades de innovación? ¿Cuáles (actividades/instituciones)?

_____

_____

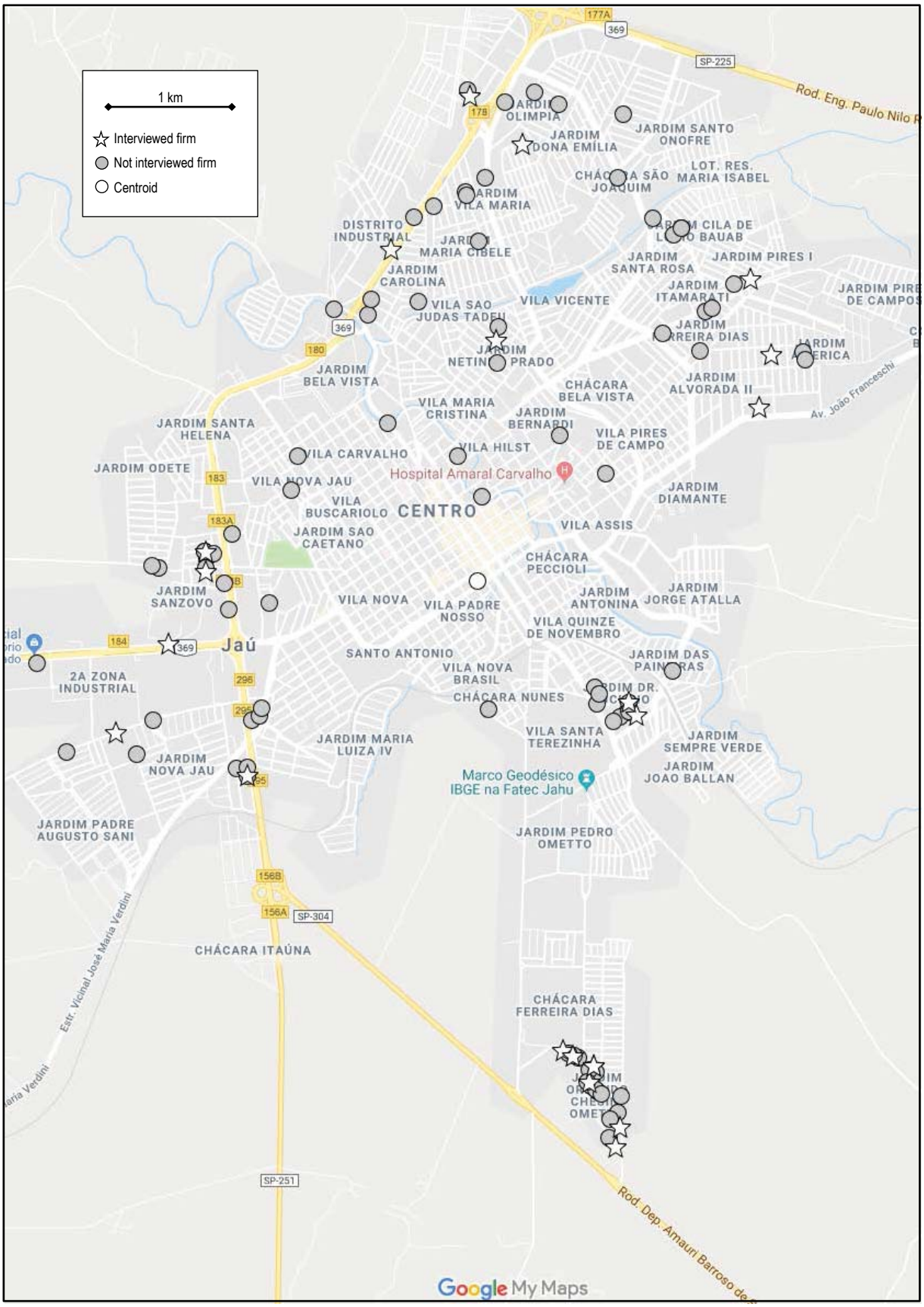
34. ¿Ha participado conjuntamente con otras organizaciones en proyectos de innovación de producto/proceso en los últimos cinco años? ¿En cuántos?# _____ ¿Hace cuántos años?# _____ ¿Cuál fue su papel (coordinador o participante)?

_____

12. Seleccione en la siguiente lista las cuatro principales áreas de interés ejecutadas por la empresa en el último año:

□ canales de comercialización
□ inteligencia de mercados
□ diversificación de mercados
□ internacionalización
□ diversificación de productos
□ logística
□ eficiencia productiva
□ nuevas tecnologías
□ gestión de conocimiento
□ calidad
□ ¿otras? ¿cuáles? _____

APPENDIX C – MAP OF THE FOOTWEAR FIRMS (JAÚ)



APPENDIX D – MAP OF THE FOOTWEAR FIRMS (CALI)