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Trajectory Dependence, Lock-In Effect, and Cluster Decline: A Case Study of the Footwear Cluster in Sinos-Paranhana Valley

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ABSTRACT

Within the cluster literature, few studies have analyzed the potential dangers of regional economic overspecialization. The lock-in effect is frequently mentioned to describe the decline of a cluster, but few studies have actually tested such arguments. The purpose of this paper is to analyze the impacts of the lock-in effect on the evolutionary trajectory of the Vale dos Sinos-Paranhana footwear cluster. To this end, we conducted interviews with industries and representatives institutions, to analyze how productive and cognitive inertia, the absence of innovative startups and the static entrepreneurial model adopted by local agents limited the acquisition and recombination of new knowledge within the cluster, making it a rigid and uncompetitive structure.

RESUMEN

En la literatura de clusters, pocos estudios han analizado los peligros potenciales de la sobreespecialización económica regional. El efecto lock-in es a menudo mencionado para describir la disminución de un cluster, pero pocos estudios han probado tales argumentos. El propósito de este artículo es analizar los impactos del efecto lock-in en la trayectoria evolutiva del Cluster Calçadista do Vale dos Sinos-Paranhana. Con este fin, hemos realizado entrevistas con industrias e instituciones representativas, para analizar cómo la inercia productiva y cognitiva, la ausencia de startups innovadoras y el modelo emprendedor estático adoptado por agentes locales, limita la adquisición y recombinación de nuevos conocimientos dentro del cluster, convirtiéndolo en una estructura rígida y poco competitiva.

RESUMO

Na literatura sobre clusters, poucos estudos analisaram os perigos potenciais da superespecialização econômica regional. O efeito *lock-in* é frequentemente mencionado para descrever o declínio de um cluster, mas poucos estudos testaram tais argumentos. Nesse sentido, o objetivo deste artigo é analisar

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os impactos do efeito *lock-in* na trajetória evolucionária do Cluster Calçadista do Vale dos Sinos-Paranhana. Para este fim, conduzimos entrevistas com indústrias e instituições representativas, analisando como a inércia produtiva e cognitiva, a ausência de *startups* inovadoras e o modelo empreendedor estático adotado pelos agentes locais, limitaram a aquisição e recombinação de novos conhecimentos dentro do cluster, tornando-o uma estrutura rígida e pouco competitiva.

Introduction

Since the 1990s, geographical clusters have attracted increasing interest. Many researchers argued that such agglomeration of firms tends to generate better factors of development, such as human capital, business culture, local infrastructure, production quality, and local learning (Giuliani, 2005; Moulaert & Sekia, 2003). Clusters may be defined as a geographical concentrations of firms and networked institutions of a particular sector (Porter, 1998).

Despite the growing interest, most studies on clusters focused on the advantages that firms enjoy as part of a cluster, such as increased innovative activity (Baptista & Swann, 1998) and the performance (Morosini, 2004), but little was investigated as to how such clusters developed over time (Menzel & Fornahl, 2010). Yet, the focus on the positive externalities generated by clusters obscured the negative effects that such clusters may bring to the regional economy (Boschma, 2005). Such effects, known as negative externalities (Martin & Sunley, 2006), reflect how agglomeration economies may suffer due to the high degree of specialization and the lack of technological heterogeneity (Cho & Hassink, 2009; Grabher, 1993; Hassink, 2005; Menzel & Fornahl, 2010).

The dependence of trajectory and the lock-in effect are among the few concepts that seek to explain the decline of clusters, which reflect the history and the institutional context of as region's economic development (Hassink, 2005). Grabher (1993) highlighted how highly productive regions could lose competitiveness and decline through the lock-in effect. The lock-in effect derives from rooted institutional aspects destined to preserve the existing industrial structures that discourage renewal and regional restructuring (Grabher, 1993). Grabher (1993) sees the lock-in effect in terms of three types—cognitive lock-in, political lock-in, and functional lock-in—showing how each of these aspects contributes to the decline of the German industrial region of Rurh.

The decline of several European clusters sparked the debate on the decline and renewal of clusters in the international literature (Hassink, 2005; Tödtling & Trippl, 2004). In the Brazilian context, the investigation

of the decline trajectory of clusters is still incipient, although a tendency of declining performance of the geographical clusters is observed in recent years (World Economic Forum, 2018). The decline of Brazilian clusters reflects both the recent economic crisis (Barbosa Filho, 2017; Rossi & Mello, 2017) and the decline of industrial participation in the Brazilian economy (Oreiro & Feijó, 2010; Paula & Pires, 2017).

The aim of this paper is to analyze the impacts of the lock-in effect on the evolutionary trajectory of the Vale dos Sinos-Paranhana footwear cluster based on a case study. This cluster is one of the oldest in Brazil and, encompassing the entire production and distribution chain, is of great economic and social importance to the region. However, cluster firms have been facing difficulties to stay competitive: the appearance of imports from Asian countries and economic instability worsened the competitive scenario, compromising the survival of cluster firms. In addition to the case study, we advance three theoretical propositions developed based on discussions of the results and on previous research. The prepositions could be tested in future research in order to expand our knowledge of the lock-in effect and what drives mature clusters to decline.

