

Section Three

ECONOMIC AGGLOMERATION AND INDUSTRIAL CLUSTERING IN DEVELOPING COUNTRIES: THE CASE OF THE MEXICAN SILICON VALLEY

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INTRODUCTION

Economic agglomeration is a ubiquitous phenomenon that has been studied for more than a century by geographers and a rather narrow slice of economists that have been intrigued by the way production and commercial activities tend to concentrate in certain points of national territories over time. In recent times, in the last decade or so, some noted members of the mainstream economics profession have discovered the geographic dimension of economic processes and have thus focused their attention on the where and why of these processes, and specifically on the concentration of businesses and industrial plants in given regions and locales. It was a member of the scholarly business profession, however, who produced a theory that has become the conventional wisdom for the study of industrial clustering the world over, namely Michael Porter.

Economic agglomeration in general, and industrial clustering in particular, tend to adopt different modalities according to the specific characteristics of the country or locale in question. Some basic, common elements remain, though, across locations and cases, which reveal recurrent patterns and permit the analyst to discern lessons and principles that can be useful for both advancing knowledge on and formulating policy guidelines to orientate new or ongoing processes of cluster formation in other latitudes. The aim of this report is to examine those phenomena by discussing some of the most influential theoretical accounts that have been developed to explain them with an eye to evaluate their relevance for developing countries. To this end, the case of Guadalajara, Mexico is analysed in detail, where a major electronics industrial cluster emerged and has developed in the last decades, which has led this city to be dubbed the Mexican Silicon Valley in national and international circles. This Latin American case is contrasted with others in East Asian developing countries as reported by Kuchiki and Tsuji (2004) and summarised in the prototype policy framework developed by Kuchiki (2004).

This report departs from the premise that Porter's widely accepted, but seldom critically evaluated, theory should be systematically assessed in order to learn about its limitations and intellectual inheritances from earlier theories of economic agglomeration and in this way to discern its actual explanatory and predictive capabilities and its true potential for strategy and policy formulation. The idea is to see through the halo of infallibility often assigned to it and thus to properly dispel the quasi magical powers usually granted to the policies it inspires. A derived premise is that industry clusters are not necessarily infallible either, as equivalent notions that were equally in vogue in previous decades failed to deliver the results they promised. Localised industrial formations are manifestations of the economic forces at play in a given national setting at a given point in time; theories reflect the realities of each epoch and provide both explanations and a set of concepts that take account of and represent the formations that arise in each case. Thus industrial complexes, industrial districts, and industrial clusters have been germane to a given historical period in which a given economic order and a related theoretical framework akin to each prevailed.

First, the main theories on economic agglomeration and industrial clustering are reviewed with the purposes of placing them in historical perspective and identifying their mutual influence and intellectual roots. The utility of theoretical formulations for policy making are considered in a second chapter, where the basic ingredients and rationale of a cluster development policy are also identified. Then, the case of Guadalajara is examined in detail discussing the extent to which it conforms to both the theories analysed and the East Asian prototype. Finally, some concluding remarks are presented and an overall analytical framework is derived, which is intended to serve as a contrasting instance *vis a vis* that prototype and to be useful in the design of cluster development policies and strategies in developing countries in general.

CHAPTER I THEORETICAL FRAMEWORK

Early Location and Economic Agglomeration Theories

For over a century, geographers and economists have sought to explain the distribution of economic activities over the geography of countries and regions. From Johann Heinrich von Thünen, August Lösch, and Alfred Weber, through Andreas Predöhl, Oskar Engländer, Hans Weigman, and Tord Palander, to Bertil Ohlin and Edgar M. Hoover, all sought for general explanations and in so doing formulated the theories that contain the essential elements for the understanding of economic agglomeration as an universal phenomenon.

In a seminal formulation, Alfred Weber (1929) identified three fundamental location forces: transport cost differentials, labour cost differentials, and agglomeration economies and diseconomies. Building on Ohlin's (1933) influential insights on international and interregional trade theory, Hoover (1937) classified Weber's third location force—agglomeration—into large-scale economies, localization economies and urbanization economies. Large-scale economies obtain upon the expansion of the scale of production of a firm in a given location, while localization economies do so upon an increase in the output of all the firms in a given industry in a given location. Finally, urbanization economies accrue to all firms in all industries emplaced in a given locale as a result of the enlargement of the economic size (population, income, and output) of that locale.

In what constituted the first comprehensive and systematic attempt at a general theory of location, Walter Isard (1956) noted that the successive influences of scale economies, localization economies, and urbanization economies determine the location of production activities. Later on, in a series of works in which he developed what he called industrial complex analysis (Isard and Vietorisz, 1955, 1959; Isard, 1960), Isard elaborated upon Hoover's formulation and detailed that localization economies obtain when plants of

similar or related character (generally within a given industry) come together on a particular location; in this case, such economies stem from the exploitation of a common resource pool or from a fuller, joint utilization of specialized facilities and infrastructure. In turn, urbanization economies are generated when plants of different nature concentrate in a given site and so are “spatially juxtaposed rather than geographically separated” (Isard, 1960: 404). These economies obtain when the products of one plant in some industry are used as inputs in a different industry but emplaced in the same location. In addition, Isard observed, urbanization economies include other, more intangible advantages such as administrative economies and other savings in indirect production costs, a finer articulation and coordination among the successive stages of the production process, more effective quality controls, and an improved attitude toward work and other welfare gains.

Since urbanization economies combine in practice with localization economies, Isard dubbed the set as “spatial juxtaposition economies”. This concept proved essential for the study of industrial complexes, which constitute a significant predecessor of what would subsequently be called industrial districts and industrial clusters.

All the above formulations were cast within the general framework of neoclassical economics, as all assume an economic landscape populated by rational economic actors who seek to maximise their utility or else their profits or corporate gains, an approach that was embraced and elaborated upon by the proponents of the new hybrid field of regional science of which Walter Isard was the founder and leading figure (Isard, 1960; 1998; 2003), and from where Isard and other numerous practitioners have contributed to the development of location and agglomeration theories for half a century.

Some Contemporary Advances in Agglomeration Theory

Some of the most influential accounts of agglomeration theory in recent times have been made from within the broader field of the so called “new economic geography”. These accounts have gone beyond the limitations of neoclassical economics and so have acknowledged both the geography of economic processes and the imperfect way competition actually takes place in domestic and international markets. The seminal orientations in this field were contributed by Masahisa Fujita (1988),¹ Anthony Venables (1996), and Paul Krugman (1991a; 1991b; 1995), who acknowledged the prevalence of imperfect—monopolistic and oligopolistic—competition in real markets and the fact that market processes could by themselves generate the increasing returns that give rise to the external economies of agglomeration.

Other major contributions have been made from other emerging hybrid fields such as economic geography proper (e.g., Alexander, 1963; Lloyd and Dicken, 1990), geographical economics (e.g. Brakman, 2001), and industrial geography (Harrington and Warf, 1995; McCann, 1998; Hayter, 1997).

In a recent and influential book Fujita et al. (2000) pointed out that the new economic geography—the study of where economic activity takes place and why—constitutes “the fourth wave of the increasing-returns revolution in economics” (2000: 2-3), the other waves being previous attempts at sidestepping the difficulties posed by increasing returns for economic modelling in the fields of urban economics (central place theory) and urban systems analysis (assuming increasing returns as a black box). Fujita et al. hold that the crucial point is to model the sources of returns to spatial concentration in order to learn how and when they may change and thus explore how the local economy changes its behaviour accordingly.

¹ Professor Fujita was a noted member of the Department of Regional Science founded by Walter Isard in 1958 at the University of Pennsylvania and closed down in 1993.

In a more recent work Fujita and Thisse (2002) further elaborated on monopolistic competition models focusing on the “economic”, as distinct to the natural, mechanisms that beget agglomeration, taking due account of increasing returns to scale, Marshallian externalities, and mobility costs. In that context, Fujita and Thisse examined industrial agglomeration under monopolistic competition using a core-periphery model following Krugman’s (1991a) original formulation. They concluded that the spatial configuration of economic activities is, ultimately, the outcome of a complicated balance between forces that “pull (agglomeration) and push (dispersion) consumers and firms into and out of particular locales” (Fujita and Thisse, 2002: 5).

Ottaviano and Thisse (2003) in turn argued that the existing imbalances in the spatial distribution of population and economic activities have two possible explanations: 1) that such imbalances are the result of the uneven distribution of natural resources, known as “first nature”, which are unable to provide a reasonable explanation of clusters much less dependent on resource endowments; and, 2) that the imbalances are the outcome of the myriad actions of human beings aimed at improving upon natural advantages or disadvantages to abate geographic imbalances, referred to as “second nature”. The point is to identify the economic forces that account for “second nature” after controlling for “first nature”.

Ottaviano and Thisse dubbed core-periphery and monopolistic competition models generically as “new economic geography models” (NEG), as they probe into the interplay among imperfect competition, plant-level returns to scale and the associated pecuniary externalities. The main contribution of NEG models, they hold, has been to knit together the legacy of early location theories which they summarise in five points that correspond to NEG’s main ingredients, focusing on pecuniary rather than technological externalities. On that basis, they argue that “*what was missing was a general equilibrium framework with*

imperfect competition connecting these various insights and allowing for a detailed study of their interactions” (Ottaviano and Thisse, 2003: 12, italics are the authors’), a point Krugman (1991a) failed to acknowledge.

One of the legacies of classical location theory stressed by NEG models is that agglomerations are the outcome of cumulative processes and that, consequently, *“the space-economy has to be understood as the outcome of the interplay between centripetal and centrifugal forces*, an idea put forward by geographers and regional scientists long ago, [but now] *within a general equilibrium framework accounting explicitly for market failures*” (Ottaviano and Thisse, 2003: 12, italics are the authors’). Fujita et al. (2000) had reached a similar conclusion in the sense that “the dramatic spatial unevenness of the real economy...is surely the result not of inherent differences among locations but of some set of cumulative processes, necessarily involving some form of increasing returns, whereby geographic concentration can be self-reinforcing.” (p. 2).

Although in a footnote, Ottaviano and Thisse acknowledged that their conclusions in fact correspond to ideas advanced in “early regional development theories” such as Gunnar Myrdal’s, and that Krugman had done so since his early works in economic geography. Fujita et al. (2000) did not acknowledge explicitly such intellectual debt either for the same reason, although they included a section on “Linkages and Circular Causation” in the Introduction of their book; they only acknowledge as antecedents the neoclassical traditions of urban economics and regional science.

In any event, the fact is that they all drew on the principle of circular and cumulative causation propounded by Myrdal (1957) and endorsed by Albert Hirschman (1958), whose works, along with those by Francois Perroux, led to the emergence of the so called unbalanced theory of growth. In this regard, it is important to point out that the concept of growth poles formulated by Perroux (1955), which he defined as a concentration of dynamic

innovative enterprises that generate propulsive effects both upstream and downstream along the production chain of a given industry and so is capable of generating growth, gave rise to heated academic debates and was a standard guide for development policy design in most developing countries for almost three decades. The point is that this concept contained some of the basic ingredients of the later notions of industrial complexes and industrial clusters, as will be discussed later on; actually, a growth pole is in rigour an industrial complex.

Other important element in the new theories of economic agglomeration is the role of production networks. Already in the late 1980s, when Silicon Valley was still regarded as an industrial district, Saxenian (1989, 1990) pointed out the importance of production networks for Silicon Valley to build its ability to overcome the crisis of large semiconductor firms in the 1970s and launch a new wave of sustained growth. She stressed the crucial role played by the formalisation of the incipient networks inherited from their predecessors by the hundreds of semiconductor start ups that spawned in the region after the crisis through the establishment of long-term relationships (strategic alliances, partnerships, and contracts) with suppliers, customers and competitors, most significantly with specialised contract manufacturers through outsourcing arrangements. All this gave rise to a process of collective learning and “reciprocal technological upgrading” in the Valley: “Local firms are organizing themselves to learn with their customers, suppliers and competitors about what to make next and how to make it” (Saxenian, 1989: 19). She thus documented key features such as the Valley’s “industrial atmosphere” and the inter-firm networking and cooperative competition occurring within its confines, which turned out to be crucial in the case of what is known today as industrial clusters.

More recently, Nicolini (1998) viewed industrial districts as network structures where “the real and inner agglomerating force” is the possibility of exploiting the advantages of inter-firm coordination and of sharing the know-how accumulated in the district. Johansson

and Quigley (2003) in turn argue that since agglomeration refers to single points while networks refer to nodes and the links connecting those nodes, “networks among economic actors dispersed over space may act as a substitute for the agglomeration of actors at a single point, by providing some or all of the utility gains and productivity increases derived from agglomeration” (Johansson and Quigley, 2003: 2). This occurs when spatial proximity is unfeasible and its derived external benefits can not be realized. In this case, networks reduce the effective distance between nodes, reducing transaction (or transport) costs which would otherwise be prohibitive. “This...means that small regions may survive and prosper, to the extent that networks can substitute for geographically proximate linkages, for local diversity in production and consumption, and for the spillouts of knowledge in dense regions” (Johansson and Quigley, 2003: 19).²

Another related factor stressed by contemporary theorists as also playing a major role in agglomeration processes are innovation and knowledge flows. Basant (2002) showed how the generation and dissemination of knowledge fosters the dynamism for industrial clusters. Likewise, Asheim and Isaksen (1996) emphasised that innovation is often a territorial phenomenon, i.e. innovation processes are in part based on formal and tacit knowledge, norms and institutions that are place-specific. On that basis, they argued for what they call regional embedded innovation systems composed of small and medium-sized enterprises. Other authors like Howells (1996) observed in turn that accessibility, economic agglomeration, and the presence of externalities jointly exert a powerful influence on the generation of knowledge flows, learning and innovation, and that this often occurs in regional settings.

² There is an extensive literature on industrial networks and the economics of networks, which provides the theoretical support for their role in the formation, functioning and development of industrial districts and clusters (e.g. Axelsson and Easton, 1992; Johansson et al., 1994; Economides, 1996). The latter author discusses positive consumption and production externalities, called network externalities, which he identifies as stemming from the fact that the value of a unit of a good increases with the expected number of units to be sold. In this way, “the demand slopes downward but shifts upward with increases in the number of units expected to be sold” (Economides, 1996: 678).

Those contributions are part of the extensive literature on innovative milieux (e.g. Camagni, 1995; Konstadakopoulos and Christopoulos, 1998; Maillat, 1991; Malecki, 1997), regional innovation systems (e.g. Cooke and Morgan; Cooke, 2001; Breschi and Malerba, 2001), knowledge-based theories of agglomeration and clustering (e.g. Maskell, 2001; Malmberg and Maskell, 2001), and innovative clusters (Hart, 2000). All of these concepts and theories allude to characteristics of dynamic regions like Silicon Valley, as documented by Saxenian, and 19th century English industrial districts, as observed by Marshall, as will be discussed in the next chapter.

For the time being, and as the foregoing discussion shows, it can be said in general that agglomeration theory has been enhanced and developed beyond its original neoclassical moulds in order to take account of factors that become more evident when the geographic dimension of economic processes is acknowledged such as imperfect competition, increasing returns to scale, the role of production and social networks, the decisive role of “second nature” location factors, and, the role played by innovation and knowledge creation.

In general, both traditional location theory as well as early and recent agglomeration theories, particularly those within the New Economic Geography field, constitute the seedbed for the vast knowledge that has been produced over the last half a century on the main formations through which agglomeration processes have materialised over the territory of developed and developing countries alike. Such formations and the concepts they go by will be discussed in more detail in the next chapter in order to pin point their most salient features and underlying rationale, as well as the theoretical issues and concepts that specifically apply in each case.

Theories of Industrial Clustering

Industrial Complex Analysis

The term industrial complex and its related concept gained currency in the 1950s and both were widely studied and discussed through the 1970s and 1980s by regional scientists, geographers and development economists who tried to explain the emergence of large assemblages of industrial plants and related production units and installations in certain locales in countries around the world. Walter Isard defined an industrial complex as “a set of activities occurring at a given location and belonging to a group (subsystem) of activities which are subject to important production [technological], marketing, or other interrelations” (Isard, 1960: 377). He then argued that “locational interdependence” is the glue that binds the complex together.

From that perspective, an industrial complex may comprise the various stages in the manufacture of an end product or class of end products, and emerge out of the joint production of two or more commodities using a single class of raw materials, form around a single but relatively broad industrial process, develop from a group of activities revolving around a single end product or service such as housing or clothing, or else emerge from the production of two or more goods which may or may not enter into the production of intermediate goods but which may combine to form two or more end products. Isard insightfully observed that since all economic activities are interrelated, the selection of a given group of them is justified only upon the fact that the rest bear relations of small order with that group of activities and so “can justifiably be ignored” (Isard, 1960: 378). In his view, the pattern of industrial complex formation (one single complex, two or more complexes) depends on the degree of geographic spread of the relevant markets and sources of raw materials.

For other analysts like Czamanski and Czamanski (1977) and Czamanski et al. (1974), the concept of industrial complexes as such was devoid of any spatial connotation, as it alluded basically to “a grouping of industries endowed with an internal structure”. More generally, though, they defined an industrial complex as “a group of industries connected by flows of goods and services stronger than those linking them to other sectors of the economy....showing in addition a significant similarity in their location patterns” (Czamanski and Czamanski, 1977: 93-94). These patterns are only partially explained by inter-sectoral flows of goods and services among the industries forming a cluster, for these flows account for only a small part of income multipliers effects in an open region, housing and construction activities playing a much larger role.

In any event, the Czamanskis concluded that industrial complexes appear as the core of the spatial organization of industries, and observed that an industrial complex is ultimately “a subgroup belonging to an industrial cluster” (Czamanski and Czamanski, 1977: 94), thus implying that clusters can be defined on either a geographic or a functional basis.

By the end of the 1990s, both the figure of the industrial complex and its underlying concept were still in vogue and under discussion. Although the concept has remained largely unchanged in its basic connotation, analysts like Prochnik (1998) added new dimensions to it which got it closer to the notions of industrial districts and clusters. He defined industrial complexes as “blocs of industries strongly interlinked and which maintain only weak links with other industries” (Prochnik, 1998: 15), a definition quite similar to that issued by the Czamanskis two decades earlier. Nonetheless, and building upon the work of Erber (1985), Prochnik introduced the notion of technological paradigm which contains the idea of innovation clustering, concluding that industrial complexes develop out of the growth and interdependent evolution of the industries that produce the originating innovation. In consequence, he views them as a group of industries with similar technological bases, in

which technological flows result in an interdependent dynamic between firms (Prochnik, 1998), a feature close to those identified today in regional innovation systems.

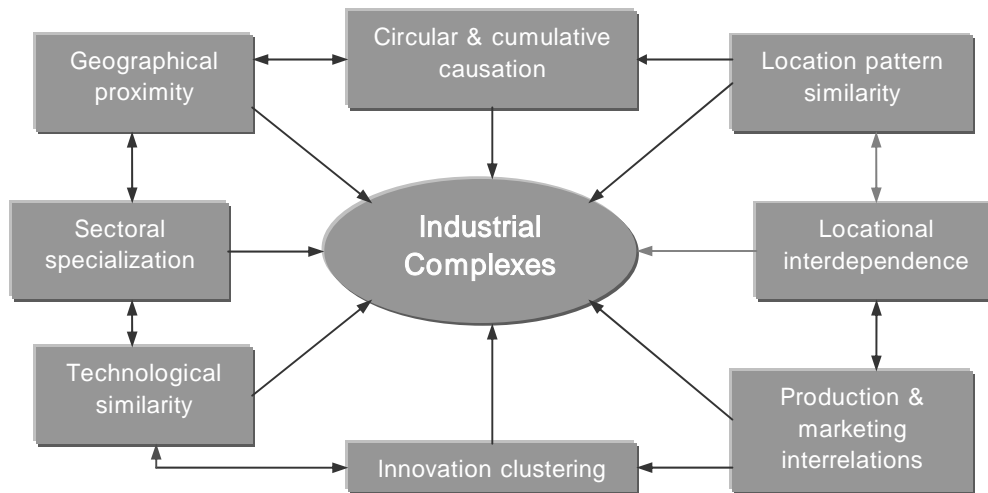
The term is still used today in government circles for promotion policy purposes. A significant case is that of the Osaka Prefecture in Japan, which presents all its portfolio of industrial and science parks and towns under the heading of “industrial complexes” (www.pref.osaka.jp/ritchi/english/support/complexes/index.html).

In sum, from a theoretical viewpoint, industrial complexes are localised industrial agglomerations with characteristics similar to those ascribed to industrial districts and clusters, although they were cast in a conceptual mould corresponding to a given epoch of industrial development where mass production, vertical integration and a brick-and-mortar economy prevailed, and the unbalanced growth theories of Gunnar Myrdal, Albert Hirschman, and Francois Perroux were in vogue. Actually, Perroux developed the concept of growth poles influenced by the work of Joseph Schumpeter on disruptive economic change and the effects of innovations on growth processes.

In that regard, Cooke (2001) significantly observed that “Perroux’s contribution was to highlight the economic geography of what Dahmén...called ‘development blocks’ or what are also known nowadays as clusters” (2001: 950).³ The point is that, as shown above, the ideas about industrial complexes were all influenced by Myrdal’s (1957) principle of circular and cumulative causation, a circumstance that also applies to subsequent theories of industrial clustering and even entire fields such as the new economic geography, as will be discussed later on. For the time being, Chart 1 summarises the foregoing discussion and illustrates the determining factors of industrial complexes.

³ The concept of development block refers to epochal technological innovations such as steam power, electricity or the telephone, which create the incentives and the conditions for the renewal of the entire industrial structure. The development block contains the seeds for a new structural crisis and the launching of a new period of technological innovation (Dahmén, 1970; 1988).

Chart 1
Driving Factors of Industrial Complex Formation and Development



Source: Assembled by the author

The concept of growth poles and the principle of cumulative causation are still in circulation today, as illustrated by the documents of the Barcelona Field Studies Centre, whose members hold that agglomeration forces tend to encourage the concentration of industrial activity via cumulative causation, as spatial concentration creates an environment that encourages this process. Thus, as it develops industrially, a region becomes a growth pole which leads to further innovation and to the attraction of new linked industries ([geographyfieldwork.com/ CumulativeCausation.htm](http://geographyfieldwork.com/CumulativeCausation.htm)).

Industrial District Theory

Alfred Marshall's seminal insights on industrial localisation and economic glomeration (Marshall, 1930) are the single most significant influence in the literature on industrial districts, as well as in Weberian and neo-Weberian location theories developed from the early 20th century onwards.

Marshall identified as the main causes leading to the localization of industries: the climate, the natural resources a region is endowed with, the preference of members of the

ruling class for particular places where they wanted certain goods produced, the role of chance, and the occurrence of particular accidents. On this basis, he defined the rationale for industrial agglomeration as follows:

“When an industry has thus chosen a locality for itself, it is likely to stay for long: so great are the advantages which people following the same skilled trade get from near neighbourhood to one another. The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. And presently subsidiary trades grow up in the neighbourhood, supplying its traffic, and in many ways conducing to the economy of its material (Marshall, 1930: 271).

