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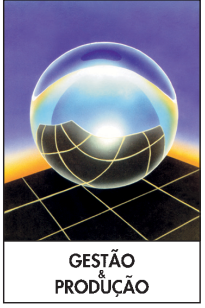

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Metamorphoses in Jaú's women's footwear product cluster: from dense to loose-knit network

Metamorfoses no arranjo produtivo local de calçados femininos de Jaú/SP: da rede densa para a rede frouxa

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Abstract: This study analyzed the changes in the structure of the political network of the footwear Local Productive Cluster (LPC) of Jaú, São Paulo in the period from 1996 to 2016. Network theory was used as theoretical basis because it has gained space in organizational studies in the last decades, besides providing explanations for various phenomena, especially to the study of productive arrangements. The sample involved 90 actors divided into three periods: 1996-2001, 2002-2010 and 2011-2016. For construction of the networks, the software Ucinet and Gephi were used. In addition to a contextual analysis, the ARS metrics (centrality, density, geodesic distance and subgroups) made it possible to identify the interactions among the actors. The results identified structural changes in the network. The number of actors that increased from 29 in the first period to 70 actors in the second period (+141%) and reduced to 39 in the following period (-44%). As for density, it was identified a dense network in the period 1996/2001 and later a diffuse network and pulverized access of information and resources in the periods 2002/2010 and 2011/2016. The central actors were Sindicalçados, Sebrae and directors of the employers' union. The participation of Sebrae and other entities influenced the creation of bonds and provided economic gains to the companies of Jaú, especially in the period 2002/2009, since the entities and the partnerships signed, not only sought the articulation of the entrepreneurs, they often became the protagonists of the changes. However, the decrease in Sebrae's shares as of 2010, has potentiated the reduction of economic indicators such as the number of companies and jobs, when compared to other shoe producing regions in Brazil.

Keywords: Networks; Footwear; Centralities; Organization.

Resumo: *Este estudo analisou as mudanças na estrutura da rede política do APL calçadista de Jaú/SP no período de 1996 à 2016. Utilizou-se a teoria das redes como base teórica pois tem obtido espaço nos estudos organizacionais nas últimas décadas, além de fornecer explicações para vários fenômenos, em especial ao estudo de arranjos produtivos. A amostra envolveu 90 atores divididos em três períodos: 1996/2001, 2002/2010 e 2011/2016. Para construção das redes, utilizou-se os softwares Ucinet e Gephi. Além de uma análise contextual, as métricas de ARS (centralidade, densidade, distância geodésica e subgrupos), possibilitaram identificar as interações entre os atores. Os resultados indicaram mudanças estruturais na rede. O número de atores aumentou de 29 no primeiro período, para 70 atores no segundo período (+141%) e, reduziu para 39 no período seguinte (-44%). Quanto a densidade, identificou-se uma rede densa no período 1996/2001 e posteriormente uma rede difusa, com acesso pulverizado de informações e recursos, nos períodos 2002/2010 e 2011/2016. Os atores centrais foram o Sindicalçados, Sebrae e diretores do sindicato patronal. A participação do Sebrae e de outras entidades influenciaram na criação de laços e propiciou ganhos econômicos as empresas de Jaú, especialmente no período 2002/2009, pois as entidades e as parcerias firmadas, não buscaram somente a articulação dos empresários, muitas vezes se tornaram as protagonistas das mudanças. Entretanto, a redução das atividades do Sebrae, a partir de 2010, potencializou a redução de indicadores econômicos como número de empresas e empregos, quando comparados com outras regiões produtoras de calçados no Brasil.*

Palavras-chave: *Redes; Calçados; Centralidades; Organização.*

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1 Introduction

The new economic order, with technological advances and changes in production systems, has given rise to a new competition environment for companies, with an interdependent economy of greater productivity and efficiency (Digalwar & Sangwan, 2007; Truzzi & Sacomano, 2007; Bouroullec & Paulillo, 2010), where competitive advantage no longer resides in the capacity or resources of a single company, but rather in networks between companies competing with other networks (Hatani & McGaughey, 2013; Mello & Paulillo, 2009, 2010).

Inserted in the context of increased competitiveness, is the footwear industry, which in general terms is labor intensive, sometimes with artisanal features in its production, and is part of the so-called "traditional" industries. The industry is classified as being dominated by the supplier, where the technological advances depend on the suppliers of components and machinery and equipment, involving the chemical, textile and capital goods industries. The innovation of shoe companies is in product design and development and is related to the company's ability to develop its brands and marketing channels (Guidolin et al., 2010).

In the footwear industry, the value chain structure is buyer-driven (buyer driven), with decentralized production being highly competitive and low barriers to entry for new producers. In this chain, retail companies or recognized brands are responsible for the development and marketing of products, but do not manufacture them. The main source of profits is not on the scale of production, but on the ability to produce value through research, design, sales, marketing and financial services, as well as the articulation of its global network of suppliers and traders (Gereffi & Memedovic, 2003).

The brazilian domestic market is one of the strongest points of the national footwear industry, which absorbed around 86% of production in 2017 (ABICALÇADOS, 2018). However, with an increase in international competition, mainly from Asian producers, together with the increase in imports in the Brazilian market, it was more difficult to compete in the international and domestic market, since part of the domestic production that was destined for export was directed to the local consumer.

The fragmented and interconnected process of shoe production favors the organization of network production, either in local productive clusters or in subcontracting and production sharing structures (Guidolin et al., 2010).

Thus, regional economic development is linked to the dynamics of relations between actors, in the network structure and in institutions, which can create ways of adapting to the new economic context, either by introducing new technologies, shifting production and seeking new ones markets (Yang et al., 2017).