This paper is organized in six sections besides the present introduction. In the theoretical background, we discuss the main concepts related to clusters, the lock-in effect, and cluster decline and renewal. In Section "Method," the methodology used is presented. In Section "Contextualization of the cluster," the historical contextualization of the cluster is discussed. In Section "Analysis of the lock-in effects," the empirical data collected are presented. In Section "Discussion," we discuss the research findings. The last section addresses the main conclusions.

Clusters, trajectory dependence, and lock-in effect

Cluster studies began with Marshall (1920), who observed that the specialization of local activities produced several positive external economies, such as knowledge diffusion among the local actors; a concentration of skilled workers specialized in the main activity of the cluster; and the development of specialized infrastructures (Marshall, 1920). Marshall's "industrial districts" represent a historical concept proposed by Porter (1998) that preceded the idea of cluster. Despite the different terminology used, both concepts refer to the same logic (Belussi, 2006): clusters are created and reinforced by processes of feedback based on advantages that emerge from the geographical agglomeration (Baptista & Swann, 1998). Only firms located in the cluster can access advantages of scale. Schmitz (1999) translated the idea as "collective efficiency," a term that referred to the

competitive advantages derived from local external economies and from the joint action of local firms.

Despite the great number of territorial models of innovation (Moulaert & Sekia, 2003), the clusters literature has become one of the most influential in the literature of strategic management. Cluster firms develop networks among suppliers and clients, and share resources, which lead to above-average growth. Local vocational institutions contribute to train the local labor supply (Morosini, 2004); and the geographical proximity catalyzes knowledge overflow, which accelerates the diffusion of knowledge and firms' innovation activity (Baptista & Swann, 1998; Giuliani, 2005). However, the advantages offered by clusters and the focus on positive externalities and success stories meant that the negative aspects of clusters were often overlooked (Grabher, 1993).

The most recent literature about the evolution of clusters (Boschma & Martin, 2010), focuses on their long-term prospects and showing the negative interference that might undermine the transformation of clusters (Crespo, 2011). Much of the literature discusses how clusters emerge, develop, decline, and renew themselves, according to the clusters life-cycle approach (Bergman, 2008; Martin & Sunley, 2011; Menzel & Fornahl, 2010; Wal & Boschma, 2011). These new approaches seek to develop an analysis of the triggering factors behind the evolution of clusters, showing that the agglomeration of economic structures no longer guarantees *per se* their local success (Martin & Sunley, 2006), offering as evidence the evolution of some trajectories that have transformed productive and innovative clusters into structures that are vulnerable (Martin & Sunley, 2006).

Path-dependence and lock-in effect

According to the evolutionary perspective, concepts such as path-dependence and lock-in help to explain the negative aspects of cluster evolution. Path-dependence refers to when a system evolves as a consequence of its own history (Martin & Sunley, 2006, p. 399); moreover, it implies the idea that evolution does not follow an ideal and balanced state, but rather, a dynamics that could cast the local system into a negative trajectory of development (Boschma & Martin, 2010).

The path-dependence literature follows a canonical model with three main characteristics (Martin, 2009): (a) path-dependence is created by small events or historical accidents that have great long-term impacts; (b) once a given trajectory is selected, it becomes progressively dominant through the emergence of externalities or feedback that encourage its continuity; (c) when a trajectory becomes dominant, it tends to persist unless an external force induces change, thus creating a new trajectory (Martin, 2009). Martin

and Sunley's (2006, p. 35) path-dependence helps to describe a situation of cluster decline through the introduction of inertia and negative lock-in that restricts the adaptability of the local system (Grabher, 1993). In this context, Boschma and Lambooy (1999) argue that old regions will tend to become imprisoned in narrow trajectories and victims of their initial success because they develop resources, competences, and structures that self-reproduce, thereby weakening their abilities to renew and innovate their industrial structure (Boschma, 2005).

Grabher (1993) describes the obstacles faced by mature and specialized regions that possess strong political systems and institutions that support path-continuation vs. path-breaking (Belussi & Trippl, 2018).

According to Grabher (1993), the lock-in effect has three types: functional lock-in, cognitive lock-in, and political lock-in. "Functional lock-in" refers to the stable hierarchical relations existing among firms, which initially reduce transaction costs and increase firms' mutual cooperation. Organizations become codependent and have little incentive to cultivate new clients or invest in research and marketing. For that matter, the cluster tends to adhere to a particular type of economic activity that does not allow renewal and innovation (Cho & Hassink, 2009). Clearly, in some cases, new paths do emerge, thanks to the introduction of new creative firms and start-ups, also encouraged by the role played by new cluster policies (Belussi & Trippl, 2018; Gertler, 2010; Simmie, 2012; Trippl et al., 2015).

