

**A VISION FOR LATIN AMERICA:
a resource-based strategy
for technological dynamism and social inclusion**

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INTRODUCTION

By way of executive summary

This essay looks at the current trends in globalization and in the diffusion of the ICT (Information and Communications Technology) revolution and its paradigm in order to propose a vision of a successful and socially equitable future for Latin America, based on the common features, while harboring all the variety of its countries. It hopes to provide the basis for intensive research and for a serious and wide ranging debate on the matter.

The proposal is rooted in the author's work on the diffusion of technological revolutions, on how technology and technological capabilities determine growth potential and on the way in which the world technological context changes the windows of opportunity for development of countries and regions.

It is a suggestion in response to the growing concern among Latin Americans that without an agreed sense of direction it will be very difficult to get onto a dynamic development path. The rising prices of raw materials have indeed provided the fuel for regaining a higher rhythm of growth, but technological capabilities are not growing apace and profound social inequalities persist –often deeper than in the 1970s. The region is becoming aware of the need to provide a solid foundation for a more stable source of economic growth and of social development potential.

Given the strong Asian bias of the current globalization process, it is very important to identify areas of technological potential where Latin America has a comparative advantage vis-à-vis Asia. In highly simplified terms one can say that Asia is a very densely populated continent with a relatively low endowment in natural resources, while Latin America is very rich in natural resources with a much lower population density. These conditions give Asia the advantage in labor intensive *fabricating* (assembly) industries, while in Latin America they favor the resource-based *processing* industries. Since the region is extremely varied in resource endowment, this general direction should allow and in fact demand differentiated specializations.

Fabrication would not –and could not– be abandoned, but the bulk of it would be strengthened in those areas that are either at the service of the processing industries or that target high-value low-volume niches, taking advantage of the hyper-segmentation of markets that characterizes the current globalization wave. Of course, in larger countries such as Brazil or Mexico volume fabrication can be competitive by leveraging the home market or incorporating specific technological features.

Acquiring capabilities in the resource-based industries associated with biology and materials has the added advantage of preparing the terrain for being well placed in the technologies that

are likely to be part of the next technological revolution: biotechnology, nanotechnology, new materials and energies. A focused effort is proposed in order to make sure that such preparation takes place.

The process industries are usually not labor-intensive and tend to need a high proportion of skilled and highly-skilled personnel. This means that although such industries can contribute to economic growth and to the enrichment in human and technical capital, –both crucial for catching-up– they cannot do enough to reduce the gulf between rich and poor, eliminate unemployment and overcome poverty. Neither can one rely on the “trickle down” effect that has been so deeply questioned by historical experience. This suggests the need for a complementary and simultaneous set of policies; a two-pronged approach to development: top-down and bottom-up. Thus, this proposal involves what could be called *a dual integrated model*.

The top-down part of the strategy already outlined aims at competitiveness in world markets, reaching the technological frontier in certain areas and processes and even forging ahead, often in alliance with global companies. In turn, the bottom-up half of the strategy would act directly in every corner of the territory at the municipal and local level by identifying, promoting, facilitating and supporting wealth-creating activities aimed at whatever market is most suitable: local or regional, national or global. These would tend to be specialized “clusters” targeting niche markets based on local advantages.

As we will discuss below, both halves of the dual strategy are enabled by the new global conditions. The bottom-up half would be aimed directly at reducing poverty, and the top-down half would aim at activating and strengthening the engines of growth of the economy, and therefore providing the resources that make both halves feasible.

This dual strategy cannot be achieved by the market alone, but neither can it effectively be imposed by government, much less so in the current paradigm which requires constant innovation and flexibility to context changes. Such a model can only function properly as a socially shared vision, with the various agents of change acting autonomously in the agreed directions and integrated by an active government with an adequate and effective institutional framework. Its implementation would require a process of consensus building involving business, government, universities and society, followed by the adequate policy measures to induce and facilitate market behavior in the agreed directions.

To set the stage for this strategy proposal we begin with an interpretation of Raul Prebisch’s Import Substitution model, seen as a successful positive-sum strategy within a very specific window of opportunity. This suggests the need to identify the nature of the current windows. With that in mind, the following section examines globalization as an intrinsic element of the ICT paradigm and singles out three processes of hyper-segmentation that strongly influence the opportunity space. The dual model is then presented in broad brush strokes identifying the general directions for the resource-based specialization in the process industries, while taking into account the urgent need to confront poverty and the rise of Asia. The next three sections analyze the three key hyper-segmentations in detail –of markets, value networks and technologies– and look at how each of them defines opportunity spaces for both sides of the proposed strategy. The following section argues that a resource-based specialization route may also effectively prepare the ground for a successful insertion in what is likely to be the next technological revolution. Then there is a very brief discussion of the theories about resource-based development and of the current conditions that create a window of opportunity for such a route to development. The concluding section argues the need to revitalize the role of government both as consensus builder and as proactive facilitator of the strategy in its two components.

While this discussion is based on the author's work on the patterns that recur in the spread of technological revolutions, it is not possible in this brief paper to present a summary of those patterns or to review the meaning of the various concepts and terminology. It is hoped that the succinct explanations provided will be sufficient for the current purposes.¹ Furthermore, it is useful to advise the reader that this is mainly an essay rather than a research article, a proposal argued from a particular world view rather than an empirical analysis of context or viability. It is meant to open –rather than close– a necessary debate.

CHANGING CONDITIONS; CHANGING STRATEGIES *Success and obsolescence of the Import Substitution model*

Successive technological revolutions and their patterns of diffusion determine the changing context for development and open successive and different scenarios for action. This means that development opportunities are a moving target and that development strategies are temporary and must be updated and reshaped accordingly.²

The Prebisch model of industrialization by import substitution (ISI)³ has often been criticized from the vantage point of a late-twentieth or early twenty-first century perspective. In a sense, this is akin to finding fault with the hierarchical organization of the old major corporations, now seen as “dinosaurs” after being replaced by the flexible network structures of the ICT paradigm. It is easy to forget that those corporations with their bureaucratic pyramidal structures successfully led the unprecedented growth of the Post War boom, precisely because they were adequate organizations for the technologies of the Age of the Automobile, Mass Production and Petrochemicals. In a similar manner, the ISI model achieved high growth rates for many Latin American countries for almost two decades, and it was a brilliant and effective positive-sum strategy for developing countries wanting to industrialize at a time when the technologies of that revolution were approaching maturity.

By the end of the 1950s, many of the large corporations in the advanced countries were increasingly facing two limits to growth. On the one hand, on the technological front, they were finding it harder and harder to add new products along the accustomed trajectories and to raise productivity in their established production lines. The rhythm of salary increases that had come with productivity growth were becoming harder to negotiate and ended up in inflation. On the other hand, in the market expansion front, they were reaching saturation. The “American Way of Life” with its consumption patterns had already encompassed the whole of the workforce in the advanced countries and the narrow elites of most of the developing countries. Market growth was mainly being achieved through “planned obsolescence”, using strong fashion trends to induce existing consumers to reject their old – perfectly functioning– products and to buy brand new ones.

At the time, the developing countries had neither the technology nor the market scale to set up competitive industries and were basically exporting raw materials and importing manufactured products. The price “scissors”, which Prebisch called attention to, got even worse as corporations, facing limits to productivity and markets, tried to squeeze raw materials prices and to transfer salary increases to the consumer.

¹ Interested readers are invited to the author's web page www.carlotaperez.org and to the publications cited in the text

² Perez (2001)

³ Prebisch (1951) and (1988)

The ISI model offered a dynamic solution both to the problems of the main corporations of the advanced countries and to those of the developing countries. Moving final assembly of the main consumer products to such countries mobilized their economies at the same time as it expanded world markets by creating significant layers of new consumers.

Replacing imports of final products with imports of capital goods and parts, and performing final assembly under strong tariff protection, did not greatly improve the balance of payments of the developing countries. Some of the savings in one direction were offset by profit repatriation and by brand, training and technology license payments, while foreign investment was often made with domestic loans. But there was growth, employment and, above all, the process generated demand for construction, infrastructure and complementary services and created the need for a wide professional middle class and an educated workforce.

The final assembly plants did not lead to much technological learning either, though they did require organizational and managerial capacities and basic skills for the workers. By contrast, local technological capabilities were required –and acquired– in order to build, improve and operate ports, airports, roads, electricity, telephony and water (usually developed with state funds and under state control), as well as in the accessory industries such as cardboard, printing, packaging, glass, plastics, cement and building materials. Market conditions were such that high productivity was not indispensable,⁴ but engineering capabilities for smooth and reliable operation were necessary. The same was true for some of the mass consumption agro-industries: beer, milk, juice, meat, pasta, etc. In these cases, though the brands and the process technology were often imported, they usually had to be adapted to the characteristics of local produce and consumer preferences.

Thus, the import substitution process worked like a starter engine for moving the rest of the economy and for creating a developmental culture in the public sector, including major investment in basic industries and infrastructure and the establishment of mass education and health systems. Obviously, the larger countries that already had a manufacturing base went much further in weaving a complete industrial structure, with more or less uneven capabilities in the various components. But even the smaller and weaker countries were able to make a substantial leap forward in growth (See figure 1). For about fifteen years the average growth of most countries in Latin America was around four percent, with periods when one country or another grew at a 10% average.

