AN INTEGRATED ASSESSMENT OF THE EFFECT OF ENVIRONMENTAL REGULATION, LAND USE CHANGES AND MARKET FORCES ON THE MEXICAN LEATHER AND FOOTWEAR INDUSTRIES' RESTRUCTURING

by

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Abstract

Traditional theories of industrial restructuring assign the most explanatory weight of the structural change phenomenon to increasing pressures via globalization and falling trade barriers. This thesis offers a new model of thinking about industrial restructuring that includes multiple stressors. The thesis focuses on three main drivers of structural change: market pressures, environmental regulation and changes in land use and land pricing, using two case studies of leather and footwear industrial clusters in Mexico, located in the cities of León and Guadalajara. Evidence of multiple drivers of structural change is found in the dissertation. Furthermore, responses to restructuring drivers in León and Guadalajara are found to be substantially different. Firms in the leather and footwear cluster in León have implemented countervailing strategies such as price competition, government lobbying, and more recently, investment in socio-economic research (competitiveness) projects. However, firms in the leather and footwear cluster in Guadalajara focused on a specific, high-end target market. At the larger, urban scale, footwear and its allied industries in the city of León resisted change and have tried to remain in operation while the city of Guadalajara has focused on a diversification strategy, attracting new (arguably more technically advanced) industries. This thesis offers empirical and theoretical advances. Empirically, it applies a firm demographics approach to the study of industrial clusters under multiple stressors. This approach has not been previously used on Mexican data. Theoretically, it demonstrates that future analyses of industrial complexes' structural change can be strengthened through the use of an integrated assessment framework investigating the effect of multiple stressors (market forces, land pricing, technical change, environmental regulations, and consumer preferences) on industrial restructuring.

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ANACU	Asociación Nacional de Curtidores	National Association of Tanners
ANPIC	Asociación Nacional de Proveedores de la Industria del Calzado	National Association of Suppliers of the Footwear Industry
ANPICUR	Asociación Nacional de Proveedores de la Industria de la Curtiduría	National Association of Suppliers of the Leather Industry
CANACINTRA	Cámara Nacional de la Industria de la Transformación	National Chamber of the Manufacturing Industry
CANACUR	Cámara Nacional de la Industria de la Curtiduría	National Chamber of the Tanning Industry
CANAICAL	Cámara Nacional de la Industria del Calzado	National Chamber of the Footwear Industry
CEC, NACEC	Comisión para la Cooperación Ambiental de América del Norte	North American Commission for Environmental Cooperation
CIATEC	Centro de Investigación y Asesoría Tecnológica en Cuero y Calzado, A.C. (Centro de Innovación Aplicada en Tecnologías Competitivas)	Centre for Research and Technological Advising on Leather and Footwear (now Centre for Applied Innovation in Competitive Technologies)
CICEG	Cámara de la Industria del Calzado del Estado de Guanajuato	Chamber of the Footwear Industry of the State of Guanajuato
CICEJ	Cámara de la Industria del Calzado del Estado de Jalisco	Chamber of the Footwer Industry of the State of Jalisco
CICUR	Cámara de la Industria de la Curtiduría del Estado de Guanajuato	Chamber of the Tanning Industry of the State of Guanajuato

CNA	Comisión Nacional del Agua	National Water Commission
CEASG	Comisión Estatal del Agua y Saneamiento de Guanajuato – As of 2003 only Comisión Estatal del Agua de Guanajuato (CEAG)	State Water and Wastewater Treatment Commission of Guanajuato – As of 2003 only State Water Commission of Guanajuato
COESE	Comisión Estatal de Ecología (Jalisco)	State Commission of Ecology
CONACYT	Consejo Nacional de Ciencia y Tecnología	National Council for Science and Technology
CRIC	Cámara Regional de la Industria de la Curtiduría en Jalisco	Regional Chamber of the Tanning Industry in Jalisco
EIA	Encuesta Industrial Anual	Annual Industrial Survey
EIM	Encuesta Industrial Mensual	Monthly Industrial Survey
GATT	Acuerdo General sobre Aranceles Aduaneros y Comercio	General Agreement on Trade and Tariffs
GIS	Sistemas de Información Geográfica	Geographical Information Systems
IEEG	Instituto de Ecología del Estado de Guanajuato	Institute of Ecology of the State of Guanajuato
IITJ	Instituto de Información Territorial de Jalisco	Institute of Territorial Information of Jalisco
IMPLAN	Instituto Municipal de Planeación de León	Municipal Institute of Planning of León
INE	Instituto Nacional de Ecología	National Institute of Ecology
INEGI	Instituto Nacional de Geografía, Estadística e Informática	National Institute of Geography, Statistics and Informatics
LEEPAG	Ley del Equilibrio Ecológico y Protección al Ambiente del Estado de Guanajuato	Law for Ecological Equilibrium and Environmental Protection of the State of Guanajuato

LEEPAJ	Ley del Equilibrio Ecológico y Protección al Ambiente del Estado de Jalisco	Law for Ecological Equilibrium and Environmental Protection of the State of Jalisco
LGEEPA	Ley General del Equilibrio Ecológico y Protección al Ambiente	General Law for Ecological Equilibrium and Environmental Protection
LIEG	Ley de Información Estadística y Geográfica	Statistical and Geographical Information Law
NAFTA	Tratado de Libre Comercio de América del Norte	North American Free Trade Agreement
NMX	Norma Mexicana (Voluntaria)	(Voluntary) Mexican Standard
NOM	Norma Oficial Mexicana	Official Mexican Standard
OECD	Organización para la Cooperación y el Desarrollo Económico	Organization for Economic Cooperation and Development
PIEL	Parque Industrial Ecológico de León	Industrial and Ecological Park of León
$PROCIC_3$	Programa de Competitividad del Cluster Cuero-Calzado	Program to Improve the Competitiveness of the Leather and Footwear Industrial Cluster
PROFEPA	Procuraduría Federal de Protección al Ambiente	Federal Attorney for Environmental Protection
PROPAEG	Procuraduría de Protección al Ambiente del Estado de Guanajuato	State Attorney for Environmental Protection
SAGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación	Secretariat of Agriculture, Livestock, Rural Development, Fishing and Food
SAPAL	Sistema de Agua Potable y Alcantarillado de León	Drinking Water and Sewage System of León
SE	Secretaría de Economía	Secretariat of Economy
SEMARNAP	Secretaría de Medio Ambiente, Recursos Naturales y Pesca	Secretariat of Environment, Natural Resources and Fisheries

SEMARNAT	Secretaría de Medio Ambiente y Recursos Naturales	Secretariat of Environment and Natural Resources
SIAPA	Sistema Intermunicipal de Agua Potable y Alcantarillado	Intermunicipal Drinking Water and Sewage System
IEM	Sistema de Información Empresarial Mexicano	Mexican Business Information System
UNEP	Programa de las Naciones Unidas para el Medio Ambiente	United Nations Environment Programme
UNIDO	Organización de las Naciones Unidas para el Desarrollo Industrial	United Nations Industrial Development Organization
WTO	Organización Mundial de Comercio	World Trade Organization
ZMCM	Zona Metropolitana de la Ciudad de México	Metropolitan Zone of Mexico City
ZMG	Zona Metropolitana de Guadalajara	Metropolitan Zone of Guadalajara

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– Sir Isaac Newton, in a letter to Robert Hooke, 1676.

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Chapter 1 Introduction

1.1 Introduction

Industrial restructuring is frequently defined in the literature as the 'rise and decline of industries'. The social sciences have treated this evolutionary phenomenon in a disjointed manner. Some times, greater emphasis is placed on emerging firms and entrepreneurship while other times increased interest is given to industrial decline. This dissertation contributes to the burgeoning literature on industrial restructuring, synthesizing both and using an integrated approach to firm demographics. The thesis uses the leather and footwear industrial clusters in the Mexican cities of León and Guadalajara as case studies to test propositions about the effect of multiple stressors on the combined process of urban and industrial restructuring.

Originally, this research was prompted by a keen interest in the leather tanning industry in the city of León, located in central Mexico. This thesis' initial objective was to study the way in which tanneries had responded to strict environmental regulation in the mid-1990s. However, as the research progressed, the focus of this thesis shifted. Preliminary research made it evident that the Mexican leather and footwear industries had been under a variety of pressures that needed to be examined in an integrated manner. Globalization and falling trade barriers posed increased threats to the local footwear industries. At the local level, scrutiny by environmental agencies increased and zoning policies began changing to minimize externalities. After learning more about these issues, it became clear that this problem was much more complex than previously thought. Thus, the overall questions that this research ended up examining are: how did multiple stressors affect the restructuring of the Mexican leather and footwear industries and what were the effects of these drivers[1] on the urban and industrial landscapes of these cities?

[1] For the purposes of this thesis, stressor and driver are used interchangeably.

Three waves or distinct bodies of work that have studied structural change have been identified in this research. The first wave has assigned the majority of explanatory weight to globalization and increased competition as the key driver of structural change. Increased competition derived from international trade agreements has rendered many firms and entire industrial sectors unable to compete and survive (Vangstrup 1997; Barnes and Kaplinsky 2000; Lord 2001; Hayter 2003). This body of work argues that industries respond to international pressures from falling trade barriers using a variety of strategies. When these adaptive strategies fail, industries choose to cease operations and exit the industry altogether. This literature suffers from a major shortcoming in that it does not consider other major factors (in addition to market forces) that play a role in shaping the structure of industries. The recognition of pressures such as environmental regulation has become the trend in what is called in this thesis the second wave of research on structural change.

This second wave has linked the pollution haven hypothesis with issues of industrial structure by arguing that polluting industries will relocate to regions and countries where laxer environmental standards are in place[2], thus changing the structure of said industry in the host country/region as well as the receiving country/region. Industry decline is attributed to stricter environmental regulatory standards, particularly in developing nations (Deily and Gray 1991; Palmer, Oates et al. 1995; Lago and Visconti 1997; Knutsen 1998; Petts 2000). Nevertheless, this causal linkage ("stringent environmental regulation leads to plant closure") remains open to discussion[3].

This dissertation proposes a third model of thinking about structural change. This model integrates multiple forces into the analysis and extends previous analyses by incorporating a third variable: changes in land prices, land uses and zoning policies. The thesis demonstrates the existence of multiple stressors and highlights the fact that industries restructure in response to a variety of forces that act simultaneously and have varying degrees of impact in their behavior. While other factors such as consumer preferences and technological change may be restructuring drivers and can also have an impact on industrial structure, this dissertation focuses primarily on market forces, environmental regulation and

[2] This is the pollution haven hypothesis.
[3] While this relocation phenomenon is often thought of as an international movement (from nation to nation), some authors still indicate a pollution haven when relocation occurs from one province (or state) to another. See for example, a recent volume edited by Kathryn Harrison (2006).

changes in land use, land prices and zoning policies. This study seeks to illuminate the inherent challenges that geographically concentrated firms face when subjected to multiple external forces. In undertaking this analysis, the thesis uses a firm demographic approach that focuses on entry, exit and survival of firms.

In this thesis, ***structural change*** means *a shift in the structure of an industry, an evolutionary process with sharp, distinctive change/break points*. Those sudden, punctuated changes aren't only short-term, short-lived shocks. They are, in fact, deep and profound changes in the industries' structure, in the patterns of interaction amongst firms within a sector and in their inter-industry linkages, both forward and backward. These changes can be described in terms of *firm size, employment distribution, product mix, spatial distribution of firms, exchanges within and across industries* and *technological developments.* This dissertation follows an evolutionary approach that examines the spatial dimension of firm survival and decline (van Geenhuizen 1999; van Dijk and Pellenbarg 2000).

Now, one may ask, how is this research new and what is the overall contribution of the dissertation? At first glance, the question may not appear to be new given that industrial decline was at the center of heated debates on the pros and cons of increasing urbanization and changes in patterns of land-use (rezoning land as urban use at the expense of industrial land) in mid-1970s England (Gripaios 1977c, a). In the American literature, more recent discussions have centered primarily on the exurbia phenomenon, defined as an increasing transformation of farmland into bedroom communities (Irwin and Geoghegan 2001; Irwin and Bockstael 2002) as a result of higher demands for housing and urban sprawl. Interest in the British literature for industrial decline waned around the late 1980s, and only recently has regained interest. Nevertheless, there is a paucity of studies that link issues of substitution of industrial land for urban residential use with the overall body of work on industrial restructuring, particularly in developing countries. The thesis makes these linkages explicit. Moreover, in the literature that has examined the leather and footwear industries both worldwide and in Mexico, discussions have been centered on the tanning industry and its environmental effects or whether the footwear industry clusters have the qualities of an industrial district. Integrated analyses of urban and industrial restructuring are lacking; thus, this thesis offers a contribution to these discussions.

1.2 Research design and methodology

This dissertation is an integrated assessment of the effects of multiple stressors on the structural change of traditionally polluting commodity chains, using leather and footwear manufacturing as a case study. Integrated assessment (IA) is the systematic examination of a complex problem using a variety of lenses (from the natural and social sciences) that offer alternative, policy-relevant explanations. This approach provides a framework for bringing together different strands of knowledge and furthering our understanding of a particular problem. Since the late 1980s, researchers interested in the human dimensions of global environmental change, particularly climate policy, changes in land use and land cover (and more recently, linkages between ecosystem and human health), have used integrated assessment (Dowlatabadi 1995; Morgan and Dowlatabadi 1996; Rotmans and Dowlatabadi 1998; Harremoes and Turner 2001; Dowlatabadi 2002). Undertaking an IA on a problem involves understanding all its key aspects, ranging from the technical aspects to the perceptions of the public through to decision-making by policy entrepreneurs.

Throughout the dissertation, a mixed (quantitative and qualitative) research methodology approach (Bordens and Abbott 1996) is used. The impact of economic forces on firms (market openness, trade-barriers, and tariffs), aspects of geographical dispersion and firm demographics are phenomena that are more amenable to quantitative treatment. Therefore, quantitative evidence was collected, assembled and analyzed to the largest extent possible. This data gathering process posed a big challenge given the traditional lack of transparency and willingness by Mexican governmental agencies and private institutions to provide reliable data. Extensive archival research in both cities (León and Guadalajara) was undertaken, working with government agencies and assembling datasets for most of the data presented here. Semi-structured interviews were conducted, combined with participant observation, expert elicitation and opinion analysis. Further, data from secondary sources, and published datasets and other quantitative data to understand structural changes in the leather and footwear industries in Mexico were collected.

Participant observation during two international footwear conferences, four national conferences on tanning, and one international meeting of experts on leather and footwear (2002-2005) offered additional empirical data, as more than seventy (70) conversations with relevant stakeholders and leather and footwear producers were held. Newspaper articles that

mentioned leather and footwear issues in León and Guadalajara from the period 1999-2007[4] were analyzed. However, these results will be reported elsewhere.

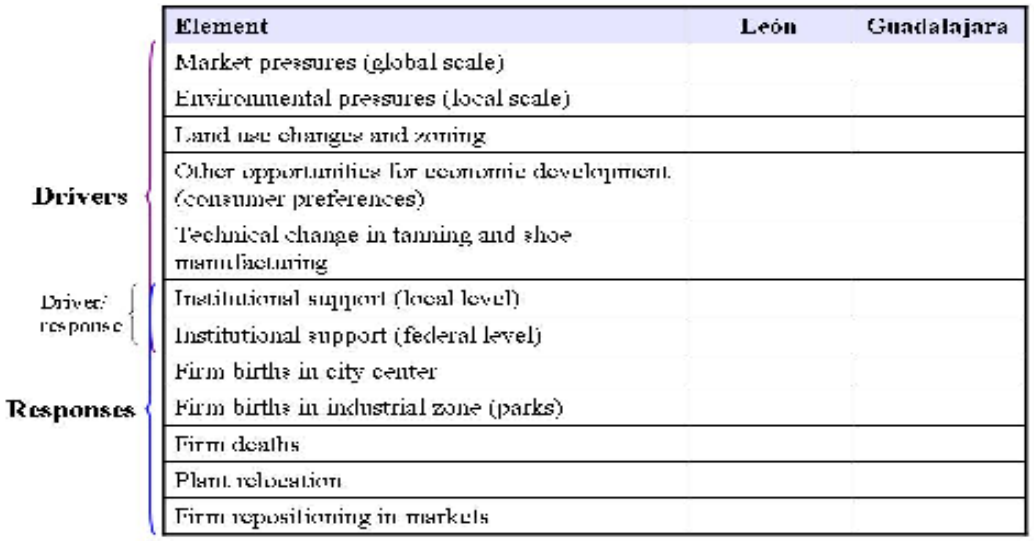

Figure 1-1 Research design using a comparative model of drivers and responses. Rows indicate factors to be analyzed. Institutional support can be considered both a driver and a response. The thesis seeks to explain variations amongst firm responses to several drivers.

This dissertation examines three primary drivers of structural change, two local forces (land use changes, zoning policy and land pricing) and one global force (globalization and market pressure) while recognizing that there might be other forces at play such as technical change and consumer preference. Figure 1-1 shows that institutional support may be considered both a driver and a response. Responses are assessed using metrics of firm demography. Repositioning is assessed qualitatively using interview data. The remainder of this chapter will describe the methodologies used in more detail.

[4] The content analysis of newspaper articles is not reported in this thesis. This material will be published as a separate journal article given that this was not one of the main intended research products.

1.2.1 International trade pressures

Much of the industrial restructuring literature focuses on globalization and market forces as drivers of structural change (Demsetz 1973; MacLachlan 1992; Rabellotti 1999; Gordon and McCann 2000; Bair and Gereffi 2001).

To account for international trade pressures, a two-pronged approach was used. Numerous market-related factors that could have an impact on the behavior of industrial clusters, such as tariffs, trade barriers and increased competition were explored.

First, a historical analysis provided an overview of how competition in the Mexican leather and footwear markets has evolved. This analysis focused primarily on the recent increased competitive pressure from Asian countries and the effects of GATT and NAFTA. If, as indicated in the literature, increasing market pressure had an effect on industrial restructuring, we should see an effect on firm population and industrial structure. If the market pressure were negative, for example, we should see industry decline. If the market pressure were positive, then we would see new firms entering foreign markets, or increasing exports. NAFTA was indeed promoted in Mexico as a panacea to increase Mexican exports to the American and Canadian markets. Both sides of market pressure are explored in the thesis.

Second, a comparative analysis of proximate measures of market pressure offers potential explanations for diverging and/or converging firm responses. The most commonly used indicator for market dominance [the four firm concentration ratio (CR_4)] was used. A cross-regional comparison of CR_4 for both leather and footwear was undertaken in order to evaluate varying degrees of market pressure intensity. These results are reported in Chapter 3.

1.2.2 Environmental regulation and civil society pressure

Different authors use a variety of measures to assess stringency of environmental regulatory pressure. Admittedly, none of these are entirely satisfactory. Establishing clear causal chains that connect intensity of regulatory pressure with environmental outcomes is particularly challenging. To analyze environmental regulatory pressure, original and previously unavailable data on tannery plant audits (inspections) by the federal prosecution

office over the course of a decade (1992-2002) were collected[5]. The number of inspections per year was used as a proxy for intensity of regulatory pressure. We would expect a rising number of tannery inspections in a situation where regulatory stringency was high, and a low number where stringency was low. If environmental regulation had made it impossible to continue operating, as tannery owners suggested, then we would have seen an increase in plant closures during the same period or shortly thereafter. Empirical evidence in Chapter 3 indicates otherwise.

1.2.3 Emerging opportunities and threats (for economic development)

Substitutes for leather-based materials that were traditionally associated with shoe construction have been around for over three decades. It may take much longer before we can find a substitute for footwear. However, through time, there have been substantial changes in the composition of shoes that can be attributable to emergence of new raw materials, thus making leather substitable.

Firms can also respond to structural change by shifting market orientation. Increased competition can also lead to shifts in corporate strategy, changing the firm's production practices and fostering innovation.

Emerging opportunities include diversification of industrial operations and transition to a de-industrialized economy. Emerging threats may include substitution and increased demand for leather and footwear from other developing nations (such as China and India). It is the combined net effect of opportunities and threats with other exogenous forces that can affect the destiny of urban and industrial development.

A historical approach to studying the potential effect of emerging threats and opportunities on economic development was taken, examining a variety of published sources such as newspapers and trade magazines. Semi-structured interviews with stakeholders in the leather and footwear industries were also conducted. Another approach taken was to examine quantitative data on the relative market dominance of various Asian countries (including China).

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[5] PROFEPA (the *Procuraduría Federal de Protección al Ambiente* or the Office of the Federal Prosecutor for Environmental Protection, the regulatory agency in charge of prosecuting environmental offenses)

1.2.4 Inter-industry dynamics and technical change

The dynamic nature of consumer preferences and technical change affects industrial restructuring in the leather and footwear commodity chain in two ways. First, it affects consumption of specific types of leather. Depending on fashion trends, some materials may be deemed 'out-of-fashion'. Leather could very well be (and is indeed) one of these materials. Second, technical change implicitly brings along shifts in the way leather and footwear is produced. New technologies may emerge and make production more efficient. However, it is very likely that technical change is also intertwined with consumer preference. History has shown that new technologies for footwear manufacturing have arisen coupled with a reduction in leather use. The inter-industry linkages between tanneries and shoe factories are then negatively affected with the rising popularity of new, non-leather materials and the implementation of technically more efficient processes for footwear production that involves these new raw materials.

To assess the impact of technical change, the interdependence of the local leather and footwear industries in León was analyzed. The likelihood of a technological ceiling[6] was scrutinized by surveying the natural science and engineering literature and comparing the evidence gleaned with claims made by social scientists (Chapter 3).

1.2.5 Federal institutional support (subsidies and other factors)

Governments need to balance [often conflicting] objectives and policy goals with the resources available to decision-makers to serve a broad range of target populations. When we assess institutional support at different governmental scales, we need to compare the degree of support of the particular commodity chain under study with that of other industrial sectors. Depending on the particular industry and the socioeconomic and political context, federal institutional support may have varying degrees of intensity. More support can be given to high priority industries (such as electric utilities, oil and gas, etc.) if there is a perceived need for said support.

To assess the degree of institutional support, interviews were conducted with government officials, stakeholders and selected experts on the leather and footwear

[6] A technological ceiling is defined as the point where a firm is unable to improve their processes through technical change simply because there is no further ground to gain.

industries. To trace/verify local and federal governments' degree of support for the time period under analysis (1980-2004), we relied on government publications, newspaper articles and industry trade magazines.

1.2.6 Local institutional support (subsidies and other factors)

Assessing restructuring responses requires an understanding of the context within which companies operate. Support from local institutions is a key element of a thriving industrial district. While industrial districts are characterized by spatial proximity, this element is not enough to sustain a cluster (Rabellotti 1998; Ferraz, Kupfer et al. 1999; Martin and Sunley 2003). Depending on the particular economic and sociopolitical environment of each country, federal institutional support will have varying degrees of intensity. We would think that local (rather than federal) authorities would provide much more support to a particular industrial sector if this industry were deemed vital to the city. This had been the case for a long time in the city of León; anecdotal accounts corroborated the idea that the population "depended on the leather and footwear industry for its survival". Different behavior was exhibited in Guadalajara, however, as will be shown in later sections of the thesis (Chapter 4).

To see whether institutional support had been strong throughout the period (1980-2004), records from the local archives and libraries (*Archivo General de Guadalajara* and the *Archivo Historico de la Ciudad de León*) were examined. Semi-structured interviews were conducted, as well as participant observation in tanning- and footwear-related meetings. . While 'strength of institutional support' is not easily measured quantitatively, a qualitative assessment can be made. The extent that local institutions invest in competitiveness programs may also be considered a form of institutional support.

1.2.7 *Firm demographics*

Structural change may be seen as an evolutionary, "birth-growth-death", life-cycle type of process, where firms are "born", then grow until they reach maturity and finally "die". This view, espoused by researchers in the organizational ecology literature, has recently given rise to a wave of economic geography literature that focuses on the

"demography of the firm" (Dijk and Pellenbarg 1999)[7]. The firm is treated both as an individual entity with a finite life-span and as a 'family' (van Dijk and Pellenbarg 2000). The most comprehensive study of firm demography to date is the collection of papers edited by these authors. However, this body of research has focused heavily on Europe (van Dijk and Pellenbarg 2000; van Wissen 2000; Pablo Martí and Muñoz Yebra 2002). Firm demographics in developing countries have been under-researched; this thesis addresses this gap in the literature.

Table 1-1 shows that there are at least five different responses a firm may take in the face of increased pressure:

Table 1-1 Definitions of firm demographic events

DEMOGRAPHIC ELEMENTS	Definition
Death	A firm may cease operations entirely. The owner does not continue in the same line of business.
Re-birth	A firm may close a plant in a particular location. Another entrepreneur decides to purchase the plant and start operations there.
Relocation	A firm may close a plant in a particular location, then re-open in a different location.
Birth	An entrepreneur may decide to start a new plant in a specific location (downtown core or industrial park).
Dormancy	A firm may cease operations temporarily. The owner waits until the economic environment allows her to re-start operations.

New births are analyzed separately depending on geographical location (downtown core versus industrial parks). If zoning regulations are not strictly enforced, then new plants may appear in the downtown core. However, if new firms follow zoning policies closely, then we would expect births to occur in industrial parks.

To study the demography of firms in León and Guadalajara, two different methods were used. First, a dynamic comparison of firm births and deaths through time in both cities was undertaken. This comparison used original panel data on a sample of leather and footwear firms from León and Guadalajara (1994-2003). Aggregate data were generated by the National Institute of Statistics, Geography and Informatics (*Instituto Nacional de Estadística, Geografía e Informática*, INEGI) albeit the raw datasets were not provided citing

[7] The traditional, "narrow" view of firm demography includes migration and survival as two demographic elements. However, in this dissertation, I take more of an evolutionary theory approach (birth-growth-survival-death), separately examining the migration element (relocation).

legal concerns[8]. Nevertheless, with these aggregate datasets, we can compare births and deaths of tanneries and shoe factories within the sample and make inferences in relation to the overall firm population. However, given that INEGI didn't provide the actual raw datasets, we were unable to make inferences as to the location of specific firms, firm sizes or production patterns. This research is reported elsewhere (Pacheco and Dowlatabadi 2007a)

To supplement the previous comparison, plant listings from directories (leather and footwear) for various years were obtained. In León, detailed datasets were only available for the years 1999 and 2004. For Guadalajara, datasets were available for the years 1991, 1994, 1995, 1996 and 2003. Data constraints didn't allow for these direct, one-on-one comparisons. Industry trade associations were either unwilling or unable to provide additional datasets.

There are some limitations with this analytical approach. Lacking yearly data on the same industry in both cities limits what we can say about the relative performance of the clusters. The analysis proves its worth by revealing important information on the spatial distribution of firm births and deaths, however. Moreover, the approach allows us to correlate firm demographics with product type and in some cases, with plant size. In combining both approaches, a better understanding of cluster and firm behavior is gained. The firm demographic analysis presented here takes into account plant births in the downtown core areas of both cities, plant births in industrial parks and peripheral zones, and plant closures.

1.2.7.1 Births in urban centers and industrial parks

Earlier research has shown that as cities grow and expand towards the periphery, industries that were formerly located in the downtown core tend to either relocate or terminate operations. We would therefore expect no new firm creation in urban centers. Industrial parks allow firms to co-locate closer to ancillary activities, thereby allowing for stronger inter-firm linkages. For births to occur in new industrial parks, firms need to have the capital necessary to make the investment in a new plant.

Market forces would encourage new firm creation in peripheral regions (where land use was deemed suitable to locate industrial parks[9]) if proximity to potential markets were

[8] This issue is discussed at length in Chapter 2.

[9] Although if environmental regulation were a strong driver, we could expect relocation to industrial parks given that these parks would have better pollution control technologies and processes generally unavailable to tanneries in the urban region.

deemed advantageous for the company. However, it is unlikely that new firms would be encouraged to locate in urban cores.

The literature on pollution havens would expect an increase of tannery births in the post-NAFTA period. However, if we take into account land prices and zoning constraints, we would expect new births to occur in non-core areas. The literature on inter-regional mobility argument (Harrison 2006) supports this view as it assumes that by virtue of providing propitious infrastructure and operating conditions, some regions would be more successful than others in attracting capital investments. This inter-regional relocation process would thus have an impact on the spatial distribution of firms (and on firm population dynamics). However, we wouldn't expect new, polluting firms to start operations in downtown city centers, as they would face rejection from the local community (the Not-In-My-BackYard effect, NIMBY).

Land value and use can have an effect on plant start-ups (births). An increase in births in the peripheral areas would be expected if zoning regulations were strictly enforced and downtown core areas were considered unsuitable for industrial production. Plants located in the downtown core areas would be forced (or at the very least, encouraged) to relocate. Relocation to peripheral areas (even if the relocation is still intra-urban) minimizes visibility of a potential source of pollution and ensures compliance with zoning restrictions.

1.2.7.2 Firm decline

For numerous authors, the concepts of declining industries, plant closures and corporate reorganization are synonyms for restructuring. MacLachlan goes as far to say "[p]lant closings are the most visible manifestation of market dynamics and corporate restructuring on the economic landscape" (MacLachlan 1992, p. 128). He identifies three forms of restructuring (strategies of production reorganization) to face market decline. The first one, *intensification*, implies an increase in productivity without a significant increase in capital investment. The second, *investment and technical change*, is based on a combination of added capital and technical skill to increase productivity and/or output. And the third, *rationalization*, is seen as the last resort, a complete reduction in production through plant closure.

The only other study of declining footwear industrial clusters that I am aware of is that of Bertram and Schamp, who examined the footwear cluster in Pirmasens, and the leather region of Offenbach, in Germany. These authors found that firms in these clusters used one or more of the following five strategies:

a) Small- and medium-sized firms who were hardly able to adjust to the crisis remained in the status quo and did not change strategies.
b) Some firms became niche specialists and focused on specific products for specialized target markets.
c) Larger family owned firms used a modernizing strategy through cost reduction and market segmentation.
d) Some companies relocated their production abroad.
e) Finally, some new entries into the production system were real innovators and brought key technological enhancements to their manufacturing systems.

Since different firms will use various strategies to face industry decline, the collective sum of their strategic responses may contribute either to the overall survival or decline of the whole conglomerate of enterprises within the district, given that "different firm strategies will determine the kind and size of external economies in old industrial districts with regards to exit from or survival in declining markets. This will in turn, affect the survival capability of all firms in different layers of the district" (Bertram and Schamp 1999, p. 69).

1.2.7.3 Firm relocation: Shifts in spatial configuration

Relocation can be viewed as a firm death (closure) in one particular place and a birth in a different location. Simultaneous birth and death of a firm may result from relocation. In this dissertation, an explicit distinction between relocation and firm birth and death is made. The logic behind this is that both new firms and plant closures are treated differently in the literature. New plants are considered a manifestation of entrepreneurial spirit and thus seen in a positive light, whereas industrial decline is viewed as a negative consequence of increased external pressures. In the thesis, the spatial implications of firm demographics are explained, with a special focus on tanneries.

In the cases under study (León and Guadalajara), the analysis first focused on assessing any significant changes in geographical location. A typology of relocation mechanisms is offered in Table 1-2.

Table 1-2 A typology of relocation

Relocation mechanism	Movement trajectory	Examples	Authors
Transnational	From one country to another country	Tanneries relocating to China from industrialized countries in the North	Knutsen (2000, 2002)
Regional	From one region of a country to another region of the same country	Shoe factories relocating from various regions in Germany to Pirmasens	Schamp (2005)
Peripheral	From the downtown core of a particular city to the outskirts	Tanneries relocating to peripheral industrial parks in León	Pacheco and Dowlatabadi (2003, 2005, 2007)

In the cases under study, only peripheral relocations are analyzed, primarily because the evidence found indicates that neither regional nor transnational relocations take place in these industries. As for regional relocations, industry association representatives from León and Guadalajara were asked to provide an informed estimate on possible relocations that had occurred between 1980 and 2004. All interviewees agreed that there was very little likelihood that a tannery (or shoe factory) in León would risk high capital costs to move from one city to another. In their words, "the distance between these two cities is so small that the move isn't even worth it". This statement could sound puzzling if we consider that relocation within the urban/periurban regions might have just the same cost. However, from interviews it became clearer that there are other social/economic factors that come into play in this decision, including labor supply and access/connections to trusted input providers[10].

[10] Rabellotti's work also agrees with this point.

1.3 Structure of the thesis chapters

The dissertation is organized into seven chapters. A brief introduction to the themes covered in the dissertation is presented in this chapter. Chapter 2 offers a theoretical overview of cluster theory and situates the dissertation within the broader literature on industrial cluster restructuring. Chapter 3 presents the historical background and offers context to the issues studied. An overview of the leather and footwear industries (at the international and regional levels) is provided. Chapter 4 provides an overview of the theory behind the notion of drivers. This chapter reviews the theoretical discussions around three main restructuring forces (globalization, environmental regulation and changes in landuse, land prices and zoning policies), while recognizing that there are many other forces that could potentially influence restructuring. Some empirical evidence on the intensity of these drivers is also presented. In Chapters 5 and 6, the responses of both industrial clusters to multiple restructuring drivers are explored. Using empirical data, variations in the effects of restructuring drivers on firm and government policy responses are examined. Chapter 5 focuses primarily on the leather industry's responses while Chapter 6 examines those of the footwear industry. Finally, Chapter 7 rounds up the integrated assessment and reflects on potential policy options that have shaped the fate of these interconnected industries. The thesis concludes with a summary of insights gained from the dissertation and questions worth exploring in the future.

1.4 Summary

This dissertation is an integrated study of the ***drivers*** of structural change in two Mexican industrial districts that house two highly interconnected industries: leather manufacturing (tanneries) and footwear (shoe factories). How these industries adapt and respond to the drivers of structural change, and what restructuring processes took place in each industrial district spanning the period from 1980 to 2004, with special emphasis on the years from 1994 to 2004, are also considered. Other researchers have asked for more sophisticated analyses of industrial structural change in leather and footwear (Lowder 1993; Rabellotti 1995). This thesis offers a modest contribution to advance their work.

For her doctoral dissertation, Rabellotti studied the footwear industrial districts in Mexico, analyzing the results of a 1993 survey of shoemakers in León and Guadalajara (Rabellotti 1997). In her conclusions, Rabellotti acknowledged that her study had been a static snapshot of the Mexican footwear commodity chain. She expressed the need to shift from static to dynamic approaches to industrial district analysis that explains changes through time[11]. This thesis is a dynamic analysis of the production chain and the developmental trajectory of the clusters'over time. The thesis takes her work one step further by simultaneously analyzing the evolution of **both** tanneries and shoe factories in **both** industrial districts (León and Guadalajara), and understanding their restructuring patterns.

Lowder emphasized the need for an in-depth study of the Mexican leather and footwear industrial structures (Lowder 1993); she even suggested that Guadalajara be compared with León. In her unpublished analysis of the industrial structure of León and Guadalajara's footwear commodity chains, Lowder found significant differences. She also indicated "the implications of this difference in industrial structure need verification" (p.28)[12]. As mentioned above, this dissertation furthers Lowder's work by undertaking a comparison at the lowest possible level of aggregation of the data (yearly data per region). These data have never before been assembled in the form presented and analyzed in this dissertation. The data obtained thus allows us to understand the broader dynamics and policy implications of industrial and urban restructuring. The thesis also investigates policies that have been implemented in León and Guadalajara and questions whether these have had a positive or negative impact on the survival of these interdependent industries.

Furthermore, one of the key contributions of this research is a systematic examination of how a number of stresses may have forced specific responses in tanneries and shoe manufacturers. Ignoring these stresses has lead to an overly simplistic attribution of structural changes in the industry to foreign competition and/or environmental regulations. Structural change viewed in the absence of relocation data masks any potential impacts that local land prices and land use regulations may have had in driving the restructuring of an industry. In the thesis, an examination is made of how firm relocations and changes in land prices and

[11] Michael Albu highlighted Rabellotti's idea in his Masters' thesis on technological learning and innovation in industrial clusters in the South (SPRU, University of Sussex, 1997), p. 42.
[12] Lowder was very specific in her call for a study of industrial structures as defined by economists and some economic geographers.

zoning regulations bring about structural change in León and Guadalajara. Chapter 2 begins this examination by providing an overview of the historical development of the two cities under study.

Chapter 2 Theoretical overview

Given that this dissertation compares industrial restructuring trajectories of two Mexican leather and footwear clusters, it is important to situate the thesis within the broader context of the literature on industrial districts. The phenomenon of geographical concentration has fascinated economists, geographers, urban and regional planners and social scientists for decades now. In Mexico, the concept of cluster/industrial district has also achieved great popularity. The premise underlying policies that encourage enterprise co-location is that geographical proximity generates advantages for small start-ups. This chapter argues that this idea is not entirely correct. While numerous authors praise the notion of spatial proximity as a panacea for regional economic development, many others caution against an overly optimistic view of the notion of spatial agglomeration. Published experiences of declining industrial districts show that proximity between firms doesn't always have a positive effect. In this chapter a typology of industrial districts/clusters' emergence is offered. The chapter (and the thesis) emphasizes the need to take a more rational and calculated approach to promoting regional development through industrial clusters. It seeks to clarify the conceptual fuzziness[13] of cluster theory and offers a roadmap of the theoretical contributions of the dissertation to the field. The thesis is thus embedded in a theoretical framework that cautions against excessive enthusiasm for cluster-based regional development.

2.1 Clarifying the conceptual fuzziness: Cluster theory revisited

The rising popularity of cluster-based policies for regional development has led scholars of many different disciplines to re-think their approach to the study of industrial agglomeration. Numerous researchers assign a substantial amount of weight to the role of geographical co-location in encouraging industry growth. The positive discussion surrounding the benefits of geographical proximity has somehow prevented a surge of more

[13] This notion is borrowed in part from Sunley and Martin (2003) and Markussen (1992).

critical analyses of the negative aspects of said agglomeration. Clusters are in no way a panacea for economic growth and sustainable industrial regional development, despite what the OECD may argue (OECD 1999). This chapter does not seek to downplay the key role that industrial districts have in regional economic development. Instead, using a historical approach, this chapter offers a roadmap of the development of industrial cluster theory, trying to situate the contribution of the dissertation within a broader body of literature.

Industrial district theory has followed an evolutionary process since 1930. The basic premise of collateral benefits that geographical agglomeration and proximity brings to groups of firms (such as knowledge diffusion, strengthening of relationships and forward and backward linkages in commodity chains) is still in vogue, particularly in the European Union and the United States. While originally the concept of industrial district is based on the work of Alfred Marshall, in recent decades the concept has been well developed by Italian researchers, including Becattini, Rabellotti and Paniccia, who have established what we know now as the bases of "Italian industrial district theory"[14] (Rabellotti 1997; Paniccia 1998; Becattini 2002).

It is clear that there is value in geographical agglomeration. Inter-firm nearness and the establishment of supporting institutions and processes to geographically clustered industries do offer advantages, such as proximity to raw materials and markets, constant supply of qualified labor and government/institutional support. However, there are other elements that may hinder their growth (Martin and Sunley 2003; Pacheco-Vega 2004; Palazuelos 2005), including *predatory behavior (in search of consumers and labor)*.

2.1.1 The rising popularity of industrial districts

The idea of implementing an industrial regional development strategy by encouraging geographical co-location of complementary industries is not new. Cluster popularity is due in great part to the success of the so-called 'Third Italy' (Rabellotti 1995; Paniccia 1998; Becattini 2002; Grandinetti and Tabacco 2003). Geographically agglomerated industries aren't only popular with Italian researchers. Anglo-Saxon scholars have also gained an

[14] Other pioneering authors include of course Pyke and Sengenberger. Their 1992 book was one of the very first texts where emphasis was paid on the social and institutional aspects of industrial district success. While Pyke and Sengenberger focused primarily on the Emilia-Romagna industrial districts, their edited volume contains examples from Canada (Montreal) and Spain.

interest in studying clustering behavior (Harrison 1992; Porter 1998, 2000; Quadrio-Curzio and Fortis 2002; Feldman, Francis et al. 2005). However, the cluster has gained even more popularity in the past decade arguably due to famed American economist Michael Porter Michael Porter, coupled the OECD's emphasis on 'the cluster approach.

Porter (1998) defines clusters as follows:

> *Clusters are a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition . . . including governmental and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations.*

In this author's definition (vague enough to encompass practically any type of firm grouping), we can note four main elements:

a) Geographical proximity
b) Interconnectivity
c) Duality of common and complementary elements
d) The presence of key external entities that encourage cluster development

Porter's enthusiastic endorsement of cluster-based development strategies merits critical analysis. In particular, we ought to examine the deliberately ambiguous notion of cluster he proposes. First, the geographical scale of analysis is rather vague. What is the scale of a cluster? Within Porter's definition, practically any size region will fit (Martin and Sunley 2003; Palazuelos 2005). Second, what is interconnectivity? Do we include common market transactions in the definition of interconnectivity? And if so, aren't all regions, cities and countries a large, big cluster? Third, while there are some elements of complementarity and others of competition, Porter's definition does not distinguish amongst either. When do plants collaborate and when do they compete? Finally, the presence of external entities may have positive or negative consequences (for example the case of a research center that develops specialized materials for a certain type of industry) or negative (like the case of institutes devoted to other types of activities, which in turn may be perceived as more profitable than the current cluster activity?)

Moreover, we can't overlook the theoretical discussions of the concepts of 'cluster', 'industrial district' and '*milieux'*. While these terms are often used interchangeably, there

have been numerous articles that try to establish the differences amongst these three concepts. From Rabellotti's work, which tries to establish the characteristics of a 'model industrial district' (Rabellotti 1995, 1997) to the work of Martin and Sunley that tries to demystify the concept of cluster, to the studies on "*milieux innovateurs*" (innovative areas) (Amara, Landry et al. 2005), one needs to be cognizant of the small (or not-so-small) differences between each concept. The following section provides a brief historical overview of the evolution of various definitional approaches.

2.2 Historical evolution of the literature on industrial districts

Harrison argues that amongst the first students of industrial agglomeration one could find Chinitz, Perroux, Vernon amongst others, (Harrison 1992). However, these references hover around the 1950s, much after the founding father of location theory had published a seminal analysis on geographical industrial agglomeration (Edgar Hoover). This brief overview takes the reader back to the early 1900s with references to Marshallian ideas.