In this way, factories tend to concentrate in “the outskirts of large towns and in manufacturing districts in their neighbourhood”, where the most advanced machinery (i. e. the latest technological innovations) could be used economically and a dynamic labour market is created in which the localized industries benefit from an abundant supply of skilled workers that flock into the district. In that context, Marshall identified the two fundamental opposing forces that govern geographic concentration of economic activities and are still invoked by contemporary theorists: the cheapening of means of communication and the facilitation of the interchange of ideas between distant places (agglomeration), and the increase or sophistication of migration flows of people and skilled workers (dispersion).

He then posited that “the full economies of division of labour” can be obtained: 1) by the concentration of large numbers of small businesses in a locality and the increase in their output (external economies); and, by an increase in the scale of the firms concentrated in that locality (internal economies), which lead to increasing returns to scale. External economies can be negative or positive, static or dynamic, pecuniary or technological, and are associated with technological innovation, economic specialization, and an increased division of labour.

As it is apparent, the above features are essentially similar to the mechanisms that were later attributed to both industrial districts and industrial clusters. In particular, the passage quoted above contains the essence of Marshall’s insights that led to the concept of

“industrial atmosphere” in contemporary accounts, which refers to “...the collective aspect of knowledge creation and diffusion, which is the hallmark of the Marshallian industrial district” (Amin, 1994: 65). More broadly, this concept alludes to the process of an area becoming into “a centre of knowledge creation, inventiveness, entrepreneurial capability and information dissemination within a given global industrial *filière*” (Ibid.), which has to do with another fundamental characteristic of industrial districts, namely the need to achieve a substantial degree of local specialisation along a given value chain but reaching beyond the locale in question so as to ensure a sufficient market for its output.

The other fundamental characteristics of industrial districts are: 1) a detailed division of labour that leads to product specialisation and to an integrated production system; and 2) “institutional thickness”, i.e. a set of institutions and organisations (trade associations, innovation centres, government agencies, universities, training centres, marketing boards) that support industrial activity and provide coordination, collective representation and conditions for mutual trust (Amin, 1994).

The observation that an industrial district needs to be part of a global production network had already been made by Amin and Thrift (1992), who argued for the transformation of traditional industrial districts into neo-Marshallian nodes of global production networks, a condition that is generally regarded as characteristic of industrial clusters.

Nadvi (1994) endorses Amin’s observations by noting that Marshall’s original view of industrial districts had been extended by recognizing the pivotal role played by local governments and industry associations, placing a greater emphasis on the respective socio-political milieu, and by stressing inter-firm cooperation and user-producer interactions as well as the resulting gains in innovation and technical learning. Nonetheless, he regarded inter-firm networking as the core ingredient of districts, and saw sector-specific clusters of

small firms as constituting “an essential building block of an industrial district” (Nadvi, 1994: 194). Other key ingredients are: the web of social relations that “tie firms together...and provide the basis for relations of trust and reciprocity necessary for the smooth functioning of network arrangements”; the web of competition and cooperation relations that are established among firms clustered in the district; and the flock of ancillary and support industries that come into the district and provide inputs and services vital for its operation (Nadvi, 1994). Basant (2002) added knowledge flows as another essential ingredient of industrial districts, which equally apply to industrial clusters.

Other authors like Harrison (1991), Scott (1988; 1992), Piore and Sabel (1984), Brusco (1990), and Becattini (1991; 2004) among many others, also focus on specific features and properties of industrial districts. Cooke (2001) in particular praises the “non-linear, decentralized and heterarchical” approach epitomized by the industrial districts of the “Third Italy” as superior to the “linear, centralized and hierarchical” conceptual schemes related to growth poles and technopoles” (2001: 950).

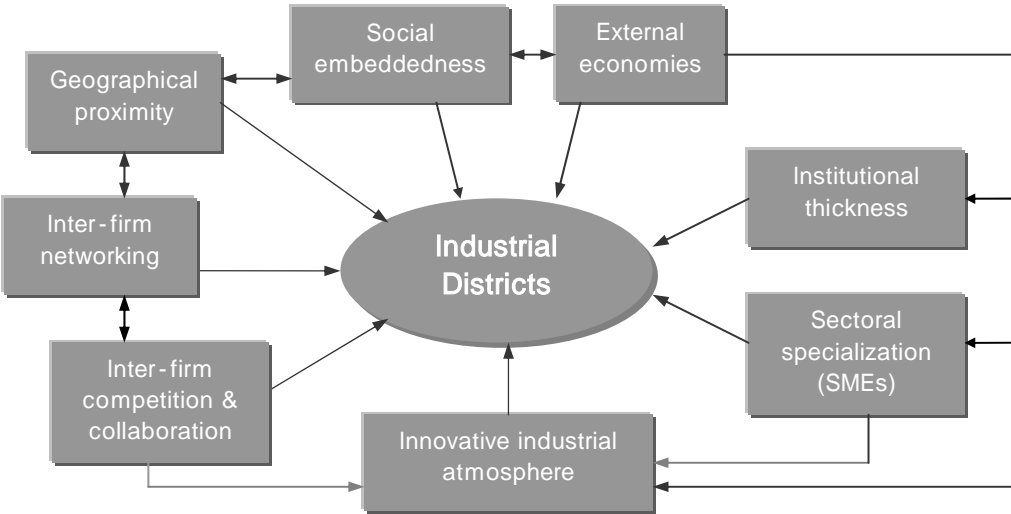
Ultimately, a district is “A highly geographically concentrated group of companies that ‘either work directly or indirectly for the same end market, share values and knowledge so important that they define a cultural environment, and are specifically linked to one another in a complex mix of competition and cooperation’” (Bergman and Fesser, 1999: 67, citing Rosenfeld, 1995), which amounts to something quite similar to an industrial cluster, as will be discussed in the next section.

Above all, however, the most distinctive feature of industrial districts is their inherently geographic character which is implicit in the noun “district” itself, as distinct from “cluster” which is in turn of an inherently functional, non-territorial nature. Such geographic character implies a notion of embeddedness and the prevalence of agglomeration economies which stem from the socio-cultural factors that make up both the social milieu and the

“industrial atmosphere” of the locale in question thus nurturing mutual knowledge and trust relations, two ingredients that reduce transaction costs and foster industrial clustering.

Chart 2 summarises the essential elements of industrial districts, which are not very different from those of industrial clusters, as will become apparent in the next chapter.

Chart 2
Driving Factors of Industrial District Formation and Development



Source: Assembled by the author

Industrial Cluster Theory

As it is widely accepted, what is known today as cluster theory was originally formulated by Michael Porter in his seminal work on competitive advantage (Porter, 1990). The concept of competitive advantage and the theory that Porter built upon it were a major departure from the doctrine of comparative advantage originally propounded by David Ricardo in the early 19th century, on which early location and agglomeration theories were based. As a result, right from the outset his ideas detached themselves from the theories of agglomeration explicitly or implicitly based on Ricardo’s doctrine.

Porter’s original and central concern was to identify the conditions in which firms can become and remain competitive and thus succeed in international markets, this being a

condition for nations to become competitive themselves. He concluded that in order to succeed firms have to base their strategies on permanent improvement and innovation, a resolute willingness to compete, and a realistic understanding of their national and local environments, the latter playing a crucial role in the process.

In that context, Porter conceived his famous “diamond” of interrelated and interacting factors determining the potential for a country to succeed in international markets in given industries.⁴ From there, he argued that “The systemic nature of the ‘diamond’ promotes the clustering of a nation’s competitive industries” (Porter, 1990: 148-149), and that “The phenomenon of industry clustering is so pervasive that it appears to be a central feature of advanced economies” (1990: 149), a process that works best when the industries involved are geographically concentrated.

Although Porter refers to external economies as a key aspect of competition and holds that “their strength is heightened by geographic proximity” (Porter, 1990: 144), he does not elaborate on the way they operate in clusters. He conceives of clusters as groups of “industries related by links of various kinds” that act as self-reinforcing systems, for after one forms the clustered industries make up a mutually supporting whole where “benefits flow forward, backward, and horizontally” (1990: 151), and becomes more than the sum of its parts, having in addition the capacity to expand given that “one competitive industry begets another”. He argues that concentration is further induced by the tendency of spin-offs and suppliers of both the clustered industry and related industries to locate near the original company. The concentration of rivals, suppliers, and customers, Porter continues, fosters efficiency and specialisation, a thesis very close to the tenets of both industrial districts and complexes.

⁴ Factor conditions (production factor endowments); demand conditions (the nature of domestic demand for the goods or services in question); related and supporting industries (presence of absence of suppliers and complementary activities); firm strategy, structure and rivalry conditions (how firms are created, organized and managed).

As it is apparent, Porter's original theory refers to export-oriented firms or else to multinational corporations and their subsidiaries in developed countries, as they are the ones engaged in international competition and so the most likely to become competitive in international markets. In effect, he believes that as more national industries are exposed to international competition "the more pronounced the movement toward clustering will become" (Porter, 1990: 152).

In two more recent works, Porter (1998; 2000) elaborated on his concept of clusters by making explicit that although location today remains fundamental to competition it is so in a qualitatively different way than a generation ago when competition was driven chiefly by input costs and place-specific comparative advantages and so mainly related to resource endowment. Then Porter rightly argues that the factors that determined clustering in previous periods have seen their influence diminished under globalization and with the emergence of an increasingly complex, knowledge-based economy. Competition is now dynamic as companies may compensate for input cost disadvantages by sourcing in global markets thanks to the advances in transportation and communication and the derived cost reductions in both. Instead of comparative advantages the goal today is to gain competitive advantage which lies in the firms' ability to use inputs more productively, not in the access to inputs or their scale of production.

In that context, Porter conceives of clusters as "a new kind of spatial organisational form that mitigates the problem of arm's-length relationships without imposing the inflexibilities of vertical integration or the management challenges of creating and maintaining formal linkages such as networks, alliances, and partnerships" (1998: 80). Thus, in his view, clusters consist of groups of independent and informally connected companies and institutions capable of achieving operational efficiency and flexibility. The point to note here is that this conception actually writes off the essential elements not only of traditional

Marshallian industrial districts but also of the very epitome of both districts and clusters, i.e. Silicon Valley.

As pointed out before, Saxenian documented the fundamental role played precisely by production networks and business alliances and partnerships in that paradigmatic region's economic success. Cooke (2001) also stresses the importance of networks for the construction of a regional innovation system, which he identifies as having five elements: the region, innovation, networks, learning, and interaction.⁵ Likewise, Konstadakopulos and Christopoulos (1998) postulate that "successful learning for regional competitive advantage is built on a socio political polycentric-cosmopolitan network system", referring in particular to innovative networks. For "firms embedded in regional and local economies characterised by such networks appear to adjust with greater facility to changes in world economy than do their counterparts in other regions with more limited or differentially shaped socio-political infrastructure and looser links between economic actors" (1998: 12).

Porter identifies local and domestic competition and, especially, exposure to foreign competition as the main forces driving cluster formation and growth given the systemic nature of his diamond of determining factors of national advantage. In his view, as one or more competitive firms manage to grow via innovation and productivity gains, demand for other firms in related industries is generated and competition among growing firms located nearby ensues. Competition further drives firms to be more productive and create new technologies and skills, which in turn reinforces their growth and leads to the creation of new firms in the area given the growing demand.

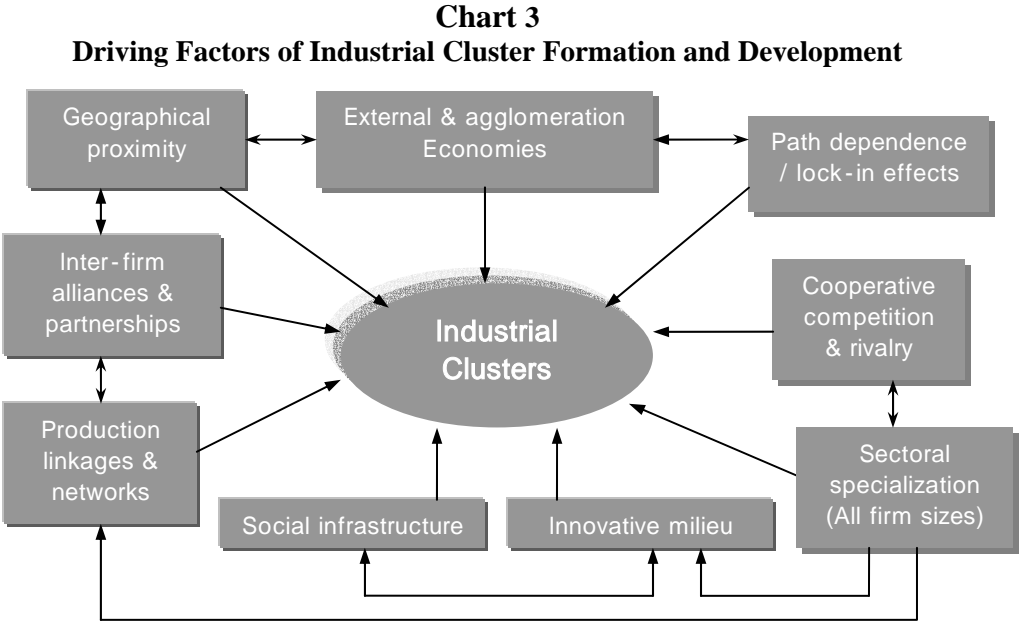
Other authors like Doeringer and Terkla (1995; 1996) point to other factors such as agglomeration economies, inter-firm alliances, face-to-face interaction, regional factor market advantages, and knowledge transfer, as major forces fostering cluster formation and

⁵ He defines networks as "...a set of reciprocal, reputational or customary trust and co-operation-based linkages among actors that coalesce to enable its members to pursue common interests, in this case in respect to innovation" (Cooke, 2001: 953).

development, including the work of supporting institutions such as universities and trade associations. Saxenian (1989; 1990; 1994) in turn stressed the key role played by social and professional networks, as well as the personal interaction they facilitate and the resulting social infrastructure for Silicon Valley’s success and resilience to cyclical crises in its core industries.

Porter adds that clusters may be born out of “historical circumstances”, from a sophisticated or strong demand for certain goods or services, from the previous existence of supplier or related industries in a locale, induced by the growth of “one or two innovative companies that stimulate the growth of many others”, or else from “chance events” such as the decision of a large company to locate in an area. Once a cluster takes form, he argues, a self-reinforcing mechanism is set in motion which can guarantee its sustained growth for centuries, or decades at least (Porter, 1998).

Chart 3 depicts the main factors that determine clusters’ constitution and growth.



Source: Assembled by the author

The novel manner in which Porter reformulated old notions and concepts, coupled with the straightforward way in which he presents his arguments and theses have led his

theory to be widely accepted and wholeheartedly embraced by scholars, politicians and policy makers around the world in the last decade. A true “clustermania” broke out as a result, as Bergmand and Feser (1999) eloquently illustrate for the 1990s⁶ and Ketels (2004) completes down to the present,⁷ which was preceded by the “districtmania” that emerged in the 1970s and 1980s, when industrial districts were the universal fashion.

Such clustermania is also illustrated by publications like the volume edited by Ketels and colleagues (Sölvell et al., 2003) entitled *The Cluster Initiative Greenbook*, which is based on a Global Cluster Initiative Survey conducted periodically in many countries around the world encompassing hundreds of cluster initiatives.⁸ Moreover, a whole Clusters and Competitiveness Foundation has also been established to disseminate Porter’s theory; this foundation in turn publishes a Cluster Competitiveness Report “to generate objective, independent data, which measures the performance of regional, economic clusters worldwide” (www.clustercompetitiveness.org/theory).

Such a strong and widespread influence is indicative of the academic relevance and policy-guiding potential of Porter’s theory, which as such are not in question. However, it is always advisable to examine the foundations and antecedents of new ideas so as to discern their limitations and true guiding potential, rather than adopting them mechanically. In this regard, it is important to notice for instance that in contrast to Porter’s simple enumeration of

⁶ “Industry clusters have become one of the most popular concepts in local and regional development research and practice. Even a cursory Internet search will turn up numerous dedicated web sites by research institutes, industry associations, consultants, and cities, states, and regions reporting cluster studies for particular localities or offering perfunctory guides to industry cluster concepts....Hundreds of U.S. cities and regions have also developed cluster strategies, from Monterey Bay, California to Jacksonville, Florida”. “European cities and regions have embraced the cluster concept with even more enthusiasm. Not surprising since much of the research that informs industry cluster studies originates in case studies of European regions in northern Italy, southern Germany, Great Britain, and Denmark.” (Bergman and Feser, 1999: 5).

⁷ “Private sector leaders....are getting increasingly interested in the concept of clusters... Companies are looking to understand the opportunities that clusters can provide, and many executives see their active participation in efforts to strengthen their home clusters as a new and important part of their role” (2004: 1). “Clusters are increasingly being realized as an important factor in the competitiveness of European economies. Europe will not be able to reach the ambitious goals it has set itself in the Lisbon-Agenda, if it fails to unlock the potential of its existing and emerging clusters”(Ketels, 2004: 5).

⁸ The 2003 survey included nearly 250

the causes of cluster formation, Bresnahan and Gambardella (2004) observe that little is known about why and how a cluster begins, and also about how many clusters will emerge in each industry. The positive feedback effects and the logic of established and successful clusters, they note, make it difficult for analysts to identify a starting point. “Positive feedback, when it is working, appears as a virtuous circle and, when it is not working, it is a difficult chicken-and-egg problem” (2004: 333). This is consistent with Bergman & Fesser’s (1999) observation that “Industry clusters identified in practice often bear little resemblance to Porter’s ideal type” (1999: 9).

More generally, Porter’s implicit claim to eclecticism projects the impression that his theory is an entirely new body of knowledge, an impression that is reinforced by the ongoing frenzy around it. The truth of the matter, however, is that, as any other, Porter’s theory does have roots and antecedents and owes much to other theories and thinkers that preceded it, as the various discussions in previous chapters showed, an intellectual debt that he fails to acknowledge.

In reality, Porter’s theses on clusters formation draw directly on both Myrdal’s notion that a region’s development is started by a historical accident and Perroux’s thesis on the propulsive effects of a dynamic firm that turns into a growth pole and leads the growth of the region in question. Likewise, his argument about the self-reinforcing mechanism that guarantees the clusters’ sustained growth directly corresponds to Myrdal’s principle of circular and cumulative causation which is tightly linked today with the notions of path dependence (Meyer-Stamer 1998; Arthur, 1994) and lock-in effects⁹ (Arthur, 1989; 1990) both widely present in cluster analysis. Moreover, these notions stem from the quest for

⁹ Path dependence refers to the notion that technological choices can assume a dominant role and be self-reinforcing but not necessarily irreversible. Lock-in effects allude to the idea that the economy can become locked-in by random historical events to technological paths that are unpredictable, not necessarily efficient, and not easy to change by standard fiscal policies (Arthur, 1989). In both cases, the underlying principle is that the economy is not deterministic, predictable and mechanistic, but instead “process-dependent, organic and always evolving” (Arthur, 1990: 12).

models that take account of increasing returns to scale, a fundamental issue that underlies most agglomeration theories and which is not acknowledged or addressed by Porter either.

Similarly, his argument that the cluster “becomes more than the sum of its parts” is a feature typically representative of Marshallian industrial districts. Moreover, the core elements identified by Porter (1990) for clusters resemble those identified for districts:

- A group of interconnected producing companies
- Specialised suppliers of inputs, equipment, and services
- Customers and market channels
- Producers of complementary goods
- Supporting and coordinating institutions (government agencies, universities, trade associations, technical schools)

Bolland (2001) explicitly acknowledges the conceptual connection between Porter’s theory and others that preceded it by plainly stating that “Research into the ‘cluster’ phenomenon can be traced back to 1890 when Alfred Marshall initiated the idea that economic success depends (in part) on industrial specialisation and concentration”. More explicitly, he observed that “What Porter calls a ‘cluster’, is also called ‘industrial districts’, ‘new industrial spaces’, ‘regional industrial complexes’ etc by other authors, according to the specific characteristics of the agglomerations in question” (Bolland, 2001: 1). Moreover, exposure to foreign competition of firms and industries, which Porter identifies as both a driving factor and distinctive feature of cluster formation and development, happens to be a characteristic of neo-Marshallian industrial districts as well, insofar as they are nodes of global networks too, as Amin and Thrift (1992) made clear.

Furthermore, as referred before, Cooke (2001: 950) observed that Perroux’s growth poles and Dahmén’s development blocks are known today as clusters. Likewise, Asheim and Isaksen (1996) pointed out that Porter’s ideas “are more or less the same as those Perroux, another Schumpeterian inspired economist, presented in the early 1950s” (1996: 5). In the same tune, Bergman & Fesser (1999) noted that “Porter’s ideas are not without important antecedents....Propulsive industries (or even individual firms) represent poles of growth

which attract, focus, and direct other economic resources...Such constellations of producers, suppliers, and other economic actors sound surprisingly like clusters (1999: 8). More specifically, they observe that “The similarities between the cluster concept and Perroux’s theory of growth poles are readily apparent.....end-market industries [that] drive the deep and broad value chains of which they are a leading part [are] consistent with propulsive industries as dominant economic actors” (1999: 9). In effect, the competitive firm that is able to achieve a sustained growth in a Porterian cluster, also referred to as flagship or core firm by Rugman and Verbeke (2002), directly corresponds to the propulsive firm in Perroux’s growth pole scheme.

Bergman & Fesser (1999) further noted that Perroux’s theory “gave rise to a related regional development strategy (growth centers) that enjoyed a meteoric rise in popularity in policy circles only to eventually prove a dismal failure” and cautioned that “While it is too soon to tell whether industry cluster policies will be similarly ineffective, the rise in their stock appears nearly as dramatic” (1999: 9). This concern is echoed even by a follower like Ketels (2004) who observes that “...to make [European cluster] policies truly effective, key challenges have to be addressed. Otherwise there is the risk of a backlash against clusters seen as just another economic policy fad” (2004: 4).

