On the Concept of Competitiveness

Guillermo Abdel Musik
David Romo Murillo

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Instituto Tecnológico Autónomo de México, ITAM
Centro de Estudios de Competitividad
Av. Camino a Santa Teresa No. 930, Col. Héroes de Padierna
10700 México, D.F.
tel (52 55) 5490-4612
fax (52 55) 5652-6284
Sitio en Internet: http://cec.itam.mx

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About the Authors

Guillermo Abdel Musik is Director of the Center for Competitiveness Studies. He holds a Ph.D. in City and Regional Planning (University of Pennsylvania), a Master in Regional Science (University of Pennsylvania) and a B.S. in Applied Mathematics (ITAM). Currently, he is professor of Operations Management and Coordinator of the Executive Program on Supply Chain Management at ITAM. Previously he was Professor of Industry and Urbanization in Latin America at the Wharton School in the University of Pennsylvania and consultant for the Industry and Energy Division at the World Bank for two years. He is co-editor of the book "Mexico 2020: Challenges and Perspectives" and author of several articles. In the last five years, he has coordinated and participated in more than 40 research and consulting projects for diverse companies, government institutions and multinational organizations.

David Romo Murillo is a researcher at the Center for Competitiveness Studies. He holds a Ph.D. in Public Affairs from Princeton University (Woodrow Wilson School of Public and International Affairs), a Master of Science in Systems Engineering from the University of Virginia, and a Bachelor of Science in Chemical Engineering from the *Universidad Autónoma de Zacatecas* (Mexico). His past posts include being a researcher at the Mexican Electric Research Institute, associate researcher at the United Nations Economic Commission for Latin America and the Caribbean, as well as teaching positions at the University of Virginia, Princeton, and ITAM (Department of International Studies). He is the recipient of a Fulbright Fellowship, various grants, and the Prize CIDE 2002 for the best research in science and technology issues in Mexico. His main research interests lie in the study of the impact of economic integration (through trade and foreign direct investment) on technological development and the environment with emphasis in Latin America.

Contact information:
gamusik@itam.mx
dromo@itam.mx; dromo@alumni.princeton.edu

Abstract

In the contemporary policy arena and the media, the term "competitivenes" is without a doubt one of the least understood and one of the most abused. This confusion obeys to the different approaches followed to define it and analyze it, the different levels at which it is applied (i.e. at the firm, industry, region, or country level), the variety of indicators used to measure it, and the multitude of factors that seem (or are believed) to have an impact on it. This inaugural issue of the Working Paper Series in Competitiveness Studies aims to clarify this concept through a review and analysis of the literature in order to increase the understanding of the term to policy makers and the general public. We also include a discussion of the importance of technology and the impact that environmental concerns have on competitiveness.

Keywords: competitiveness; comparative advantage; industry; policy.

1. Introduction

The Oxford Dictionary of Economics defines the term competitiveness as "[t]he ability to compete in markets for goods or services." This deceivingly simple and apparently innocuous term has nonetheless sparked a controversy during the past two decades regarding its meaning at different levels of analysis, the available ways to measure it, and the public policies that can be implemented to improve it.

Even before the appearance of the 1994 paper of economist Paul Krugman (Krugman, 1994) criticizing the term and characterizing it as a "dangerous obsession" when applied to countries, the literature on the topic was already vast. Krugman's piece re-ignited the controversy and certainly did not stop the use of the term and the widespread use of national competitiveness indices to the point where competitiveness has become yet another "buzzword" sharing headlines with equally ill-defined terms such as globalization.

The need to clearly define and understand the term goes beyond pure semantic purposes, since it is often used to justify the implementation of public policies without due analysis of their impacts on the different levels of competitiveness. This inaugural issue of the Working Paper Series in Competitiveness Studies aims to clarify this concept through a review and analysis of the literature in order to increase the relevancy of the term to policy makers and the general public. Our purpose is not to propose yet another definition or approach to analyze the term, but to provide a "road map" and to frame the debate surrounding the issue.

A crucial first step in our enterprise is to clearly differentiate the concepts of *comparative* advantage in one hand and *competitive* advantage (or competitiveness) on the other.[1] Whereas the first one is among the oldest and most fundamental concepts in economic science dating from the work of David Ricardo in the early XIX century, the second one is more ambiguous and subject to a range of interpretations. We can say that "[a] country has a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries (Krugman and Obstfeld, 2000, p. 13)." Thus, comparative advantage is driven by differences in the costs of inputs such as labor or capital. Competitive advantage, on the other hand, is driven by differences in the capacity to transform these inputs into goods and services at maximum profit (Kogut, 1985). This concept clearly involves the notion of other tangible and intangible assets in the form of technology and administrative skills that together act to increase the efficiency in the use of inputs as well as the creation of more sophisticated products and production processes.

In this way, as Porter (2003) points out, "[a] nation's companies must shift from competing on comparative advantages (low-cost labor or natural resources) to competing on competitive advantages arising from unique products and processes" (p. 25). This involves the

[1] Siggel (2003) offers a detailed discussion of both concepts and proposes an integrated approach that pretends to show how competitiveness and comparative advantage are related.

abandonment of an excessive reliance on cheap and relatively unskilled labor as a source of competitiveness in favor of labor training and an increased effort to introduce and diffuse technological innovations in order to increase the productivity in the use of factors of production.

We should stress, however, that both concepts are not completely independent from each other. Competitive advantage is built to some extent upon the factors that determine comparative advantage. A clear example can be seen in the case of technological innovation. The development of new technology, as well as the incorporation of existing one into the production process, is not only expensive but risky. Lack of mature financial institutions that know how to evaluate risky innovation and fund it translates into a high cost for capital and the absence of technological upgrading in industry. Thus, lack of comparative advantage in certain factors (besides the cost of capital we can cite energy prices and transportation costs) can constitute an obstacle for the development of competitive advantage.

This paper is structured as follows. The next section discusses the different approaches followed in the study of competitiveness. Having established that different units of analysis require a specific definition of the term, section three elaborates on such definitions at the level of the firm, the industry, the region, and the country. In section four we stress the crucial link between competitiveness and technology at every level, whereas in section five we explore the linkage between the environment (especially the impact of environmental regulations) on competitiveness. Finally section six offers some concluding remarks.

2. Different Approaches to Study Competitiveness

Most of the writings on competitiveness of the late eighties and early nineties focused on the analysis of the weak performance (reflected in reduced market shares) of American companies vis-à-vis foreign ones in sectors traditionally dominated by Americans. This issue was particularly acute with regard to Japanese companies. Nonetheless, as Nelson (1992) noted in a review article, the literature was divided into disjoined intellectual clusters that tended to be relatively isolated from one another. He identified three of such clusters in the literature on competitiveness:

- Writings focusing on individual firms,
- Writings focusing on the macroeconomic performance of national economies, and
- Writings focusing on the formulation of industrial policies.[2]

The first group of writings is traditionally the domain of business schools, whereas the second is almost exclusively the work of economists (who consider that the behavior of individual firms is largely determined by their macroeconomic environment). The last group of writings concentrates on the use of government policies at the microeconomic level to

[2] Sanjaya Lall (1995) defines industrial policies as "all forms of conscious and coordinated government interventions to promote industrial development" (p. 103).

foster firms' development in a particular industry. Authors in this goup hold the view that government can play a vital role in complementing the market to guide industrial activity.