As briefly mentioned in Chapter 1, the leather and footwear commodity chain has been "the poster child" of geographical agglomeration studies and the focus of numerous studies of geographical agglomeration, primarily as a result of the historically inextricable and complex interrelationships between tanneries and shoe factories. Numerous theories have tried to explain the effects of geographical proximity. The vast majority of those are based more or less on the pioneering work of Edgar Hoover on the American tanning and footwear industries at the beginning of the XX century (Hoover 1937).

There are numerous factors that influence the emergence of industrial districts. Institutions, knowledge transmission mechanisms and other exogenous factors all play a role. However, as shown by Hoover, in the early stages of development, the proximity of raw materials, coupled with the need to maintain reliable and constant supply of leather for the footwear industry was one of the key factors that triggered the co-location of leather tanneries near footwear industries, thus creating an industrial cluster. More recently, many other commodity chains have been analyzed under the lens of industrial district theory, including electronics, automotive parts and biotechnology.

2.2.1 Agglomeration and geographical location

Economist Alfred Marshall first described the concept of positive externalities at the end of the XIX century (1890). Marshall establishes that, in the same way that firms can enjoy 'economies of scale' within the firm (as more pieces are produced with the same installed capacity), there is a point where it is possible to enjoy *external* economies of scale. His phrase "the secret of industry is in the air…" is famous. However, it isn't until Hoover that we see a linkage between the notion of external economies of scale and modern location theory. Hoover's unit of analysis is the firm/plant/establishment. Based on micro-economic foundations, Hoover establishes that location decisions are dependent on the location of raw materials, markets and external clients, and the transport/transfer costs. Therefore, new firms locate and operate efficiently in a specific zone by virtue of having the above-mentioned elements available within a relatively small perimeter. Thus, the footwear industry would need to locate near where tanneries are (or viceversa) as well as in the vicinity of specific target markets. Despite being over 70 years old,

2.2.2 The new industrial district

Many prominent scholars have anointed a number of regions as industrial districts based on their compliance with Marshall's conceptual framework. For example, the Italianate or neo-Marshallian variety of industrial districts (Becattini 1990) are predicated on the basis of a "sense of belonging" (e.g. a socialization of the role of each actor within the industrial complex). Becattini's work also set the foundation for more sociological explanations for the emergence of industrial districts (with the work of Granovetter on the strength of weak ties).

The global shift in forms of the division of labor has made it necessary for firms to become more flexible and focus on niche markets and key, high-value products. (Piore and Sabel 1984). One of the most significant contributions that gave rise to the post-Fordist literature is precisely Piore and Sabel's '*Second Industrial Divide'*, which sets the basis for flexible specialization. Flexible modes of manufacturing emerge as mass production models wane. Piore and Sabel argue that a new form of capitalism and flexible production had emerged in the Emilia-Romagna region where inter-firm cooperation and collaborative relationships were encouraged. One should exercise caution, though, as Piore and Sabel's work assumes that industrial districts are successful (in the same way as other enthusiasts) yet do not offer enough empirical evidence to back up this claim. Nevertheless, their book is

considered a classic of the literature and should be considered in any overview of industrial district works.

Building on the work of Becattini and Piore and Sabel, Rabellotti sought to determine whether the 2 Italian and 2 Mexican districts she examined had characteristics specific of 'classic' industrial districts(Rabellotti 1995, 1997, 1998, 1999)[15]. Instead of attempting to uncover the characteristics of a successful industrial district,. However, determining exactly which elements make a successful cluster seems to be the 64 million dollar puzzle. There is no clear answer and each case is contextual. Despite having analyzed dozens (even hundreds) of cases, we still don't have the magic formula to create a successful, economically viable cluster.

While a vast majority of the industrial district literature still takes from the neo-classical interpretation, the more sociological explanation comes from Granovetter, who argued that analyses of network relationships fail to find the strength of 'weak' ties that keep networks cohesive. Industrial districts are thus production hubs where inter-firm cooperation occurs because of the accumulation of social capital. However, as Staber cautions, this research avenue should be taken with a grain of salt, particularly because of limitations in research strategies and counterfactual analyses (Staber 2007).

2.2.3 Sticky places in slippery spaces and the location of production

Ann Markusen rejects the notion that only the Marshallian and/or Italianate models of industrial districts are the dominant paradigm for appropriate industrial regional development. By identifying other successful models of industrial district, she offers an alternative to the traditional model of absolute geographical concentration. Markusen's typology of industrial districts is widely cited in the literature tries to explain the paradox of "stickiness" of certain industries in "slippery" regions ("*sticky places in slippery spaces"*) (Markusen 1996). Markusen's four main types of industrial districts are:

- *Marshallian* districts (e.g. Emilia-Romagna and the Third Italy). These are traditionally clusters of small businesses that are geographically agglomerated. Large

[15] Additional theoretical discussions on the definition of a 'model' industrial district has taken

corporations do not enjoy economies of scale, and micro-enterprises prevail. The vast majority of transactions occur within the district[16].

- "*Hub and Spoke*" districts – where a certain number of plants act as the centroid around which other firms gravitate and associate, both as suppliers and buyers. Classic examples include Seattle and the airplane industry with Boeing at its hub.
- '*Satellite Platform'* districts, composed of subsidiaries or "absent multinational corporations", whose centers of operation or headquarters are not physically in those districts. A clear example is Vancouver's film industry cluster. A large number of studios have a subsidiary in the city but not the headquarters.
- "*State-Centric*" districts developed mainly as a result of the presence of a governmental entity that becomes the cornerstone of regional development in a specific geographical area. For example, the increasing expansion of the Universidade de Campinas in Brazil has encouraged city growth. Washington, DC has grown as well and part of its growth has been attributed to the Federal government, although the Environmental Protection Agency's Research Triangle Park in North Carolina and some of the Department of Energy National Labs are also good examples).

Harrison argues that industrial district success goes beyond simple agglomeration economies. Traditional neo-classical analysis looks at local and regional economies as sets of agents competing against one another. Harrison argues that modern industrial district theory emphasizes firm interdependence, cooperative competition and trust. These new, "soft" elements thus replace the "hard" components (such geographical proximity) as the main explanatory variables. However, a problem arises with these soft elements given that research methods to capture their effects are still in their infancy. Measuring trust is still hard to do. While one could think of using in-depth interviews with CEOs, or general managers, but it is unlikely that the researcher will be entirely sure that trust can be measurable through interviews. Nevertheless, a recent study of the wine cluster in Chile by Elisa Giulani and collaborators has used social network analysis to study interactions amongst the different cluster agents, and included trust as one of the variables (Giuliani and Bell 2005).

[16] Markusen also talks about the *Italianate* districts, 'vibrant and cooperative'. For an in-depth examination of the typology see Markusen (1996).

Schmitz proposes the idea of collective efficiency as a cohesive element for an industrial district. Collective efficiency has two main dimensions: incidental effects (result of externalities) and intentional effects (result of strategies defined by governmental agencies). Schmitz uses the case of the Sinos Valley footwear industry to pose that firms that comprise the clusters remain competitive thanks to "collective efficiencies" that are partly a result of externalities (positive effects derived from geographical agglomeration (Schmitz 1995, 1999).

2.2.4 Innovation and clusters

The recent wave of studies on the *knowledge economy*, has also spurred growth in the number of studies about industrial districts. These are proposed as the cornerstone of a regional innovation system within which clusters are embedded. The set of institutions created around an industrial district is called a regional innovation system (OECD 1999; Hwan 2002; Grandinetti and Tabacco 2003). This idea has been derived from previous work on national innovation systems (Lundvall 1992), spurring the regional innovation systems literature (Cooke 2004).

The evolution of cluster theory has meant a shift in the main conceptual paradigm. While initially industrial districts were basically geographically concentrated clusters of firms within a spatially defined region, the current research focus is how knowledge is transmitted and accumulated within the cluster. On the basis of this consideration, we would argue that a cluster is composed of a network of firms that share knowledge, that have established trust and credibility relationships and that are supported by a group of institutions and organizations that allow them to evolve, thrive and sustain a competitive market position.

While "soft" elements are particularly important in *knowledge-based clusters* (biotechnology, aerospace, software), there is no way to establish a direct correlation between the degree of innovation and geographical collocation. This is, we can't say that firms that are located within a specific geographical zone will be more or less innovative (Martin and Sunley 2003).

Even though some authors suggest that agglomeration encourages innovation, not all empirical evidence supports these hypotheses, particularly when the industry under study has numerous interconnections with international markets (Simmie 2004).

On the other hand, a review of recently published empirical cases shows that, contrary to what is generally postulated (cooperation amongst enterprises is the main activity that generates or transmits knowledge), apparently social interaction at the individual level it is much more important. These informal knowledge exchanges may help strengthen the activities of different firms (Malmberg and Power 2005). As indicated in this summary, the jury is still out there on whether knowledge spillovers are a sufficient condition for clusters to emerge (Breschi and Malerba 2001; Enright 2001; Hayter and Le Heron 2002; Martin and Sunley 2003; Windrum 2005; Scott 2006).

2.3 Urban cores and peripheries and industrial spatial location

While Scott's pioneering (Scott 1982, 1986; Scott 1988)early work seemed to privilege the role of industrial production in the creation of the modern metropolis, it is important to realize that the interdependency of industrial, societal and urban elements is much more complex and intricate. Restructuring of industrial sites meant a shift in the division of labour in central cities in the twenty-first century. Fordist manufacturing models of production declined, while a new, emerging type of labor force, more oriented towards creative/intellectual activities.

In the developed world, de-industrialization and conversion of industrial land to residential use has been somewhat of a structural feature of post-Fordism, although it is a relatively new phenomenon in the developing world. An examination of the literature on studies of regional transformation in developed-world urban regions yields cases of industrial decline in South East London (Gripaios 1977b), structural change in northeastern Ohio (McKee and Bennett 1987), restructuring in the Hainaut in Belgium (Leloup and Moyart 2003) and the steel industry demise in Pittsburgh (Beeson 2004). Nevertheless, only Gripaios indicates changes in the spatial configuration of industry within London as a potential explanatory factor for the decline of its industrial base. It should be noted though that in his conclusions, Gripaios hesitates to assign higher explanatory power to any of the major factors he finds (changes in production costs, urban policy, locational disadvantages and the decline of docks).

The transformations of the inner city take different trajectories depending on contextual factors. With the emergence of the "New Economy", the relevance of inner city cores has shifted from purely industrial (Gripaios 1977a; Keeble 1977; Lloyd and Mason 1978; Elias and Keogh 1982; Lewis 2001) to a mixed model where industry co-exists with residential use. Land use and zoning restrictions are different for cultural/high tech industries thus enabling them to locate within a CBD.

Restructuring in the post-Fordist era shifted traditional industries (e.g. manufacturing) from central city locations, taking one of two possible pathways: closure or relocation. However, industrial decline doesn't mean that downtown cores have to fully de-industrialize. Creative, knowledge intensive industries are seen as the precursors of a resurgence of central business districts (CBD). Hutton demonstrates that production is returning to the inner city by virtue of technology-driven, knowledge-intensive firms. These new industrial clusters are an example of what Hutton calls "the spatiality of the New Economy) (Hutton 2004, 2006, 2008).

In his model of production in the new economy of the inner city Hutton notes the relevance of land use and zoning policies. This element of industrial/urban restructuring has for long been an under-researched topic. Hence this dissertation attempts to bring this issue to the forum by undertaking empirical research.

2.3.1 Structural transformations of inner cities and cluster theory

Cities and regions that have grown around a core industry (thus forming a geographical cluster) also face constraints in generating meaningful employment within a narrowly diversified group of businesses. The increasing concentration of labor within a few firms means that the region becomes increasingly dependent on one specific industry and thus, shocks to the core industry have a ripple effect on the region's economic growth (Hayter 1997). Designing urban policy that is coherent with economic and environmental policy is therefore a big challenge.

Changes in spatial concentration, location of firms and market structures implicitly bring along changes in the broader regional landscape, including environmental changes (such as increased resource consumption and pollutant discharges). As patterns of production and consumption are modified, underlying industrial structures change and regional

economies undergo profound restructuring, which brings with it economic, political, societal and environmental implications.

While the literature on industrial restructuring is extensive, very little has been written about the relevance of geographical concentration to the distribution of pollution and small-scale firm interconnectedness with issues of economic growth and societal well-being. A clear gap has been identified, as previous studies on industrial restructuring have not explored how processes of structural change bring along shifts in small-scale polluter behavior and production patterns. To the best of my knowledge, no study before has investigated how does environmental regulation influence patterns of industrial restructuring of enterprise clusters[17]. Furthermore, previous studies have placed greater emphasis on the industrial organization aspects of geographical concentration of business, to the relative neglect of other equally important and relevant factors. Finally, this thesis contributes to the ongoing debate on whether direct environmental regulation has an effect on the behaviour of small-scale firms or whether there are other forces that have a stronger impact and that can be disguised as direct environmental regulation (e.g. zoning regulations, land-use changes and land prices).

The only other works that bear some resemblance and touch upon some aspects of this restructuring process include the work of Knutsen in the European and Latin American tanning industry (Knutsen 1998, 2000) and, to some extent the work of Schamp in the German footwear industry (Schamp 2000, 2005). This dissertation departs from Knutsen and her colleagues and Schamp in that its focus is broader and more far-reaching, as it studies the leather and footwear industrial complexes in an integrated fashion. These works are used as a stepping stone to uncover the complex adaptive responses to external shocks facing the whole leather and footwear commodity chain at different scales (firm-level, regional and national).

It is important to search for new and unexplored research avenues in regards to cluster theory. Just to give an example, Chakravorty *et al* (2005) question the conventional wisdom

[17] Knutsen indicates her research interest in the international division of labour and the shift in location of tanneries from the North to the South. Schamp illustrates the decline and exit of shoe manufacturers in Pirmasen (Germany). This study is intended to understand the complex dynamics of industrial restructuring in interconnected industries facing multiple stressors. Therefore, its scope and focus is quite different from the above-mentioned work.

on whether localization economies are the main drivers for industry clustering. The authors argue that

- 'land-market rigidities exist everywhere and that in the specific case of Indian metropolises these rigidities seriously constrain location choices for firms, so much that localization economies practically do not matter when the location choice is made."
- "The rigidities in the land market arise from state actions, specifically industrial location policy, environmental policy on segregating or buffering out polluting industry, and land-use policy on land-use change"

This dissertation examines (amongst other factors) the role of land use policy, land use changes and pricing in the restructuring of two Mexican cities, building on the work of Chakravorty *et al*, but expanding the analysis through an integrated assessment that includes other restructuring forces.

2.4 Cluster restructuring: Decline, transformation and adaptation

While previous studies of industrial districts have examined a variety of issues, ranging from the rationale behind cluster[18] formation (Steinle and Schiele 2002), typologies of industrial districts (Harrison 1992; Markusen 1996), evolutionary theory explanations of cluster configurations (Boschma and Lamboy 2002), the evolution of industrial districts in Italy (Paniccia 1998), USA/Sweden (Braunerhjelm and Borgman 2004) and Britain (Day, Burnett et al. 2000) few (if any) have tried to specifically answer questions that explicitly deal with restructuring of industrial districts, particularly trying to examine the different drivers of restructuring and/or assessing the influence of each driver.

Four notable contributions to the study of declining industrial districts are Benton's examination of industrial restructuring and cooperation within Spanish industrial districts (Benton 1992), Whitford's critical review of recent debates in the Italian language on industrial districts' restructuring (Whitford 2001), Schamp's study of de-industrialization in the footwear clusters of the German border area (Schamp 2005) and Staber's analyses of the declining Baden-Württemberg cluster (Staber 1997).

[18] Cluster and industrial district are used interchangeably throughout the text.

Benton's chapter is concerned with examining the forms of cooperation within the industrial districts and how this cooperation (or lack thereof) affects the diverging regional responses of Spanish industrial districts. She calls for an institutional framework that is more conducive to inter-firm cooperation and for a more diversified regional policy that takes into account the need for increased horizontal collaboration (within the same industry). Although not explicitly writing about "restructuring drivers", Benton indicates that cooperation is a key factor for industrial district restructuring.

Whitford's article indicates that the questions of how and why do Italian industrial districts restructure have been dealt with in the Italian-language literature, but have been neglected by English-speaking researchers. Whitford argues that the trivial question of whether an industrial district is a 'system of firms' or 'firms within a system' is key to design policy prescriptions (p. 40). He suggests that maybe this is the right time for a "firm-centered view", where the locus of analysis is based on the system of firms. This dissertation takes a dynamic and systemic view of the trajectory of the industrial district as the aggregate (but clearly differentiated) result of individual firm behavior through time. While recognizing that individual firms may have quite distinct strategies, I argue that the overall performance of the industrial district may be explained by looking at the aggregate behavioral patterns of multiple firms as a whole. Thus agreeing with Whitford in that "a focus on firm strategy leaves ample theoretical space for variation in the evolutionary paths that different districts will follow" (Whitford 2001, p. 51).

Schamp's work (Schamp 2000, 2005) uses an evolutionary argument to highlight the path dependency shown by the Pirmasens footwear industrial district in Germany. He finds two dominant strategic responses to decline: firms remained in industry, but left the region (geographical relocation) or stayed in the region but left the industry (diversification). Schamp uses the path-dependency and evolutionary theory conceptual frameworks (Arthur 1994; Rahnema and Howlett 2002; Redding 2002) to substantiate the claims that there have been three types of lock-ins in this industrial district: functional, political and cognitive. He further develops his argument by affirming that the cognitive lock-in of the older generation was that firms might decline for a short while but that they would recover. Whereas in the case of the younger generation, the cognitive lock-in led to a disinterest in learning the craft of shoe manufacturing, thus contributing to the demise of family-owned firms (Schamp

2005). This view will be further explored when the Mexican leather and footwear clusters' restructuring trajectories are discussed.

In his 1997 study of the Baden-Württemberg knitwear industrial district (Reutlingen), Staber found that, contrary to commonly held beliefs; specialized firms do not have an advantage over more integrated firms. When comparing large, integrated firms with smaller, more specialized firms, the industrial district literature tends to favor the latter by virtue of their 'flexibility'. Staber uses event history analysis examining business failure rates from 1946 to 1993, finding that "contrary to the district model, specialists were outlived by integrated firms" (Staber 1997, p. 476)

2.4.1 Negative effects of geographical co-location: Cluster decline

Geographical co-location doesn't always render the results one expects. There are counterproductive effects to geographical agglomeration. First, spatial concentration of firms may encourage *predatory behavior*). Intense competition amongst the same type of firms or that target the same market. This behavior is particularly problematic for start-ups, which are just starting to establish a market base as opposed to those that already have established relationships with suppliers and buyers. Competition can be exacerbated in a geographically restricted environment. When small firms have to undertake considerable investments in mobilizing their product and penetrate markets not within the contextual perimeter of their common activities, then they may fall prey to predatory behavior from more established firms with better transportation capabilities, accessing markets within a larger geographical scope. This behavior can have even more negative effects within markets with high price elasticity. The more a firm needs to yield to continue in a specific market, the higher the probability of failure and closure.

Secondly, this concentration also allows competition for qualified labour. When a group of firms are geographically concentrated within the same region, there is a possibility that some companies will want to attract qualified personnel in order to enhance their own human capital, luring them with better salaries, working environment and quality of life. This situation is more common in regions where there is a high degree of worker mobility. For

example, many highly specialized workers of well-established (and highly-paying) leather tanneries in León had undergone training while working (or studying) at a leather and footwear research institution. These tanneries would offer better-paying jobs in their own plants to lure these highly specialized workers.

Other risks of geographical agglomeration include as over-specialization, price increases and other negative externalities (Palazuelos 2005). As indicated by Palazuelos, it is hard to identify which elements make a cluster successful, and it is difficult to combine all elements that may contribute to achieving this success, particularly when the cluster starts from scratch.

Thirdly, if a region specializes in only one single type of industry, the probabilities of collapse when said industry faces adverse conditions are increased. If a city or region lacks diverse options for regional growth (i.e. sole-industry cities) then there will be problems. The classic example quoted in the literature is steel manufacturing in England, which declined until it completely disappeared, in a similar fashion as it occurred in Pittsburgh (Pennsylvania) also in the XX century (Markusen 1988).

Market saturation can also be a negative effect of geographical concentration. It may even deteriorate innovation processes. For example, the case of Toledo (Spain) where market saturation may encourage predatory price competition. Intense competition would force firms that can't compete on the basis of price to close their doors, originating a market failure and changing industrial structure from a fairly competitive market to an oligopoly/monopoly. Market saturation may also lead to innovative processes may be unsuccessful as firms are more focused in price competition than product differentiation.

In his 2001 paper, Staber challenges another commonly held assumption: that proximity in and of itself is good for firms, because it encourages cooperation and information exchange. Nevertheless, he finds that 86% of 1213 knitwear enterprises were terminated by 1998 (Staber 2001). In the case of the Baden-Württemberg cluster, geographical closeness had competing effects hence increasing mortality. His study shows a higher mortality rate in crowded business populations. Staber demonstrates that, contrary to the vast majority of the literature on industrial districts, spatial proximity does not have a positive effect on firms. Therefore the locational context should be taken into account as but one of several factors that influences performance.

Staber found that geographical proximity in the Batten-Wuttemburg wool-knitting cluster did not help cluster growth, but instead hindered it. Using ecological, random action and neo-institutional theories, Staber finds that co-location in clusters of firms within the same industry increased failure rate, while location in diversified clusters that operate in complementary industries lower the failure rate. His empirical findings are consistend with an ecological localized competition model in shared resources environments (Staber 1997, 2001).

It is important, however, not to leave the temporal dimension and dynamism of supporting elements to the cluster. This discussion is relevant because knowledge accumulation is not continuous. There is a discontinuity in the way in which knowledge is absorbed, accumulated and utilized.

Therefore, the temporal dimension is key when designing public policy for regional development. What may work for a mature cluster may not work for an emerging one. Depending on the point at which the cluster is within its life cycle (embryonic, mature or declining), some elements are more important than others. In earlier stages of development, governmental and institutional support play a critical role. As the cluster starts building up momentum and establishing a niche, other elements such as access to raw materials and markets, new knowledge absorption, and acquiring skilled human capital become more relevant.

The presence of some “anchor” firms in certain regions may also encourage the emergence of a cluster (for example, the presence of Microsoft in Richmond, WA has encouraged suppliers to move closer). The case of Silicon Valley is a classic example of this behavior. Same case with automotive industries, tires, TVs and lasers in the US (Arora, Gambardella et al. 2005). Arora and their collaborators found that when some firms are leaders in a certain type of industry and they locate in a specific region, they “grow roots” and have a multiplying effect. This effect contributes to the consolidation of this industry, and helps explain how information technology and software clusters have emerged.

2.4.2 Cluster transformation and adaptation

Schamp's work (Schamp 2000, 2005) uses an evolutionary argument to highlight the path dependency shown by the Pirmasens footwear industrial district in Germany. He finds two dominant strategic responses to decline: firms remained in industry, but left the region (geographical relocation) or stayed in the region but left the industry (diversification). Schamp uses the path-dependency and evolutionary theory conceptual frameworks (Arthur 1994; Rahnema and Howlett 2002; Redding 2002) to substantiate the claims that there have been three types of lock-ins in this industrial district: functional, political and cognitive. He further develops his argument by affirming that the cognitive lock-in of the older generation was that firms might decline for a short while but that they would recover. Whereas in the case of the younger generation, the cognitive lock-in led to a disinterest in learning the craft of shoe manufacturing, thus contributing to the demise of family-owned firms (Schamp 2005).

Schamp makes two intriguing assertions in his most recent paper (2005). The first is that "deindustrialization of the location does not necessarily mean the death of the firm" (p. 627). This sounds counterintuitive, as firm deaths are one of the main indicators of industrial restructuring (albeit output reduction is another form of restructuring without any loss of employment and/or business shutdown). The second is that there is no definite answer to what the industrial trajectory of these regions will be. This assertion is interesting because it implies (although Schamp does not make this explicit) that the heterogeneity of forces facing the footwear cluster is such that there will be no clear-cut, straightforward strategy to countervail restructuring forces. Therefore, more research is needed on this subject (a body of literature to which this dissertation intends to contribute).

Industrial districts that house polluting firms offer a particularly interesting opportunity to examine the intricacies of the delicate balance between protecting the environment and promoting economic development in industrial regions. Since firms within the cluster are inextricably linked, governments have to ensure that any policies to be implemented (be it industrial, environmental or both) take into account this high degree of interconnectedness. Shutting down highly polluting factories that provide employment to

surrounding communities may create negative effects far beyond direct job losses. Policy impacting one link in the supply chain leads to impacts on other firms, up- and down-stream (buyers/suppliers), particularly when the degree of interdependence is high and inter-firm ties are strong[19].

Table 2-1 Four pathways of failure (Source: Adapted from Moulton, Thomas and Pret 1996, p. 574)

	Firm Sales	
Industries	**Declining**	**Growing**
Declining	*Market deterioration*	*Fight for market share*
Growing	*Market maladaptation*	*Loss of control pathway*

If sales are declining in a declining industry, failure is characterized by market deterioration. Those firms unable to compete must yield to stronger ones. However, if sales are growing in a declining industry, it is suggested that the company fights for market share. Intense price competition is common in this pathway. If sales are declining in a growing industry, it means that the firm has not adapted properly to its market and should find mechanisms to adjust to more stringent competition. Companies are less adapted to their changing niches. Finally, if the company sales are growing just as the industry is growing, one should be mindful of a trajectory of "loss of control". This 'unlikely' pathway of failure may appear if business managers are unable to design appropriate growth strategies (Moulton, Thomas et al. 1996).

From the previous discussion, it is clear that for a number of authors, the concepts of declining industries, plant closures and corporate reorganization are synonyms to restructuring. MacLachlan goes as far to say "[p]lant closings are the most visible manifestation of market dynamics and corporate restructuring on the economic landscape" (MacLachlan 1992, p. 128). He identifies three forms of restructuring (strategies of production reorganization) to face market decline. The first one, *intensification*, implies an increase in productivity without a significant increase in capital investment. The second, *investment and technical change*, is based on a combination of added capital and technical

[19] The degree of interconnectedness is discussed in Chapter 3.

skill to increase productivity and/or output. And the third, *rationalization*, is seen as the last resort, a complete reduction in production through plant closure.

Bertram and Schamp's argue "different firm strategies will determine the kind and size of external economies in old industrial districts with regards to exit from or survival in declining markets. This will in turn, affect the survival capability of all firms in different layers of the district" (Bertram and Schamp 1999, p. 69). Since different firms will use varied strategies to face industry decline, the collective sum of their strategic responses may contribute either to the overall survival or decline of the whole conglomerate of enterprises within the district.

As indicated previously, industrial restructuring is often seen as "the rise and fall of industries". When firms' profitability starts to fall, market shares begin to shrink, and the future looks gloomy, companies may feel compelled to shutdown in the face of decline ("die fast rather than a slow death"). A number of researchers indicate that exit is a preferred strategy when industries have reached a level of maturity where they can't simply compete any longer (Ghemawat and Nalebuff 1990). However, as Harrigan has shown, end-game strategies may include divestiture, focusing in a new industry, etc. (Harrigan 1980). Decline is not always a death sentence, though. A recent study shows that manufacturers of baseball cards in the United States modified their strategic behavior in response to structural changes that occurred in the industry in the last 20 years (Zillante 2005). Declining industries that are able to engage in strategic behavior to slow and even stop the decline process. As Zillante shows, manufacturer behavior can change quickly to adapt to adverse conditions. In the case of the baseball card industry, he finds a response period of 20 years. Baseball cards manufacturers adjusted their strategies and capture as much of the remaining market as the customer base declined.

Thus, while the future of some industries may not look so bright, the key to survival and a surging restructuring trajectory is the reformulation of industrial, urban and environmental policies in an integrated fashion. This policy change should be based on a clear recognition of industrial heterogeneities and of the importance of cross-scalar (time, space, regulatory and cognitive) dynamics. A summary of the relevant literature is presented in Table 2-2. The table is intended to show that there are various exit strategies, not only closure.

Table 2-2 Summary of exit strategies proposed in the literature.

Author(s)	Strategies	Industries under analysis	Comments
Bertram & Schamp (2005)	1. Perish 2. Niche 3. Modernize 4. Innovate 5. Relocate	Footwear and leather goods in Germany	Develop this classification from their empirical findings
Freeman (1974)	1. Offensive 2. Defensive 3. Imitative 4. Dependent 5. Traditional 6. Opportunist	No industry specified	Technological strategies – can be competitive strategies High focus on R&D expenditures
Harrigan (1980, 1982), Harrigan and Porter (1984)	1. Exit 2. Increase market share 3. Gain first mover advantage 4. Lower unit cost focus 5. Customer focus		Empirical research is dated (>20 yrs). Mostly applies to industries in decline.
Hayter (2000)	1. Traditional 2. Dependent 3. Imitative 4. Defensive 5. Offensive	Forestry in British Columbia	Follows Freeman's model with only five strategies (discounts opportunist)
MacLachlan (1992)	1. Intensification 2. Technical change + investment 3. Rationalization	Sheller-Globe Corporation's Canadian Steering Wheel Division	Focused on how to avoid plant closure.
Moulton (1996)	1. Market mal-adaptation 2. Market deterioration 3. Fight for market share 4. Loss of control	None indicated (firms facing bankruptcy)	Described as the fourth pathways of failure, each one of these could be strategically countered.

2.4.3 An emergence-based typology of clusters

It's important to recognize that not all clusters will succeed. In this chapter, we proposed a typology of clusters based on their origin. Natural clusters emerge as the result of an evolutionary process where industries naturally locate within a certain region. Leather and footwear in León, México (Pacheco-Vega 2004; Martinez Martinez 2006), wool knitting in

Baden-Wurttemberg (Staber 2001), software firms in Seoul, South Korea (Hwan 2002), garment industry in Japan (Yamamura, Sonobe et al. 2003) and shipbuilding in the Netherlands (van Klink and de Langen 2001). Forced or induced cluster are defined as geographical agglomerations of firms as a result of national (or sub-national) industrial policy. A classic example for the Mexican case is the electronics industry in Guadalajara, which has flourished in great part as a result of governmental incentives for firms such as Kodak, Hewlett Packard, etc. to set their plants within the metropolitan region of Guadalajara (Pozos Ponce 1997; Rodríguez Bautista and Cota Yañez 2001).

Another way of classifying clusters is using a life cycle approach. We can distinguish three types of clusters[20]: clusters in a formative (embryonic) stage, mature or consolidated clusters and senescent clusters. This life-cycle approach to clusters is shown in Figure 2-1. This typology applies primarily to what we call natural clusters. This doesn't mean that forced clusters can't be included in this classification. However, it is intuitive that forced clusters have a life cycle that is different from the natural clusters.

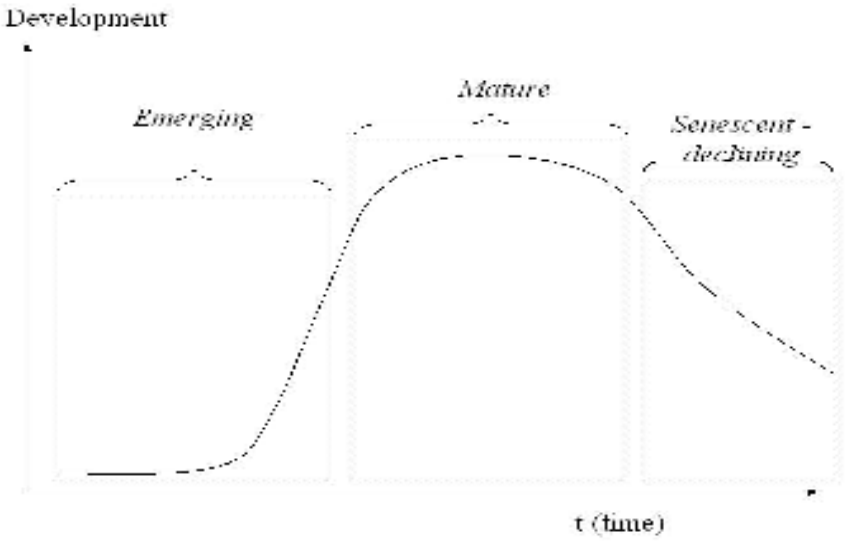

Figure 2-1 A typology of cluster evolution.

As a side note, in recent years, the Foreign Trade Office of the State of Guanajuato (Coordinadora de Fomento al Comercio Exterior de Guanajuato, COFOCE), with financial

[20] This could be seen as a cluster life-cycle.

support from the Inter American Development Bank (IADB) started a program encouraging industrial regional development through clusters[21]. The idea behind this program is that it is possible to encourage strategic alliances amongst already established companies by encouraging cooperative and trust-building relationships amongst suppliers and buyers. The program is still too young to assess its effects and determine whether a cluster-based policy in Guanajuato did indeed work.

2.5 Summary

This chapter provides a brief yet critical examination of the literature on industrial clusters. Caution should be exercised when suggesting a cluster-based regional development strategy. A deep understanding of the policy issues at stake and the cluster's evolutionary stage is a prerequisite for sound policy prescriptions. The whole thesis takes a critical stance vis-à-vis the popularity of the industrial district concept. While there are clear benefits to geographical co-location/spatial proximity, clusters can (and often do) fail.

Feldman indicates that it is difficult to decipher whether entrepreneurial activities would have occurred before any research had been undertaken (e.g. there is no counter-factual) (Feldman 2001; Feldman and Francis 2004; Feldman, Francis et al. 2005). This adds to the complexity of researching industrial districts: everyone knows they exist but it's too complicated to create them and maintain their competitive advantages. Hence why it is necessary to understand how clusters work instead of taking them for granted and as some sort of panacea. Clusters/industrial district theory appears to be the perfect application of the phrase "*I know [a cluster] when I see it*".

Often times, scholars of a certain discipline profess allegiance to just one theoretical framework when studying clusters/industrial districts. However, it is important to undertake interdisciplinary research to uncover potential research avenues that might be still unexplored. For example, Scott's model of metropolitan industrial location has ample explanatory power, the case studies presented in this thesis offer new insights into the prevalence of this model. The cases shown offer empirical evidence that new models of

[21] Also known as the "Programa de Fomento a Cadenas Productivas (BID/FOMIN/COFOCE)".

understanding and theorizing coupled industrial and urban restructuring must take into account a variety of restructuring drivers. Scott's model is useful in explaining the role of industry as an agent encouraging urban growth. But despite this intermingling of urban form, social relationships and industrial production, the predominance of this model of metropolis is dependent on more than capitalism alone. Thus, Scott's work may be well supplemented with the theoretical model of multiple stressors presented in this thesis[22].

As the previous sections have shown, the industrial district body of literature has primarily concerned itself with enshrining the cluster as a new model for industrial organization, to the relative neglect of other issues, such as resource constraints and pollution control within the district (environmental), paradigm shifts in consumer behavior and preferences, changes in patterns of production and consumption in response to sustainability concerns, etc. Furthermore, despite the fact that by definition industrial districts have an intrinsic spatial dimension of spatial, no discussion on the patterns of land-use within a cluster has been found in the literature yet. These are just two examples of the theoretical avenues that this thesis contributes to.

[22] Scott's more recent work on the new economy and creative industries does acknowledge that his previous work was somewhat simplified. See Scott (2007) for an example.

Chapter 3 Historical overview of the Mexican leather and footwear industries

This chapter traces the history and compares the development patterns (convergence/divergence) of leather and footwear in León and Guadalajara

Similarities and differences in the growh of these industries is relevant when assessing restructuring trend because it helps us discern two important issues:

a) Whether the two clusters were somehow 'predestined' to their present state of development, and
b) Whether we are able to find patterns that help us predict future states of restructuring.

Traditionally, the Mexican leather and footwear industries have been regionally concentrated in León and Guadalajara. In the case of León, these industries held significant political and economic power. This grip on power has not been able to shield them from external pressures, however. From 1987-2000 (and particularly during the years 1994-1996), leather production became the target of environmentalist concerns over pollution (tanneries), as well as increased competition from other products and other producing nations (footwear). Pressures on the districts have occurred both at the local and national levels. However, the nature and scale of pressures is different. Market pressures originate from international competition (at a global scale) whereas environmental pressures originate at the local scale. Other pressures, such as land use and zoning policy have a local scope.

It is important to analyze the commodity chain in its entirety rather than as individual sectors. This broader characterization of the industry and its evolution is critical to framing the issues likely to influence its future. Simultaneous consideration of the various pressures will provide an understanding of the challenges that this industry faces and the policy options that can be used to tackle them. All of this needs to be borne in mind while dealing with societal, political, environmental and economic concerns in an integrated fashion. The remainder of the chapter will provide a cursory historical overview.

3.1 The case studies: León and Guadalajara

The cities of León and Guadalajara are located in the central part of Mexico (Figure 3-1). Guadalajara and León are two of the five most populated cities in the country (led by Mexico City with a population of 19.2 million people and occupying the second and fifth places, with official populations of 1.98 and 1.02 million respectively)[23].

Figure 3-1 Map of Mexico with León and Guadalajara highlighted by red dots.

Historically, Guadalajara had higher population growth rates than León, particularly in the early 1960s (Figure 3-2). The population of the city of Guadalajara levelled off after 1980, however. The Metropolitan Zone of Guadalajara (ZMG), in contrast, experienced rapid growth during this time.

[23] INEGI, *Censos de Población 2005*. The population of the metropolitan zone of Guadalajara is calculated by adding that of the five municipalities (El Salto, Tlaquepaque, Tonalá, Zapopan and Guadalajara). Other sources indicate that it adds up to 4.5 million people.

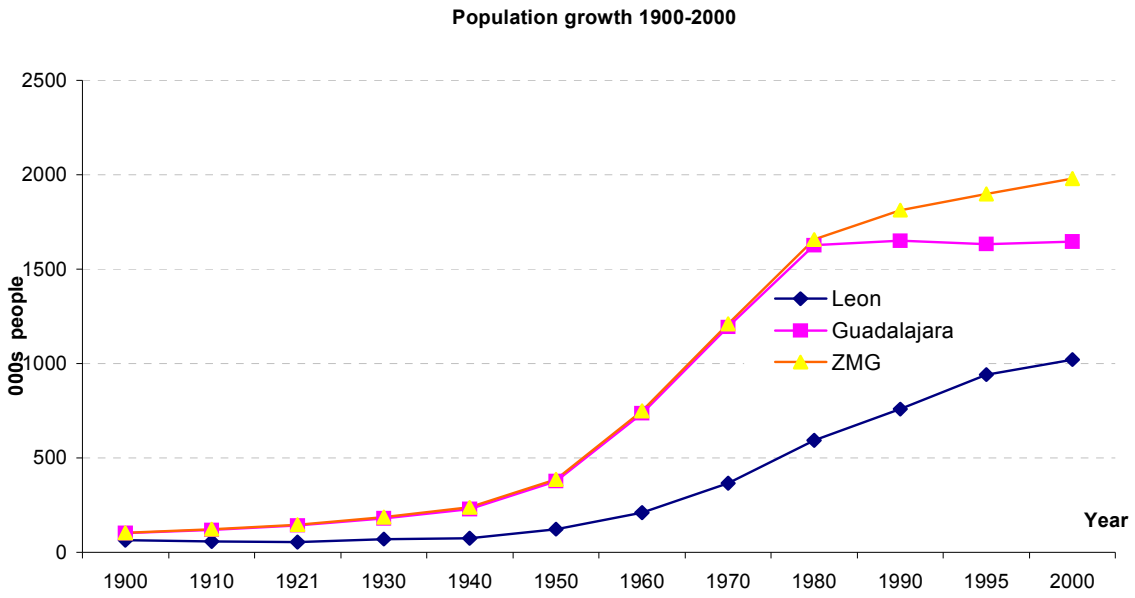

Figure 3-2 Population growth of the top five cities in Mexico (Source: Constructed from INEGI, Censos de Población, various years). After 1980 the population of the city of Guadalajara remains stable while the population of the ZMG increased at a similar rate to that of León.

The Village of León, founded on January 20, 1576, officially became a city more than 250 years later, on June 2, 1830. León is located to the northwest of the State of Guanajuato (21° 44' 38" North and 103° 44' 18" West), within the region nicknamed "*El Bajío*", a region that has historically favoured agricultural development (Calleja-Pinedo 1984, 1994). León was considered a 'marginal town' as it wasn't directly located along the '*Ruta de la Plata*', a road built for the purpose of transporting silver from the mines in the northern state of Zacatecas along the central states up to its final destination in Mexico City (Guerra-Mulgado 2001, 2005).

Figure 3-3 Location of León within the state of Guanajuato.

Guadalajara, originally known as the "New Galicia,"[24] was founded in 1532. Now the second largest city in Mexico, Guadalajara's officials were forced to curtail urban sprawl by 'annexing' three other cities: Zapopan, Zapotlanejo and Tonalá[25]. Recently, El Salto (where the electronics industry is concentrated) was welcomed into the Metropolitan Zone of Guadalajara (Pozos Ponce 1996; Cota Yañez 1997a; Rodríguez Bautista and Cota Yañez 2001). Figure 3-4 shows the geographical location of Guadalajara within the state of Jalisco, and Figure 3-5 depicts the actual situation of the Metropolitan Zone of Guadalajara.

[24] Galicia is a region in northern Spain. The region of Jalisco was called "New Galicia" because it resembled that region of Spain. When Spaniards arrived in Mexico, this region was the least dominated by Aztecs and thus they faced much less resistance to occupation (Ayala-Castellanos et al 1992).
[25] For a review of Guadalajara's geographical expansion see: *Anuario Socioeconómico y Demográfico de Guadalajara*, 2001. Available electronically (in Spanish) at: http://business.guadalajara.gob.mx/anuario/pdf/001_020.pdf

Figure 3-4 Location of the metropolitan zone of Guadalajara within the state of Jalisco.