By the 1980s, however, the ISI model had become obsolete. The information revolution was already taking off, its paradigm was beginning to rejuvenate the mature industries, driving them to reorganize and innovate in new directions. It became easier to acquire old technologies but –or because– they were no longer competitive, while at the same time international loans were becoming easily available.⁵ The attempts at subsidized export promotion were only successful when there were real local capabilities involved (a flagship case is Embraer, the Brazilian airplane producer). It was not easy to export manufactures made with mature technologies in a world in stagflation. The multinationals no longer had much interest in the assembly affiliates or the licensed producers; they were busy constructing global networks with Asian suppliers and exporting across the world at

⁴ In a highly protected economy, all relative prices are consistent with a lower level of productivity and an attractive profit rate. Foreign products are also over-priced by world standards and can be prohibitive in those cases where there is local production, which is precisely what the protection is for.

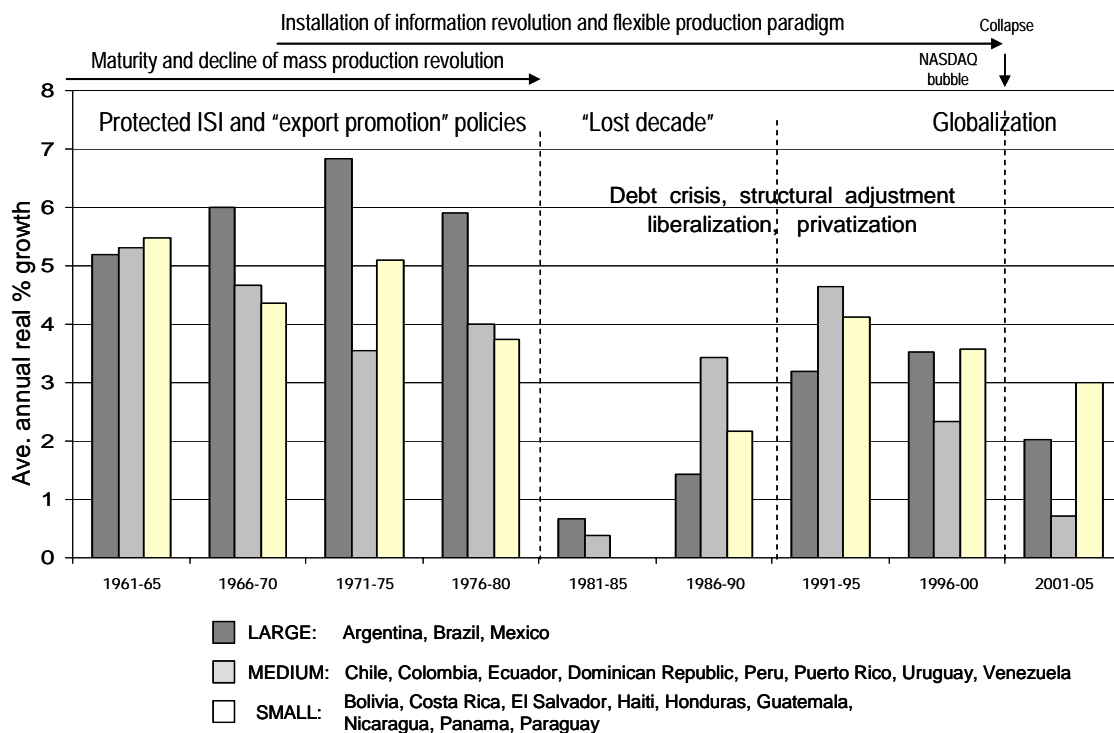
⁵ In the 1970s, international loans were abundant and easily acquired at high interest rates and they became common for both private and public sector companies. See Kindleberger 1978 p. 19 about how the loans were “practically forced” on the developing countries. Whether these loans were for legitimate investment purposes or led by corrupt motives, the consequence was a debt level that could not be repaid.

competitive prices. The debt crisis soon engulfed Latin America and the “Washington consensus” institutions made it clear that protection was no longer acceptable. The process of “structural adjustment” proceeded at an uneven rhythm, much public sector investment was privatized, the opening of the economies gradually destroyed most of the final assembly industries and the continent entered the “lost decade”.⁶

By the mid-1980s, the MNCs were modernizing, gradually becoming globalized and searching for partners in global value chains. Some of the surviving Latin American ISI or “export promotion” companies began learning the hard way how to modernize without protection, become competitive without subsidies and/or participate in those global networks in one role or another. The overall growth rates came down to an average of 2%, and many countries had falls reaching -6 or -8% in some years.

Figure 1

Average real annual growth of groups of Latin American countries by relative size 1961-2005



Source: World Bank WDI 2006 (original data in constant 1995\$)

The Asian Tigers had also applied the ISI model, in fact with less success at the beginning. However, and partly because they did not have an independent source of foreign income from

⁶ It is in the context of the “lost decade”, in the late 1980s, that Fernando Fajnzylber leads the CEPAL project that results in *Changing Production Patterns with Social Equity* (Cepal 1990). This publication was perhaps the first attempt at finding a modern route for Latin America to pursue in the context of the ICT revolution. Unfortunately, Fajnzylber died before the fruits of his work could be reaped. Perhaps the time has come to revive that project, which on a current reading, 17 years later, still sounds amazingly valid.

raw materials, they devised a way of using import protection and export subsidies to achieve export-led growth by providing sheltered learning time to their “infant industries” and facilitating the emergence and growth of competitive exporting companies and industrial complexes. Their relationship with the multi-national corporations (MNCs) became one of suppliers of exported final goods, with advanced-country quality but at developing-country costs, exactly what maturing industries were looking for in the 1970s and early 1980s. Succeeding in that role implied uniting high productivity with low labor costs. The process involved intensive technological learning, aided by subsidies while required.⁷

There was an element of luck in that the Asian region had developed as a site for assembly of electronics products and components, which happened to be the core of the next revolution. Although their initial exports were in mechanical, electromechanical and clothing products, these countries quickly understood the importance of ICT and the trend towards global markets. They constructed –explicitly or implicitly– clear and nationally shared “visions” for their economic development, and experienced a resounding success.

It would be useless to try to replicate their policies now; the window of opportunity of which they took advantage has already passed. The ICT revolution is already mid-way along its life diffusion path⁸ and the Asian region is far ahead in its accumulation of knowledge and experience in technology, production, management and trade. Many of their companies are now innovating at the frontier. For Latin America to get onto a fast development path, the continent needs to recognize what its possibilities are within the present context, and into the future.

The premise of this interpretation –and of this article as a whole– is that successful development strategies (except for countries forging ahead at the front ranks) are positive-sum ones. The technological and economic transformation taking place in the core countries of the world system and in the leading corporations of the main industries determine the context in which catching-up processes can take place. It is through a clear understanding of their changing interests and needs and of one’s advantages and assets that opportunities are identified and that development ladders can be constructed and climbed. The cases of the four Asian Tigers, and now of China and India, show that being in the periphery of the world system is not a situation of “static dependency” but rather a potentially dynamic one. Of course, all catching-up processes take time;⁹ they require persistence and effort and demand active learning in order to relate to the most powerful on the basis of real mutual advantage.¹⁰ These processes are also difficult, uneven and often unfair, but no good shortcuts have been found yet.

GLOBALIZATION AND ITS DETERMINANTS ***The ICT paradigm and the global corporation***

Globalization is an intrinsic feature of the ICT paradigm; liberalization is not. It is true that the characteristics of the information and communication technologies make national boundaries transparent and expand the potential scale of production, thus enabling and

⁷ In Latin America, the tariff level was customarily calculated in relation to the local cost of producing the equivalent product, so there was no incentive for productivity, let alone innovation. As the model moved towards export promotion in the mid-seventies, subsidies tended to be calculated in a similar manner and had no expected tapering in time.

⁸ See Perez (2002) Ch. 5 pp. 47-59 and Epilogue pp. 167-171

⁹ Bell (2006)

¹⁰ Perez (2001) pp. 120-121

requiring planetary scale markets. But the “free market” policies, understood as letting all markets run loose –unregulated, unguided and unrestricted, both within countries and across the planet– are no longer effective. In fact, the *laissez faire* stage is perhaps an inevitable but temporary period in the process of diffusion of every technological revolution, but it is no longer effective at this time.¹¹ The first two or three decades of propagation are a grand experiment of creative destruction when the new technologies replace or modernize the old and when competition determines which of the many aspiring candidates will be the new industries and the new industry leaders. It is also the time when the new paradigm is learned by all the agents and the new infrastructures are installed, usually in a frenzy of overinvestment. Historically, a major technology bubble ends each Installation Period and marks the end of *laissez faire* and the return of the regulatory and redistributive State. This happens in a unique manner each time.

On this particular occasion, the necessary institutional recomposition has been delayed and the tensions hidden under the carpet due to the opening of the ex-socialist countries, particularly China, that provided a “miracle solution”, both for producing at lower costs and for providing enormous fresh spaces for market growth. But repressed structural tensions usually resurface explosively (as with the 2007-08 sub-prime mortgage credit crunch). In the meantime, unrestrained free markets can do nothing but aggravate the problems they created while they had a positive function. The concentration of wealth in the stock market and the technological revolution in the core regions achieve the installation of the new potential but result in a regressive income distribution within and between countries. This was and continues to be an important factor in the impoverishment of those parts of the developing world that did not ride the ICT wave, where the consequences have been social unrest, violence, migratory pressures, terrorism and messianic leaders.