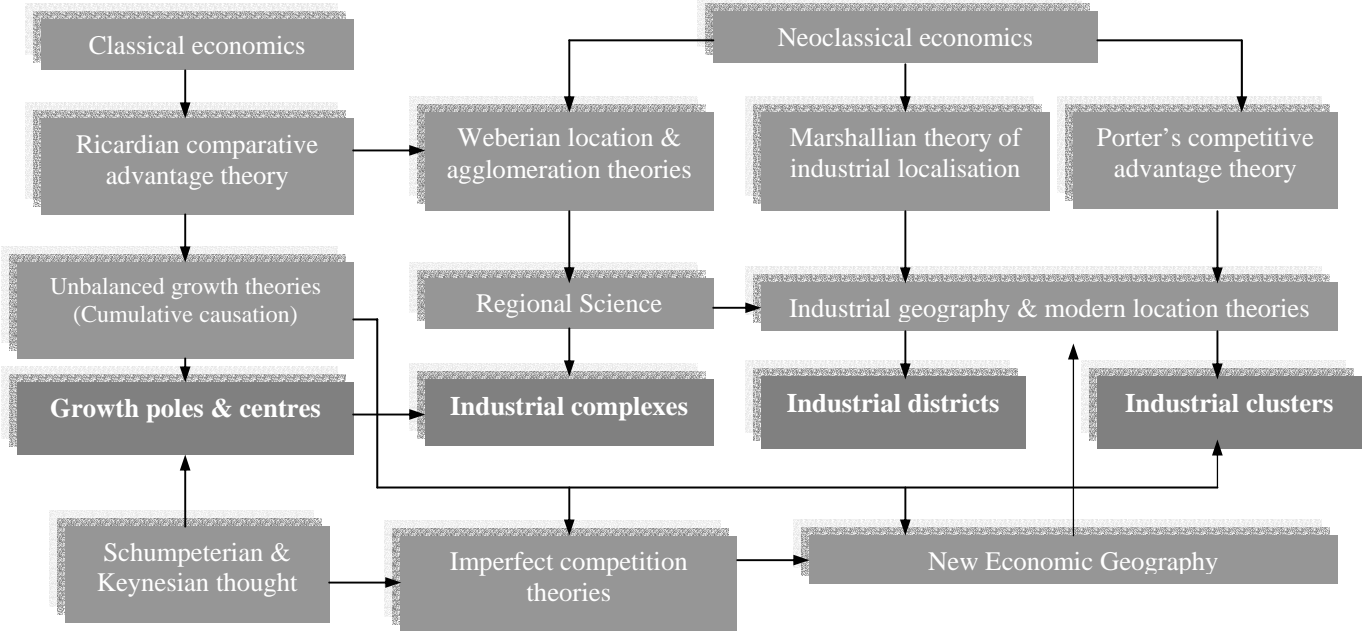
Finally, it is also significant to observe that Porter’s notion of industry clusters is practically the same as the concept of “localised territorial complexes” formulated in the mid 1980s by Scott (1987) within the post-Fordist flexible specialisation tradition under which the theory of industrial districts was ultimately cast.

In sum, although he does not acknowledge it, the fact is that Porter’s theory is rooted in and owes much to various theoretical traditions with which it shares their insights and explanatory power. What matters, though, is that it also shares the limitations and the fate

some of the latter faced as policy guidelines, particularly in the case of Perrouxian growth poles and industrial complexes and Marshallian industrial districts.

That point will be considered more in detail when discussing policy issues. For the time being, Chart 4 summarises the roots and theoretical linkages of the concepts and figures of industrial complexes, districts and clusters, including those with the location and agglomeration theories and hybrid fields such as regional science and economic and industrial geography discussed in previous chapters.

Chart 4
Theoretical Roots of Localised Industrial Formations



Source: Assembled by the author

As noted earlier, cluster theory's distinctive feature is its alignment away from Ricardo's comparative advantage trade doctrine and its rooting in Porter's theory of competitive advantage. It should be noted that, although Weberian and neo-Weberian location theories and derived formulations within the field of regional science were developed entirely within the neoclassical economics tradition, they were also influenced by

comparative advantage theory, as illustrated for example in the work of geographers like Harrington and Warf (1995).

The point is that cluster theory should be taken in the context of its interrelations with and debts to other theories so as to highlight its roots and underlying limitations. For the question is asked as to whether “industry clusters [are] a passing fad, the latest craze in a field prone to embrace miracle solutions only until a more fashionable idea emerges”, and the fact is that “...at issue among some regional scholars is whether there is actually anything new or innovative about industry clusters” (Bergman and Feser, 1999: 5).

The value of industry cluster theory lies therefore in its analytical potential and its intuitive appeal which make it easily understood and readily usable for practical applications in the design and implementation of development policies and strategies.¹⁰ Nevertheless, it has to be borne in mind that, as any other theory, Porter’s is not an infallible, magical tool as the foregoing discussion has shown. This circumstance does not demerit, nonetheless, its condition as an internally consistent body of knowledge that is nowadays the dominant conceptual framework for understanding the phenomena of industrial agglomeration and regional development in the context of the increasingly networked and globalised world economy of the 21st century, in which, though, “The enduring competitive advantages.... are often heavily local” (Porter, 1998: 90). Anyhow, this theory’s ultimate value and relevance reside in that it is attuned to the trends and circumstances of today’s global and local economic milieux. As Roelandt et al. (2000) put it, “The emerging network economy leads towards more tightly coupled, more intense, more persistent and more intimate relations among firms and between firms and governmental organisations. The cluster concept

¹⁰ “Industry cluster analysis can help exploit the growing wealth of regional economic data, provide a means of thinking effectively about industrial interdependence, and generate unique pictures of a regional economy that reveal more effective policy options” (Bergman and Feser, 1999: 5).

embraces this new paradigm and helps us to understand it in a coherent and systematic way” (2000: 20).

A Comparative Analysis

The formulations discussed in the foregoing paragraphs are characterised not only by their affiliation with a given theoretical tradition but also by their correspondence with a particular economic order and a given stage of industrial development, each characterised by the trends and practices prevailing in each historical epoch. Exhibit 1 shows such correspondence.

**Exhibit 1
Industrial Development Epochs and related Localised Industrial Formations**

Period	Features	Industrial formations
Late 1920s to mid 1970s	<ul style="list-style-type: none"> - Heyday of Fordist accumulation - Mass production - Vertical integration of production - Vertical producer-supplier relations - Simple (stand-alone plant) corporate integration strategies - Brick and mortar economy - Natural resource-driven location 	Growth poles Industrial complexes
Late 1970s to late 1980s	<ul style="list-style-type: none"> - Transit to Post-Fordist accumulation - Rise of systemofacture - JIT production & procurement - Flexible specialization in labour process - Systemic use of microelectronics in production and labour management - De-verticalisation of production - Transition from Old to New economy 	Industrial districts Technopoles
Late 1980s onwards	<ul style="list-style-type: none"> - Post-Fordist accumulation - Sequential-VMI production & procurement - Globalisation of production - Emergence of global sourcing - Boom of production outsourcing - Emergence of global production networks - Horizontalisation of production & corporate structures - Consolidation of the New Economy - Advent of the Internet and its use in business - Competitive advantage-driven location 	Industrial clusters

Source: Assembled by the author

Each industrial formation is both a product and a reflection of the constellation of factors, trends and circumstances present in the epoch in which it comes to be. A basic consistency holds in each period where nonetheless the forces in operation ultimately drive the transition to the next. Thus, industrial complexes were cast in a conceptual mould corresponding to a stage in industrial development where Fordist accumulation was at its heyday, mass production predominated in most countries, and production and corporate structures were vertically integrated, the same as producer-supplier relations. Moreover, simple integration strategies were the common practice, with multinational corporations deploying stand-alone plants in different locations around the world and industrial location decisions being driven by natural resource endowments under the context of a mature brick and mortar economy.

In contrast, industrial districts are akin to an economic conjuncture where just in time (JIT) production required a new kind of relations between assemblers and suppliers involving geographic proximity, a close collaboration in production and scheduling, a close cooperation for keeping quality standards, a detailed collaboration among component suppliers, and, in general, a sound coordination and integration among all the participants in the production process as a whole (Hoffman and Kaplinski, 1988). These requirements led to the de-verticalisation of production processes, the emergence of flexible specialisation, and in general to the rise of what Hoffman and Kaplinski called *sistemofacture*, all of which is consistent with the tenets of the theory on industrial districts. As Martin and Sunley (1996) observed, “The thrust of flexible specialization ideas in economic geography is that agglomeration is associated with the shift from vertical integration to the horizontal integration of related activities among small, competitive firms which cluster together to minimize transaction costs” (Martin and Sunley, 1996: 285).

More specifically, Digiovanna (1996) sees industrial districts as “a path to economic development” and shows the correspondence of regulation theory with the experiences of the Emilia-Romagna, Baden-Wurttemberg and Silicon Valley regions as illustrating the emergence of post-Fordism. Accordingly, the bulk of literature on industrial districts was produced in the 1980s and early 1990s, although by the end of the latter decade, when Porter’ ideas had been vogue for several years, the term was still used in influential industrial geography circles to designate both districts and what is now known as clusters (e.g. Hayer, 1997).

In the same way, the maturation of post-Fordism in the late 1980s and onwards was concomitant with the rise of globalisation, the explosion of outsourcing, the emergence of global production networks, the horizontalisation of corporate structures, and the advent of the Internet, all of which led to the consolidation of the New Economy and the prevalence of new factors driving industrial location that were related to the competitive advantage of firms and nations rather than to the comparative advantage of places.

Therefore, each localised industrial formation has its own features that distinguish it from others that were conceived in a previous or a later period. In the last instance, however, and as Harrison (1991) rightly put it, it all boils down to “old wine in new bottles”. Industrial complexes have both a functional and a territorial connotation and, as pointed out, constitute building blocks for the formation of industrial clusters. Moreover, like districts and clusters, industrial complexes are regional innovation systems as well (Prochnik, 1998). Moreover, given its generic character, the term industrial complex was used in previous decades to designate formations that were also known as growth poles and, more recently, others that have been given numerous names, in particular Silicon Valley, as will be noted below.

In contrast, an industrial district is by definition a piece of territory—a region, a locality, a metropolitan area—and thus has an inherent geographic connotation and meaning. In turn, an industrial cluster is literally an amorphous entity, a bunch of things growing, standing or being held together. Therefore, the concept has a functional, non-geographic connotation. Actually, Porter believes that clusters tend to concentrate geographically but does not argue that they should be inherently localised in a given locale (Bergman & Fesser, 1999). Clusters are even regarded as building blocks of industrial districts (Nadvi, 1994: 194); moreover, it has been argued that industrial policies should aim at transforming spontaneous, unplanned clusters of small firms into industrial districts (Asheim, 1994: 127).

Silicon Valley epitomises such multiple cross identifications and visible conceptual overlapping, as it has been labelled and dubbed indistinctly as industrial district, technopole, industrial cluster, high-tech cluster, high-tech region, high technology industry complex, and many other adjectives, which renders Harrison's (1991) observation most pertinent.

In point of fact, an industrial district is a cluster and vice-versa and both ultimately constitute industrial complexes, which, as the Czamanskis pointed out, in turn can be part of a cluster. Likewise, growth poles, industrial districts, industrial complexes, and technopoles, all can be called clusters using this noun's generic, functional, non-territorial connotation. This is why Maskell (2001) relies on both Marshall's theory of districts and Porter's theory of clusters for the development of a theory of the "geographic cluster", and Rugman and Verbeke (2002) speak of such thing as "Marshallian clusters". This is why Porter refers to the advantages of nations but not to those of regions or cities, at least explicitly, and so why he picked a generic term—clusters—and developed upon it a functional, non-territorial concept as the centrepiece of his theoretical framework.

One key feature that differentiates those formations is the size of the business establishments involved. Industrial complexes are usually composed of one or a number of

large propulsive firms along with many induced smaller businesses, while industrial districts are typically formed by small and medium-sized companies. Industrial clusters, in turn, can accommodate a multi-size business population, depending on the sector in which they operate and the way each cluster was originated. In any event, the resemblances among them are evident as is further illustrated in Exhibit 2.

Exhibit 2
Key Features of Localised Industrial Agglomerations

Industrial complexes	Industrial districts	Industrial clusters
Geographical proximity	Geographical proximity	Geographical proximity
Innovation clustering	Innovative industrial atmosphere	Innovative milieu
Location pattern similarity	Inter-firm competition	Cooperative competition & rivalry
Locational interdependence	Inter-firm collaboration	Inter-firm alliances & partnerships
Technological similarity	External economies	External & agglomeration economies
Circular & cumulative causation	Social embeddedness	Path dependence / lock-in effects
Production & marketing interrelations	Inter-firm networking	Production linkages & networks
Sectoral specialization (All firm sizes)	Sectoral specialization (SMEs)	Sectoral specialization (All firm sizes)
	Institutional thickness	Social (non-business) infrastructure

Source: Assembled by the author.

The point, therefore, is again that cluster theory is not new after all. It is rooted in earlier theories which were gradually abandoned as they did not live up to the expectations and results they promised and so were superseded by newer and more powerful notions, something that may well happen to Porter’s theses too and to the policy orientations it has given rise to.

In the last instance, what is required is a new concept that combines the generic character and the wide applicability of clusters and complexes and the geographic connotation and inherent territorial embeddedness of industrial districts. It has to be capable of capturing the descriptive and explanatory power of those three concepts as well as that of other related notions such as localised territorial complexes and science and technology groupings. It will have to refer to a new kind of cluster with an explicit territorial referent that constitutes its defining feature from which it can not be detached, so that it becomes a

true localised industrial agglomeration. It could be a variant of what Maskell (2001) calls the “geographical cluster” but taking seriously the full meaning of the adjective that qualifies the noun in this expression.

Therefore, the argument posed here is that although Porterian cluster theory is currently the dominant approach on industrial agglomeration and regional development, its fundamental concept should be qualified and complemented with the insights and observations derived from a critical examination of its rationale and intellectual underpinnings. It is hoped that the lines drawn above may be useful for such purpose, in particular for making its explicit territorial connotation a crucial element in its constitution. Therefore, the term “cluster” will be understood hereafter not in its common, ambiguous sense, but in the territorial, socially embedded connotation proposed here to become the essential, defining characteristic of the industrial formations it designates.

CHAPTER II

INDUSTRIAL CLUSTERS AS POLICY INSTRUMENTS AND TARGETS

A Typology of Localised Industrial Agglomerations

At a general level, two basic kinds of industrial agglomerations can be distinguished, namely spontaneous formations and planned complexes. Spontaneous industrial formations originate in “natural” processes of economic concentration that take root in certain places driven by the attraction of “first” and “second nature” location advantages, the force of competition and external economies, and the permanent quest for productivity, market access and lower production costs. Planned complexes, on the other hand, are created by design, as the product of local or national development policies implemented by government agencies or private sector organisations.

Industrial complexes, industrial districts, and industry clusters are thus spontaneous formations in the light of the discussion of the previous chapter, the same as Scott’s (1987) localised territorial complexes. Other spontaneous formations include technopoles, as defined by Castells and Hall (1994); technology clusters, as considered by Rosenberg (2002); high technology clusters as envisaged by (Miller and Côté, 1987); and innovative clusters, as typified by Hart (2000). Castells and Hall actually put under the technopole label, also known as technopolis, a wide variety of both spontaneous and planned formations ranging from Silicon Valley and Route 128 to science cities like Tsukuba and Taedok and major, mature agglomerations like London and Tokyo. Likewise, technology clusters are conceived of by Rosenberg (2002) as all those formations that vie to become clones of Silicon Valley, including such diverse places as the Island of Singapore, the city of Bangalore in India, Hsinchu science-based industrial park in Taiwan, and the cities of Cambridge in England and Helsinki in Finland.

Finally, innovative clusters are groups of “inter-acting firms operating, often in a particular industry, within a fairly small spatial compass...‘embedded’ in their local area in

terms of production linkages including their workforce and communication flows.” (Hart (2000: 2). Silicon Valley is included in virtually all the above denominations, and so constitutes the universal, non-replicable yardstick of spontaneous formations.

Planned complexes correspond to the well known figure of industrial parks and estates, as well as to other compounds such as research parks (Luger & Goldstein, 1991), science parks (Carter, 1989), and science and technology industrial parks (PECC, 1991; 1994). Likewise, Castells and Hall (1994) regard as planned complexes science cities and towns like Tsukuba and Kansai in Japan; Taedok in South Korea; technology parks like Sophia Antipolis, France; science-based industrial parks like Hsinchu in Taiwan; and technocities like Cartuja '93 in Spain and Adelaide in Australia..

One especial instance of is that of Export Processing Zones (EPZs). An EPZ is defined as “a delimited geographical area or an export-oriented manufacturing or service enterprise located in any part of the country, which benefits from special investment-promotion incentives, including exemptions from customs duties and preferential treatment with respect to various fiscal and financial regulations” (Romero, 1995: 1).¹¹ EPZs made up of individual factories correspond to in-bond processing schemes under which the companies involved are called maquiladoras in Mexico and Central America.¹²

EPZs are, essentially, industrial compounds for export oriented manufacturing enterprises provided with an efficient infrastructure and quality services and “a favourable business environment, few regulatory restrictions, and a minimum of red tape” (World Bank, 1992: 1). Although they are a policy instrument mainly suited for and used by developing

¹¹ EPZs have received a wide diversity of alternative names including: free zones, special economic zones (China), industrial free zones, free trade zones, export free zones, free trade and industrial zones, special export processing zones, export processing free zones, tax free factories, bonded zones, special processing zones, free economic zones and tax-free export-processing territories (Russia), industrial estates, "Points francs" (French-speaking countries). See Romero, 1995; World Bank, 1992; Vaknin, 2003).

¹² In this sense, Mexico created the world's largest EPZ along its northern border with the United States through the attraction of foreign-owned in-bond assembly plants under its Maquiladora Program first established in 1965 in a 20-kilometre strip along that border and extended to the rest of the national territory in 1972 (Palacios, 1990).

countries, EPZs have been regarded in International Labour Organisation circles as “the mechanism through which global production chains are elaborated, and their prospects are closely linked to the dynamics of global investment and trade” (Van Heerden, 1998: 2).

A significant variant of EPZs are the figures of special economic zones (SEZs) and economic and technological development zones (ETDZs) conceived of in China as part of the economic reforms implemented by Deng Xiao Ping. Along with others created more recently such as Open Cities and Open Coastal Areas, SEZs and ETDZs are the places where most foreign direct investment (FDI) has been located in mainland China to date (Gupta, 1996; Fung et al., 2004). In general, EPZs and SEZs, which by the way are “a variant of what used to be called growth centre strategies”, constitute an instrument *par excellence* for attracting FDI in developing countries around the world (Hayter, 1997: 398).

Industrial and regional development policies have traditionally aimed at creating planned complexes more than at fostering the growth of spontaneous formations. In fact, industrial and research parks, EPZs, SEZs, and science and technology industrial parks have been the common object of government policies in both developed and developing countries. In the case of industrial districts and clusters, what can be done is only to accelerate the process by creating the required institutional conditions through public policy and/or private action, insofar as they are spontaneous phenomena that emerge as a result of a gradual build up of entrepreneurial activities over several decades in a given locale (Miller and Côté, 1987). The end product of such processes is “a large regional grouping of geographically proximate innovative firms, where those firms have strong linkages to local educational and research bodies, government laboratories, financial institutions, other elements of the business infrastructure, and to each other” (Bekar and Lipsey, 2001: 63).

Policy Choices and Strategy Building in Developing Countries

As discussed earlier, the concept of industrial clusters bears clear commonalities with those of industrial districts and complexes, to the extent that it is derived from and is in fact an updated remake of the latter two with which it shares their theoretical underpinnings and limitations. As Bergman and Feser (1999) put it, “In large measure, industry cluster analyses and policies may be viewed as applications of a set of well-worn but rejuvenated theories of how geography helps drive economic growth and change” (1999: 5). Indeed, complexes, districts and clusters mainly differ in that each concept was formulated in a particular epoch and so cast in the moulds determined by the ideas and development paradigms prevalent in it. Their respective inner essence, though, has remained largely unchanged.

From that perspective, cluster theory turns out to be the most akin to the present era of globalised production and fast communications and transport, where firms and countries strive for competitiveness and productivity in order to thrive and survive, the sources of which are no longer necessarily tied to the specificities of place and circumstance but to those of the more diffuse realms of today’s increasingly networked global economy. This is why the cluster approach has become useful for the formulation of regional development policies and strategies nowadays. However, as cautioned before, the analyst has to use this approach well aware of the inheritances and limitations of the theory on which it is based so as to tap into, and make a proper use of, its actual potential for the design of a policy framework suited for in developing countries in particular.

The construction of such framework requires first to define the overall goals and objectives to be achieved in each case. Next, a general strategy has to be devised which is to describe the actions that will be required to achieve those objectives and the sequence in which these actions will have to be taken. These steps will have to include the definition of

the type of cluster, or clusters, that are to be promoted or created, depending on the characteristics of the region or locale in question and the industry sectors involved. A related, key choice that will have to be made is whether the purpose is to promote the deployment of new plants or the relocation of existing ones by firms from outside the region or locale, or else the creation of new firms by local entrepreneurs or the establishment of new plants by local existing firms, or both.

The above requires governments to decide the extent to which the participation of foreign multinational corporations (MNCs) should be called for in order to attain the established policy objectives. This is connected with the old issue of the costs and benefits of FDI for developing countries. In this respect, there seems to be consensus as to the fact that MNCs can be essential for the initiation of local industrial development as catalysts of the process by bringing in fresh financial resources and a bundle of technological and management know-how and links to global markets, input sources, and distribution and service networks (Hayter, 1997). The problem is that branch plants can develop links within the parent firm's global corporate structure instead of embedding their operations into their local economic milieu with which they usually end up maintaining negligible linkages. Host economies, at both the national and regional level, can thus become branch-plant dominated, truncated systems, where branch plants lack authority over investment and production decisions which are taken by the parent company and by definition tend to reflect the priorities and interests of the corporation as a whole (Hayter, 1997).

Such location schemes are a product of what Campos and Kinoshita (2003) term as vertical or export-oriented FDI, which involves the relocation of parts of the production chain to host countries and is primarily driven by the availability of low-cost labour. In contrast, horizontal FDI, also called market-seeking FDI, involves the replication of production facilities (i.e. the deployment of stand-alone branch plants) in the host country

and seeks to serve host-country local and regional markets. This corresponds to the so-called simple integration strategies characteristic of vertically integrated production models and corporate structures prevalent prior to the emergence of an integrated international production system in the 1980s and early 1990s (UNCTAD, 1993).

By extension, it can be inferred that branch-plant dominated, truncated economies give rise to branch-plant dominated, truncated clusters. This is in line with Miller & Côté's observation that "As a rule, branch plants are not the basis upon which the development of a self-sustained cluster is articulated" (1987: 53).¹³

The link between MNCs and industrial clustering derives from the patterns followed by FDI and the factors that determine its location in particular countries and regions. In this sense, Campos and Kinoshita (2003) identified three main types of attracting factors: 1) low labour costs, a large domestic market, a skilled labour force, an adequate infrastructure, and proximity to large markets; 2) supporting domestic institutions and favourable business-operating conditions; and, 3) agglomeration economies. They found that the most powerful ones are the last two—supporting institutions and agglomeration economies—the latter being the chief force that originates industry clusters.

FDI may thus lead to the formation of core-firm dominated, asymmetrical clusters, where a flagship firm becomes the cluster's champion who deliberately fosters the co-evolution of the clustered firms and the other organisations and agencies involved, as well as the resulting spill over effects (Rugman and Verbeke, 2002). This approach implies that the flagship firm is a subsidiary of a MNC, whose behaviour differs from that of domestic firms, insofar as it is emplaced in a cluster located in a foreign country and so faces "difficulties in

¹³ Self-sustained clusters have a diversified technological infrastructure and generate the agglomeration economies that lead to a high rate of local business formation. In contrast, fabrication-oriented clusters house low technology activities and are largely composed of foreign branch plants, though they may provide conditions for the entry of local businesses to supply these plants. Finally, dependent research clusters are rich, diverse but stagnant and dependent on continued government support or corporate sponsorship, while focused clusters are made up of a few high technology firms serving a large, mature industrial agglomeration (Miller & Côté, 1987).

diffusing [its] knowledge base to other affiliates or even to be responsive to the needs of other parts of the MNE and its home country cluster” (Rugman and Verbeke, 2002: 18). This picture contrasts with that of symmetrical, Porter-like clusters, which theoretically are a “federation of equals” though, in practice, actually constitute a mix of firms of different sizes and diverse economic activities, with no single actor taking the lead but all sharing the costs and benefits of cluster formation and exploitation.