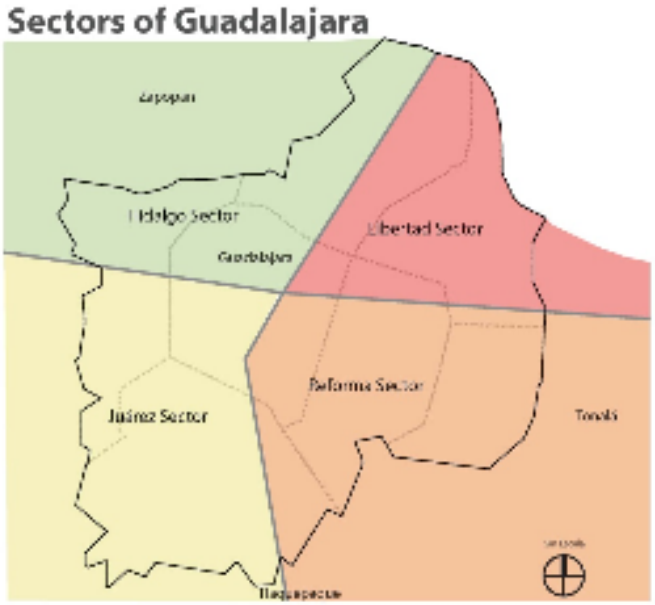

Figure 3-5 A simplified map of the Metropolitan Zone of Guadalajara showing the four major urban sectors and the five municipalities considered El Salto, Tonalá, Tlaquepaque, Zapopan and Guadalajara as the ZMG (Adapted from a previous version by IITJAL). The city of Guadalajara is located at the intersection of the four sectors, and as shown in the map, cannot expand beyond its current limits.

While traditionally Jalisco was considered an agricultural state, and Guadalajara was predominantly an agricultural region, by the end of the eighteenth century it had a significant number of shawl making, shoemaking and leather crafting workshops (Ayala Castellanos and Flores Peredo 1992). However, the government of Jalisco has pursued industrialization strategies that have reduced the relevance of traditional primary industries.

In a concerted effort to increase diversification, Guadalajara has slowly evolved into becoming the Mexican "Silicon Valley", notably with significant economic contributions and institutional support from the state government (Pozos Ponce 1997; Cota Yañez and Rodríguez Bautista 2001; Alba Vega 2002). This diversification trend has had significant (negative) implications for the traditional artisanal industries such as leather and footwear. More governmental support has been given to "cutting-edge" industries such as electronics, while more traditional industries are not paid much attention. Guadalajara's leather and footwear industries do not have the same visibility or relevance as they do in León. Guadalajara now has about 50 tanneries (mostly specialized in non-bovine leather manufacturing) and 700 shoe factories (women's footwear), compared to León's 450 tanneries (leather uppers) and 1200 shoe factories (men's footwear).

3.2 The leather and footwear industries in Mexico, with a focus on León and Guadalajara

Before discussing actual figures on leather and footwear production, a caveat is in order. Accurate figures on the geographical distribution of Mexican leather tanneries and shoe factories are very hard to come by, in part due to considerable industrial heterogeneity. While recent efforts have been implemented to increase access to vital and useful information, a tradition of secrecy is still prevalent in this country. Records for many other industries have been well maintained, but leather and footwear has lacked a systematic information gathering process.

The empirical evidence gathered in this thesis shows that leather and footwear are not high contributors to the gross domestic product (GDP) or employment (relative to other industries) despite anecdotal discussions about the relevance of these industries at the national level. The textile, garment and leather industrial sectors contributed 1.7% on average

to the national GDP (from 1995 to 2004, at constant prices in Mexican pesos)[26]. This sector's contribution to national employment and production value appears rather marginal, and continues to decline (Table 3-1). If we compare the percent contribution of the entire commercial sector (22.6% in 2004, calculated at constant prices of 1993) with that of the textile, garment and leather sectors (1.43% in 2004) we see that commercial activities (e.g., restaurants, hotels and retail) contribute 10 times more to the GDP than theleather, textile and footwear sectors combined.

Table 3-1 Contribution of leather and footwear to national production and employment (Source: INEGI)

	1999	2000	2001	2002	2003	2004
Total production in constant prices of 1993 (Mexican pesos)	2.53 billion	2.73 billion	2.70 billion	2.74 billion	2.78 billion	2.92 billion
GD 3 Manufacturing	953.11 million	1.05 billion	1.01 billion	1.02 billion	1.02 billion	1.09 billion
Div II: Textile, garment and leather sectors	75.69 million	82 million	76.36 million	74.17 million	69.51 million	70.22 million
Leather and footwear	10.88 million	10.40 million	9.52 million	9.37 million	8.88 million	8.82 million
Percentage of national production due to leather and footwear (%)	0.29	0.29	0.26	0.24	0.23	0.21
Percentage of national employment due to leather and footwear (%)	0.43	0.38	0.35	0.34	0.32	0.30

Notes: Data obtained from INEGI's System of National Accounts, Vols. I and II. Percentages were calculated based on these data.

Determining the industrial structure of leather and footwear in Mexico proved difficult, given that the Mexican regulatory framework was unable to provide data adequate for analysis of individual plants. The Law of Statistical and Geographical Information (*Ley de Información Geográfica y Estadística, LIGE*) precludes INEGI from providing plant-level information, regardless of the type. For example, if we wanted to find out about the production of a particular shoe making plant in Mexico for a particular month and/or year, INEGI would refuse to provide it because they are obligated to comply with LIGE. According to LIGE, data that can allow for full identification of the firm that has provided statistical and/or geographical data to INEGI will never be released. Therefore, INEGI uses a

[26] Sistema de Cuentas Nacionales de Mexico, Cuentas de Bienes y Servicios 1999-2004, Tomo I, INEGI

system to "blind" data. A single datum merging three observations will be released, with no address or any other information. A request for data on production volumes of the top three firms in the leather goods market (e.g., Firm One, 200 tonnes, Firm Two, 180 tonnes and Firm Three, 150 tonnes) would yield a single datum (530 tonnes). This reluctance to offer individual data poses a real challenge, particularly when it comes to studies of industry structure. Since we are unable to determine exactly how much each plant has produced or sold, we can't calculate concentration indices from raw data.

To demonstrate the importance of triangulation of quantitative data, a search on the website of the Mexican Business Information System (*Sistema de Información Empresarial Mexicano*, SIEM) that yielded the industrial structure shown in Table 3-2 was conducted. These data contrast drastically with those presented by Rabellotti (1995), Woodruff (1998) and other authors, as they used CICEG and CANAICAL data. Rabellotti indicates the existence of nearly 1200 shoe factories and about 900 tanneries in both Leon and Guadalajara. Other authors claim the existence of nearly 6000 establishments throughout the Mexican territory. Thus it was important to cross-reference several sources of information in order to ensure data quality.

Table 3-2 Structure of the Mexican leather and footwear industry according to the SIEM (Source: Constructed from 2006 SIEM data[27])

	León	Guadalajara	Rest of Mexico	Total (national)
Tanneries	242	20	12	274
Shoe factories	817	92	70	979

Note: Information for the SIEM is not provided by the industry associations (CICEG, CICUR, CRIC, CICEJ) but by the national manufacturing chamber (CANACINTRA), which might explain divergences.

While exact numbers for industrial structure can vary greatly, it is generally accepted that a larger proportion of small- and medium-sized firms and smaller percentage of large firms have traditionally characterized the structure of the world leather and footwear industries. This has typically been the case with leather and footwear clusters in Brazil, Argentina and Mexico (Korzeniewicz 1990; Rabellotti and Ciarli 2002). INEGI's classification of firm sizes from 1999 to 2004 indicated that **micro** firms employed less than

[27] http://www.siem.gob.mx, visited on April 24, 2006.

15 workers, **small** firms employed more than 15 but less than 100, **medium** firms employed between 100 and 250 and **large** firms employed 251 or more. Figures 3-6 and 3-7 show the predominance of micro, small and medium-sized firms in the Mexican clusters under analysis.

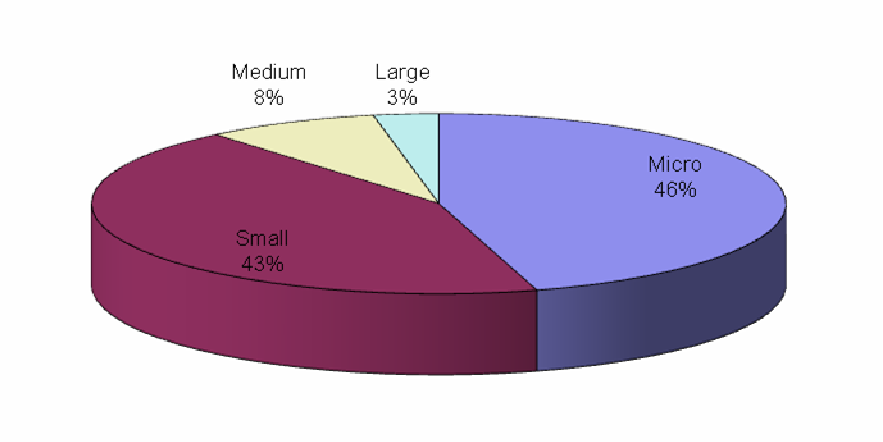

Figure 3-6 Size distribution of shoe factories in León (in percentage of the total number of firms) (Source: Estimates from Iglesias 1998, p. 40 and 125). Micro factories are predominant in León.

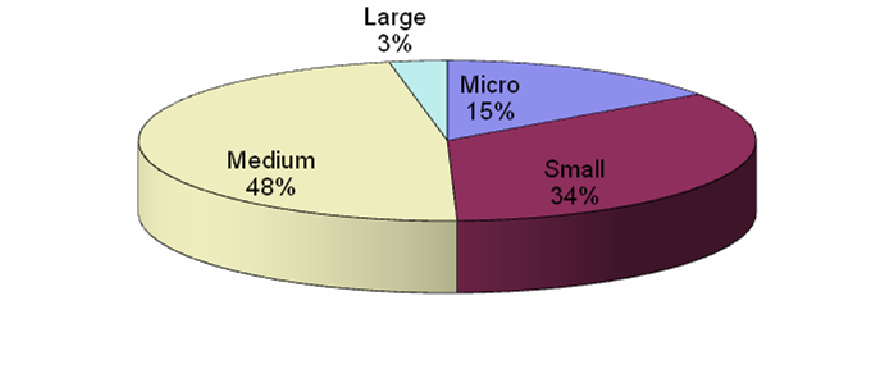

Figure 3-7 Size distribution of shoe factories in Guadalajara (in percentage of the total number of firms) (Source: Estimates from Iglesias 1998, p. 40 and 125). This graph shows that medium-sized firms are predominant in Guadalajara, while micro factories are pervasive in León.

3.3 Historical background of the first case study: León (Guanajuato)[28]

3.3.1 Leather[29]

This section offers a historical overview of León's development and its leather and footwear industrial districts. The introduction of the train to Mexico brought about a radical shift in the market for tannery products. In León, production of leather goods for saddles and other animal-transportation gear gave way to leather for shoe-manufacturing (Piñón-Medina 1994).

The origins of this tradition of leather-making and footwear production in León are not very well documented, although tanneries may have been around since the late 1500s[30] (Piñón-Medina 1994). From the mid- to late-nineteenth century, the leather, footwear and shawl-making industries flourished and began clustering by neighborhoods (*barrios*). Leather and footwear were found in the *Barrio Arriba*, in the heart of downtown León. Also, many smaller shoe factories, shawl-making workshops and smitheries could be found in the *Coecillo* (slightly northeast of downtown). Additional shawl factories could also be found in the *San Miguel* barrio (in the southern part of the city) (Guerra-Mulgado 2001; Rivera-Tafoya 2004).

It seems paradoxical to have leather tanneries in León given that historically this region has been plagued with water scarcity and its population relies on ever-shrinking groundwater supplies. Nevertheless, in the early 1500s (when the city was founded), water supply wasn't a problem as heavy rainfall was common. The city endured several floods; one of the most important occurred on June 18 and 19, 1888 when 2232 houses were destroyed and a number of human lives lost. This accident led to the construction of a levee along the *Rio de los Gómez* (Gómez River) to prevent new floods. Within 70 years, the Gómez River had dried up. Thus, the city went from a state of water abundance to scarcity.

The village's downtown core was designed as the primary location for core economic and social activity (Guerra-Mulgado 2005). Numerous Mexican cities (particularly in the

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[28] Special emphasis is given to events that have had environmental, land use and market competition effects, as these are the main forces under examination in the thesis.
[29] The discussion is divided in issues related to leather and footwear, but it is impossible to discuss one without the other, therefore some events may be reiterated throughout the text.
[30] In the following sections, the post-war period is discussed, with a special focus on the period after 1980.

post-colonial period) developed around downtown cores, keeping peripheral areas for residential use. However, urban planning as a coherent discipline did not take off until the late 1980s. Therefore, little consideration was given to divergent and often-conflicting land uses. This was not considered an issue around the 1800s, but as the city has grown, land use and zoning has become a concern. This is especially true for the post-1997 period.

Allegedly, in 1997, the leather industry employed "about 15,000 people directly and many more indirectly" (Rodriguez-Abitia 1997, p. 43). This employment figure (less than 1% of the total local employment) doesn't support the idea that this city depended on the leather industry for its survival, as frequently argued in the popular press. Further, it is inconsistent with those I calculated from INEGI and presented in Table 2-1. Nevertheless, leather tanning was popular in the late 1980s and early 1990s (Morris and Lowder 1992; Rodríguez-Abitia 1997; Knutsen and Wiik 1999).

In the mid-1990s, the tanning industry in León began to face increased pressure from environmental concerns almost at the same time as when the North American Free Trade Agreement (NAFTA) entered into force (January 1994). The pressure was multiplied in December 1994 with the die-off of 40,000 birds in the Silva reservoir, downstream of León. Also, as consumption of water for agricultural purposes increased, the region faced water shortages, threatening the long-term survival of traditional tanning practices[31].

As a result of increased pressure and visibility within the international community, leather tanneries in León (represented by their trade association, CICUR) and the Mexican government at various levels (federal, state and municipal) entered into an unorthodox voluntary agreement to reduce pollution generation and, as an ancillary benefit, "save the Turbio River". While an initial agreement (*convenio*) was undersigned in 1987, the 1997 one is considered the first serious attempt at curtailing wastewater pollution by tanneries in León. This policy instrument was flawed, both in its wording and implementation.

The die-off significantly increased the industry's visibility and led to localized, focused surveillance efforts by environmental authorities[32]. This event triggered an

[31] There are two related problems with the tanning industry—resource availability and environmental quality/pollution control. In this dissertation, priority has been given to environmental quality since it was the major concern of environmentalists and government officials at the time these events started unfolding. However, in an integrated assessment, it is necessary to take both issues into account (see Pacheco and Dowlatabadi 2003, 2005).

[32] As it will be shown in Chapter 3, all this increased regulatory pressure was short-lived.

intervention by the North American Commission for Environmental Cooperation (NACEC or CEC), which started an independent investigation studying whether this massive bird death had been the result of accumulated toxics in the Turbio river basin or whether there were other factors involved. The CEC's independent, trinational scientific panel concluded that botulism had been the key morbidity factor and not tannery waste. While this report cleared the tanning industry of any wrongdoing, it also highlighted the importance of cleaning up the Turbio River basin.

The 1997 *convenio* had the more ambitious goal of cleaning up the Turbio River (a tributary of the Lerma River). Signed in 1997 by the federal and local governments, representatives of three municipalities (León, San Francisco del Rincón and Purísima del Rincón) and two tannery associations, ANACU and CICUR, this convenio appeared to be more the result of international pressure than genuine interest in righting environmental wrongs.

From 1994 to 1996, the number of tannery inspections by the federal environmental agency increased. However, this heightened environmental pressure had pretty much disappeared by the year 2000 (Pacheco and Dowlatabadi 2005). Ten years after the 1997 *convenio*, the Mexican government has announced a "new program to rescue the Turbio river."[33] However, one has to question the likelihood of this program having any impact on the river's water quality. If the 1997 convenio, amid intense scrutiny from environmental regulators, could not be hailed as a success, what hope is there for this new agreement?

3.3.2 Footwear

Until the early 1940s, Mexico City was believed to be the largest producer of shoes, followed by Guadalajara and León. There are conflicting accounts on whether this was really the case. Some authors have argued that León produced a higher volume of footwear than Mexico City. The way to reconcile these conflicting accounts might be that León's footwear industry was primarily export while Mexico City's was focused on the regional domestic market. The fact that the footwear industry in León would target export markets makes sense given that León is geographically closer to the United States and had more direct cargo and

[33] Méndez, José Trinidad (2007), Periódico a.m., June 1, 2007.

freight routes to the US-Mexico border. At the time, travel between Mexico City and León took 11 hours, perhaps hindering deeper penetration of the León market by Mexico City manufacturers.

From 1946 to 1947, the leather and footwear sectors in León continued growing through increased sales to the US, while textiles continued fading, mostly because the shawl (*rebozo*) became less popular as a traditional garment. The Second World War helped solidify the strong market position of the leather and footwear industries given that a high percentage of US domestic footwear was imported from Mexico (Martínez and Ortíz 2000).

Some reports indicate that by 1951, León had 25 big shoe factories and 1500 family workshops that employed 22,000 employees (Ruelas 2002). Total daily shoe production (city-wide) was said to be 300,000 pairs per year, a figure that seems quite excessive as this would suggestt the total national shoe market was nearing 240 million pairs[34] (Rivera-Tafoya 2004). In 1960, as footwear continued to grow in strength and relevance at the local level, the last shawl-makers migrated from León, thereby signaling the "beginning" of a new industrial era. As the effects of the World War waned, the international market for footwear shrank and the industry turned its focus on domestic opportunities. Protectionist measures imposed by the Mexican government at the time allowed the whole leather-footwear chain to blossom.

The first big shock that these industries suffered was the big recession that Mexico suffered in 1976. This recession was arguably the cause for many shoe factories shutting down. As a response, the Mexican science and technology agency (*Consejo Nacional de Ciencia y Tecnología*, CONACYT) created an R&D institute that would provide technical expertise and support to the leather and footwear industries. This institute, CIATEC (Center for Research and Development on Leather and Footwear) was founded in 1976 and located in León at the request of the local industry[35].

The incorporation of Mexico into the General Agreement on Trade and Tariffs (in January 1986) marked the beginning of an intense process of market liberalization. For Mexico, being a party to GATT meant lowering trade barriers and opening internal markets

[34] In mentioning these figures, two facts need to be highlighted. First, the production figures seem quite excessive. This overinflation of production figures has led astray numerous analyses of the leather and footwear industries. Second, the industry was (despite the overinflation in figures) an important source of employment in this region.

[35] CIATEC was originally thought of as a research center for leather and footwear. However, since 1994, the Centre has tried to broaden its target markets and now provides services to the chemical, petrochemical and food industries.

to international competition. This had an extremely negative impact on the domestic footwear producers. For, as Rabellotti (1999) notes, it meant a significant increase in imports (a more than tenfold increase from US$ 13.7 million in 1987 to US$ 145.2 million by 1994 (figures in constant dollars) and a decline in the domestic industry.

The signing of the North American Free Trade Agreement (NAFTA) in 1994 brought along a widespread belief in Mexico that this treaty would increase the export of Mexican products to the Canadian and American markets. However, quantitative data shows that after NAFTA, exports did not increase substantially. On the contrary, imports grew both in value and volume.

Increasing panic from footwear manufacturers regarding the acceptance of China into the World Trade Organization (WTO) in 2000 forced the Chamber of the Footwear Industry of the State of Guanajuato (CICEG) to undertake aggressive countervailing strategies. CICEG hired a Mexico City-based consultant to analyze the competitiveness of the leather and footwear cluster in León. This project ($PROCIC_3$)[36] took place from early 2001 to late 2002. While thorough and strategic in its aim, one shortcoming of the report is that it focuses almost entirely on the León footwear industry, and has very little coverage of tanners and the challenges that they face except for a brief section on how tanners perceive the competitiveness of the León footwear industry. As a result, the $PROCIC_3$ implementation efforts currently underway have limited or no input from tanners nor any policy measures that are directly targeted at providing León tanners with options to enhance their competitiveness.

Several measures were implemented as a result of $PROCIC_3$, including a series of workshops implemented by CICEG from 2002 to 2005 to encourage the export of shoes. From early 2005 to early 2007, the three footwear trade associations (CICEG, CICEJ, CANAICAL) created a working group that would gather information from more than 400 firms to support a request to the federal government to maintain economic sanctions against Chinese shoe imports. These efforts led to the creation of "Annex 08", a special regulatory instrument that would legalize on-the-spot searches and allow local police to seize any

[36] The actual text of $PROCIC_3$ was disclosed only to CICEG at the time of writing, so only summaries of the report were provided. CICEG wanted to keep the findings of this report "confidential for fear that someone would steal information from it" (personal communication with CICEG representative, October 2002).

suspicious counterfeit or smuggled footwear. In spite of the fact that all three organizations participated in this effort, it has only been implemented in León.

3.4 Historical overview of the second case study: Guadalajara (Jalisco)

3.4.1 Leather

Historical evidence shows that while León was known as "the capital of leather and footwear", Guadalajara also had a long tradition of leather tanning. Olmedo goes so far as to say that one should call people from Guadalajara "*cuereros*" (leather producers) instead of "*tapatíos*"[37] (Olmedo 1997, p.30). For this author, two main conditions encouraged the development of a shoe industry in Guadalajara during the 1700s and 1800s; namely, a high number of retail merchants, and an increase in population. Furthermore, Olmedo indicates that the shoemaker trade was considered 'low-status,' thus generating an increased supply of cheaper labor[38]. Arias (1992) argued that at the time (early 1800s), for a young *tapatío* looking for a trade to learn, the options were often lifelong and limited to textile-related crafts or shoemaking. However, when we compare the co-evolution of leather and footwear industries with textiles, we find similarities in their manufacturing processes. Workers displaced from the tanning or footwear industries would thus be able to find work in the textile sector, and vice versa. Therefore an evolutionary lens (van Geenhuizen 1999) would not support Arias' point.

The political instability resulting from the Mexican Revolution (1910-1917) had a negative effect on manufacturing activities, although the city appeared to recover quite rapidly. The development of Guadalajara's footwear industry was strongly influenced by the presence of the United Shoe Machinery (USM), a vertically-integrated firm that tanned leather, manufactured shoes and also built shoe machinery. USM provided visible employment opportunities, thereby playing a role in increasing the relevance of the footwear industry in Guadalajara. The leather industries continued growing slowly and by 1920 Guadalajara had 32 shoe factories and 11 tanneries. Leather tanneries in Guadalajara have not had such straightforward success, as will be shown below.

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[37] *Tapatío* is the nickname for inhabitants of Guadalajara.
[38] Some may see this trade as requiring few skills rather than being of low status.

The explosions of April 22, 1992 in the Reforma sector of Guadalajara were a wake-up call for better environmental regulations and emergency preparedness. This catastrophic event killed 210 people and destroyed nearly 3000 homes. More than 15,000 people lost their belongings and/or homes, and nearly 1000 individuals disappeared (García Bátiz, González R. et al. 1995). The agency responsible for Guadalajara's water supply, the *Sistema Intermunicipal de Agua Potable y Alcantarillado* (SIAPA), was charged with negligence and corruption. However, after a year of investigation, no guilty party was officially mentioned. Regulatory environmental monitoring of chemical industries increased after the 1992 explosions. While Lezama argues that this tragedy led to the creation of the Office of the Federal Attorney for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*, PROFEPA) (Lezama 2004), there is no evidence to that effect, as PROFEPA was already operating at the time[39].

Inadequate land-use planning may have also played a role in the 1992 explosion. Numerous small- and medium-sized chemical plants were located in mixed-use areas[40]. These plants use chemical compounds that may have been inadequately disposed of in municipal sewers. García-Bátiz et al (1995) propose that high concentrations of people living in zones with incompatible land-uses led to an increased vulnerability of the population towards disasters. While tanneries were not charged or pointed out as responsible for these explosions, the social response towards them was negative. Tanneries had traditionally been located in the urban core of Guadalajara. Therefore, it seems reasonable that neighbors would be suspicious of their activities, especially since the production process generates odors.

Complex intermunicipal politics also contributed to increasingly unfavorable conditions for tanneries in Guadalajara. On July 31st, 1991, the municipal government of Guadalajara signed an agreement with the Regional Chamber of Tanning in Jalisco (*Cámara Regional de la Industria Curtidora de Jalisco*, CRIJ) that allowed tannery members of the Chamber to dispose of their solid waste in the processing plant located at Potrero de los Ayala, in the municipality of Tonalá. This agreement was an extended loan that allowed tanneries to use the land for waste disposal[41]. The "*comodato*" would mean that the consortia

[39] However, as it will be shown in Chapter 3, PROFEPA did not pressure Guadalajara's tanneries to the same extent as those located in León.
[40] "Mixed-use areas" refers to a combination of residential and industrial areas.
[41] This loan is commonly known in Spanish as "*comodato*"

(*Curtidores Asociados de Occidente, S.A*. also known as CAOSA) would be responsible for maintaining the landfill site and making sure that solid waste was properly disposed of (CRIJ 2001b).

On March 3rd, 1992, the municipality of Guadalajara signed an amendment to the original agreement with CRIJ that established the specific measurements and location of the disposal area. This amendment was needed to allow tanneries to start disposing waste in the area designated for that purpose. Tannery owners had enough foresight to prepare for tightening environmental standards[42]. They agreed to comply with environmental regulations that were currently under review (NOM 052- ECOL-1993). However, the agreement was never implemented. From 1992 onwards, environmental agencies and the municipal departments of ecology increasingly scrutinized tanneries both in León and Guadalajara. These agencies increasingly sought to create and enforce stricter environmental regulations, and solid waste became the focus of this regulatory process (CRIJ 2001a). Thus, tannery owners in León took a reactive approach to legislation, whereas tanners in Guadalajara took a proactive approach.

After much lobbying by CRIJ officials, on November 28th, 2000, the State Congress of Jalisco finally approved the "*comodato*" agreement. However, a published version of a governing council session of Tonalá on October 10th, 2001 shows the stiff opposition that this *comodato* agreement faced. Tonalá's Secretary General argued that tannery sludge was considered hazardous waste according to NOM-ECOL 052/1993, and therefore argued that the *Potrero de los Ayala* site was therefore inadequate[43]. He further requested that the National Institute of Ecology (*Instituto Nacional de Ecología*, INE) verify the landfill's suitability and provide written authorization for hazardous waste disposal (CRIJ 2001c).

3.4.2 Footwear

While the Cristero rebellion[44] led to a crisis in 1929 in Guadalajara, the year also marked the start of a new large footwear company (created by former textile entrepreneurs

[42] An interviewee (October 2002) mentioned "*…it was surprising how well prepared tannery owners in Guadalajara were*".
[43] We examine this "anywhere but here" phenomenon in detail in a forthcoming publication (Pacheco and Dowlatabadi 2007c)
[44] A civil war that confronted Catholic civilians with Mexican armed forces, around 1925-26.

Augusto and Mauricio Brun), making the 1930s the beginning of a decade of slow but steady recovery (Arias 1992).

Guadalajara's industry flourished largely due to Calzado Canadá. The footwear-manufacturing firm that grew so much as to become "the largest footwear factory in Latin America" (Arias 1980) was considered an anomalous example of growth and vertical integration (Rabellotti 1997). While it began with 12 people, it grew to employ nearly 10,000. This company aimed its products at the middleclass, producing mainly average-priced shoes for men. Its impressive growth from 1940 to 1980 strengthened the national position of Guadalajara in the footwear landscape, but not its reputation in the women's footwear market. From 1945-1960, Guadalajara's footwear industries used a niche strategy and sought to become specialized in women's footwear. Only Calzado Canadá and two other factories did not manufacture women's shoes at the time (Arias 1980).

The creation of the Regional Chamber of Footwear in Jalisco on June 30th, 1942, gave shoe manufacturers the opportunity to demand institutional support from the government as a united front. Business flourished during this period. Guadalajara footwear firms covered most of the Pacific Rim routes, leaving the northern and central Mexico markets for the León-based shoe factories. The footwear industry grew to be one of the most important industrial activities in Jalisco, with 757 establishments employing 25,000 people with a value of production of $864 million pesos in 1950, while 9 tanneries supplied leather for footwear (Arias 1992)[45]. Institutional support was key in this development and CICEJ contributed to strengthening ties among participating firms (Lozano Uvario and Méndez Guardado; Serrano Camarena 2002).

As shoe factories in León exported to the US market during the War, shoemakers in Guadalajara started to focus on other products, such as *huaraches* (sandals) and women's footwear, supplying formerly unexplored (domestic) markets such as Mexico City. Guadalajara grew to be the "indisputable national center for women's footwear production", supplying nearly 55 million pairs in 1992 (Arias 1992, p. 1). However, 2002 marked the beginning of a decline for tanning and footwear in Guadalajara, with the acquisition of

[45] This figure is questionable, as it would be unlikely that 9 tanneries would supply 757 shoe factories, unless these tanneries were really large. In a review of historical records, the evidence suggested a much higher number of tanneries (100).

Calzado Canadá by Coppel (an appliances, furniture and clothing wholesaler), coupled with the closing of several high-end, well-known tanneries[46].

3.5 Evolving (and diverging) social norms?

One important element that may have been overlooked by other analysts when looking at the evolution of the leather and footwear industrial cluster in Mexico, and particularly in León, is the change in social norms that occurred after 1985. On September 19th, 1985, an earthquake of 8.1 degrees Richter shocked Mexico City and its inhabitants. The earthquake took place at 7:19 am (Mexico City time) and an aftershock of magnitude 7.5 occurred 36 hours later. While the number of victims varies (the Mexican government indicated 4541 people died while CNN reported around 10,000), it became one of the most devastating events in Mexican history. The earthquake prompted a massive migration outside of the metropolitan area of Mexico City. A recent report by the Government of the State of Guanajuato indicated that about 49,000 people migrated to Guanajuato (38% were originally from Mexico City and 17% from the State of Mexico). Reportedly, 24% of the people who relocated to León hailed from Mexico City and 16% were originally from the State of Mexico[47].

Why is this earthquake relevant? Because one could hypothesize that the people who relocated to León from Mexico City were not tied to the footwear and leather industries. These people didn't have a family tradition of shoemaking or leather manufacturing. Therefore, it would make sense for them to continue doing what they did before their forced relocation. If they were in a different business from the start, then one could argue that they may not have been interested in keeping with the accepted social norms (e.g. pursuing the traditional business of León). Forced migration to León in 1985 may have played a role in how the leather and footwear district evolved. Interest in the future development of the commodity chain might have waned after 1985.

[46] Fregoso, Juliana (2005) "*Menos cueros, mas correas*". La Jornada, January 10th, 2005.
[47] UPIE, Personal communication. September 19th, 2005.

3.6 Summary.

This chapter provided a historical overview of events (environmental, economic, land use) that had an impact on urban and industrial structure in the cities of León and Guadalajara. Figure 3- 8 briefly summarizes the main forces discussed in the historical overview and shows how these forces are related to market, environmental and zoning factors.

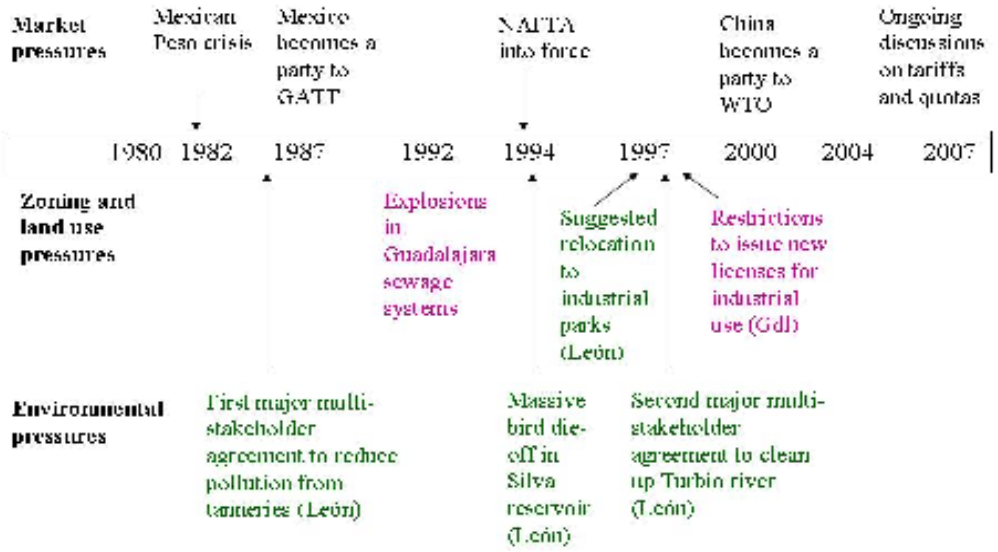

Figure 3-8 A timeline of events showing the multiplicity of stressors facing the Mexican leather and footwear industries. Rows represent the three major drivers analyzed in the thesis. Each column indicates specific events or shocks. Please note that critical events in León are marked in dark green and those specific to Guadalajara are marked in purple.

The leather and footwear industries had different origins and followed diverging pathways. In León, leather tanning was promoted as an activity that would (at the time) provide job stability for the majority of workers who were the main local economic force. In contrast, Guadalajara tanneries emerged as a response to increased demand on leather by local shoe factories towards the end of the nineteenth century. The further evolution of their commodity chains did not lead to parallel paths, nor did their urban development trajectories.

A review of historical records indicates that, contrary to commonly held belief, Guadalajara was *de facto* much more of a "leather town" than León. In the late 1700s and

early 1800s, the "*zapateros*[48]" from Guadalajara formed a "*gremio*[49]" that held strong political power and was positioned within the higher rungs of the hierarchy. This wasn't the case in León, where the shawl industry predominated until early this century. For the past 15 years, footwear factory owners have still had more political clout than leather tannery owners. This fact has had important implications in the way León's leather and footwear industrial cluster has responded to multiple stressors. The following chapters will examine the theory underneath the drivers, some empirical evidence to the effect, and the clusters' responses.

[48] Shoemakers, in Spanish.
[49] Union, in Spanish.

Chapter 4 Drivers

4.1 Introduction

Definitions for "restructuring" are dependent on the particular discipline. This section surveys several disciplinary definitions of industrial restructuring (IR) and attempts to reconcile diverging views on the concept. A broad survey of literature offers insights from a broad range of disciplines. While many theories discuss the causes for structural changes at varying scales (local, regional, global), few attempts if any have been done to integrate these theories. This chapter provides the foundation for a model of industry responses to structural change under multiple stressors. The chapter begins by developing a unified definition of industrial restructuring through an in-depth literature review. It then describes in detail how other authors have looked at eachof the three major drivers examined in the thesis: market forces and globalization, environmental regulation, land-use changes and zoning policies[50]. The discussion of institutional factors is done in Chapter 4 as it can be considered both a driver and a response. Some of the empirical evidence obtained is offered here to show the effect of restructuring drivers. Finally, a conceptual model is proposed and then applied to assess cluster responses in Chapter 4 and 5.

4.2 Towards a unified definition of industrial restructuring and restructuring drivers

In the industrial organization literature, the definition of industry structure is based on the number of buyers and sellers, competitive environment, levels of product differentiation, barriers to entry, cost structures and vertical integration (Barney 1996). Thus, a broad change in the number of buyers and sellers (e.g. a change from a perfectly competitive market to an oligopoly, or the establishment of a monopsony) would be a form of restructuring. Increased competition due to lowered barriers to entry would also lead to a completely new industry

[50] A brief overview of technical change as a restructuring driver is offered here but it is described in more detail in Chapter 5.

structure. Competition may increase because of changes in product differentiation strategies (e.g. a shoe factory that manufactures high-quality, high-priced shoes could potentially be able to create a "higher quality" medium-priced shoe without detriment to its main market). This also constitutes restructuring. Finally, changes in the configuration of the production chain that lead to vertical integration can also be considered restructuring[51].

From an industrial geography viewpoint, changes in the spatial location as well as increases or decreases in geographical concentration of industries also constitute a form of restructuring. This definition implies that restructuring is the response of firms to external factors that promote or discourage agglomeration and/or change industry decisions about where the operations are located. Increased agglomeration might lead to the formation of an industrial district or "cluster". In the clusters literature, however, decreased geographical concentration is almost never mentioned. Thus, restructuring is mostly understood as a change in the spatial configuration of industrial plants within a specific region. This reconfiguration can create closer ties between firms as a result of external economies (Dijk and Rabellotti 1997), technology and knowledge transfer (Gertler 1995), shared labor pools and inter-firm linkages (Mazzola and Bruni 2000). There appears to be an implicit assumption that geographical proximity and closeness leads to stronger ties amongst firms, and therefore to positive externalities. This might not be the case, particularly in declining industrial clusters[52]. Staber finds that in the Baden-Württemberg knitwear industry, geographical closeness increased mortality rates (Staber 2001). This finding contrasts with the general views of the literature, particularly as promoted by Michael Porter[53].

From a political economy viewpoint, restructuring is understood "both as a response by firms to crises and structural changes in the world economy and as a means to maintain and enhance competitiveness on a more continuous basis" (Knutsen 1998, p. 256). Restructuring is always a response of an industrial system to external (exogenous) pressures. This definition agrees with that proposed in this thesis in that it emphasizes industrial restructuring as a dependent variable to study (since it is 'dependent' on the external forces

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[51] More recently, economists have examined the issue of agglomeration, thus leading to the emergence of the "new geographical economics"

[52] See Chapter 2 for an in-depth treatment of the foundations of cluster theory.

[53] Porter has long promoted (along with the OECD) a cluster-based policy that encourages the development of new geographically concentrated districts. However, despite the fact that much research has been done, it is still unclear whether forcing (or "encouraging") new clusters is actually the right policy to implement.

that exert pressure on the system). One small shortcoming in Knutsen's definition is that it does not address issues of cross-scalar dynamics. Restructuring takes place at various scales: firm- and industry-level, regional, national and global.

In this dissertation, structural changes are primarily related to changes in employment composition, product value composition, modifications in the urban/social/environmental landscapes and shifts in geographical concentration. Therefore, IR can be measured on the basis of changes in one or more of the following parameters:

- Output (production quantities, sales revenue, GDP for a specific industry)
- Number and/or geographical concentration of firms
- Economic performance (revenue/value-added activities)
- Inter-industry linkages (vertical integration/horizontal diversification/stratification)

Understanding restructuring and its associated dimensions requires a thorough analysis of causal relationships between the factors that lead to structural change and their interplay. For example, increased competition due to vanishing borders and globalization can force firms to choose new operational strategies, ranging from specialization in a particular production process and reaping economies of scale to development of flexible production facilities and seeking the advantages of a responsive manufacturing facility. Technological changes within an industrial process can drive some firms out of business as their processes become obsolete and their capital base too depleted to invest in new technology.

McGrath-Champ indicates that the view of industrial restructuring from an economic geography standpoint, "conceives restructuring outcomes as products of conscious strategies employed by all the different, structurally defined actors in and around industry, each motivated by different goals, aware of short-term objectives and usually unaware of the structural implications of their actions [whether they be profit maximization, improvements to wage and working conditions or increased state revenue]" (McGrath-Champ 1999, p. 242). This "rational-actor" position does not consider that many actors can be unwitting and/or unwilling parties to decisions taken by others.

To understand IR we ought to assess the shapes that industry may take after having undergone structural changes. One can ask, how has the composition of GDP changed over time (i.e., has the % of GDP based on leather and/or footwear grown or declined? Has the

regional GDP grown or declined? And, more importantly, to which factors might we attribute these changes?) To undertake a dynamic analysis of structural change, we need to examine how these factors change on a longitudinal timescale (e.g., how each variable changes over time). We also need to determine what is causing the changes (e.g., external shocks or internal shifts) and what scales the restructuring takes place at (e.g., firm and industry-level, cognitive scales, etc.). Finally, we need to examine the shifts in geographical scales that derive from exogenous pressures.

Drivers are defined as the forces that influence the state of a particular system and generate some degree of change. They are "stressors" that modify patterns of behavior in firms. Aggregating individual company responses to stress leads us to a better understanding of how industry sectors cope with exogenous pressures. Restructuring drivers influence the patterns of industrial transformation and effect change on the system's state. By monitoring state variables and response indicators, we may be able to trace the extent of restructuring and assess the magnitude and direction of structural changes. These factors (typically external) change the social, political and/or economic landscape. Restructuring drivers are wide-ranging and operate at different scales.

R**esponses** are defined as as the internal changes that firms, industrial sectors and regions undergo to cope with the exogenous factors that they are faced with. Firms can use a variety of strategic responses, depending on the specific driver and its intensity. Drivers effect *pressure* at multiple scales (firms, industrial sectors and regions). Agents under multiple stresses react through various response mechanisms to bring the state of the system back to a desired point.

Table 3-1 lists some common examples of drivers of industrial restructuring. The forces listed in this table are primarily exogenous to the system. However, it is useful to remember that some **endogenous** factors also act as triggers of structural change. For example, shifts in core values and beliefs held by company owners can cause a shock in the way the system works. If a tannery owner suddenly decides that it is in her best interest to simply shut down the factory, sellout and leave the business altogether, her actions would become an endogenous driver of change. Depending on the size and structure of the industry (e.g., on how important is this firm is compared to the rest), her decision could have strong effects on the sector as a whole. Nevertheless, this thesis focuses on external drivers.

Table 4-1 Some examples of drivers of industrial restructuring

Variables	Examples
Macroeconomic	• External shocks to the system (financial crises/sudden changes in exchange rates) • Market liberalization—decreasing tariffs and lower trade barriers • Price of capital • Shifting demands and price substitution
Environmental	• Resource availability, scarcity of other inputs • Actual levels of pollution abatement • Sensitivity to pollution events • Regulation
Societal	• Political events and social mobilization (social unrest) • Changes in behaviors and attitudes at the broader level (societal level) • Changes in patterns of consumption (consumer preference) and fashion trends
Technological	• Shifts in technological regimes • New innovative technologies currently under adoption

4.3 Market pressures

Increasingly, globalization has become associated with (and held responsible for) shifts in employment, production and consumption patterns, and changes in the geographical location of production (international division of labor). The literature frequently highlights the relationship between market forces and restructuring as reciprocal (bidirectional). That is, economic forces may induce structural change, or restructuring of firms, corporations and sectors may shift market dynamics.

Global markets force businesses to design intelligent strategies to outperform their competitors. These strategic responses may vary from shifting to a totally new market, to enhancing product quality, improving delivery, streaming logistics and providing better customer service. However, it may not always be in the best interest of firms to remain in business. Therefore, exit should also be considered a viable strategy, particularly in declining sectors (Harrigan 1980, 1984, 1988).