We argue that part of the confusion surrounding the term is due to a failure to recognize the different levels of analysis and to elaborate appropriate definitions of competitiveness for each of them. The taxonomy of writings proposed by Nelson identified two of such levels: the micro at the level of the firm and the macro at the national level. We identify two additional definitions at the meso-level: the industry and the region, which impact the behavior of the firm in ways specific enough and to such an extent that their separate treatment is justified.

Regarding the last strand of literature focused on the use of industrial policies, it should be noted that despite the recent wave of liberalisation of national economies and the decreased role of the state (with the consequent dismissal of active industrial policies), government intervention in national economies is still necessary to remedy market failures[3] (which are particularly pervasive in developing countries). The World Bank (1997) recognized that the state can reduce coordination problems and information gaps in order to encourage market development. Contrasting the poor results of the application of industrial policies in developing countries to those of successful examples (policies implemented in the past by today's oldest industrial economies and contemporary examples mostly in East Asia), the conclusion is reached that a crucial condition for a successful industrial policy was a strong institutional capability, which is still lacking in most of the developing world.

It is not our purpose to further elaborate on the use or desirability of industrial policies (such topic would deserve an entire paper in its own right),[4] but we would like to emphasize two areas where government intervention has a particularly important impact on competitiveness: technology and the environment.

The innovation and technology market is very prone to market failures. The reasons for these failures lie on the very nature of knowledge: it is difficult to contain, returns to technology investment are uncertain, coordinating agents for major projects is costly and the diffusion of innovation is hard to appropriate (World Bank, 2003). Given this uncertainty and the lack of appropriability, it has been recognized that under market conditions, investment on technology and innovation tends to be sub-optimal. Social returns to technology tend to be higher than private returns, leading to firms under-investing in technological innovation. For these reasons, it is now generally accepted that government should play an active role in the support of innovation activities.

The environment presents another classical case for government intervention in order to address negative externalities. Externalities arise when the actions of a person or a firm hurt or benefit others without that person or firm paying or receiving compensation. Pollution

[3] We can define market failure as a set of conditions under which a market economy fails to allocate resources efficiently (World Bank, 1997).

[4] Lall (1995), Pack (2000) and Rodrik (1995) elaborate on the rationale for the formulation of industrial policies and evaluate the impact of their application in developing countries.

control, as an example of a negative externality,[5] requires government action to mitigate the harm imposed on society by bad industrial practices. This can be achieved in several ways: imposition of a tax on emissions equal to the marginal environmental damage caused by the pollution, limitation of the firm's output by the imposition of quotas, technology mandates, or the implementation of a system of tradable permits to name some of the policy options available. The effect of environmental regulation on competitiveness will be further discussed in section five.

3. Different Levels of Competitiveness

As has been argued above, in order to derive some sense from the use of the term "competitiveness," we must clarify the level at which we are applying it. We identify four of such levels: the firm, the industy, the region, and the nation. We further categorize these levels into a structure of "nested rings of competitiveness"[6] as shown in figure 1.

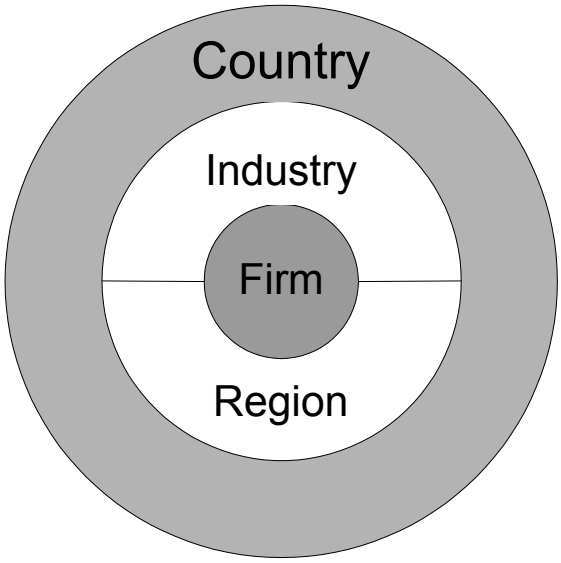

Figure 1. Nested rings of competitiveness

[5] We can mention more examples of negative externalities: global warming caused by carbon dioxide emissions, traffic congestion, the depletion of natural resources such as fish stocks, the adverse health effects to other people caused by one person's smoking, the destruction of natural habitats caused by housing and other developments, the harm to drinking water, fishing, and recreational activities caused by the discharge of solid waste into waterways, etc.

[6] Villarreal and Villarreal (2002) use a similar graphic representation to portray the idea of "systemic competitiveness" through six levels (going in the outward direction): micro-economic, meso-economic, macro-economic, international, institutional, and the political and social system.

As can be seen in the diagram, our taxonomy includes micro (the firm), meso (the industry and the region), and macro (the nation) levels of analysis. We chose to represent these levels graphically in concentric rings in order to portray the idea that the competitiveness of the firm is affected by conditions at the industry and regional level. At the same time, competitiveness of firms, industries, and regions is affected by conditions prevalent at the country level. We should also note that the concept of competitiveness at the firm and industry levels is relatively uncontroversial and straightforward, so that we focus the discussion on the regional and national levels.

3.1 The firm level

The meaning of competitiveness of the firm is fairly clear and uncontroversial. It is agreed that it derives from the competitive advantage a firm possesses through its production and organization methods (reflected in the price and quality of the final product) relative to those of its rivals in a particular market. Thus, loss of competitiveness would translate into loss of sales, market share and, ultimately, plant closure.

As can be seen, the definition provided in the introductory section ("the ability to compete in markets for goods or services") clearly fits the definition at the firm level. Such ability to compete is based on a combination of price and quality of the good or service provided, so that with equal quality in competitive markets (i.e. markets with a large number of producers where each of them lacks the power to set prices), suppliers will remain competitive if their prices are as low as (or lower than) those of their rivals. On the other hand, firms having established a reputation of superior quality can differentiate themselves from the rest and remain competitive even charging higher prices than their rivals in that particular market.