Under globalisation, dynamic clusters are seen as key factors in a country’s capacity to attract international investments that generate new technological expertise, interest investors in innovation (e.g. venture capital), and benefit from the international mobility of skilled personnel (OECD, 1999).

As a matter of fact, the formation of core firm clusters depends upon the previous existence of identity ties and “historically grown cluster relationships” which the core firm is induced to ‘re-engineer’ so as to “reduce the relative importance of social embeddedness for its ‘private club’ of cluster participants” (Rugman and Verbeke, 2002: 10). This is consistent with the views on MNC-based strategies put forward by Porter himself. As Hayter, he also believes that MNCs can play an important role in the early stages of economic development, but holds that “it is rarely in a multinational’s interest to make a developing country a major center for producing sophisticated components or for conducting core R&D” (Porter, 1990: 678). On this basis, Porter openly advocates a strategy mainly based on domestic firms and endogenous initiatives on the grounds that:

“A development strategy based solely on foreign multinationals may doom a nation to remaining a factor-driven economy. If reliance on foreign multinationals is too complete, the nation will not be the home base for any industry. At the same time, multinationals can relocate when factor costs shift or if wages get too high....The growth of indigenous companies is a much slower, and in many cases riskier, process than attracting foreign multinationals. Yet if it succeeds, the result can be the means to move beyond factor-driven advantage as Japan and more recently Korea have demonstrated.... Foreign multinationals should be only *one component* of a developing nation’s economic strategy, and an evolving component. At some stage in the development process, the focus should shift to indigenous companies” (1990: 679).

He further observes that MNCs can be the seed of industry clusters by acting as major, sophisticated buyers and by creating the conditions for the entry of local companies into support industries or new market niches, which is equivalent to Rugman and Verbeke's concept of core MNC-dominated clusters. Porter adds that countries should attract several MNCs operating in a given industry to encourage rivalry and stimulate the creation of supporting or related industries in the domestic economy, the role of domestic governments being to foster the formation and upgrading of indigenous companies in such industries.

At a more general level, the policy questions that should be asked when defining a cluster development strategy are whether the ultimate goal is the competitiveness and/or success of the firms involved, the upgrading and diversification of the industry those firms belong to, the development of the entire cluster as such, or the overall development of the local community in consideration. These questions boil down to asking whether clusters are to be used as an instrument or as a target of policy, as a means or as an end.

The answer will vary depending on who is taking the lead, i.e. a government agency, a group of investors/entrepreneurs, or an industry association. In all cases, though, the answer should be that clusters are to be used as means to reach some ends, and that the goal in the last instance should be to achieve the overall economic development of local and regional communities by means of the development of industry clusters. This responds to a double rationale. On the one hand, local economic development takes account of both equity and efficiency aspects and so is the most legitimate and legitimising objective any development initiative can have. On the other, it is a sequential process: the success of the clustered firms can lead to the development of both the cluster and the industry, and the later can contribute to the development of the community in question. Chart 5 illustrates that process.

Chart 5
Industrial Cluster Policy Objective



Source: Developed by the author

As Fisher and Reuben (2000) put it, the most developed regions in both advanced and developing countries happen to be those sharing the characteristic of being home to successful industrial clusters. All this requires a long term strategy to obtain, as will be discussed presently.

Cluster Formation and Policy Intervention

Accepting that FDI is a valuable resource for feeding the initial stages of domestic development processes, the main issue then is for developing countries to find first how to attract the required FDI that fulfils such role, then the way to generate the conditions for the formation of local businesses to supply foreign subsidiaries, and subsequently the way to foster the generation of spin-offs and further start-ups, the latter being the part of the process that should become the ultimate object of national development efforts.

In that regard, branch plants are not much likely to produce such results according to the points noted above in this respect. Moreover, as Miller and Côté noted, branch plants “are not likely to lead to technologically based spin-offs because their managers are seldom exposed to the market place and to the difficulties of product design...[and so]...the

production-oriented work environment is not conducive to entrepreneurial initiatives by employees” (Miller and Côté, 1987: 53). Porter himself observes in this respect that “...foreign subsidiaries do not necessarily breed managers with an orientation toward exports and international competition” (1990: 679).

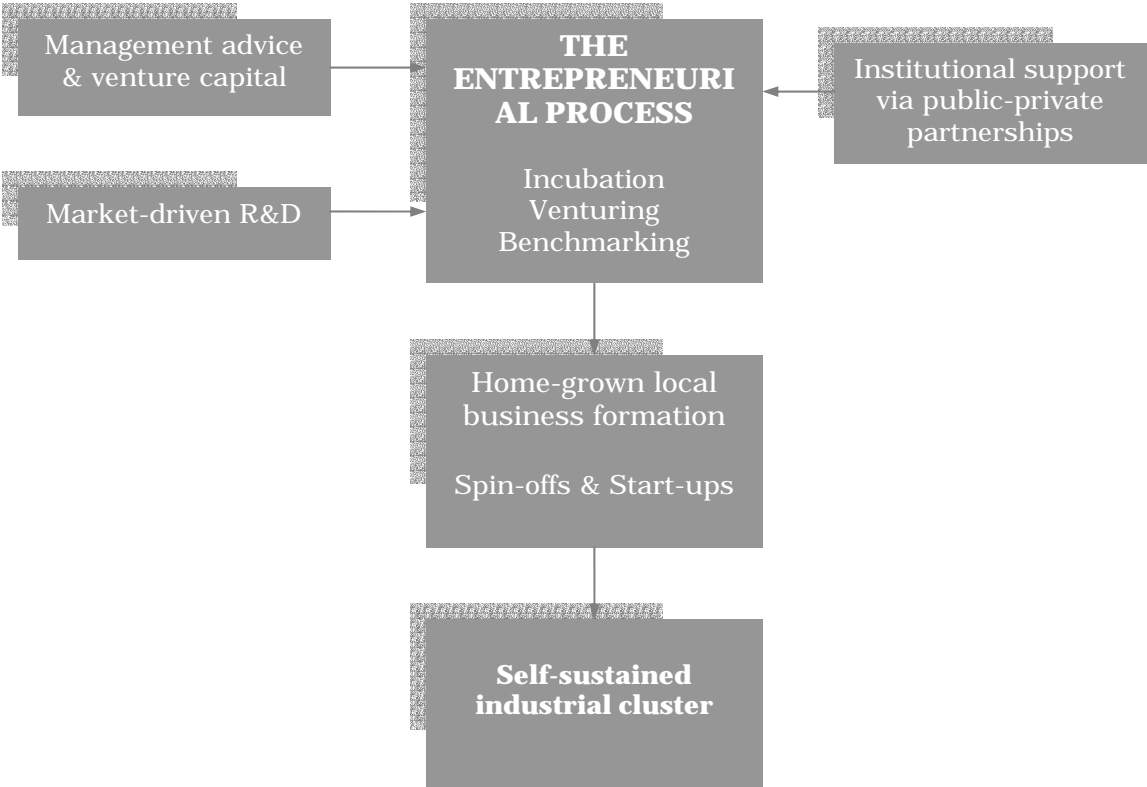
The above requires the strategist to first know how clusters emerge and what factors determine such emergence so as to identify the chief aspects of the process on which planned intervention can and should be focused, this in order to achieve the goals and objectives set by the government agency or private organisation taking the initiative in question.

The character and features of each process will vary depending on the nature of the locale and country in which it takes place. In all cases, however, one factor that has proven to be crucial and is not considered in the theories on industrial clustering reviewed in the first chapter is entrepreneurship. This is so in either the case of a strategy based on branch plants supplied by MNCs or one relying on home-grown firms from the outset. In this regard, Miller and Côté (1987) hold that entrepreneurship is the force driving the formation of self-sustaining clusters, and is nurtured by a diversified industrial base, a large supply of venture capital and managerial know-how, market-driven research activities, and institutional support from public and private entities that partner to provide entrepreneurs with the conditions for creativity and innovation. The result is an entrepreneurial process consisting of “a gradual build-up and grafting of locally initiated activities and firms...by entrepreneurs who find niches, imitate successful strategies, and undertake technical ventures to supply large firms” (1987: 42-44), which leads to the formation of self-sustained clusters. Chart 6 illustrates this process.

Likewise, Rosenfeld (2002) argues that innovation, imitation, and entrepreneurship are the forces propelling the development and functioning of competitive clusters. He adds that “Entrepreneurial capacity is the fuel that drives the expansion of cluster growth....The

genesis of most clusters can be traced to the employees of one or two companies who left to start their own company” (Rosenfeld, 2002: 14). Entrepreneurship is crucial because is the force behind the creation of spin-offs and local start ups, which in turn are the life and blood of cluster formation and growth as the experience of the most paradigmatic instance of all, Silicon Valley, has shown.

**Chart 6
The Entrepreneurial Process**



Source: Adapted by the author from Miller and Côté (1987: 43)

Castells and Hall (1994: 224) add synergy as “a crucial element in the construction of technopoles”, which is difficult to achieve and they define as “the generation of new and valuable information through human interaction”. Information often stands for innovation and can range from high technological know-how to practical knowledge on market penetration and organizational and even promotional matters. Further illustrating the apparent consensus regarding the basic features that should characterise technopoles, they

envisage 12 pointers as critical for the design of a sound promotion policy; the first four and the most significant of these pointers are: 1) Build a clear development strategy; 2) Branch-plants are better than no plants; 3) Synergy is crucial in the long run; and 4) Develop a long-term vision (Castells and Hall, 1994: 248).

The crucial role of endogenous local business creation for the development of both clusters and the local community as a whole was already stressed by growth-pole theorists. As Luger and Glodstein (1991) put it, “The types of expected induced economic growth from research parks, according to growth-pole/centre doctrine, would be weighted more toward new business formation through the development of localization economies, including spin-offs, and growth from residentially based trade and services” (1991: 17). This further shows the relevance of theories that are assumed away as outdated while in fact still have currency insofar as they actually underpin those in vogue today which in turn are readily assumed as new as is the case of cluster theory.

Finally, a useful reference for cluster policy making in developing countries might be the figure of Economic Development Districts (EDDs) as conceived and operated by the U. S. Economic Development Administration. EDDs are framed within a Comprehensive Economic Development Strategy that guides and coordinates local initiatives, focusing on local actors as a way to foster sustainable economic development and an improved production capacity for a regional community as a whole (Fasenfest and Reese 2002).¹⁴ The point is that cluster development policies could use locales similar to economic development districts as their main geographic referent and be part of comprehensive economic development strategies tailored for each community or region.

¹⁴ By 2002 EDA was operating 325 EDDs providing funds for guidelines that help direct their regional planning processes.

Elements of a Cluster Development Strategy

As can be inferred from the foregoing discussion, the proposals regarding the basic elements and orientations cluster development strategies should have show notable commonalities. For instance, Miller and Côté (1987: 132-133) argue that a sound development strategy should include the following features:

1. A long term planning horizon (10-20 years)
2. An explicit emphasis on the creation of institutional conditions for cluster formation with the support—not direct intervention—of government agencies
3. Focus on the creation and activation of linkages between local start-ups and spin-offs, on the one hand, and mature firms, financial institutions, universities, and research centres, on the other
4. Reliance on home-grown, local firms and subsequently on outside branch plants or corporate divisions
5. Priority on the creation of a favourable business climate that stimulates private entrepreneurial actions

The World Bank in turn propounds that a comprehensive cluster-based policy should abide by the following basic principles (www.worldbank.org/urban/led/cluster2.html):

1. The creation of clusters should not be a government-driven effort but should be the result of market-induced and market-led initiatives
2. Government policy should not have a strong orientation towards directly subsidizing industries and firms or to limiting the rivalry in the market
3. Government policy should shift from direct intervention to indirect inducement
4. Government should not try to take the direct lead or ownership in cluster initiatives but basically should work as a catalyst and broker that brings actors together and supplies supporting structures and incentives to facilitate the clustering and innovation process
5. Cluster policy should not ignore small and emerging clusters, nor should it focus only on 'classic' and existing clusters
6. While cluster policy needs cluster analysis and cluster studies, the government should not focus on analysis alone without action. An effective cluster policy means interaction between researchers, captains of industry, policy-makers and scientists and creating a forum for constructive dialogue
7. Clusters should not be created from "scratch" [from] declining markets and industries

Porter (1998) adds that, contrary to traditional industrial policy, governments should have a new role consisting in: ensuring the supply of educated citizens and a good physical infrastructure; setting the rules for competition, particularly by protecting intellectual property and enforcing anti-trust laws; and, promoting cluster formation and upgrading via the supply of public goods. He further argues that, also contrary to traditional industrial

policy, governments should reinforce the development of all clusters because “Every cluster not only contributes to national productivity but also affects other clusters” (1998: 89).

The seventh of the World Bank’s principles alludes to a recurrent observation about the fact that clusters can not and should not be started anew and so that policies should focus on building on already existing or emerging ones. Bekar and Lipsey, 2001: 65) pointed out that “Clusters should build on existing specialities and competencies within a region rather than trying to create them anew”. Likewise, Porter himself sentenced that “Government, working with the private sector, should reinforce and build on existing and emerging clusters rather than attempt to create entirely new ones...To justify cluster development efforts, some seeds of a cluster should have already passed a market test (Porter, 1998: 89)”. Therefore, it will always be most sensible to start by identifying potential or emerging clusters to which direct policy actions and promotion efforts. This is what governments are actually doing in most countries where cluster initiatives are or have been undertaken.

World Bank principles 3 to 5 refer to the also recurrent point that government intervention should be reduced to assistance and support actions so as to let the emergence and development of cluster be a market-driven process. In this respect, Porter also sentences that “Not all clusters will succeed...but market forces—not government decision—should determine the outcomes” (1998: 89).

Derived from the above, there also seems to be consensus as to the fact that clusters emerge spontaneously, as a result of a protracted process that extends over several decades and is rooted in the particular conditions and economic history of each region or locale. Miller and Côté reported that “In fact, high technology clusters en the United States, Canada and Western Europe have appeared naturally in various metropolitan areas without public strategic design” (1987: 41). Similarly, Porter observed that “most clusters form independently of government action—and sometimes in spite of it” (1998: 89). The same

occurs in the case of industrial districts, as Schmitz and Musyck (1993) pointed out: “the emergence of the industrial districts does not result from consciously pursued local or regional industrial strategy” (cited in Asheim, 1994: 126).

In consequence, most analysts concur in the need for cluster development efforts to be guided by a long-term strategy, given the protracted extension of cluster formation processes. In this respect, Nel and Makuwaza (2001: 3) observe that “While clusters often form naturally....stakeholders in an industry or region can expedite the development of a competitive cluster through a process of interaction.”

Analysts also agree in that there is no single, ideal way to go about creating or developing industry clusters. As cited earlier, Bresnahan and Gambardella’s (2004) observed that little is known about why and how a cluster begins, and also about how many clusters will emerge in each industry. Likewise, Miller and Côté (1987: 41) noted that “Each cluster seems to call for a distinct explanation”, the same as Bekar and Lipsey (2001) who pointed out that there is no unique or optimal way to generate new clusters but that possible ways include: to link the initiative to an existing cluster; to attract a lead or ‘champion’ firm to a region; to establish “...regular meetings of firms and organizations related to a particular network of production in the value chain”; and, by creating agencies that assist in brokering and networking, such as the Dutch Innovation Centres (2001: 65).

Ultimately, what is at issue is whether industrial clusters can be created by design at all in the first place. This question is being asked since the times when industrial districts captured the imagination of theorists and policy makers as clusters do in the present time: the central policy problem is “whether it is possible, through planned intervention, to create the sufficient conditions—represented by agglomeration economies—for the development of industrial districts” (Asheim (1994: 126). This in turn leads to the crucial question of

replicability, which was highly debated in the case of districts but rather rarely in the case of clusters, even though it is equally relevant in the latter.

Asheim (1994) distinguishes between specific factors (socio-cultural features historically embedded in a region's particular setting) which cannot be replicated elsewhere, and general factors (the lessons derived from the actual working of external economies through inter-firm networking and public-private cooperation) which can be more replicable. In spite of the power clusters are believed to command in theory, the question is still begging an answer. In most cases it is just assumed that clusters can be replicated provided the analyst or policy maker follows the right procedure, which in reality is nothing more than an assumption. For the time being, and in the light of the foregoing discussions, it will be safe to assume instead that each agglomeration—cluster or district—has its own specificities that make it non-replicable in other settings, and that only the general factors of each experience can be transferred to others.

A final point is that regarding the ends which clusters can be put to. According to the above reflections, this will vary in each case as well depending on the particular characteristics of both the local and regional setting at hand and the firms and industries involved. It will also depend, therefore, on the type of cluster under consideration, e.g. whether it is core-firm or branch-plant dominated, or else based on locally initiated firms.

In any case, clusters can be used: for diversifying a region's economic base by developing supplier networks and related support services catering to larger firms in the cluster; for industry targeting and recruitment to fill the gaps that are revealed when clusters are identified and thus complete production processes and value chains; and, for stimulating competition and rivalry (LeVeen, 1998).

On the other hand, as Bekar and Lipsey point out, clusters can serve as firm incubators, as settings for the generation of spin-offs and/or start-ups, as technology transfer

locales, as focal points for industry interaction, or as engines of growth. Government intervention should therefore be defined according to the role or roles clusters are to play in each development strategy. For instance, when the aim is to incubate or spin off new firms, policies should focus on the provision of low-cost venture capital, in contrast when the goal is technology transfer a solid support from universities, industry organizations and research laboratories will be crucial (Bekar and Lipsey, 2001).

In sum, a sound cluster development policy in developing countries will have a sound grounding by taking into account all the above reflections and considerations, especially those regarding the need of a framework that defines clearly the goals and objectives to be achieved, specifies a strategy that describes the steps to be taken, envisages a long-term planning horizon, and defines in detail the nature of the cluster or clusters to be promoted as well as the role they are to play and the ends they are to be used for, including the sources which the required capital and financial resources will come from.

In that way cluster policies may be able to produce the expected results from their implementation. Otherwise, they run the risk of becoming a passing development fad as growth poles and industrial complexes did in previous decades, and industrial districts are not far from being as well insofar as they are being superseded by the figure of industrial clusters on both the theoretical and policy planes. After all, as shown earlier, clusters share not only the theoretical roots but also the basic rationale of those earlier agglomerations.

It is wise to keep in mind therefore that “While it is too soon to tell whether industry cluster policies will be similarly ineffective, the rise in their stock appears nearly as dramatic” (Bergman & Fesser (1999: 9), and that there is the “risk of a backlash against clusters seen as just another economic policy fad” and that some “key challenges” need to be addressed in order for European cluster policies to be truly effective (Ketels, 2004: 4). If it is so in developed nations, the caution has to be even greater in developing countries.

CHAPTER III
THE CASE OF THE MEXICAN SILICON VALLEY

The National Context

Geographically, Mexico is located in North America south of the United States' mainland (Map 1). Its surface area tops 1.9 million square kilometres, which makes it a rather large country at least by European standards.

Map 1
Mexico's Location in North America



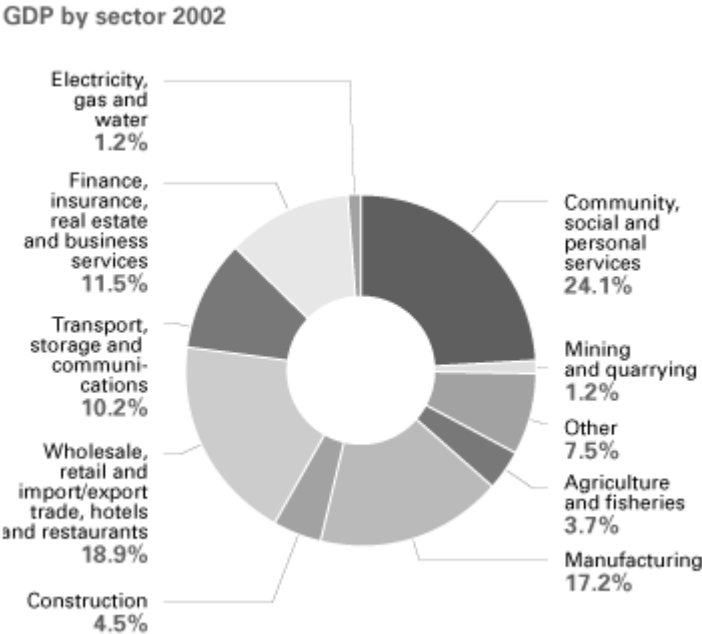
A federal republic, Mexico is divided into 31 states and one Federal District, seat of Mexico City, the nation's capital (Map 2). Jalisco lies northwest of Mexico City.

Map 2
Mexico's Politico-Territorial Division



Mexico is the world's 9th economy with a Gross Domestic Product (GDP) that totalled US\$ 637 billion in 2002, and a per capita counterpart that reached US\$ 6,261 in that year. It is Latin America's largest economy and the United States' third largest trading partner. The Mexican economy has a diversified structure with services, manufacturing, and foreign trade, commerce and tourism accounting for the largest shares of GDP (Chart 7)

Chart 7
Mexico's Economic Structure



Source: HSBC Mexico Business Profile

Mexico is the United States' third trading partner. Ninety per cent of Mexico's exports go to its northern neighbour, from which it buys 63 per cent of its imports. In general, Mexico is one of the most open economies in the world with a weighted average tariff of 5 per cent. In late 1993 the Mexican government signed the North American Free Trade Agreement (NAFTA), which entered into force in January 1994. In the subsequent years, it has subscribed another 10 free trade agreements (FTAs) with countries in three continents (Exhibit 1).

Exhibit 1
Mexico: Free Trade Agreements Subscribed

FTA	Partners	Date
NAFTA	United States & Canada	1 January 1994
G3 FTA	Colombia & Venezuela	1 January 1995
Mexico – Costa Rica FTA	Costa Rica	1 January 1995
Mexico - Bolivia FTA	Bolivia	1 January 1995
Mexico - Nicaragua FTA	Nicaragua	1 July 1998
Mexico - Chile FTA	Chile	1 August 1999
Mexico-European Union FTA	European Union	1 July 2000
Mexico – Israel FTA	Israel	1 de julio de 2000
Mexico – Central America North Triangle FTA	El Salvador, Guatemala & Honduras	15 March 2001 & 1 June 2001
México – FTEA FTA	Island, Norway, Liechtenstein & Switzerland	1 July 2001
México - Uruguay FTA	Uruguay	15 July 2004

Source: Ministry of Foreign Affairs, Mexican Government

Major trade regimes include the Maquiladora Industry Program and the Temporal Importation for Export Program (PITEX). The Maquiladora regime allows U. S. subsidiaries to import duty free equipment, parts, and components for assembly in Mexico, provided the assembled products are shipped back to the United States for the final stages in the value chain. PITEX is open for both domestic and foreign companies which under this program are able to temporally import parts and components for use in the processing of products for export free of general importation duties and value added tax. PITEX requires companies to export between 10 and 30 per cent of their production depending on the kind of goods imported and the tariff categories these goods are classified into.