Market forces can contribute to structural change by transforming the composition of production output within a particular geographical region (Barr and Waters 1983),

contributing to earnings inequality (Beeson 2004), and changing labor conditions through productivity improvements (Disney, Haskel et al. 2003). Globalization and increased competition may affect firm demography by pressuring companies to outperform their competitors in order to survive.

The literature on clusters tends to romanticize the concept of cluster/industrial district by assuming that because of their spatial proximity, firms will not decline even if faced with increased market pressure simply because they are embedded in these ideal "industrial districts" that are somehow shielded from exogenous pressures (Porter 2000). However, not even geographical concentration helped the steel industry in Pittsburgh survive (Beeson 2004). Other industrial districts have experienced decline, such as the Baden-Württemberg knitting and textile cluster (Staber 2001), steel casings (Baden-Fuller 1989) and shipbuilding (van Klink and de Langen 2001)

The interaction of different drivers must also be taken into account in the analysis of restructuring drivers. Individual drivers often interact with one another, thereby creating a negative (or positive) feedback effect. For example, globalization can have a compounding effect in industries already in decline. Barnes and Kaplinsky (2000) argue that the negative effects of globalization are exacerbated in declining industries because the industry is already locked in a downward trajectory. Their findings indicate that "South African [automobile] component suppliers are increasingly being relegated to highly competitive niches in mature technologies in external after-markets, making them vulnerable to exchange rates, due to increased foreign sourcing of components" (Barnes and Kaplinsky 2000).

The impact of globalization on industrial concentration is not negligible either. Changing macroeconomic conditions and ever-evolving patterns of trade amongst nations has meant that those players who are strong enough to compete within this new "globalization game" (Porter 1980, 1985) remain in business. This leads to a reorganization of the market structure, with the stronger and more established firms remaining in business while the weaker firms leave the business. The US beer brewing industry is a good example of an industry where increased international and domestic competition has led to an increased concentration of business with a few large players (Lynk 1985; Greer 1998; Tremblay, Iwasaki et al. 2005).

Finally, economic forces can contribute to the spatial reorganization of production at different geographical scales. For example, Florida and Keeney (1992) found that reorganization influences the location that industries choose. In their study of Japanese investment in US steel production, they discovered that new plants chose to locate where steel mills already existed (Florida and Keeney 1992). Lower wages in developing countries may attract firms too (Haddad and Azzoni 2002). Several scholars argue that this is the rationale behind the relocation of production in peripheral countries (Smith 1966; Scott 1986; Conti, Malecki et al. 1995; Bárcena-Ruiz and Garzón 2003; Chakravorty 2003). Countries in the periphery are also seen as attracting wage-sensitive industrial sectors, however, footwear being one of them (Donaghu and Barff 1990; Gereffi and Korzeniewicz 1990; Parkinson 1990; ILO 1992; Korzeniewicz 1992; Barff and Austen 1993; Lim 1994; ILO 1996; Brenton, Pinna et al. 2000; Frenkel 2001). This literature thus argues flexibilization led to structural changes that reflected on firm location.

In order to examine the effect of market pressure, concentration indices for tanneries in both cities (León and Guadalajara) were compared. No CR_4 data were available at the time of writing from before the period of trade liberalization and thus conclusions regarding the presence of highly concentrated leather and footwear industries cannot be drawn. While it would be useful to compare these industries with others where trade would not be expected to have a big impact, CR_4 data are not available in the disaggregated form presented in this dissertation, so comparisons cannot be drawn at this time.

On industrial structure

Several interviewees indicated that the tanning industry in León had ups and downs during the 1980s and 1990s. One respondent indicated that the number of tanneries decreased from 641 in 1980 to 533 in 1990 but increased again to 908 by 2002[1]. This expert predicted that by 2010, only 447 tanneries would be operating. However, this prediction has become true less than three years after the interview took place. Destiny fulfilled itself 7 years earlier!

(Interview on file, E-04-01, Dec 1, 2004)

The equivalent firm size in León and Guadalajara was calculated, to compare firm sizes across regions (Table 4-2). During the period under study, the tanning industry increased its concentration ratio faster in Guadalajara than in León (and nation-wide) (Figure 4-1). In the absence of raw data, it is hard to draw conclusions on whether this increase in concentration

is due to market pressure. However, if we link the data presented to those of footwear and firm size, we may be able to draw more solid inferences.

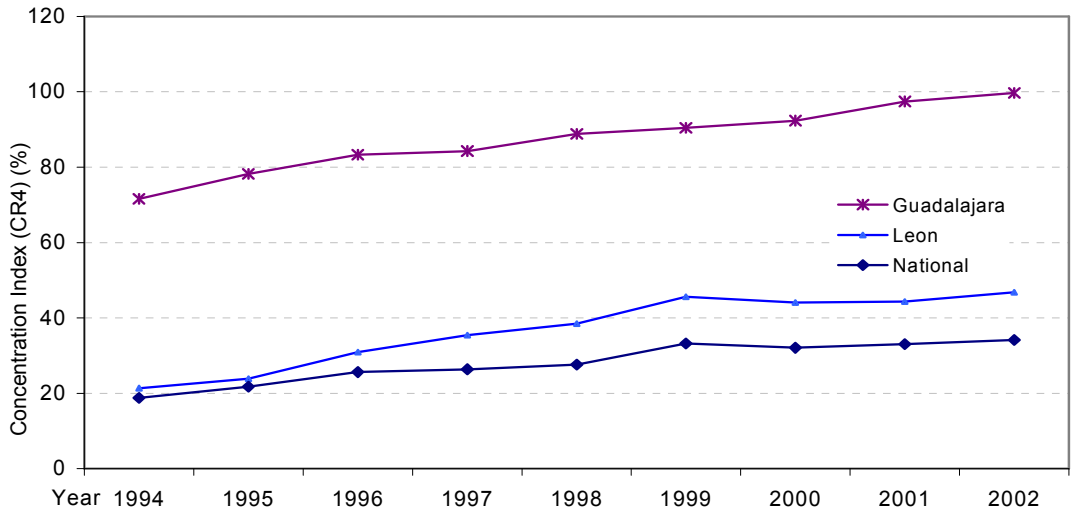

Figure 4-1 Comparative view of changes in industrial concentration ratios of tanneries over the period 1994-2002. (Constructed from INEGI data, 2003).

To calculate the size of the top four firms, the following assumptions were made:

a) that the CR_4 did not change throughout the year
b) that the top four firms were of equal size (this is a rather bold simplification, but it is just for comparative purposes)

Calculations for the ratio of firm sizes in León and Guadalajara (FS_L/FS_G) for the three activity classes under study (full-leather footwear, synthetic footwear and leather tanning) are shown in Table 4-2. Taking the year 2002 as an example and using CR_4 data to estimate large firm sizes, a tannery in León would be 4.9 times larger than a tannery in Guadalajara. Interestingly enough, a large synthetic shoe factory in León would be 13.5 times larger than one in Guadalajara (which implies that synthetic footwear firms in León are much more prevalent than in Guadalajara). Table 4-2 shows that with the exception of synthetic footwear, there is constant growth through time in the ratio of large firm sizes (León/Guadalajara).

Table 4-2 Ratio of firm sizes (León/Guadalajara) as calculated from CR_4 data

Year	Leather tanning	Full-leather footwear	Synthetic footwear
1994	1.59	0.6	4.14
1995	1.46	0.8	4.15
1996	1.33	1.81	4.63
1997	2.31	1.86	9.06
1998	2.06	1.97	9.46
1999	2.9	1.97	11.44
2000	2.8	2.09	13.57
2001	4.14	2.83	10.1
2002	4.9	5.34	9.14

As for the leather-based footwear industry, Figure 4-2 indicates two phenomena. First, there is a sharp decline in industry concentration from 1994 to 1996 in Guadalajara (89% to 70% in two years), with a recovery in 1996 and then a slow and steady increase to about 80% (although it declines again in 2002). Second, León, in contrast, experienced a steady increase in concentration of business over 10 years (from about 15% to nearly 30%)

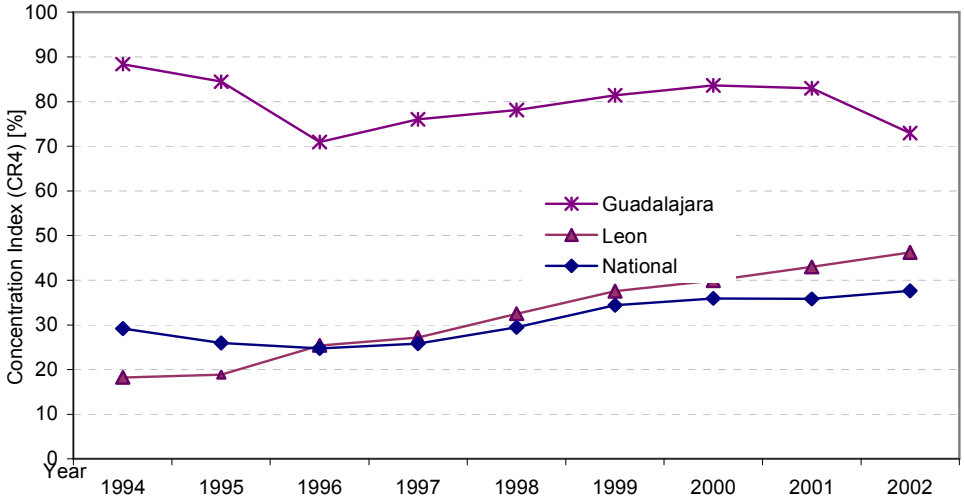

Figure 4-2 Comparative view of changes in industrial concentration ratios of leather-based footwear firms over the period 1994-2002 (Source: Constructed from INEGI data, 2003).

4.3.1 International Trade

Given that signing GATT and NAFTA was an action undertaken by the federal government of Mexico, the effects of these agreements should have been perceived in both clusters with the same intensity. However, since the product mix and the target markets of both clusters are significantly different, the strategies each cluster followed to face the challenges posed by increased market pressures were very different. In the case of footwear manufacturing in Guadalajara, shoemakers continued to concentrate on women's shoes and high-priced, low-volume products[54]. Certainly, Guadalajara has fewer tanneries than León does. However, these tanneries have a much more diversified product mix, as they have concentrated on mid- to high-priced leather.

The discussion above suggests that market forces have an effect on restructuring in these clusters, although we can't say that these forces were the main drivers. Concentration increased in both clusters (albeit at different rates). Both clusters have had a decline in the number of firms and employment. Both industrial clusters faced the same international pressures, but responded in different ways. León's shoe factories continued to compete on the basis of volume sold (i.e., price) whereas Guadalajara's shoe factories used a differentiation strategy.

A number of tannery owners in Guadalajara had considered the possibility of selling their product to León's shoemakers. This would have increased competitive pressure on León's tanneries, shrinking the available share of local markets. However, this competitive threat did not materialize. A potential explanation is the divergence of target markets. Guadalajara tanneries produced more sophisticated leather products than those used by León's shoemakers, which competed not on the basis of quality but on the basis of price.

The evidence presented here suggests that León's tanneries were substantially larger than those of Guadalajara. But whether León's larger firms have adapted better to economic pressures than those of Guadalajara cannot be determined/is unclear. An increase in concentration ratios indicates that the industry is consolidating (fewer firms of larger size). We can argue, then, that there is enough evidence of restructuring in response to increased market pressure as shown by the increase in concentration in Figure 4-2.

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[54] Anonymous expert interview using the survey instrument implemented over the summer of 2003. Interview on July 1st, 2003.

4.4 Technical change

Hides are a by-product of meat production and consumption. Since ancient times, hides have also been used for cover and protection (manufacturing coats, mostly). However, with time, the hide structure would decay due to lack of preservation. Therefore, conservation methods were necessary to maintain the hide's properties for an extended period of time. Some of these methods included drying the hide, adding oil and vegetable substances derived from tree barks (tannins). The latter has become the basis for vegetable tanning. While it is hard to pinpoint the exact era when leather processing began, some authors argue that it can be traced as far back as near 5,000 B.C (Ballance, Ghislain et al. 1993).

Technology is a key element of regional and national development (Schätz and Revilla Diez 2002). New technologies allow us to develop better materials, save lives, protect our borders, share information, cure diseases, help impoverished communities, etc. Technological advances can shut down entire industries by virtue of making processes obsolete and non-valuable. Technical change may also be a key element injecting dynamism into companies worldwide. A Schumpeterian view would argue that technological change goes through periods of relative stability punctuated by discontinuous advances. However, it is still not very well understood and there is a high degree of uncertainty associated with prediction of availability of resources and other factors (Teitelbaum and Dowlatabadi 2000).

The question asked here is – how does technical change influence industrial restructuring? There are many ways. The diffusion and adoption of innovative technologies may strengthen particular firms while weakening others. Leaders may be able to better position themselves in their competitive environment, whereas laggards may suffer and perish. Other times leaders may fall prey to the trap of "too innovative too early" and incur in substantial sunk costs that may leave them weakened to compete in a rapidly changing environment. Often being a follower may pay-off better.

Technological change can have an effect on firm survival. Those firms that have better technologies may be better able to cope with external shocks than those with obsolete ones. As indicated by Tushman and Anderson: "technological change affects the rise and fall

of populations within organizational communities"(Tushman and Anderson 1987, p.88). There are two dimensions that we need to examine when looking at technological change and its impact on industry structure.

The first dimension is *firm size*. We need to understand how new technologies impact the distribution of small/large plants. Companies of different sizes may be able to co-exist without problems (targeting different markets). It is somewhat surprising that Gans and Quiggin indicate, "[the] size distribution of firms has received little attention in the international organization literature" (Gans and Quiggin 2003, p.252) when the issue of firm demography has started to grow as a mainstream line of investigation within evolutionary economics (Malerba, Nelson et al. 1999, 2001; Malerba and Orsenigo 2002).

The second dimension is *market structure and dominance*. While Klepper and Simons indicate that there is no consensus on the role played by technological change in the evolution of market structures, their research demonstrates that technological change has played a key role in the shakeout of at least four industries: automobiles, tires, televisions and penicillin (Klepper and Simons 1997, 2005).

In their study of the U.S. automobile tire industry, Klepper and Simons analyze new entrants, long-term survival and market dominance. The dynamics of new entrants and exiting firms was such that the U.S. automobile tires industry evolved to become a tight oligopoly (having peaked at 274 firms after the industry was nearly 25 years old) (Klepper and Simons 2000). These authors also demonstrate that "increasing returns associated with technological change appear to have had a major influence on firm survival and the emergence of the industry as an oligopoly" (p. 759). Their work reinforces the notion previously we previously posed in this chapter that there is an intricate linkage between firm demographics and industrial structure.

Antonelli's argument points out to the need to understand whether technological change will be positive (centripetal) or negative (centrifugal). He writes:

> "[n]ew innovative firms enter the market and destroy barriers to entry and monopolistic rents with the reduction of concentration. New technologies can be either centripetal or centrifugal according to their impact on regional and industrial concentration. In the latter case, new technologies, such as electric power and lately advanced telecommunications, favour the even distribution of firms and plants in regional space and the reduction in their minimum efficient size" (Antonelli 2003, p.7)

When linking technological change with location (or relocation), the idea of "knowledge spillovers" comes up repeatedly. Firms will want to locate somewhere where they can reap these positive externalities as a result of geographical closeness. This issue has been discussed at length in the industrial district/cluster studies (Capello 1999; Maskell 2001; Boschma and Lamboy 2002; Hayter and Le Heron 2002; Grandinetti and Tabacco 2003). However, this body of literature does not explicitly deal with firm relocation.

Footwear manufacturing and leather tanning operations may appear to lack a particularly high technological content, as opposed to biotech, nanotechnology and software. However, there have been substantial changes in the past 50 years about the way footwear production is carried out. The same can be said for leather, particularly in regards to cleaner technologies.

There are conflicting views on the actual state of technological change in the leather tanning industry. Some authors argue that the tanning industry is hitting is a technological ceiling (Knutsen 2000; Hesselberg and Knutsen 2002b). Others argue that under certain conditions (such as availability of information and technical training by chemical suppliers) tanneries could be willing to adopt cleaner technologies and improve their processes (Blackman and Kildegaard 2003; Blackman 2005). However, the technical literature on leather science demonstrates the absence of said technological ceiling (Schramm 1997; Kanagaraj, Chandra Babu et al. 2001; Suresh, Kanthimathi et al. 2001; Sundar, Raghava Rao et al. 2002). New processes to manufacture leather (including chrome-free products) are being developed and innovations occur continuously. Even large manufacturers like Nike are adopting non-chromed leather as a raw material.

Technological change has shaped the evolution of the footwear industry not only in Mexico but elsewhere in the world. Miranda notes that the modernization of the American footwear industry in the mid-19th century derived from technological improvements in the process of building shoes (Miranda 2004). Interestingly enough, the same company that spurred innovation and growth in the Guadalajara footwear industry had a similar effect in Europe, the United Shoe Machinery Company. While the complexity of design of a particular type of shoe may hamper the implementation of more mechanized (higher-technological content) solutions, there may be other reasons why technology is adopted following irregular patterns.

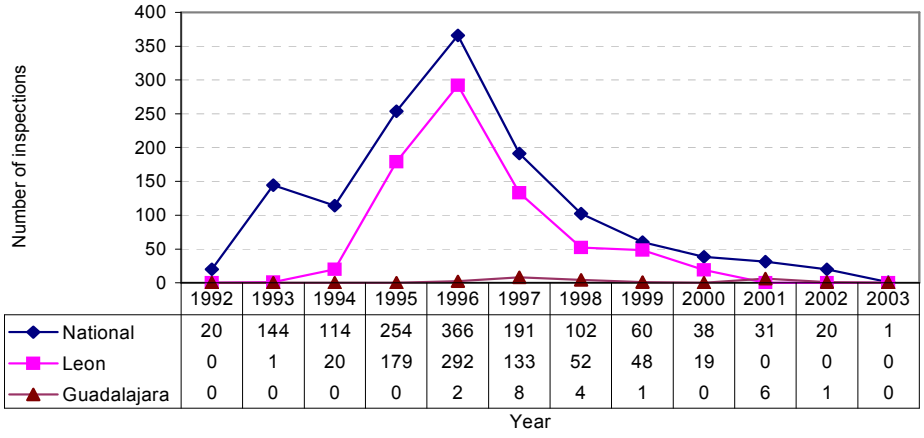
Boon argues that while technological progress in the footwear industry is market induced, the state of the art constrains technical progress (Boon 1980). He further indicates that "[t]he more simple leather built-up footwears apply the shoemaking methods of stitchdown and cementing (glueing) which are considerably more simple and cheaper than the complex method of so-called Goodyear welt" (p. 169).

4.5 Environmental pressures

There are two main variations of the "environmental regulations as drivers of industrial restructuring" argument. The first variation, called the pollution haven hypothesis, argues that companies with plants in countries (or regions) following stricter environmental laws will want to relocate to countries (or regions) with laxer regulations (Vogel 1997). The main outcome of this structural change is thus industry relocation and offshore shipment of pollution (Cole, Elliot et al. 2000). Knutsen and collaborators suggest that tanneries have been relocating from Northern to Southern countries due to laxer environmental regulations (Knutsen 1998, 2000). While it is tempting to follow Knutsen's argument for the tanning industry in Mexico, we would need to investigate whether NAFTA or GATT has driven US tanneries to relocate to Mexico. Knutsen and collaborators do not provide empirical evidence to this effect. Industrial flight may also occur within the same country (e.g., inter-regional relocations) (Harrison 2006). If there were significant differences in stringency of monitoring and enforcement in different regions, one could consider migration of firms from, for example, León to Guadalajara.

The second variation views restructuring as a series of internal evolutionary processes derived from environmental concerns and/or environmental regulatory pressure. Restructuring as a form of industrial metabolism indicates that a dematerialization strategy has been driving structural changes (which they understand as the rise and decline of dirty industries) (Janicke, Binder et al. 1997; Binder, Janicke et al. 2001; Jost 2001; Nill, Petschow et al. 2001; Ruigrok 2001; Zundel 2001). These authors argue that industrial policy should be harmonized with environmental policy if the broader goal is to comply with environmental, social and political considerations altogether (Ayres and Simonis 1994; Ayres and Weaver 1998). However, this body of works does not offer regional data, let alone plant-level data.

To assess the degree of environmental pressure, previously unavailable data on the number of plant inspections by PROFEPA were collected during 2002-2003 (Pacheco and Dowlatabadi, 2003, 2005). Inspections are used as a proxy for stringency of environmental regulatory pressure for several reasons. First, a plant inspection implies that the regulatory agency has a significant interest in ensuring compliance to environmental laws. Second, inspections are summarized and written records are sent to PROFEPA regarding firm compliance (or lack thereof)[55]. And third, inspections trigger a monitoring and enforcement process intended to reduce pollution emissions by individual plants. Once a plant has been inspected, it will be under tighter scrutiny to comply with environmental regulations[56]. Figure 4-3 shows a comparative view of the number of inspections in León and Guadalajara from 1992 to 2003.



	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
National	20	144	114	254	366	191	102	60	38	31	20	1
Leon	0	1	20	179	292	133	52	48	19	0	0	0
Guadalajara	0	0	0	0	2	8	4	1	0	6	1	0

Figure 4-3 Comparative view of total annual number of inspections to tanneries [disaggregated by industrial district] (1992-2003) (Source: Author's own calculations based on 2003 data by PROFEPA)[57].

[55] See Appendix 1 for a description of the inspection process.
[56] One additional reason is that PROFEPA had designed individual federal government-tannery agreements to ensure compliance with the 1997 *Convenio*. These self-regulation agreements (*convenio de autoregulación ambiental*) were to be signed between each tannery and PROFEPA (representing SEMARNAP). Inspections specifically geared towards tanneries used these agreements as leverage.
[57] This graph was also published in Pacheco and Dowlatabadi (2005), p. 160, Fig. 14.2.

If an industrial sector were under stricter environmental enforcement, we would expect the number of inspections to rise. If, however, regulatory pressure were weak (or losing its strength), we would see a reduction in the total number of inspections.

There were almost no inspections prior to 1992. The start of inspections is tied to the creation of PROFEPA and INE. During the first two years there were very few inspections in our two clusters, while total inspections (nationally) rose from about 20 to about 150. The lack of inspections in León and Guadalajara can be due to the following factors:

a) These industries were relatively clean compared to others[58].
b) León and Guadalajara were relatively clean regions compared to others.
c) These regions were politically powerful and escaped attention.

Late in 1994, when the bird die-off occurred, we see a huge rise in the number of inspections in León. This suggests a response of politicians to the media uproar and exposure. Inspection rates start to fall in 1996 in León while the industry is negotiating the changed practices. Meanwhile, only late in 1996 and in 1997 we find increased inspections in Guadalajara. After 2000 (the year when Mr. Vicente Fox was elected to the Presidency), we find an absolute decline (2001) and no further inspections. This may be associated with the fact that Mr. Fox owns a large boot factory (which was vertically integrated with a tannery). Some journalistic accounts have frequently blamed Fox for allowing the tanning industry to enjoy a particularly lax regulatory environment. Interviews conducted in 2003 confirmed this particular point.

Notice that the early inspections in 1992 and 1993 could have led to a pollution haven situation within Mexico with firms moving to León and Guadalajara. However, the relocation analysis found no evidence of this phenomenon occurring.

Figure 4-3 also shows a substantial variation in regulatory stringency per region. The difference in environmental pressure is quite marked (133 inspections of tanneries in León in 1997 compared with 8 in Guadalajara in 1997). While the regulation that prescribed tanneries' solid wastes from tanneries as hazardous had a scope that encompassed the

[58] Available data on total number of inspections for the chemical industry shows that the total number of chemical plants inspected by PROFEPA far outweighs the total number of tanneries inspected. While we could argue that there are many more chemical plants than tanneries anyway, the data also show a steady pressure on chemical plants as opposed to tanneries.

industry at a national level, enforcement was much more stringent in the leather cluster in León than in the Guadalajara cluster.

Several options to mitigate the environmental impact of León's tanning industry were discussed during the 1997 Rio Turbio negotiations. Similar options were curiously not negotiated in Guadalajara. Nevertheless, PROFEPA's inspections of Guadalajara's tanneries were informed by the options in the 1997 agreement. Table 4-3 summarizes where these options were discussed:

Table 4-3 Options to reduce pollution offered by government officials in the two industrial clusters

Option	León	Guadalajara
Implementation of wastewater treatment systems in each plant	Yes	Yes
Collection and disposal of solid wastes in hazardous waste landfills	Yes	***No***
Adoption of cleaner technologies for leather manufacturing	Yes	Yes
Relocation of tanneries outside the geographical boundaries of the city (industrial parks)	Yes	***No***
Limiting tanneries within the city boundaries to just buying wet-blue (leather already tanned) and perform wet-end processing (retanning, dyeing and fatliquoring) up to finished product (leather)	Yes	***No***
Combinations of the above	Yes	Yes(1)
Shutting down operations	Yes	Yes

Notes: (1) Except when it included geographical relocation.

Figure 4-4 shows the distribution of options preferred by tanneries that remained within the urban boundaries of León. Tanneries that chose only one option built their own wastewater treatment plant (14.9%), recycled (12.8%) and upgraded their processes through optimization (18.4%). Tanneries only needed to fulfill one option. However, the troubling part is that some tanneries committed to more than one option (which clearly entailed much higher investments). Blackman and Sisto (2005) have argued that none of the voluntary agreements really assigned any responsibilities for financing to any given instance. Tanners were left to their own devices and were asked to find the money to support their investments. Therefore it was troubling to find that 54% of tanneries committed to more than one strategy, even going as far as to committing to all three (12.1%).

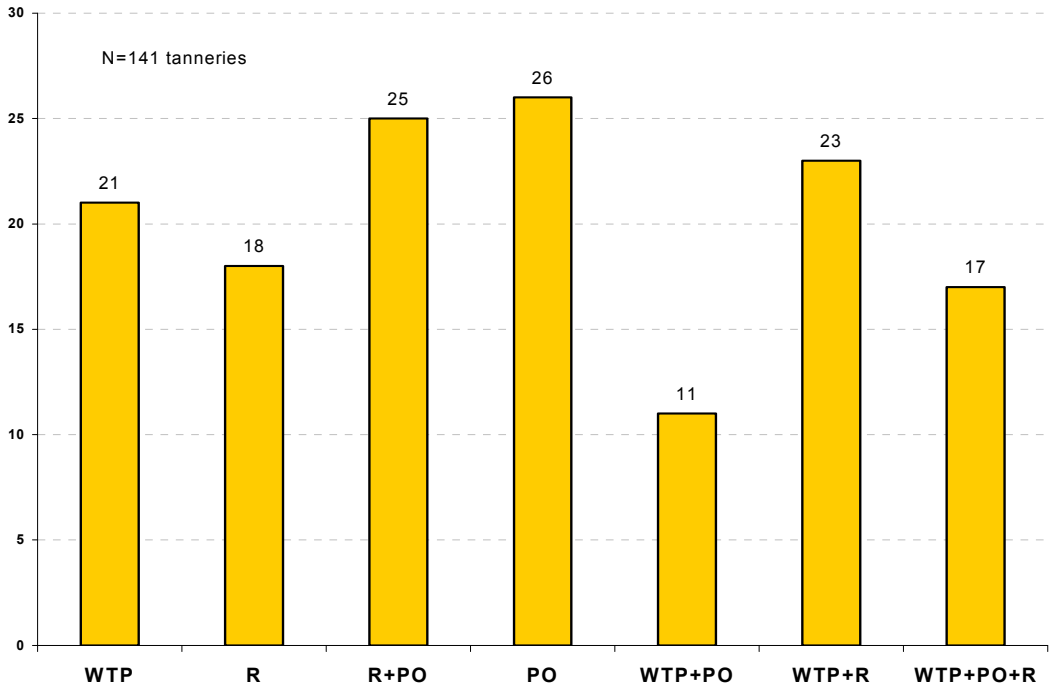


Figure 4-4 Proposed strategies of tanneries to comply with 1997 *convenio*. (Source: Author's own calculations based on 1999 data by PROPAEG). Acronyms are as follows: WTP (wastewater treatment plant); R (recycling), PO (process optimization).

So how well did León's tanneries comply with their pollution mitigation strategies? By 1999, many of these options should have been fully implemented. However, as shown in Figure 4-5, 58.8% of the total number of inspected tanneries were found to be non-compliant.

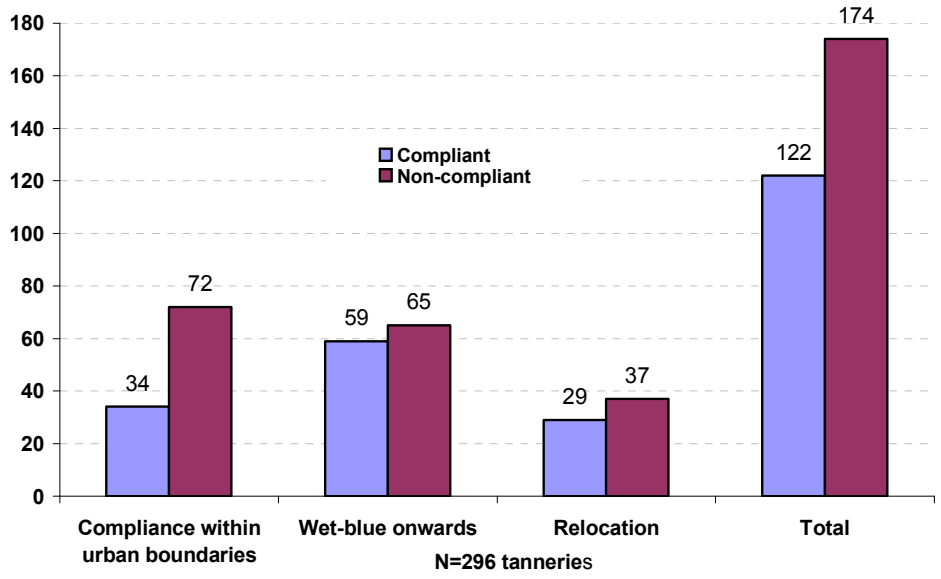


Figure 4-5 Results of 1999 survey of tannery compliance with proposed options (Source: Author's own calculations based on 1999 data by PROPAEG).

Tanneries that chose to stay in urban areas (agreeing to change their processes and only use wet-blue[59] for further processing) complied best (52.4%) whereas tanneries that relocated complied worst of all. Out of the total number of inspected firms that relocated, only 56.1% complied.

These results provide an interesting twist to the story of leather tanning regulation. While it is clear that regulatory pressure wasn't as stringent as members of the tanning industry had portrayed it, some industries relocated, and at first glance, it seems as though they did it because of regulatory pressure. However, as shown in Chapter 4, the low degree of compliance with the 1997 *convenio* and the minimal interest shown in relocating also shows that zoning regulation may have had more to do with relocations than environmental regulation.

From the previous discussion we can see that tanneries in Guadalajara were subjected to much less monitoring. This disparity in intensity of environmental scrutiny reveals a negative aspect of Mexican environmental regulation. The 1997 *convenio* was deemed as a

[59] Wet-blue is a term that refers to hides that have been chemically tanned with chromium compounds.

consensus-building, all-encompassing policy instrument, but as the evidence shows, it instead created a policy vaccum.

4.6 Land-use changes and zoning policy

Land-use change and regulation are inextricably linked. Land use affects restructuring by changing the conditions of the physical landscape and consequently, the spatial distribution within a region. Several factors may cause changes in land use. Bürgi et al mention five: political, social, technological, cultural and natural (Bürgi, Hersperger et al. 2004). While maintaining a systemic view, the focus here is primarily on the interaction between land-use regulation (zoning) and land-use change, and their effects on restructuring.

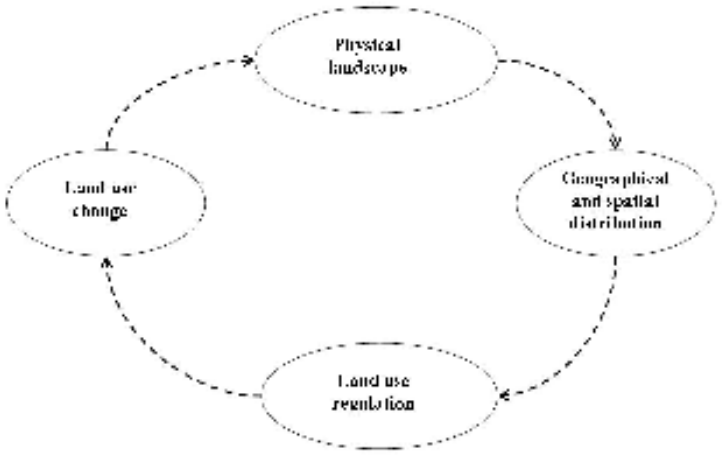


Figure 4-6 A diagram showing the linkages between land-use change and regulation.

As shown in Figure 4-6, regulation is the *control* mechanism. Regulation can affect how land is used as well as other specific aspects of the landscape. Local governments set zoning regulations to mitigate potentially negative effects of changes in land use within their jurisdictions. However, land-use change may occur in an illegal, non-regulated manner, too. An example would be squatters that occupy plots of land without being entitled to them. It might be harder for a company to conduct operations in a covert way, although it is not uncommon. For example, small, family-owned shoe workshops in León (*picas*) often operate

out of the owner's home (Calleja-Pinedo 1994) without having an industrial-use license. The same applies to other manufacturing operations that do not require expensive capital investments or machinery.

Regulation is, however, rarely retroactive. Thus, if a plot has historically had incompatible uses, this problem cannot be solved unless specific conditions apply. The government can set a new land-use rule correcting previous incompatibilities when one or more of the following apply to the titleholder:

a) She decides to sell her land (either to private developers or the government).
b) She dies without a will and the government seizes the property.
c) She dies and her heirs decide to sell the land (either to private developers or the government).
d) Her land is deemed "of public interest" and is expropriated with compensation.

Why is land-use change relevant to the topic of structural change? There are several reasons. First, land-use changes highlight one of the most visible restructuring phenomena: a reconfiguration of spatial distribution within a region. Different patterns of landuse will yield various possibilities for reorganization of production within a specific plot of land, or relocation to other zones or regions. Second, land-use changes also have a substantial effect on housing development. The compromise between industrial and residential landuse is an important issue in understanding how patterns of urban structural change affect industrial development and viceversa. If zoning laws are strictly enforced, then areas with mixed or incompatible uses (e.g., industrial where there should be only residential, or vice versa) are minimized. However, the situation is not as clear-cut in reality. We find varied (and often contradicting) patterns of landuse that may even pose an increased risk to vulnerable populations (for example, if a chemical plant is located near a high density residential area). Third, increases in urban population raise demands for affordable and conveniently located housing. Given the commons-like nature of land (i.e., limited availability for consumption within specific geographical boundaries and openaccess to numerous would-be users), structural changes in clusters may affect industrial agglomeration in a specific location, potentially increasing availability of land.

In theory, land-use regulation will constrain land supply, thereby increasing demand and raising housing prices (Mayer and Somerville 2000). Mayer and Somerville indicate that

a potential role for governments would be to control and even curtail how much housing is developed and at what rate. Land-use regulation may have other roles, too. Ihlanfeldt lists four areas that regulations are supposed to address:

c) reduce or mitigate the effect of negative externalities;
d) improve service delivery or focus on satisfying the requirements of specific housing market segments;
e) maintain the identity and 'character' of a given community; and
f) exclude household owners below a certain income (Ihlanfeldt 2004).

Structural change is measured in terms of changes in firm demography (and its spatial implications); therefore, only the first item (mitigation of negative impacts on adjacent urban residents) applies to this study. Land-use regulation would be expected to reduce or eliminate incompatible uses by establishing a physical divide between new or existing industrial plants and residential zones. However, it is important to recognize that the spatial distribution of firms is often a reflection of historical development. For example, 40 years ago, a plant may have located itself in the peripheries of a municipality, but increasing housing development reached such proportions that the plant was eventually incorporated within the core city. High conversion rates to low-density, non-contiguous and land-intensive residential use is referred to as 'sprawl' (Irwin and Bockstael 2002).

Arnott and Lewis developed a model examining the choices developers face in terms of how and when empty (vacant) land should be occupied. They argued that timing and density of new developments is key to understanding how empty land is used and developed. Their model shows that development "will take place when the ratio of the value of the land to the value of the post-development property is equal to the ratio of the expected growth of rents to the interest rate" (Arnott and Lewis 1979, p. 168-169). While Arnott and Lewis looked at the transformation from empty to developed land, this dissertation looks at the change from previously occupied industrial land to residential land. If a firm manager or owner finds that their land is worth more redeveloped for urban or other (e.g., commercial) use, then she might consider selling it.

Geoghegan, Bockstael and Irwin have also looked at land changes in the rural/urban fringe (Irwin and Geoghegan 2001; Irwin and Bockstael 2002), although they have focused their efforts more on conversion of open space to urban use and not on redevelopment of

brownfields. Irwin and Bockstael make an interesting point that resonates with the above-mentioned decision-making process:

> "[r]ather than being the result of an optimal intertemporal strategy, in which land is purposely withheld from development because of anticipated higher returns in the future, sprawl may be caused by negative externalities between developments. The implication is that undeveloped land that is adjacent to development is *less* valuable in residential use and therefore, less likely, *ceteris paribus*, to be developed residentially in the future" (Irwin and Bockstael 2002, p. 52).

If Irwin and Bockstael's finding holds true, then there is an additional incentive for firms to sell their firm as land-to-be-developed to avoid falling prey to a risk of becoming "unwanted" open space.

4.7 Summary

This chapter has offered a broad review of the literature on structural change. Three main restructuring drivers are discussed: globalization and increased pressures due to international competition, environmental regulation and changes in land use, zoning policies and rising land prices. In this chapter, the analytical framework is further extended by integrating the literature on adaptive management, thus offering a broader view of restructuring dynamics not previously presented. Using examples and theoretical insights from the body of work on adaptation to rapid climate change, an analogous model that shows how industries respond in different ways to multiple stressors is offered.

This chapter offers a framework that addresses the effect of multiple stressors on the restructuring of industrial complexes. The framework examines three main stressors: market pressure, environmental pressure and land-use change and zoning policy. To gain a better understanding of market pressures, changes in industrial concentration were calculated. To explore the intensity of environmental pressure, the number of tannery inspections performed by the environmental authority was analyzed. To evaluate the effect of zoning policies and land prices, a study of zoning strategies and land pricing was undertaken. Furthermore, the dynamics of firm entry and exit are also discussed.

Figure 4-8 shows an influence diagram that summarizes how different restructuring drivers work. The influence diagram should be read starting from the center. At the center of

the discussion we find the leather and footwear industries. The left-hand side shows that leather tanneries have faced environmental pressure through civil society organizations. The right-hand side shows that the footwear industry has faced market pressures arising from increased competition. Acting simultaneously, these forces have exerted pressure on the leather-footwear commodity chain. A preliminary influence diagram included only these forces. The thesis extends this model by examining changes in land use, land prices and zoning policies (as shown in the upper left-hand side of the diagram). Moreover, in the diagram, the combined pressures and shifts in consumer preference coupled with technological changes have weakened the formerly strong linkages between local shoe factories and tanneries.

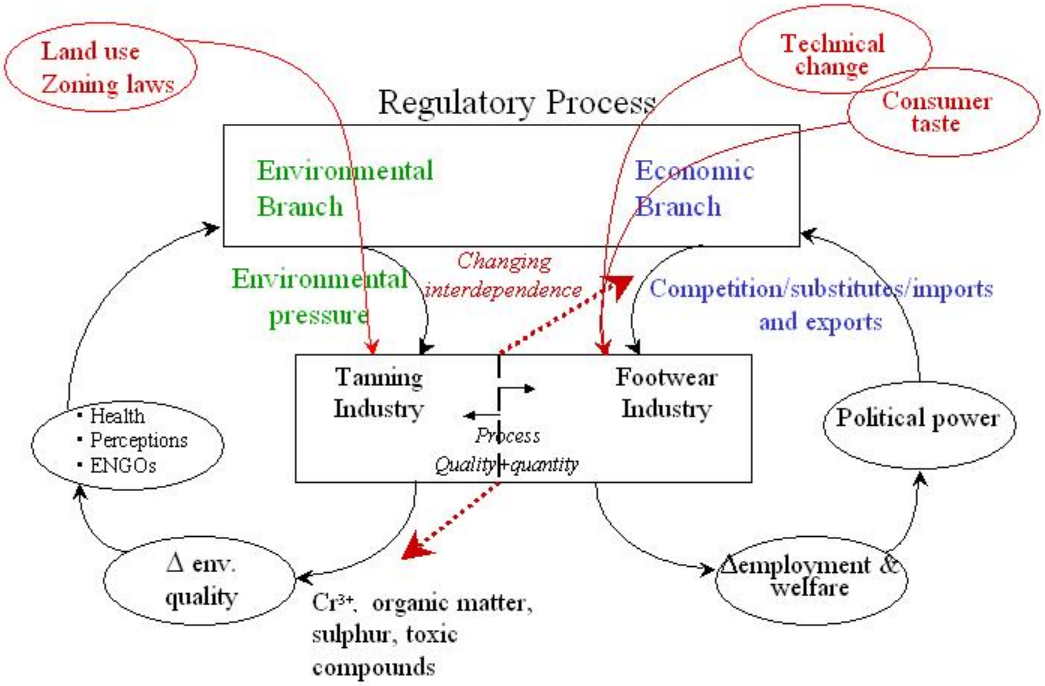


Figure 4-7 A revised version of an influence diagram that shows the multiplicity of stressors facing the leather and footwear industries. Please note that Δ means 'an increase in' and Cr3+ refers to chromium (III). The abbreviation 'env.' Refers to environmental.

Different restructuring drivers will have varying degrees of intensity, and therefore we can expect a broad spectrum of firm responses at different scales. Scale is a key concept to understanding how industrial complexes respond to exogenous pressures. Economic

pressures derived from increasing globalization have an international sphere of influence, and therefore they occur at a more global scale. However, these global economic forces have significant impacts at the regional and local scales as well. The empirical results of this dissertation show that the extent of restructuring both local clusters is directly associated with the increasing threat of new entrants to the global market. This idea is further explored in Chapter 4.