The tension between paper values and real values, born from the easy gains in the stock market during the technology bubble, now diverts investment from innovation and job creation, at best, towards mergers, acquisitions and changing production sites, at worst and mainly, towards housing bubbles, derivatives, hedge funds and other casino-like instruments for wealth redistribution.¹² Perhaps only a serious worldwide recession will make it clear that global regulation of finance is indispensable and that States must come back actively to modify the conditions in which markets operate and to make the most of the current paradigm for the well being of their citizens.¹³

In order for government to be effective, though, it cannot just return to past practices. Bureaucratic methods and controls are now obsolete and counterproductive. In the wake of each technological revolution, government institutions must grasp the features of the new paradigm and shape their action by them while keeping their particular goals in mind. What needs to be understood is that each technological revolution provides an enormous potential for wealth creation and social well being, vastly superior to the previous one in terms of effectiveness and productivity; this is indeed what underlies our notion of progress. Yet the difference is not only one of greater or lesser efficiency but also of distinctly new principles, methods and organizational forms and criteria. Entrepreneurs, companies, governments and societies benefit more or less from that potential depending on their capacity to adopt and adapt the paradigm to their specific purposes. Each new paradigm defines the wide range of

¹¹ Perez (2006) pp. 52-54

¹² Perez (2006) pp. 38-41

¹³ For an extended discussion of this issue, see Perez (2002) Ch. 11, 12 and Epilogue

the possible and of the impossible –or rather of the ineffective and inefficient– in the new conditions.

Some of the shifts involved in the adoption of the ICT paradigm are gradually becoming accepted and commonplace. Decentralized networks with a guiding center are replacing closed centralized control pyramids; continuous improvement and innovation are replacing the previous practice of stable routines and planned change; the notions of human capital and of the value creating powers of knowledge and expertise are displacing the view of personnel as “human resources”. Although there is still resistance and controversy surrounding some of those shifts, none has been more subject to debate and extreme positions than the shift towards globalization.

Globalization is not about the disappearance of the nation-state or of national governments, though it is likely that these will eventually yield some powers to supranational institutions and devolve others to local governments. Globalization is about making the most of regional, national and local differentiation, both in production and in markets. Perhaps the motto of the environmentalists “think global, act local” best captures the meaning of the whole globalization process. That does not mean that it is a harmless process of equivalent impact on participants. What it does mean is that national governments have a crucial role in shaping how globalization will affect each country and –through their “brokerage”– so do supranational institutions and local authorities.¹⁴

Identifying the likely windows of opportunity requires not only an understanding of the nature of the ICT paradigm, but also of the nature of the new global corporations. They are the real agents of globalization and their behavior and interests are the key to drawing up positive-sum strategies.

There is a profound difference between the old multinationals (MNCs) and the current global corporations (GCs). The first were the final phase of the mass production paradigm and were a form of dealing with maturity and market saturation; the current GCs are the organizations that use the new ICT paradigm to best advantage.

The multinational corporations established affiliates in various countries, sometimes front end companies –either commercial or for assembling the final product– in other cases producing many of the parts locally. These investments were motivated by their interest in being near (or within) each market and were often induced by the policies of the host nations.

Around the 1970s, in an effort to prop up profits in maturity, a more complex structure began taking shape (especially in Europe): different parts would be made in different countries and the final assembly done in others in order to optimize economies of scale and take advantage of local specialization patterns. This was accompanied by manipulations in international payments and exchange rates that were often detrimental to the national economies –even that of their own home-country. At the same time, and for similar reasons, there was the so-called “industrial redeployment” in search of cost advantages in labor, energy and materials in the Third World. By the end of the 1970s and early 1980s clothing and other manufactured

¹⁴ If there is a case in the world where the State maintains control of foreign investment through all sorts of limits, restrictions, regulations and purpose driven negotiations, it is today’s China. Not only does it drive a hard bargain for its markets and its low cost advantages, but it defines in what part of the territory and in which sectors the foreign companies will operate and establishes conditions for local participation and local learning. This was also the case for South Korea and many other successful countries. Under very different conditions, the high growth rates achieved by Abu Dhabi and Dubai are only possible due to the intense government investment of the oil revenues and their bold visions, together with radical policies to favor foreign investment with local participation.

products as well as steel, aluminum and petrochemicals were being imported from lower-cost developing countries into the advanced world. This led to the hope for a “New International Economic Order” and the term “transnational corporations” (TNCs) was then used to mark the shift. The TNC can be seen as a transitional form of organization while the logic and the potential of the new paradigm were being experimented and learned, still under the prevalence of the old one.

The modern *global corporation* (GC) warrants its own distinct name. It is not just about having affiliates in multiple markets, nor is it merely about taking advantage of lower production costs in various countries; it is a different structure and it follows a different logic; it is the optimum form of the new network organization driven and facilitated by the information and communications revolution. This affects the company itself profoundly.

Reaching for giant global markets is a direct consequence of applying and taking full advantage of the potential and characteristics of information and telecommunications technologies (ICT). A new higher level of productivity can now be achieved through networked organizations spanning the globe. The Internet infrastructure, with its satellites and transoceanic fiber optic cables, allows smooth and instant communication across the world and permits evaluating the whole planet for comparative advantages, assessing the conditions for *outsourcing*, *off-shoring*, *in-sourcing*, *joint-sourcing* and other options, estimating the qualities and costs of engineering, production, transport and transaction “as if” the economic space were open and unlimited, but fully taking into account the political and policy conditions of each country.

The coordination capabilities provided by ICT enable levels of organizational complexity and size that go well beyond the maximum achievable by the old multinational or transnational corporations with their pyramidal structures and slow information systems. Not only is it now possible to guide, monitor and control a truly giant organization, but territorial coverage and structural complexity are relatively easy to handle with ICT and are likely to become much more so with further adaptive innovation.

The process of globalization has brought with it the hyper-segmentation of three key areas: the value chains, the global markets and the technological capabilities. Each of these areas becomes a complex network with differentiated components. The result could be termed *integrated decentralization* or *systemic componentization*, where each component has a very high degree of autonomy within an inter-functional and interactive structure.

In the structure of each corporation, there is a segmentation of its value-network (including that of its suppliers and clients) into components and sub-components, which can connect in a variety of different types of relationship, from being part of the core structure, through being a stable independent contractor or an ally, all the way to being a temporary supplier tapped only when the need arises. In turn, each of these components is supported by its own network of relationships on the basis of a high degree of autonomy, which in these structures is considered indispensable to assure flexibility and competitiveness. The components can be territorially scattered in multiple countries, yet they conform a single *global value network* leveraged and coordinated by the global corporation.¹⁵

This same capacity for handling complex networks also facilitates the hyper-segmentation of markets, allowing a highly diversified product profile and great adaptability to a wide variety of specific and even ultra-specialized demand.

¹⁵ On-line resources for the global value chain literature seen from the point of view of the developing countries can be found in: <http://www.globalvaluechains.org/>

Once the value network is segmented into its simplest sub-components and the markets splintered into innumerable niches, technological capabilities can be singled out and very deep and innovative specialization can allow small knowledge-intensive units or companies to thrive inside or outside global corporations. At the other end, some traditional artisan methods can also occupy premium niches.

These patterns of best practice have become part of the prevailing ICT paradigm and are likely to shape all organizations beyond the global corporations and the productive sphere itself.

These characteristics of the globalization process open specific windows of opportunity for the companies and countries of Latin America. Such opportunities will be analyzed after discussing the overall proposed strategy, and in relation to it.

THE CONTEXT AND A RESOURCE-BASED STRATEGY

A dual approach for a dual reality

There are two realities that must be faced by whatever strategy for development is adopted by Latin America. One is the nature of the competition with China and other Asian countries in the global markets. The other is the very polarized income distribution, with an unacceptably high proportion of the Latin American population living in poverty.

The direction taken by the current process of globalization seems to have given Asia the role of *factory of the world* as far as the ‘fabrication industries’ are concerned (electronics, electrical appliances, clothing, etc.).¹⁶ The advantages upon which this global specialization is mounted are massive amounts of low cost labor and an abundant number of engineers and highly educated personnel in the population. The scarcity of raw materials in that continent, in relation to its growth needs, has allowed Latin America and Africa to export growing amounts of minerals, energy and agricultural products at higher and higher prices.

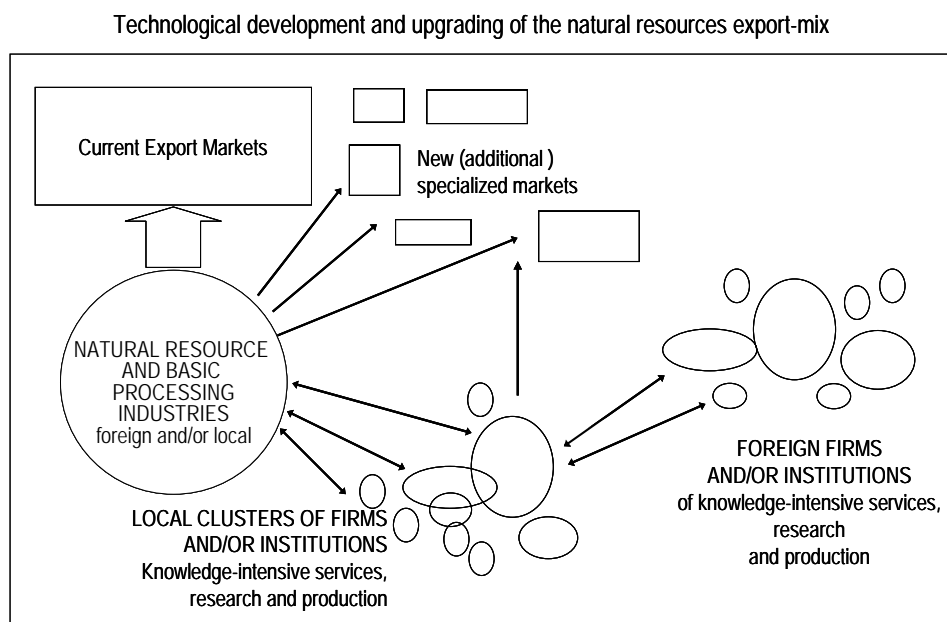
Latin America has increasing difficulty competing in fabrication, especially in the areas of high-volume, low-cost products. It is far less densely populated than Asia and what is, in fact, very low cost labor is still far above the Asian levels. Yet, its rich endowment of natural resources and energy provides a window of opportunity for specializing in the ‘process industries’. The traditional problem of mono-export of raw materials could be turned into a high-tech and high-growth future by taking intelligent advantage of the current and, most likely, also future favorable prices of these products in order to fund an effort in developing the technologies and the human capital related to those very products. The continent could become the supplier of material inputs, food and other agricultural goods (from the most standard to the most tailored and sophisticated) to the rest of the world.