In addition to the Maquiladora and PITEX regimes, in late 2004 a new federal Strategic Economic Zones Law was passed by Mexico's Congress, which opens the way for the establishment of free trade zones officially called Strategic Fiscal Enclosures. Companies located within these enclosures will operate duty and tax free (general importation, value added, foreign trade taxes and compensatory charges) while the imported goods remain within the enclosures' perimeter. The first of these zones was opened in December 2004 in San Luis Potosi, north of Mexico City in the country's central region; it is a 530-hectare estate provided with a container terminal, a dedicated customs office, and its

own railroad line. Similar zones are under construction in the border towns of Colombia, Nuevo Leon and Tijuana, Baja California.

The new figure of strategic economic zones (ZEE) will permit Mexico to offer both domestic and foreign companies an option similar to EPZs so common in Asia, whose only domestic counterpart has been the Maquiladora regime which, as mentioned above, grants duty free status to U. S. subsidiaries throughout Mexico's national territory. The functioning of ZEEs will be supported by a 15,000-kilometre railway system; a network of 84 airports, 38 of which handle international cargo and provide bond-warehousing support; and, 24 main maritime ports, the main of which are Manzanillo and Lazaro Cardenas on the Pacific Coast, and Veracruz and Altamira on the Gulf of Mexico coast.

Guadalajara's Locational Advantages

Guadalajara is the capital of the State of Jalisco. In colonial times, Guadalajara was the political, religious and administrative capital of the New Galicia province, which surpassed in surface area and rivalled in political power with the New Spain, seat of the colonial government. Since then, Guadalajara has been the main commercial hub in Western Central Mexico, the nation's second largest city, and also a major hub that articulates domestic and continental transport and communications networks.

Guadalajara is part of the so-called Golden Triangle which it forms with Mexico City and Monterrey, the country's third largest city (Map 3). It is located on both Mexico's Pacific Trade Corridor and the NAFTA corridor that runs north from the port of Manzanillo, on the Pacific coast, through Guadalajara and Monterrey in Mexico, to Oklahoma and Chicago in the United States, and all the way to Winnipeg in Canada, with an extension to New York City.

Map 3
Guadalajara in Mexico's Golden Triangle



In addition to NAFTA, Jalisco enjoys the advantages of the other several free trade agreements Mexico has subscribed with countries in South America and Europe referred to above, a circumstance that enhances Guadalajara's potential as an international commercial hub.

Jalisco is Mexico's third regional economy after Mexico City's metro area and the State of Nuevo Leon. Traditional industry sectors (food and beverages, footwear, textiles and apparel, and furniture) predominated in Jalisco up to the mid 20th century, while metal-mechanic industries started to flourish in the subsequent decades. From the late 1960s onwards, electronics and telecommunications started to emerge as fledgling industries that were to become some of the most characteristic sectors of the state economy.

The city of Guadalajara is the core of a large metropolitan region encompassing six municipalities in central Jalisco, with a surface area of nearly 800 square kilometres and a population of 3.7 inhabitants according to the 2000 Population Census, but which presently rounds 4.5 million (Map 4).

Map 4
The Guadalajara Metropolitan Area in Jalisco



In addition to its strategic location in Mexico and North America, Guadalajara boasts a variety of locational advantages that have made it a preferred location for U. S. and Asian corporations in the electronics and telecommunications industries. These advantages include:

- A fairly efficient transportation, communications and logistics infrastructure (four-lane access highways, a metropolitan peripheral loop, an international airport, optic fibre phone communication networks, Internet backbone sites and access, broad-band DSL and VOIP cable networks, efficient logistics, and airfreight and courier services provided by leading companies like FedEx, UPS, DHL, Bax, Cargolux, Martin Air, Jett
- A rather large and diversified industrial apparatus
- A sufficient water supply, much larger than in towns and cities along the U. S. border
- A reasonably efficient industrial infrastructure (three industrial zones and 17 major industrial parks—see Map 5—, plus six more parks in other regions of Jalisco’s interior)¹⁵
- An abundant labour supply and friendly worker unions, plus a low labour turnover, much lower than in northern border towns and cities
- A sizeable and growing pool of engineering and managerial talent and skilled technicians
- A dozen major universities with research centres and labs, two technological universities, seven technology institutes, 16 technical schools, over 400 preparatory schools, and 442 work training centres
- An adequate number and of good-quality elementary education schools
- A rich cultural life and a cosmopolitan urban environment

¹⁵ Two of these industrial zones are already part of the city’s built environment, namely El Alamo Industrial Park and the Guadalajara Industrial Zone, the oldest in the area; the other is El Salto Industrial Corridor in this adjacent municipality. These zones concentrate the bulk of Guadalajara’s industrial activities. Other seven parks entered into operation more recently in the Guadalajara region, which add to the ones described in Map 5.

- Historical landmarks, a typically Mexican provincial flavour combined with a cosmopolitan atmosphere, a rather orderly urban structure and a nice architectural physiognomy, all of which make the city an international tourist attraction

Map 5
Location of Major Industrial Parks in the Guadalajara Metropolitan Region



Source: Jalisco State Industrial Parks Association

- | | | |
|---|----------------------------------|------------------------------------|
| 1. Vallarta Industrial Park | 7. Santa Rosa Industrial Park | 13. Technology Industrial Park I |
| 2. IDEA, Guadalajara Campus | 8. San Jorge Industrial Park | 14. Technology Industrial Park II |
| 3. Guadalajara Technology Park | 9. Airport Industrial Park | 15. Bugambillas Industrial Park |
| 4. Integral Park | 10. Guadalajara Industrial Park | 16. San Agustin Industrial Park |
| 5. Ecopark, Technology & Business Park | 11. El Bosque Industrial Park | 17. San Agustin Industrial Park II |
| 6. Ecopark II, Technology & Business Park | 12. El Bosque Industrial Park II | |

A number of projects are underway to strengthen Guadalajara's position as a major node on the NAFTA corridor, and so its advantages as a preferred location for FDI in North

America. The idea is to turn this Mexican city into a Smart Port and connect it with the main trade rivers of the United States along which most of NAFTA trade is carried to its major destinations in the continent (SEPROE, 2004). The main project is the construction of a Smart Transportation Hub in a 470-hectare site adjacent to Guadalajara's international airport, which will be equipped with new landing tracks, a state of the art air traffic management system, and efficient custom-control service and facilities. Other projects are intended to improve the region's road communication infrastructure and include the construction of a new major regional highway that will permit traffic coming from Mexico City to bypass the Guadalajara metropolitan area and thus become a relief to the latter's already heavy traffic, and the completion of both the four-lane Manzanillo-Guadalajara segment of the NAFTA corridor and the eastern part of the metropolitan peripheral loop.

Guadalajara: The Mexican Silicon Valley

In the mid 1980s Guadalajara and its environs started to be dubbed as the Mexican Silicon Valley in national and international circles, in reference to the considerable number of high technology manufacturing companies, all subsidiaries of the world's largest multinational firms in the electronics industry, that had already concentrated in that part of Mexico by that time. Cover stories were devoted to this emerging cluster in international publications like the *World Press Review* (1988) and *Businessweek* (April 3, 1989) and in Mexico's top business magazine, *Expansión* (September, 1989).

Such reputation kept growing into the 1990s as Guadalajara's emerging electronics cluster continued to grow and diversify in those years and the city continued to attract the interest of analysts and journalists of some of the most prestigious U. S. and international newspapers and magazines. That interest was reflected in the numerous articles that were

published particularly in the later years of that decade and the initial ones of the 2000s all with the aim of making Guadalajara's case known to the world.¹⁶

By the mid 1990s Guadalajara was given a new denomination, Silicon Valley South, which was intended to establish it as the only region in the Americas, south of the United States, deserving the Silicon Valley adjective *vis a vis* other conglomerates such as Campinas, near Sao Paulo, Brazil. This occurred under the favourable atmosphere created by the signing of NAFTA and its entering into force in January 1994, and the outright free-trade oriented economic policies implemented by the Salinas administration since the late 1980s, of which NAFTA was the backbone.

The fact, however, is that the nature of the Guadalajara electronics complex as well the factors that gave rise to it and have driven its development for over three decades, are qualitatively different from the ones that originated the rise and propelled the growth of the original Silicon Valley in California. Guadalajara's is closer to similar cases in other developing countries, particularly that of Penang, Malaysia, incidentally known as the Silicon Valley of the East (Palacios, 1995). Nonetheless, the fact is also that some Silicon Valley-like features have been present at some points in the Guadalajara experience, as will be discussed later on.

The Guadalajara metropolitan region concentrates around 90 per cent of the stock of direct investment in the electronics industry in Jalisco and so, for practical purposes, it stands for the state as a whole when it comes to the development of this industry (Table 1).

¹⁶ E.g. "Salsa and Chips", *Los Angeles Times*, Marzo 8, 1998; "High-tech jobs transfer to México with surprising speed", *The Wall Street Journal*, April 9, 1998; "Contract manufacturing creates Guadalajara, México, technology corridor", *Dallas Morning News*, Septiembre 9, 1999; "Do PC jobs in México benefit state? *The Wall Street Journal* Interactive Edition, Julio 28, 1999; G. Pierre Goad (1999) "The Mexican Wave", *Far Eastern Economic Review*, November 11; Jennifer Bjorhus (2000) "México's Silicon Valley", *The San Jose Mercury News*, December 3; Philip Siekman (2001) "High-Tech México: Guadalajara, with its stable work force, is the favorite Mexican factory town of sophisticated U.S. companies", *Fortune Magazine* 158, October 29.

Table 1
Jalisco: Cumulative Investment in the
Electronics Industry by Municipality, 2001-2004
(Thousand U. S. dollars)

Municipality	Investment	%
Guadalajara metro region		
Zapopan	282,649	51.6
El Salto	145,870	26.6
Tlajomulco de Zúñiga	34,000	6.2
Tlaquepaque	17,733	3.2
Guadalajara	300	0.1
Various municipalities	5,176	1.0
Sum	485,728	88.7
Other municipalities	61,689	11.3
Total	547,417	100.0

Source: Jalisco State Information System (SEIJAL),
Secretariat of Economic Promotion

Most of this investment comes from abroad, as Table 2 shows. The downturn in the proportion of foreign capitals over the last years is a reflection of the effects of the slump experienced by the U. S. economy after the boom of the 1990s and the lost of many projects to China in these years, which was reflected in the closing down of several subsidiaries of both U. S. and Asian corporations in the area, notably NEC, NatSteel, VTech, Motorola, and Lucent Technologies. The decline in FDI inflows has combined with a concomitant increase in the participation of domestic capitals.

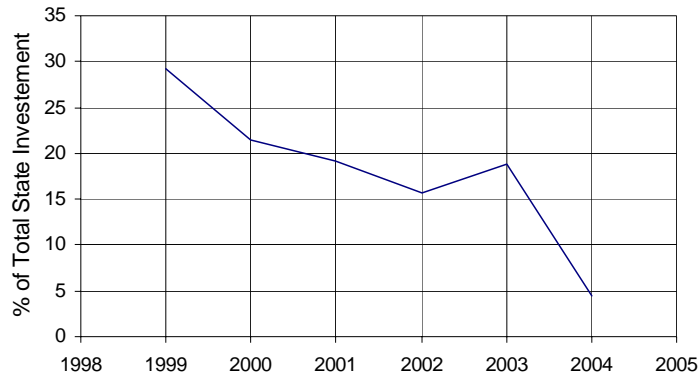
Table 2
Jalisco: National Origin of Direct Investment
in the Electronics Industry, 2001–2004
(Million dollars)

Origin	2001		2002		2003		2001-2003	
	\$	%	\$	%	\$	%	\$	%
Foreign	179,720	99.90	81,330	51.32	142,076	67.97	403,126	73.64
Domestic	107	0.05	77,146	48.68	66,238	31.69	143,491	26.21
Mixed	100	0.05	0	0	700	0.34	800	0.15
Total	179,927	100.00	158,476	100.00	209,014	100.00	547,417	100.00

Source: SEIJAL, Jalisco Secretariat of Economic Promotion

Actually, as Chart 7 shows, the proportion of total direct investment inflows to Jalisco accounted for by the electronics industry has sharply declined over the last years from 29 per cent in 1999 down to just over 4 per cent in 2004, when the most serious drop was experienced.

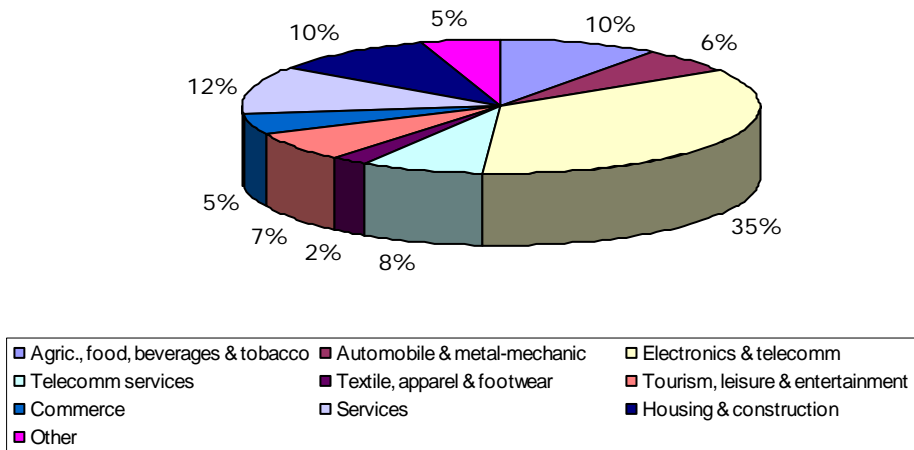
Chart 7
Jalisco: Share of Electronics in Total Direct Investment



Source: SEIJAL, Jalisco Secretariat of Economic Promotion

The fact is, nonetheless, that on a historical perspective the electronics industry has captured the lion share of total cumulative investment in Jalisco over the period from 1995 to 2003 *vis a vis* the other sectors of the state’s economy. As Chart 8 illustrates, electronics has accounted for over one third of the total, followed far down by services.

Chart 8
Jalisco: Cumulative Total Direct Investment by Sector, 1995-2003



Source: SEIJAL, Jalisco Secretariat of Economic Promotion

Given Guadalajara’s location just two hours away from major U. S. logistics hubs like Dallas and Houston and three from Atlanta, the bulk of FDI into the electronics sector corresponds to U. S. capitals (Table 3). During the boom of the late 1990s the proportion of

FDI coming from the United States was highest as it accounted for nine out ten dollars that were invested in electronics ventures in Jalisco in those years in this industry (Singaporean and Taiwanese capitals were next but way down from U. S. investments).

Table 3
Jalisco: National Origin of Total Direct
Investment in the Electronics Industry, 1995-1999 & 2001
(Million US dollars)

Country	1995-1999		Country	2001	
	\$	%		\$	%
United States	1,584	91.0	United States	137.270	76.31
Singapore	94	5.4	Singapore	22.000	12.23
Taiwan	23	1.3	Germany	19.000	10.56
Japan	9	0.5	Holland	1.000	0.56
Hong Kong	8	0.5	Venezuela	0.250	0.14
Germany	3	0.2	Mexico	0.107	0.06
Mexico	19	1.1	Mixed	0.100	0.05
Total	1,740	100.0	Total	179.927	100.0

Source: SEIJAL, Secretariat of Economic Promotion

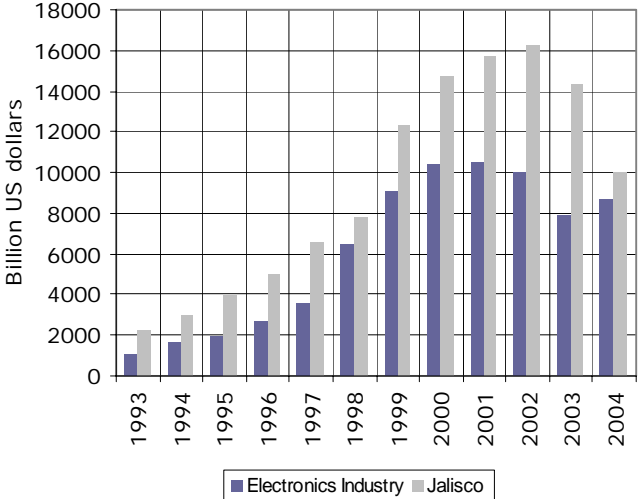
In 2001, that proportion dropped to just a little over ¾ of the total, as an indication of the U. S. economy’s slump referred to above, with Singapore and Germany increasing significantly their shares. Mexico’s northern neighbour and NAFTA partner, though, remained as the first and foremost provider of fresh investment to Guadalajara’s electronics industry.

The point is that the Mexican Silicon Valley is highly exposed to international factors, and more precisely highly dependent on the U. S. economy. As the above figures indicate, the large bulk of the companies making up the Valley are subsidiaries of foreign multinational corporations that operate in global markets and whose production and investment decisions are therefore guided by the interests of those corporations and by the logic imposed by the rigours of global competition.

Nonetheless, the electronics industry not only accounts for a sizeable proportion of total direct investment in Jalisco but also for the largest share of total exports, as Chart 9 presents. It has been followed far down in the last few years by the food, beverages and tobacco sector. This has been the result of a fairly consistent performance in the generation of exportable

output, which has averaged six billion dollars in this period, peaking up in 2000 and 2001, all as a result of the inertia created by the boom years of the late 1990s.

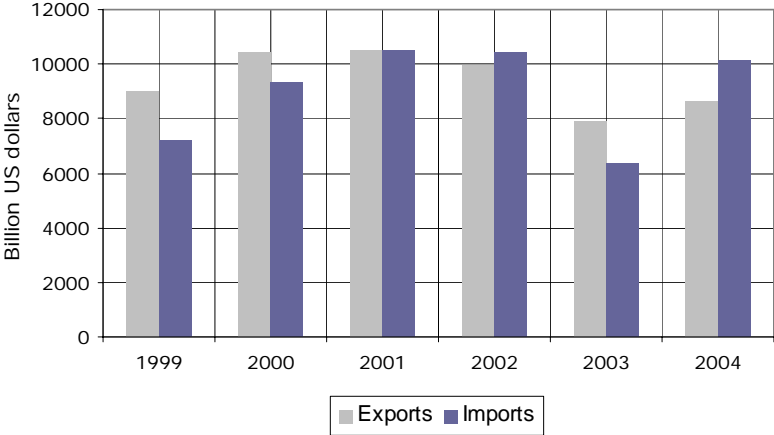
Chart 9
Jalisco: Electronics exports, 1993-2004



Source: SEIJAL, Secretariat of Economic Promotion

The point, however, is that imports have shown a similar dynamism, particularly in the last five years as Chart 10 illustrates, with exports having been virtually matched by imports. This circumstance is indicative of a shallow integration of the electronics industry with the local economic milieu, which further illustrates the condition of the Mexican Silicon Valley as a branch-plant dominated industrial cluster.

Chart 10
Jalisco: Electronics Exports vs. Imports, 1999-2004



Source: SEIJAL, Secretariat of Economic Promotion

In any event, the fact is that the electronics industry constitutes one of the most important economic sectors in Jalisco. Not only has it historically accounted for a substantial proportion of total direct investment, but is also the top exporter and one of the main attractors of capital investment in the state. Therefore, a dynamic and solid electronics sector seems essential for the good health and sound performance of Jalisco's regional economy as a whole. Its promotion and support has been, in consequence, a high priority of the state government, as expressed by the consistent policy that has been implemented to those ends over the last decade.

Institutional Support and Policy Environment

The most proactive and solid policies aimed at promoting the electronics industry in Jalisco were implemented by the state government in the 1995-2001 administration, which turned out to be essential for the boom experienced by the industry in the second half of the 1990s. Those policies were carried out in coordination with and with the full backing of both the electronics companies operating in the state and the industry associations in which they were grouped, specifically the local branches of the American Chamber of Commerce (AmCham) and the Electronics, Telecommunications, and Informatics Industry National Chamber (CANIETI), as well as the Jalisco Industrial Chamber Council (CCIJ). Therefore, it occurred that this has been a typical instance of close public-private partnership and collaboration as those praised by both students and pundits of industrial districts and clusters, Porter included.

CANIETI was originally founded in 1935 in Mexico City as the Federal District Radio Distributors Association, a denomination that changed to that of Electronics Industry National Association in 1950, to Electronics and Electric Communications Industry Chamber (CANIECE) in 1957, and finally to CANIETI in 1997. Still as CANIECE, this key chamber established its western regional office in Guadalajara in 1992, which in 1997 accordingly became CANIETI's.

Some of CANIETI's most prominent member companies—IBM, Intel, Hewlett Packard, Jabil Circuit, Lucent technologies, and NatSteel Electronics, the last two no longer in the area today—partnered in 1997 to set up the Electronics Supply Chain agency (CADELEC), as a specialised research and coordination body charged with the mission of promoting the development of local supply networks by facilitating the connection between local start ups and foreign subsidiaries with an eye to building a local electronics industry supply chain linked to other strategic sectors in the regional and national economies. CADELEC also receives support from the Secretariat of Economic Promotion (SEPROE) and the Foundation for Technology Transfer to the Micro, Small and Medium-sized Enterprise (FUNTEC).¹⁷

Also as part of those efforts, other relevant institutions were created in subsequent years, including the Digital Economy Promotion Council in 2000 and the Jalisco Institute for Information Technologies (IJALTI) in 2002, both with the support and direct participation of the state government and private sector organisations. Likewise, the Jalisco State Science and Technology Council (COECYTJAL) was established in 2000 with the mission of contributing to the collective quest for achieving the consolidation of the electronics industry, and to the development of the information technology sector as a whole. In this context, in 2004 COECYTJAL created a state-wide Commercial Intelligence System, which is intended to promote the development of e-commerce and e-business in Jalisco.

Other institutions established in those years include bodies like the Jalisco State Economic Promotion Council (CEPE) and the Jalisco State Economic Council for Development and Competitiveness. Organically part of the Secretariat for Economic Promotion, CEPE was created in 1994 and charged with the mission of promoting investment by providing incentives to new companies, which include physical infrastructure and urban

¹⁷ CADELEC's functions include market intelligence (a supplier database, statistics, strategic studies), supplier development (supplier assessment, support and orientation for getting ISO certification, financing and grants, and investor attraction), and industrial promotion (sales strategies, agreements with public institutions, participation in trade missions).

public services, support for employee technical training, and land sites owned by the council at preferential prices below market level usually in industrial parks and estates. CEPE is also responsible for the observance of the Jalisco State Economic Promotion Law, which was originally passed in 2001 but underwent substantial reforms that were approved in December 2004. These reforms specified in more detail and slightly extended the incentives scheme instituted in 2001 by including a new export promotion program and economic support for companies to participate in national and international business fairs and exhibitions.¹⁸

The Jalisco State Economic and Social Council for Development and Competitiveness in turn was created in August 2004 with representatives of the public, private and academic sectors. Its functions are aimed at: supporting the formulation of prospective studies to promote sustainable development; strengthening the state's competitive advantages by recommending high impact strategic projects for fostering the state's social and economic development and competitiveness; proposing criteria and orientations for a state industrial policy focusing on the integration of regional supply chains; fostering innovation and technologic advance; and, reducing transaction costs.