Chapter 5 Responses in the leather industry

The theoretical framework presented in Chapter 4 poses a number of restructuring drivers that should be considered in an integrated assessment of structural change at the commodity chain scale. Different drivers will have varying degrees of influence on restructuring. Assessing the effect of restructuring drivers on the plant population dynamics requires a consideration of how market, environmental and land-use can affect births, deaths and relocation of firms[60]. As indicated in Chapter 4, understanding the effect of drivers at the firm- and regional-level is complex because the effect of other drivers is perceived at these levels. These effects may in turn lead to changes, thereby creating a feedback loop (from driver to effect to driver).

The chapter begins by offering a brief recapitulation of adaptation as a response to multiple stressors. It is suggested that changes in firm demographics are a form of adaptive industrial restructuring of clusters. The chapter then offers empirical evidence that reveals how firm demographics change, specifically firm birth/death and survival. Finally, a discussion of the effects of land-use changes, zoning policy and land prices is integrated into the analysis.

5.1 Adaptation and industrial restructuring

Being able to recognize the signals of structural change in a timely manner allows firms to develop innovative adaptive strategies to cope with exogenous pressures. The climate change literature offers a definition of adaptation that refers to the capacity of human populations to shift their behavioral patterns to be better equipped to face changes in temperature, weather and other extreme events[61]. For Smits et al, adaptation is a series of "adjustments in ecological-social-economic systems in response to actual or expected

[60] As indicated previously, institutional support can be considered both a driver and a response. However, the bulk of the thesis concentrates on market, environmental and zoning/land use forces.
[61] From an economic standpoint, markets adapt through price changes.

climatic stimuli, their effects or impacts" (Smit, Burton et al. 1999, p. 200). Adaptation is tied to a person's/individual/societal anticipation and response to certain events. Climatic change may offer opportunities for societies if they are well prepared and forecast appropriately into the future (Yohe and Dowlatabadi 1999). If these societies are able to recognize new markets and opportunities when faced with climatic change, then they will not only be able to survive but thrive. The same applies to individual firms and industrial sectors.

Structural change in a changing, globalized environment is unavoidable, and adaptation would be the natural mechanism for firms to continue operations. Adaptation to multiple stressors, as shown by the global environmental change literature, is an evolutionary process where subjects adapt continuously while facing conditions of uncertainty, variability and cross-scalar dynamics. Adaptation is a multidimensional and contextual process (Risbey, Kandlikar et al. 1999; Shepherd, Tansey et al. 2006). For firms to properly adapt to structural change under multiple stressors, they need to be able to detect whether there are external pressures that will force them to undertake structural changes, identify the multiplicity of driving forces, and design an adaptive strategy.

Mapping these strategies along a temporal scale and within a broader context may provide insight into the restructuring trends of the region and allow firms to improve their odds of survival. The remainder of the chapter offers empirical evidence on the responses of industrial clusters to external pressures.

5.2 Institutional support (federal)

As indicated in previous sections, institutional support may be both a driver ***and*** a response. A federal agency's institutional support can drive the direction of industrial restructuring (by pushing forward its agenda on which industries should be 'national', or most heavily supported). Nascent industries are popular because they bring about economic growth, employment and myriad positive repercussions. On the contrary, declining industries are not positively viewed due to job losses and negative economic repercussions for society at large. Therefore, it is up to the federal government to decide what types of industries and which sectors to promote.

Federal institutional support can also be seen as a response to increased competitive pressure on specific industries. An example would be the rigid stance that Mexico took against increased illegal smuggling of Vietnamese footwear into the country[62].

The federal government has historically provided generous support to the footwear industry. This is due in part in part to the stronger political clout of the footwear industry representatives, particularly at the federal level (President Fox, who held office from 2000 to 2006, is the owner of one of the largest boot manufacturing companies). The Federal Secretary of Economy held numerous meetings with industry representatives between 2004 and 2006. These negotiations were aimed at maintaining countervailing duties on Asian footwear imports.

Firms supported by the federal government received 1,000,000 pesos in total (US$ 100,000) to be divided among 800 firms, the majority of these located in León. This amount, though quite small considering the large number of firms that needed financing, was meant to help shoe manufacturers keep their businesses afloat. Although it is not easy to discern whether support was given primarily to micro or small firms, several large shoe manufacturers were included in the listing. Both clusters received about the same federal support. Nevertheless, the leather and footwear industries from León lobbied the federal government much more intensely than those from Guadalajara.

Regulatory latitude on the part of federal (and local) governmental agencies may be interpreted as providing indirect institutional support. Environmental authorities allowed some tanneries in León to stay in their original location while in Guadalajara these firms were forced out of the city core. This disparity has been evident since the early 1990s, when municipal presidents and several government footwear entrepreneurs of León began occupying posts at the local and state levels. Indeed, a federal environmental regulator indicated, “they had stopped pressuring the tanning industry because of a directive by [the] President [Fox]”. The literature on regulatory capture[63] supports this hypothesis. If, as argued above, the tanning and footwear industries in León had captured the municipal environmental authorities, then instances where regulators bent the rules should be apparent.

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[62] As reported in the newspaper La Jornada.
http://www.jornada.unam.mx/2004/08/16/034n1est.php?origen=estados.php&fly=1

[63] Regulatory capture refers to the domination of business interests in the government agenda over public welfare.

5.3 Institutional support (local)

Institutional support is rather straightforward at the local scale. Local and regional authorities worry about their traditional industries. It is therefore important that federal and local authorities keep communication channels open, particularly in a country like Mexico that employs a centralist system. The more localized decision-making has to be, the more important it is that all three levels of government have a mutual understanding. This is particularly relevant when designing and implementing complementary programs.

At the local level, institutional support was provided in the form of a research center (CIATEC), local training programs and mitigation strategies against smuggling and illegal trafficking of footwear and shoe uppers. While the Federation tried to negotiate with the World Trade Organization to protect the domestic footwear industry against the constant threat of China, the local government continued to support the leather and footwear industries primarily through cooperative agreements, regulatory latitude and small subsidies (e.g., funding training programs for shopfloor workers).

The research shows that key footwear industry stakeholders in León have continued to provide support to (arguably) countervail macroeconomic conditions and strengthen local industry. However, this has not been the case in Guadalajara, where a continued quest for diversification has made this city a hub for electronics and related industries. These different strategies have shaped the way in which both cities have evolved.

The government of León and the state government of Guanajuato chose to implement a number of strategies to boost the regional economy by increasing the competitiveness of footwear and leather firms within the cluster. This approach may be due in part to President Fox's involvement with the leather and footwear industry in León, but it may also be a result of successful lobbying efforts by local entrepreneurs, particularly those from the footwear industry.

The tanning industry association (CICUR) successfully lobbied the municipal government to extend the relocation period for tanneries to 2000[64]. As shown in this thesis, the number of relocations was much smaller. During field research, empirical evidence

[64] At the time of writing this dissertation, no more than seven tanneries had already relocated to PIEL. That said, many tanneries had already relocated to industrial parks in peripheral areas as discussed in Chapter 3.

indicated that tanneries in Guadalajara did not really have the option to relocate— they were forced to choose between staying put that location or shutting down.

Furthermore, a divide between tanneries and shoe factories is evident in how policy options have been designed and what issues have been examined. $PROCIC_3$ seems to overlook the importance of resource availability and constraints in León (e.g., water scarcity, availability of hide and finished leather, zoning and land available for industrial purposes). The limited coverage that this report gives to environmental issues only outlines "the need for coordination of all governmental institutions to provide a support base for the leather and footwear cluster"[65].

5.4 Firm demographics

This section explores how the restructuring drivers (e.g., land use changes, zoning policies, market forces and environmental regulation) affected the birth/death/survival of tanneries (see also Chapter 4). Figure 5-1 shows a simplified map of León where the downtown core has been highlighted along with the location of three main industrial parks. The map shows that the industrial parks are geographically located in the periphery of the city. In the case of León, these industrial parks were located roughly 10 km from the downtown core; therefore, firms (tanneries) in parks, or firms 10 km or more from the downtown core, were defined as being in the periphery. Locating industrial parks in the peripheral areas of the city suits the needs of residents and regulators alike. Residents are spared from the effects of pollution "in their back yards", and regulators are spared from dealing with complaints about new polluting plants locating in people's neighborhoods (Munton 1996). However, as indicated in Chapter 2, the southern part of the city is also where the Gómez River connects with the Turbio River. Given the intense scrutiny faced by tanneries in the mid-1990s, it would not make sense to move tanneries near areas of ecological concern (e.g., the Silva reservoir).

[65] CECIC (2001), $PROCIC_3$ report, Chapter X, p. 568.

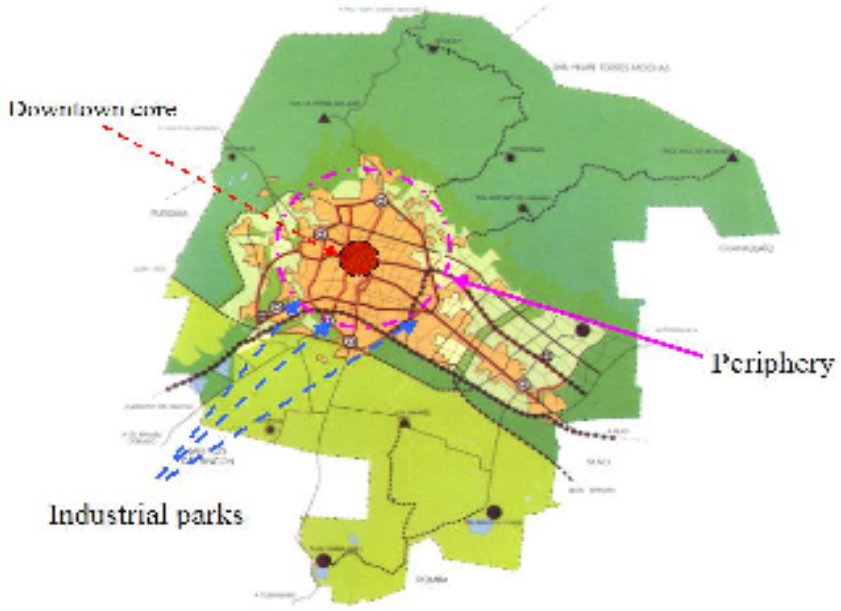


Figure 5-1 Map of León showing the location of three industrial parks (Constructed from a 2004 map provided by IMPLAN).

In the case of Guadalajara, the city was subdivided into "sectors", as shown in Figure 5-2. The dark purple sector is the downtown core of Guadalajara; the light purple sectors are the peripheral areas.

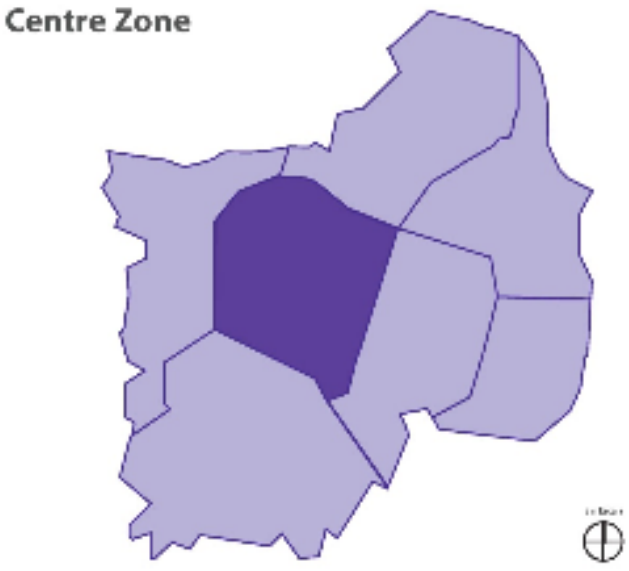


Figure 5-2 Map of Guadalajara showing the location of the downtown core in the city of Guadalajara and the subdivision in seven sub-zones. The "Centro" (core) zone is highlighted in dark purple (Constructed from a 2006 map provided by IITJAL).

In the following sections, the spatial aspects of firm demographics in city centers and industrial parks are discussed. Comparative analysis of the dynamics of firm births, decline and survival allows us to gain a broader perspective on the spatial implications of firm demography.

Three steps comprised the demographic analysis. The first step was to calculate the absolute number of plant births, closures and relocations. The second step was to calculate birth rates, mortality rates and relocation rates, and compare them by spatial location (downtown core, periphery and industrial parks). This analysis allowed us to build a causal chain between a particular restructuring driver and a specific spatial and firm demographic outcome. The third step was to calculate annual mortality rates (if enough data were available). Annual mortality rates are important because they show the relative speeds of firm births and deaths/closures. When researchers compare two different sets of annual mortality rates (by city as well as spatial location), they can infer whether a specific factor led to a faster rate of decline, and gain a much more complete picture of the rise and fall phenomenon

In this thesis, mortality rate is defined as the fraction of firms that closed within the period under study. This fraction is calculated as the ratio of closures to firms originally located in the geographical area under analysis. Therefore, the mortality rate for tanneries in the downtown core of León from 1999 to 2004 would be calculated as follows

$$\mu = \left[\frac{C\big|_{1999}^{2004}}{N_{1999}} \right]_{DT} = \left[\frac{\left[N_{1999} - N_{2004} \right]}{N_{1999}} \right]_{DT}$$

Where the term $[N_{1999}\text{-}N_{2004}]$ denotes the total number of closures in the downtown core area, and N_{1999} denotes the total number of firms in the downtown core area at the time (hence the sub-index DT).

When subtracting the number of firms, new births need to be accounted for. This disaggregation process has been performed in the computation of closures and births to ensure no double counting.

Similarly, the relocation rate for industrial parks in León during the period 1999-2004 would be calculated as follows

$$\rho = \left[\frac{R\big|_{1999}^{2004}}{N_{1999}} \right]_{IP}$$

Where R is the total number of firms relocating to industrial parks from 1999 to 2004, and N is the original number of firms in their original location.

Birth rate was defined as the ratio of firms that opened in a specific location between 1999 and 2004 to the total number of firms in that specific location.

5.4.1 Firm births in city centers and industrial parks

In Chapter 3 the reasons why we wouldn't expect new, polluting firms to be located in city centers were discussed. Preference would have to be given to peripheral regions and/or industrial parks because of better wastewater infrastructure and shelter from public criticism (i.e., the "out of sight, out of mind" phenomenon).

Figure 4-3 shows the locational patterns of surviving tanneries in León[66]. Bars corresponding to industrial parks arein dark green; peripheral areas are in orange. Despite numerous plant closures, tanneries in the *Obregón* neighborhood (the downtown core) is still the area where tanneries are most highly concentrated. However, on examining the graph more closely, we find that an increasing number of tanneries have begun locating in industrial parks and peripheral areas rather than in the downtown core (see Figure 4-5). There are two possible explanations for this interesting pattern. The first possibility is that the increasing presence of tanneries in peripheral areas and industrial parks is a response to stringent environmental regulation. The second possibility is that more stringent zoning regulations were put in place, forcing tannery owners to consider land sale as an exit strategy.[67]

While there is no direct evidence that the cost of insitu wastewater treatment would be higher than at the industrial park, Kabdasli et al found that it is cheaper for tanneries located in industrial districts to treat their water collectively rather than building their own

[66] Survival is examined here as a multi-layered phenomenon: Firms may survive because they have relocated elsewhere, because they have managed to lay low and stay within the downtown core, or because they have changed ownership. A fourth layer would include firm births.

[67] A third possibility is that increases in land prices would make it more profitable to redevelop industrial land as residential land.

plants (Kabdasli, Tünay et al. 1999). Therefore, tanneries could respond to more stringent environmental pressure and save money from reduced wastewater treatment costs by locating in an industrial park. The cost of land in the industrial park may also be less than the cost of land in the downtown core, and owners could benefit financially by relocating[68].

If the first possibility were true, we would expect to find no tanneries (or a very small number of them) in the urban core and many more located in industrial parks. Figure 5-3 shows clearly this is not the case. If the second possibility were true, we would expect that an increasing number of tanneries would exit the industry altogether and sell their land. This possibility is further explored in section 5.6.1

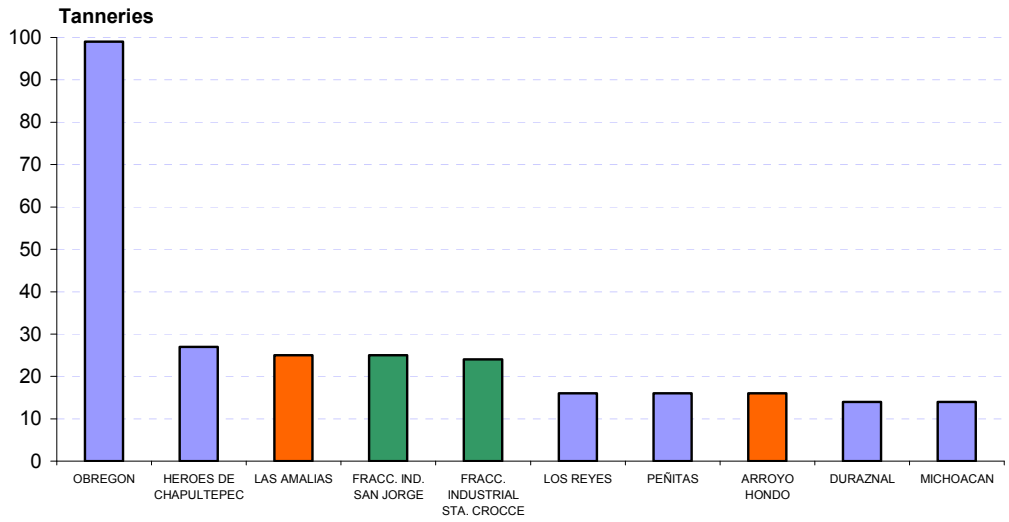


Figure 5-3 Geographical distribution of surviving tanneries in León (top 10 neighborhoods, N=461) (Source: Own calculations with datasets from CIATEC and CICUR, 1999,2004). Orange bars indicate ***peripheral*** neighborhoods; green bars indicate ***industrial parks***, and gray bars refer to ***downtown core*** neighborhoods.

In this study, not only raw plant counts were used; relocation and birth rates were also calculated. If the birth rate of new firms were higher in the downtown core than in the industrial parks, a hypothesis regarding the effect of environmental regulation and land-use and pricing on firm births would be proven as false.

A first examination of the data on firm survival shows that 27.5 % of new firms located in industrial parks (either relocated or opened on or after 1999), while 39.4% located

[68] Direct evidence of this phenomenon wasn't available at the time, but as will be discussed further, land price increases are higher in the downtown core than the periphery.

in the periphery of León. A surprising 33.1% of new firms also located in the downtown core (Figure 5-4).

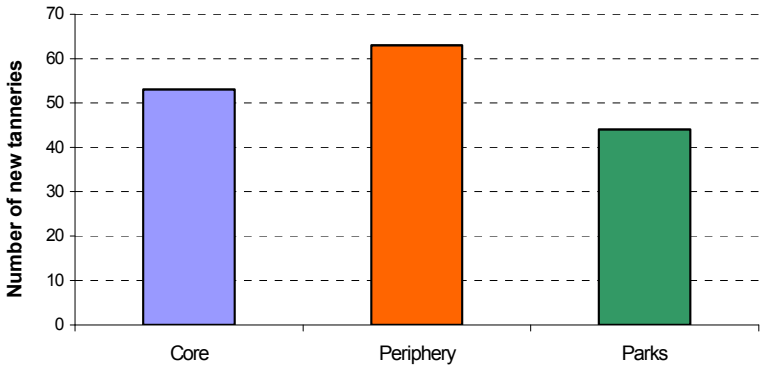


Figure 5-4 Location of new tanneries 1999-2004 (Source: Author's own calculations with data from CICUR).

Further examination of the data yielded the number of new firms that were indeed firm births and the number that were just relocations. The firm birth rates shown in Figure 5-5 were thus recalculated using these new data.

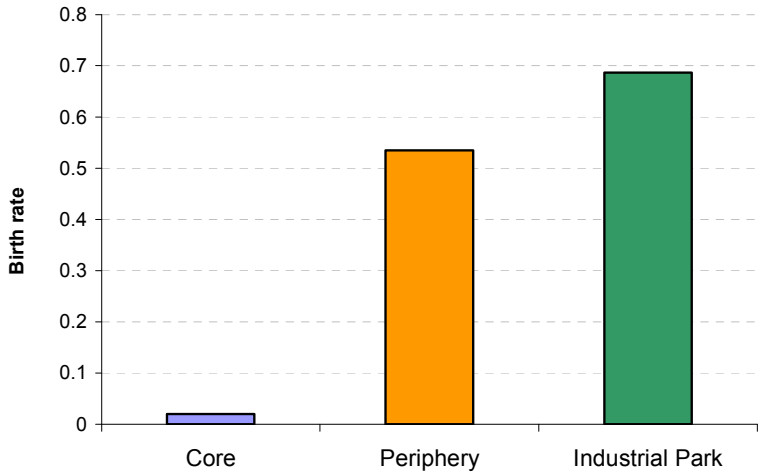


Figure 5-5 Birth rates for tanneries in León (Source: Own calculations with datasets from CIATEC and CICUR, 1999,2004). Orange bars indicate peripheral neighborhoods; green bars indicate industrial parks; gray bars refer to downtown core neighborhoods.

As shown in Figure 5-5, the birth rate for industrial parks is higher than that of the periphery, and much higher than that of the core. These findings support the argument that stringent environmental regulation drives new firm location. A small number of new firms did locate in the downtown core despite more stringent environmental regulations. These firms may have started up with new technologies that complied with land use and environmental regulations. It may also be the case that though stringent regulations are in place, they are not well enforced in the region. Nevertheless, the thesis finds support the notion that new firms would tend to locate in industrial parks.

An increasing number of tanneries locating in peripheral areas and industrial parks indicates a response to changing patterns of land use and zoning. When comparing the distribution of tannery closings with Figure 5-3 it was found that there were still a number of tanneries operating within the urban core (despite the broader mandate of the 1997 *convenio* to severely restrict tannery production and growth in this area).

The combined volume of new tanneries in peripheral areas and industrial parks is 66.9%; this finding supports the notion that new firms obey zoning regulations.

Though conclusions about firm size or products cannot be drawn at this time, the data in Figures 5-4 and 5-5 show that when faced with locational constraints, new firms chose peripheral areas and industrial parks more than the downtown core. This behavior is consistent with hypotheses regarding the influence of zoning regulations and land uses on firm demographics.

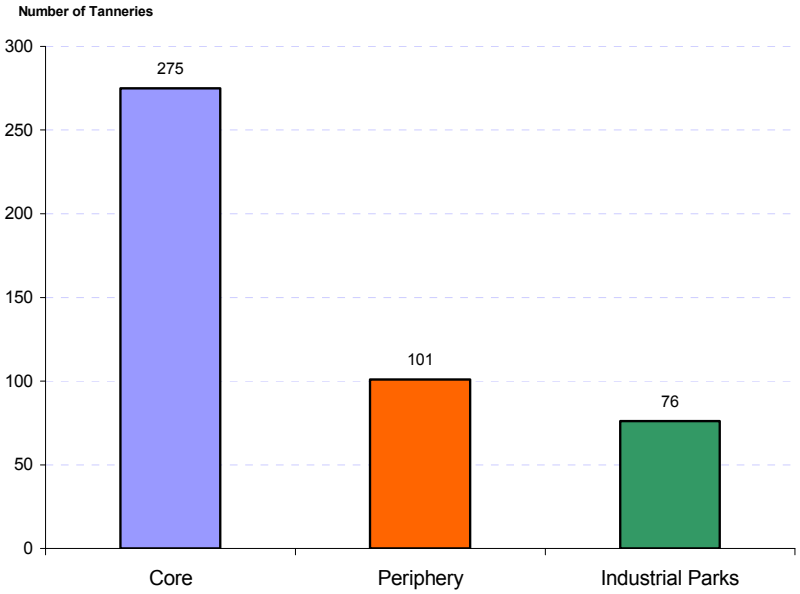


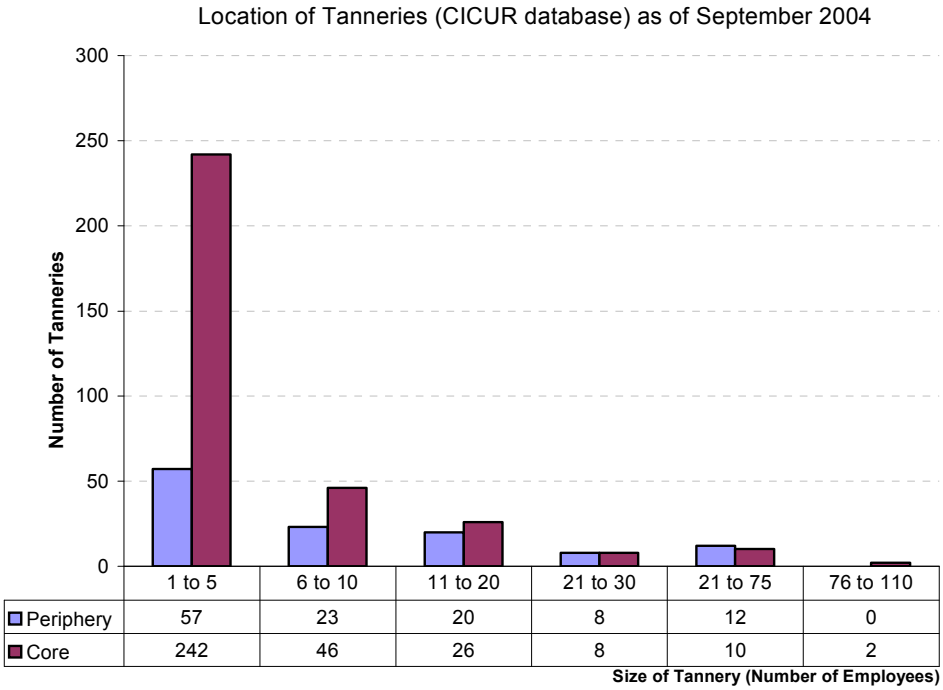
Figure 5-6 Geographical distribution of surviving tanneries in León (N=461) (Source: Own calculations with datasets from CIATEC and CICUR, 2004).

Figure 5-6 would appear to show that the vast majority of surviving tanneries in León (from 1999-2004) are located in the downtown core. However, as demonstrated in this chapter, the birth rates for industrial parks are higher than those for the core and periphery. This figure thus demonstrates why the geographical distribution of surviving tanneries needs to be studied separately (i.e., what fraction of the new plants is due to relocations; what fraction is new births; and what are the overall spatial implications of this phenomenon).

Firm size and strategic locational choice were also analyzed to find out where small/medium/large tanneries locate. If a firm's locational choice is constrained by its size, the ability of the firm to respond to increased restructuring pressures is limited. If a small firm is not able to relocate to an *authorized* industrial park, then it may relocate to a *non-authorized* park or area, or choose a different exit strategy altogether. To test whether this is the case, the number of small/medium/large tanneries that shifted location was calculated, and the area they relocated to was documented. This analysis was only carried out for León, as Guadalajara had no relocations due to constraints set by land-use regulations.

While the distance between the Silva reservoir and the first industrial park is more than 20 km, the distance between these parks and the Turbio River is less than 3 km. Furthermore, while it was promised that these industrial complexes would have shared

wastewater treatment facilities, these plants had not been constructed at the time of writing. The evidence shows an OOSOOM phenomenon ("out of sight, out of mind"). Regulators appear content to ignore tanneries within the urban perimeter.



	1 to 5	6 to 10	11 to 20	21 to 30	21 to 75	76 to 110
Periphery	57	23	20	8	12	0
Core	242	46	26	8	10	2

Figure 5-7 Location of tanneries as of September 2004 (Source: Author's own calculations with data from CICUR[69]).

Figure 5-7 shows that a large proportion of really small (micro) tanneries are still located in the downtown core of León[70]. One might expect that if their operations were large enough to make a substantial profit margin, really large tanneries (the largest at least by number of employees) would be the first to relocate to the periphery. One might also expect that smaller firms could move more quickly than larger firms because they have less capital assets to mobilize and could re-establish operations in an industrial park more easily. The data support the second hypothesis.

[69] CICUR specifically requested that the data they provided for these calculations be kept confidential and carefully handled.

[70] There is also the hypothesis that really small firms escape attention and that the really big ones can avoid pressure, with medium-sized firms more likely to relocate. That would make them visible enough to be a target for regulatory pressure and small enough not to push back. However, from the data on closure rates, higher closure rates for small and micro tanneries and lower closure rates for medium-sized firms were found.

New births in industrial parks could be interpreted as indicating compliance with zoning policies. If new firms chose to locate in industrial parks, one could imagine that these firms would face fewer regulatory pressures and could enjoy a longer life span if their commercial operations are successful. Some of these industrial parks have built infrastructure to deal collectively with pollutant emissions. While there is no quantitative evidence that the use of this infrastructure saves money, tannery owners located in the San Jorge I industrial park indicated that one of the main reasons for their location (or relocation) was the availability of shared wastewater facilities, which was perceived to lower operational costs and increase competitiveness[71]. For example, the tannery-oriented park (PIEL) was designed to house a wastewater treatment plant that would treat alkaline and acid liquid effluents separately (Blackman 2005), thus providing an additional incentive for relocation.

5.4.2 Firm decline

Given its category as a 'mature' industry[72], it is not surprising to find that the leather and (particularly) the footwear industries have shown to be declining (senescent) industries (Harfield and Hamilton 1997; Schamp 2005). Empirical data gathered in this dissertation confirm these arguments. This section further complements the previously shown analyses by analyzing patterns of decline of tanneries.

In this part of the research, the hypothesis that the downtown core of the city would experience larger rates of tannery decline compared to those in the periphery was posed[73]. It was also hypothesized that small-scale tanneries would be expected to die off faster than large-scale tanneries under conditions of multiple stressors because these firms could not muster the resources to face the combined pressures of increased competition, environmental regulatory pressure, technological change and land use policy.

[71] Interviews with: Jorge Uribe and Pancho Alvarado.
[72] Industries are considered mature when they have passed the growth stage of their industrial cycle.
[73] One could hypothesize that smaller firms might have escaped pressure due to their size.

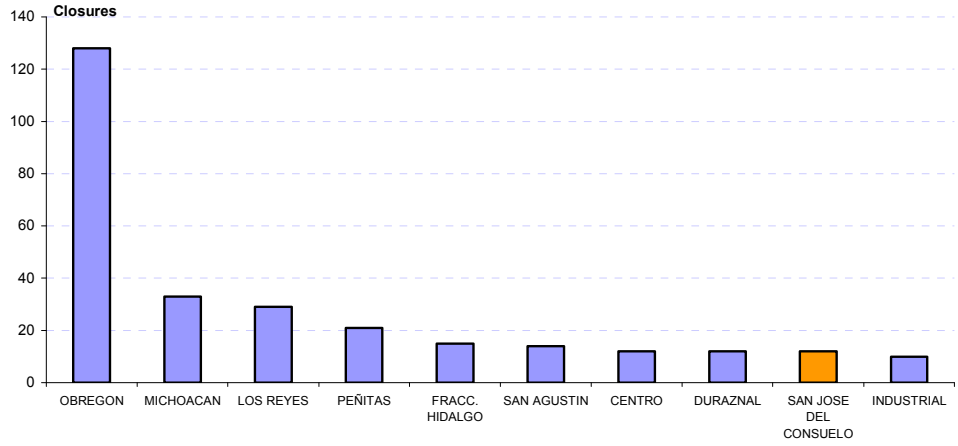


Figure 5-8 Distribution of tannery closings (top 10 neighborhoods, N=286 of a total 449) (Source: Own calculations with datasets from CIATEC and CICUR, 1999 and 2004). Columns in orange indicate ***peripheral*** neighborhoods; columns in green indicate ***industrial parks***, and columns in gray refer to ***downtown core*** neighborhoods. Note that in absolute terms, industrial parks aren't in the top 10 neighborhoods with the most number of plant closures.

The findings are consistent with the geographical location hypothesis. Figure 5-8 shows the total number of tannery closures in a five-year period. Nine neighbourhoods (all of which are located in the downtown core of León) accumulate 63.9% of the total number of firm closings in the dataset (449). Obregón (historically the neighbourhood with the most tanneries) accumulated 28.6% of the total closings in the dataset. However, when we take into account only the top 10 neighbourhoods with the most closings, Obregón accumulated 44.8% (of 286). The closure rates for León tanneries are shown in Figure 4-9.

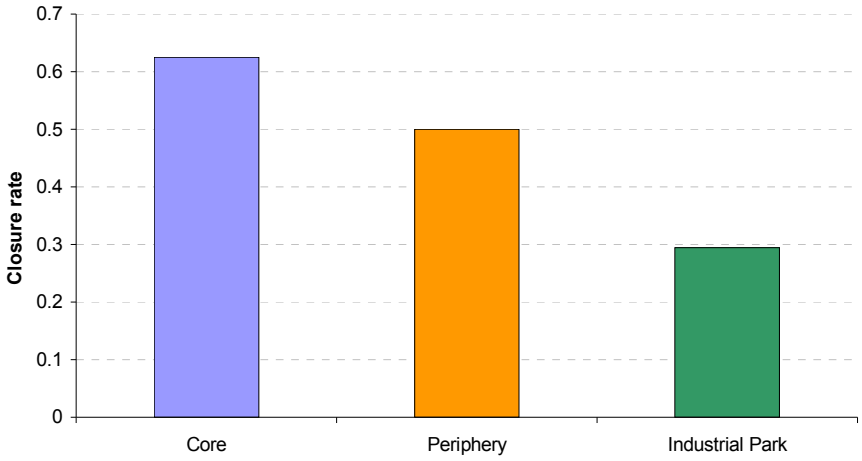


Figure 5-9 Tannery closure rate (Source: Own calculations with datasets from CIATEC and CICUR, 1999 and 2004). Orange bars indicate *peripheral* neighborhoods; green bars indicate *industrial parks*, and blue bars refer to *downtown core* neighbourhoods. Note that these figures show an aggregate closure rate.

Figure 5-9 offers a comparison of closure rates in the downtown core compared with the periphery (including industrial parks). For this analysis, neighborhoods were categorized as 'core' if they were adjacent to, or less than 10 km from, the downtown urban center; 'peripheral' if they were further than 10 km; and 'industrial parks' if they were located in an approved industrial park[74]. The highest closure rate found was that of tanneries in the downtown core, followed by the periphery, and the lowest in industrial parks. This finding is consistent with the hypotheses previously posed. From a policy perspective, it makes more sense to locate new tanneries in industrial parks due to the low closure rates. We could still expect some closures in approved peripheral areas, particularly if the tanneries were smaller in size.

Table 5-1 exhibits a decline rate of 0.69 for the Michoacán neighbourhood and 0.58 for the Los Reyes neighbourhood, whereas the decline rates for the two industrial parks in the table (Santa Crocce and San Jorge) are 0.30 and 0.27, respectively. More peripheral firms (both San José del Consuelo with 0.50 and Los Castillos with 0.50 are peripheral)

[74] I used a "concentric circles" approach, which differs from the CICUR classification of five regions within León. I chose this methodology to better show the spatial decisions made by tanneries. If I had followed CICUR's classification I would not have been able to differentiate between core, periphery and industrial parks. My 'concentric circles' approach allows for this distinction to be made.

experienced less decline/fewer closures than more central neighbourhoods (such as Obregón, Industrial, Peñitas and Michoacán). .

Table 5-1 Tanneries' closure ratio for 13 selected neighbourhoods in León (1999-2004)

Neighbourhood	Ratio
Fracc. Hidalgo	0.75
San Agustín	0.74
Michoacán	0.69
Peñitas	0.60
Industrial	0.59
Obregón	0.58
Los Reyes	0.55
Duraznal	0.55
Los Castillos	0.50
San José del Consuelo	0.50
Casablanca	0.44
Santa Crocce	**0.30**
San Jorge	**0.27**

Notes: The two shaded rows highlight two core neighbourhoods with substantial spatial reorganization due to requirements for increased urban infrastructure. The two rows in boldface are industrial parks. It is noteworthy that the lowest closure ratios are associated with industrial parks.

Additional spatial implications include the fact that the Michoacán and Los Reyes neighbourhoods have been subject to substantial urban reorganization. Many tanneries located in these neighbourhoods shut down during the 1999-2004 period and were dismantled to allow for new bridges and road construction to add to the urban infrastructure. Thus tanneries located in areas with poor infrastructure have a poor record of survival .

Findings shown in Table 5-1 also have the same policy and driver-associated implications mentioned above. Given that the highest rates of closure were associated with tannery location in the downtown core, we would infer that a tannery ought to be located in an industrial park (or peripheral region) to decrease the probability of closure. Data from Figure 5-9 and Table 5-1 also demonstrate that tannery closures were four times more likely in the urban region (core) than the periphery.

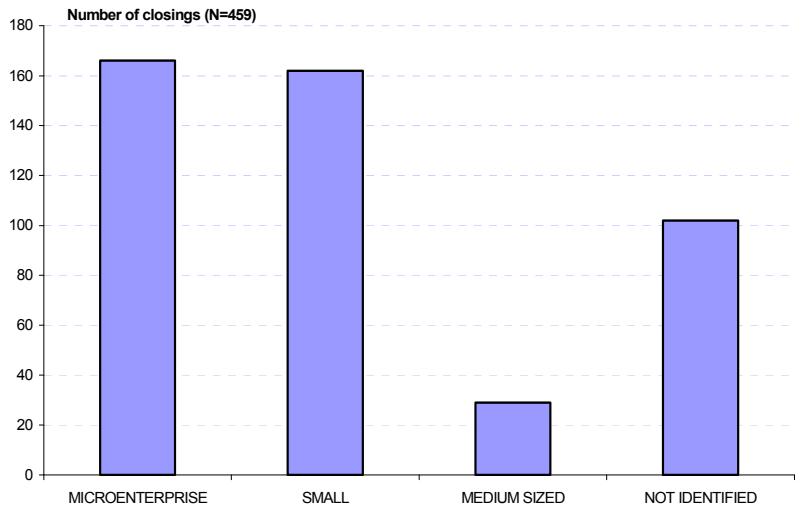


Figure 5-10 Distribution of tannery closings by size (Source: Own calculations with datasets from CIATEC and CICUR, 1999 and 2004).

Figure 5-10 shows that micro- and small-sized firms experience many more closures than medium-sized firms. Micro and small tannery closures averaged nearly 72% of the total number of plant closures, compared to 6.3% for medium-sized tanneries. Non-identified firms comprised 22% of the total number of tanneries that shut down during the period under study. Given the structure of the tanning industry, these non-identified firms were probably not large in size.

Figure 5-11 reveals actual closure rates by firm size. Calculations show a closure ratio of 0.60 for micro-tanneries closed in the period under study, while small- and medium-sized closure rates are respectively 0.61 and 0.44. It would appear as though the smaller the firm, the larger the rate of closure. However, if we were to aggregate micro-sized and small-sized tanneries, we would still have a much larger closure rate (0.60 compared with 0.44).

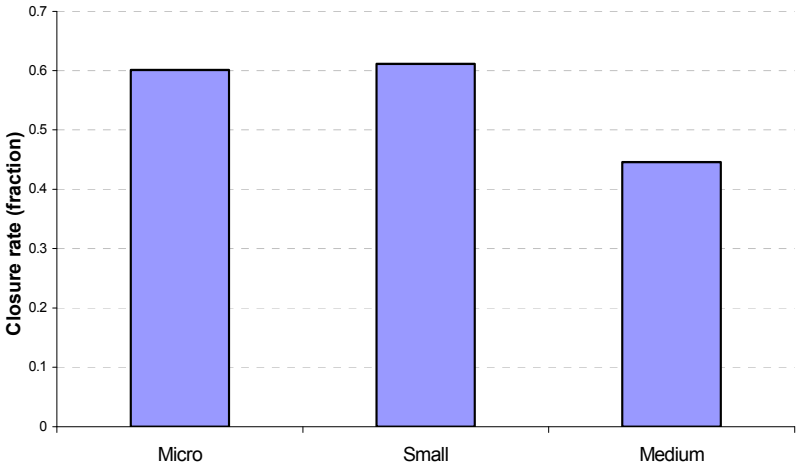


Figure 5-11 Tannery closure rates by size (Source: Own calculations with datasets from CIATEC and CICUR, 1999 and 2004)

Finally, Figure 5-12 shows that over 40% of the total number of closures in the dataset were indeed tanneries, while 13.6% were tanneries which acted as subcontractors for other businesses (e.g., *maquilas*). There are a substantial number (35%) of businesses not identified. However, upon closer examination of the dataset, it can be inferred that these are full-processing tanneries.

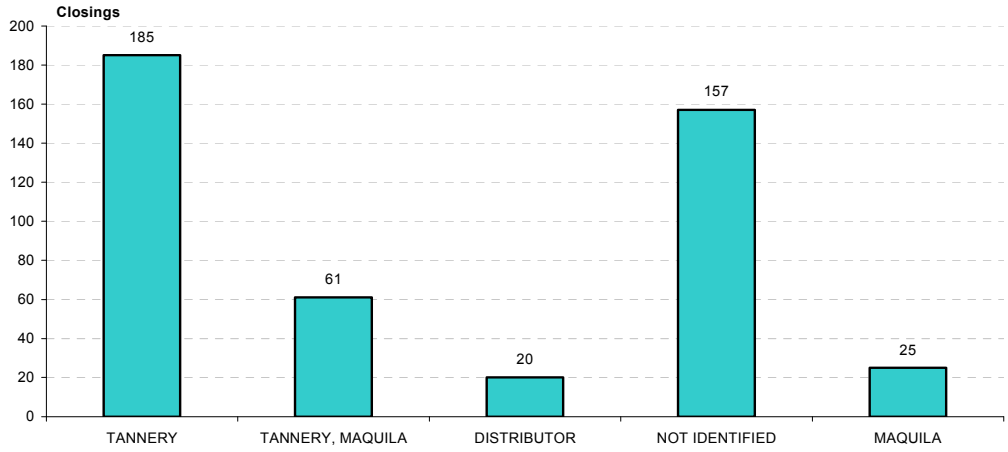


Figure 5-12 Distribution of tannery closings by type of business (Source: Own calculations with datasets from CIATEC and CICUR, 1999 and 2004).

"Death velocity" indices (i.e., the number of closures divided by 5 years[75]) were also calculated for firms in the core, periphery and industrial parks. Tanneries in the core averaged 72.2 closures per year, followed by 14.6 closures in the periphery and 2.8 closures in industrial parks. In an effort to uncover restructuring trends, the ratios of core/periphery and [core/industrial park] plant closures were calculated. It was found that for every 5 closures in the core of León, 1 ceased operations in the periphery (5:1). The ratio grows to almost 26:1 when closures in the core are compared to closures in industrial parks. These ratios indicate a restructuring trend where some tanneries responded to external pressures by shifting their locations.