Networked organizations began to demonstrate satisfactory economic results in diverse productive sectors and branches of business in recent decades. Designing and characterizing network governance and relationships has become central to the entrepreneur (Shu et al., 2018; Burt & Burzynska, 2017). This has not happened only in the area of production and distribution of products, but has also involved the political space (as entrepreneurs have engaged in politics to obtain economic gains), and the so-called social networks (virtual or otherwise), whose information on social positioning, personal tastes, and consumption preferences have provided concrete results for companies.

In the field of organizational strategy, this process of organizational evolution shows that economic, political, and social relations need more attentive mapping by business managers. These relationships explain advances, setbacks, successes, and even failures of entrepreneurs (Carvalho & Paulillo, 2018). In the organizational world, attention has always been paid to the relations of companies in the achievement of results, now, the types of networks through which the company establishes governances to obtain new results also demand study (Cruz & Paulillo, 2016).

This process has advanced in recent decades. One example is the growth of Local Productive Clusters (LPCs) in Brazil or the Italian industrial districts of the 1990s. The success of these agglomerations was attributed to characteristics such as geographical proximity and cohesive social relations, which helped reduce transaction costs and fostering trust, as well as the formation of informal networks that have facilitated the flow of information, knowledge and skills (De Marchi & Grandinetti, 2014).

LPCs have little by little shown evidence of forming networks, either in a structural form of cooperative relationships, or as real space of power struggles (either by orchestrating interests to achieve economic gains through public policies, or by delimiting internal disputes among participants). The cooperation networks were generally formed by small and medium-sized companies in close geographical proximity, whose relations are marked by similar capacities (Silva & Heber. 2014). As power networks, the LPCs

> […] were built with more or less powerful actors that influenced the coordination of the arrangement and also the articulation among companies in a given territory (Sacomano & Paulillo, 2012, p. 1133).

The literature of networked and governance organizations shows that the phenomenon of the local productive cluster is much more complex than the suggestion or definition considered by the public bodies (Belik et al., 2012). The government designation of LPC addresses the interaction of companies producing goods and services, suppliers

of inputs and equipment, consultants, and services. It also includes public and private institutions focused on the training and qualification of human resources, research, development, promotion, and financing (Wang et al., 2018).

However, the challenges of cooperation-emulation-competition, and the process of orchestrating economic interests through the achievement of more varied resources (financial, technological, political, legal, and symbolic) have become central to explaining the success or failure of these places or areas (Lopes et al., 2011). The productive arrangement as a network of power then turns to the process of conquering varied resources and fundamental attributes—such as centralities, density, information, etc. To the extent that these attributes are present with the actors and in the relationships, the network can achieve improved competitiveness.

The Jaú women's footwear industry is formally recognized by federal, state and municipal government agencies and has allowed them to be included in public policies aimed at the development of grouping of companies. Jaú has an estimated population of 148,581 population (IBGE, 2018) and is located in a strategic position, within the largest consumer market in Brazil which is the State of São Paulo (SEADE, 2018).

The women's footwear LPC located in the city of Jaú, São Paulo state, Brazil, has its origins with the early 20th century shoemakers who made rustic leather boots and shoes for travelers, farm workers, and the local community. The decline of coffee and sugar cane production in the 1950s turned footwear production into a viable option for the municipality's economy (SINDICALÇADOS, 2018).

With the creation of a unit of the Brazilian Support Service for Micro and Small Enterprises (Sebrae) in the nearby city of Bauru in 1991, companies from Jaú began to have access to training, courses, and consultancies, which were extended after the 2001 implementation of the Integrated Sector Program, developed by the Brazilian Trade and Investment Promotion Agency (Apex-Brasil) and Sebrae. This was a milestone in the history of the industry in Jaú, since in addition to providing financial resources, it brought projects from other public institutions.

The strengthening of Jaú's LPC was supported by a sustainable development program beginning in 2003, organized and coordinated by the Shoe Industry Union (Sindicalçados), which was responsible for governance, with technical and financial support from Sebrae in partnership with the municipal government; National Service for Industrial Training (Senai); National Service for Commercial Training (Senac); Faculty of Technology (Fatec) Jahu; Institute of Technological Research (IPT); Federal University of São Carlos (UFSCar); State University of São Paulo (Unesp); and the Brazilian Association of Companies of Components for Leather, Footwear, and Artifacts (Assintecal). The program aims to integrate and strengthen companies, institutions, and suppliers, whose development depends on the improvement of business management and organizational changes (SINDICALÇADOS, 2018).

Although Jaú's footwear industry has more than 100 years of history, the emergence of new companies has always followed a pattern: employees leave companies to launch new ones. As a result, there are few companies in operation with more than 10 years of existence, and no tradition of big companies.

The data from 2015 reports that of the 276 companies listed in the Annual Social Information Report of the Ministry of Labor and Employment (RAIS/MTE), only 9 of them had more than 99 employees; 96.7% were classed as micro and small enterprises (Brasil, 2018).

Despite this, the actors have considerable influence on the decisions of the arrangement, thanks to the available political resources and the employers' union Sindicalçados, "[…] which concentrates much of the information flow of the sector and has the political power to impose its decisions and guide the direction of the LPC" (Malagolli & Paulillo, 2013, p. 933).

The Jaú LPC accounted for more than 60% of formal industry jobs in the years 2006, 2007, and 2010, reaching more than 9,300 people in 2010, but saw this percentage decline to 44.22% in 2015. Nonetheless, shoe factories continued to be the largest employer in Jaú (4,806 people or 44.22% of the total) as of 2015, ranking well ahead of the food sector at 1,238 jobs (Brasil, 2018).

As a policy network, this arrangement can facilitate the flow of information and other resources among the actors. Strategies for developing densities matter, because more actors participating in the arrangement will be connected to each other. Centrality, in its three different contributions (of degree, of intermediation, and of proximity), also collaborates. Proximity overcomes hindrances and information barriers, and creates compromise between parties, just as the presence of a competent intermediary actor leads to the same type of resolution (Balland et al., 2016).