"Cognitive lock-in" refers to the way in which the organization interprets its economic environment. The cluster common language and the technologies adopted create a cognitive barrier towards novelties. Firms cannot identify new problems and propose new solutions. Cognitive lock-in also stifles entrepreneurial activity and technological innovation; this then weakens the local adaptability to new cycles and market fluctuations (Cho & Hassink, 2009; Grabher, 1993).

"Political lock-in" refers to the inability of the political and administrative systems to change the local culture and the goals of the cluster policies, due to the dependence on the already-established trajectory (Grabher, 1993; Hassink, 2005). Local authorities may also be against diversification of the local structure, since most of the contributions that support them come from traditional firms (Boschma & Martin, 2010; Hassink, 2005). Martin (2009) has criticized the canonic model of path dependence since it emphasizes continuity and economic stability. According to Martin and Sunley (2006), the lock-in effect is not necessarily negative, because positive lock-in can emerge from the dynamics of positive externalities and increasing feedback. They suggest that the evolution of a cluster or a region involves the transition from a positive lock-in to a negative lock-in.

Decline and renewal of the cluster

As long as a cluster develops a dominant trajectory, it tends to decrease its heterogeneity in order to increase cohesion. Moreover, growing feedback effects and positive externalities emerge (Martin & Sunley, 2006). On the other hand, the decline of technological heterogeneity decreases the variability of technological knowledge existing inside the cluster. This reduction may trap the cluster in a specific routine, reducing its innovative capacity (Martin & Sunley, 2011; Menzel & Fornahl, 2010; Wal & Boschma, 2011). The cluster is imprisoned in its own success history. The initial strengths—"its industrial atmosphere, the highly developed and specialized infrastructures, the closed bonds existing among firms, and the strong political support become an obstacle for innovation" (Grabher, 1993, p. 256).

A declining cluster is characterized by shrinking numbers of firms and employees (Menzel & Fornahl, 2010). Such a decrease is called shake-out and it derives from a loss of competitiveness (Wal & Boschma, 2011). A declining cluster also loses its ability to keep its diversity and to adjust itself to the conditions of environmental changes (Grabher, 1993; Menzel & Fornahl, 2010). Yet, geographical proximity accelerates the diffusion of knowledge and helps the setting of social standards (Boschma, 2005) insofar as the cluster becomes a closed system able to reproduce itself. During periods of fast radical change, the cluster faces difficulties to adapt, leading the agents to a state of technological obsolescence (Tomassini & Rocha, 2014).

However, the conditions created by lock-in are not impossible to revert. Renewal may happen under certain conditions, opening new ways for cluster development (Martin & Sunley, 2011; Menzel & Fornahl, 2010; Tödtling & Trippl, 2004). Renewal strategies aim to break the existing trajectory and stimulate the transition to a new dynamic state where firms adopt new technological innovations and enter new markets (Martin & Sunley, 2006; Tödtling & Trippl, 2005). Often, the insertion of new knowledge increases heterogeneity, which then allows the cluster to escape from its "prison" (Bathelt et al., 2004). The renewal of cluster networks plays a fundamental role; this includes new links with suppliers and innovation networks. The connections with the national system of innovation and international partners are also necessary for cluster renovation (Wal & Boschma, 2011).

Trippl and Tödtling (2008) suggest three distinct forms for cluster renewal: The first form suggests the introduction of incremental changes in order to modify the existing trajectory, but without altering it. The main idea is to regain competitiveness through a process of regeneration, creative recycling, and further development of the existing knowledge base (Menzel & Fornahl, 2010).

The second form regards the diversification of the cluster and involves a more drastic reconfiguration of the cluster. Such diversification implies the

emergence of industries new to the geographic area, but already existing elsewhere, when then fuel the expansion of the cluster's economic activities (Tomassini & Rocha, 2014; Trippl & Tödtling, 2008). Expansion includes modernization of the existing firms, creation of new firms, attracting foreign investments, and development of local universities.

The third form implies a radical alteration of the cluster including a complete transformation of the local productive structure; under this scenario, firms start to explore new economic niches (Trippl & Tödtling, 2008).

The evolutionary perspective underscores the fact that a cluster's decline does not mean it will disappear, but rather that its current trajectory no longer fits the established economic structure (Bergman, 2008; Cho & Hassink, 2009; Hassink, 2005; Martin, 2009; Martin & Sunley, 2006; Menzel & Fornahl, 2010).

Method

This paper has an exploratory character and follows a qualitative approach through a case study based of the footwear cluster in Vale dos Sinos-Paranhana. The footwear cluster was chosen due to its long history of development and its economic importance. Despite its relevance, the cluster has undergone several difficulties to keep its firms competitive and innovative. The case is a typical example of cluster decline.

We carried out fifteen interviews to identify the evolutionary processes that have characterized the decline of the cluster. The data, collected between 2016 and 2017, is based on interviews with cluster organizations and firms. We use also data obtained from RAIS (Annual Relation of Social Information) and perform document analysis. For the interviews, a semi structured questionnaire script was designed with open questions related to the lock-in effect. Table 1 summarizes the profile of the respondents.