The evidence presented above suggests that the number of tannery closures in the city core (downtown) is higher than in the periphery. This finding coincides with earlier work on inner-city closures[76](Lloyd and Mason 1978; Mason 1980; Elias and Keogh 1982). It is not clear from the data why tanneries closed. If closures were due to market pressure, similar rates of closure should be observed across all firms. To verify if this was the case, data on firm size and closure rates were re-examined. Most closures were associated with small firms located in the downtown city core. Since closure rates were not similar across all firm sizes, there must be at least an additional factor that hadn't been taken into account (in this case, zoning) in previous analyses.

Figure 5-13 shows a summary of plant closures in Guadalajara. The majority of closures occur in 1994 and 1996. We can correlate this behavior with increased competitive pressure from NAFTA, although we can't discount the 1992 explosions. It would be rather difficult to discern which of the two stressors might be the primary factor for plant closures; however, the temporal proximity of the two events mentioned above (from 1992 to 1994 and from 1994 to 1996) would support the argument that tanneries in Guadalajara responded to the signals of increased competition and zoning pressure.

[75] This study focused on the 5-year period from 1999 to 2004.
[76] Inner-city is another term used for the downtown core area.

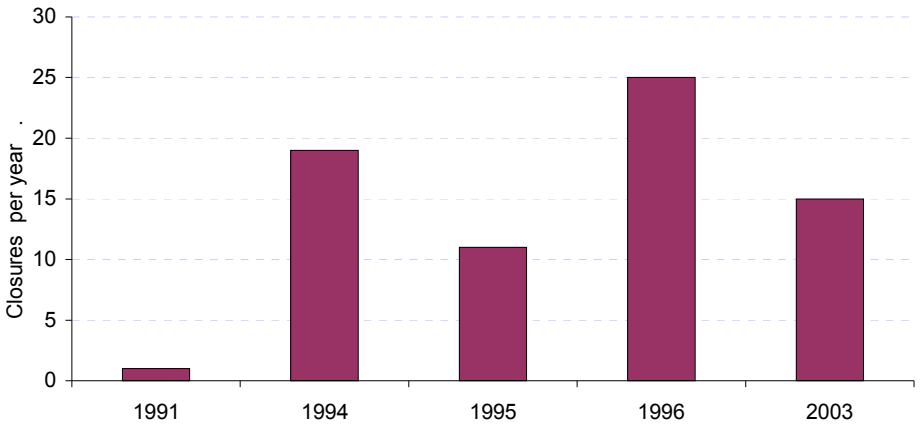


Figure 5-13 Distribution of tannery closings, various years (Source: Own calculations with datasets from CRIJ, 1991-2003).

Despite the inextricable relationship that exists between leather tanning and shoe manufacturing, often we find that these industries (in particular their trade associations) work independently from each other, without recognizing that they belong to the same commodity chain, and that anything that affects the earlier nodes of the chain will have a ripple effect on the latter nodes, and viceversa.

One key insight on how tannery owners may be changing their strategies is reflected in an interviewee's E-03-11 response:

> "… tannery owners got used to a really good business. Their profit margins were extremely attractive… However, they have not invested back on their business. On the contrary, they build houses, sell houses, buy rural properties (ranchos), they put their money elsewhere rather than back into the business. We used to have a saying 'rich business men, poor businesses'…"[1]

By de-capitalizing and shifting money away from their businesses, some tannery owners in León may have sealed the fate of their plants. Even if inadvertently, these decisions have had negative consequences leading to plant closure. This phenomenon wasn't pervasive only in León. There were at least three occurrences of decapitalization in Guadalajara, all of them related to large, formerly successful but then declining firms.

5.5 Firm relocation: Shifts in spatial configuration

An examination of foreign direct investment (FDI) data from the Secretariat of Economy (SE) in Mexico yielded no firms investing in footwear and leather relocations outside of Mexico. According to the theoretical stream of the international division of labor, one would expect that if firms in Mexico expect to benefit from cheaper labor in foreign countries (e.g. South Asia, Vietnam, China, Taiwan), they would have invested in production facilities abroad. However, interviews held with representatives of the foreign trade ministry reveal that this is not the case, so we can infer that there are no transnational relocations (at least during the period of study).

As for regional relocations, tannery association representatives from León and Guadalajara were asked to provide an informed estimate on possible relocations that had occurred within the period 1980 to 2004. All interviewees agreed that there was very little likelihood that a tannery (or shoe factory) in León would risk high capital costs to move from one city to another. In their words, "the distance between these two cities is so small that the move isn't even worth it". This statement could sound puzzling if we consider that relocation within the urban/periurban regions might have just the same cost. However, from interviews it became clearer that there are other social/economic factors that come into play in this decision, including labor supply and access/connections to trusted input providers[77].

These datasets provide fertile ground, though, to test responses to some important signals[78], like the signing of the 1997 Turbio River Agreement. Given that the agreement was signed in 1997 and one of the clauses specifically indicated that tanneries should relocate outside of the downtown core to specialized industrial parks, we would expect a change in geographical location if tanneries were responsive to the enforcement and fines put in place in the agreement. The adaptive response of tanneries (relocation) would depend on credibility of signals, enforcement of the agreement, and specific land-use rules and their enforcement.

[77] Rabellotti's work also agrees with this point.
[78] Following Risbey, Kandlikar, Dowlatabadi and Graetz (1999), firms adapt to exogenous pressures depending on their ability to respond to and recognize signals.

A more detailed explanation of the land-use regulations and their effect on spatial organization is provided in further sections of the thesis (Section 4.6 onwards).

5.5.1 Analysis of patterns of relocation

What patterns do tanneries follow when relocating? Tanneries may:

a) Relocate to an industrial park that belongs to the list of approved parks (zoning and land-use regulation).
b) Relocate to an industrial park not belonging to the list of approved parks but outside the downtown core.
c) Relocate to a peripheral area, which is not within the approved areas for relocation but is outside the downtown core.
d) Relocate to a different city/region/state or country.

In these case studies, no evidence of (d) occurring was found. Therefore, the remaining choices are relocation within approved/non-approved parks or relocation outside the core. Choice of an optimal location would be driven by a number of factors: access to markets, labor, and proximity to material inputs.

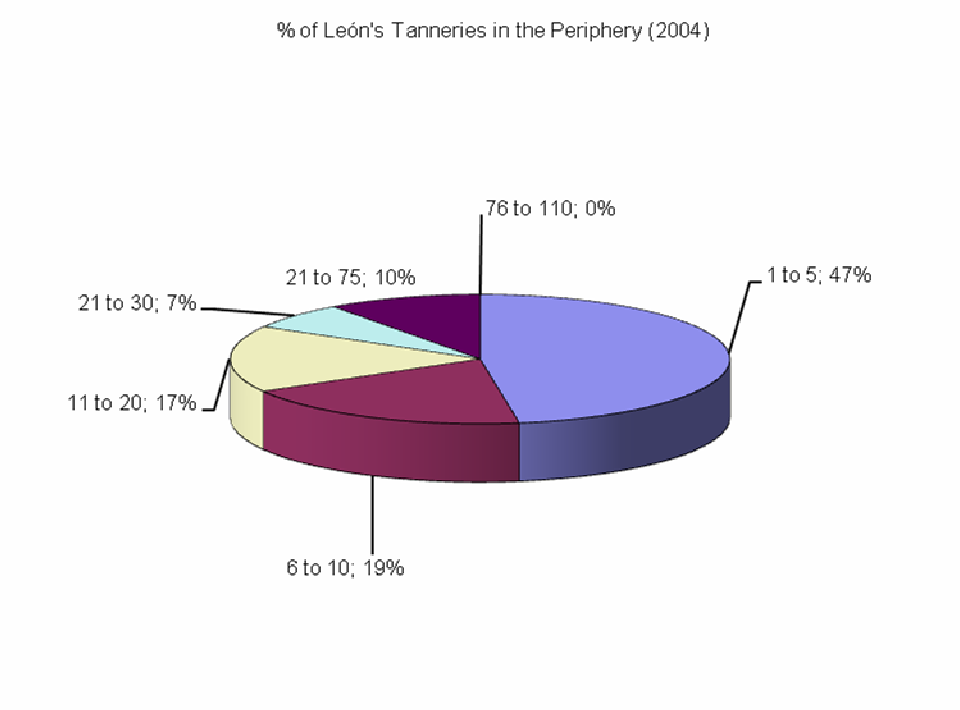


Figure 5-14 Geographical distribution of tanneries in León's peripheral locations by number of employees, 2004 (Source: Own calculations from CICUR database)

The total percentage of León's tanneries located in peripheral industrial parks amounts to 26.5% (120/454). A very large percentage of those tanneries employ very few workers (1 to 5). Figure 5-14 shows that 90% of all tanneries currently located in the periphery employ less than 30 workers. This finding has two potential explanations. First, it might be that we are miscounting tanneries. This would mean that 47% of the total number of CICUR-registered tanneries shown in Figure 5-14 are in fact small workshops where different stages of the tanning process are carried out (called "*maquilas*"). This argument is plausible if we consider that medium-sized (or at least not-so-small tanneries) would need to subcontract parts of the process to these *maquilas*. This inter-firm linkage would benefit both the *maquilas* and the tannery. The second potential explanation is that smaller firms were able to move to peripheral areas much more easily than their larger counterparts.

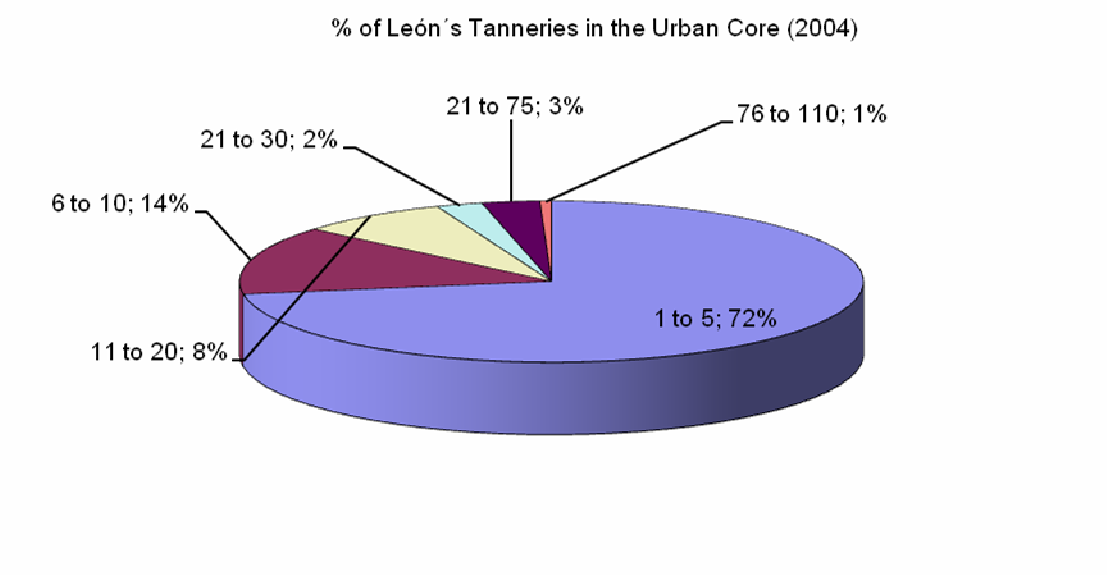


Figure 5-15 Geographical distribution of tanneries in León's urban core by number of employees, 2004 (Source: Own calculations from CICUR database)

Figure 5-15 shows a phenomenon we could have predicted from the historical review (Chapter 2): 72% of the really small tanneries (micro) are located in the urban core of León. Only 1% of the total number of tanneries employs more than 76 employees. This finding brings into question the contribution that the leather tanning industry makes to employment. Stakeholders in this industry have claimed that the tanning industry provides thousands of jobs. But since only 1% of the total number of tanneries is large, employment would not be affected by closures to the extent that stakeholders perceive. If the size distribution of firms were different (e.g., many more large tanneries than small tanneries), the negative effects caused by closures could be real cause for alarm. To evaluate the impact of industrial restructuring on overall employment, the size distribution of firms and overall number of jobs require consideration.

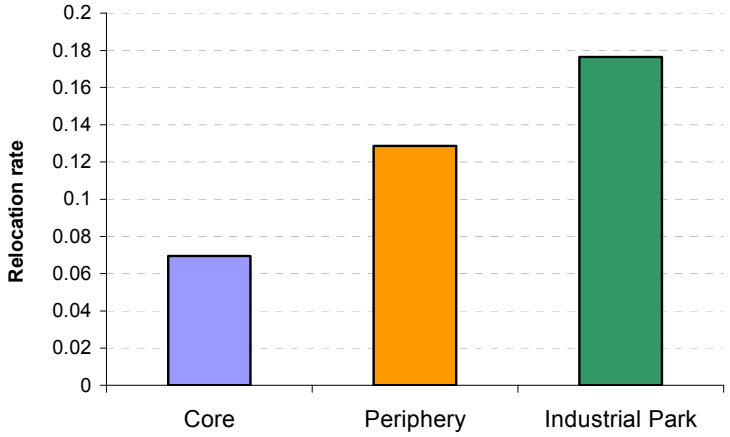


Figure 5-16 Relocation rates of tanneries 1999-2004 (Source: Author's own calculations with data from CICUR). Orange bars indicate peripheral neighborhoods; green bars indicate industrial parks, and gray bars refer to downtown core neighborhoods.

Figure 5-16 shows the relocation rates of tanneries by geographical location in the León cluster. As shown in the figure, relocation rates were highest to industrial parks, followed by peripheral areas, with the fewest relocating to the core. This finding confirms the hypothesis presented in earlier paragraphs, but one puzzling element remains. Why have some firms relocated to the downtown core? Shouldn't we expect no relocations to the core? Closer inspection of the data on relocations to the downtown core revealed that these firms had shifted further away from the core, yet remained within city limits. Furthermore, once these firms relocated, they only processed leather from the wet-blue stage[79] onwards. Thus, this confirms the hypotheses posed before, and suggests that tanneries make decisions to shift technologies and processes based on a multiplicity of factors that include zoning policies, market forces, technological capabilities and environmental regulations.

5.6 Empirical evidence (land use changes)

Two key issues regarding land-use changes and zoning laws, as restructuring drivers need to be taken into account. The first is whether a firm would respond to changes in land-

[79] Please see Appendix 1 for a description of the tanning process.

use and land prices by selling its property as an exit strategy. The second is whether firm relocation is driven by land-use changes and zoning laws.

To test whether land sales are used as an exit strategy, data on land prices in the downtown core and peripheral areas of León and Guadalajara were compiled into a dataset and compared. Neighborhoods where tanneries had traditionally located (e.g., the city's downtown core) were selected and compared with residential (peripheral) neighborhoods. Tanneries have been heavily criticized precisely because of their geographical location (in the downtown core), thus lending themselves to this analysis.

To assess whether land-use changes and zoning laws had an effect on structural change, we also need to compare how stringent zoning laws were in León and Guadalajara. Zoning laws are very relevant in determining where a plant locates. In the case of polluting industries, it is expected that adjacent communities will demand they either relocate or locate elsewhere (a variation of the NIMBY theme) (Hunter and Leyden 1995; Munton 1996) [80]. Policy makers are expected then to yield to community pressure and enforce stricter zoning and land-use regulation.

For the first component, we would hypothesize that more tannery deaths should occur in areas where the prices are higher. For the second component, we would hypothesize that more tannery relocations would occur from the core to the peripheral zone (given stricter enforcement of land-use regulation).

5.6.1 Patterns of land use, pricing and zoning in León

If zoning rather than environmental regulation drove relocation, we would expect tanneries to relocate to peripheral zones where their plants could hold land-use permits, thus allowing them to operate legally.

[80] NIMBY is the acronym for Not-In-My-Back-Yard. This phrase refers to the reluctance of communities to have solid waste or hazardous waste facilities located near by.

Table 5-2 Changes in land price in León (2001-2006), various neighborhoods (Source: Catastro Municipal de León, 2006). Prices in Mexican pesos

	2001	2002	2003	2004	2005	2006
Obregón	$ 105	$ 500	$ 500	$ 500	$ 550	$ 600
Los Reyes / Héroes de Chapultepec	$ 107	$ 500	$ 500	$ 500	$ 535	$ 572
San Crispín	$ 43	$ 500	$ 500	$ 530	$ 550	$ 600
Delta	$ 43	$ 400	$ 400	$ 450	$ 500	$ 550
Arroyo Hondo	$ 43	$ 100	$ 100	$ 110	$ 120	$ 208
San Jorge / Housing	$ 275	$ 800	$ 800	$ 800	$ 830	$ 1092
San Jorge / Industrial	$ 43	$ 600	$ 600	$ 630	$ 650	$ 700

Notes:

Prices in Mexican pesos. The first two rows are considered downtown core neighborhoods. The five following neighborhoods are peripheral (industrial parks). Note how San Jorge also includes residential housing.

In Table 5-2, a fourfold increase in price in the downtown core from 2001 to 2002 but then a relatively stable price can be seen. The price of industrial land increased much more than the urban/residential land from 2001 to 2002 (from $43 to $500 within a year—a tenfold increase). If these prices are assumed to be correct, then the hypothesis might not hold because the differences in prices are really minimal[81].

The last two rows show that residential land prices are higher than the price of industrial land. This would support the hypothesis that tanneries use land sales as a potential exit strategy.

To validate the above shown prices, quotes were independently collected from two real estate developers (although they would not provide historical time series data). For 2005, prices in the downtown core ranged between $1800 and $3000 pesos/$m^2$, whereas in the periphery, they ranged between $1000 and $1800[82]. Prices in the innermost area (e.g., the closest to the city center), hovered in the $10000 pesos/$m^2$ range. These data support the hypothesis that tanneries might want to sell their land as an exit strategy.

[81] The *Catastro Municipal* is the official source for land price statistics. However, as was the case with the rest of this dissertation's datasets, it was extremely difficult to extract these data from the *Catastro* office. Thus, prices were also collected from local real estate agents.

[82] This suggests that the *Catastro* prices are reduced from the 'market' prices.

Table 5-3 Correlating tannery closures with prices in León (selected neighborhoods)

Zone	Number of tanneries closed	ΔPrice (2001-2004) ($/m^2) (in %)
Obregón	0.58	376.2
Los Reyes	0.55	367.3
Arroyo Hondo	0.22	179.1
San Jorge	0.27	1411.62

Notes:
Prices in Mexican pesos, non-adjusted for inflation, data from *Catastro Municipal de León*.

The neighbourhoods with the lowest closure rates surprisingly had the lowest rise in price within the period. Arroyo Hondo (a peripheral neighbourhood) had a closure rate of 0.22 and only a 180% rise in price, whereas San Jorge (with a closure rate slightly higher) had the highest rise in price. These results were not expected and prompted further inquiry.

In interviews with real estate agents in León, prices in the downtown core of 6000-8000 pesos ($600-800 USD) were mentioned (10 times higher than those shown for the Obregón neighborhood in Table 5-1). Furthermore, interviewees indicated that the large influx of migrants into León and the need for additional urban infrastructure meant that the downtown core needed to rid itself of industrial facilities. This makes sense, because even if the selling price were similar to that of industrial parks, tannery owners would be more willing to sell their plant as land under a stricter land-use regime rather than spend money on relocating.

Increased zoning pressure through regulation also coincided with shifts in technology and 'regularization' of land-use permits. To obtain their land use permits, many tanneries located within core areas shifted to buying and processing leather from the wet-blue stage to the final stage— crust leather. Environmental and urban planning authorities saw this change in process as a genuine effort to reduce environmental impacts and comply with zoning regulations. Thus, if the firm provided evidence of this change and complied with several restrictions, it was issued a new land-use permit that would allow it to operate 'legally' within the bounds of the core area.

The number of firms that underwent the regularization process was calculated (by neighbourhood and subsequently analyzed. The results show a peculiar pattern. Firms that were expected to have relocated showed a behavior that was consistent with the original location of the tannery. However, the number of tanneries in León that chose to "regularize"

their operations was significant: 20 tanneries in the Obregón neighborhood 30 additional plants in core neighborhoods (but further away from the city center). If we examine the number of tanneries that closed in the downtown core (128 closures compared with 20 regularizations in the Obregón neighborhood), it probably would have been a smarter strategy to regularize than shut down the tannery. There is a possibility that environmental regulatory enforcement might be less stringent in the near future and thus the tannery could start operations again. However, this regularization strategy might have only been available after many of these tanneries had already ceased operations.

5.6.2 Patterns of land use, pricing and zoning in Guadalajara

A database of all tanneries with a valid land-use permit (*permiso de uso de suelo*) was constructed. The total number of plants with a valid permit is higher than the actual number of tanneries in operation. Figure 5-17 shows the distribution of permits in all regions of Guadalajara.

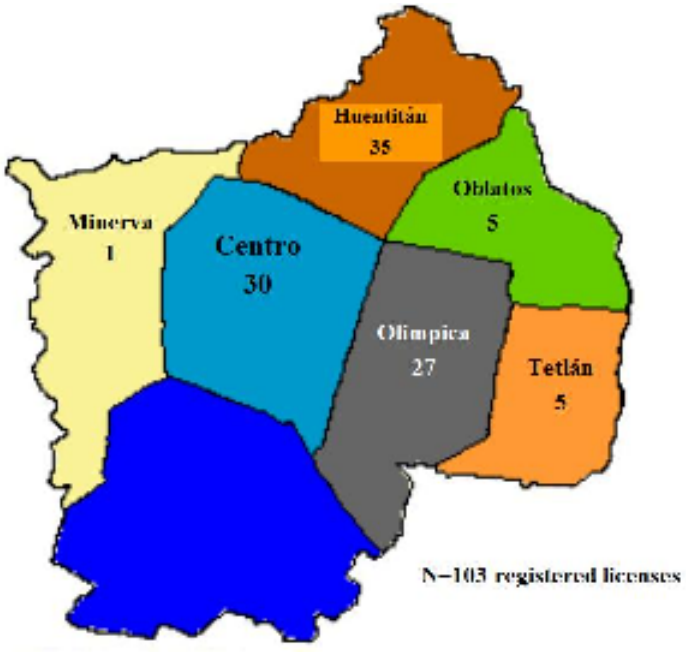


Figure 5-17 Geographical distribution of licenses in the city of Guadalajara [2006] (Constructed with data from the *Catastro* office in Guadalajara).

As shown in Figure 5-17, the vast majority of licenses for tannery-related businesses is located in three urban subdivisions: Centro, Olímpica and Huentitlán[83]. Centro corresponds to the downtown core and includes the traditional tannery-oriented El Retiro neighborhood; Olímpica includes the Mirador El Alamo neighborhood; and Huentitán corresponds to La Federacha.

Table 5-4 shows the distribution of active licenses per zone according to the division posed by the Guadalajara municipal government.

Table 5-4 Distribution of active licenses per zone in Guadalajara 2006 (Source: Calculated from Catastro data, 2006) N=103 licenses

Zone	Number of licenses	Percentage of total
Centro	30	29.1%
Minerva	1	1.0%
Huentitán	35	34.0%
Oblatos	5	4.9%
Olímpica	27	26.2%
Tetlán	5	4.9%

Data provided by the *Catastro de Guadalajara* show that tanneries are lumped together with other types of business similar to tanning. The data were disaggregated per tannery, tannery with *maquila*, chemical products supplier, etc., and then Table 5-4 was recalculated to show the distribution of all types of business (Figure 5-18).

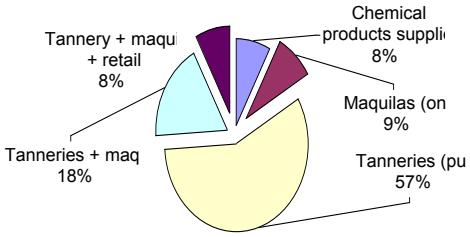


Figure 5-18 Distribution of tannery licenses in Guadalajara [2006] (Constructed with data from the *Catastro* office in Guadalajara). Data have been disaggregated to account for firm size and specific activity.

[83] The nomenclature assigned by the Institute of Territorial Information of Jalisco (*Instituto de Información Territorial de Jalisco, IITJ*) is Centro 11, Olímpica 11 and Huentitán 07, respectively.

Data in Table 5-5 are shown in order of degree of vertical integration (given that the chemical products suppliers are a separate node of the production chain, they are shown in the first row, while more vertically integrated tanneries are shown in the last row). While the majority (57%) of licenses were originally given to tanneries, 18% were given to tanneries that also do some degree of subcontracting for other tanneries, while only 9% were given to *maquilas*.

Table 5-5 Distribution of licenses per zone in Guadalajara, disaggregated by type of firm (Source: Calculated from Catastro data, 2006) N=103 licenses

	Centro	**Minerva**	**Huentitán**	**Oblatos**	**Olímpica**	**Tetlán**
Chemical products suppliers	2		2		2	2
Maquilas (only)	7		1		1	
Tanneries (only)	17	1	21	3	14	3
Tanneries + *maquila*	2		8	1	8	
Tannery + *maquilas* + retail	2		3	1	2	
	30	**1**	**35**	**5**	**27**	**5**

Since those plants that are only *maquilas* are basically subcontractors who perform parts of the leather making process on demand, and chemical product suppliers do not actually do any hide processing, we can subtract them from the database. This leaves a total of 86 licenses given to tanneries that carry out the full hide-to-leather process. Figure 5-19 shows still a predominance of geographical location in the inner (downtown) core of the city of Guadalajara.

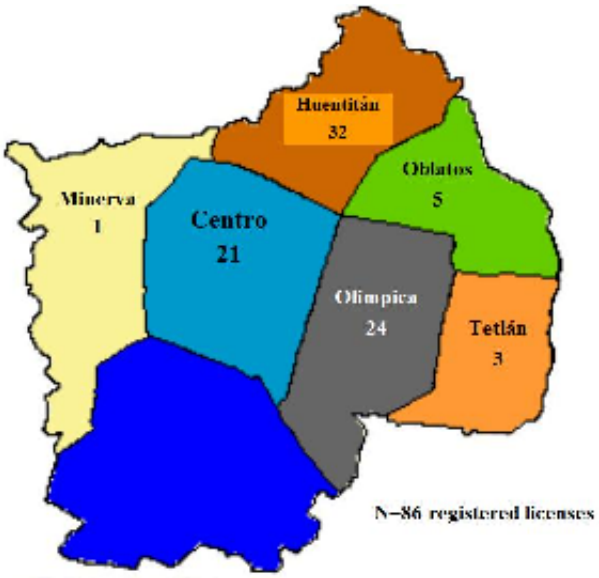


Figure 5-19 Geographical distribution of land-use licenses in Guadalajara [2006] adjusted to contain tanneries (Constructed with data from the *Catastro* office in Guadalajara)

The actual geographical distribution of licenses given to tanneries and tanning-related businesses does not yield the number of tanneries still existing[84]. The total population of surviving tanneries was calculated. The dataset was based on the SIEM system (*Sistema de Información Empresarial Mexicano*) and the CRIJ directories.

Table 5-6 Comparison of active licenses per zone in Guadalajara versus total number of tanneries really operating in 2006 (Source: Calculated from Catastro data, 2006)

Zone	Number of licenses (only tanneries)	Number of tanneries	Percentage of total (survivors)
Centro	21	8	38.1%
Minerva	1	0	-
Huentitán	32	11	52.4%
Oblatos	5	1	4.8%
Olímpica	24	1	4.8%
Tetlán	3	0	-

Table 5-6 shows the pattern of tannery survival in different zones of Guadalajara. Twenty tanneries were still operating at the time when the dataset was constructed. While 38% of the remaining tanneries are still located within the urban core of Guadalajara

[84] As indicated by one interviewee, some tanneries will keep their land-use licenses active even if they're not actually working (see Chapter 6).

(Centro), the majority is located in a peripheral sub-zone (52% located in Huentitán). The fact that over 50% of the tanneries previously located in the downtown core are not producing anymore despite owning a license indicates a shift away from industrial activity in this urban sub-region.

To analyze the relationship between land prices and tannery survival in Guadalajara, the approach shown in the previous section was taken. First, data from the Catastro Municipal were obtained, and then independent assessments were asked from real estate developers.

From Table 5-7 we can see that the prices rise faster in the neighborhoods that were formerly industrial. However, when we compare the upper bounds of prices we see similar values. This apparent homogeneity would imply that a price differential would not be a strong driver for relocation (or firm closure). However, if we see it as a strategic move, we could infer that a tannery owner would react to the rate of price increases over time and decide to sell her tannery to reap the economic gains of selling it as industrial land as it would have approximately the same value as core/residential land.

Table 5-7 Changes in land prices in Guadalajara (1996-2005), selected neighborhoods (Source: Catastro Municipal de Guadalajara, 2005)

Centro 11	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Upper bound	$ 400	$ 400	$ 400	$ 400	$ 450	$ 500	$ 600	$ 700	$1000	$1000
Lower bound	$1400	$1400	$1400	$1600	$1450	$1450	$1850	$2800	$2800	$2800
Olímpica 11	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Upper bound	$ 240	$ 250	$ 300	$ 400	$ 450	$ 500	$ 600	$ 700	$ 900	$ 900
Lower bound	$ 700	$ 700	$ 700	$ 700	$ 770	$ 900	$1050	$1250	$1400	$1400
Huentitán 07	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Upper bound	$ 250	$ 250	$ 250	$ 350	$ 450	$ 500	$ 700	$ 900	$ 900	$ 900
Lower bound	$ 420	$ 420	$ 420	$ 500	$1450	$1900	$2400	$2400	$2800	$2800

Notes:

Prices in Mexican pesos, non-adjusted for inflation. Note that the first row is a downtown core area. When plotted in a map, Olímpica and Huentitán are peripheral.

Independent realtors provided figures for the year 2005 (again, without providing time-series data for several years). Their figures are similar to those of the Guadalajara *Catastro* office. For those urban sub-zones where tannery closures occurred, the price hovered around the same range. However, as seen from the previous table, prices increased faster in formerly industrial (and currently urban) zones. Thus, tanneries in Guadalajara opted to shut down operations but keep their licenses active (see Table 5-8). This is the 'dormancy' phenomenon that has been mentioned in Chapters 4 and 5.

On dormancy

A puzzling finding was that the number of licenses to operate remains the same while the number of tanneries decline. Expert E-04-01 indicated that tanneries in Guadalajara tended to keep their licenses active even if their operations had ceased. In the expert's opinion, it was to ensure that

> "… if the business got better after the economic hardships, well, they can always get back into it. However if they didn't have a valid license for land-use, they'd be most certainly not given a new one by the Municipal Register of Licenses (*Padrón Municipal de Licencias*)".

Table 5-8 Correlating tannery closures with prices in Guadalajara

Zone	Number of tanneries closed	Price range (2005) ($/m^2)
Centro	13	1000-2800
Huentitán	21	900-2800
Olímpica	23	900-1400

Notes:
Prices in Mexican pesos, non-adjusted for inflation, data from *Catastro Municipal de Guadalajara*.

In summary, the evidence gathered indicates a pattern of "peripheralization" in both industrial clusters driven by changes in land use and pricing. Where prices rose, more tanneries shut down. The change in use from industrial to urban/residential has also marked a pattern of urban transformation in both cities. However, we have seen an earlier pattern of urbanization in Guadalajara, although the process might have been faster in León.

5.7 Summary

Institutional support at the federal level was basically the same for both clusters, when measured as financing, protectionist measures and tariffs. However, differences were apparent in the degree of local political involvement in industrial and environmental affairs. While environmental concern increased in Guadalajara as a result of the 1992 explosions (which partly blamed the tanning industry), governmental response resulted in a rejection of any type of industry in the downtown core (this is called the "BANANA" response - *Build Absolutely Nothing Anywhere Near Anybody*). The Guadalajara government thus created and upheld stricter land-use and zoning policies (Pacheco and Dowlatabadi 2007). The evidence gathered through interviews, documents and historical records does not point to the same phenomenon of regulatory capture in Guadalajara that has occurred in León. Guadalajara had a more conducive political environment to stricter zoning regulations than León did during the period under discussion (1992-2002).

We would have expected no new firms locating in the downtown core of either city if zoning regulations had been very stringent. However, in the case of Guadalajara, two intriguing trends were revealed. First, some tanneries decided to shut down operations for a certain period of time. Other authors have mentioned this 'dormancy' phenomenon albeit

only in passing (Watts 1991). The second trend was that over time, some tanneries emerged in peripheral zones within the city of Guadalajara. While no new tanneries were located in downtown core areas, those that located themselves in the periphery soon found themselves within the metropolitan zone (and therefore within the urban area). This is a classic example of urban sprawl catching up to industries. These plants located themselves in a permitted zoning geographical area. However, Guadalajara has grown to the point where there is no clear divide with the remaining four municipalities of the ZMG.

To further explore this issue, all the newspaper issues from the period 1980 to 2005 were examined. *El Informador*, the oldest (and most widely disseminated) newspaper in Guadalajara, was chosen as a data source. Newspaper articles from around the time when the Guadalajara explosions took place (1992) show that the government wanted tanneries and other chemical-based industries relocated to the peripheral city of Zapopan. This proposal was tabled before the cities of Guadalajara and Zapopan had physically merged.

Guadalajara tanneries were not able to obtain new licenses from the urban development secretariat. Surviving tanneries were expected to locate in the periphery, in an industrial park, or outside Guadalajara. This situation is touted here as the "*anywhere but here*" phenomenon. The government of Guadalajara steered the location of new tanneries further away from the inner city core using zoning permits as a strong locational driver.

Chapter 6 offers a similar analysis of drivers and responses on the Mexican footwear industry, while Chapter 7 brings the dissertation to a close by providing a reflection on policy prescriptions that have been implemented and their appropriateness.

Chapter 6 Responses in the footwear industry

Despite the high degree of interconnectedness that the leather and footwear have enjoyed in the past, the vast majority of analytical studies pay primary attention to either one instead of undertaking a more comprehensive analysis that takes into account these (seemingly) inextricably linkages. This chapter uses the firm demographics methodology to describe drivers and analyze responses in the footwear industry.

The chapter begins by examining the theory and empirical evidence behind market pressures, technical change and consumer preferences and their role as restructuring drivers of the footwear industry. This chapter argues that globalization, technological change and consumer preferences are intrinsically linked restructuring drivers and that their influence should be taken into account. These factors may affect synergistic (negative) effects on firm demography and industrial concentration, mainly due to switching behavior.

6.1 International market dynamics, technical change and consumer preferences

While this dissertation acknowledges that technical change and consumer preferences can have an effect on industrial restructuring, these factors have more of an impact on the inter-firm dynamics and the interdependence of leather and footwear. In this thesis I do not pay primary attention to these two forces[85]. Nevertheless, a brief discussion of the theory behind technical change and consumer preference as restructuring drivers is provided here.

Technical change and consumer preferences can shift the dynamics of interdependence of leather and footwear. If footwear manufacturers do not need leather as a raw material anymore due to changes in fashion and consumer preferences then the interest that stakeholders in the footwear industry may have in protecting their suppliers may be

[85] Despite the fact that in this thesis, the primary focus is neither technical change nor consumer preference, the thesis does provide an examination of the theoretical underpinnings and empirical basis for the study of the role of technical change in industrial restructuring.

reduced. This hypothesis is further confirmed when looking at interdependence data (i.e., how much leather is consumed by the footwear industry and vice versa). According to 1998 figures, 38% of the value of leather being produced in Mexico was devoted to production of uppers for footwear (Figure 3-7).

These data confirm our suspicion that these industries continue to be closely related and strongly interdependent.

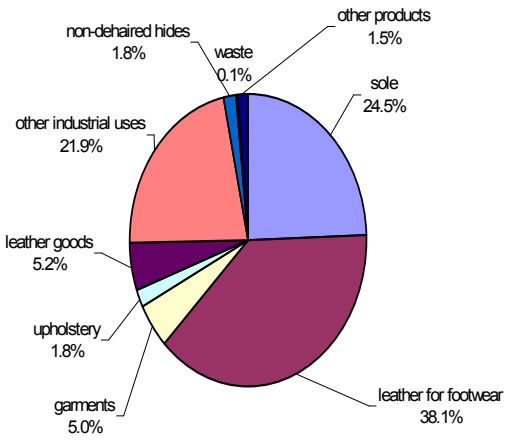


Figure 6-1 Breakdown of percentage of leather used for purposes shown (by value in dollars) in 1998 (Source: Constructed with 2002 data from Rosas/CIATEC).

If, as argued here, the bulk of locally produced leather is bought by the local footwear industry, then impacts in the latter nodes of the commodity chain (footwear manufacturing, distribution and sale) will also have a ripple effect in the earlier nodes of the chain (leather production, distribution and sale). Therefore, it is key to understand the dynamics of these linkages, which would allow us to foresee the impact that sudden changes in the driving (leading) industry of the commodity chain have on the driven (following) sector. Gereffi and Korzeniewicz call this *a buyer-driven commodity chain* (Gereffi and Korzeniewicz 1994; Bair and Gereffi 2001). Technical change can also be a factor in industrial restructuring, as new technologies can generate opportunities for new entrants.

There are conflicting views on the actual state of technological change in the leather tanning industry. Some authors argue that the tanning industry is hitting a technological ceiling (Knutsen 2000; Hesselberg and Knutsen 2002b). Others argue that under certain conditions (such as availability of information and technical training by chemical suppliers), tanneries could be willing to adopt cleaner technologies and improve their processes (Blackman and Kildegaard 2003; Blackman 2005). However, this research found that there is no such technological ceiling. The technical literature on leather science demonstrates the absence of said technological ceiling (Schramm 1997; Kanagaraj, Chandra Babu et al. 2001; Suresh, Kanthimathi et al. 2001; Sundar, Raghava Rao et al. 2002). New processes to manufacture leather (including chrome-free products) are being developed and innovations occur continuously. There have been (and continue to be) many technological improvements in the way in which leather is processed. Cleaner chemical processes for hide tanning are now much more the norm than they could have been in the past three decades. Even large manufacturers like Nike are adopting non-chromed leather as a raw material.

Technological advances can also shut down entire industries by virtue of making processes obsolete and worthless. Technological change can have an effect on firm survival. Those firms that have better technologies may be able to cope better with external shocks than those with obsolete ones. Leaders may be able to position themselves better in their competitive environment, whereas laggards may suffer and perish. Other times, leaders may fall prey to the trap of "too innovative too early" and incur substantial sunk costs that leave them too weak to compete in a rapidly changing environment unless their innovation can be used for market differentiation. A follower strategy has a more predictable payoff.

Consumer preferences can shape industrial performance, production techniques, the division of labor, etc. In buyer-driven commodity chains, such as in leather and footwear , customers play a key role. New product development is often driven by consumer taste and behavior. Consumer preference can affect restructuring processes, particularly at the local scale. Firms will need to reinvent themselves and their products if they want to compete in the regional, national and global marketplaces.

Firm demographics are affected by consumer preferences primarily in buyer-driven commodity chains. Given that consumer preferences can be affected by technology, firms

that do not embrace a particular process can die off. As indicated by MacLachlan (1992, p.134)

> "[o]utput may be reduced in two different competitive contexts. [In the first context], demand may decline because of changes in consumer preferences or demographics, the development of innovative substitutes that usurp the place of less efficient products or changes in buyer behavior. In the second context, aggressive new entrants add more products than the market can absorb, forcing a reduction of supply capacity."

Finally, customer behavior can have a significant effect in the geographical distribution of businesses, particularly if the product is extremely sensitive to consumer demand. For example, if customers are forced to travel a further distance than they are comfortable with, they may opt for a product manufactured by a closer firm. If a region is particularly afflicted by extreme weather (e.g., heavy rainfall throughout the year), people will want to buy waterproof or water-resistant shoes. The same case occurs with snow-ridden areas. For firms to function within these markets, they need to develop products specific to their target markets. Changes in the composition of products are also motivated by specific health requirements. Diabetics require specialized footwear that will ensure their feet stay warm (to fend off the complication of poor circulation) but also stay dry (to avoid fungal attack). While this may not reflect the customer's actual preference, she will need to use this type of shoe for health reasons. In recent years, the market share for casual footwear has been growing steadily, particularly since customers seek comfort and durability.

Technological change and consumer preferences are inextricably interwoven. The technology and machinery used is determined by consumer wants and needs. Obviously other factors such as proximity to the market, response speed, etc., also have a role. Conversely, consumer preference is to some extent determined by what technology is available. Furthermore, the impact of consumer preference is intertwined with that of globalization. If the consumer is highly sensitive to price, she will likely switch because of lower prices being offered by a foreign entrant to the domestic market. This argument, however, would not hold true in the case of cultural or social norms (such as specific traditional footwear for rituals or technical labour) that prevented switching in spite of lower costs.

This thesis thus argues that globalization, technological change and consumer preferences are intrinsically linked restructuring drivers and that their influence should be taken into account. These factors may have synergistic (negative) effects on firm demography and industrial concentration, mainly due to switching behavior.

The changing global dynamics of leather and footwear manufacturing spurred a number of studies on the relocation of firms from developed nations to developing countries as a response to ever-changing international division of labor (Korzeniewicz 1992; Ballance, Ghislain et al. 1993; Gereffi and Korzeniewicz 1994; Knutsen 1998; Hesselberg and Knutsen 2002a). Shifting patterns of industrialization such as flexible specialization (Korzeniewicz 1990) and increased globalization and dropping wages in developing countries (Ballance, Ghislain et al. 1993). However, as indicated by Lowder, globalization of footwear isn't just a simple case of finding cheap labor (Lowder 1999). There are many other intricate causal mechanisms that need to be uncovered in explaining why relocation occurs. While this literature has been examined and is relevant, it will not be the major focus of this dissertation. The main point here is to say that it the footwear and leather worldwide are evolving at a fast pace and that Asian economies (particularly China) are dominating the industry.

On the interconnectedness of leather and footwear

Expert E-02-10, a former tannery owner (whose son still carries on with the leather tanning tradition) made it clear that the relationship between shoe manufacturers and leather tanneries had deteriorated because tanners didn't provide leather on time for shoemakers and the quality wasn't up to the standard required to compete more effectively with imports or develop a strong export strategy.