What are the factors that lie behind the competitiveness of firms? In the late eighties, American firms used to be regarded as uncompetitive because they were still engaged in mass-production methods (when the Japanese were making full use of flexible manufacturing and just-in-time systems), had a hierarchical job organization, and assigned to workers narrowly defined tasks. In addition, research and development activities were considered to be too distant from production, so that the time elapsed form design to mass production was substantially larger than that of Japanese rivals (Reich, 1989). Even though other (macroeconomic) factors were also at play, the list certainly points to some of the perceived weaknesses of firms that were ultimately reflected negatively on their ability to compete.

Other factors worth mentioning are the importance of worker training, especially in an environment with high worker mobility (like the American), where incentives to provide training are reduced because of the fear that company-specific knowledge may be transferred to potential rivals. In addition, firms must also be willing to cooperate with other firms in matters where collaboration may involve high payoffs (e.g. research and development). Since, as a result of the factors listed above investments will have to be made in order to upgrade and

improve plant's performance, a final but crucial factor is the availability of credit to companies.

In figure 1 we placed the firm at the center of the nested rings of competitiveness. This implies that, besides all the factors internal to the firm mentioned above, there are other exogenous variables with an equally important impact on its competitiveness. At the level of the industry, market concentration, product differentiation, world prices of the good produced, and the existence of an explicit industrial policy in the sector, are just a few of the most important variables. At the regional level we can mention the existence of the appropriate infrastructure, the existence of a pool of qualified workers, or the possibility of agglomeration effects arising from the location of plants within the same geographical area (these will be discussed below). Finally, country-wide variables also impact a firm, especially the value of the exchange rate and interest rates.

3.2 The industry level

An industry is the aggregation of all firms involved in similar economic activities, so that the discussion of the preceding section largely applies to this level too. Thus, the competitiveness of an industry derives from superior productivity, either by facing lower costs than international rivals in the same activity or by the ability to offer products with higher value. Given our definition of industry, it follows that its competitiveness is the result to a large extent of the competitiveness of individual firms, but at the same time the competitiveness of firms will be enhanced by the competitive environment prevalent in the industry. Firms being in a competitive industry tend to be benefited in a variety of ways, creating a virtuous circle between firm and industry performance. Industry level economies of scale allow for the creation of specialized infrastructure, including research centers and educational institutions, which help develop industry-specific skills and knowledge. From the production side, vertical linkages allow increased responsiveness and flexibility to changes in market requirements, both in quantity and product specifications.

One reason that justifies our concern about industrial competitiveness lies in the fact that a competitive industry presents more opportunities to develop such vertical linkages, with positive impacts on a country's industrial development. In the case of developing countries, once the process of assembly of imported components (with little domestic value added) has started and taken roots, the industrialization process must advance to increase the use of local inputs and foster backward linkages with domestic suppliers. This allows for the diffusion of technologies and skills.

Following Battat *et al*. (1996), we define backward linkages as "inter-firm relationships in which a company purchases goods and services as its production inputs on a regular basis from one or more other companies in the production chain" (p. 4). By providing inputs to firms in competitive industries, subcontractors must heed superior preferences regarding design, technical specifications, product quality, and delivery times. In addition, subcontracting may allow firms to expand output and achieve economies of scale. The nature of the industry has an important effect on the likelihood of observing backward linkages. As

Battat *et al*. (1996) point out, the tendency to develop backward linkages increases when the final product requires various types of manufactured components or involves specific manufacturing skills or technologies. When the in-house capabilities to supply these components is limited, outsourcing is inevitable.[7]

As noted above, not all industries are the same and different characteristics will play a different role in determining their competitiveness, among them we can cite: nature of the good produced (intermediate, consumer non-durable, consumer durable); market concentration and barriers to entry (to determine the nature and strength of competitive forces); capital intensity and technical complexity; maturity of technology employed (in order to determine the technological dynamism of the sector); export potential (participation in international markets acts as a further incentive to improve industry's competitiveness); foreign presence (which may act as a mechanism for technology transfer[8]); and strategy followed by foreign investors (market-seeking, efficiency seeking, or resources-seeking).

Alternative ways of looking at competitiveness at this level of analysis include the relative attractiveness of different countries as locations for a particular industry (Jenkins, 1998) or different measures of participation in international trade (e.g. market share or an index of revealed comparative advantage).

3.3 The regional level

Do regions compete?[9] We can argue that, in a way, this is indeed the case. They compete for firms looking for a location and for gifted individuals looking for a job. As Charles and Benneworth (1996) point out "the critical debate for regional competitiveness concerns the relation between the competitiveness of firms, and the effect this has on the competitiveness of territories related to these firms, either through ownership or location" (p. 5).

In addition, and in agreement with the framework of nested rings of competitiveness depicted in figure 1, it should be recognized that the performance and development of a firm is determined to a considerable extent by the conditions prevailing in its surrounding environment, especially the conditions in the immediate geographic proximity (Malmberg *et al.*, 1996).

The regional element cannot be overstated in the discussion about competitiveness. Once the business environment improves (due to better infrastructure, education centers, living standards, or other explicit government policies designed to attract investment to a region), companies begin to concentrate in specific geographic locations giving rise to the

[7] The authors report that industries where the prospects for backward linkages are the greatest include the automobile industry (which requires parts and components constituting 70% or more of final sale value), machinery and precision instruments, and the consumer electrical and electronics industries.

[8] On the importance of foreign direct investment to contribute to the technological development of the host country, see Romo Murillo (2002).

[9] Here we follow a rather loose definition of what constitutes a region. It may range from the geographical area that contains a cluster of firms to an entire state (or even a group of states).

formation of *clusters*. Following Michael Porter's definition, "*clusters* are geographically proximate groups of interconnected companies, suppliers, service providers, and associated institutions in a particular field, linked by commonalities and complementarities" (Porter, 2003, p. 26). According to Porter, clusters have the potential to positively affect competitiveness mainly through three ways:

1. By increasing the productivity of constituent firms or industries, since transaction costs are lowered and capital costs reduced (physical proximity contributes to this result, e.g. stocks of material inputs can be kept low since suppliers are within short distance).
2. By increasing the capacity for innovation and thus productivity growth. This is due to the fact that opportunities for innovation are easier to perceive within the cluster. Once an innovation (in a product, production process or managerial practice) is introduced in a firm, a demonstration effect[10] occurs and the probability of adaptation in other firms increases.
3. By stimulating new business formation that expands the cluster and consequently further supports innovation. This occurs because the barriers to entry are reduced, business opportunities are easier to identify within the cluster, and inter-personal relationships may have developed, making it easier to establish a new supplier-buyer relationship.

We can add that agglomeration also reduces the barriers for the diffusion of knowledge. As Malmberg *et al.*, 1996) point out, "[t]he formal and informal networks between people in a common location, which have often been developed through long-term interaction, and the resulting evolution of local institutions form part of the social capital surrounding innovation processes" (p. 92).