In order to define the geographical area characterizing the cluster we use the geographical delimitation proposed by GADPI (Gaúcha Agency for Development and Investment Promotion). Some general information about the cluster (number of firms, number of workers, and number of cities), were collected from Brazil's Department of Labor annual social information report (RAIS), using the sectorial classification of IBGE, the option "IBGE sub-sector," and the keyword "footwear industry." The information obtained from RAIS refers to the period 1985–2018.

The information collected was condensed the transcriptions of the interviews with the cluster organizations. We also analyzed the RAIS data and published and unpublished documents. The data were subject to content analysis (Bardin, 2011). The questions selected for the analysis of the interviews were referring to the literature regarding the lock-in effect described

Table 1. Profile of the respondent.

Codename	Type of organization	Position of the respondent
Respondent 1	Footwear manufacturer	Entrepreneur
Respondent 2	Footwear manufacturer	Supply Manager
Respondent 3	Footwear manufacturer	Export Manager
Respondent 4	Footwear manufacturer	Export Manager
Respondent 5	Footwear manufacturer	Marketing Manager
Respondent 6	Footwear manufacturer	Factory Director
Respondent 7	Footwear manufacturer	Entrepreneur
Respondent 8	Footwear manufacturer	Operations Director
Respondent 9	Footwear manufacturer	Marketing and Communication Director
Respondent 10	Tannery	Products Development
Respondent 11	Components for shoes	Chief Executive Officer
Respondent 12	Service provider of shoe sole elaboration	Vice President
Respondent 13	Design service provider	Entrepreneur
Respondent 14	Support institution	Project Manager
Respondent 15	Support institution	Director

Table 2. Framework of analysis.

Type		Description	Element of analysis
Lock-in	Functional	Hierarchical relations of the firms and the stability of long-term relationships	Production process Production focus Relationship networks Way of relation Trading Investments in R&D and Marketing
	Cognitive	How the organizations perceive the phenomenon	Labor forces Entrepreneurship Culture and ideology Scope of activities
	Political	Inability of the political and administrative systems to change the culture and the local cluster policies	Goal of the policies Network policy Interest groups

by Grabher (1993), Cho and Hassink (2009), Hassink (2005), Ingstrup and Damgaard (2013), and Tödtling and Trippl (2005). They are summarized in Table 2.

Contextualization of the cluster

The Vale dos Sinos-Paranhana footwear cluster is located in the countryside of Rio Grande do Sul and is considered one of the oldest productive clusters in Brazil. It comprises a great number of shoes manufacturers, suppliers, transport providers, and research and support institutions (Calandro & Campos, 2016). Women's shoes are the main product of the cluster. The leather footwear tradition in the region started with the German immigration, which brought skilled workers with a comprehensive knowledge of leather treatments. Shoe production was driven by the domestic market demand until the 1960s, but then the sector started to grow at an extraordinary level, mainly due to orders from foreign client (Costa, 2009). The success of Vale dos Sinos-Paranhana until the 1980s was not only the

consequence of the positive externalities created by the agglomeration, but was driven by the major foreign brands, which were looking to lower production costs by buying finished products from local suppliers. Such external demand boosted shoe production and thus the growth of the footwear cluster (Costa, 2009).

However, this model, here called "private label," made the industry extremely dependent. Local firms did not need to worry about developing marketing, technological competences, and private brands, making the productive process extremely focused on the reduction of costs without adding specific value to the production cycle. This aspect also contributed to local entrepreneurs' maintaining a closed culture resistant the innovation. The cluster only noticed the lack of competition and autonomy in terms of the entrepreneurial function when Asian countries entered the world footwear market in the early 1990s, producing shoes more cheaply than Brazil. The cluster had been specialized in the to-order production of low-cost shoes for foreign brands. With the increased competition, the industry could not compete with the Asian production in terms of costs. Additionally, investments in training, product development, branding, and private trade and distribution channels were almost non-existent until the 1990s (Calandro & Campos, 2016).

The low costs of the Asian producers attracted the interest of the major brands, who started doing business with them. This reduced the demand for the shoes produced in the cluster. From the 1990s, however, the governments in the Northeast of Brazil started to give tax subsidies to the footwear industry, in order to induce firms to "migrate" and delocalize their factories. Both the financial shock related to the currency appreciation of the Real Plan and the collapse of foreign demand created a crisis for the Vale dos Sinos-Paranhana footwear cluster, jeopardizing its dominance in production and trading. The industries were forced to invest in the production of products with more added value and develop reputable private brands to face the competition from Asian producers. Such reorientation happened during the 2000s and was marked by the introduction of new knowledge in the sector and the strong role played by the sectorial institutions. However, the technological changes introduced by local firms continued to be incremental, and the production processes remained heavily dependent on manual skills, which demanded highly qualified workers. Then, post-2008, the cluster faced additional difficulties due to the major international and national economic crisis.