¹⁶ The term *fabricating* is being used to refer to the manufacturing of products by the assembly of distinct parts. Such is the case of automobiles, mechanical, electrical and electronic equipment, clothing and so on. The production methods may include automated machinery and robotics, but they are usually intensive in the use of labor, from unskilled to highly skilled, depending on the product and the technology applied. The term *processing* industries refers to the direct transformation of raw materials by chemical, electrical, heating or other methods such as those used in making steel from iron and coal, paper from wood pulp, bottled tomato sauce from fresh tomatoes, gasoline from petroleum, plastic from gas or electricity from fuels as well as certain types of services such as telecommunications that process and transmit signals using a network of cables and equipment. The main distinction is that the process of production occurs “inside” the system of equipment and the personnel oversees and supports the process rather than perform it, as in fabrication. For a classification of production systems see Joan Woodward (1965)

The process would involve the constant technological upgrading of the resource-based activities, gradually improving the export profile through continuous innovation in products, processes and auxiliary activities, in particular with a view to creating high value niches differentiated from the traditional commodity markets.

This implies a gradual transformation of the whole economy. The idea is to engage in a concentrated effort to master the processing industries, from large-scale aluminum, paper, refining, beer, petrochemicals or food, through medium-scale specialties (chemical, biotechnological, nanotechnological) to small-scale customized materials and special chemicals or other niche products. This effort can take root in the capabilities already acquired by each country in its specific area of resource endowment and in other processing industries –metallurgy, chemistry, food processing– and could advance along the new technological trajectories being opened on the basis of materials science and the life sciences. The goals would be to migrate gradually towards higher and higher value-added products with greater and greater specialized and customized features and to establish strong networks of innovation (with the participation of local, continental and international firms and universities) to sustain the effort in time. Figure 2 represents the idea in diagram form.

Figure 2



Some of the innovation networks could engage the active participation of the GCs that do the bulk of the extraction or the agriculture, be they foreign or national. Or they could be constructed by the association of local companies in formal or informal clusters (such as wine makers, flower growers, cocoa producers, organic farmers, tourist inns and guides, textile designers and so on).

The idea would be for each country to strengthen the knowledge and know-how already achieved in its current export products and to move technologically up, down and sideways¹⁷ within the related value networks. Depending on the resource endowment of each country, the efforts would be directed towards a specific set of goals such as:

- To give special qualities to the current export materials in order to target niche markets, for example anti-termite (or highly elastic) wood, fully customized or bio-degradable materials, special alloys or composites
- To develop further capabilities for tailored and niche products in the major processing industries (metallurgy, petrochemicals, paper, glass, etc.)
- To increase the technological capabilities of the drinks and food-processing industries (both in products and in process technologies)
- To increase the technological capabilities of those engaged in export agriculture, animal products, fisheries, forestry, etc. and further develop the industries that produce inputs for them
- To rescue the innumerable original vegetables and fruits –with their wonderful flavor and texture– and to develop the necessary technologies for exporting them intact to high-priced “gourmet” niche markets
- To define areas destined for “organic” production and to establish a system for awarding guaranteed certificates of origin
- To develop health-related biotechnologies for identified human or animal local needs and/or for export-related improvements
- To develop capabilities in environmental protection through alternative energies, recycling, pollution capture, etc.
- To exploit the multiple types of modern tourism, taking full advantage of the variety of natural and historical conditions and using imaginative business models
- To become able to custom-design the additives, catalysts and other specialized chemicals that may be required by the resource-based process industries (local or for export)
- To develop a specialized capital goods industry associated with the process industries of various scales, and capable of responding to very exacting requirements
- To develop a complementary ICT instruments industry and software sector with similar characteristics
- To promote a dense network of knowledge-intensive service enterprises (KISEs) to serve each of the areas of specialization
- To intensify the corresponding directions in R&D and education.

The specific resource endowment and the levels of knowledge and expertise already acquired in each country would indicate the preferred areas of specialization to be pursued and the appropriate links and alliances to form within the continent and beyond. The new knowledge and expertise required to follow the suggested paths will necessarily involve global networks

¹⁷ In their argument for a resource-based strategy in South Africa, Walker and Jourdan (2003) insist on the importance of side stream innovations that originate in mining and, thanks to their generic nature, can later be used in other industries.

and alliances both with the academic and research communities and with the GCs at the forefront of these new industries. They are also likely to require foreign investment, and joint-ventures between GCs and locals and among companies in the region.

The mixed technological legacies of Latin American countries must be taken into account when judging the potential to pursue a particular strategy. A brief and very stylized assessment, trying to encompass the whole variety of countries, would point out the following: While the industries established under the import substitution model restricted innovation (often by contractual obligation), the export activities, often in the hands of multinationals, were basically up to date technologically, employed local personnel in the managerial and technical activities and often engaged in adaptive innovation.¹⁸ As mentioned above, the accessory industries (glass, paper, cardboard, plastics, packaging, printing, cement, paint, ceramics) and the basic agro-industries (beer, milk, juice, coffee, pasta) are all mainly process industries and they all needed adaptation and improvements, even if they were based on foreign technologies and equipment.¹⁹ Most of the public service industries, usually set up by governments, such as telephone, electricity, water and sewage, were manned by local personnel that had to have full operational and maintenance capacity as well as the ability to make minor improvements. Once privatized, the foreign companies came with new technologies and had to upgrade the existing personnel on the basis of their previous experience. Depending on how far each country went in import substitution, the move upstream to steel, petrochemicals and capital goods was realized with a resulting accumulation of know how and engineering capabilities that also led to some innovation capacity. Later, with the opening of the economies and the arrival of the information revolution, most countries developed indigenous companies to design hardware and software products and to provide systems integration, maintenance, and other services.

Altogether, this provides a previous bias towards the processing industries and enough ICT capabilities to serve as a minimum platform of technological expertise for this strategy. Yet, the whole proposal hinges on a gigantic effort in education, training and technological capability enhancement across the range involved.

Unfortunately, with the exception of tourism and some agricultural sectors, most of the process industries are not labor-intensive, but rather skill and capital-intensive. Furthermore, the reorientation proposed would make them even more knowledge-intensive. Hence, the strategy demands a complementary effort for the growth of certain high employment industries (construction, health, personal services). But that would not be enough.

The issues of income distribution and poverty have been highlighted by the social polarization that China and India, the successful emerging countries, have been experiencing. Indeed Latin America comes from a tradition of polarized income distribution and of marginalization in the countryside and in the shanty towns surrounding the main cities, which worsened during the “lost decade” and have given rise to social discontent, resentment and an ardent desire for change. Any strategy for growth that does not recognize this appalling reality will be socially unacceptable and politically unstable. The goal must be the same one that was promoted by Fernando Fajnzylber in CEPAL in 1990: *Changing Production Patterns with Social Equity*.²⁰ Indeed he had already pointed out that while Asian and South European growth in the 1970s had reduced inequalities, the majority of the Latin American

¹⁸ Given the local specificity of raw materials production (or extraction) important innovations were sometimes made *in situ*. Lake Maracaibo in Venezuela was the site of pioneering innovations in underwater drilling.

¹⁹ See, for instance, Vera-Cruz (2006) and Dutrenit (2006) for beer and glass bottle-making in Mexico.

²⁰ CEPAL (1990)

countries had grown with very unequal income distribution patterns.²¹ It is interesting to note that, during their catching-up process, the four Asian Tigers all established universal intensive education programs with a strong technical bias, and progressively developed a more even income distribution, which continues to prevail as they move up the growth and development ranks.²²

It is by recognizing social polarization across the continent and by observing the risks inherent in the recent fast growth models that we consider that a realistic development strategy cannot wait for any “trickle down” effect but should rather aim at lifting the bottom of the pyramid in tandem with the growth in the front ranks of the economy. In the course of the analysis that follows we will argue that it is precisely the characteristics of the current paradigm that make this goal feasible.

This demands setting up a dual strategy –or an integrated dual model. On the one hand, achieve technological mastery (deep specialization) in the resource-based industries, aiming at reaching strong positions in the global market spaces and, on the other, develop the wealth-creating capacity of each bit of the territory, aiming at the improvement of the quality of life of its inhabitants, leveraging local advantages to target local, national or global niche markets. In the first area competitiveness is the goal, in the second it becomes a means. The first would be top-down growth; the second bottom-up. The sectors in the first would be the Engines of Growth; those in the second would be the anti-poverty activities.