The importance of geographical agglomeration lies in the fact that it gives rise to the generation of so-called "external economies," which can be of two types: technological and pecuniary (Krugman, 1991). Technological external economies involve the transfer (or spillover[11]) of knowledge between firms; this transfer contributes to the development of technological capabilities in the receiving party that tends to reinforce the industry's competitive advantage. Pecuniary external economies, on the other hand, involve the creation of a market for specialized labor and suppliers that again tends to reinforce the industry's

[10] Blomström *et al*. (2000) noted that the successful introduction of new production techniques reduces the subjective risk surrounding the adoption of the innovation and should promote its adaptation more widely. Certainly, before a new type of organization of production or a new piece of machinery or equipment is widely spread in the market, potential adopters have limited information about the costs and benefits of the innovation and consequently it may be associated with a high degree of risk. As the information concerning the pros and cons of the innovation is diffused through informal channels, the uncertainty is reduced and the likelihood of imitation increases.

[11] More formally, by technological spillovers Grossman and Helpman (1991, p. 16) mean that "(1) firms can acquire information created by others without paying for that information in a market transaction, and (2) the creators (or current owners) of the information have no effective recourse, under prevailing laws, if other firms utilize information so acquired."

advantage. Put in another words, agglomeration improves firms' performance (and consequently industry's) by reducing transaction costs for both tangible and intangible assets.

External economies at work can be seen in various cases of regional specialization. Famous industry clusters include Silicon Valley in California and Route 128 in Massachusetts for high-tech industries, the cluster of carpet manufacturers around Dalton, Georgia, and the insurance cluster in Hartford, Connecticut in the United States. Other examples include London as a financial center, ceramic tiles manufacturers in Italy, or tanneries in the Mexican city of Leon.

Porter identified four environmental variables that determine the relative competitiveness of a region for a segment of an industry. We defer the discussion of these variables for the next section because this framework also applies to the national level.

3.4 The national level

We arrive now at the discussion of the outer ring of competitiveness at the national level. Needless to say, this is crucial since it will determine to a large extent the competitiveness of the other lower levels. Central to the question of national competitiveness is whether countries actually compete with each other, or the term competitiveness is an inadequate way of assesing the general "health" of an economy. It can certainly be argued that countries compete in attracting foreign investment but, as Siggel (2003) argues, "the attributes attracting foreign investment are stability, good government and profitable investment oportunities, which are not identical to strong performance in exports" (p. 6). We now explore the different facets of national competitiveness.

The Clinton administration assumed power with the objective of implementing a "competitiveness strategy" aiming at restoring the international competitiveness of American firms. Even the President stated that the United States was "like a big corporation competing in the global marketplace."[12] Likewise, the then president of the European Commission, Jacques Delors, blamed the high unemployment rate in Europe on the loss of international competitiveness, especially the inability to compete against the Americans and the Japanese (and not on the elaborate European welfare system that made employers reluctant to create new jobs). It was against this backdrop that Paul Krugman launched an attack against the idea of national competitiveness in an article appeared in *Foreign Affairs* (Krugman, 1994). He argued that, despite the attractiveness of the argument, framing national economic problems in terms of international competition was unfounded and dangerous, since this view diverts attention from the real underlying problems and leads to bad economic policies with the consequent waste of scarce resources.

Analyzing the problems of the American industry, and instead of putting the blame mostly on factors internal to the firm, macroeconomists saw the underlying problem in other variables, mainly the stagnant productivity experienced in the US during the period comprised since the early seventies and the large government deficits. In addition, the low savings rate

[12] Quoted in Gilpin (2001), p. 180.

was considered a factor leading to low investment rates in new plants and equipment, reinforcing low productivity growth rates.[13] Thus, according to them, internal firm behavior is just a small part of the problem. The macroeconomic environment in which they operate is what really matters.

Boltho (1996) presented more concise definitions of competitiveness from a macroeconomic perspective. In the short run, he equated competitiveness with the value of the real exchange rate.[14] Thus, a country at full employment lacking competitiveness would be running a persistent current account deficit which would usually be adjusted by a mixture of deflation and depreciation. The costs of such misalignments, particularly an over-valued exchange rate, can lead to losses in market share and unemployment. On the other hand, the longer run definition of competitiveness includes the objective of raising living standards of the population, and it is a function of productivity growth, adjusted for changes in the terms of trade.

The business perspective of competitiveness is represented by Michael Porter, for whom a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. Even though Porter analyzes competitivenss at the level of the nation, his framework of analysis is systemic in the sense that it implicitly incorporates the levels of the firm, the region, and the industry. He argues that:

> Competitive advantage is created and sustained through a highly localized process. Differences in national values, culture, economic structures, institutions, and histories all contribute to competitive success. There are striking differences in the patterns of competitiveness in every country; no nation can or will be competitive in every or even most industries. Ultimately, nations succeed in particular industries because their home environment is the most forward-looking, dynamic, and challenging (Porter, 1990, p. 73).

Porter further defines a "diamond" with four determinants of national competitive advantage:[15]

1. *Factor Conditions*. Includes the factors of production (skilled labor, infrastructure, financing) necessary to compete in a given industry.

[13] Klein (1988) and Krugman (1991) elaborate on the perceived problems of the American industry during the late eighties.

[14] However, Boltho also points out the difficulties inherent in measuring this variable (defined theoretically as the domestic ratio of non-tradable to tradable prices), proposing instead the use of relative cost indicators to overcome them. The indicator most often used in empirical work is an index of relative unit labor costs in the manufacturing sector.

[15] This framework is widely used for the competitive analysis of industries. For an example of its application to the Mexican case, see NAFIN (1995).

2. *Demand Conditions*. This refers to the nature (i.e. the degree of sophistication) of the home-market demand for the goods or services produced by a given industry.
3. *Related and Supporting Industries*. Refers to the presence of internationally competitive suppliers and other related industries.
4. *Firm Strategy, Structure, and Rivalry*. This reflects the general conditions governing how companies are created, organized and managed, as well as the nature of rivalry among them.

Each of the four determinants interacts with one another to create an environment in which companies will develop and accumulate specialized assests or skills to increase their competitive advantage. Porter explicitly rejects the purely macroeconomic definition of competitiveness. Writing in 1990, he argues that Japan, Italy, and South Korea enjoyed rising living standards despite budget deficits, Germany and Switzerland did the same despite appreciating currencies, and Italy and Korea despite high interest rates. In the same way, he rejects explanations for differences in competitiveness across countries based on the abundance of cheap labor, natural resources, or differences in management practices. Porter concludes that "the only meaningful concept of competitiveness at the national level is *productivity*." This is the case because productivity is the main determinant of the long-run standard of living in a country and per capita income (it determines employee wages and return on capital).

At this point it is interesting to note that practically all the authors on the issue, whether they are from economics or business schools or whether they agree with the use of the term when applied to national economies agree that the productivity growth rate (not the rate of productivity growth relative to other countries) is the ultimate measure of the competitiveness. A country's productivity determines its standard of living, since a higher productivity can support higher wages and attractive returns to capital.