This study is guided by the following central questions: How did the Jaú shoe network become structured, and how is its structure influenced by relationships? Which were the most central actors in the period studied? What events, if any, have led to changes in the network? How did these interactions promote advances or setbacks in network formation? Has the participation of institutions such as Sebrae and state and federal governments promoted structuring, changes, and improvement in network relationships?

The present paper analyzes the footwear production cluster of Jaú, São Paulo as a policy network that, in its different phases of development, aligns

resources and often produces very positive results (in terms of growth of production, number of jobs and entrepreneurs, financial and political support, etc.). However, structural changes in the network do not always result in business growth. It is important, therefore, to show the changes and metamorphoses in the network of the footwear industry in Jaú, São Paulo over a relatively long period, from 1996 to 2016, in order to explain the advances and setbacks of a productive place or territory during the twenty-year period of its peak production and sales performance.

The social network analysis methodology was used to quantify the network density and identify the actors with greatest centrality. The present article is structured as follows: a bibliographical review about the characteristics of networks; a presentation of the methodological design of the work; the analysis of the results; and the final considerations that enable understanding of the process of metamorphosis in the footwear network of Jaú, São Paulo between 1996 and 2016.

2 Theoretical context

Network approaches have been gaining significant ground in organizational studies in recent decades (Hanneman & Riddle, 2005; Hatani & McGaughey, 2013; Mizruchi, 2006; Opsahl et al., 2010; Rivera et al., 2010; Paulillo et al., 2016). Moreover, a wide variety of disciplines, from psychology to economics, has assimilated this approach to complex relationships which are initially structured by formal or informal institutional environments, (Borgatti et al., 2009).

Granovetter (2007) embeddedness concept greatly contributed to explaining embedded market relations in formal and informal institutions—from customs, traditions, beliefs, routines (which may be millennial in scope)—to relatively more recent rules, norms, and laws (perhaps only decades or a few years old). Regardless of this term, these formal or informal institutions significantly influence decisions and economic relations.

The actors of these networks form the nodes, which have different characteristics or qualities. An actor is regarded as the unit that can be represented by a person, or a discrete set of individuals gathered in a collective social unit, as subgroups or institutions such as associations, unions, etc. There is a dyad responsible for establishing the relational ties between pairs of actors, and there is a relation that determines the set of ties that follow the same criteria of relationship (Wasserman & Faust, 1994). In these relations the attributes of the actors are manifested. These attributes justify and legitimize the network as an organizational phenomenon that seeks, and can achieve, concrete positive results. These characteristics vary from the categorical (such as male or female) to the quantitative (such as years of age) (Borgatti et al., 2013).

In characterizing policy networks, Dowding (1995) presents an important relation of characteristics to the actors (nodes) and the relationships (ties) of the network, according to Chart 1.

In the case of knowledge or information, interdependence emerges because the cognitive capacities of each actor—their criteria, mode of appreciation, and the sectoral routines to which they submit—provide a specific form of insertion in the network. This insertion has an effect on the other connected actors, who react actively. In the case of legitimacy, interdependence is revealed because there is a clear recognition within the network that the actions of an organization or stakeholder group are authentic. This establishes the reputation of each member (individual or collective), as determined by the resources obtained, by the state's granting of public status to deal with network issues, and by other private actors for the representation of interests and/or introduction of new actors (Deephouse & Suchman, 2008).

At the analysis level of the actors, centrality has been gaining prominence. An actor is pivotal when directly communicating with others, is close to many other actors, or when used by a number of actors as an intermediary in their communications (Kadushin, 2012).

Centrality can have three different measures: a) **degree**: identifies the number of direct contacts that an actor maintains in a network. Actors who have more ties can be in an advantageous position and have less dependence on other actors; b) **betweenness:** shows how an actor has the function of an agent among others; the actor can decide, according to the number of interrelationships, whether to increase the volume of exchanges, isolate actors, or prevent contacts, all with a sense of direction; and c) **closeness**: measures the distance that an actor is from others. Better-connected actors may enjoy the same advantages offered by the degree of centrality (Robins, 2015).

The direct skills of the members derive from their specificities, such as management control, the degree of vertical integration, etc. Indirect skills emerge from something that was not specifically developed by the actor, although it does not prevent the actor

Chart 1. Policy Network Features.

Characteristics of the actors	Characteristics of the relationships
1. Knowledge/Information	1. Rules and regulations
2. Legitimacy	2. Frequency
3. Reputation	3. Speed
4. Centralization	4. Density
5. Skills for change	5. Formality/Informality

Adapted from "Model or metaphor? A critical review of the policy network approach" by Dowding (1995).

from taking advantage of positive externalities, natural conditions, etc. Both direct and indirect skills influence network interactions. Thus, the power of a member is dependent on the other members and the type of relationship that they possess. Managers must develop their interpersonal skills to guide the building of organizational networks, using these social skills and highly interrelated people at the corporate level (Paulillo et al., 2016; Sacomano et al., 2016).

Similarly, the characteristics of the links between the network segments also reveal the strategic interdependence needed for the network to achieve concrete results. The set of rules and norms acts decisively in the formation of the institutional environment of each network, and consequently influence the degrees of centralization of the operations (high or low), and the involvement of the actors (few or many). These operations may occur with varying degrees of intensity (frequency) (Owen-Smith & Powell, 2008; Sacomano et al., 2013).

Density is a structural property of the network. The more actors that are linked to each other, and the more extensive the interconnection between actors, the denser it will be (Kadushin, 2012). A network with low interconnectedness (density) is considered loosely-knit. However, cohesive groups are those with strong, intense, and frequent or positive interactions and commitment to resources (Wasserman & Faust, 1994).