In the last section it will be argued that the two prongs of the dual model need to be socially accepted and ideologically integrated, but clearly distinguished institutionally. Let us now discuss how the three hyper-segmentations that characterize the globalization process open opportunities for each side of this dual strategy.

HYPER-SEGMENTATION OF MARKETS

Opportunities at both ends of the dual model

The ICT revolution has led to a refined fragmentation of all markets, not only in manufacturing but also in raw materials and services, in such a way that the notion of *commodity* now applies to many fabricated products, from mobile phones and desktop computers to T-shirts and refrigerators, while the idea of *specialty* is now frequently associated with raw materials such as coffee or steel.

In each case, the commodity segment is simply the very high-volume, no-frills, lowest-cost version of each product, once it has reached a certain degree of maturity. The profit margin in these industrial commodities is very thin, and comparative production advantages are absolutely indispensable for success. On the other hand, many raw materials markets have upper layers with special qualities that command a premium in the market and can turn into semi-monopolies with relatively stable high prices.²³ Similar comments can of course be made about those services and industrial products that are customized, branded or organized in creative business models. Figure 3 presents the map of the market segmentation, indicating the two main directions of differentiation, the relative proportion of profit margins in each and how they are obtained and protected. Figure 4 gives some illustrative examples and indicates the direction of improved repositioning.

²¹ Fajnzylber (1990), Figure 1 p.12

²² South Korea, Singapore and Hong Kong are among the top 28 countries (score above 0.9) in the Human Development Index UNDP (2007).

²³ Kaplinsky (2005)

Figure 3. Hyper-segmentation of markets in the ICT paradigm

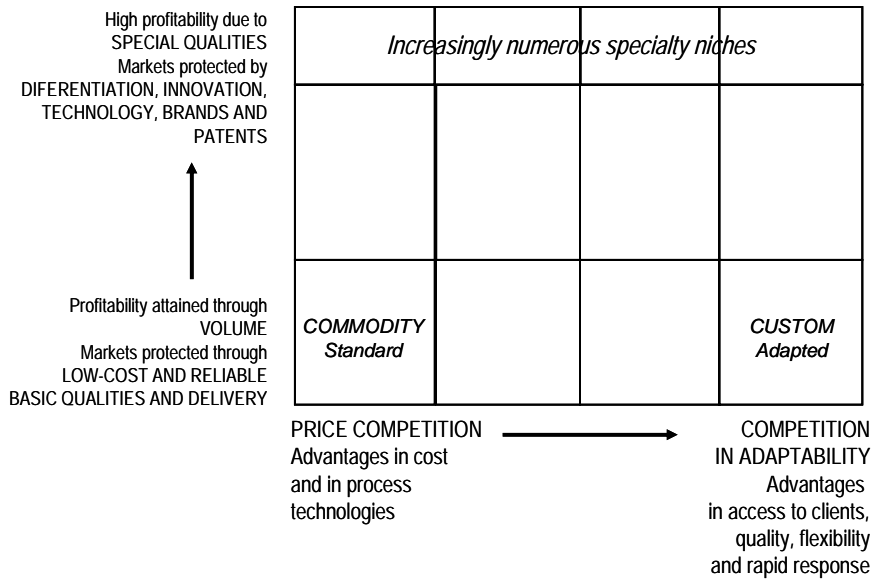
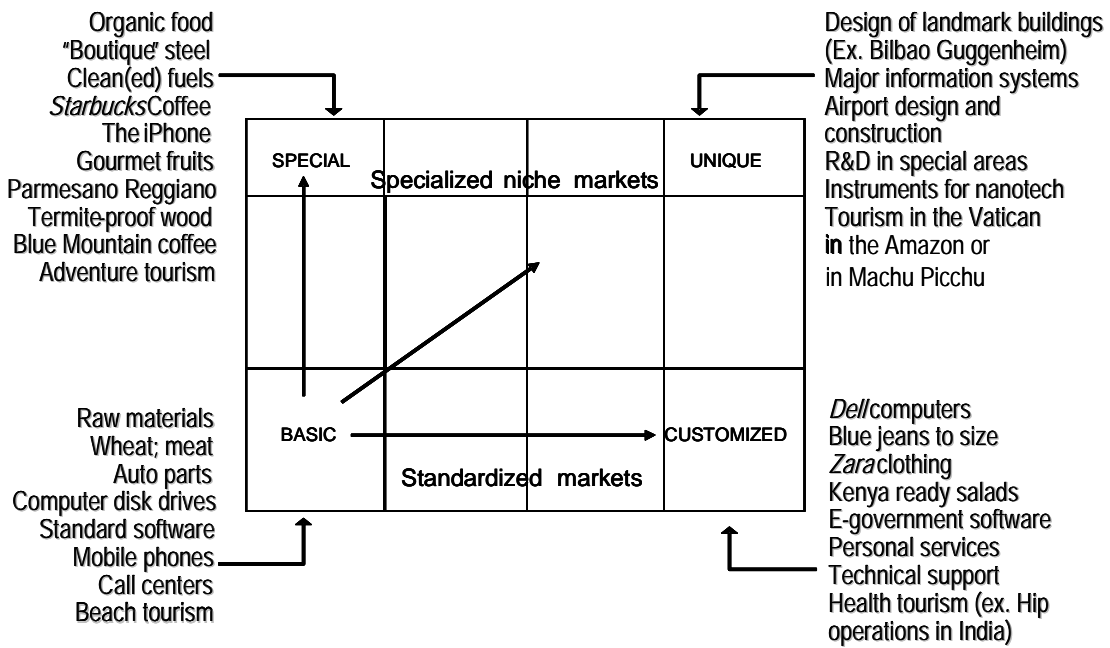


Figure 4. Some examples of market segmentation



One of the consequences of this complex structure of all markets is the switch from considering "industrialization" as the top of the range in development, to perhaps having to coin a term such as "technologization" to refer to the more advantageous positions in the world market maps (i.e. moving from basic products or services towards the special, unique or custom corners of the map in figure 3). This, together with the growth of raw materials prices, driven by the advance of globalization, can contribute to eliminate or significantly diminish the traditional disadvantage of raw materials. This feature is at the heart of the

current proposal, especially for the “engines of growth” sectors of the top-down part of the strategy.

Another consequence of this kaleidoscopic structure is that there is plenty of space for SMEs to coexist with giant corporations and for traditional products to aspire to global markets next to high tech ones. This means that adequate market targeting is as much a prerequisite and a rich possibility for the bottom-up sectors as for the top-down ones.

Furthermore, hyper-segmentation leads to industry groupings that differ substantially from those that were the norm in mass production, based on type of product and production process. The integration of industries is now often at the points of use. A producer of especially woven and treated cloth for making sails is no longer in the textile industry but rather in the sports and leisure industry. A company specializing in shoes for diabetics would be ranged in the health industry and so on. Sports and leisure, entertainment, environmental protection, health or creative industries are becoming more relevant classifications. Typically these new industries offer more lucrative and protected opportunities for specialized producers as well as better targeted distribution channels.

A particularly useful aspect of this variety in markets is that it opens opportunities for much smaller scales of production. Within the mass production paradigm, in order to even consider exports, production had to be several containers or several tons per month. Neither the transportation nor the distribution systems were geared to handling small quantities of anything. Today, there are innumerable specialist stores that stock global “niche” products; the supermarkets and the department stores make it their business to offer an extremely wide range of “choice”; the global courier services have developed very efficient systems of transport and delivery of any quantity at any frequency at relatively decreasing prices. Innovation in this direction is happening and is meeting a growing demand.

In this new world of proliferating niche markets, the range is extremely wide from the most traditional to the most high-tech and knowledge-intensive. There are niches for artisan ceramics and for biotech diagnostic kits. Long distance services can go from simple call centers to interpretation of geological survey readings. Similarly, local outsourced services can range from food catering to data security. Specialized exports can go from an outstanding local marmalade or cheese to fault detecting services in sophisticated process equipment. Tourism offers can range from a traditional Andean Village organized into a “local experience” for travelers or a bird watching trip in the tropical forest to a high-tech conference centre in the middle of a beautiful landscape or an expedition to Antarctica. Environmental protection activities can go from certified “organic” produce to the use of especially developed bacteria to “digest” oil spills. The range is as wide as the variety of local conditions; the limits are set by the entrepreneurial imagination.

The notion of “glocalization” is particularly useful here. It refers both to the adaptation of global products to local conditions and to the identification of local products with global potential.

HYPER-SEGMENTATION OF THE VALUE NETWORK ***Strategies and policies for mutual advantage***

There are many types of value networks, from those coordinated by a global producing corporation or *producer-driven* (such as IBM, Toyota, Telefonica or Zara), through the supply networks of purely commercial GCs or *buyer-driven* (such as Walmart or TESCO), to

the local industrial districts that weave the network locally and sell globally.²⁴ What they all have in common is that they combine the autonomy of each of the elements with coordinating power over the whole network. In the case of the GCs, headquarters defines the goals and the degrees of autonomy of the elements; in the case of clusters formed by association of independent producers, it is the elements that define the strategy and the powers of the common core. The latter can sometimes become part of a GC network.