We now turn briefly to an alternative view that defines a country's competitiveness as the share of world markets for its products. This view represents a deeply flawed definition of the term. Adopting this definition would present competitiveness as a zero-sum game, since a country's gain comes necessarily at the expense of others, and it would imply that policies like holding down local wages and devaluing the currency would contribute to increase competitiveness. However, it would be hard to argue that the standards of living and the general prosperity of the population would benefit as a result of the implementation of such policies.

The United Nations Conference on Trade and Development (UNCTAD) provides a more concise definition about the role of exports, stressing that although export competitiveness starts with increasing market shares, it goes beyond that: "[i]t involves diversifying the export basket, sustaining higher rates of export growth over time, upgrading the technological and skill content of export activity, and expanding the base of domestic firms able to compete internationally so that competitiveness becomes sustainable and is accompanied by rising incomes" (UNCTAD, 2002, p. xx). This definition explicitly

incorporates an evolutionary perspective, in which countries move away from primary exports to products with a higher technological content (which present a greater potential to generate spillovers to the rest of the economy) that present a greater potential to develop a country's technological capabilities. This starts a virtuous cycle whereby more firms are able to enter international markets and contribute to strengthen these capabilities.

We end this section with a few words on competitiveness indices. The two best known indices of national competitiveness are those formulated by the World Economic Forum (WEF, 2003) and the Institute of Management Development (IMD, 2003).[16] They attempt mainly to rank countries in terms of their business climate by using a large number of attributes condensed into a single index. Both efforts make use of hard data and opinion surveys to quantify factors related to technology, infrastructure, quality of public institutions, and macroeconomic environment, among others.

It is not our purpose to describe or analyze in detail the formulation of such indices. Suffice it to say that, as other authors have pointed out, the theoretical basis of these indices is problematic. One of the best articulated critiques is presented by Sanjaya Lall (2001), who finds, after analyzing the Global Competitiveness Report, that the definitions employed are too broad, the approach is biased, the methodology is flawed, and many qualitative measures are vague, redundant or wrong. Consequently, he warns that given the weak theoretical and empirical foundations, the index should be employed with care.[17] However, contrary to Krugman, Lall concludes that there is a valid case for competitiveness analysis, especifically regarding the use of government strategies to deal with market failures.[18] In addition, even though he largely disqualifies the WEF index, he sees a role for such indices in general. In his own words,

> […] competitiveness analysis involves making assumptions on government capabilities as well as on the nature of market failures affecting dynamic comparative advantage. The value of the analysis depends on the theoretical and empirical validity of those assumptions.
>
> If competitiveness analysis is valid, there is a useful role for competitiveness indices to benchmark national performance. Indices can help policy makers to evaluate the shortcomings of their economies, in the same

[16] Both, the WEF and the IMD are based in Switzerland. They used to publish jointly a competitiveness index, but they split up in 1996. Since then, they publish separate indices.

[17] Lall goes as far as saying that "While the *Global Competitiveness Report* is well written and contains useful material, its competitiveness indices do not merit the attention they attract and the policy concern and debate they generate" (p. 1519).

[18] Krugman (1996) identified four positions regarding the concept of competitiveness: (a) *mercantilist* (people advocating this view regard as obvious that countries compete in the same way that corporations do); (b) *classicist* (the standard view of classical economics based on the idea of comparative advantage); (c) *strategist* (based on the classical position but incorporating market imperfections and the role of governments, leading to the formulation of "strategic trade policies"); and (d) *realist* (they are skeptical about the extent to which strategic trade theory can justify government intervention). Krugman declares himself a realist.

> way that technical benchmarking helps enterprises to assess themselves against rivals and undertake appropriate strategies. Indices can also help investors to allocate resources between countries, researchers to analyze important issues in comparative terms, aid donors and international institutions to judge economic performance, and domestic industries to measure themselves against competitors (Lall, 2001, p. 1505).

Most current analysis of competitiveness use a broader definition that goes beyond macroeconomic variables and include structural factors affecting medium and long-term economic performance concerning productivity and innovation. The Economic and Social Progress in Latin America Report 2001 (IADB, 2001) was devoted exclusively to the analysis of the competitiveness issue in the region. In the document, prepared by the Inter-American Development Bank, the term is defined as "the quality of the environment for investment and for increasing productivity in a climate of macroeconomic stability and integration into the international economy" (p. 1). The same document places emphasis on identifying deficiencies in the markets of factors of production that limit the development of the private sector and that can be corrected through the implementation of appropriate public policies. The factors included in the analysis are: credit, human resources, infrastructure for ports, electricity and telecommunications, and new information technologies.

4. Competitiveness and Technology

Fagerberg (1996) analyzed the empirical evidence regarding international trade for the major industrialized countries and found that countries that gained market share also displayed faster productivity growth and increased their technological capabilites. As a result of his empirical research he also concluded that it is technological, rather than price competition that matters most, so that to equate international competitiveness solely with indicators of relative unit costs or prices can be misleading.[19] This result had also been proposed by a number of previous analyses (see, for example Porter, 1986, 1990).

Granted, price competition can be expected to be of importance in labor intensive industries, such as garments. However, as the process of development advances, countries can also be expected to diversify their exports to goods of higher technological content. In this section we briefly discuss the crucial role of technology in a country's competitiveness and in the development process in general.

Technology plays a key role in the process of industrial development since, as noted by Guerrieri (1994, p. 287), "industrial development may be seen as a sequence of structural transformation within the manufacturing sector, which is driven by technology and

[19] Fagerberg proposed this explanation to the so-called "Kaldor paradox." Economist Nicholas Kaldor showed that, over the long term, market shares for exports and relative unit costs or prices tended to move together (i.e. growing market shares and increasing relative costs go hand in hand), contrary to the conventional wisdom that ignored the role of technology.

contributes to the emergence of new products and sectors." Najmabadi and Lall (1995) put very succinctly the meaning and importance of the development of technological capabilities (TC). They define technological capability as the "skills – technical, managerial, and organizational – that are necessary for enterprises to set up a plant, utilize it efficiently, improve and expand it over time, and develop new products and processes" (p. 2).[20] Thus, implicit in this definition lies the idea that capabilities must be developed in three areas: *investment* (in order to identify, prepare, design, construct, and equip a new facility or expand an existing one), *production* (in order to operate production facilities with the ability to adapt operations to changing market circumstances), and *innovation* (in order to improve technology or develop new products or processes that better meet specific needs).[21]

Due to the many tacit elements of technology,[22] such capabilities must be consciously acquired, and cannot be expected to arise as an automatic by-product of production capacity (i.e. though passive learning by doing). Bell and Pavitt (1993) draw a distinction between production capacity and technological capability. The former involves equipment, product and input specifications, and organizational systems. Technological capability, on the other hand, includes the specific resources needed to generate and manage technical change, mainly skills, knowledge, experience, and institutional structures.