The pressures from international competition left a negative mark in the footwear cluster (Associação Brasileira das Indústrias de Calçados, 2018; Calandro & Campos, 2016; Costa, 2009). From 2014 to 2017, Brazilian production shrank to 909 million pairs. Brazil dropped from third to fourth largest world producer (Associação Brasileira das Indústrias de Calçados,

2018). However, the expansion of the industry to the Northeast area made the region Brazil's main footwear production center, accounting for 51.9% of the total national production in 2017. Still, Rio Grande do Sul remained the export leader, producing 41.4% of national exports in 2017 (Associação Brasileira das Indústrias de Calçados, 2018). The footwear industry suffered three consecutive years sharp declines, losing 33,700 jobs between the years of 2015 and 2017; 2,500 of these jobs were located in Rio Grande do Sul (Associação Brasileira das Indústrias de Calçados, 2018).

Figure 1 shows the sharp decline in the number of firms in the footwear sector starting from 2012. The period 1997–2012 saw a phase of growth, when the number firms reached 3063, only then to fall back to 1924, in 2018. The data provided by RAIS also showed a systematic loss of jobs in the cluster, down to 58,931 in 2018, the lowest number ever. Despite being relevant, the quantitative data do not entirely explain the decline of the footwear cluster; therefore, in the next section, we will present the perceptions of the respondents about the formation and the causes of lock-in effect that occurred in the footwear cluster in those years.

Analysis of the lock-in effects

Functional lock-in

Over the years, the Vale dos Sinos-Paranhana footwear cluster developed a high degree of specialization in shoe production. The main causes of the functional lock-in in the region are connected to the rigid productive

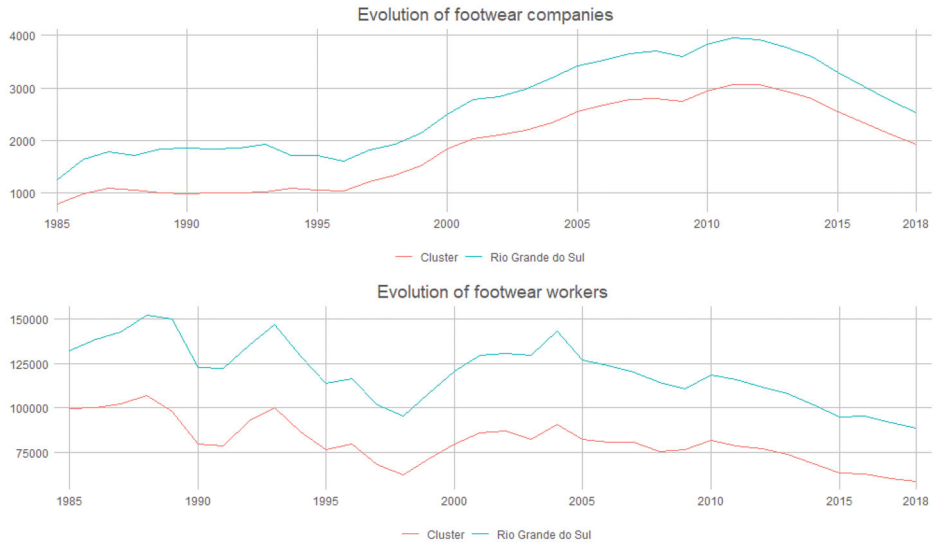

Figure 1. Evolution of the number of footwear firms and workers. Source: Authors, based on RAIS/MTE (2019).

structure and the firms' networks. Until the 1990s, the cluster was characterized by production for foreign brands. This neither encouraged innovation nor added value. Shoe designs were provided by the client firm. Yet, the period was considered the golden era of shoe production in Brazil (Respondent 6). The big brands that bought the production could exert a high degree of control on the cluster, and the export companies were responsible for all business relationships, keeping to themselves the critical business information (Respondent 1). The model only broke down with the appearance of Asian competition in the sector. The footwear firms had to find new markets and try to develop more fashionable shoes in order to compete with the national and international market. In that period, that is, during the 1990s (Respondent 5), many shoe factories closed.

Design and commercial activities were organized by the foreign brands (Respondent 1). Thus, the shoe factories tried to produce in large volumes in order to reduce costs, but this tactic proved unsuccessful. Then they decided to become subcontractors for third parties, working for mediators who sell to multi-brand stores. According to Respondent 14, this trend was also unsuccessful, which led to small firms trying to sell directly on the internet, or to shops, without mediators. However, production on demand is suited to high added-value products and services, and this limits profitability. Although some firms invested in their own stores, the model of multi brand stores is still the main sales channel.

The historical legacy of the private label production can still be seen in the cluster. In the past, the factories had few incentives for horizontal cooperation, since all production was vertical and internalized. Cooperation inside the cluster happens mainly between the suppliers of components and the firms, but not among direct competitors (Respondent 14). The fierce competition and the fear of being copied made the firms self-sufficient and unwilling to search for joint solutions (Respondent 3). One of the few activities of cooperation happens during the trade shows. However, the booths of firms at trade shows are closed—even to potential buyers—because the firms are afraid of being copied (Respondent 5). Respondent 6 pointed out that few people or organizations are willing to cooperate, finishing with the sentence: "… every man for himself, God for all."