It is important to note that in these structures the ultimate level of competitiveness belongs to the network rather than to any of its components. Consequently, relationships within the network will be marked by the contribution that each component makes to the whole. The link between this contribution and the relative distribution of benefits across the network is, of course, strongly mediated by relative power and by the relative information that each participant has about the network and the markets.²⁵

Isolated firms do not fare well in the ICT paradigm. Arm's length relationships with suppliers, clients and competitors, as in the mass production paradigm, no longer yield the best results and can endanger the survival of the company. This fact is at the root of the success of the clustering strategies all over the world and of the various programs undertaken by governments and international agencies to promote diverse forms of association for cost sharing or joint world marketing or training, as well as the formation of stable clusters or consortia, both to help established industries survive and to generate new sources of activity in impoverished areas. It is also behind the attempts of many companies in Latin America to become suppliers of commercial or production GCs, with diverse results.

From the discussion on the segmentation of markets, it is clear that the closer a product or service is to the commodity corner of the map, the stronger the price pressure will be, as well as the demand for stable, basic, standard qualities with little deviation from specifications and delivery times. The more special the product or service, or the more knowledge value it incorporates, the higher the bargaining power of the supplier. While some countries may enjoy some unique capabilities or traditions that can represent a valuable specialty, or be the site of some highly knowledgeable specialists or innovators that can command a premium for their work, the majority are likely to have to begin the learning process at the bottom and aim at repositioning from there by innovating upward or sideways into more niche products or services. Appropriate support for enabling such improvement could –or should– be designed and made available, especially for the bottom-up part of the strategy.

But perhaps the discussion about conditions for joining production networks is the most relevant to the engines of growth –top-down– part of the strategy, which in the end is the one that will fund the other half. The management literature has abundantly studied the behavior of global corporations, analyzing how they are changing their structures and spreading across the world, how they take decisions and how they compete; the development literature has been examining how the companies and regions that do the outsourced work fare in the process.²⁶ This essay can only touch on some of the aspects most relevant to the proposal being discussed.

²⁴ For producer- and buyer-driven networks, see Gereffi (1994) and Gereffi and Kaplinsky eds. (2001). For local networks see Schmitz ed. (2004).

²⁵ Schmitz ed. (2004)

²⁶ In management see for example Berger (2006) and Garten ed. (2000); in the development side see Gereffi and Kaplinsky (2001), Giuliani et al. (2005), Humphrey and Schmitz 2004. For systems integration, see Prencipe et al. eds. (2003) and Hobday et al. (2006). For the notion of global production networks and how

The extended geographical network of a global corporation is composed of an enormous variety of relationships with local companies and local labor forces across the many countries involved. The corporation itself is spread across the globe. Not only are the regional managers sited abroad but some of the global managers are located in a country different from headquarters, to take advantage of specific local conditions. Many of the production units are geographically situated to best advantage and, increasingly, certain staff units are also being spread in various countries, including sections of R&D departments. This and the greater autonomy and incentive to innovate given to local subsidiaries open spaces for mutual benefit negotiations with the host governments, for raising the quality of jobs and of the activities performed locally.²⁷ There are indeed two different types of global workers in the GC network: *off-shore* and *outsource* personnel. The latter work for a local company that belongs to the network through some sort of alliance or contract; the former are “inside” the GC and on its payroll.

In the case of the “inside” personnel, they will receive a salary that can be the same or lower than in the country of origin but generally higher than the usual in the host country. They can also benefit from levels of security that will elicit loyalty and allegiance. Even the so-called “processing zones”, such as in the North of Mexico, no longer follow the minimum training routine work model. They need to involve the workers in learning for quality control, continuous improvement and flexibility.²⁸ Moreover, the growth of this type of job through further foreign investment in the same region, may end up setting the rhythm of salary increases and of expected education and training levels.

On the other hand, the more GC units there are in a particular country or locality, the more the demand for services and the greater the outsourcing opportunities in that same locality, depending of course on the type of units and the local conditions.

The resource-based industries have to go off-shore for obvious reasons; in fact they have been there for decades. They typically keep control of the core activities and employ as much local personnel at each level as possible. They tend to outsource any high tech work to global service corporations that can also employ local personnel. For this reason, in most Latin American countries with energy or mineral resources, there is a pool of high-level professionals in engineering and management who have experience in that industry and who could take over some activities as outsource contractors. Resistance to using local companies has traditionally been high, though one could attribute this partly to the legacy of the Import Substitution model and its lax attitude to productivity and technological mastery.²⁹ Policies to enable componentization of the value network in agreement with the locally present GCs could, under the new conditions, function as a positive sum strategy. The increase in demand generated by globalization is already calling forth further and further investment in raw materials³⁰ and generating growing demand for the service companies. This will put pressure on existing experienced personnel to spread to the new sites and open opportunities for competent local companies.

Outsourcing relationships, be they in raw materials GCs or in the downstream fabricating or process industries, are not necessarily the old arm’s length, price squeezing ones of the past.

not only production but also innovation is being outsourced, see Ernst (2000) and Ernst and Linsu Kim (2002).

²⁷ See Marin (2007)

²⁸ See Dutrénit and Vera-Cruz (2007) on the Mexican maquilas

²⁹ Perez (1996)

³⁰ Gurlit at al. (2007)

The relationship with suppliers in the value network varies, of course, going from high pressure on price to high quality interaction, as the product or service moves from requiring low skills to higher levels of knowledge intensity and innovativeness. In the latter end of the range, there can be strong technical interaction, information sharing, very well paid contracts and even co-funding of innovations. The idea in the strategy would be to facilitate the process of moving up to those positions in the value networks, while recognizing that reaching those levels may require gradual upgrading and that the lower ranks in the ladder may create more employment and provide opportunity for capability accumulation. The ultimate goal would be to widen and enrich the skill profile as well as the export mix.

The current behavior of the GCs towards the local society and the environment is not as careless as it may have been in many cases in the past. The trend towards social responsibility, both in the treatment of personnel and of the surrounding communities, as well as regarding the environment, is growing and is likely to spread further. It has perhaps been stronger in those industries where creativity is the determinant factor for competitiveness and personnel satisfaction is the indispensable condition for bringing it forth; it has also become important in those consumer industries that are exposed to the transparency of Internet and need to maintain a good image. However, even in cases such as mining, where geographical distance acts as a shield against visibility of behavior and where the clients are major companies rather than consumers, corporate responsibility has not only increased but it has also enhanced productivity and hence may tend to spread as normal practice.³¹ This said, it is still the responsibility of national and local government organizations to assure the preservation and furthering of the natural and human environment. The information about the standards of responsible business practice being set by the leading companies in these fields can modify expectations and inform realistic and mutually beneficial negotiations.

HYPER-SEGMENTATION OF TECHNOLOGIES:

Increasing high-tech specialization coexisting with traditional methods

It may seem odd to claim that there is a segmentation of technologies when team work and interdisciplinarity are increasingly the way in which research results and commercial innovation are achieved. As with other aspects of the ICT paradigm, dichotomies are no longer useful for understanding the new best practice. In technology there is a combined movement of componentization and reintegration. Once each component of the whole becomes fully differentiated and specialized they all interact and come together into a much more dynamic network. And the process has a fractal nature, because each of the specialized segments in turn is componentized into all the contributing parts.

In its restructuring process, the GC determines its *core competences*,³² which are those that are at the heart of its position in the market and of its strategy into the future. It is in those core aspects where the GC concentrates its own technological mastery and innovation efforts. The other areas will be finely segmented and analyzed in terms of the technological capabilities required and will be outsourced under contract or bought when needed from carefully chosen competent suppliers, whose core competence is in that component. These will therefore be willing and able to reach for mastery in that aspect and to innovate in it. Through outsourcing and constructing this complex value network the GC is also erecting an innovative structure across the whole range of activities involved.

³¹ Warhurst (2005)

³² Prahalad and Hamel (1990) introduced the concept

In this structure, there are plenty of opportunities for small local knowledge-intensive service enterprises (KISEs) both for face-to-face supply and for digital services at a distance. In fact, the nature of the globalization process generates markets for KISEs in each locality, as it spreads. In turn, the existence of a competent and reliable fabric of such knowledge-intensive services increases the competitiveness of all users already on location and serves as an attractor for further foreign investment, which will continue to strengthen the KISE network.

There is also ample space for competent suppliers of standard or semi-standard goods and services with enough mastery of the process technologies involved to be able to continuously improve quality and productivity.

None of these opportunities appears automatically. Persistence, time and directed efforts are necessary in order to build the capabilities needed to play those roles (possibly starting by working in less demanding markets) as well as to develop the capability to negotiate a favorable position.

Large national exporting companies aiming to become competitive GCs would, in turn, need to follow a learning path geared to developing the capability to componentize and outsource, while building mastery in the core technologies and in their constant improvement and innovation.

Though little mention has been made here of the electronics, software, telecommunications and Internet service industries, they in fact constitute the basic platform for the competitiveness of networked organizations and for the effective participation in the global economy. The success of any strategy in the current period, under the logic of the ICT paradigm, requires efficient low cost telecommunications and the availability of highly competent software, systems and maintenance KISEs. Most Latin American countries have already advanced quite a bit along this path. Policies to intensify the process should be able to easily gain the agreement of all participants.

A particular feature of ICT is the intangible nature of many of its products and services. This enables the outsourcing of most back-office data services (including call centers) to any part of the planet where a competent and responsible entrepreneur sets up the service. The same can be said of translation services and of the interpretation of complex digitalized data in any field (geology, medicine, biology, finance, climatology, etc.) as long as the appropriate specialists are available.