The importance of the development of domestic TC to strengthen competitiveness at all levels lies in the fact that over time, the process involves a "deepening" of such capabilities, i.e. the undertaking of more complex and demanding tasks in terms of adaptation, improvement, design, engineering, development and innovation. As explained by Najmabadi and Lall (1995), this deepening of capabilities generates additional benefits, including: more widespread diffusion of technology, greater use of local inputs, more product differentiation, higher domestic value added, and the ability to respond more effectively to changes in market conditions. Additionally, the process of industrial progress is accelerated by the entry into higher value-added activities.

We should stress that the development of domestic technological capabilities does not imply the pursuit of technological self-sufficiency. As Dahlman *et al*. (1985) conclude, countries should combine foreign and local technological elements in a way that progressively develops local capabilities in areas where they can be more efficient. For most developing countries, a critical component of the development of TC involves the ability to become more efficient in the use of technologies imported by various means. These means include foreign

[20] Borrowing from Bell *et al*. (1984), "*technology* refers to a collection of physical processes that transform inputs into outputs, to the specifications of the inputs and the outputs, and to the procedural and organizational arrangements for carrying out the transformations [...] *Technological effort* is conscious exertion to use technological information and to accumulate technological knowledge to choose, assimilate, adapt, or create technology" (p. 10).

[21] See Lall (1992) and Dahlman *et al*. (1985).

[22] In this context, tacitness refers to the incomplete specification of technology. Following Amsden (2001), this can be due to several factors: (a) the scientific properties of the new technology are not fully understood so that documentation is impossible; (b) the properties are proprietary; or (c) the nature of the properties are more art than science.

direct investment, licensing, turnkey projects, purchases of capital goods and technical assistance contracts. The advantages and drawbacks of each alternative are described by Dahlman *et al*. (1985) and will not be repeated here.

For developing countries, one of the most promising channels for technology transfer and the development of TC is foreign direct investment. There are several ways available for the transfer of technology through foreign investment: (a) technical documentation; (b) education and training of the affiliate's labor force; (c) exchanges of technical workers; (d) shipments of machinery and equipment; and (e) continuing communication to solve whatever problems occur in the production process. Kokko and Blomström (1995) found that the mode of technology transfer depends on the level of development of the receptor country. Their analysis shows that imports of capital equipment (embodied technology) is the main mode of transfer to affiliates in developing countries, whereas affiliates in developed countries rely more on licenses (disembodied technology). One possible explanation, according to the authors, is that embodied technology requires less human capital, which is scarce in developing countries.[23] Even though foreign investment may involve the transfer of technological information and goods, this may not be associated with the transfer of technological understanding. Thus, even if there is an agreement about the role that FDI can play in the transfer of technology, it is still uncertain to what extent and how technological improvements in enterprises with foreign capital participation will affect domestic capabilities. It seems that the policy objective should not only be to attract foreign investment, but also to create an environment where the process of developing domestic technological capabilities benefits from the presence of foreign firms.

A final concept of importance in this discussion is that of National Innovation System (NIS), which can be defined as "the network of institutions of private and public sectors, whose activities and interactions initiate, import, modify, and diffuse new technologies" (Freeman, 1987, p.1). Capdevielle *et al*. (2000) describe in detail the development of the "Mexican Innovation System" that comprises, according to their taxonomy, four types of institutions:

1. Institutions that provide financial incentives and encourage the productive development of small and medium enterprises.
2. Specialized institutions oriented to the strengthening of technological capabilities in specific sectors (oil industry, electric energy, nuclear energy, and water).
3. Centers devoted to basic and applied research, technological development, and higher level training and education.
4. Institutions devoted to the creation of an environment of trust and certainty addressing aspects of standardization, certification, quality, and training.

[23] Other explanations may lie in the restrictions imposed on the payment of license fees in developing countries, and the possible distortions in the data caused by transfer pricing.

Recently, however, the usefulness of the concept of NIS has been questioned. It is argued that, rather than national, innovation systems are *regional* or *sectoral*. In other words, a focus on geographical concentration or on a specific industry could prove to be a more fruitful approach.

5. Competitiveness and the Environment

In this section we discuss the impact that environmental regulations have on competitiveness. The conventional approach assumes that there is a conflict between environmental regulation and competitiveness. More stringent environmental regulations, it is argued, imply higher costs for firms seeking to comply with those measures. As a result, firms will lose price competitiveness and may begin to lose market share or even consider going out of business with the consequent loss of jobs. Alternatively, faced with increasing operating costs, firms may consider relocating their production facilities to locations with less stringent environmental regulations or lax enforcement, creating what has been called "pollution havens."

Contrary to the conventional approach, Porter and van der Linde (1995) argue that more stringent environmental regulations act as an incentive for companies to innovate and become more competitive, and at the same time partially or fully offset the costs of complying with them. Such "innovation offsets" will improve the competitiveness of the firm because, the authors argue, reducing pollution often involves improving the productivity and efficiency with wich resources are used. It should be stressed that not all environmental regulations have the potential to lead to innovations; if environmental standards are to improve competitiveness through innovation offsets, they have to adhere to three principles: (a) they must create the maximum opportunity for innovation, which implies that industry (not the regulatory agency) should be in charge of leading the innovation process; (b) instead of setting technology standards and lock the use of a particular technology, regulations should foster continuous improvement; and (c) the regulatory process should eliminate any uncertainty at every stage to encourage innovation.

Regarding the "pollution havens" hypothesis, the vast majority of empirical studies rejects its existence. Some studies (Low and Yeats, 1992; Sorsa, 1994) show evidence according to which developed countries were loosing competitiveness (measured by trade indicators like market share or revealed comparative advantage indices) in pollution-intensive industries while developing countries (generally with less stringent environmental regulations) were becoming more competitive. At first sight, these results may seem to support the view that the pollution havens phenomenon actually occurred, especially during the period when developed countries tightened their regulations. However, as the authors also point out, other more plausible explanations are possible. One of them is the fact that, as developing countries advanced in their industrialization process, they began to concentrate on heavy industries (which are the most pollution intensive) and this pattern was reflected in trade statistics. Besides, it should be noted that more recent studies using comprehensive datasets and examining data from different perspectives (Xu, 1999), find that export

performances of dirty industries for most countries remained unchanged between the 1960s and 1990s despite the introduction of stringent environmental standards in developed countries.