According to Respondent 6, the shoe factories were generally not interested in developing new models: "everybody makes the same kind of shoes." Heterogeneity of knowledge among local firms is low; despite the presence of several local research institutions, such as universities and technology centers, few firms cooperate with them in order to develop innovations (Respondent 2). On the whole, most innovations come from the components sector (Respondent 15). The few firms that do carry out R&D act separately and they do not seek partnerships (Respondent 3). The

cluster is dominated by the "copy culture;" thus, although firms send their representatives to international trade shows to copy the new models, the fear of being copied complicates the flow of information.

Cognitive lock-in

Cognitive lock-in is related to the sharing of a world vision among the actors belonging to the cluster, being rooted in the local culture and habits. Indeed, all respondents converged to agree that the culture was closed and conservative, the fruit of the historical legacy of the cluster, located in region colonized by German farmers. Respondent 7 points out that "it is much more difficult to do business here than in São Paulo. I stay one week in São Paulo and the firms are much more dynamic than here." With some exceptions, most cluster firms are family businesses, which perpetuates a conservative mental model from one generation to the next. The private label firms did not cooperate with their suppliers or subcontractors, and the rampant copying made firms very suspicious of cooperation. The insular and conservative culture also makes the sector disconnected, which hinders the attempts of the trade unions to create joint initiatives (Respondent 2). Another negative characteristic connected to the mental model of entrepreneurs is the view that research results must be immediate (Respondent 2). This limits the propensity towards long-term R&D.

The conservative culture not only complicates cooperation, but also inhibits the emergency of new firms and new models of businesses. Respondent 10 pointed out that the new (machinery, design, selling modalities) is not always appreciated, since the major part of the producers lived in a time when processes were handmade. Therefore, they tend to keep that tradition, avoiding novelties or as mentioned by Respondent 3: "the firms are very linear, I learned how to make shoes in this way, and I will do it this way for ever." Only Respondent 4 stressed the existence of cooperation: "People are trying to help each other because they want to share and solve the difficulty." Abicalçados, a local trade association, is also seeking to boost cooperation through new projects like Future Footwear and Brazilian Footwear, and organizing social events such as a marathon.

Respondent 1 also points out the existence of outstanding payments among the multi-brands stores and cluster firms. "Firms supply the stores on credit, and sometimes they fail to pay their invoices. In fact, the rate of non-payment of Brazil's stores is very high." The Rio Grande do Sul culture was also highlighted during the interviews.

The connections with foreign supply chains made cluster firms dependent on foreign demand and so they do not develop specific export capability. With the decline of international demand, most of the surviving firms

focused their efforts on selling to the domestic market, which is protected from foreign imports (Respondent 15). The focus on the internal market also contributed to the loss of export capabilities. In turn, a specific project was launched by the local institutions to retrain entrepreneurs to become exporters. Clearly, exporting is seen as an opportunity when the exchange rate is favorable.

Traditionally, the region always had a labor force specialized in shoe production. However, young workers do not look for employment in shoe factories because of poor working conditions and low salaries. Thus, vocational courses do not find new students. Additionally, the older workers try to find jobs outside the footwear industry for their children "I have been working very hard because my son will not work with shoes" (Respondent 13).

Five of the entrepreneurs interviewed moved some or all of their production to the Northeast, while maintaining their strategic activities in the cluster, such as research and development, design, and marketing.

The footwear cluster is characterized by the existence of many small and family companies. The older entrepreneurs, formed during the period 1970–1980, are still in the top managerial positions (Respondent 2). To counter this trend, Abicalçados has launched projects to train young future entrepreneurs, with the aim of changing the mental outlook of the next generation (Respondent 14).

Political lock-in

The development of the footwear cluster was historically supported by Federal and State entities, unions, and associations linked to shoe manufacturing training centers. However, such institutions were also responsible for the political lock-in. One of the main complaints of the entrepreneurs interviewed was that the support institutions act only at a superficial level (Respondent 2). Only recently have they worked to develop new business strategies and to facilitate the entry of firms in international markets (Respondent 5).

Despite the increasing number of institutional actions, only large firms benefited. In the international market, Abicalçados has been strongly supporting the export activity of a few large national brands in order to improve the worldwide image of Brazilian shoe (Respondent 4; Respondent 7). Despite the geographical proximity with universities, firms do not often seek to collaborate with them (Respondent 8). To date, Abicalçados has failed to develop projects encouraging the adoption of new technologies (Respondent 14).

Table 3. Main causes of the lock-in effect.