The other aspect of intangible products is that ambitious innovations in intangible services can be initiated in any country and become global if successful, as in the case of Skype, for instance, where little Estonia has played an important role. Knowledge or language specificities can also generate niches in local or global markets. In Brazil there are dozens of Portuguese language equivalents of the most successful Web 2.0 English sites, which benefit from Portuguese language advertising and can reach the colonies of the old Portuguese empire. The Spanish-speaking world has also developed on the web, but it still has a long way to go along that direction (and its constituency includes the Hispanics in the USA).

Another useful feature of the ICT paradigm is that the hyper-segmentation of markets results in the coexistence of a much greater variety of technologies and scales than was ever possible in mass production times. This opens innumerable opportunities in the bottom-up side of the dual strategy. Organic coffee grown in the shade, gathered by hand and toasted by traditional methods and with a guarantee of origin is sold in gourmet shops at premium prices, while machine harvested coffee will be the commodity low-cost variety in the supermarkets (where the gourmet types will also be sold). There is no exclusion or marginalization of one

technology by the other, nor is there price equalization at the lowest level, but rather a differentiation process by qualities and a price range that recognizes the differences.

On the other hand, information technology enables customization reaching even to the level of the individual user. This sort of *high-tech-artisan production* or of *mass customization*, when it is done in high volume, is one of the many old dichotomies that this paradigm overcomes by fusion.³³

The range of opportunities for going in new directions and trying out products in relatively small quantities is immense. That is the route being taken by innovation in new energy sources and systems; that was the manner in which the low-cost airlines entered the industry and is the form taken by the attempts to create products for the so-called “bottom of the pyramid”³⁴. A particularly striking innovation that breaks with the trajectory followed in the last decades by the automobile industry is the ultra-simple \$2500 dollar car developed by Tata Motors in India. At the same time, extremely expensive, ultra-advanced electric cars built by new start-up companies are being brought to market in California, competing with the majors.

The time has come for the long-sought “adequate” or “appropriate” technologies, but the concept had to wait for a technological paradigm capable of handling the coexistence of different levels of productivity and technological sophistication without having to homogenize the prices or the markets. This is, of course, greatly facilitated by the ease with which information technology tools handle commercial inventory control and other administrative processes, regardless of numbers, variety or changes in time.

THE SEEDS OF THE FUTURE

Using the current market opportunities to prepare conditions for a leap in future technologies

Choosing a resource-based path for the *technologization* of production in Latin America has an additional advantage pregnant with future possibilities.

The ICT revolution is now entering the *deployment period*, when its power to increase productivity and facilitate innovation spreads to all other industries.³⁵ It is also the time when the next revolution is in gestation. It would appear now that the future revolutionary industries are likely to be some combination of biotechnology, nanotechnology, bio-electronics, new materials and new energies, socially shaped by the growing environmental awareness and concerns.

All those technologies can be roughly ranged in the category of process industries. During the current gestation period they are likely to develop in connection with some of the leading existing industries. New materials will find more and more uses in the fabrication industries, nanotechnology in surfaces, electronics, cosmetics, health products and others. They can also influence raw materials production itself, such as special bacteria for leaching in mining or for removing pollution and spills, special chemical additives to give particular qualities to

³³ We have been witnessing the proliferation of rather ugly but meaningful fusion terms such as *coopetition* or the above-mentioned *glocalization*.

³⁴ Prahalad (2004)

³⁵ Perez (2002) pp. 44-46 and 127-137 and Perez (2006)

wood or to serve as catalysts for oil refining and petrochemicals, processes for natural pest control in organic agriculture and so on.³⁶

If historical rhythms are a guide, the transition to that new revolution might occur in about two or three decades. Whatever the time-frame, Latin America can start now a process of enhancement of its capabilities in order to be better prepared to enter the next revolution with a head start, using its current raw materials exports as a platform, and as a source of funding.

As mentioned before, it is important to note that Japan and the four Asian Tigers acquired their initial experience by assembling transistors and electronic equipment from the 1950s and especially 1960s and early 1970s. At the time, these were being used in the typical products of the mass production revolution: radios, TVs, record players, etc. for which the portable versions constituted a market-expanding innovation. This placed those countries in an advantageous position in terms of experience and capabilities when the microprocessor inaugurated the ICT revolution. Something similar can take place in Latin America the next time around, not now by chance but by a conscious drive in this direction.

A TEMPORARY WINDOW OF OPPORTUNITY and why theories about resource-based development are also temporary

The proposal being presented here asserts that natural resources can, in the current conditions –and possibly for a few years– become the basis for launching a self funded development leap and become the object of *technologization* in order to improve the quality of the export mix and to open opportunities for parts of the marginalized populations. Yet traditional doubts about the possibilities of resource-based development may lead to questioning its feasibility.

It is interesting to note that the *resource curse* idea is very recent and has been preceded by other theories with other arguments which may sometimes seem contradictory. What is being held here is that opportunities change as different technological revolutions with different conditions emerge and propagate.

Classical economists (and popular opinion) considered the possession of natural resources an advantage for development. The idea was confirmed –and partly inspired– by the fact that such countries as Australia, New Zealand, Canada and Argentina made huge leaps forward on the basis of their mining, agricultural, meat and wool exports in the last quarter of the 19th Century. They funded their ports and railways and other infrastructures with them. Resources also played a positive role in the economic history of the Scandinavian countries as well as in that of Great Britain and the United States.

Natural resource production began to be seen as a burden for development after the mass production revolution was fully installed and high productivity industry became insatiable in its need for cheap energy and raw materials and when synthetics began replacing one natural material after another. Both Prebisch and Singer³⁷ saw the price scissors between manufactures and materials as an obstacle to development, when they had in practice become so, just as the deployment period of mass production was beginning in the mid 1940s.

The notion of the “Dutch disease” appeared later to refer to how gas (or oil) exports determined the exchange rate to the detriment of manufactured exports. The concept appeared when energy prices soared in the 1970s and was first used in an article in *The*

³⁶ For strategic thinking on biotech in Latin America see Hernandez-Cuevas and Palenzuela (2004) and Gutman et al. (2006)

³⁷ Prebisch (1951), Singer (1949)

Economist in 1977. More recently, various “resource curse” hypotheses became fashionable. Some rode on the back of the African experience of violence, wars and corruption in the internal struggle for the control of such sources of wealth as diamonds, gold and oil; others were based on data from the rise of the Asian Tigers and the lost decade in Africa and Latin America.

I would hold that there are certain specificities in the current context that are different from those that prompted those recent theories and that open a temporary window of opportunity for resource-based growth. However, it is only a window and it may be of relatively short duration, perhaps a decade.³⁸ This judgment and those that follow are based on my personal assessment of the conditions that make the present proposal viable.

The following are some of the factors that create a favorable context for initiating the strategy now (2008-2009):

- The prices of raw materials are likely to remain high (with temporary dips) until regulation of finance and readjustments of supply and demand establish the eventual levels (almost certainly higher than historical levels)
- While significant extraordinary profits continue to flow it should be possible to achieve positive-sum negotiations within and between corporations and governments to allocate natural resource profits and taxes to investment in capacity expansion, downstream processing, *technologization* and improvement of externalities for the top-down strategy (human capital, high tech services, infrastructures, environmental protection) as well as to provide funding for the bottom-up projects
- Environmental awareness, regulation and the related changes in corporate behavior are still incipient but are beginning to intensify. In particular, the process industries and the resource extraction corporations lagged in protecting the environment and in adopting the global ICT paradigm (in terms of incorporating local capabilities into their networks). But they are ostensibly moving now.
- The specialized service companies are overstretched and will probably welcome the entry of local allies. In time they will have expanded to meet demand and those that are not “inside” the network (independently or allied) will find it much harder to enter
- The potential competitors in this sort of strategy (Africa, Russia, Kazakhstan) are only beginning on a similar route
- Those countries or regions that become early competitors in riding those trends will carry a lead and whichever region attracts the most dynamic GCs will have acquired decisive advantages

Another aspect that places resources on a dynamic path is the way in which the current direction of globalization is increasing its environmental impact. Both the limits on the availability of natural resources and the climate change threat are going to become key shaping forces in the markets and the technologies related to energy, materials, water and food. This suggests that scarcity will tend to push up the prices of natural resources, making their possession an even greater advantage. This price change together with the resulting rise in freight costs will penalize the movement of unprocessed raw materials across the world. That would favor local processing. At the same time, the rise in prices puts pressure on users

³⁸ The time available to initiate a strategy with a chance of success is different from the time that this strategy may pay off. South Korea entered the semiconductor industry and became a leader in memory chips at the right moment. Ten years later it would not have been possible, but the benefits of that early entry and success have been multiplied as that expertise has served as a platform for further advances as conditions changed.

to reduce the amount of material per unit of product. That would favor more finely specified materials, such as those that would result from the proposed strategy.

The rise in freight costs is likely to lead to a reconsideration of the geographic distribution of activities reshaping globalization and taking more factors into account in the choice of local, regional or global sourcing, depending on the characteristics of the products. This both opens and closes opportunities.

The time frame in which these environment-related trends will become the mainstream may be very short, depending on the intensity of the effects of global warming and the regulation that may accompany it. In any case, this needs to be a central feature in any resource-based strategy, from the start.

Finally, the whole of this proposal depends on a serious effort of active engagement and of simultaneous strengthening of the knowledge and experience front. Learning and the creation of human capital takes time (as do major investment projects). This implies that only an early and intense pursuit of the goals will place the Latin American countries on a dynamic growth path and in time to follow it successfully

What is clear is that if the increased income from natural resource exports ends up becoming a source of superficial growth and of increased imports for consumption, a very valuable opportunity will have been squandered.