Interview on file, Jun 8, 2002

When we compare industrial concentration at the national level both for the full-leather footwear and synthetic footwear, we find substantial evidence of structural change. Figure 6-1 shows the changes in industry structure as defined by the industrial concentration ratio (CR_4)[86]. Data shown here are unpublished and previously unavailable in the present form.

[86] Raw data to calculate concentration ratios are unavailable, since the LIEG requires confidentiality. As a result, concentration ratios provided in Figures 4-3 and thereafter should be carefully analyzed for internal consistency by simultaneously examining other factors and figures.

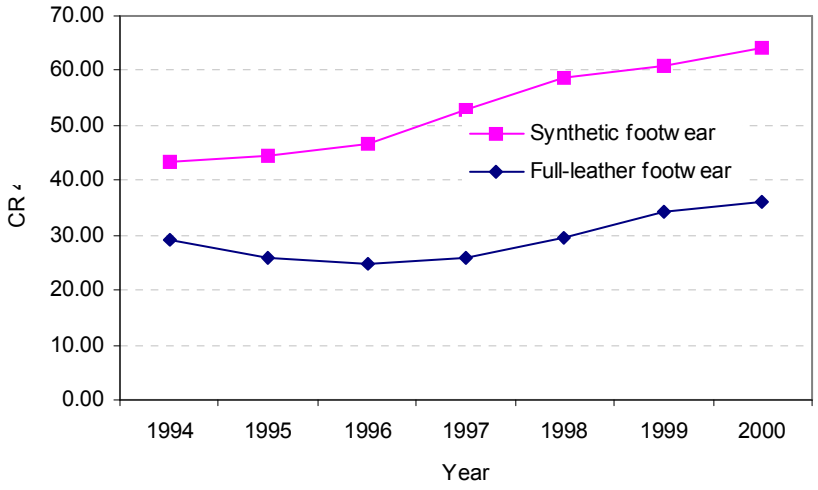


Figure 6-1 Concentration ratios in selected Mexican industrial sectors (constructed with data collected from INEGI, October 2003).

Data shown in Figure 6-1 are only for domestic production. Imports of synthetic footwear have increased during the period under study. We can see a steady increase in concentration ratio from 1994 to 2000 for synthetic footwear, but in full leather shoes concentration ratios fell from 1994 to 1996 and rose there after. Analyzing this result together with the pattern of employment shown in Figure 6-2 we see an increased concentration of business within fewer firms in the synthetic footwear industry. From here I inferred that smaller firms lost market share to larger firms.

This structural change may have been triggered by several factors. First, increased competition effects due to market liberalization could have led the full-leather industry to consolidate, thereby reducing the total number of firms. It is important to note that the mechanism observed here is primarily decline of the number of firms coupled with decline in total employment. The number of mergers and acquisitions is extremely low (less than 1%). Alternatively, consumer demand might have shifted to a different product mix altogether. Concentration ratios for synthetic footwear increased more rapidly two years into the implementation of NAFTA. This observation, coupled with the decline in employment shown in Figure 4-3 leads us to think that the total structural change in synthetic footwear is associated both with economies of scope and globalization effects. Entry of new players in

the market (particularly Chinese synthetic footwear) and increased competition eroded the stranglehold of Mexican synthetic-based footwear firms on the domestic market.

6.2 Technical change and consumer preferences in the footwear industry

Shoes have long been recognized as one of the primary commodities of society. While many of our ancestors walked around without any protection (and some societies still do to some extent), shoes have become an integral part of our lives. Tanneries have been intimately associated with shoe manufacturing, for throughout the years, leather has been a component of footwear. One of the first known forms of shoe/sandal was pieces of animal skin and/or fur attached with tendons. Egyptians tended to make shoes out of wood and paper. The Greeks and Romans used leather to make their shoes (mainly tanned with vegetable tannins from bark). Leather was often (and continues to be) used to manufacture shoes. However, it started to have other uses such as constructing water and wine containers, bags, clothing items, belts, seats, and cushions amongst a great variety of items.

Technological change and shifts in consumer preferences have shaped the development of new styles of footwear. The past three decades have witnessed an impressive growth in consumption of athletic footwear all over the world, particularly in the United States. Large firms like Nike and Adidas have positioned themselves as leaders in the market (Donaghu and Barff 1990; Clark 1998). They have managed to design comfortable shoes while retaining many other necessary characteristics (durability, imperviousness, etc.)

Could technological change have played a role in the changing industrial structure of the footwear and leather clusters? To answer this question, databases containing monthly information on production of full-leather footwear, synthetic footwear and semi-synthetic footwear were examined. Data were extracted from the EIM. Apparent consumption figures were calculated using this database. Figure 6-1 offers a cross-regional comparison between production and consumption of synthetic footwear and semi-synthetic footwear vis-à-vis full-leather footwear. If we pose the hypothesis that technological change had been a restructuring driver, we should expect a decline in full-leather footwear production, given that the technology for more comfortable/casual shoes uses synthetic soles. We could argue that technological improvements had made synthetic footwear production easier and

therefore, the mix of products would increasingly shift towards production of synthetic footwear.

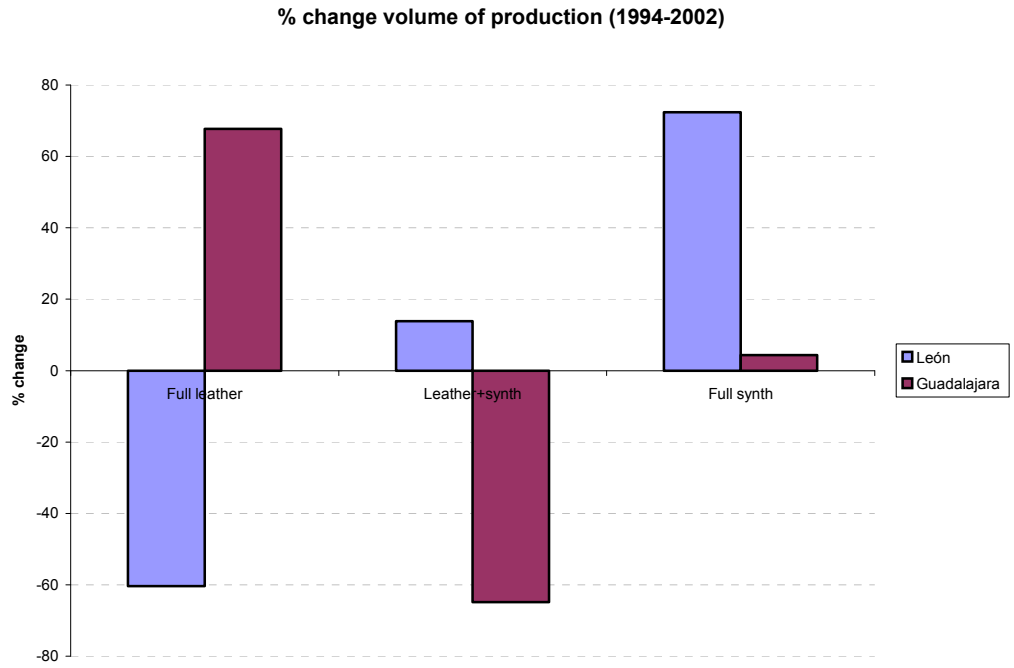


Figure 6-2 Percentage change in production volume (synthetic shoe/semi-synthetic/full-leather shoe) in León and Guadalajara. (Constructed from databases obtained from INEGI, July 2003)

If, as we hypothesize, there has been a technological shift towards more synthetic footwear (an argument we examine also in the consumer preference section), then we should expect a comparative increase in the volume of full leather production in Guadalajara. Figure provides support to this hypothesis.

We then turn to synthetic footwear vis-à-vis full-leather footwear. We should expect a decrease in production of full leather footwear vis-à-vis synthetic. Figure 6-4 shows a slightly perplexing pattern. It would seem as though the price of of full-leather footwear has increased (not surprisingly) but also that the price of synthetic footwear has increased as well (and even more in Guadalajara than León). The answer could be that the synthetic footwear produced in Guadalajara is of better quality and targeted to a different market (e.g. women's wear).

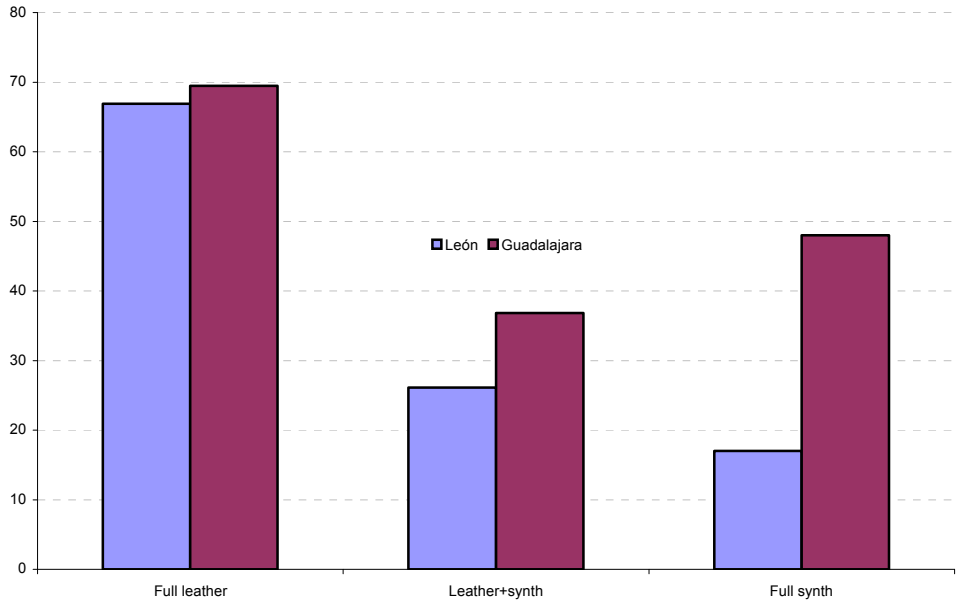


Figure 6-3 Percentage change in price (synthetic shoe/semi-synthetic/full-leather shoe) in León and Guadalajara. (Constructed from databases obtained from INEGI, July 2003)

According to figures by the Boston Consulting Group, in 1988, 65% of the total national footwear consumption was leather footwear, 20% plastic footwear and 15% textile-based footwear (BCG 1988). The report hypothesized that import liberalization would lead to increased pressure on domestic, low to medium quality footwear because of increased availability of plastic based footwear.

When we examine data on the growth or fall of US imports value by from 2004 to 2005, we see that US imports of synthetic footwear from Mexico fell 69%, whereas (surprisingly) imports from Canada grew over 95%. However, if instead of looking at the percentage change in year-to-date US imports of synthetic footwear, we plot the increase in percentage share that each country holds, we obtain that China's share grew from 54.9% to 77.6% from 1996 to 2004 (meaning 77.6% of the 2004 US imports of synthetic footwear are supplied by China). However, when we examine the case of Mexico, we find that its share declined from 2.8% to 1.6% during the same period. We see a small increase in share for Italy, Canada and Brazil. This overwhelming Chinese dominance of the allegedly main export target market for Mexico has negative implications for the type of strategic choices for Mexican synthetic footwear manufacturers. Would it be smart for Mexican footwear

manufacturers to try to out-perform and out-compete China in a low-to-medium footwear market? From the empirical evidence gathered, this would not be a smart idea.

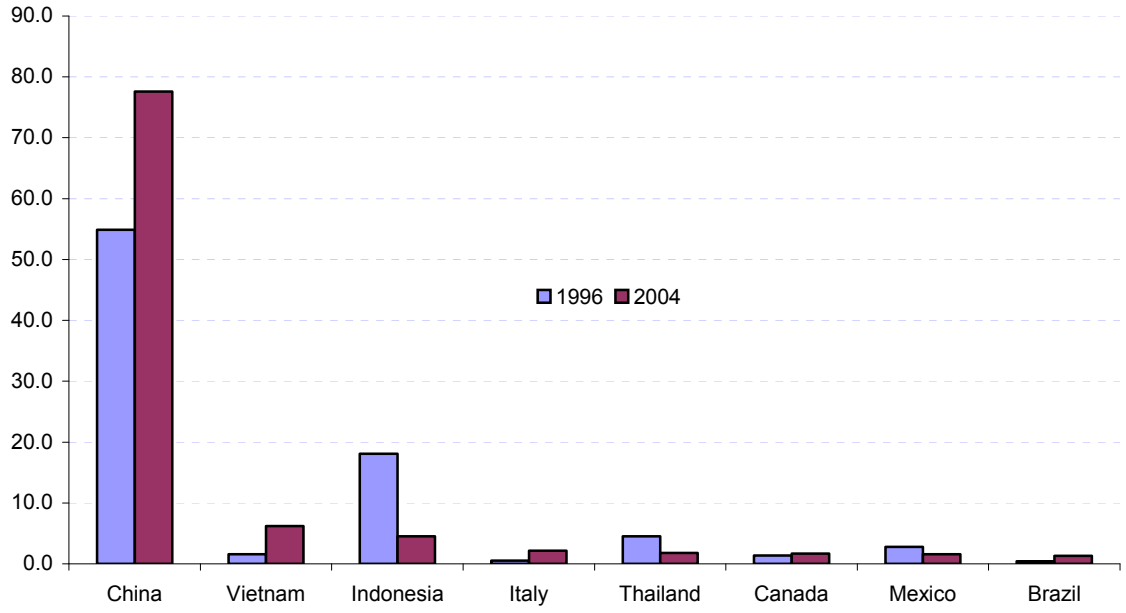


Figure 6-4 Increase in percentage share of the US imports of synthetic footwear by value in current USD. (Own calculations from data provided by the US Office of Health and Consumer Goods, 2005)

The empirical evidence shown demonstrates a shift in consumer preference not only in Mexico, but overall (world-wide). Frenzel-Baudisch argues in his PhD dissertation that consumer preferences have shaped the evolution of the US footwear industry[87]. He indicates that the growth in consumption of synthetic footwear is shaped by a structural change in the norms and preferences (comfort) of the American consumer.

Consumers can effectively drive structural change in an industrial district. While one could argue that the number of customers needed to actually influence industrial structures is rather high, it would be unwise to rule consumer preferences out. Only in the US market, sports shoes and synthetic shoes have effectively displaced full-leather shoes from the shelves and from the average American. A survey undertaken recently by the American Association of Footwear and Apparel and presented at a recent UNIDO leather-products

[87] Frenzel-Baudisch (2007).

panel showed the fast rate of substitution between full-leather footwear and synthetic footwear (Table 6-1).

Consumer preferences can also follow fashion trends and style. For example, Table 6-1 shows the increase in "casualization" of the US footwear market. These data aren't available for the case of Mexico, but the trend towards more casual footwear is a worldwide phenomenon (Donaghu and Barff 1990; Barff and Austen 1993; Frenkel 2001) and thus these data can be used as a guideline.

Table 6-1 Percentage distribution of the total US footwear market by value in dollars (Source NPD Fashionworld Consumer Study, US Footwear Distributors and Retailers of America, 2005)

	12 months ending Nov 2002	**12 months ending Nov 2003**	**% Change**
Dress	14.7	12.9	-1.8
Dress casual	25.0	23.6	-1.4
Casual/work	21.8	24.4	+2.6
Athletic	38.5	39.1	+0.5

Given the increase in consumer preference towards more casual, athletic footwear, we can expect a decline in the number of firms (and volume and value of production) in the full-leather footwear industry. Athletic and casual footwear do not have full-leather soles and have begun to substitute leather uppers for textiles and other synthetic material.

On consumer preferences and material switching

Expert E-02-14, a former shoe factory owner (whose son is also in the business) agreed with this viewpoint. He also mentioned that one of the reasons why his factory was switching to manufacturing with synthetic materials was precisely the lack of confidence in tanneries to provide steady, high-quality leather on a regular basis. He also mentioned that it was very hard for them to really trust a tannery because they had to pay "on the spot" rather than on a 'credit line', thereby suggesting that synthetic shoes manufacturers not only have a new material but also employ new business practices.

Interview, E-02-14, July 6, 2002

Furthermore, following Korzeniewicz and Gereffi, if we accept that the footwear industry is a buyer-driven commodity chain (Gereffi and Korzeniewicz 1994; Vangstrup 1997; Gereffi 1999; Frenkel 2001), we can expect consumers to exert a high degree of bargaining power.

Consumers can decide that it is in their best economic interest to buy inexpensive, China-manufactured athletic shoes than expensive, Italy-produced footwear.

From the above-presented evidence, we can't discount consumer preferences as a driver of industrial restructuring. Nevertheless, its effect on the Mexican leather and footwear commodity chain is very much dependent on the global landscape. If fashion trends in Mexico follow the behavior of the US market and/or other international markets, then consumer preference will have a stronger impact.

This driver highlights again the importance of taking into account cross-scalar dynamics. Despite the fact that consumer preferences are a localized phenomenon (occur at the individual scale), the customer has cognition of the worldwide consumption and fashion patterns. Therefore, in making an individual choice, she is influenced by global trends. Thus, global phenomena have local impacts and vice-versa.

6.3 Firm demographics for the footwear industry

This section applies the methodology shown in Chapter 5 to examine the evolution of footwear along the same time-frame (1999-2004). To examine the behavior of all activity classes at the national level, we compare their absolute rates of net decline (Figure 6-5). Calculation of net decline involves computing the number of firms added to the EIM sample and subtracting from the total decline calculated

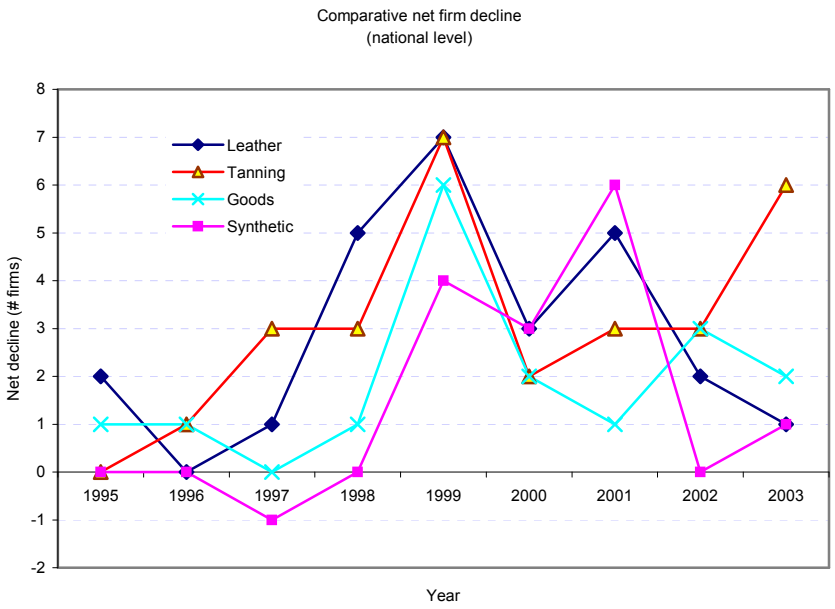


Figure 6-5 Comparison of net rates of firm decline for four Mexican activity classes at the national level (Source: Author's calculations from data collected from the EIM/INEGI, June-July 2003)

Notes: Leather refers to leather-based footwear. Tanning refers to tanned leather production (tanneries). Synthetic refers to synthetic footwear. Goods refers to leather-based goods.

As shown in Figure 6-5, the net rate of firm decline is zero or positive in almost all the years and production categories (except for synthetic footwear production in 1997). From this graph, the behavior of full-leather footwear and tanneries shows some correlation. This may be due to the tight inter-linkages that exist between these industries. To assess the rate of mortality, percentage of total decline was calculated based on the data provided. This procedure does not allow us to calculate cumulative percentage loss, but we can calculate it from initial (1994) and final (2003) figures. Figure 6-6 shows a comparative view of percentage deaths (mortality index). This calculation does not include new births (Figure 6-6 corrects for net decline).

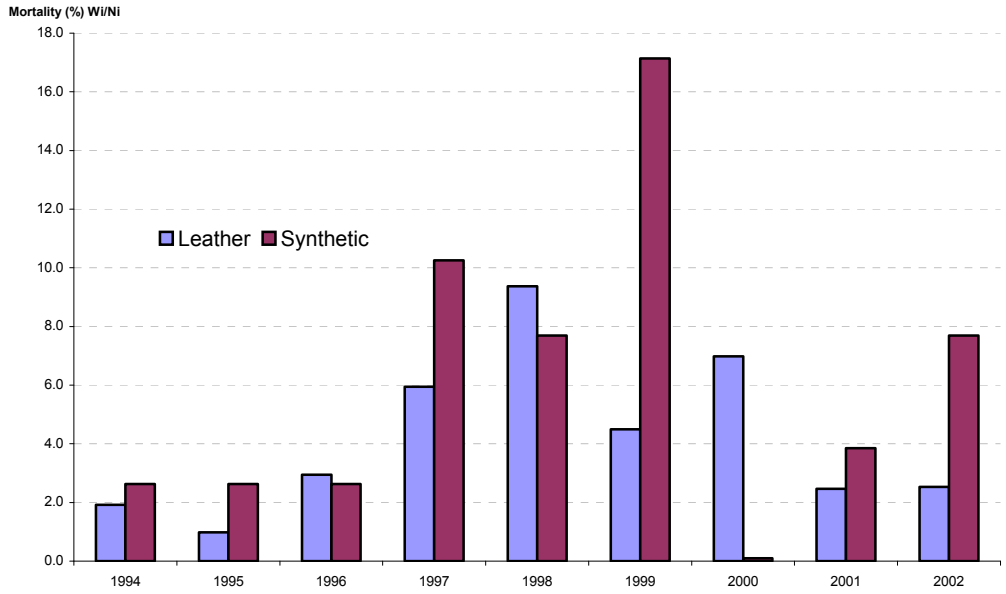


Figure 6-6 Comparison of annual mortality rates for leather and synthetic footwear at the national level (Source: Author's calculations from data collected from the EIM/INEGI, June-July 2003)

Total cumulative mortality for full leather footwear is 33.7% whereas for synthetic footwear is 50%. This result seems perplexing at first glance. However, it does make sense. Given that the product is typically low-priced, increased competition from outside sources (e.g. Chinese imports) can bring about a much stronger effect on synthetic-footwear manufacturers than it does on full-leather shoe manufacturers. The total overall decline over the period under analysis is 25.0% for full leather as opposed to 34.2% for synthetic. If, as argued in previous sections, the full-leather shoe manufacturing industry is more prone to decline (at least in the number of firms), this result may seem somewhat contradictory to that obtained in previous sections when analyzing employment behavior (where the number of jobs lost in full-leather footwear is higher than those lost in synthetic footwear). What explains this phenomenon? This may be a case of industry consolidation. There are fewer employees in the synthetic footwear industry sector and the total number of firms lost is higher (comparatively speaking with regards to full-leather footwear).

Table 6-2 Global decline in the four activity classes under study (national-level) (Source: Own calculations from EIM data, October 2003).

	Footwear		Leather	
	Leather	**Synthetic**	**Tanning**	**Goods**
Absolute decline in number of firms (1994-2003)	26	13	28	17
% Overall decline in number of firms	25.0%	34.2%	28.6%	51.5%
N_0 (Initial number of firms in the sample @ t=1994)	104	38	98	33

Table 6-2 summarizes findings with regards the overall percentage decline for all the four activity classes at the national level. The industry with highest mortality rate is the leather goods. This result makes sense since this sector is one of the most price-sensitive and affected by increased competition from Chinese and other Asian manufacturers. When examining the decline percentage rate for leather tanning, it is surprisingly low when compared with the actual calculated rate (near 50%) using data from 1999 to 2004.

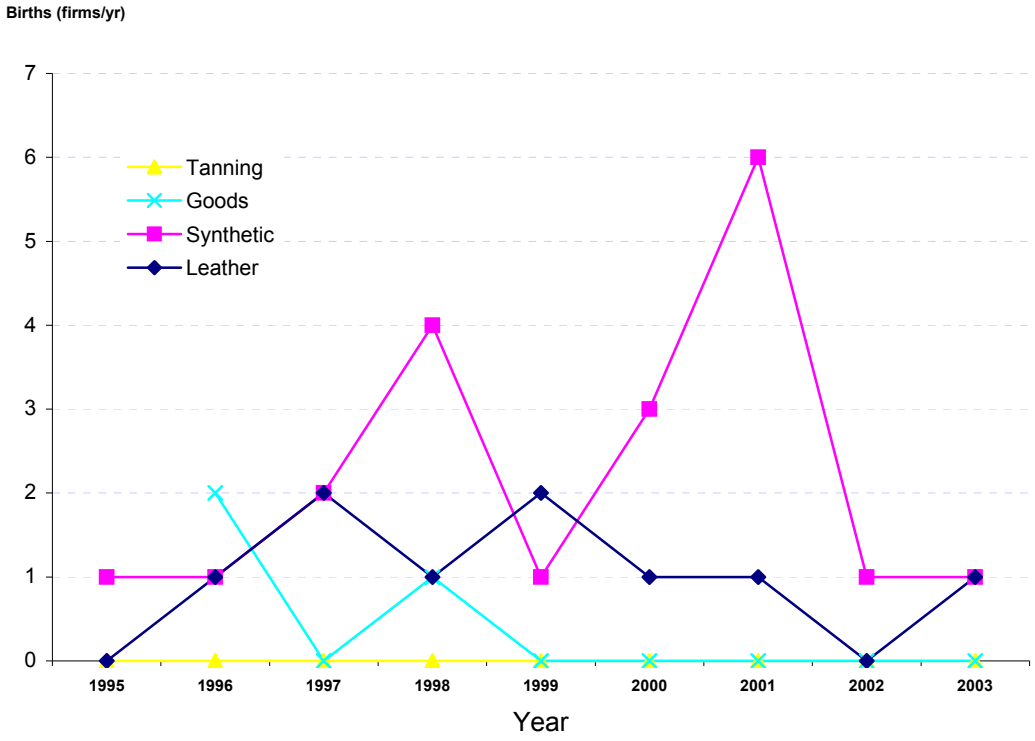


Figure 6-7 Comparison of net rates of firm births (Source: Author's calculations from data collected from the EIM/INEGI, June-July 2003).

Notes: Leather refers to leather-based footwear. Tanning refers to tanned leather production (tanneries). Synthetic refers to synthetic footwear. Goods refers to leather-based goods. Data are shown in absolute figures (number of births).

Not surprisingly, the number of synthetic shoe factories being "born" was by far much higher than the births of leather-based shoe factories. This can be attributed to the lower barriers to entry (lower capital investments and operating costs) that synthetic manufacturing poses, compared to full-leather footwear. Also, some full-leather footwear firms might have switched to synthetic (and according to interviews on file, had indeed done so).

At the regional level, given the historical development of Guadalajara as a center for high-price women's footwear and León as a beacon for middle-to-high-price footwear, we could hypothesize that Guadalajara's full-leather shoe factories would be less prone to failure than those of León. We would expect that kind of behavior since prices for women's shoes

are generally higher than those of men footwear and therefore could bring more revenue (although obviously, their cost would be higher too)[88]. This would hold true, of course, only if these firms sell enough volume or have low expenses (e.g. can hold their market share). We could anticipate that this type of firm be better equipped to compete with increased foreign trade having a stronger negative effect on low-priced shoe manufacturing.

The number of tanneries in Guadalajara is less than in León. Since they supply mostly high-quality leather for the domestic (local) footwear market and some leather goods shops, we could infer that the rate of decline for tanneries would be lower in Guadalajara than in León, if their profit margins were high enough. As for leather goods, we cannot pose a hypothesis with regards to the number of firms that might drop out of the sample in both regions as we cannot fully assess how sensitive or vulnerable this industry might be to increased foreign trade without plant-level data. That said, intuitively one would infer that if the market is highly price-sensitive and less sensitive to quality, then leather goods manufacturers would be more prone to decline. Furthermore, as their value is directly dependent on and linked to the quality of leather used to manufacture the final product (bags, upholstery, garments), then we could infer that the higher the quality, the lower the chance that the firm will shut down.

6.4 Firm relocation

As indicated in Chapters 1 and 4, the footwear industry had not been under pressure for domestic relocation, and therefore analyzing the relocation element of the firm demographics is not deemed necessary.

6.5 The relevance of other drivers (land use change, pricing and zoning) for footwear

Changes in land use, pricing and zoning could potentially be considered drivers of footwear restructuring. However, in comparison to other restructuring drivers (such as consumer preference, technical change and/or market pressures), land use and zoning

[88] Just increasing price is not enough to make profits. However, in interviews with shoe manufacturers in Guadalajara, they mentioned the fact that they were focusing on a specific niche market and therefore enjoyed higher profits even if their costs were higher than men's footwear costs.

policies become less relevant. Technical change and consumer preferences can shift entirely the production mode of footwear firms depending on whether costumers prefer a certain type of shoe and/or specific technologies are available. Increased domestic and international competition also has the potential to transform footwear manufacturers' business and corporate strategy. Locational elements, while relevant, are not a primary consideration during the day-to-day operation of a shoe factory.

Market forces would encourage new firm creation in peripheral regions (where land use was deemed suitable to locate industrial parks) if proximity to potential markets is deemed advantageous for the company. An inter-regional mobility argument (Harrison 2006) could be supported too, if we assumed that by virtue of providing propitious infrastructure and operating conditions, some regions would be more successful than others in attracting capital investments. This inter-regional relocation process thus would affect an impact on the spatial distribution of firms (and implicitly, a change in firm population dynamics).

Land-uses and land pricing can have an effect on plant start-ups (births). The argument indicates that we would expect an increase in births in the peripheral areas if zoning regulation were strictly enforced and downtown core areas were considered unsuitable for industrial production. Plants located in the downtown core areas would be forced/encouraged to relocate. Relocation to peripheral areas (even if the relocation is still intra-urban) minimizes visibility of a potential source of pollution and ensures compliance with zoning restrictions. The evidence gathered in this thesis doesn't support this hypothesis in regards to footwear production. Nevertheless, as Chapter 5 shows, tanneries' polluting activities are more visible and thus we find support for land use and zoning to be drivers of tanning restructuring.

6.6 Summary

The empirical evidence shown in this chapter indicates that technical change and consumer preference have a more significant role in footwear restructuring than in leather structural change. In summary, technological change (in theory) could have had a role in the Mexican leather and footwear industrial restructuring. The evidence to this extent is inconclusive, however. It is important to recognize that it is hard to extricate the relationships between the appearance of new materials and changes in technology choice and consumer

preferences. In the absence of more solid empirical evidence, we can't assign a higher weight to this driver compared to others or argue that it has played a role.

Furthermore, the impact of consumer preference is intertwined with that of globalization. If the consumer is highly sensitive to price, she will likely switch because of lower prices being offered by a foreign entrant to the domestic market. This argument, however, would not hold true in the case of cultural or social norms that prevented switching in spite of lower costs.

On entrepreneurial attitudes towards international market pressure

Lack of entrepreneurial culture was also frequently cited as a key shortcoming of the tanning industry in León[1]. This expert considered that this issue was particularly marked in León, although it was also present in tanners in Guadalajara. This was also a problem within the footwear industry, particularly under conditions of extreme uncertainty in the international trading environment. In the words of an interviewee,

> "if the Mexican footwear industry wants to compete in the global marketplace, it needs to be able to connect to the international buyer. Footwear manufacturers in Mexico have not taken into account that the customer requires formality and in-time delivery…"[1]
>
> Interview, E-02-08,

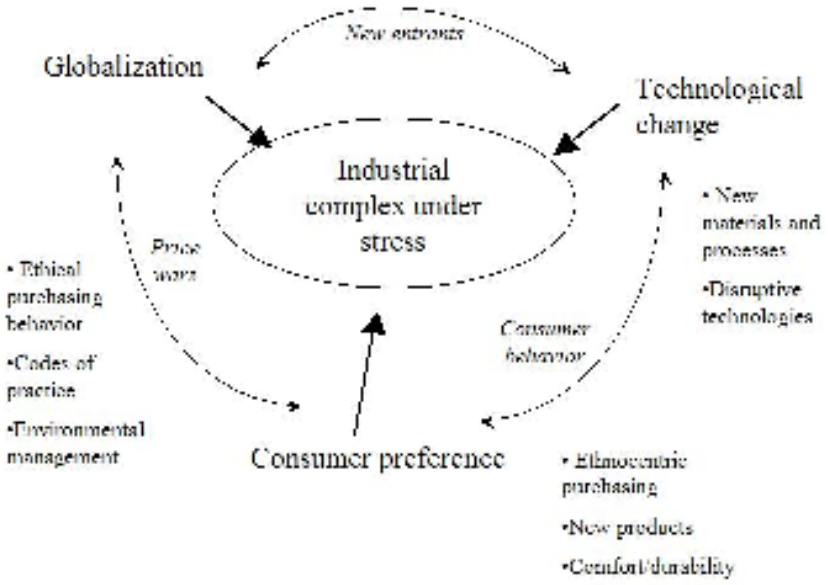


Figure 6-8 Graphical depiction of synergistic effects of market forces, technological change and consumer preference as restructuring drivers

This chapter argues that globalization, technological change and consumer preferences are intrinsically linked restructuring drivers and that their influence should be taken into account. These factors may affect synergistic (negative) effects on firm demography and industrial concentration, mainly due to switching behavior. Figure 5-7 shows a mental model of how these drivers can work synergistically to exert increased pressure on the industrial complexes under study.

Chapter 7 Policy implications of structural change in industrial complexes

7.1 Introduction

This thesis has identified a number of forces that affect the way industries shift their production patterns, and challenged conventional arguments that economic changes are the predominant restructuring drivers. Environmental regulation and changes in land-use patterns, two other restructuring drivers, were also incorporated into a broader framework that showed how they influence corporate and industrial structure. The goal of this integrated assessment of market forces, environmental regulation and changes in land use and zoning was to analyze current policies and offer policy-relevant reflections on the future development of these cities. The purpose of this chapter is to reflect on said options and offer a summary of lessons learned while undertaking this PhD research. The chapter offers an overview of insights gained through the dissertation research, followed by a slightly extended summary of research findings. Finally, the implications of this research and policy recommendations are discussed.

7.2 A recapitulation

Why is it important to understand how industries restructure in response to multiple stressors? Because policy decisions related to industrial development need to be grounded in solid empirical evidence and rigorous studies. Staber makes a strong case for this. In his study of the declining Baden-Wutterburg industrial districts:

> "An unknown number of policy failures in industrial policy and regional planning may have resulted from premature judgments of the demise of Fordism or from having underestimated the limits of small firm districts. Policy practitioners are easily misguided by the kinds of selective, static and retrospective research designs that have been commonplace in the industrial district literature. Policy interventions

> would benefit from longitudinal studies of entire populations of district firms that assess the rate at which, and the conditions under which, particular business strategies fail and others succeed" (Staber 1997, p. 491).

This thesis answers Staber's call to action by examining the complexities of firm demographics in two Mexican leather and footwear districts, León and Guadalajara. The methodology presented here can be used even within the data constraints discussed in Chapter 1[89]. The data offered in this thesis are valuable in that they allow informed, empirical inferences to be made about geographically concentrated firms faced with multiple stressors. Furthermore, the thesis is also unique in that the research focused on co-dependent areas.

As discussed in Chapter 4, there are two types of stressors (also referred to as a drivers)—exogenous and endogenous. While for example, market forces can be clearly seen as an exogenous driver (exogenous to the firm), other forces may be considered responses. Institutional support (both local and federal) can be taken both as an endogenous driver and as a response, whereas market forces, environmental regulation, zoning policy and land prices are all taken solely as exogenous drivers. Responses to these stressors are analyzed using a firm demographic approach grounded in evolutionary and adaptation theories. Figure 7-1 is a reminder of the multiple stressors that the Mexican leather and footwear industries faced throughout the period of study.

[89] As discussed in Chapter 1, Mexico is traditionally renowned for its lack of open access to information.

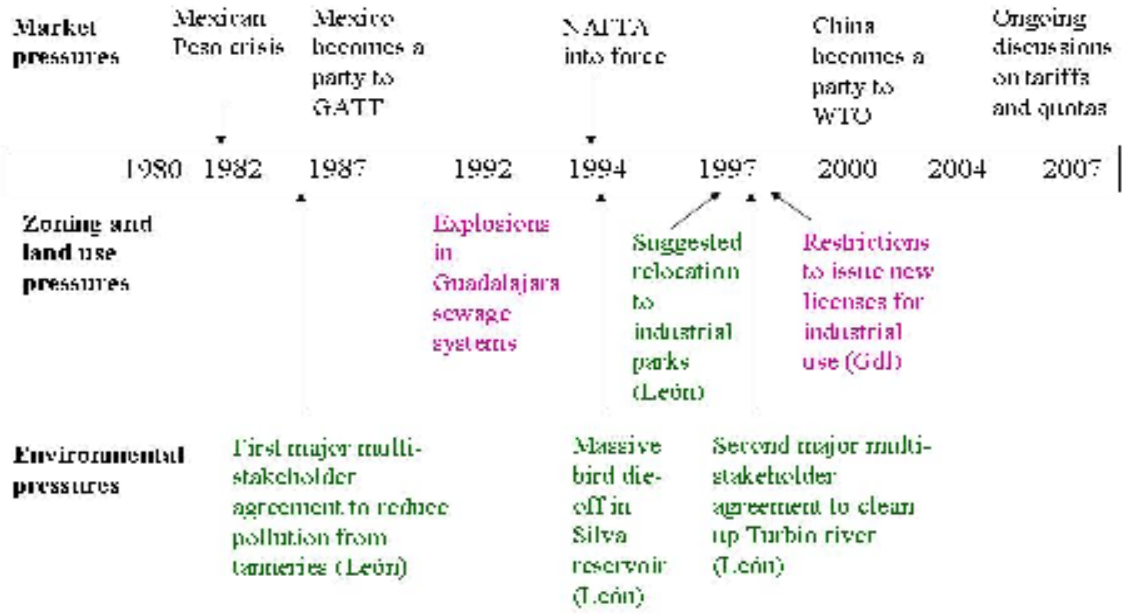


Figure 7-1 A timeline of events showing the multiplicity of stressors facing the Mexican leather and footwear industries. Rows represent the three major drivers analyzed in the thesis. Each column indicates specific events or shocks. Critical events are marked in dark green (León) and purple (Guadalajara).

The case studies of the leather and footwear clusters in León and Guadalajara's show complex cross-scalar dynamics[90]. Stressors such as environmental regulation, land use, zoning policy, and changes in land prices are local in nature, whereas globalization and market competition are global. Chapters 2 and 3 show that market forces had a global nature and therefore affected both cities, whereas zoning and environmental policies were more localized in nature and thus had varying degrees of influence on each city.

Furthermore, as Dowlatabadi (2002) has shown, there are at least two additional scales to examine complex processes with: the ***cognitive*** scale and the ***social organization*** scale. The cognitive scale speaks to our ability to comprehend the world and understand the processes of change. The social organization scale encompasses the rules and norms that societies have built through time (i.e., institutions).

[90] Evolving degrees of interaction and overlapping between the local and global scales can be found.

The cognitive dimension is important when examining industrial restructuring under multiple stressors. If firm managers are unable or ill-prepared to recognize trends and signs of potential restructuring drivers, then their ability to respond and adapt will be hindered. As indicated by MacLachlan, "corporate planners often fail to predict future market trends or are unable to maintain their market share when competitive conditions in the industry change" (MacLachlan 1992, p. 131). This statement links the relevance of cognitive scales and the ability of agents to respond to signs of stress. If the economic agent is unable to recognize the signs of a stressor and its impact on the firm's performance, then restructuring could lead to failure.

The institutional (social organization) scale is also relevant in this dissertation, as shown in Chapters 3 and 4. While the leather and footwear industrial districts in León and Guadalajara are both in decline, this is where the similarities end. The institutions and cultural norms of these two districts are substantially different. León's social organization is more amenable to the growth and survival of leather and footwear. Given the smaller size of these industries in Guadalajara and the government focus on the high-tech industry, it seems unlikely that traditional industries will receive enough support to continue their operations as required.

On the feminization of footwear manufacturing and the evolving social organization and division of labour…

Jarquín-Sanchez's assertion of a feminization of the Mexican footwear labour market as a derivation of its industrial restructuring is confirmed by Expert 03-10's assertion.

> "If you want to understand why 1 out of 5 shoemaking workers were women in 1980 and why it increased to about 1 out of 2 by the year 2000, you have to consider that women work because they **need** to and men because they **have** to."
>
> "The shift in manufacturing requirements (from a focus on low-priced footwear to higher-end shoes), led to more women entered the shoemaking workforce."

Interview w/ Expert 03-10, June 23, 2003

7.3 Reflections on the behavior of both clusters

León and Guadalajara's leather and footwear clusters have diverged over time. This divergence was somewhat evident in the early twentieth century. Both regions evolved in accordance with their urban development pattern. While León maintained a large number of tanneries and shoe factories, the concentration of these industries dropped in Guadalajara. However, with increased migration to León, and the emphasis over the last few years on commercial and trade-show business, leather and footwear have become secondary industries. Furthermore, the 'tertiarization' of León has been driven by imitation of larger metropolises (e.g., Guadalajara and Mexico City) (Pacheco and Dowlatabadi 2007).

Table 7-1 provides a quick summary of stressors and their effects on León and Guadalajara's commodity chains.

Table 7-1 Summary of impacts of multiple stressors on León and Guadalajara's leather and footwear industrial districts

Stressors	**León**	**Guadalajara**
Political factors	• In the period from 1990 to 2004, León has been a hotbed for bureaucrats (linked with the party currently in power, the PAN). • Entrepreneurs from both the leather and the footwear industries sought high-paying government jobs that allowed them to remain close to their enterprises and at the same time gave them political power.	• Guadalajara doesn't have the type of entrepreneurs or politicians that León does. Therefore, tannery associations are unable to wield political power to influence policy design or outcomes.
Sociocultural factors	• There was a tradition of and reputation for leather and footwear commodities in León.	• Guadalajara is currently known as the Mexican Silicon Valley and has less of a focus on "traditional" industries.
Environmental regulation	• Tanneries were under heavy scrutiny for a few years but then "were left off the hook" after 2000.	• Less direct environmental monitoring and enforcement—none after 2000.
Zoning and land use regulation	• Zoning regulations were more strictly enforced after 1998. • Land use has changed towards more residential usage.	• Strict enforcement of land-use licenses and permits led to an inability to relocate tanneries outside the urban core.
Institutional support	• CICEG has invested substantial amounts of money and resources into the PROCIC program, organizing industry against illegal dumping, lobbying the government, and more recently, funding benchmarking and visioning projects for the industry. • CICUR played a key role in lobbying the government throughout the signing of the 1997 agreement and the further declassification of tannery residues as hazardous wastes from 1997-2001. However, membership has declined substantially (435 members as of December 2005)	• CICEJ undertakes surveys and censuses of the footwear industry in the Guadalajara metropolitan zone bi-annually. Provides strong support to remaining shoe factories. • CRIJ provides some degree of support to tanneries, but the number of affiliated firms is small, and thus has very little clout.