Although no explicit policy on industrial parks exists in Jalisco, in practice CEPE operates one as part of its responsibilities referred to above. In December 2004 CEPE launched an Idle Industrial Infrastructure Program aimed at renovating and rehabilitating over five dozen industrial shades owned by the state government in seven of Jalisco's major regions. This program seeks to facilitate the installation of new enterprises in existing industrial premises, create new jobs, and link the various state-owned industrial zones to favour the emergence of regional supply chains. In addition, the state government provides support for the development

¹⁸ Incentives are granted in three priority levels according to the location of the company in question: first, to those locating in areas where the state is applying decentralisation policies; second, to those locating in small and mid-sized cities; and third, to those enterprises locating in municipalities or geographic zones with high incidence of extreme poverty.

of industrial parks by private developers, most of which are grouped in the Jalisco State Industrial Parks Association (APIEJ) whose members were listed earlier in this chapter.

In sum, a dense institutional framework has been built in Jalisco over the last decade, which has provided a critical support for investors to set up new ventures in the state, particularly in Guadalajara and environs. The one factor that has been the real dynamo in that context, though, is the consistent commitment and collective initiatives of the local managers of the electronics companies operating in the area, who have successfully teamed up with the leaders of industry associations, chiefly CANIETI and CADELEC, and the successive officials of industrial promotion state government agencies and branches to advance the interests and projects not only of the industry as such but of the wider community that has been formed as the aggregate result of those collective actions, which is generally dubbed as the Jaliscan electronics cluster.

The above has thus contributed to further enhance the locational advantages of this region by creating a more favourable business environment for both domestic companies and foreign corporations to set up shop in this part of Mexico. This environment has been conditioned and enhanced by the regulations and the programs that have been instituted by federal authorities and government agencies regarding industrial promotion, taxation, foreign trade, and telecommunications. In the last instance, though, it is the actions undertaken by local institutions and agencies which have been instrumental for the growth and development of the electronics industry in this region that has thus become the Mexican Silicon Valley.

Formation and Development of the Guadalajara Electronics Cluster

The institutional and policy environment described above has exerted a positive influence in the decisions of global companies to locate production facilities in Jalisco, and particularly in Guadalajara, thus strengthening the city's natural and man-made advantages described at the beginning of this chapter. As a result, a dynamic cluster of electronics firms emerged and

flourished in this region, which after three and a half decades has reached considerable dimensions as a product of a singular process of industrial agglomeration that has followed a development pattern that is specific to the geographic, economic and social characteristics of this part of Mexico but that, at the same time, illustrates the way cluster formation processes unfold in Latin American developing countries in general.¹⁹

East Asian References and Theoretical Expectations

Latin American cluster formation patterns are different from those observed in East Asian countries as reported by Kuchiki and Tsuji (2004). This is largely due to the particular logic of branch plant deployment followed by Asian MNCs, which usually leads to the formation of core-firm dominated clusters around a large branch-plant manufacturing facility that plays the role of anchor in the respective conglomerate. Another differentiating factor is the widespread presence in Asian countries of EPZs, SEZs and similar planned complexes where most incoming FDI tends to concentrate, absent in Latin American countries.

Such differences in development patterns necessarily imply differences in the kind of conditions that have to be met for clusters to form in each of these two continental regions. Kuchiki (2004) concluded that there are four main factors that have proven to be determinant for cluster formation in East Asian countries: 1) industrial zones (industrial parks, EPZs, and the like); 2) capacity building (physical infrastructure, simplification of official paperwork, deregulation of investment procedures); 3) anchor firms; and, 4) related firms. From there, Kuchiki inferred that the process develops in two basic stages, provided conditions 1 and 2 hold: 1) an anchor firm sets up shop in an industrial zone, and 2) its related firms follow suit once the anchor firm reaches a critical production scale capable of generating sufficient external economies for these firms to become its suppliers. Although Kuchiki adds some

¹⁹ As established in Chapter I, the term cluster is meant here to designate a particular locale in which a constellation of business enterprises and non-business institutions take seat and form a rather coherent system that behaves and evolves as whole over time.

caveats about cases in which this sequence may not hold, his framework ultimately assumes a linear process that unfolds in a sequential fashion and originates in a planned industrial estate.

While the above conditions may in general be common to many instances of cluster formation, the case of Guadalajara shows that others intervene as well in Latin American regions. Likewise, while the basic features of the pattern described by East Asian clusters, including some sequential elements, may also be present in other latitudes, the Mexican case reveals that the pattern is different in these latitudes.

Before analysing in detail the case of the Mexican Silicon Valley, it is in order to recall that from a theoretical point of view, and as discussed in Chapters I and II, two basic dimensions can be distinguished when analysing the process of birth, growth and evolution of an industry cluster. One refers to its constituent elements, that is, the chief players that make it up and make it function at a given point in time. The other alludes to the set of interacting forces that drive the process over time and determine the distinguishing characteristics of the resulting industrial formation. Regarding the first, and as referred before, Michael Porter holds that the critical elements for a cluster to take shape are:

- A group of interconnected producing companies
- Specialised suppliers of inputs, equipment, and services
- Customers and market channels
- Producers of complementary goods
- Supporting and coordinating institutions (government agencies, universities, trade associations, technical schools)

On the other hand, and as summarised in Exhibit 2, the forces driving the process include:

- Geographic propinquity
- The presence of a favourable “industrial atmosphere” and a vibrant innovative milieu
- The existence of a sound social (non-business) infrastructure or institutional thickness
- The emergence and persistence of an active cooperative competition and rivalry among clustered firms
- The occurrence of inter-firm alliances and partnerships
- The emergence of production linkages and inter-firm networks
- The presence of external and agglomeration economies

An industrial formation that bears all those features is said to develop path dependence and lock-in effects over time, which will reinforce the circularity and continued dynamics of the process as a whole and make it produce a self-sustained industrial cluster as defined by Miller and Côté (1987).

On the other hand, and as established in Chapter II, a wide consensus exists among theorists and students that industry clusters are born spontaneously out of a market-driven process on the basis of existing industrial specialities and production competencies within a region, not by design or as a result of a deliberate strategy. Therefore, the consensus continues, policy efforts should be aimed at strengthening such competencies and locational advantages in existing or emerging industrial agglomerations instead of creating others entirely anew. In consequence, each cluster has its own story and a distinct explanation as to its birth, development trajectory and long term evolution pattern. The point then is to identify common ingredients and features across particular instances of cluster formation so as to discern the underlying patterns and derive general lessons that may be useful for policy making purposes. The only way to achieve this is by performing comparative analyses between cases in different latitudes, which is the ultimate aim of this study.

Birth and Initial Stages

As the theory predicts, the birth of the Guadalajara electronics cluster was a spontaneous, market-led phenomenon. It all began with the installation in 1968 of branch plants by two leading U. S.-based global electronics corporations, Motorola and Burroughs, which looked South of the border, into Mexico's interior, for a low-cost location with a good supply of labour and other critical conditions for the deployment of assembly operations. Guadalajara met those conditions and so constituted an attractive location *vis a vis* the string of cities and towns along the Mexico-US border, which had been the preferred option for U. S. firms to deploy in-bond assembly plants under the Maquiladora Program instituted back in 1965 by the

Mexican government to allow that kind of plants located on a 20-kilometre strip along the border to import parts and components duty free, provided the assembled products be exported back to the United States for the final stages of a cross-border value chain.

Although the Maquiladora Program was not extended to the rest of Mexico's territory until 1972, by the end of the 1960s Guadalajara offered other advantages, as described at the beginning of this chapter, some of them derived from its urban size and its condition as Mexico's second largest city. Those advantages proved to be compelling enough for Motorola and Burroughs²⁰ to set up their branch plants, the former to assemble semiconductors, integrated circuits, radio sets and microphones; the latter, a wide variety of components including PCBs, minidisks, harnesses, microprocessors, and power supplies.²¹ A significant antecedent was the alliance Siemens, the German engineering giant, had entered into in 1965 with Productos Industriales (PINSa), a local firm, to manufacture electrical motors.²²

Those seminal ventures ignited the process of electronics firm clustering in the area. A few years later, two other MNCs set up assembly plants in Guadalajara: General Instrument in 1974 and IBM in 1975, both under the same cross-border supply chain scheme as Motorola and Burroughs, procuring parts and components from the United States and exporting the assembled products back there for finishing operations. General Instrument did relays and surge suppressor assembly, while IBM manufactured electric typewriters.

IBM actually moved its manufacturing operations from Mexico City to set up the Guadalajara plant, which started production of minicomputers (S/34, S/36 and AS/400) in 1982. The plant became a wholly owned subsidiary of IBM Corp. in 1985; it began producing PCs in that year and disk drive components in 1986. General Instrument's plant was acquired years later by C. P. Clare Corp. and in 1999 by Sumida Electric Corp. of Japan.

²⁰ In 1986 Burroughs merged with Sperry and became Unisys

²¹ Motorola's plant was emplaced in a high-income residential area, and Burroughs' in a urban sector developed in the 1950s as Guadalajara's industrial zone. Motorola's was acquired in 1999 by On Semiconductor, which closed down its local operations and left the area in 2002.

²² PINSa was acquired by and incorporated to Siemens in 1982.

A big outlier in the trend toward the concentration of foreign subsidiaries in the city already in motion those years was Electrónica Zonda, a wholly owned local start up. Established in 1970, Zonda began producing portable radios and audio consoles (a radio set, a turntable, and speakers, all in a wooden cabinet) and three years later it started making black and white TV sets designing its own prototype and using its own brand name. By 1975 Zonda became Mexico's top maker of radio consoles still widely popular in those years.

In the late 1980s, Zonda spun off four daughter companies, and through one of them, COMPUMEX, started making PCs in Tijuana, but the 1982 devaluation of the Mexican peso led this and other two of those companies to bankruptcy. In 1988 Zonda set up a new PC making venture in its premises in Guadalajara, Computadoras Logix, which the company also marketed with its own brand name, although importing PCBs, motherboards and all the other key components from Asia and the United States.²³

By the mid 1970s a critical mass of core companies had set foot in Guadalajara, all of them subsidiaries of MNCs, with the exception of Zonda, a circumstance that would establish the character of the process of cluster formation in the area and the extra-national origin of the main forces that were to drive its development in the years and decades to come.

Building on the external economies of agglomeration that were already being generated by the critical mass of companies that had concentrated in the area, throughout the 1980s and up to the early 1990s, a second round in the development of the electronics industry took place as new companies were set up in this region thus further fueling the process. A mixture of wholly owned foreign subsidiaries, joint ventures, more local start ups, and, for the first time, some spin-offs, were set up in the area in this period. In this way, some basic features of the snowball-like process of exponential firm creation that has been the lifeblood of Silicon Valley

²³ Logix computers were produced until 1993 when Zonda was forced out of business by increased competition from other domestic brands like Lanix and Gama.

emerged in Guadalajara. These features included the emergence of design and research and development (R&D) operations, as will be detailed below.

Stands out in this second stage the arrival of subsidiaries of other major electronics original equipment manufacturers (OEMs) like Hewlett Packard, Wang, Tandem, NEC, and AT&T, as well as the conversion of Kodak's local subsidiary, established years before to produce photographic film, into a new factory that started to produce floppy disks, harnesses and printed circuit boards (PCBs) in the mid 1980s.

Wang, Tandem, NEC, and AT&T either sold or closed down their operations after a decade or so of their establishment, only Hewlett Packard and Kodak remained and are still in operation to date, as it is IBM which started earlier. In this way, IBM, Hewlett Packard and Kodak came to constitute the anchor firms of the emerging electronics cluster in Guadalajara.

Exhibit 3 lists the companies that were set up in the two initial stages in the development of the cluster discussed up to here, describing in each case the year of establishment, the character, and the initial products of the respective firm.

Fourth Stage: The Invasion of Contract Manufacturers

The third stage in the development of the Mexican Silicon Valley begins in the mid 1990s, when the critical mass of companies had become a sizeable and growing cluster, the December 1994 devaluation of the Mexican peso had produced its positive effects, and the signing of NAFTA had created an even more favourable environment for FDI in Mexico. This stage was dominated by the emergence of contract manufacturing operations and the flourishing of the electronics manufacturing industry in the area.

Subsequently, a virtual invasion of subsidiaries of the world's leading contract manufacturers took place in the wake of a few years. Charts 11 and 12 describe the number and names of these companies, and the year in which each settled in.

Exhibit 3
Guadalajara Electronics Cluster Core Company Setup / Deployment
Initial Stages

Company	Year Established	Character	Initial Product (s)
First Stage			
Siemens de Mexico	1965	Foreign subsidiary	Electric motors, contractors & switches
Motorola	1968	Joint venture	Cables, harnesses & power supplies
Burroughs	1968	Joint venture	Semiconductors, radio & microphones
Electrónica Zonda	1970	Local start up	Portable radios & audio system consoles
General Instrument	1974	Joint venture	Relays & surge suppressors
IBM	1975	Joint venture	Electric typewriters
Second Stage			
Microton/Info-Espacio	1979	Local start up	Personal computers & buffers
Wind Computers	1981	Local start up	Personal computers (PCs)
Hewlett-Packard	1982	Wholly owned subsidiary	Minicomputers
Telectra ¹	1982	Joint venture	Low-tension control devices
Kitron	1982	Local start up	Digital control instruments
Sistemas Delphi	1983	Spin off	PC keyboards & Printed circuit boards (PCBs)
Encitel ²	1983	Spin off/joint venture	PCBs
Resser	1983	Local start up	Electronic alarm systems
Poder Digital	1985	Local start up	Power supplies
Electrónica Pantera	1985	Spin off	Cables and harnesses for PCs
Cherokee Electrónica	1985	Joint venture	Power supplies
Tulon de México	1985	Wholly owned subsidiary	Drills for PCB assembly
Shizuki Electronics	1986	Wholly owned subsidiary	Connectors & moulded capacitors
Kodak ³	1986	Foreign subsidiary	Floppy disks, harnesses & PCBs
Wang de México	1986	Foreign subsidiary	PCs, minicomputers & phone sets
Compubur	1986	Spin off	PCBs
Tandem Computers	1986	Foreign subsidiary	PC assembly
Third Stage			
Adelantos de Tecnología ⁴	1987	Induced location	PCBs
Logix	1987	Local firm spin off	Personal computers
Molex	1989	Wholly owned subsidiary	Cables & connectors
Mexaltec (formerly Kitron)	1990	Local venture	Relays & digital control instruments
NEC de México	1990	Joint venture	Microprocessor-controlled cell phones
ATT de México	1990	Wholly owned subsidiary	Phone answering machines
Panamericana de Tecnología	1994	Joint venture	n. a.
Circuit Assembly de México	1994	Wholly owned subsidiary	PCBs
Computadoras Electron	1992-1994	Local start up	PCs, printers & other peripherals
Scale Computers ⁵	1993-1994	Local start up	Personal computers
Advanced Electronics	1993-1994	Local start up	Personal computers

Sources: Palacios (1997) and Palacios (2004), updating by the same author up to January 2005

1. Established by Siemens building on SITESA, a company also founded by Siemens in Mexico State

2. It was established with 100 per cent local capital but as a Siemens de Mexico subsidiary

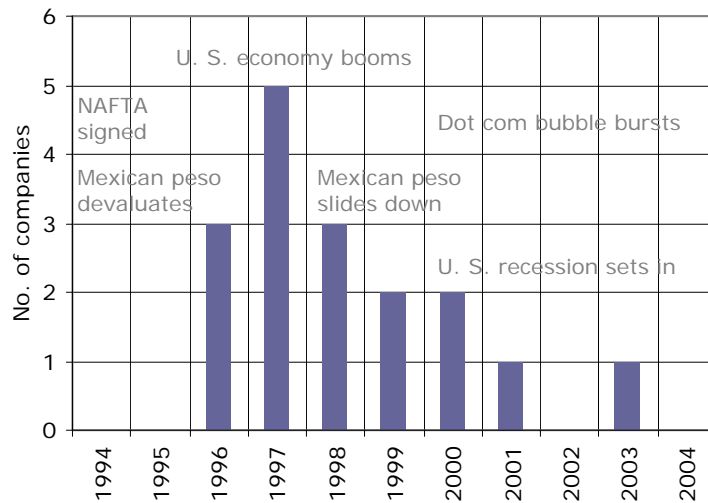
3. Up to this year the plant produced photographic film

4. It was established to supply the local IBM plant, located three kilometres away

5. 100 per cent local capital

Notes: Microton and Wind marketed their PCs with their own brand name

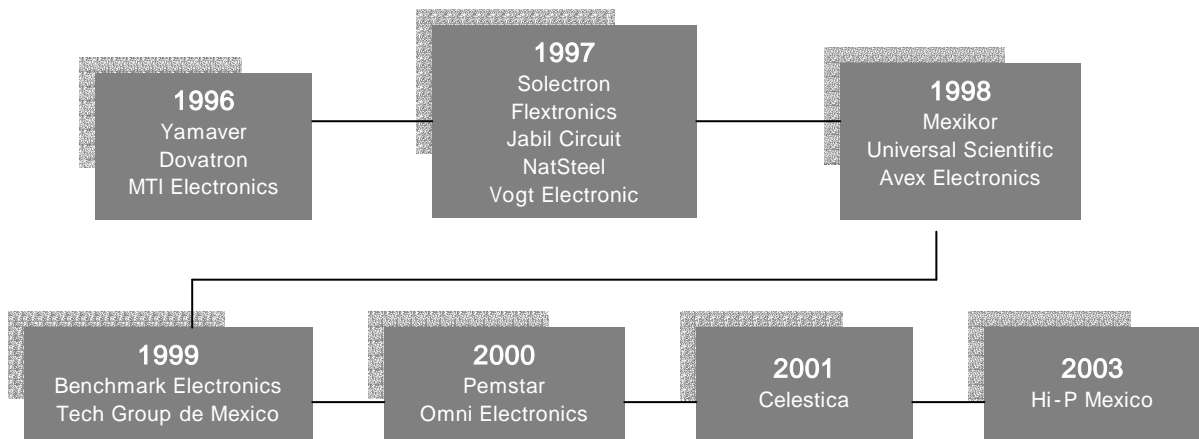
Chart 11
Number of Foreign Electronic Contract Manufacturers established in Guadalajara, 1994-2004



Sources: Palacios (2004); company online data, and direct research by the author

Although the presence of some of the world’s largest OEMs in the electronics industry was an important influence, such massive arrival of CMs was ultimately induced by the factors referred to above, and most of all by the high demand and strong impetus generated in global markets by the extraordinary expansion experienced by the U. S. economy in the 1990s, which peaked out precisely in the middle of that decade. All those circumstances and prospects led MNCs in general and CMs in particular to expand their production capabilities by deploying branch plants abroad. After all, the OEMs had been in Guadalajara for years and even decades.

Chart 12
Foreign Electronic Contract Manufacturers established in Guadalajara, 1994-2004



NAFTA's provisions had made it easier for U. S., and much convenient for Asian, CMs to set up shop in Mexico and from there to supply their customers around the world. The drastic devaluation of the Mexican peso of December 1994 and its further substantial sliding in 1998 resulted in a major appreciation of the US dollar that turned labour and other inputs much cheaper, thus making it possible for CMs to reduce landed costs by operating in this country. Guadalajara's geographic location close to the United States and the derived transport cost advantages, relative to Asian locations, played the rest.

In parallel with the arrival of CMs, another round of core producing companies established premises in Guadalajara, including assemblers of PCBs, cables, harnesses and connectors, a PC maker, and a major facility of the new venture resulting from the merger between IBM's and Hitachi's storage technology businesses, named Hitachi Global Storage Technologies. The facility was installed inside the IBM Technology Campus in El Salto Industrial Corridor. Also in this group was Technicolor, formerly a division of Kodak, which set up a state of the art manufacturing facility that is presently the world's largest DVD replication and printing plant.

All of those were wholly owned subsidiaries of foreign OEMs, except for one joint venture (CUMEX) and a local start up (SERIIE). Exhibit 4 presents the details of this period.

During those years, the electronics industry in Guadalajara experienced its highest prosperity ever as discussed at the beginning in this chapter, largely as a result of the massive arrival of CMs and the resulting surge in the electronics manufacturing industry in the area. It was, therefore, a CM-led boom which ended in the early 2000s, when the U. S. economy entered into recession, demand for electronic products slumped, markets collapsed, and even the dot com bubble finally burst.

Exhibit 4
Core Company Setup / Deployment
Fourth Stage

Year established	Company	Capital	Product (s)	Corporate character
1993	Cumex ¹	Joint venture	PCBs	OEM
1997	Siemens ²	Wholly owned subsidiary	Air bags, break systems, electronic brains, displays, travel computers	OEM
1997	Best Technology Computer	Wholly owned subsidiary	PCs	OEM
1997	Telect	Wholly owned subsidiary	Fibre optic, digital & communication products	OEM
1999	Lo Dan West	Wholly owned subsidiary	Cables & inter-connectors	OEM
2002	SERIE	Local start up	PCBs, cables and harnesses	OEM
2002	Foxconn	Wholly owned subsidiary	Connectors & cable components	OEM
2003	Technicolor	Wholly owned subsidiary	Content DVDs	OEM
2003	Hitachi Global Storage Technologies	Wholly owned subsidiary	HDD slider assembly	OEM
2003	BDT Mexico	Wholly owned subsidiary	Paper handling, optical storage & tape automation equipment	OEM

Source: Company online data and local newspapers

1. It was acquired by Multek in 2000, which closed down its local operations in 2003
2. It opened a new plant to produce such automobile electronic systems

Mergers, Acquisitions and Company Exit-Entry

Industry clusters are living organisms and Guadalajara is not the exception. In the early 2000s, after more than two decades of development, this cluster experienced some significant changes in the composition of its company population, with the exit and subsequent entry of foreign subsidiaries. In 1999, Motorola, the only company in the area that included wafer fabrication in its operations, sold out its plant to On Semiconductor and left the area. In 2000 Lucent Technologies in turn sold its manufacturing plant in Guadalajara to Hong Kong-based V-Tech, where Lucent was making phone sets and accessories; two months later V-Tech closed down the plant and moved its operations to China. Likewise, NEC de Mexico halted operations and closed down its plant in the El Salto Industrial Corridor laying off its 450 employees.

In 2001, NatSteel's Guadalajara plant became Solectron's as the latter acquired the former at the corporate level. In the same way, SCI Systems merged with a subsidiary of Sanmina forming Sanmina-SCI, with SCI thus becoming a subsidiary of the latter. Moreover, Flextronics entered into an alliance with Xerox Corporation under which Flextronics took over Xerox's plant in Aguascalientes along with its photocopier manufacturing operations; Xerox then relocated its California and New York operations into the Aguascalientes plant now managed by Flextronics.