In the view of Paulillo et al. (2016), density and cohesion are related, since the intensity of the relations (strong or weak) depends on the structure (dense or loose-knit). Granovetter (2007) argues that the higher the density, the faster the information travels between the actors, and the lower the costs for the monitoring of opportunistic relations in the network (Soares et al., 2013).

Dense networks can facilitate the flow of information and resources; they also function as closed systems of trust and norms, where structures of behavior develop more easily; and facilitate the application of sanctions (Robins, 2015).

Dense networks with strong and relatively isolated connections facilitate the development of cohesive cultures with strong collective identities. They are advantageous in stable environments with already dominated technologies. Diffuse networks and weak links are best in environments marked by uncertainties and low technological and innovation levels (Candido et al., 2015).

In the relational perspective, it is important to observe the history of relationships, which are a set of factors that perpetuate themselves over time with the objective of preserving and strengthening behavior which is reciprocally understood and which has the probability of continuous repetition. This history is evidenced by the attitudes of the coalition towards inducing actors over time through the development of social relations and by the relations of power and dependence established between the actors (Granovetter, 2007; Weber, 2012).

The network can be political if it is discovered that one of the primary objectives of the members is to interfere in politics to obtain economic advantages. A diverse set of resources can be sought, but legitimate rules and norms are constitutional remedies. Public status attributed by the state, power of representation, or agglutination of a collective actor are examples of political resources. Financial resources may come from the state or from the market, such as financing, tax incentives, subsidies, commissions on scale of production, promotional quotas, etc. No less important are technological resources (acquired knowledge, management and information technologies, processes, specific raw materials, etc.); and organizational resources (infrastructure with research institutes, training centers and marketing agencies, partnerships, consortia, information, proximity to suppliers, outsourcing, subcontracting, use of brand, etc.). Legal resources (such as intellectual property and physical property rights, antidumping appeals, contract designs, etc.) can create greater trust in the actors and even define investments within the network (Dowding, 1995).

In view of the theoretical framework reviewed here, it is worth to understand a case in which the most surprising characteristics of networks in recent years, such as centralities and density, explain different steps in the scope of results. The productive arrangement of women's shoes in Jaú, São Paulo is a relevant case for the analysis of a network structural change process. As will be shown, with distinct centralities and densities in marked historical stages (that is, with important institutional milestones for the evolution of the Jaú footwear network), the production arrangement achieved very different economic results.

3 Research method

The present study presents exploratory and descriptive characteristics: the exploratory aims to identify the main actors of the Jaú footwear LPC, and descriptive seeks to evaluate the structural and relational properties of the network, besides exposing characteristics of the phenomenon studied.

It was possible to visualize the composition of the network and its properties by diving it into three periods: 1996-2001, 2002-2010, and 2011-2016, and using quantitative approaches and mathematical techniques such as Ucinet (Borgatti et al., 2002) and Gephi software (Gephi is an open source software for analysis of networks and graphs) (Bastian et al., 2009).

3.1 Data collection

The study mapped 90 distinct business agents, including institutions, individuals, and companies, that developed effective actions to support the Jaú cluster in the period studied. Although the sector has,

according to secondary data, more than 250 companies in operation, it was not possible to identify them because they did not participate in the activities developed during the period reviewed here.

For collection and identification of the actors, research was done on documents, publications, minutes, and reports in the archives of Sindicalçados. Access to this information was through the organization's website and five visits between March and April/2018 on the premises of the union.

The period analyzed was between 1996 and 2016, which coincides with a project to foster the competitiveness of the women's footwear industry in the Jaú region, led by Sebrae Bauru. From the first moment we expected that there could be changes in the network structure studied in this period.

It was defined that the actors that had some type of relationship (Borgatti et al., 2013), that is, at some point were met (geographical proximity). It is assumed that geographic proximity ultimately defines the structure of relationships, which enables the actors to develop a close network of personal contacts, which allows the partners to gradually learn about each other, strengthening the ongoing relationship (Chang, 2011), and share information and knowledge, and participate in joint actions to solve common problems (Lund-Thomsen & Pillay, 2012). For the actors who had some type of relation was assigned the value of 1. For the authors without any type of contact was assigned the value zero.

3.2 Data analysis

The procedure of analyzing the composition and properties of the networks was based on social network analysis (SNA) metrics such as density, geodesic distance, mouse clicks, and centrality, which made it possible to analyze the interactions among the actors.

Borgatti et al. (2013) posit that centrality is one of the most used measures in SNA, as it represents the structural importance of each node in the network by analyzing how many connections a node has. High-grade nodes are highly visible and important: it is assumed that the more central an actor, the more links it will have with other actors, and the greater its degree of influence.

Another network measure is density, which shows how close the network is to being complete. In other words, the closer the measure is to 1, the more interactions are occurring in this network. The values of the density metric were obtained through the formula $n\,(n\text{-}1)\,/\,2$, where n is the number of actors in the network. The calculation shows the number of possible connections in the network, and by dividing the existing connections by the number of possible connections we arrive at the density (Borgatti et al., 2013).

In addition to the degree and density centralities, we also calculated the metrics of: 1) geodesic distance, which is a measure between pairs of nodes, determined by the number of nodes along the shortest path between them; and 2) cliques, which determine the subset of nodes next to each other, which makes it possible to identify small groups of people within a network who know each other. A clique should have at least three nodes (Borgatti et al., 2013). By calculating the number of cliques it is possible to verify the patterns of relations between the actors from the point of view of the subgroups, and thus identify the level of cohesion.

4 Research results

4.1 Network centrality and density

The constructed relationship matrices and the visualization of the networks between 1996 and 2016 showed changes that may justify the advances and setbacks in a cluster that has been recognized by important public institutions such as Sebrae and the state and federal governments.