7.3.1 International trade pressures

Will the footwear and leather industries in León and Guadalajara survive to increased market pressures? As shown in this thesis, this question is not easily answered without taking into account many other factors, both endogenous (e.g., core competencies, ability to adapt to external shocks, etc) and exogenous (e.g., exchange rate fluctuation, sudden changes in trade liberalization regimes, conflict, and war[91]). The evidence presented in the thesis indicates that the leather and footwear industries in Mexico are sensitive to changes in trade regimes (e.g., shifts in tariffs and increased price competition with foreign trading partners). Nevertheless, the ability of the industries to adapt to these changes will depend on several factors: individual- and sector-level adaptive capabilities to external stressors, intensity of foreign competition, and shifts in market economy dynamics.

While the effect of global market forces on industrial restructuring warrants further examination, this thesis proposes that this phenomenon should not be examined in isolation of other compounding factors that can also act as restructuring drivers. It would be possible to make an informed guess on the future of the leather and footwear industries based on the experience of other industrial sectors in Mexico. But this exercise would be futile without taking into account the pressures highlighted in this dissertation—environmental regulation, land-use changes and zoning policy, technological change, and consumer preference.

7.3.2 Environmental regulation and civil society pressure

Knutsen and collaborators have argued that the tanning commodity chain has faced both environmental and market pressures and that restructuring of the global tanning industry has led to a shift in its geographical location[92]. Knutsen argues that under increased environmental regulation and market pressures, tanneries in the North (e.g., Germany) have shifted locations to the South (e.g., China, India). While their argument follows the pollution haven hypothesis, their evidence is not convincing, as they do not provide any quantitative measures of intensity of environmental regulatory pressure. Nor do they establish clear

[91] The two World Wars significantly boosted performance of the Mexican leather and footwear industries (particularly footwear).

[92] Knutsen and collaborators argue that all tanning commodity chains have experienced these simultaneous pressures.

causal chains between intensity of environmental regulation and changes in firm location (or market pressures).

This dissertation used the Mexican leather and footwear commodity chain to test Knutsen's arguments, comparing the effects of environmental regulation and market forces on two industrial districts located in León and Guadalajara. As Chapters 4 and 5 have shown, environmental regulatory pressure during the period under study was not a key driver of structural change. Direct environmental regulatory pressure was short-lived and had little impact on tannery behavior. This is an important insight that ought to be incorporated into the analysis on impact of environmental regulation in small-scale firms. As discussed earlier, a relatively new body of work in industrial ecology studies has argued that 'green industrial restructuring' is a dematerialization process that leads to reduced pollution. This 'green restructuring' theory argues that as countries evolve, they reduce their pollution output, thereby reducing overall pollution (Janicke, Binder et al. 1997; Binder 2001; Binder, Janicke et al. 2001; Nill, Petschow et al. 2001). This thesis does not find any evidence to support this hypothesis (or, incidentally, the pollution haven hypothesis), therefore challenging their validity. Further inquiry is warranted.

7.4 Land-use changes, land pricing and zoning policies

Urban growth has increased land prices, and become a major driver of restructuring in both cities, though in different ways. In León, the rising demand for urban infrastructure coupled with increasing land prices in the downtown core led to a somewhat unorthodox restructuring strategy among tanneries. Faced with the choice between continuing operations (and eventually being forced out of business when the municipal government needed the land for urban infrastructure) or making the best of increasing land prices, a number of tanneries shut down and sold their land. Quantitative accounts of this response are provided in Chapter 5. In Guadalajara, since permits were not issued anymore, tannery owners opted for plant closure. Interview data gathered during the 2003 and 2004 fieldwork seasons further confirm these findings.

This thesis finds that zoning policy can be a powerful regulatory tool if appropriately enforced. If the Mexican government (more specifically the municipal authorities) wanted to force tanneries out of the downtown core of León, they could have followed Guadalajara's

strategy of strict zoning regulation to ensure that no further industrial development took place in the urban area, and forced industries to move to designated industrial parks[93].

Variations in the geographical location of tanneries in both districts are explained not only by the different degrees of land use and zoning policy enforcement, but also by the dissimilar urban geographies of both cities. An additional factor that contributed to tannery displacement in the downtown core of Guadalajara (but not León) was also found. The unique geographical location of the city of Guadalajara (surrounded by four other municipalities and with no physical space to grow) meant that if any new industries wanted to settle in Guadalajara, they would be faced with a lack of designated space. New permits for industrial land use had not been issued since the late 1990s, so entrepreneurs who wanted to locate in the city of Guadalajara were faced with locational constraints. Firms had to choose between locating within the periphery of the metropolitan zone of Guadalajara, in one of the municipalities that could issue new permits, or elsewhere. The municipality of El Salto has since become the site of a number of new plants, particularly electronics, and has faced less environmental scrutiny, primarily because of the predominant base of industrial parks in the municipality, which has given it a "cleaner" public image.

7.4.1 Emerging opportunities and threats (for economic development)

Interviews with new entrants into the tanning business offered insights into how and why they got into business. Key factors include inter-firm alliances, good customers and location.The empirical evidence gathered in this dissertation points out several emerging threats for the leather and footwear commodity chains. The first threat is related to market forces. Increasing competition from foreign entrants into the domestic market implicitly requires firms to create countervailing strategies. Industries may choose to differentiate, focus on one specific niche market or be cost-effective (Porter 1980).

The second threat (which may also be seen as an opportunity) is associated with an overall urban transformation in both cities. As shown in Chapters 3 through 6 , both the cities of León and Guadalajara have been undergoing a structural transformation that has seen decline in at least part of their industrial base. This phenomenon has been brought on in part

[93] A successful example of this strict enforcement process is described in Pacheco and Dowlatabadi (2007c)

by an increasing demand on residential land and steady migration to metropolitan areas from other states and rural areas.

7.4.2 Inter-industry dynamics and technical change

This thesis finds that the once-inextricable relationship between the leather and footwear industries has been damaged throughout the years. In both case studies, dependence of the footwear industry on synthetic materials has lessened the relevance of the leather industry.

Analyses of interview data showed a divergence in the way both industrial sectors approached local institutional support. While stakeholders from both industries showed concern over their future in the face of increased competition, neither industry seemed to be willing to establish collaborative relationships. This disjointed response was prevalent at the industry and regional levels.

Empirical evidence gathered in interviews with leather and footwear industry leaders, government officials and shoe and leather manufacturers further indicates that an alliance between the leather and footwear industries in León has been supported and encouraged because of a mental model of their interdependence. In newspaper articles and media interviews, government officials have often spoken about the dependence of León on the leather and footwear industries, and how these industries should support one another. If leather and footwear manufacturers continue with their lobbying strategies, and the evidence seems to indicate they will succeed, who should be responsible for creating policy options that enhance the capacity of industries to adapt? Will the solution involve all three agents (government, leather and footwear industries)? While there is no clear-cut strategy they will pursue, any policy option should involve all three agents.

7.4.3 Local institutional support (subsidies and other factors)

Key conditions of cluster development include well-established local networks of suppliers and buyers as well as supportive institutions. Policy makers ought to be aware of all these interconnections when developing policies. Chapter 2 showed that propitious local economic, sociopolitical and institutional conditions encouraged the development of the

leather and footwear clusters in León and, to a lesser extent, Guadalajara. This commodity chain includes ancillary industries that are sensitive to negative macroeconomic and environmental conditions.

The extent of local institutional support is different in both clusters. This thesis found that Guadalajara's leather and footwear industries did not lobby as intensely as Leon's did. The reason for this may be that Guadalajara has a more diversified industrial base than León. Its recent regional development strategy is focused primarily on the electronics industry, although there are also strong food production and service-oriented businesses. Leather and footwear have decreased in importance. In contrast, León has more of a tradition of tanning and shoe manufacturing than Guadalajara, and therefore they seem to be more worried about their potential demise. The second hypothesis is based on a disparity in power. Industrial scions in León were able to co-opt the local and state governments, while Guadalajara's politicians could not. The empirical evidence partially supports both hypotheses but does not give more weight to one over another.

7.4.4 Federal institutional support (subsidies and other factors)

Given the rates of decline in the leather and footwear industries presented in Chapters 4, 5 and 6, one could ask why the government of the State of Guanajuato would want to invest money and effort into continuing with the leather and footwear industries. One answer is the strong emphasis governments place on 'competitiveness' (Martin and Sunley 2003). In their critical analysis of the concept of 'industrial clusters', Martin and Sunley indicate that Michael Porter's success in promoting the concept of 'cluster' is due to his ability to market increased industrial agglomeration as a key to succeeding in today's global economy, and as a key to increased competitiveness (Porter 1998, 2000). Mexico has historically been receptive to international policy prescriptions, regardless of their goodness of fit. The leather and footwear trade associations exemplify this behavior. The PROCIC3 report extensively quotes a 1999 study by the OECD (Organisation for Economic Co-operation and Development. 1999) that promotes and encourages the 'cluster approach' to promote innovation. This cluster approach is defined as the promotion of agglomeration in order to achieve purportedly positive geographical spillover effects. However, the success of cluster-based industrial policy is entirely dependent on the contextual factors of the cluster under

analysis. Martin and Sunley (2003) call for holistic (not just cluster-based) regional development policies that encourage productivity. As they rightfully pointout, "the danger of a cluster-based approach to policy is likely that it detracts from the need to take a more holistic view of regional development" (Martin and Sunley 2003, p.28).

The Guadalajara cluster shows an interesting pattern of development. As indicated by a number of authors, Guadalajara's restructuring (particularly industrial) has been guided by a rapid urban expansion into the peripheral metropolitan areas (Tonalá, El Salto, Tlaquepaque, Zapopan). Its industrial policy has strongly fostered foreign direct investment (FDI) particularly from electronics and software companies (a-la-*Silicon Valley*). The empirical data gathered through interviews and datasets presented in previous sections shows a decline of footwear manufacturing and leather tanneries in Guadalajara. While Serrano argues that there is strong institutional support for the footwear industry in Guadalajara (Serrano Camarena 2002), the increasing focus on other "high-tech" industries has also meant that the relevance of traditional industries has been reduced. Industry-supportive policies and institutional support for leather and footwear industries have steadily declined in recent years.

The Mexican footwear trade associations have continued lobbying the Mexican government seeking protectionist measures. At a 2005 international conference on the future of footwear (UNIDO Panel on Leather and Leather Industries) organized by CIATEC, the representatives of León's tanning and footwear industries association called for additional support from the Mexican Secretariat of Economy to continue imposing countervailing duties on Asian shoe imports. The battle continues to this day.

7.4.5 Births and surviving firms (urban centers/industrial parks)

Empirical evidence (both qualitative and quantitative) presented in Chapters 3 and 4 indicate that a number of tanneries foresaw the challenges of having a tannery in the downtown core of León, and decided to locate in an industrial park in the peripheral areas of the city. This adaptive strategy allowed them to continue their businesses. Other tanneries decided to exit the business altogether. These firms viewed divestiture as the dominant strategy.

There were a number of leather factories that stayed within the downtown core and continued to face regulatory and community pressures. Through a 'regularization process', these companies were able to change their land-use permits to allow them to continue processing leather. These permits would allow them to complete the retanning-dyeing-finishing and dry-finish stages even if they were located within the downtown core. This is surprising since the sentiment from 1994-1997 had been that tanneries would need to relocate. However, community pressure has reduced since then, perhaps due to an increased public awareness of tannery closures. Since locals now perceive that tanneries are fading fast, the stigma attached to tanning seems to have lessened.

7.4.6 Deaths (urban centers/industrial parks)

Under the current economic circumstances (with increasing pressure from Chinese and other Asian footwear exporters, and the decline in consumer demand for leather), it would seem that the most viable strategy for tannery owners would be to exit the business altogether[94]. One tannery owner indicates:

> "… Many tannery owners have preferred to shut down and sell their warehouses and storage areas as plots of land. Due to the urbanization trends and the introduction of the new bus system, this area ended up losing a high number of tanneries. But we persevered and stayed here and so far, we are doing well..."

For this tannery owner, remaining in business was a decision that he and his family had to make. They consulted with each other and decided that they would keep running the tannery. He also indicated that he had not done a thorough financial analysis to actually assess whether an exit strategy was the most viable option. Cultural heritage, customs and social norms may indeed play a bigger role in the decision-making process than we give them credit for.

There isn't enough evidence to associate any one of the restructuring drivers with firm decline. However, the evidence suggests that the combined competitive pressure and shifts in land use could have had an impact on restructuring strategies. What can be said about firm decline is that overall, the combined firm demographics of the leather tanning industry show a pattern of decline that does not seem to be slowing. Tannery births, deaths

[94] Anecdotal evidence to support this statement was obtained through interviews with tannery owners.

and relocation were simultaneously examined, finding that rates of tannery closure are consistently higher in urban core areas than those of industrial parks. The natural policy implication would be that to avoid closure, firms should relocate as a restructuring strategy.

7.4.7 Firm relocation: Shifts in spatial configuration

Controlling structural change likely involves more than just **forcing** industrial relocation. The evidence presented here suggests that decisions to relocate are moderated by plant size as well. A large majority of firms chose to close instead of relocating (and closure rates are higher than relocation rates). Therefore, if a plant owner believes she can stay in business despite the capital investments needed for relocation, then she may decide to relocate instead of closing down. That decision, however, is an individual's strategic choice and is dependent (as shown in the thesis) on their ability to respond to multiple external forces acting simultaneously.

The insights gained from this thesis will be shared with policy makers in both cities (León and Guadalajara) to clarify the role of multiple stressors in industrial and urban restructuring. The thesis provides evidence regarding the prevalence of tannery relocation, and thus, can be used for policy purposes.

A summary of the restructuring trajectories of the two clusters is presented in Table 7-2.

Table 7-2 A comparative view of restructuring trajectories in León and Guadalajara (adapted from Pacheco and Dowlatabadi 2003, 2005)

	León	Guadalajara
Fraction of total number of inspections to tanneries (1994-2002) (1)	55.5%	1.6%
Degree of environmental pressure	High	Low
Degree of change in industrial concentration ratios of footwear firms (1994-2002) (% absolute change) (2)	+ 25%	+ 28%
Degree of change in industrial concentration ratios of tanneries (1994-2002) (% absolute change) (3)	+ 28%	- 15%
Target market	Domestic	Export
Premiere footwear product	Men's footwear	Women's footwear
Competitive strategy of the industrial district (4)	Cost Leadership Focus on low price, high volume	Product Differentiation High price and quality, low volume

Notes:

(1) Data from PROFEPA, June 25 2003
(2) Source: EIM, INEGI (June-July 2003)
(3) Source: EIM, INEGI (June-July 2003)
(4) Classification of competitive strategies from Barney (1997) and Porter (1980)

With respect to urban restructuring, the city of León followed a restructuring trajectory that predominantly saw the cluster remain as a "core centre for leather and footwear" (Pacheco and Dowlatabadi 2003), while Guadalajara reached a strong degree of diversification (that is, the degree of specialization in León increased while it decreased in Guadalajara) (Arroyo Alejandre and Velázquez 1992; Pozos Ponce 1996; Cota Yañez 1997b; Pozos Ponce 1997; Cota Yañez and Rodríguez Bautista 2001; Rodríguez Bautista and Cota Yañez 2001). The footwear and leather industries in Guadalajara chose to pursue a 'niche' strategy, which would potentially yield much better results than competing on price.

The government of León (and the state government of Guanajuato) chose to implement a number of strategies and invest on a core plan to boost the regional economy through measures to increase the competitiveness of footwear and leather firms within the

cluster. This strategy may be due in part to President Fox's involvement with the leather and footwear industry in León, on the one hand, but it is also a result of successful lobbying efforts by local entrepreneurs, particularly those from the footwear industry.

7.5 In summary

This project started with a strong focus on environmental regulation for pollution control. As shown in the dissertation, voluntary environmental agreements of local scope (e.g., reducing pollution in León) by design had a cross-regional impact on tanneries in Guadalajara via federal regulation. This finding illustrates the need to understand cross-scalar regulatory dynamics. Market pressures of a global nature (foreign trade leading to increased competition) have local effects. This is not a surprise. However, the fact that local actions have inter-regional effects emphasizes the need to understand how scales of regulation experience top-down (from global to national to local) and bottom-up (from local to national to global) cross over.

The thesis examined the evolution of two highly interdependent industries (leather and footwear). Disregarding the interconnectedness of tanning and footwear, and looking at only the environmental regulation aspects of pollution control does not help create smart policy. Tanneries have been historically not only a source of pollution but also of employment and societal welfare. Blackman and Sisto argue that public pressure may not have been enough to raise environmental awareness and strengthen enforcement of environmental regulation in León. However, civil society hasn’t been (historically speaking) as strong and vocal in Mexico as it is in the United States or other developed countries. Contrary to Blackman and Sisto, it is argued that this case did help raise the profile of the tanning industry (at least in León) and increase its visibility. Furthermore, it may be that the generally positive perception of tanneries overshadowed its negative impacts. However, Mexican policy makers have needed to create smart policy options that address environmental concerns without being detrimental to job creation and welfare.

Guadalajara presents a really interesting empirical case because the sensitivity of its citizens to potential risks posed by hazardous waste was exacerbated with the 1992 explosion. This event gave rise to a generalized NIMBY syndrome. Given that tanneries use

volatile compounds (solvents and sprays) in the dry finishing process, they were an obvious target of community and regulatory sanctioning.

7.6 Policy implications

Watts has argued that:

> "a local policy response to plant closure must recognize that it will be unable to affect the motivation for plant closure, since motivation arises primarily from macro-economic conditions and inter-corporate relations which, if they can be controlled at all, respond to policy initiatives at the national rather than at the local scale". (Watts 1991, p. 8.15)

It is true that policy development at the local level is affected by the national and international context. However, Watts overgeneralizes. Policymakers at both the local and national levels can indeed influence closure decisions by providing subsidies, tax relief, increased infrastructure, technical support, etc., depending on what the industries require. When designing policy recommendations, the complexity of industrial dynamics and the multiple feedback loops and interconnections between different agents and firms must be considered. Policy interventions should occur at both local and national scales; otherwise, there is a risk that policy decisions made at one level may be countervailed at a different level. Recognizing the cross-scalar dynamics of macroeconomic, sociopolitical and environmental factors is therefore necessary in the development of sound policy recommendations.

Policy makers must try to understand the decision-making process of industrial firm owners while avoiding oversimplification of the issues at hand. Most academic literature on industrial restructuring has focused primarily on industrial sectors that are not co-dependent, thereby overlooking peculiarities of industrial clusters that are relevant to policy discussions. Neglecting the fact that geographically concentrated firms are more intimately interconnected than other types of industrial sectors perpetuates the myth that bureaucrats and politicians can create smart, "clear-cut" policy responses that deal with specific sectors in isolation. For example, it is often suggested that industrial restructuring, (i.e., closing down plants) is one way to reduce pollution. However, this suggestion neglects the existence of forward and backward industrial linkages, and overlooks the negative effects that shutting down an entire industry would have on dependent communities. This thesis has shown that conventional

policy options previously suggested in the literature to alleviate pollution in urban areas (arising from tanning processes) are unrealistic. While the tanning industry has clearly declined in both cities (in terms of number of plants and overall employment), there is no strong evidence that this decline will actually lead to improved environmental conditions.

As shown in the dissertation, restructuring occurs at and is responsive to multiple scales. Implicit in this observation is a need to match regulatory concerns with the appropriate scale of cognition, organization, time and space (McDaniels, Dowlatabadi et al. 2005). Designing policy responses that just try to mitigate local effects of global problems outside the cognitive scale of the individual firms is a futile exercise. For example, leather trading occurs at the global scale and responds to market forces. However, the way in which local tanneries and shoe manufacturers respond to these global challenges depends on their ability to recognize signals of pressure (Risbey, Kandlikar et al. 1999; Shepherd, Tansey et al. 2006) and implement smart, adaptive strategies at the local level that respond to as many stressors as possible.

A tough but relevant question that arises from this research is, should the Mexican government continue feeding money, subsidies and institutional support into these declining industries? The empirical research in this thesis showed that tannery closures occurred at much higher rates than births. Firms continue to shut down and industries keep going out of business. However, entire cities don't shut down. Displaced workers are able to find ways to obtain new jobs. The cases of central London, the Greater Manchester region and Pittsburgh are but a few examples. Even larger regions like Southeastern Ohio have found ways to continue thriving. Moreover, to make complex decisions, it is key to recognize that firms respond to multiple forces. The case studies discussed in this thesis offer empirical examples of what happens to industries when faced with strategic restructuring choices.

Why maintain an industry under conditions of multiple stresses? The evidence shows that these industries have continued to decline over time, and that despite spurts of growth and firm formation, these two industries are senescent.

Does plant closure mean city death? Documented cases of industrial decline in South East London (Gripaios 1977b), structural change in northeastern Ohio (McKee and Bennett 1987), restructuring in the Hainaut in Belgium (Leloup and Moyart 2003) and the steel industry demise in Pittsburgh (Beeson 2004) show that industries have disappeared and

affected cities have managed to survive. Based on what wass learned throughout the dissertation, we could say that there are opportunities for these cities, particularly with a diverse industrial base and a shift towards a tertiary industry. Nevertheless, smart, coherent industrial policy that accounts for myriad factors when dealing with issues of structural change is called for (see Table 7-2).

If the policy objective of environmental officials is to clean up the downtown urban core and reduce the number of industries emitting pollutants, then giving plants an option to "*remain where they are currently located*" does not make any sense. As discussed in Chapter 4, the municipal government of León recently (2004-2005) began to allow a number of micro-tanneries located in the downtown core to remain. By bending the rules and allowing some tanneries to stay downtown, León politicians would matter-of-factly fail to address environmental goals. This did not occur in Guadalajara, thus showing how zoning regulations were more strictly enforced.

Policy -makers may often want to control structural change and steer it in a certain direction. To achieve this goal, there are a few places where policy interventions can effect some directional change. For example, some authors argue that one intervention governments could undertake is to induce structural change by shifting the location of industries. Following this line of reasoning, Mason suggests that "plant relocation may be the element of industrial change which policy makers and planners can most easily control and direct into their structure plans" (Mason 1980, p. 269). As shown in the case studies presented in this thesis, plant relocation rates to industrial parks were the highest. Nevertheless, relocation will be dependent on the capabilities, financial investments, sunk costs and the desire of individual firms to remain in business or use closure as an exit strategy.

The question one would ask here is, what are the chances that the Mexican leather and footwear industries will suddenly collapse? This is a conceptually challenging question that could be explored through two scenarios: one where there is direct governmental support to protect the industry from decline (as is the case in León) and one where there is no *apparent* governmental support (as in Guadalajara).

Cassing and Hillman find that industry decline leads to *reduced* political support. This finding may appear counterintuitive, for we would expect governments to try and countervail industry decline through subsidies and support. However, these authors find that as a declining industry becomes less relevant as a result of decline, probabilities that firms will suddenly decline and collapse increase. If the process repeats itself, feedback loops lead to what they call a "*downward spiraling*" (Cassing and Hillman 1986).

An example of this is taken from Johnson, who found that despite the fact that the US provided critical financial and technical support to the gum naval stores industries during World War II, the industry declined. He found that this decline was due in part to rising post-war wages, but also reduced yield and value of saw-timber, which therefore favored the production of (higher-priced, more profitable) pulpwood and saw-timber over gum production (Johnson 2000).

In these cases, industries collapse regardless of governmental support. Thus it is clear that one issue we ought to think about is whether this policy intervention to sustain the footwear industry in León is indeed smart. Particularly, it is important to choose appropriate policy options that encourage adaptive strategies by footwear manufacturers and by tanneries.

Is it smart for the Mexican government to respond to intense lobbying from the footwear trade associations? The answer is "maybe not". Brainard and Verdier (Brainard and Verdier 1997, p.221) find that "persistent protection arises whenever lobbying is an alternative to costly adjustment" (the more the industry lobbies, the greater protection it receives and the less it adjusts, and the less the industry adjust, the more effective it is in lobbying next period). It might therefore be inferred that if politicians keep responding to shoemakers' lobbying activities, footwear manufacturers will be less likely to respond with appropriate adaptive strategies that are independent of governmental support.

Finally, while pollution levels in both industrial districts may have been lowered, these reductions have not been the result of stricter environmental regulation, but in fact derive from evolving zoning regulations and shifting patterns of land use towards a more urban, less industrial distribution. Increasing demand for housing has changed the way in which land is viewed, and the relative value of maintaining industrial plants in specific locations compared with building new houses (brownfield redevelopment) decreases.

Table 7-3 Summary of the literature on industrial districts' restructuring highlighting the contributions of this thesis.

Authors	Location	Sector	Pressures studied	Outcomes of structural change	Policy options
Schamp 2000, 2005	Pirmasen (Germany)	Footwear	• Competitive pressure from local and global businesses	Decline of the footwear industrial districts (primarily closures)	None from the government. Five adaptive strategies undertaken by firms.
Schmitz 1995, 2001	Sinos Valley (Brazil)	Footwear	• Competitive pressure from global business	First decline, then revitalization of the footwear clusters	None from the government. Adaptive strategy from business associations and stakeholders.
Van Klink and DeLargen 2001	Netherlands	Shipbuilding	• Competition from local business	Cyclical behavior with periods of decline and then resurgence	None from the government Adaptive strategies from industry associations.
This thesis[95]	León and Guadalajara (Mexico)	Leather and footwear	• Global competition • Environmental regulation • Land-use changes and shifts in land pricing	Decline in both industrial clusters. León's stakeholders fighting to keep the industry. Guadalajara's stakeholders shaping new strategies – diversification and focus on higher value.	Some support from national and sub-national governments. Adaptive strategies primarily from industry associations but in conflict with one another.

[95] For reference see Pacheco and Dowlatabadi 2003, 2005, 2007 and forthcoming publications.

7.7 Contributions to the literature

Table 7-3 offers a summary of the literature analyzed on restructuring of industrial districts. As shown in the table, this thesis is the first examination of multiple stressors on the restructuring of a cluster. Not only is the thesis innovative in the analytical framework (firm demographics and multiple stressors) but it also contributes through the application of this new framework to data that had never been previously gathered.

This thesis provides insights in two areas: urban and industrial restructuring. The city of León decided upon a path that ultimately preserved the cluster as a "core center for leather and footwear" (Pacheco and Dowlatabadi 2003), while Guadalajara chose to diversify (i.e., the degree of specialization in León increased while it decreased in Guadalajara) (Arroyo Alejandre and Velázquez 1992; Pozos Ponce 1996; Cota Yañez 1997b; Pozos Ponce 1997; Cota Yañez and Rodríguez Bautista 2001; Rodríguez Bautista and Cota Yañez 2001).

Three theoretical and empirical insights gained with this thesis are offered. First, this thesis contributes to the (still open) debate on the effects of trade liberalization on the emergence of pollution havens. Since the signing of NAFTA would imply increased possibilities for US or Canadian tanneries to relocate to Mexico, we would expect a pollution haven effect. The empirical findings presented in the thesis do no support this hypothesis. No evidence of foreign direct investment in the tanning industry is found in either case study (León or Guadalajara). Whenever new tanneries were created, local entrepreneurs were the founders. This insight is relevant not only to the literature on pollution havens but also to the body of knowledge on entrepreneurship. While an outsider would question whether it is a smart decision to create a new tannery when the sector appears to be in decline, the evidence suggests that in both case studies, new tanneries found market niches and propitious circumstances to continue operating.

Second, this thesis offers a new understanding of the combined role of zoning policies, land-use changes and land prices in effecting industrial restructuring, both in developing and developed countries. This thesis finds that as demand for residential land increased in both cities, and prices in the downtown core rose, the number of tannery closings increased as well. In León, the few firms that emerged in latter periods located themselves in peripheral regions and industrial parks. However, in Guadalajara, a few tanneries chose to follow a “dormancy” strategy whereby owners would shut down

operations for a brief period of time, until they could 'weather' competition. This "dormancy" strategy warrants further inquiry.

Finally, this dissertation posits that a firm demographics approach to the study of industrial restructuring can help us understand the inherent complexities of structural change. While some researchers focus primarily on firm creation and others examine causes of industrial decline, this thesis proposes that we look at both phenomena simultaneously and not in isolation from each other. An evolutionary approach allows us to gain insight into the mechanisms that firms use to create opportunities to survive. The thesis shows that while in León tanneries chose to use closure as a primary exit strategy, Guadalajara tanneries had a much slower rate of decline and those who exited the industry were primarily traditional leather makers.

Neither the firm demographics approach nor the multiple stressors framework employed in this dissertation have been used in the study of industrial clusters located in newly industrializing countries (in this case, Mexico). Furthermore, new data on firm demographics and environmental regulatory pressure presented in this thesis had not been previously available. Thus this thesis offers at least two modest empirical contributions to our understanding of the phenomenon of restructuring of industrial clusters.

Furthermore, while there has been a substantial change in the international division of labor, it is important to note that domestic policy prescription can influence locational dynamics. Barff and Austen go as far as to say that "[n]ational-level regulatory policies can define the international geography of an industry and can be as powerful an influence on location as is labor" (Barff and Austen 1993, p.111)

7.8 Caveats

This thesis has shed new light on the intricate dynamics of urban/industrial structural change using the leather and footwear industries in León and Guadalajara as case studies. The thesis presents previously unavailable data on environmental regulatory pressure, land prices, concentration ratios of industrial sectors, and firm demographic data. This research has caveats and limitations that are further described below.

The analysis does not single out any specific restructuring driver that can be attributed to the majority of structural changes. We cannot say that the restructuring of shoe factories is due solely to increased competition from foreign companies based primarily in Chinese and South Asian countries. Accordingly, we cannot argue that increased regulatory pressure from local and federal environmental authorities in León drove tanneries to shut down. There is no significant correlation between increasing regulatory pressure (with number of inspections as a proxy) and tannery closures.

The thesis uncovered the influence of indirect environmental regulation in the form of zoning laws. Guadalajara had stricter zoning regulations and much tighter enforcement of these laws. As a result, peripheral relocation was not a feasible adaptive strategy for tanneries. The only other (arguably much more expensive) options were transnational and interregional relocation. Empirical evidence shows that regulators in the Guadalajara metropolitan region did not allow tanneries to relocate even if it was outside the city of Guadalajara (to any of the municipalities in the ZMG). This extreme enforcement of zoning laws also has political and scalar implications. Politically, the municipality of Guadalajara overstepped its authority by not allowing tanneries to relocate to the peripheral municipalities (even if these would allow it). In regards to scale, this case study shows that geographical boundaries become irrelevant when they collide with political interests. If the environmental regulators of the municipality of Guadalajara had allowed relocation of tanneries outside the downtown core, they would have avoided dealing with them in the future ("out of sight, out of mind")[96].

7.9 Future research projects

Future avenues for research may include:

a) *A dynamic analysis of structural change using panel data*. This exercise would require Mexican geographical information and statistics laws (LIEG) to change, or extensive funding from the Mexican government at all three levels (federal, state and municipal

[96] One should bear in mind that if the municipality of Guadalajara needed to coordinate with the remainder of the ZMG, then the issue of tannery relocation would potentially arise and become an issue. However, the argument made here is that tanneries would not be visible to the community and therefore, a NIMBY syndrome could be avoided.

government) to undertake longitudinal surveys through time. This would also require strong support from the firms under surveillance, something that might pose a big problem in a country with a tradition of lacking transparency in information.

b) *Spatial visualization of relocation processes*. This could be an interesting exercise that would contribute to our understanding of how relocation processes work. If the project were to be undertaken in Mexico, the same caution as in a) would apply (making sure that data are available).

c) *Analyses of adaptive processes in interconnected industries*. Risbey and his collaborators devised a typology of adaptation by farmers to climatic change, and showed how "leader" farmers are able to recognize stressors and adapt accordingly (Risbey, Kandlikar et al. 1999). This typology could be further explored applying it to the case of leather tanneries and/or shoe factories.

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Appendix 1. Verification of regulatory compliance at the Federal level

From 1994 to 2000, SEMARNAP functioned under the afore-mentioned dual responsibility framework shown in Figure 2-10. As a result, owners and managers of industrial firms would always have to deal with PROFEPA's inspectors (and never with INE directly, only when they needed information as to which regulation they had violated). PROFEPA's inspectors would review the plant's performance and compliance with environmental regulations set by INE (inspection visit, "*visita de inspección*"). If the results of this inspection indicated non-compliance, PROFEPA's inspectors wrote a memo requesting the firm to show proof that they had basis for such non-compliance and that they were working towards righting their wrong ("*Emplazamiento*").

After reviewing documents ("*Pruebas y alegatos*") supplied by the firm that proved their efforts to be "greener", PROFEPA would submit a "technical opinion" (*Dictamen Técnico*). This technical opinion would assess whether the firm had provided sufficient technical information to prove their environmentally friendly efforts. The administrative resolution ("*Resolución Administrativa*") then would outline what measures the firm would have to implement in order to be compliant again with Mexican environmental law. This administrative resolution would establish a timeline within which the firm would be free from sanctions and inspections. Sometimes, a re-inspection (i.e., verification visit, "*Visita de Verificación*") would be scheduled within the next calendar year (e.g., a tannery would be inspected in 2001 and its compliance with the action plan set in the administrative resolution could be verified in 2002).

The coordination between INE and PROFEPA at all levels (federal level and within each State office [*Delegación*]) has historically been somewhat troubled and miscommunications have occurred rather frequently. As a result, discussions between INE and PROFEPA officials frequently resulted in conflicts of jurisdictional powers.

Despite the reorganization of SEMARNAP into SEMARNAT in 2000, the "environmental police officer" role remained with PROFEPA. However, the regulatory function was absorbed into SEMARNAT's Sub-Secretariat of Environmental Regulation

(*Subsecretaría de Fomento y Normatividad Ambiental*). Also, the inspection and verification procedure has remained unchanged since 1992, when PROFEPA was founded[97].

Empirical evidence gathered during fieldwork shows that fines are much smaller than the cost of wastewater treatment. Fines are as low as the equivalent of $ 50 USD.

[97] PROFEPA was originally founded in 1992, and became an agency under the jurisdiction of SEMARNAP in 1994. Between 1992 and 1994, PROFEPA was ascribed to the Secretariat of Social Development (SEDESOL), with pretty much the same mandate, but somewhat more limited powers.

Appendix 2. The leather and footwear manufacturing processes

This appendix is intended to briefly depict how leather and footwear are made, and the environmental effects that these processes have.

The leather making process (and its environmental effects)

The process of transforming raw hides from animals (bovine, sheep, etc.) into leather is called tanning. For each end product, the tanning process can be very different, and the amount of waste produced may vary enormously. The term "tanning" generally implies the whole leather production process (and not only the actual process of transformation of hide into tanned leather). There are approximately 14 steps in the transformation of a hide to finished leather. These steps are clustered in four stages: beam-house, tanning, wet finishing and dry finishing. The three first stages are "wet", i.e., processes that involve the use of water as a carrier of chemical products or to cleanse the hide. The last stage is "dry" in the sense that it doesn't involve the use of water as a transport medium for chemicals into the hide. Figure A-1 shows a simplified version of the tanning process. A broader overview of the process can be found in Thorstensen (1997).

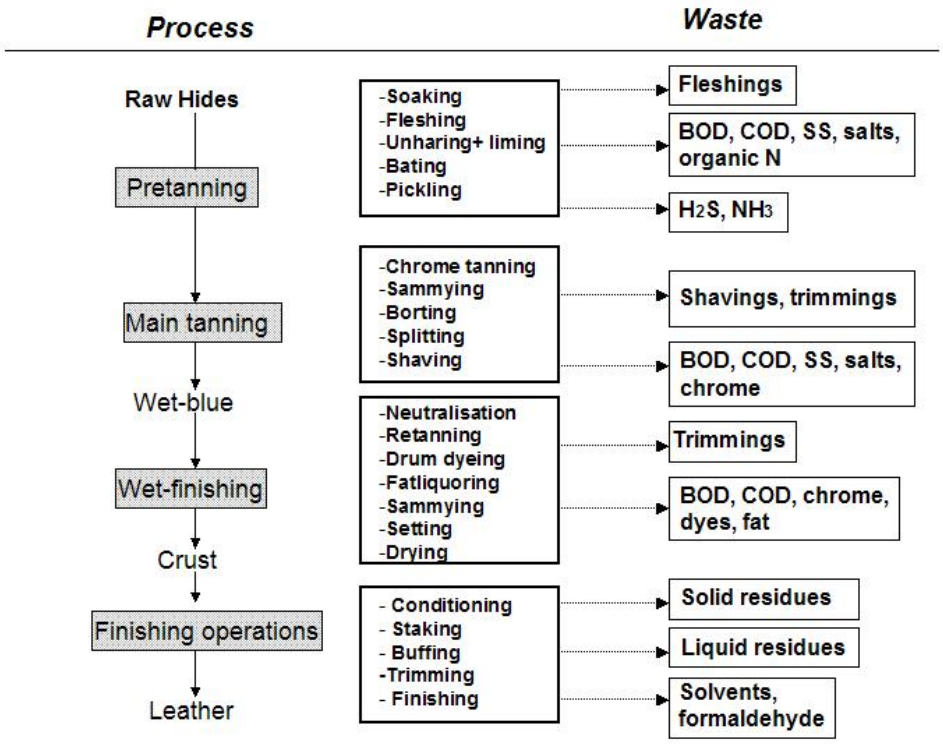

Figure A-1. A schematic view of the leather tanning process.

The footwear manufacturing process (and its environmental effects)

Footwear has long been associated with leather manufacturing as the consumer preference for full-leather (leather upper and sole) footwear was strong until recently. According to the Footwear Industries of America's historical review of footwear, until the latter half of the nineteenth century, all shoes were made by hand (Schachter 1983). By 1858, the invention of a sewing machine to attach soles to uppers triggered high mechanization of the footwear industry. This section will provide a very brief review of footwear manufacturing. Of particular interest are the materials used to manufacture shoes and the different processes to adhere soles to uppers, given the broad variety of materials available that said uppers and soles can be made from. Figure A-2 depicts the parts of a standard men's shoe.

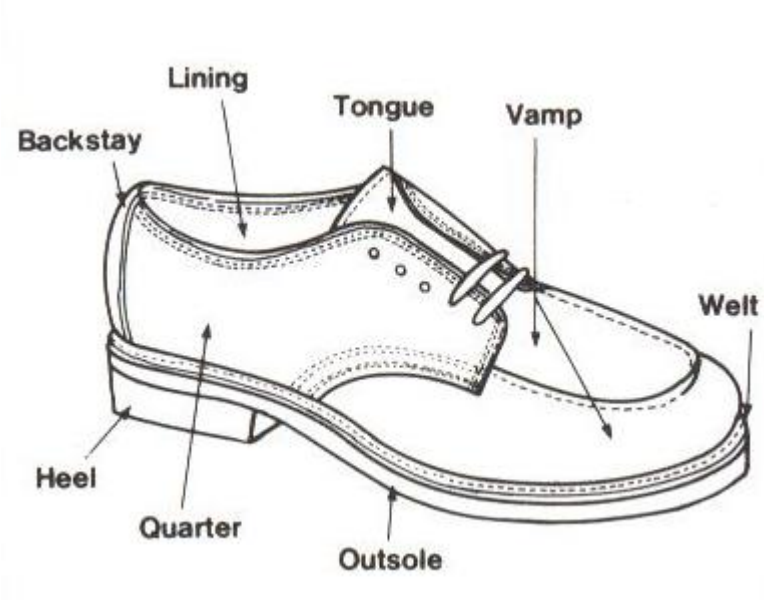

Figure A-2. Parts of a shoe (Source: Schachter 1983)

The upper is constructed by assembling a vamp (which covers the toes and front of the foot) and the quarters (which cover the back portion of the foot). Sometimes, uppers can have linings that cover the inside of the upper. The insole lies on the inside of a shoe, directly beneath the foot. Insoles prepared for use in welted construction have a fabric rib to which the welt is stitched. Welts are attached to the upper and insole and then become the anchor point for the outsole. Usually stitching does this process, although sometimes welts can be attached with cement. Soles are the layers of material that cover the bottom of the shoe, and can be made of a diversity of materials (leather, rubber, plastic, etc.). The heel is the part of the shoe that carries the weight of the foot's heel, and can be made of a variety of materials, too (most often wood, plastic, rubber, etc.) (Harvey 1983).

Appendix 3. UBC Behavioral Research Ethics Board Certificate of Approval

A scanned copy of a letter indicating that the research presented in this thesis had a Certificate of Approval by UBC BREB is shown in this page.

THE UNIVERSITY OF BRITISH COLUMBIA

Research Ethics, Office of Research Services
[illegible] Agronomy Road
Vancouver B.C. [illegible]

Phone: [illegible]
Fax: [illegible]

November 12, 2009

Faculty of Graduate Studies
180-6371 Crescent Road
Vancouver, B.C. V6T 1Z2

To whom it may concern

Re: **B02-0511 Title: From "Wet-Blue" to "True-Blue": An Integrated Assessment of the Mexican Leather and Footwear Industries' Restructuring under Simultaneous Market and Environmental Pressures**

Principal Investigator: Dr. Hadi Dowlatabadi
Co-Investigator: Mr. H.H. Pacheco-Vega

This letter will confirm that the above noted study was reviewed by the Behavioural Research Ethics Board at the September 12, 2002 meeting and approved on October 9, 2002. The file was archived on site in September 2004.

Mr. Pacheco has informed me that he used a different title on his thesis; i.e. "An integrated assessment of the effect of environmental regulation, trade changes and market forces on the Mexican leather and footwear industries" but I am satisfied that these titles refer to the same study.

Sincerely yours,

Shirley Thompson
Manager, Behavioural Research Ethics Board