Further confirmation of the lack of empirical support for the hypothesis that environmental regulations have had an adverse effect on competitiveness is presented by the comprehensive reviews of Jaffe *et al.* (1995) and Levinson (1996). Thus, there is just no clear empirical evidence supporting the fact that high environmental standards have a systematically negative impact on competitiveness.[24] There are several reasons that contribute to explain why this is the case:

- Environmental policy and the costs that it implies for firms in a market is only one factor among many others that determine the competitiveness of a firm. There are others that can potentially have a far greater impact: quality of management, capacity to innovate and incorporate technological advances, etc.
- The costs of complying with environmental regulations is a small fraction of total production costs (the average share for the US industry is estimated to be about 2%), so that labor, energy and raw materials cost differentials, infrastructure, and political stability among other factors overwhelm the environmental effect in the decision about where to locate a facility.
- Within a country, if all competing firms face the same cost increase, there will not be a relative shift in costs and prices, or any change in competitiveness in that market.
- Facing increased costs as a result of new (more stringent) environmental regulations, firms may regard it as an incentive to adapt their operations and improve the efficiency of the facility.
- The degree to which new costs impact on sales will depend on: whether these costs can be passed on to consumers;[25] the price response of competitors; and the elasticity of demand for the product (OECD, 1997).
- Multinational corporations may be reluctant to build less than state-of-the-art plants in developing countries to benefit from differences in regulatory stringency. This is because corporations doing business in a variety of locations may find it most cost effective to operate according to the most stringent regulations and benefit from economies of scale in plant and equipment design.
- Finally, capital markets begin to reward good environmental performance.[26]

[24] The nexus private sector-environment and its impact on competitiveness is analyzed in more detail by Pratt (2000) with special emphasis on Latin America.

[25] As Jenkins (1998) notes, this will depend on the market power in the industry

[26] In effect, Dasgupta *et al*. (2001) studied the capital markets in Argentina, Chile, Mexico and the Philippines and found that they react to environmental news, penalizing firms which are the object of citizens' complaints and rewarding firms which obtain the recognition of superior environmental performance.

Environmental issues have already entered the mainstream business literature and are beginning to be perceived as a source to further develop competitive advantage rather than a burden (Hart, 1997; Lovins *et al*., 1999). Developing cleaner technologies and processes to gain a first-mover advantage in environmental niches, or identifying improvements as a result of environmental regulations, business managers are slowly realizing that the environment and competitiveness are not in direct opposition. Instead (with appropriately designed regulations) they can help create a virtuous cycle where environment and competitiveness reinforce each other.

6. Conclusions

As can be concluded by the casual reader on the topic of competitiveness, institutions and scholars alike have been very prolific in providing definitions of competitiveness. Without forgetting Krugman's warnings about following a purely mercantilist approach to define the term, most of the contemporary definitions conceive competitiveness as the ability to create an environment that is conducive to a sustained productivity growth reflected in higher living standards for its population. This incorporates macro, meso and microeconomic factors in a context of integration into the global economy.

By introducing the framework of nested rings of competitiveness we present the idea that each level requires a different analysis and demands the application of different sets of policy instruments. From the same framework it also follows that the firm is at the center of all discussion surrounding competitiveness. This is the case because the industry, the region, and the nation can provide an environment conducive to the development of competitive advantage. However, it is the firm, as the basic economic agent that will ultimately respond to this environment by enhancing its capacities to transform inputs into good and services at maximum profit. As a corollary from the previous discussion, policies aimed at improving competitiveness should have the firm as the ultimate target.

Having ruled out the view that portrays countries competing with each other in zero-sum games, it can instead be argued that countries compete primarily with themselves, since "a country grows more rapidly if it succeeds in creating a business environment better than the one that would be expected for its own income level (IADB, 2001, p. 11)."

References

Amsden, Alice H. (2001), *The Rise of "The Rest": Challenges to the West from Late-Industrializing Economies*, Oxford University Press, New York.

Battat, Joseph, Isaiah Frank and Xiaofang Shen (1996), *Suppliers to Multinationals: Linkage Programs to Strengthen Local Companies in Developing Countries*, Foreign Investment Advisory Service, Occasional Paper No. 6, The World Bank, Washington, D.C.

Bell, Martin and Keith Pavitt (1993), *Accumulating Technological Capability in Developing Countries*, Proceedings of the Annual World Bank Conference on Development Economics 1992, The World Bank, Washington, D.C.

Bell, Martin, Bruce Ross-Larson and Larry E. Westphal (1984), *Assessing the Performance of Infant Industries*, World Bank Staff Working Papers No. 666, The World Bank, Washington, D.C.

Blomström, Magnus, Steven Globerman and Ari Kokko (2000), *The Determinants of Host Country Spillovers from Foreign Direct Investment: Review and Synthesis of the Literature*, Discussion Paper No. 2350, Centre for Economic Policy Research, London.

Boltho, Andrea (1996), "The Assessment: International Competitiveness", *Oxford Review of Economic Policy*, Vol. 12, No. 3, pp. 1-16.

Capdevielle, Mario, Mónica Casalet, and Mario Cimoli (2000), *Sistema de Innovación: El Caso Mexicano*, Proyecto Interdivisional CEPAL/GTZ FRG/98/S24, Comisión Económica para América Latina y el Caribe, Santiago de Chile.

Charles, David and Paul Benneworth (1996), *The Competitiveness Project: North East Regional Competitiveness Report 1996*, Centre for Urban and Regional Development Studies, University of Newcastle, Newcastle upon Tyne.

Dahlman, Carl J., Bruce Ross-Larson and Larry E. Westphal (1985), *Managing Technological Development: Lessons from the Newly Industrializing Countries*, World Bank Staff Working Papers No. 717, The World Bank, Washington, D.C.

Dasgupta, Susmita, Benoit Laplante, and Nlandu Mamingi (2001), "Pollution and Capital Markets in Developing Countries," *Journal of Environmental Economics and Management*, Vol. 42, pp. 310-335.

Fagerberg, Jan (1996), "Technology and Competitiveness", *Oxford Review of Economic Policy*, Vol. 12, No. 3, pp. 39-51.

Freeman, Christopher (1987), *Technology Policy and Economic Performance: Lessons from Japan*, Pinter Publishers, London.

Gilpin, Robert (2001), *Global Political Economy: Understanding the International Economic Order*, Princeton University Press, Princeton, NJ.

Grossman, Gene M. and Elhanan Helpman (1991), *Innovation and Growth in the Global Economy*, The MIT Press, Cambridge, MA.

Guerrieri, Paolo (1994), "International Trade Pattern, Structural Change and Technology in Major Latin American Countries", *Giornale degli Economisti e Annali di Economia*, Vol. 53, No. 4-6, pp. 285-314.

Haque, Irfan ul (1995), *Trade, Technology, and International Competitiveness*, Economic Development Institute, The World Bank, Washington, D.C.

Hart, Stuart L. (1997), "Beyond Greening: Strategies for a Sustainable World," *Harvard Business Review*, Vol. 75, No. 1, pp. 66-76.

IADB (2001), *Competitiveness: The Business of Growth*, Inter-American Development Bank, Washington, D.C.

IMD (2003), *IMD World Competitiveness Yearbook 2003*, International Institute for Management Development, Lausanne.