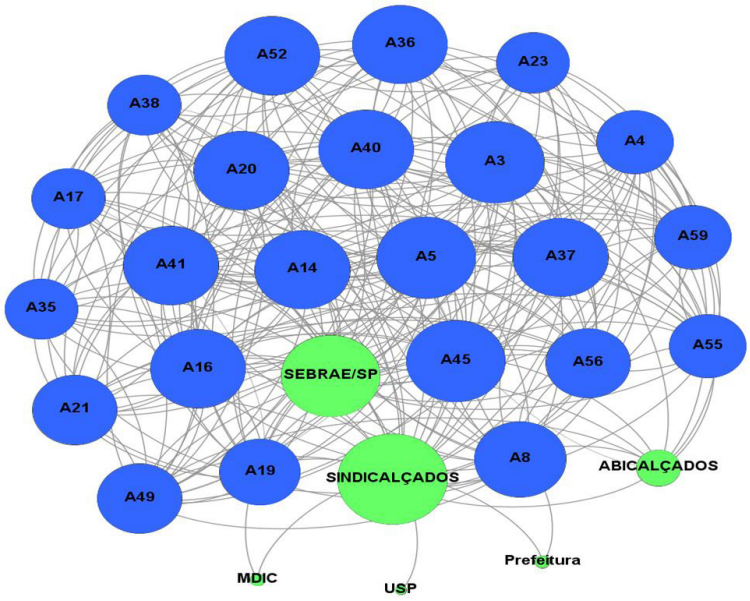
Figures 1, 2, and 3 present graphs of the networks between the business agents and their links, created by surveying the relationships among the 90 identified actors. It should be noted that some actors appeared in more than one studied network, but were counted only once for the purpose of this study.

The size of the nodes is proportional to the degree of centrality and the types of nodes dividing the actors between companies, individuals, and institutions. The distribution used was the Fruchterman-Reingold algorithm, which according to Sampaio et al. (2015) makes a circular distribution of the vertices, placing the elements with greater centrality in the center of the sphere.

4.2 Density and proximity of actors - 1996-2001

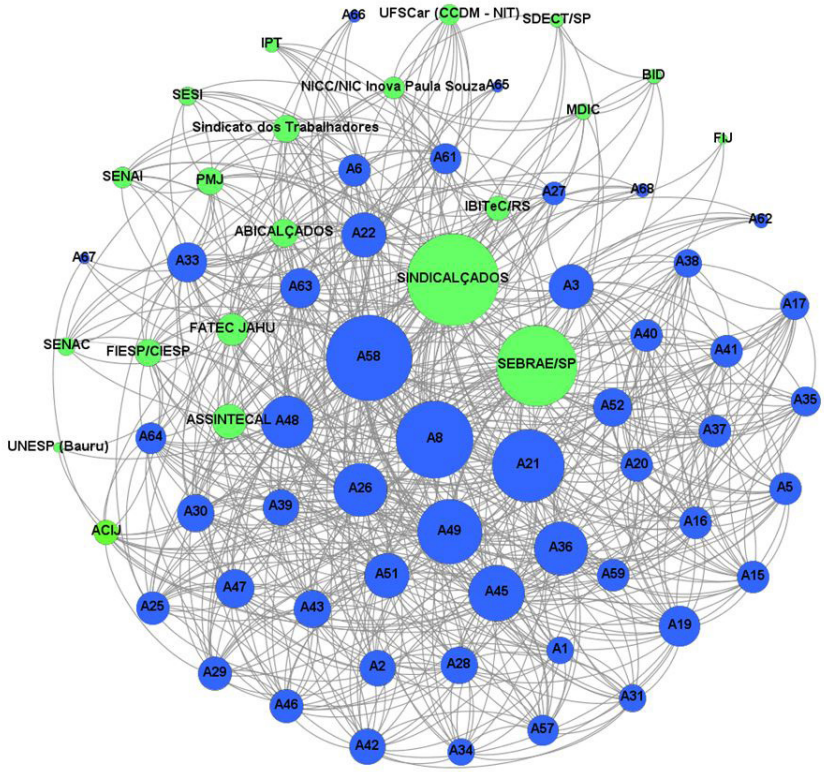
In the construction of this network in the 1996-2001 period, 29 nodes (actors) and 566 ties were identified. The density measurement was considered high, since out of 100% of possible interactions, 70.2% were effectively performed (Figure 1). Smaller networks tend to have higher densities, since there are few people and it is easier to maintain relationships (Borgatti et al., 2013). A dense network can be advantageous to the point where all actors share the same information and resources (Candido et al., 2015).

It was possible to individually analyze the existence of actors with high and low degrees of centrality, ranging from 1 to 28. The centrality of the network as a whole was 19.65, meaning that each actor had on average 20 connections with peers (Figure 1).