IMPLEMENTING THE VISION

Generating consensus and establishing an adequate institutional framework

There are already many Latin American companies participating in the networks of global corporations, and some are building global networks of their own. There are also many government initiatives to promote associations among small and medium firms to increase their competitiveness. Some countries have gone much further in one or another aspect of the strategies suggested here as well as in other directions. The question is whether those scattered efforts are enough; whether they will yield the maximum potential benefits to the companies and to the population of their countries; and whether the current conditions are bringing forth all the existing potential for wealth creation and innovation. A concentrated effort in an agreed direction would create increasing externalities for all and is likely to bring more rapidly the urgently needed results.

As discussed in the section about globalization, the Deployment Period –the second half of each of the surges driven by successive technological revolutions– brings back the need for the active agency of the State. To be effective, though, such an active role must be exercised in consonance with the features of the new paradigm.

It has been held here that the whole hyper-segmented structure of globalization –in production, markets and technologies– is based on differentiation. It is precisely the multiplicity of roles, of conditions and advantages, of specializations and peculiarities of each locality, country or region that fosters the potential positive-sum strategy among all the economic, social and political agents.

Globalization is then a technical, economic and organizational process led by the global corporations, that can only yield its maximum growth and human development potential if guided by an equally complex (and equally efficient) institutional framework at the global, regional, national, sub-regional and local level.

First and foremost, the power structure of such a framework needs to involve a process of consensus building for autonomous convergent actions. The ‘State or Market’ dichotomy is now obsolete and counterproductive. Neither central planning nor a “level playing field” will do. The field has to be tilted to favor the great majorities and to stimulate strongly the growth and success of the potentially competitive sectors of the economy, by further reinforcing their advantages. A consensus vision resulting from a richly informed and intense debate would bring the maximum cohesion, the most effective guidance, the enabling instruments and the most profitable overall results for the local (and global) participants.

Among the possible stakeholders to bring to the table are governments (from national to local), global corporations (GCs), large local companies, knowledge intensive service enterprises (KISEs), small and medium enterprises (SMEs), universities and research institutes, relevant NGOs, consultancy firms, banks and international funding agencies, the diasporas (especially business and intellectual), the media and... society at large. The aim is to achieve the promise of every positive sum game: everyone contributes to increasing the size of the pie and everyone gets more of it.

The funding source would mainly be the increasing prices of raw materials, which might take a dip if there is a serious recession, but that are likely to follow the growth in demand from globalization. The extra profits create ideal conditions for setting up an ambitious strategy such as the one proposed here. As mentioned above, the companies themselves can invest in technology to improve their market position and to strengthen their local specialized supplier base. Governments would be able to intensify the learning processes by directing a significant portion of the additional tax and royalty income toward education, training and increasing innovation capabilities. Thus, the very sectors that would become the engines of growth would provide the seed money for implementing the vision.

The learning would need to involve three complementary layers. First there is the learning in the public sector itself, given that only a well-working competent government structure can guide a sophisticated modern economy. Then there is the education system, which has to be updated and made adequate as much in methods and behavior as in technical content. Finally, there is the learning to be done in the business sector in whatever measure is necessary in each case to increase innovative capabilities gradually. Collaboration among the three sectors –in connection with their global counterparts when appropriate– is what will weave a strong *national system of innovation*.³⁹

Together with these active agents, the learning would need to spread to society both as general public opinion, aided by the experience of work and education as well as by the media, and as proactive support, through various NGOs and other organizations.

In terms of policies and instruments, the two prongs of the strategy are very different. Thus, the institutional framework needs to be dual also. The institutions on the top-down engines-of-growth side of the strategy, whose goal is to ensure the constant upgrading of the production and export profile, would manage a set of national and regional programs enabled by effective policies and ensuring the cooperation of all the agents involved, public and private, economic and scientific, technological and commercial, national and international. These would include articulating policies and negotiating mutually beneficial agreements with the global corporations that are active in the chosen resource areas.

³⁹ This wider notion of *national systems of innovation* as encompassing all the societal agents involved in the innovation process was introduced by Freeman (1987) and Lundvall (1988)

The bottom-up quality-of-life side of the strategy, whose goal is to fight poverty through direct wealth creation across the territory, would need to be actively promoted at the community level by each local government. Both pre-investment and investment will probably need to be largely financed by outside sources, be they the national government, international agencies or private banks. To be effective, the process would also imply a major training effort, both of the promoters and of the personnel of the production companies created.⁴⁰ The training of the local government personnel (or of traveling promoters) could be organized by international agencies (CEPAL among them) taking advantage of the successful cluster experiences scattered all over the world and, in other cases, that of micro-credits.⁴¹ Bold policies might be required to succeed and that means not excluding tariff barriers or special taxes and subsidies to launch a major push from below to bring the impoverished populations into decent living conditions.

In the author's view the criteria and the methods to be used in the two sides of the dual model are different enough to require different attitudes, behaviors and competencies in the institutions involved. Yet, on both levels success will require a sufficient amount of highly skilled personnel with the adequate capacities and dedication and enough power to commit the government, along with a clear understanding of the new market dynamics and the opportunities it presents for favorable positioning and articulation. The ultimate results, though, will depend on being able to mobilize society for multiple actors to take multiple initiatives following different paths in the general agreed direction.

There are obviously major differences between the larger and more powerful countries and the smaller ones, both in terms of resource potential and of implementation capabilities in the private and public sector. In this respect, some of the regional and multilateral organizations could contribute with technical and financial support and/or the stronger countries could establish mechanisms to serve as dynamic poles and help pull the smaller ones.

Beyond the relative sizes and levels of previous development, there are many other power-related factors that will influence the feasibility of the strategy in general and could result in major differences between countries: The conditions of production and markets are very different for foreign or local companies; for minerals and energy or agriculture, livestock, forestry, fisheries; for cases of concentrated or of scattered property and control of production; for concentrated or scattered local and international trade and markets; whether much or little of the value chain or network is (or can be) in the territory; whether the proportion of knowledge intensive vs. routine activities is high or low and so on. The variety of conditions will define the need for appropriate –and different– policies in each case with the same general goal.

Yet, the crucial question that could make or break the strategy is that of the existing or potential strength of the institutions to promote consensus; to apply bold measures and or to sustain policies; to enforce regulation or taxes and to avoid failure through “capture” and/or corruption.

There is also likely to be competition from other resource-rich countries and regions, such as Russia and Africa, which may choose to follow a similar path. There is space in the expanding global economy for all, but relative success may depend on investment rhythm, adequate market targeting and strategic implementation

⁴⁰ This has been the experience of multilateral organizations such as UNDP and IADB's FOMIN, when promoting clusters at the local level

⁴¹ The “structural funds” provided by the European Union to upgrade the wealth creating capabilities of the relatively backward regions of each member country are an interesting model to study

So, if this proposal does indeed represent an effective way of taking advantage of the current global context, then it is important to act now. The successful strategies of companies as well as countries are those that get both the direction and the timing right. As indicated above, the window of opportunity for launching resource-led growth may last a decade or so. Whatever positions are gained along that path will serve as platform for the next change in global conditions.

One should have no illusions about the likely resistance that the proposed strategy may call forth from both ends of the ideological and political spectrum. There will be objections both to the role of the State and to that of the global corporations in the process; there will be doubts about the potential in relation to resource-based growth as well as about the local innovation capabilities. Thus the debates should be enriched with ample information. The more knowledge that is made available about what is happening in other parts of the world (and in Latin America itself) in terms of innovation and cooperation and in relation to raw materials niches, the more likely it is for prejudices to be overcome.

Neither should one ignore how difficult it would be, even for the most convinced, to engage in the very hard work involved in implementation. Bold and determined political leadership would be needed. Gradual experimenting, monitoring and public discussion would be part of the uphill process of achieving convincing outcomes and reaching a consensus vision. Fortunately, the logic of this paradigm facilitates the pilot project approach. If, by applying the general direction of the strategy, one country here and another country there achieve some impressive results; if one sector here and another one there become huge successes, if some parts of government or of the education system make a leap in effectiveness here or there, the imitation process can spread and the basis for incorporating others will be strengthened. In the end, the whole innovative network will result from the growing interaction of an increasing number of autonomous or semi-autonomous units engaging in convergent actions.

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It has been argued here that there is now a window of opportunity particularly suited for the Latin American endowment and historical experience. It would demand taking advantage of the hyper-segmentation of markets, activities and technologies typical of the ICT paradigm and applying them even more deeply in the resource-based processing industries. This would be facilitated by the rising price of such resources resulting partly from globalization. By using a portion of the increased revenues to technologically upgrade the export mix and to improve the wealth creating capabilities of the population, the continent can become highly specialized in custom materials and sophisticated foods and other natural products, while preparing for a good positioning in the next technological revolution. The strategy can serve both for high end competition in global markets and for lifting the poor out of poverty through creating clusters for “niche” specialization across the territory.

Much institutional imagination will be necessary to bring such a strategy to fruition. Innovation in all aspects of business is increasingly exercised and understood as the way to success. The time has come for an equivalent wave of rethinking, reorganizing and innovating in the public sector as agent and facilitator of change for the maximum public benefit. Indeed, the success of a strategy such as the one proposed here will very much depend on bringing forth determined leadership and wide-ranging institutional creativity.

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