Type of lock-in	Cause
Functional	High specialization in leather and women's shoe manufacturing
	Focus on cost reductions
	Networks controlled by important brands—Private label
	Little collaboration and diffusion of knowledge
	Little investments in R&D and rampant copying
Cognitive	Reluctance to innovate and adoption of new business models
	Conservative culture
	Lack of unity in the sector and mutual distrust
	Lack of export strategy: based on foreign exchange rates
	Stuck in the mental model of the older generations
Political	Most institutional actions involve only the major footwear firms
	Support only at the institutional level
	Domain of the sector in the regional economy

In 2016, the Government of the State of Rio Grande do Sul granted a tax benefit and reduced sales for shoe manufacturers, aiming at supporting and preserving the sector jobs (Respondent 1). However, despite significant activism, the institutions could not stop the political games being played in the cluster. Thus, the cluster continues to specialize in women's shoes, while other segments deemed as less important, such as children's and men's footwear, do not receive much attention (Respondent 9).

Based on our analysis, Table 3 summarizes the main causes of lock-in.

Discussion

The stability of long-term relations and the model based on being part of a global supply chain (Gereffi et al., 2005) with foreign firms made the Vale dos Sinos-Paranhana footwear cluster dependent on famous footwear brands. Similar to the case of the Rurh district described by Grabher (1993), the Vale dos Sinos-Paranhana footwear cluster bet on the stability its relationships with foreign firms. However, this stability created difficulties when it came to responding to changing market demands. Because of their tradition of selling to foreign producers, the cluster firms failed to build a flexible organization able to innovate and differentiate, even though heterogeneity of knowledge is essential stay vibrant (Menzel & Fornahl, 2010). The low innovation of the firms contributed to weak heterogeneity; indeed, its low level helps explain the lack of cooperation in the cluster. Boschma (2005) claims that when cognitive proximity between firms is high, knowledge becomes redundant. Consequently, the firms do not identify the advantages in the cooperation because any knowledge that leaks may mean the loss of a competitive advantage.

Cognitive and political lock-in are two related processes that are self-reinforcing over time. This study agrees with the findings of Staber and Sautter (2011), who identified that over the years the clusters created cultural identities

that weakened or restricted their renovation and diffusion of knowledge (Giuliani, 2005).

The support institutions became more active from the 2000s, due to the evident need for the cluster to reimagine itself. However, the actions identified focus more on expanding the market than on renewing the knowledge bases. A mismatch between the sectorial policies and the needs of the cluster occur, according to Ingstrup and Damgaard (2013), when local political agents fail to encourage the renewal of knowledge bases to increase diversity and innovation. Concomitantly, firms and institutions fail to follow a parallel path of diversification (Belussi et al., 2008) based on the emergence of new sectors built by recombining existing and new knowledge (Frenken et al., 2007). Such aspects lead us to the first proposition, which points to the idea that the strong local culture focused on traditional means of production and the absence of innovation policies influenced the stagnation of the Vale dos Sinos-Paranhana footwear cluster.

> Proposition 1: Clusters with a strong local culture may be more prone to cognitive and political lock-in

The RAIS data indicate that the footwear cluster was undergoing a shakeout period, with firms exiting the cluster; the productive model was no longer appropriate (Wal & Boschma, 2011). In some cases, firms tried to avoid cut-throat price competition and invested in private branding. Cluster firms followed a model of change through incremental improvements (Trippl & Tödtling, 2008). The governance bodies of the cluster chose not to "refresh their leadership" (Tomassini & Rocha, 2014), and local firms failed to search for radical new B2C markets (Tödtling & Trippl, 2005).

For decades, the cluster prospered due to the private production of shoes for foreign brands. When the foreign brands abandoned the Brazilian market for the Asian one, the footwear industries had huge difficulties in adapting and developing new technological and marketing competencies, because their dependency on foreign brands limited their ability to search for new knowledge. In this sense, the second proposition points to the fact that clusters acting from positions of dependency in the global value chain may be more susceptible to functional lock-in.

> Proposition 2: Clusters with a position of dependence in the value global chain are more prone to functional lock-in.

The adoption of new technologies is uncommon in cluster firms. Much of the learning in weak clusters stems from new knowledge brought-in by clients or suppliers (Belussi et al., 2018), which aids in cluster renovation (Menzel & Fornahl, 2010). One of the ways to stimulate cluster innovation is through the creation of new industries endowed with complementary

technological bases to those existing within the cluster (Frenken et al., 2007; Tödtling & Trippl, 2005). The presence of related sectors allows a greater exchange of knowledge between them, since the cognitive distance between them tends to be low (Boschma, 2005). Due to the reuse of routines and skilled labor, combined with greater cooperation and innovation, regions with related economic structures tend to have higher rates of growth and productivity (Farhauer & Kröll, 2012). In the footwear cluster, such related activities manifest, for example, through design services and the chemical and tanning industries. The proximity of these industries can facilitate the recombination of knowledge and propel the cluster to a new trajectory of growth.

Proposition 3: The advent of innovative firms can contribute to the renewal of the cluster.