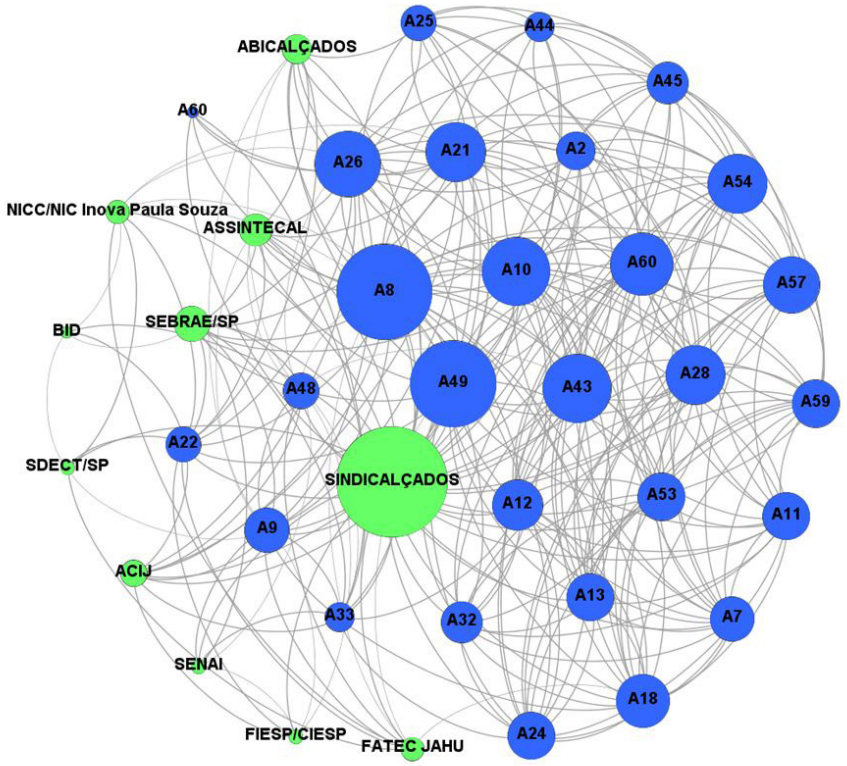
Nodes	Ties	Geodesic distance	Subgroups	Average degree of centrality	Graph density
29	566	1,298	7	19.65	0.702

Figure 1. Actors and degree of centrality in the Jaú footwear LPC (1996/2001). MDIC is Brazil's Ministry of Industry, Foreign Trade, and Services. USP is University of São Paulo. Abicalçado is the Brazilian Footwear Industry Association. Sindicalçados is the Jaú Footwear Industry Trade Union and Prefeitura is City Hall.



Nodes	Ties	Geodesic distance	Subgroups	Average degree of centrality	Graph density
70	1571	1,675	132	22.45	0.325

Figure 2. Actors and degree of centrality in the Jaú footwear LPC (2002-2010).



Nodes	Ties	Geodesic distance	Subgroups	Average degree of centrality	Graph density
39	605	1,576	61	16.10	0.424

Figure 3. Actors and degree of centrality of the Jaú footwear LPC (2011-2016)

Of the 29 identified actors, we highlight Sebrae, A3, A5 and A45, with 24 connections, and Sindicalçados, with 28 connections.

These were in fact important players for the network, because Sindicalçados enabled cooperation agreements with technical agencies and services such as Sebrae, Senai, and the São Paulo State Industry Association (Ciesp), allowing local producers to improve technological innovation and diversify their production in the face of competition, mainly from Asian footwear (Fuini, 2013).

It is noteworthy that this period was when shoe manufacturers were creating initial strategies and policies for the group, as a result of the 1992 Foundation Institute of Administration (FIA/USP) project, which was notable for the level of participation of entrepreneurs, gathering a great number of them around problems and initiating several directives for actions. The questions about the formation of a LPC began in the 1990s, still with the cluster design, and in 1996, Sebrae/SP initiated the first project to stimulate the competitiveness of the women's footwear industry in the Jaú region (SINDICALÇADOS, 2018).

In addition to Sindicalçados and Sebrae, actors A3, A5 and A45 were during this period and in the others, as members of the board of Sindicalçados. It is noteworthy that at the end of the analyzed periods, both actors left the position and moved another branch of economic activity.

There was a degree of proximity between the actors with personal relationships and frequent contacts, justified by the geodesic distance of 1,298 relations: that is, 29 actors had an average of 2 contacts with other actors in the network. According to Uzzi (1996), when relationships of personal friendships are fraught with economic concerns, the relationship of closeness generates greater confidence, reinforces the exchange of information, and adds value to the relationship.

As for the patterns of relations (level of cohesion) between the actors from the point of view of the subgroups, the Clique routine was calculated, in which all the choices made by a pair are mutual. The software identified 7 cliques, indicating that there were few subgroups in the network. This feature may be related to the proximity of the members and the ease of contact between them and/or the frequency of the ties between the network actors (Wasserman & Faust, 1994).

4.3 From dense to loose - 2002-2010

In the 2002-2010 period, 70 actors and 1571 ties were identified in a decentralized issue network, with several central actors.

The calculated density was 0.325, considered low or even diffuse, since only 32.5% of the potential relations were used. Compared to the previous network, the density here is lower, which is justified because it is a period of intense movements in the Jaú industry, with the entry of new players, financial resources from entities such as Sebrae, courses and training provided by Fatec, Senai and Senac.

The degree of centrality varied from 3 to 69, and the centrality of the network was 22.45, meaning that each actor had on average 23 connections with their peers. The actors identified as major centralities were: A26 and A36 (38), A45 (40), A49 (47), A8 (51), A21 (53), Sebrae (60), A58 (64), and Sindicalçados (69). Actor 58 was the manager of the LPC in this period, serving as the link between Sebrae and the companies. The other actors were directors and presidents of Sindicalçados. The actors with a low degree of centrality were considered neutral within the network, because they did not have a strong relationship with the other actors and did not participate in disseminating knowledge within the network.

The geodetic distance was calculated at 1,675 relations, which still maintains the ratio of 2 contacts with other actors in the network, on average. In relation to the previous period (1,298), there was a 28% increase in the distance between actors, due to the insertion of new actors.

The results also demonstrated the existence of 132 subgroups within the network. Initially, it could be inferred that central actors lost influence and information was no longer privileged, and therefore extended to more people. However, according to data from SINDICALÇADOS (2018), during this period there was a great number of training and consulting sessions, courses, events, exhibitions, and fairs focused specifically on the entrepreneurs of the footwear industry in Jaú, with emphasis on projects financed by Sebrae, and which sparked the interest of new actors.

Our findings show that the period between 2002 and 2010 witnessed the greatest interaction between footwear manufacturers and other institutions and companies, especially Sebrae; the São Paulo state Department of Economic Development, Science, Technology and Innovation (Sdect); the Inter-American Development Bank (Bid); Senai; and Senac, which until then had no effective participation in the actions of the network.