In 2002 On Semiconductor finally closed down the plant it had acquired from Motorola and sold it to Grupo Fracsa, a local concern. On Semiconductor then moved its local operations—wafers, tiristors and rectifiers—to its plants in Phoenix, Arizona and Seremban, Malasia. Finally, in August, Eker, a PCB assembler, moved its operations from Saltillo, Coahuila to Yamaver, both subsidiaries of Epiq, a German firm.

Fifth Stage: Support-Industries, Logistics / Supply Chain Management

Almost right after CMs started to arrive in Guadalajara, a flock of firms in a number of supporting industries providing inputs and logistic services to electronics manufacturers and assemblers join in the cluster. Most of them were subsidiaries of MNCs as well, given the failure of local entrepreneurs to venture into the electronics business to fill in the innumerable market niches open by the multiplication and diversification of the industrial operations performed by foreign assemblers and manufacturers. Exhibit 5 describes the new companies whose business is to provide parts, components and basic materials to the latter.

Attracted by the already sizeable concentration of electronics companies, in particular of CMs, another flock of firms specialised in logistics and supply chain management arrived in Guadalajara almost in parallel with the establishment of support-industry companies described above. Exhibit 6 enlists the names, character and main services provided by those firms.

Exhibit 5
Major Support-Industry Companies

Year established	Company	Character	Operations & Products
1998	Puget Plastics	Wholly owned subsidiary	Plastic injection parts & medical and office products
1998	DTM	Wholly owned subsidiary	Plastic injection & moulding
1999	Bermo	Wholly owned subsidiary	Metal die stamping parts
1999	Tech Group de Mexico	Wholly owned subsidiary	Precision injection moulding, pad printing, sonic welding
1999	Triquest	Wholly owned subsidiary	Plastic injection & moulding, cables and harness assembly
2000	Cowden Metal	Wholly owned subsidiary	Metal die stamping parts
2000	Trend Electronics	Wholly owned subsidiary	Plastic injection & die-stamping parts
2000	Empresas Titán	Domestic subsidiary	Packaging materials
2000	EM Solutions	Wholly owned subsidiary	Plastic injection & moulding
2001	Fu Yu Manufacture	Wholly owned subsidiary	Plastic injection & moulding
2001	Fleck de México	Wholly owned subsidiary	Plastic injection & moulding
2001	Electri-Cord	Local company	Cables & harnesses assembly
2001	KeyTec Mexico	Wholly owned subsidiary	Metal & plastic high-precision components & assemblies
2001	Avantex	Wholly owned subsidiary	Electronic component reworking
2002	Cableton	Local company	Cables & harnesses assembly
2002	Newark Electronics	Wholly owned subsidiary	Component supply & e-procurement
2002	Kervo	Joint venture	Metal die stamping
2002	Ensamblés Electrónicos de Jalisco	Local company	Electronic component reworking
2003	HI-P	Wholly owned subsidiary	Plastic injection & moulding, tampo printing & component assembly
2003	Rosti Mexico	Wholly owned subsidiary	Plastic injection moulding, printing, welding, heat staking, metal mechanical assembly & shielding
2004	CCT de México	Wholly owned subsidiary	Cables & harnesses assembly

Source: Palacios (2001; 2004); local newspapers; company websites; and direct research by the author.

As can be observed, vendor-managed inventory (VMI) logistics services have been provided from the outset by companies like Span, also known as third-party logistics providers, which also offer other advanced options such as e-warehousing and cross-docking, the latter being widely practiced in Toyota's industry cluster in Tianjin, China, as referred by Kuchiki (2004). Cross-docking is a shipping and delivery method that is said to move companies and production systems from "supply chain" to "demand chain" as goods arriving in cross-docks have already been pre-allocated to another point in the supply chain such as a retailer, an airport, or another cross-dock. Such move is part of the more general trend toward demand-driven supply chain management which requires companies to maximise their efficiency and

yet keep enough stock for meeting unexpected changes in an ever changing and dynamic demand for their products and services.²⁴

Exhibit 6
Major Logistics and Supply Chain Management Providers

Year established	Company	Character	Services
1998	Span International	Wholly own subsidiary	Vendor hub management, vendor managed inventory (VMI), cross docking, storage and e-warehousing
1998	Emery Logistics	Wholly own subsidiary	Airfreight forwarding, logistics
1999	Redwood Systems	Wholly own subsidiary	Logistics, distribution, transport, inventory management and storage
1999	YCH	Wholly own subsidiary	Logistics, storage & export-import management
1999	iLogistix ¹	Wholly own subsidiary	Full Internet-based supply chain management
2001	Ryder de Mexico	Wholly own subsidiary	Integrated logistics & supply chain management solutions
2000	Roadway Express	Wholly own subsidiary	Logistics, storage & transport
2000	Modus Media Internacional	Wholly own subsidiary	E-commerce solutions, supply chain management, e-manufacturing solutions, VMI
2002	Bax Global	Wholly own subsidiary	Logistics, supply chain management, storage, packaging
2002	SalesLink	Wholly own subsidiary	Inventory & warehouse management, e-fulfilment, sourcing & procurement, logistics, VMI
2003	Kuehne + Nagel de Mexico	Wholly own subsidiary	Logistics, supply chain management, VMI

Source: Palacios (2004); local newspapers; CADELEC data base; and online direct research by the author.
1. In 2002 it was acquired by CMG Information Services and merged into a new venture, SalesLink.

Cross-docking reduces time to market and more specifically the time shipments spend at the logistics provider's facilities, but in a developing country its efficiency will ultimately depend on the efficiency of the local customs office and its storage and processing facilities. VMI in turn is a sequential logistics and procurement method that reduces the time between the point when an order is placed and that in which it is supplied, an advantage that is more critical

²⁴ Cross-docking is a logistics method that eliminates storage and order picking, the most expensive operations of warehousing, by transferring shipments almost directly from incoming to outgoing trucks, spending no more than 24 hours in the cross-dock, and sometimes less than an hour. Thus, cross-docks are essentially transshipment facilities to which trucks arrive with goods that must be sorted, consolidated with other products, and loaded onto outbound trucks. Warehouses traditionally keep stock until a customer places an order, while in a cross-docking scheme the customer is known before the product gets to the warehouse so that there is no need to storage it (see Gue, 2001).

for the manufacturer's efficiency and productivity. In addition, VMI induces, and even forces, suppliers to locate close to the customer's manufacturing premises and promotes outsourcing of parts and components. VMI has been a usual practice in Guadalajara at the local manufacturing sites of large OEMs like IBM and most CMs, hence the emergence of several providers in the area.²⁵

Also common in Guadalajara has been the method known as supplier-managed inventory (SMI), which consists in that SMI providers, also known as "service maquiladoras", procure and bring the required parts and components right into the customer's production line. Two of the most visible SMI providers operating in the area are Arrow Dicapel and Memec Insight, the latter specializing in the distribution of semiconductors and other components for the electronics industry; its facilities are located inside Flextronics industrial campus.

Design and R&D Companies and Centres

Design and R&D operations emerged in Guadalajara in the early 1980s and have developed in tandem with the other types of industrial activities examined in the preceding paragraphs. Those operations started with the establishments of local companies like Resser and research centres like the Semiconductor Technology Centre (CTS) set up by the Centre for Advanced Studies and Research, part of Mexico's National Polytechnic Institute (IPN), in its Guadalajara Unit in turn established in 1988. Foreign companies also performed R&D activities in the late 1980s, particularly Hewlett Packard which set up a research department dedicated to the design of minicomputer components a few years after it set up its manufacturing site in Guadalajara. Design and R&D operations continued to develop into the 1990s and early 2000s both at other foreign subsidiaries and at local and domestic companies and design centres. Exhibit 7 shows the details of this process up to 2004.

²⁵ Incidentally, the Ministry of the Economy recently announced that auto makers and assemblers in Mexico are moving from just-in-time to VMI; about 50 companies are investing up to US\$500 million to supply Ford's assembly plant in Hermosillo, Sonora with auto parts and components.

Exhibit 7
Major Design Companies and Research Centres

Year established	Company	Character	Operations
1983	Resser	Local design & manufacturing company	Car, home & corporate security system design
Late 1980s	Hewlett Packard	Foreign company R&D department	Mini-computer memories
1988	CINVESTAV	Semiconductor Technology Centre (CTS)	PCBs, ICs, memory chips, teletext systems, firmware, PC prototypes
1993	Arquitectura en Sistemas Computacionales Integrales (ASCI)	Local design & development company	Software, firmware, & hardware system design
Early 1990s	IBM Guadalajara Programming Lab (GPL)	Foreign company software development	Software design
Early 1990s	Lucent Technologies	R Foreign company R&D department	Product & component design, re-engineering
1998	GPI Mexicana de Alta Tecnología	Local design & manufacturing company	Hardware & software design
Late 1990s	Mixbaal	Local design & development company	Product & component design, development & manufacturing, digital signal processing
2000	Centro Jalisciense de Diseño (CIJALDE)	Government-funded design & research centre	Graphic, industrial & engineering design, & product development
2001	Centro de Investigación y Promoción de la Industria del Software (CIPIS)	Local software design centre	Software design & development promotion
2001	Centre for Design Innovations (CDI)	Foreign design & development company	Equipment, parts, components & software design for the aeronautic, auto & medical industries
2002	Intel Guadalajara Design Centre	Foreign company research centre	Integrated circuit & chip design
2003	Siemens VDO	Foreign company design area	Hardware & software design
2003	Global Vantage	Foreign company design centre	Air space equipment design
2003-2004	DDTECH	Design & development company	Firmware & electronic design
2003-2004	Quest	Foreign company design area	Hardware & software design
2004	Gollet	Foreign design & development company	PCB & electronic design
2003-2004	INSOL	Design & development company	Test equipment design
2003-2004	DSPr Design Master	Design & development company	Electronic & software design
2003-2004	ADIT	Design & development company	Electronic & software design
2003-2004	Centro de Diseño Electrónico y Digital	Local design & development company	Digital & electronic equipment design

Source: Palacios (2004); local newspapers; CADELEC data base; company websites; and direct research by the author.

1. It was established by CANIETT's regional office and other 16 partners which include the Jalisco State Economic Promotion Council (CEPE), the Jalisco State of Science and Technology (CECyT).

In addition to its own design centre, Intel announced in mid 2004 plans for building a business incubator for technology-based local start ups, in which incubating firms will also be provided with venture capital. Those included a contribution for improving CINVESTAV's research and educational facilities, and collaboration with Flextronics' local plant in its quest to attract design responsibilities and projects to its premises in Zapopan. Other CMs, particularly Jabil Circuit, also included some product design and development in its operations. After all, as Saxennian (1989) reported, CMs had evolved in the 1980s from simple job shops into sophisticated high-tech manufacturers with design capabilities.

Design and R&D activities will be strengthened with the imminent opening of a so-called Technopole in Zapopan municipality, which is intended to become the leading science and technology research complex in Jalisco. Its anchor tenants are CINVESTAV's local unit, which is the project leader, its Semiconductor Technology Centre, and the Ensenada Centre for Higher Learning and Scientific Research (CICESE). Efforts are underway to attract leading semiconductor companies like Texas Instruments and ST Microelectronics, as well as the design areas of already established ones like Siemens VDO, Hewlett Packard, IBM, and Intel. Another major, potential tenant is Freescale, Motorola's former semiconductor division, which will concentrate in Guadalajara all its Mexican operations in 2005.²⁶

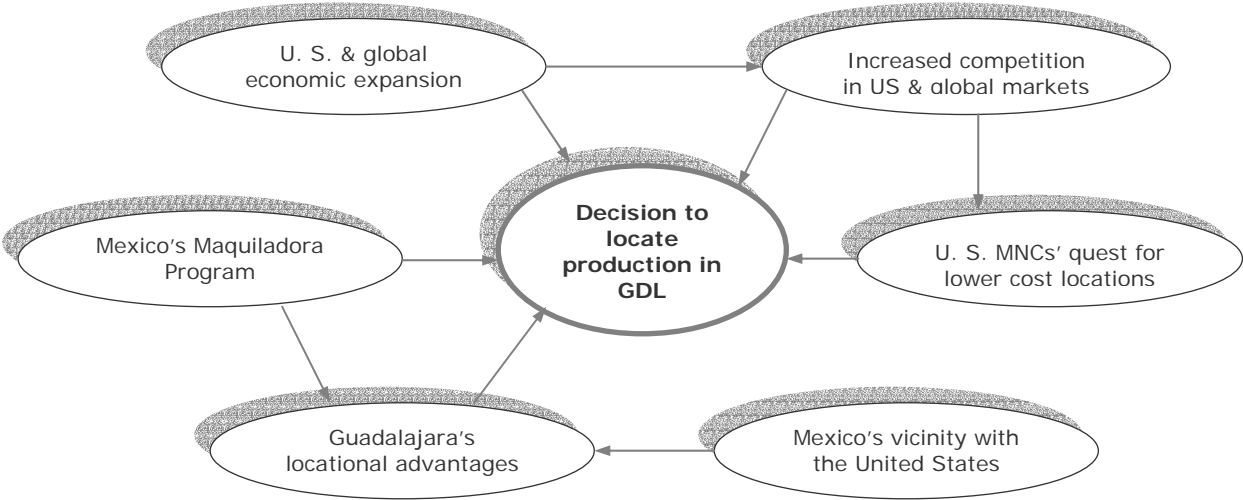
The goal is to gather at least 1,000 semiconductor designers at the Technopole by 2010. According to the State Science and Technology Council, by the end of 2004 Jalisco already had in place an installed capacity corresponding to 20 per cent of the world's semiconductor design effort.

²⁶ These will include the relocation of its semiconductor design centre in Puebla and its Transport Application Support Centre for the Americas.

The Process as a Whole

As shown in the previous paragraphs, the electronics complex that took root in Guadalajara is the result of a complex and protracted process that spans over more than three decades. The process was set off by the decision of two leading multinational firms that, stimulated by the prosperity the U. S. economy and the world at large were experiencing at the end of the 1960s, looked out beyond the borders of their home country for lower cost locations where to deploy production operations in order to be able to face an increased competition in both domestic and international markets. Mexico’s second largest city offered not only cheap labour but also a set of critical advantages that made it a convenient location under that context as Chart 13 summarises

Chart 13
Birth of the Guadalajara Electronics Cluster: Generating Factors

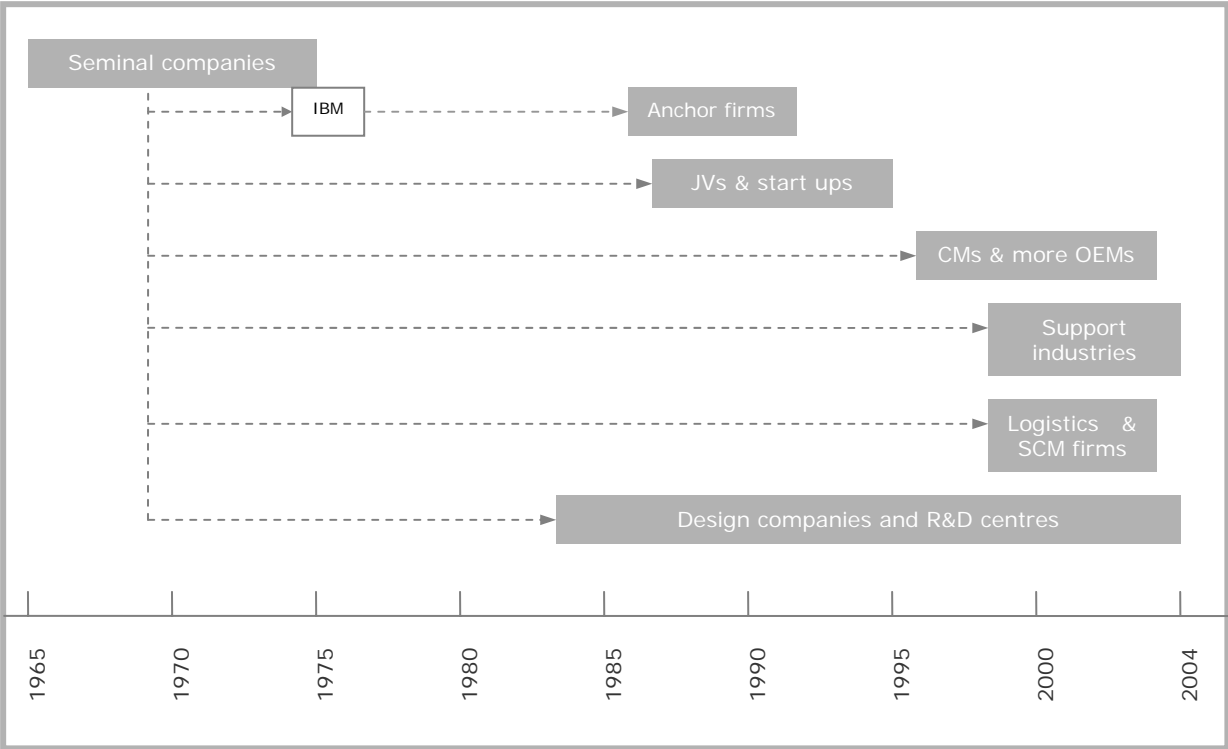


Source: Assembled by the author

Implicitly, one of those advantages stemmed from the circumstance that Mexico is the United States’ southern neighbour. In turn, and although it was restricted to border towns, the Maquiladora Program did also contribute to create a favourable environment for FDI in Mexico’s interior cities in the late 1960s.

As examined above, the Guadalajara electronics cluster consists of a core of assemblers and manufacturers and their suppliers, and a constellation of supporting and coordinating institutions and agencies that have played a key role in its day-to-day functioning and long term development. Annex I summarises this multi-layer structure, including the players that indirectly operate at the federal level. In turn, Chart 14 illustrates the process of deployment of the core players over time, beginning in 1965 when Siemens started operations in the area via PINSA.

Chart 14
Formation Stages of the Guadalajara Electronics Cluster
Core Producing Players

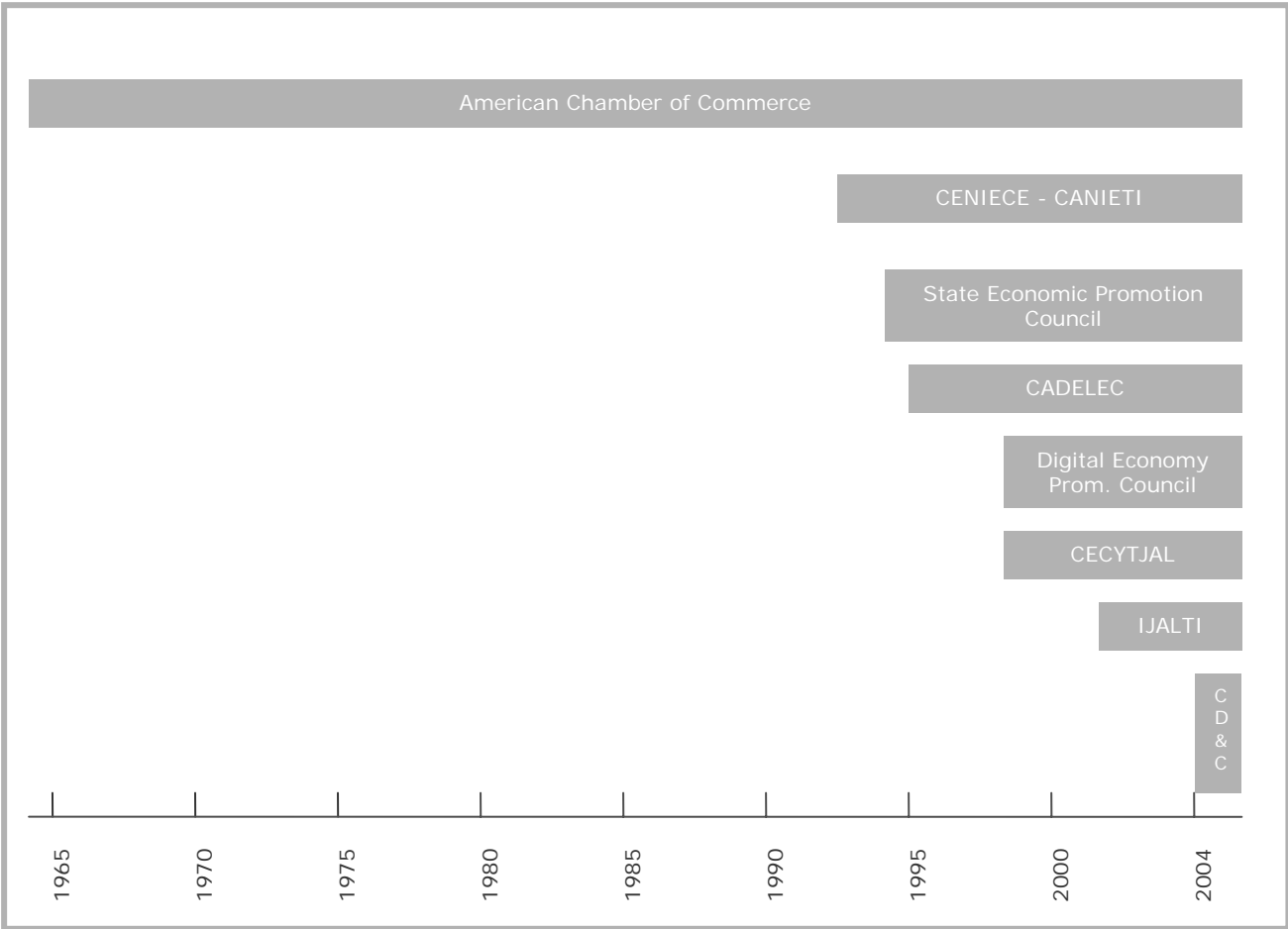


Source: Developed by the author

As the chart shows, the progression of this central segment of the process is not continuous over time either, except for design companies and R&D centres which started to appear just before the seminal and anchor firms were on foot and a critical mass had thus been reached in the mid 1980s. The arrival of both CMs and providers of logistics and supply chain

management services was produced after the cluster’s main core companies were in place, a circumstance that endorses the notion that in a broad sense the development of industry clusters describes some kind of sequential pattern. A roughly similar pattern is observed in the case of supporting institutions, as Chart 15 illustrates, although there some significant differences.

Chart 15
Formation Stages of the Guadalajara Electronics Cluster
Institutional Players



Source: Developed by the author
 CENIECE: Electronics and Electric Communications Industry Chamber
 CANIETI: Electronics, Telecommunications, and Informatics Industry National Chamber
 CADELEC: Electronics Supply Chain agency
 COECYT: Jalisco State Science and Technology Council
 IJALTI: Jalisco Institute for Information Technologies
 CD&C: Jalisco State Economic and Social Council for Development and Competitiveness

This Mexican case shows therefore that clusters do not necessarily originate in planned complexes as the East Asian prototype assumes. Industrial parks have played a rather complementary, facilitating role in Guadalajara’s and mostly in later stages of the process, but

were not essential for its ignition and early development. Exhibit 8 presents the dates of establishment and selected tenants of most of the estates whose location was illustrated in Map 5. This is partly derived from the fact that there are no EPZs or SEZs in Mexico.