The lock-in effect helps us to explain how productive, cognitive, and political inertia may drive the decline of a cluster. However, decline is not a deterministic process caused by single sequential elements. Through historical cluster analysis, we identified how the business relationships of private labels imprisoned the cluster. Initially, the footwear industries that adopted the private-label model obtained economic gains, albeit being copied then by their competitors. This pattern fostered a reduction in technological heterogeneity as well as functional and cognitive lock-in of the cluster. From this point going forward, the behavior of firms began to be ever more stipulated and reinforced by their historical past, thus reducing the search for new knowledge (Isaksen, 2018). Later, the success of the cluster was reinforced by public policies that initially sought the economic development of the region and, later, the preservation of the industrial hub and jobs, thereby reinforcing the regional political lock-in. In this sense, the lock-in effects described seem to be self-reinforcing processes that emerge as the cluster develops a strong reliance on the routines that marked its past success (Cho & Hassink, 2009; Grabher, 1993).

Renewal of the cluster is directly related to its ability to introduce new knowledge to break with the dominant trajectory and assume new routines. New firms should be created in the region, seeking such renewal. In this sense, we identified the creation of the group Future Footwear, which involves the sponsorship of new young entrepreneurs. New firms have introduced new routines (based on vertical and horizontal cooperation) and have been more willing to share information.

The decline of the footwear cluster in Sinos-Paranhana Valley was followed by the expansion of the activities in the Brazilian northeast and in China. Such events reinforced the argument of Buciuni and Pisano (2015) that the decline of a cluster may be linked both to the obsolescence of the

technologies and the emergence of other more competitive clusters around the world.

Hannigan et al. (2015) observe that, despite the fact that the automotive industry has largely moved to low-cost regions, Detroit continues to be one of the most innovative centers in the industry. The same process could be is happening in the footwear cluster. Although the increased competition forced the footwear factories to move to cheaper productive regions, they kept their strategical activities in Vale dos Sinos-Paranhana. Furthermore, even if the region loses part of its factories, it can retain its intellectual property at the main office, thus providing added value in footwear production. Such changes accentuate the historical importance of a trajectory-dependent economy in which new economic activities do not emerge from zero but through a continuous process of economic evolution (Martin, 2009).35Despite the crisis in the footwear cluster, it was capable of transforming itself by adapting to the new market conditions. Moreover, it is when clusters decline that they have a greater freedom to search for new routines (Cowell, 2013; Martin & Sunley, 2011; Simmie & Martin, 2010). The new assets are still far from becoming dominant, and novelties have been introduced mainly by the new start-ups with the support of the representative institutions. The success of new models can act as a trigger for the other cluster firms to change their strategies (Hervas-Oliver & Albors-Garrigos, 2014), thus forging a new cycle of growth and development (Cowell, 2013; Martin & Sunley, 2006, 2011; Menzel & Fornahl, 2010; Simmie & Martin, 2010).

Conclusions

The purpose of this paper was to analyze the impacts of the lock-in effect on the evolutionary trajectory of the Vale dos Sinos-Paranhana footwear cluster. Over time, the clusters came to be seen as structures that ensured regional economic success through the generation of positive externalities (Martin & Sunley, 2006). However, the evolutionary perspective highlights the dynamic character of clusters, explaining their emergence, development, and possible decline (Belussi & Caldari, 2011; Menzel & Fornahl, 2010). The lock-in effect in the footwear cluster of Sinos-Paranhana Valley helps explain the problems a cluster can face. The lock-in effect occurred during a historical process that prized stability and inertia to the detriment of innovation; it self-reinforced throughout several entrepreneurial generations, embedded in the cultural identity of the cluster.

The decline of the cluster is not tantamount to its disappearance. On the contrary, the cluster will survive because over time, if novelties are not introduced, all competences, local resources, and assets will be lost.

Decline is often activated by changes in global competition. The reaction of the Sinos-Paranhana Valley cluster has been timid: firms' improvements have mainly been incremental with some increased cooperation and absorption of external knowledge. The renovation of the cluster is a delicate process that demands the support of institutions.

The analysis of the literature pertaining to cluster renewal shows several alternative paths. However, there is no ideal model that can be replicated (Tödtling & Trippl, 2005). The evolution of other footwear clusters, such as Riviera del Brenta or Montebelluna in Italy (Belussi et al., 2018), show a variety of possible successful strategies: creation of new innovative firms, diversification of the sector, attraction of multinationals (Belussi, 2018), introduction of new technologies, diversification of firm business models (Belussi et al., 2008), and so on. No economic system is immune to the lock-in effect, if only because extreme specialization is not necessarily bad for the regional economy. However, strong specialization, standardization of firm routines, closed social-institutional environments, and excessive dependence from global supply chains (Di Maria et al., 2018) may become economic traps.

This research has contributed to the understanding of how a cluster develops, matures, and declines, highlighting a case of lock-in. This study suggests possible policies focused on cluster renewal within a general context (Belussi & Trippl, 2018). The main limitation of this study is its exploratory nature.

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