This increased interaction was the result of the creation, in July 2001, of the Integrated Sector Program for exports of women's footwear from the Jaú industrial hub, with financial contributions from APEX. This program provided the companies of the network with access to institutional videos; Internet platform; participation in national and international fairs and events; market study and strategic planning; communication and public relations programs; and publicity coverage, including advertising in specialized magazines in the sector such as *Revista Moda Pelle; Revista Ars Sutoria; Vogue Pelle;* and *Revista Footwear News* (SINDICALÇADOS, 2018).

In 2006, Jaú was included as a priority LPC within the State of São Paulo, after a listing developed by the Permanent Working Group of the MDIC. The term "Jaú LPC" was formalized by Sdect, the state agency responsible for supporting LPCs and coordinating the "Program for strengthening the Competitiveness of companies located in LPCs in the State of São Paulo," partly financed by the Inter-American Development Bank (Fuini, 2013).

In 2007, the Preliminary Development Plan for the installation of a LPC of the footwear industry in the region of Jaú was created, whose governance was to be exercised by the institutions: Sindicalçados, Fiesp/Ciesp, Sebrae, Senai, PMJ, Fatec Jahu, Abicalçados, Assintecal, IBITeC, UFSCar, Unesp, Senac, Sesi, and IPT. Of the fifteen institutions listed, eight have activities beyond the LPC, and seven of these have no physical location in Jaú. Nine institutions do have headquarters or units in Jaú and region, and strong institutional performance in the shoe segment and in the local territory. Three institutions participating in governance, Abicalçados, Assintecal, and IBITeC, have a strong role in the sectoral governance of the footwear industry. Considering that some LPC companies are associated with such entities, they also end up intervening in territorial governance (Fuini, 2013).

These events are accord with the metrics found in the study, and configure an issue-based and decentralized network. According to Candido et al. (2015), issue networks and weak links are best in environments marked by uncertainty and low levels of technology and innovation. In this type of network, actors may not use policy resources with the appropriate strategic skill, forming networks that are structured, hierarchical, and less institutionalized and integrated (loose or diffuse).

4.4 Network diffusion and information centrality - 2011-2016

In the period 2011-2016 the study identified 39 actors and 605 ties. The density calculated by the software was 0.424, considered low, since only 42% of the potential relations were used.

The centrality degree ranged from 2 to 38, and the centrality of the network was 16.1. The most central actors presented links between 24 and 38 actors, with

emphasis on actors A10 (24), A49 (28), A8 (30), and Sindicalçados (38).

In this period there was still some degree of closeness between the actors, with friendships and the presence of some important institutions such as Sebrae, Fiesp, Senai, and Fatec Jahu, but with less intensity of participation in the actions (Figure 3).

Since 2010, however, there has been a decrease in Sebrae's actions in the network, due to the public civil action filed in 2009 by the Public Prosecutor's Office (PPO) against the national Sebrae office, which prohibits the outsourcing of labor through cooperatives, companies, or through an intermediary.

The PPO's claim was that the Sebrae tried to "[…] mask the existing employment relationship between the institution and the so-called 'facilitators'", professionals hired through cooperatives to train or advise micro entrepreneurs (Brasil, 2015). The action had repercussions throughout the national territory, and since Sebrae was a central actor in the actions of the LPC, the reduction of these investments led to the reduction of the number of actors and a change in the network, which without this support could not maintain cohesive relations.

Another important fact was the change in the behavior of shoe buyers, who started to purchase with credit cards, and demand that the manufacturers issue invoices for the full purchase value. Also, the obligation for all footwear companies to adopt electronic invoicing as of 2010 made many businesses financially impossible, both in Jaú and other producing hubs. Some businessmen from Jaú closed their doors and moved to other economic activities, such as construction, gas stations, commerce, and hospital administration.

Together with all this, the national footwear sector felt strongly the impacts of the Brazilian economic crisis that began in 2014. Because they are mostly small, Jaú's companies suffered sharply from the contraction of internal demand.

In spite of all the training and structuring of the network, Jaú's footwear industry has changed its production, currently competing with low-quality synthetic and low-priced products, although it still has production agility. In addition, competitors, especially companies from Rio Grande do Sul, moved to Brazil's northeast in search of cost and price reduction, especially through lower taxes applied to the commercialization of goods and services.

5 Final considerations

The footwear industry has become a success story for many studies that have studied and demonstrated the importance of local endogenous development in Brazil, especially in Jaú, which was provided by a set of entities and organizations built specifically for and for this industry.

The study sought to show the transformations experienced by the social actors participating in the productive arrangement of female footwear in Jaú, and explain, as of 2010, the increase in network fragility, difficulties in maintaining the intensity of relationships, reduction in the frequency of interactions and resources, as well as the reduction of their importance and the loss of identity and competitiveness vis-à-vis the other regional footwear centers.

The built network, which was determinant for the economic result of the main local business, underwent important metamorphoses. Initially, there were changes in its structure, since there were changes in the number of actors, increasing from 29 in the first period to 70 actors in the second period (+141%) and reducing to 39 in the following period (-44%), or better, the network intensified a lot in the period 2002/2010, but was basically the same in the periods 1996/2001 and 2011/2016.

With respect to density, which is a structural property, we also observed changes in the cohesion of network relationships. Between 1996/2001 it was configured with high density and then a loose network in the following periods, with consequences for the level of employment and for the relationships of the actors.

Issues such as Chinese competition, technology and economic crisis could also explain changes in the structure of the network, after all, there is a national dynamic of the industry, particularly of footwear, which is formed mostly by companies more fragile and historically with competitive shortcomings.