**Exhibit 8
Major Industrial Parks in Guadalajara**

Estate	Date Established	Selected Tenants
GDL Industrial Zone	1950s	SalesLink
Vallarta Industrial Park	1998	Rosti
Guadalajara Technology Park	2001	
Integral Park	1997	Flextronics, Samsung, Philips, Emerson, Arconix Worldmark, LoDan, KHLandsburg, Parker Hannifen, Memec-Insight
Ecopark, Technology & Business Park	2000	Advanced Optical Disc, Trend Technologies, Telect, Anconix
Santa Rosa Industrial Park	n. a.	
San Jorge Industrial Park	2000	Modus Media
Aeropuerto Industrial Park	n. a.	Usco Logistics, Kuehne + Nagel
Guadalajara Industrial Park	1987	Benchmark Electronics, Molex, Xerox, Tech Group
El Bosque Industrial Park	1997	
El Bosque Industrial Park II	2000	BDT de México
Technology Industrial Park I	n. a.	
Technology Industrial Park II	2000	Span, Intel Design Centre
Bugambilias Industrial Park	2000	Siemens de Mexico, Solectron
Ferran	2000	V-TEK, Tiger Technology
San Agustin Industrial Park	2000	
Intermex Industrial Complex	2001	Ryder

Source: Jalisco State Industrial Parks Association, and online research by the author

Note: Several others have been established in recent years and are currently in operation including Intermex Industrial Complex, Alamo Techno Park, San Angel Industrial Park, Cedros Industrial Park, City Park, Perisur Industrial Park.

As most theoretical formulations predict, an essential factor that has nurtured the process in Guadalajara has been the emergence from the outset of cooperation, coordination and collaboration relationships among producing firms—the core—and between these and the

local and national institutional milieux. The local chapter of the American Chamber of Commerce played a key role in the initial stages as the forum where company managers met to discuss common problems and projects, a role CANIETI and CADELEC took up in the 1990s and significantly enhanced thereafter.

In that regard, and as pointed out before, a critical ingredient throughout the process has been the formation and growth of a community of company managers, industry captains, and industry chamber leaders, who in practice embody and represent the “Jaliscoan Electronics Cluster” as it is customary for them to call it. This sense of community gave rise to the creation of social and personal relationships and communication networks that were in turn the basis for the emergence, since the early stages, of collective learning and the sharing of knowledge and information; collective lobbying to cope with common problems then ensued.

An enabling factor that was also essential at the beginning and has become crucial since the 1990s is the presence of a sizeable cluster of good-quality universities, research centres, and technical schools in the area, which have provided the engineering and managerial talent demanded by core companies to staff their local sites. Local company managers and leaders of industry associations, mainly CANIETI and CADELEC, as well as promotion officials at federal agencies like the Ministry of the Economy, recently reiterated that top quality educational institutions and research centres have become the top promotion factor for attracting FDI in general and foreign and domestic electronics companies in particular to cities and towns in Mexico, as their presence assures an adequate supply of talent that is critical for the operation of company plants and offices. As a result, some of the largest universities based in Mexico City, notably the Technologic University of Mexico (UNITEC) and the University of the Valley of Mexico (UVM) have established large local branches in response to the growing demand for qualified personnel in Guadalajara. Moreover, one of Mexico’s top two national universities, the National Polytechnic Institute (IPN) has just announced plans for

setting up its own branch in Jalisco's capital. In turn, the main local institutions, in particular the University of Guadalajara, the Western Institute of Technology and Higher Learning (ITESO), and the Guadalajara Campus of the Monterrey Institute of Technology and Higher Learning (ITESM), have introduced new academic programs and research centres to cater to the needs of firms in the electronics industry.²⁷ In this way, and paraphrasing Saxenian (1989) and other theorists, it can be said that reciprocal technological upgrading and cooperative competition have emerged and an industrial atmosphere has been created for an electronics cluster to hatch and grow in this regional setting.

Once the cluster reached its critical mass in the mid 1970, external economies started to flow and as the number of core companies increased during the 1990s a variety of production links were established which gave rise to the emergence of business and production networks among clustered firms. As Palacios (2001) has documented, this occurred mainly between CMs and the larger OEMs operating in the area and, as expected, between the latter and their nearby suppliers. In this way, as the concentration of linked and interacting firms in the area increased, network externalities and agglomeration and localisation—i.e. spatial juxtaposition, in Isardian jargon—economies seem to have obtained and the process seems to be nurtured by circular and cumulative causation—i.e., path dependence—and lock-in effects.

The fact, though, is that the process is nurtured by foreign capitals and know-how and that as a result Guadalajara's turns out to be a branch-plant dominated cluster, as it lacks some crucial ingredients of self-sustained electronics clusters as defined by Miller and Côté (1987), mainly an adequate local venture capital supply, a real market-driven R&D, and above all the entrepreneurial thrust required for sustaining a process of home-grown business formation via either spin-offs or start-ups. Some critical conditions and elements have nevertheless been created for a self-sustained cluster to be hatched and developed in the area, including above all

²⁷ A swarm of small, low-ranking universities has emerged over the last decade too as a further indication of the extraordinary growth in the demand for education and training in the area.

the solid business culture and management know-how that local managers and engineers have acquired over the years working at the subsidiaries of MNCs that have operated in Guadalajara, the industrial infrastructure that has been built as a result of those operations, the social and production networks that have been established accordingly among companies, and the sense of community that has developed around the electronics cluster that was born and has developed for more than three decades in this part of NAFTA's southernmost and less developed partner.

CHAPTER IV CONCLUDING AND POLICY IMPLICATIONS

The case of Guadalajara confirms the convention that each cluster has its own story which is unique and specific to its place and circumstance. The electronics cluster that emerged in this Mexican city differs substantially from the prototype summarised by Kuchiki (2004). This prototype refers to a special case of cluster formation in developing countries, namely that of foreign core-firm dominated industry clusters as represented by Toyota's in Tianjin, and only considers the birth and very first stage of the process. The analysis of the later stages of cluster growth and evolution in the Mexican case permits one to distinguish between seminal and anchor firms, which turns out to be a necessary exercise for a deeper understanding of cluster development in general since seminal firms do not necessarily become anchor firms and the latter do not necessarily correspond to seminal ones.

Unlike in East Asian regions, the formation of the Guadalajara electronics cluster has not been a linear process nor has followed a single development sequence. Instead, it has ramified into various streams that in some cases have even overlapped over time. This derives from the fact, not considered in the East Asian prototype, that clusters consist not only of the set of producing companies and related supplying partners, which correspond to its core element, but also includes all the supporting and coordinating institutions and agencies that participate in the process. The message stemming from the Mexican case is, therefore, that cluster analysis and policy should focus not only on core companies but also on all the other players and ingredients that make an industrial agglomeration to warrant the cluster adjective, in particular collaboration and cooperation relationships and networks which are the kernel of cluster formations in all latitudes.

Guadalajara's experience also shows that it is crucial to distinguish between foreign and domestic companies, given that their behaviour, outlook and expectations as to becoming members of industry cluster clubs will differ substantially depending on their national or

regional origin and the location of their respective parent firms. This will in turn determine the extent of their markets and the geography of their sourcing patterns as well as their corporate (subsidiary, branch plant, parent firm) and functional character (OEM, CM, supplier), also including the capital mix of each venture.

Guadalajara's electronics cluster is a typical case of FDI attraction as envisaged by Campos and Kinoshita (2003) who, as referred earlier, concluded that foreign capitals choose locations with low labour costs, a large domestic market, a skilled labour force, an adequate infrastructure, proximity to large markets, the existence of supporting domestic institutions, a favourable business-operating conditions, and a large flow of agglomeration economies, which is just the case of this Mexican city. Moreover, given the overwhelming presence of subsidiaries of MNCs, more than branch-plant dominated, Guadalajara's is a singular case of branch-plant populated industry cluster since virtually all its constituent core companies are subsidiaries of MNCs. Therefore, it only partially conforms with Rugman and Verbeke's (2002) assertion that FDI usually begets core-firm dominated, asymmetrical clusters, where a flagship firm—a subsidiary of a MNC—becomes the cluster's champion, which is punctually the case of Toyota's cluster in Tianjin documented by Kuchiki (2004) instead.

Therefore, Guadalajara's is also a typical instance of a truncated production system as defined by Hayter (1997), given that its constituent MNC subsidiaries are active nodes of simultaneous global production networks extending over many locations around the world, and thus operate along cross-border or cross-continental supply chains depending on whether the respective parent firms are in the United States, Asia Pacific, or Europe.

Although, as discussed earlier in this report, MNCs can play the role of catalysts of regional industrial development processes in their initial phases, theorists and analysts concur in that branch plants tend to develop limited linkages with their local economic milieu, so that national and regional host economies can become branch-plant dominated, truncated

production systems themselves. According to Miller & Côté (1987), branch plants do not lead to the development of self-sustained clusters, that is, those capable of achieving a diversified technological infrastructure and of generating the agglomeration economies that lead to high rates of local business formation. Porter himself advocates policies that promote domestic firms and endogenous business formation in view that “a development strategy based solely on foreign multinationals may doom a nation to remaining a factor-driven economy”, adding that foreign subsidiaries should be just one among many components of economic strategies in developing countries but that after some time the focus should shift to indigenous firms.

Guadalajara’s case shows that FDI-led clusters in developing countries are vulnerable to external threats, as the slump experienced by the electronics industry in Jalisco caused by the 2001-2003 downturn in the U. S. economy confirmed. That slump led to the migration to China of numerous of the projects and plants that had been located in Guadalajara, although eventually also led to the industry’s ongoing upgrading into higher value-added operations and to moving it up from a high-volume/low mix to a low volume/high mix production model in the last few years. According to Mr. Federico Lepe, Chief Coordinator for Investment Promotion at the Jalisco Secretariat of Economic Promotion (SEPROE),²⁸ such upgrading has been largely the result of major changes in the corporate strategies of parent firms regarding the allocation of products, projects, and operations by region in each continent in which they operate. Nonetheless, the force that has made the upgrading become a concrete reality has been the consistent actions taken by the wider Guadalajara electronics cluster community, especially local company managers and their backers at dedicated local institutions, mainly CANIETI, CADELEC, SEPROE and COECYT.

One important feature that helps the Guadalajara electronics cluster to weather the adverse winds of foreign forces, is its multi-sector composition, for as LeVein (1998) and well

²⁸ Mr. Lepe shared these views with the author in an interview held on January 3, 2005.

known students of clusters like Doeringer and Terkla (1995) and Rosenfeld (1997) conclude, clusters that include industries across several sectors are more adaptable to change and can better withstand the downturns in the economic cycle.

In the last instance, the Mexican Silicon Valley bears features of Isardian industrial complexes, Marshallian industrial districts, Porterian industry clusters, Castellsian technopoles, and Asian export processing zones, thus revealing once more the substantial overlapping existing among the main concepts that characterise the major localised industrial formations. It should be noted again, however, that Guadalajara has the potential for hatching a self-sustained industrial cluster as defined by Miller and Côté, and more generally one as that defined at the end of Chapter I building on Maskell's (2001) concept of the "geographical cluster", that is, a cluster territorially defined and well embedded into the local social and economic milieu and so capable of generating home-grown local businesses and of transcending the enclave-related features the current one still presents.

The above reflections and the case of the Mexican Silicon Valley in general, thus give ground for arguing that Porter's theory has to be qualified and extended in order to be properly useful for developing countries. After all, as Bergman & Fesser (1999) observed, industrial clusters in practice bear little resemblance to Porter's ideal type. The remarks made in the preceding paragraphs as well as those made throughout this report may be used for that purpose. A crucial element that has to be incorporated in particular in any theory of cluster formation and development is local entrepreneurship so as to make it possible for these processes to rely on home-grown business creation. Likewise, a clear distinction has to be made in all cases between domestic, local and foreign members of an industry cluster given the substantial differences that each kind of company shows in practice as to behaviour, objectives and interests.

Proposed Analytical Framework

A number of basic guidelines can be derived from the foregoing discussion regarding the formulation of policies for cluster development. First, it is advisable to stress that all policy endeavours should consider some broad principles on which the literature on clusters tends to converge:

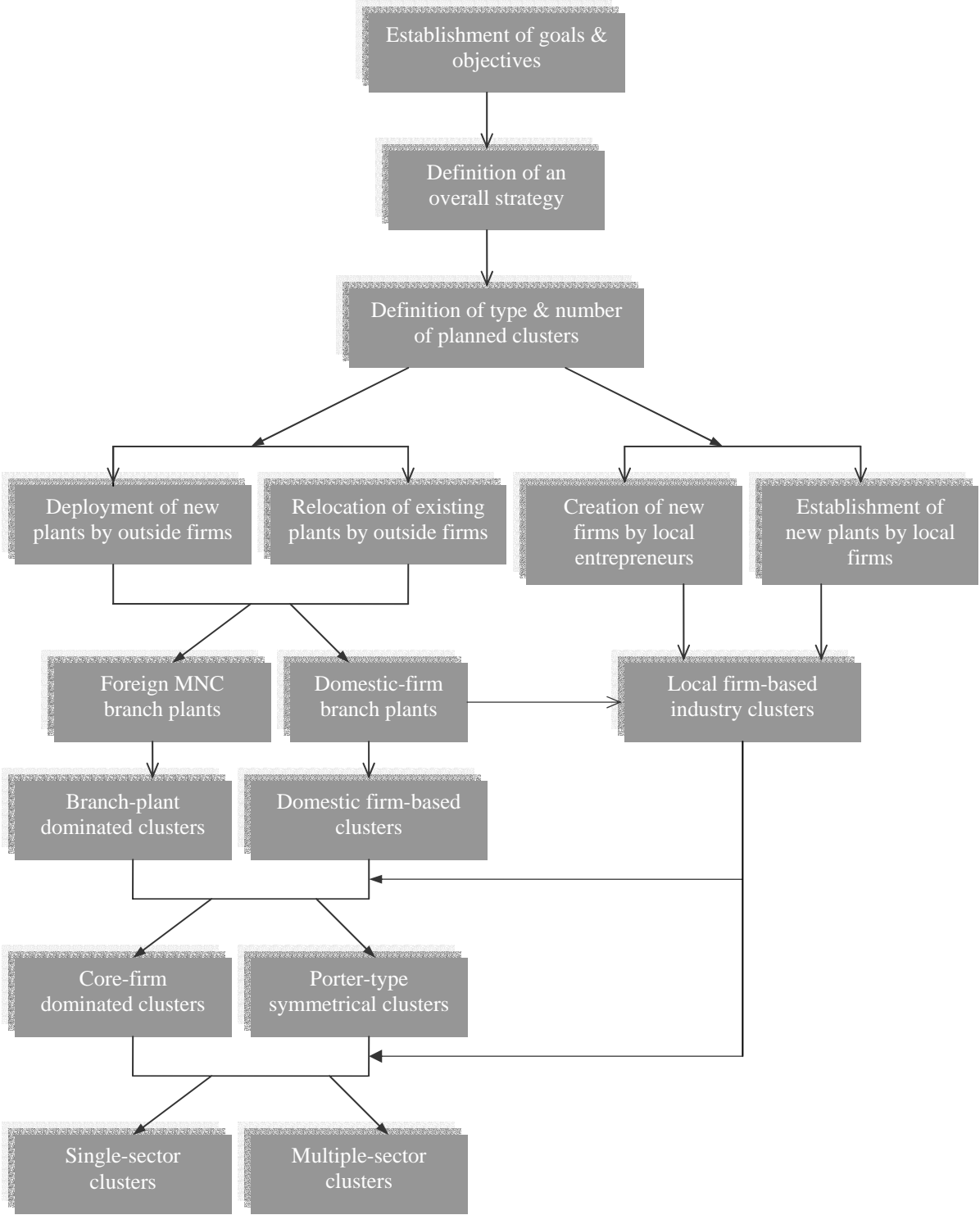
1. Clusters should not be created entirely anew, since industrial agglomeration is an essentially spontaneous phenomenon that can only be harnessed, guided, or manipulated
2. Durable, successful formations cannot be replicated but only imitated and at most emulated
3. Accordingly, cluster initiatives should build on existing formations or else on those incipiently emerging in urban regions

On that basis, and as established in Chapter II, the first step is to define the overall goals and objectives of the initiative, and only then an overall strategy that specifies the required actions and the sequence in which they should be taken. The first aspect to be considered in the strategy will be to define the type of cluster to be promoted and the industry sectors in which its constituent firms are to operate. This implies the need to first define whether to promote the deployment of new plants by outside firms, the relocation of existing plants by outside firms, the creation of new firms by local entrepreneurs, or else the establishment of new plants by local firms.

The national origin, size, and sectoral dimensions of the future cluster members have to be determined next; more specifically, it has to be specified whether the goal is to promote indigenous-firm based or branch-plant dominated clusters; then, whether a federation-of-equals Porter-like, or a core-firm dominated asymmetrical cluster is the objective; and, finally, whether the latter is to be a single-sector or multi-sector cluster. Finally, the next step will be to define the strategy's time dimension which involves the establishment of the sequence of deployment and the definition of whether to promote: a) only branch plants for ever; b) only branch plants for a while and then shift to home-grown companies; c) branch plants mixed with MNC subsidiaries for ever; d) branch plants mixed with MNC subsidiaries for a while, then

shift to indigenous firms; and, e) home-grown companies forever. Chart 16 summarises the process.

Chart 16
A Cluster Development Strategy Framework in Developing Countries



Source: Developed by the author

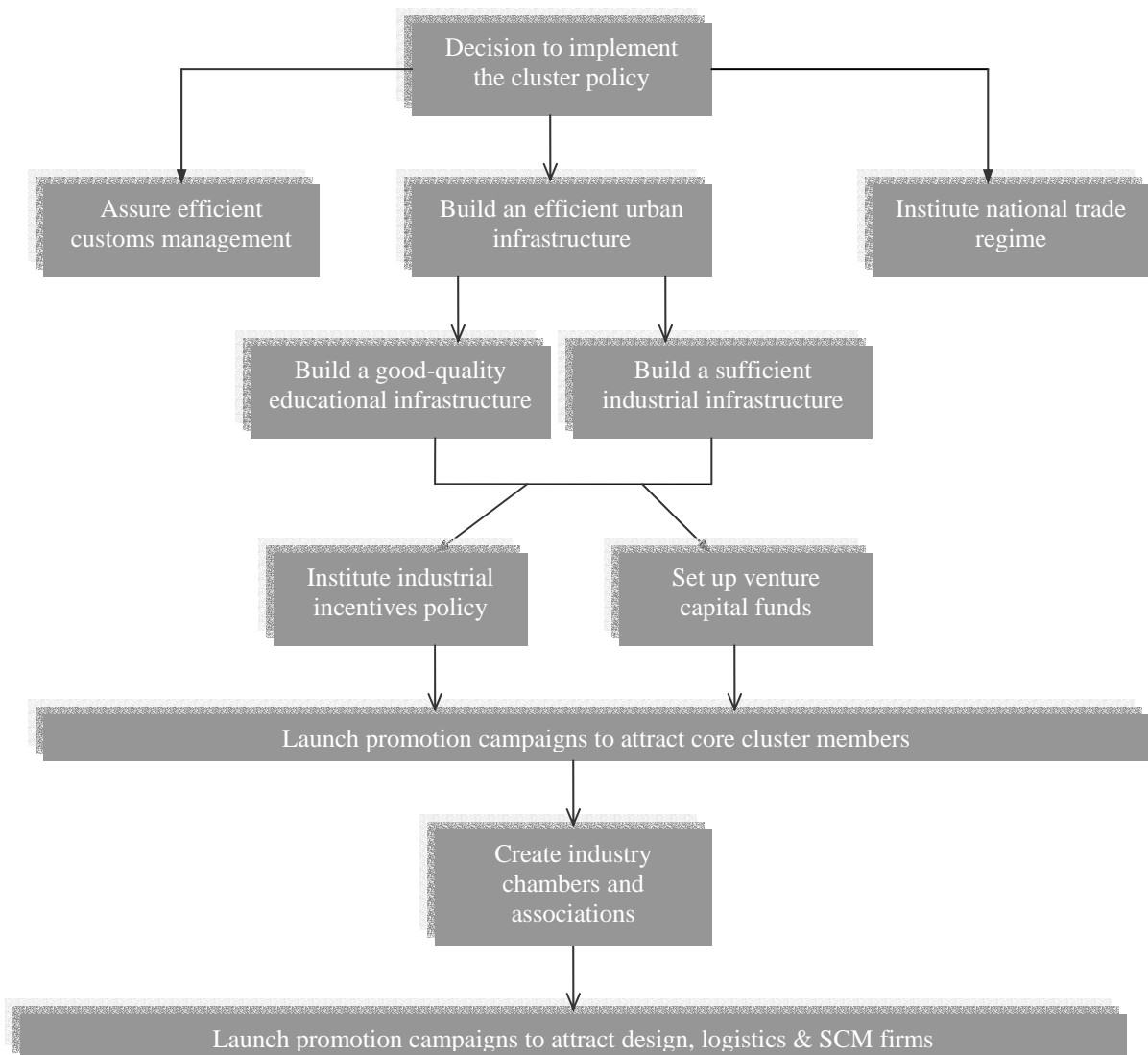
Once all the above aspects are defined, a general procedure can be inferred from the analyses and discussions presented in this report, which may consider the possibility of promoting new clusters, aid the development of emerging or existing ones, or promote the development of entire regions and communities by means of the formation and development of industry clusters. The procedure includes the following steps:

1. Build and/or improve a sound and efficient urban infrastructure (freeways, urban public services, telecommunication networks)
2. Assure efficient customs management services and facilities at the local level
3. Build a solid and good-quality educational infrastructure, including R&D facilities and centres, that inculcates entrepreneurship in students and produces skilled professionals
4. Build a sufficient industrial infrastructure (industrial estates, industrial urban zones)
5. Lobby for and institute an efficient national trade regime that favours and facilitates both exports and imports, including EPZs and free trade zones
6. Lobby for and institute a public (federal, state, municipal) incentives policy framework and programs for industrial firms
7. Set up venture capital funds and firms to supply start up and, eventually, spin off ventures
8. Launch promotion campaigns and business missions with representatives from government and business organisations to let the world know about the sought-for cluster and attract domestic and foreign OEMs and their critical suppliers to the target area (a town, a city, a metropolitan region)
9. Create industry chambers and associations to support, coordinate, represent, and further the interests and initiatives of clustered firms, and generate the conditions for entrepreneurship and synergy to flow as crucial ingredients for the home-grown business formation in the area
10. Launch promotion campaigns and business missions to attract logistics and supply-chain management firms that cater to the cluster's constituent companies

The sequence can adopt different variants in each case according to the degree of development and the geographic, cultural, economic and social characteristics of the country in question. The ingredients can also vary from case to case, but not as much. As a matter of fact, some steps can be taken simultaneously depending on the time and circumstances in which the initiative is undertaken. Chart 17 depicts a typical way in which the procedure can unfold.

In the last instance, the role and power of policies for the development of localised industrial agglomerations cannot go beyond promotion, support, inducement, encouragement and guidance. In the end, the market has to determine the outcomes as theorists and pundits, including Porter, have repeatedly sentenced.

Chart 17
A Cluster Formation Procedure in Developing Countries



Source: Developed by the author

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Annex I
Critical Players in the Guadalajara Electronics Cluster System