Jaffe, Adam, Steven Peterson, Paul Portney and Robert Stavins (1995), "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?", *Journal of Economic Literature*, Vol. 33, pp. 132-163.

Jenkins, Rhys (1998), *Environmental Regulation and International Competitiveness: A Review of Literature and Some European Evidence*, Discussion Paper Series No. 9801, Institute for New Technologies, The United Nations University, Maastricht.

Klein, Lawrence (1988), "Components of Competitiveness", *Science*, Vol. 241, Issue 4863, pp. 308-313.

Kogut, Bruce (1985), "Designing Global Strategies: Comparative and Competitive Value-Added Chains", *Sloan Management Review*, Vol. 26, No. 4, pp. 15-28.

Kokko, Ari and Magnus Blomström (1995), "Policies to Encourage Inflows of Technology Through Foreign Multinationals", *World Development*, Vol. 23, No. 3, pp. 459-468.

Krugman, Paul (1991), "Myths and Realities of U.S. Competitiveness," *Science*, Vol. 254, Issue 5033, pp. 811-815.

Krugman, Paul (1994), "Competitiveness: A Dangerous Obsession", *Foreign Affairs*, Vol. 73, No. 2, pp. 28-44.

Krugman, Paul (1996), "Making Sense of the Competitiveness Debate", *Oxford Review of Economic Policy*, Vol. 12, No. 3, pp. 17-25.

Krugman, Paul and Maurice Obstfeld (2000), *International Economics: Theory and Policy*, fifth edition, Addison Wesley, Reading, Massachusetts.

Lall, Sanjaya (1992), "Technological Capabilities and Industrialization," *World Development*, Vol. 20, No. 2, pp. 165-186.

Lall, Sanjaya (1995), "The Creation of Comparative Advantage: The Role of Industrial Policy" in Irfan ul Haque (ed.), *Trade, Technology, and International Competitiveness*, Economic Development Institute, The World Bank, Washington, D.C.

Lall, Sanjaya (2001), "Competitiveness Indices and Developing Countries: An Economic Evaluation of the Global Competitiveness Report", *World Development*, Vol. 29, No. 9, pp. 1501-1525.

Levinson, Arik (1996), "Environmental Regulations and Industry Location: International and Domestic Evidence" in Jagdish Bhagwati and Robert Hudec (eds.), *Fair Trade and Harmonization: Prerequisites for Free Trade?*, Volume I: Economic Analysis, The MIT Press, Cambridge, Massachusetts.

Lovins, Amory B., L. Hunter Lovins, and Paul Hawken (1999), "A Road Map for Natural Capitalism," *Harvard Business Review*, Vol. 77, No. 3, pp. 145-158.

Low, Patrick and Alexander Yeats (1992), "Do 'Dirty' Industries Migrate?" in Patrick Low (ed.), *International Trade and the Environment*, Wold Bank Discussion Paper No. 159, Washington, D.C.

Malmberg, Anders, Orjan Solvell and Ivo Zander (1996), "Spatial Clustering, Local Accumulation of Knowledge and Firm Competitiveness," *Geografiska Annaler. Series B, Human Geography*, Vol. 78, No. 2, pp. 85-97.

NAFIN (1995), *La Competitividad de la Empresa Mexicana*, Biblioteca NAFIN No. 9, Instituto Mexicano de Ejecutivos de Finanzas and Nacional Financiera, Mexico City.

Najmabadi, Farrokh and Sanjaya Lall (1995), *Developing Industrial Technology: Lessons for Policy and Practice*, The World Bank, Washington, D.C.

Nelson, Richard (1992), "Recent Writings on Competitiveness: Boxing the Compass", *California Management Review*, Vol. 34, No. 2, pp. 127-137.

OECD (1997), *Economic Globalisation and the Environment*, Organization for Economic Co-operation and Development, Paris.

Pack, Howard (2000), "Industrial Policy: Growth Elixir or Poison?" *The World Bank Research Observer*, Vol. 15, No. 1, pp. 47-67.

Porter, Michael (1986), "Changing Patterns of International Competition", *California Management Review*, Vol. 28, No. 2, pp. 9-40.

Porter, Michael (1990), "The Competitive Advantage of Nations", *Harvard Business Review*, Vol. 68, No. 2, pp. 73-93.

Porter, Michael and Claas van der Linde (1995), "Toward a New Conception of the Environment-Competitiveness Relationship", *Journal of Economic Perspectives*, Vol. 9, No. 4, pp. 97-118.

Porter, Michael (2003), "Building the Microeconomic Foundations of Prosperity: Findings from the Microeconomic Competitiveness Index", in WEF, *The Global Competitiveness Report: 2002-2003*, World Economic Forum, Oxford University Press, New York.

Pratt, Lawrence (2000), *Rethinking the Private Sector-Environment Relationship in Latin America*, Background paper for the Seminar on the 'New Vision for Sustainability: Private Sector and the Environment,' Inter-American Development Bank, New Orleans.

Reich, Robert (1989), "The Quiet Path to Technological Preeminence," *Scientific American*, Vol. 261, No. 4, pp. 19-25.

Rodrik, Dani (1995), "Trade and Industrial Policy Reform", in Jere Behrman and T.N. Srinivasan (eds.), *Handbook of Development Economics*, Volume IIIB, Elsevier, Amsterdam.

Romo Murillo, David (2002), *Foreign Direct Investment in the Mexican Industry: Spillovers and the Development of Technological Capabilities*, Unpublished Ph.D. dissertation, Princeton University, Princeton, New Jersey.

Siggel, Eckhard (2003), *Concepts and Measurements of Competitiveness and Comparative Advantage: Towards and Integrated Approach*, Paper prepared for the International Industrial Organization Conference, Boston.

Sorsa, Piritta (1994), *Competitiveness and Environmental Standards: Some Exploratory Results*, Policy Research Working Paper No. 1249, The World Bank, Washington, D.C.

UNCTAD (2002), *World Investment Report 2002: Transnational Corporations and Export Competitiveness*, United Nations Conference on Trade and Development, New York and Geneva.

Villarreal, René and Rocío de Villarreal (2002), *México Competitivo 2020: Un Modelo de Competitividad Sistémica para el Desarrollo*, Editorial Océano, Ciudad de México.

WEF (2003), *The Global Competitiveness Report: 2002-2003*, World Economic Forum, Oxford University Press, New York.

World Bank (1997), *World Development Report 1997: The State in a Changing World*, Oxford University Press, New York.

World Bank (2003), *Closing the Gap in Education and Technology*, World Bank Latin American and Caribbean Studies, The World Bank, Washington, D.C.

Xu, Xinpeng (1999), "Do Stringent Environmental Regulations Reduce the International Competitiveness of Environmentally Sensitive Goods? A Global Perspective," *World Development*, Vol. 27, No. 7, pp. 1215-1226.

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