If we look at the same periods of this study, other regional shoe clusters such as Franca and Birigui in the state of São Paulo, São João Batista in Santa Catarina and Nova Serrana / MG, it can be noted that there was also a decrease in jobs and number of companies, but to a lesser extent than in Jaú (Table 1).

In the period 1996/2001, the footwear company of Jaú was not among the highest growth rates of companies and jobs, increased by 15.3% and 12.76%, respectively, while Franca grew 69.96% and 11.24% % and Birigui, 9.95% and 39.38%. Santa Catarina of São João Batista in this period, increased by 69.12% the number of companies and decreased by 5.81% the number of jobs. Nova Serrana, the mining capital of footwear, increased 49.49% in the number of companies and 69.17% in jobs (Table 1).

In the period 2002/2010, the footwear companies of Jaú grew 96.54%, being the largest indicator among the 05 clusters analyzed, and jobs increased by more than 106%, behind the Santa Catarina cluster (+ 218.49%) and (+ 113.30%).

Considering the period 2011/2016, it was observed that LPC jauense was the one that lost most companies (-35.31%) and jobs (-43.53%) among the 05 clusters analyzed, whereas in Nova Serrana there was an

Table 1. Growth rates / reduction of companies and jobs in the footwear clusters of Jaú, Franca, Birigui, São João Batista / SC and Nova Serrana / MG in the periods 1996/2001, 2002/2010 and 2011/2016.

Period	1996/2001		2002/2010		2011/2016	
	Industries*	***Jobs****	***Industries***	***Jobs***	***Industries***	***Jobs***
Jaú/SP	**+15.30%**	**+12.76%**	**+96.54%**	**+106.55%**	**-35.31%**	**-43.53%**
Franca/SP	+69.96%	+11.24%	+32.49%	+26.60%	-13.62%	-18.93%
Birigui/SP	+9.95%	+39.38%	+66.22%	+6.08%	-7.65%	-28.86%
São João Batista/SP	+69.12%	-5.81%	+72.22%	+218.49%	-13.62%	-6.14%
Nova Serrana/MG	+49.49%	+69.17%	+43.41%	+113.30%	+0.44%	+6.43%

*Companies and jobs according to classification CNAE 95 Div (until 2005) and CNAE 2.0 Div - Leather Preparation and Manufacture of Leather Goods, Travel Articles and Footwear (as of 2006). Source: Elaboration based on information (Brasil, 2018).

increase of companies and jobs. One can`t deny the economic changes experienced by the companies, but what was observed in the study is that it has become deeper in Jaú than in the other footwear cluster analyzed.

As for the centrality of the actors, it should be noted that the Sebrae, which in general aims to articulate the relationship between entrepreneurs, was not a peripheral actor in the Jaú's network. He was a central actor in the networks built, but lost centrality in the period 2010/2016, just after public civil action. This fact limited the performance of this institution in promotion actions in several regions across the country. Given some dependence of the actions of the Lpc de Jaú with the Sebrae, their removal consequently generated a disintegration and disintegration of the network.

For the findings of this study, the reduction of Sebrae's activities from 2010 onwards has boosted the economic dimension (companies, employment, production), as the footwear industry in Jaú represented almost 25% of the city's jobs and more than 50% more than 9,300 people in 2010, but reduced this amount and in 2016 employed a little more than 4,400 individuals (Brasil, 2018).

In addition, the central actors A3, A5, A8, A10, A21, A26, A36, A45, A49 and A58 who played a key role in network construction and industry development found it difficult to maintain a cohesive network density) and that could help in the promotion of trust, reciprocity, cooperation and belonging.

Sindicalçados was also a central actor, but part of its centrality is explained by the issue of legal identity, that is, it was through the entity Sindicalçados that Sebrae made available resources. Not necessarily the Sindicalçados was representative of the sector or that obtained legitimacy or reputation.

It can´t be ignored that the participation of Sebrae and other entities influenced the creation of bonds and provided economic gains to the companies of Jaú, especially in the period 2002/2009, because these entities and the partnerships signed, not only sought the articulation of the entrepreneurs, they were often the protagonists of the changes, which were not incorporated by shoe manufacturers.

As a result, the LPC lost its identity of the "National Capital of Women's Shoes", as other production centers, such as the cities of Franca and Birigui, gained prominence in the sector. Another issue was the replacement of leather as a differential of Jaú's shoe. There are few companies in Jaú manufacturing leather footwear, since much of it has migrated to synthetic material that is cheaper, more productive and has greater availability of colors and textures.

It should also be noted that there were conflicts and difficulties of interaction, mainly with the exit of central actors to other sectors of the economy. If there were cohesion in the relationships, this would allow local companies to better face the aggressive competitiveness of the footwear market, especially with the competition from Asian products. In this business environment, important relational resources for the acquisition and maintenance of other resources—technological, political, legal, and symbolic—have become central to the success or failure of this productive region.

It is therefore vital to ensure consistency between production and the social system, insofar as, by supporting the competitiveness of enterprises, support for small enterprises in overcoming difficulties can also occur, as well as introducing measures to promote social cohesion, such as regular meetings, participation local government, business innovation and partnerships (Ottati, 2017, p. 264).

In short, a positive reaction to increased competitiveness is linked to a combination of strategies such as product innovation and quality improvement, R&D investments, increased brand visibility, marketing and distribution. However, only these conditions are not determinant for success or failure, and the existence of pride and awareness of the importance of producing the best possible product, as well as the feeling of belonging to the local environment, is determinant. The locality or industrial district must be connected with the locality in which it was incorporated, and the reputation of the geographic location adds value to the products

produced there, as well as attracting new actors in the market (Konzelmann et al., 2016).

A limitation of the research that supported this article was the number of companies and institutions surveyed, which could be higher, although those related in this research were recognized as central in the development of the sector, and made it possible to describe the relations embedded in the footwear industry in Jaú.

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