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The Challenge of the Knowledge Economy for Latin America

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El desafío de la economía del conocimiento en América Latina
O desafio da economia do conhecimento para a América Latina

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The international competitive environment has become much more demanding and fast paced as a result of increased speed in the creation and dissemination of knowledge, a reduction of transportation and communications costs, a growing share of imports and exports in global economic activity, a doubling of the global labor force, and the increased control of global production and distribution chains by global corporations. While more rapidly growing parts of the world, Asia in particular, are producing a diversified range of manufactured products and services, Latin America is specializing in the production of raw materials and basic commodities which are notoriously cyclical and have lower long term growth prospects. To avoid being left behind Latin American countries need to further improve their macroeconomic and institutional regimes, improve the quality and level of education and training, become more effective at tapping and making effective use of global knowledge, develop their own knowledge, and improve their information and communication technologies, as well as transport infrastructure and logistics. Addressing these challenges requires greater awareness of what is at stake, vision, developing and implementing longer term strategies, and effective monitoring and coordination mechanisms

El entorno internacional competitivo es ahora mucho más exigente y acelerado por diversos motivos, a saber, la creciente rapidez en la creación y diseminación del conocimiento, la reducción de los costes de transporte y comunicaciones, la creciente participación de las importaciones y exportaciones en la actividad económica global, la duplicación de la mano de obra global y un mayor control de las cadenas de producción por parte de las empresas globales. Mientras determinadas regiones del mundo, en concreto la región asiática, producen una gama diversificada de productos manufacturados y servicios, América Latina se está especializando en la producción de materias primas y productos básicos claramente cíclicos y con menor perspectiva de crecimiento a largo plazo. Para evitar quedarse rezagados, los países de América Latina deben mejorar sus regímenes macroeconómicos e institucionales, así como la calidad y el nivel de la educación y la formación. También deben ser más eficaces en el aprovechamiento y el uso más eficaz del conocimiento global, desarrollar su propio conocimiento y mejorar sus tecnologías de información y comunicación, además de las infraestructuras y la logística. Para enfrentarse a estos desafíos, es necesario tomar conciencia de lo que está en juego, tener una mente visionaria, desarrollar e implementar estrategias más a largo plazo y lograr mecanismos eficaces de supervisión y coordinación.

O ambiente internacional competitivo tornou-se muito mais exigente e acelerado como resultado da crescente rapidez na criação e disseminação de conhecimento, uma redução nos custos de transporte e das comunicações, uma crescente participação das importações e exportações na actividade económica global, uma duplicação na força de trabalho global, e o crescente controlo das cadeias de produção e distribuição globais por parte de empresas globais. Embora certas partes do mundo em rápido crescimento, em particular a Ásia, estejam a produzir uma gama diversificada de produtos manufacturados e serviços, a América Latina tem-se especializado na produção de matérias-primas e produtos básicos reconhecidamente cíclicos e com menores perspectivas de crescimento a longo prazo. Para evitarem ficar para trás, os países da América Latina precisam de melhorar os seus regimes macroeconómicos e institucionais, a qualidade e o nível de educação e formação, tornarem-se mais eficazes no aproveitamento e uso mais efectivo do conhecimento global, desenvolver o seu próprio conhecimento, e melhorar as suas tecnologias de informação e comunicação, bem como as infra-estruturas de transporte e logística. Para enfrentar estes desafios é necessário tomar consciência do que está em causa, alargar a visão, desenvolver e aplicar estratégias a mais longo prazo, bem como mecanismos eficazes de acompanhamento e coordenação.

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1. Introduction: What is the Knowledge Economy and why is it Relevant for Latin America?

A lot is being written and said about the knowledge economy. What exactly is the knowledge economy, and is it relevant for Latin America? This paper explains what is behind the concept of the knowledge economy and argues that it is indeed very relevant for Latin America. Moreover, it argues that Latin American countries need to do a lot more in the area of the knowledge economy in order to perform better in today's increasingly competitive and demanding international environment.

There are many definitions of the knowledge economy. They range from those that focus almost exclusively on the ICT aspects, too much broader definitions including the knowledge society. One problem with the concept is that it has been notoriously difficult to operationalize or measure. In this context, and thinking about what is most relevant to developing countries, the definition developed by the UK's Department of Trade and Industry is worth highlighting as it underpins the analysis in this paper: a knowledge economy is one in which the generation and exploitation of knowledge has come to play the predominant part in the creation of wealth. It is not simply about pushing back the frontiers of knowledge; it is also about the most effective use and exploitation of all types of knowledge in all manners of economic activity. (DTI Competitiveness White Paper, 1999)

A key point in this definition is that it is not just about high technology, or just about creating new knowledge. It is about the effective use of all type of knowledge. This is particularly relevant for developing countries as most of them are not large producers of knowledge. However they can all be much more effective users of knowledge.

Knowledge has always been an important part of economic activity. There is renewed interest in knowledge and development because there has been a speed up in the creation dissemination of knowledge. In addition knowledge and innovation have become more important to international competitiveness and growth. That is affecting global trends and the competitiveness of different regions and the international division of labor as will be argued in this paper.

Most economists as well as policy makers in Latin America do not buy into the notion of the knowledge economy[1]. They argue that there is nothing new in the concept. Many point out that Latin America has made much improvement in its macro situation since being set back by the debt problems and macro instability of the lost decades of the 1980s and 1990s. Furthermore they note that in the last few years Latin American growth has picked up. That is largely due to the increased demand for commodities and Latin American countries' strong comparative advantage in natural resource and commodity exports[2].

KEY WORDS
Knowledge Economy, Latin America, Globalization

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1. The European Community fully bought into the idea of the knowledge economy. The 2000 Council of Ministers meeting in Lisbon announced the goal to make Europe "the most dynamic and competitive knowledge based economy" by 2010. Progress has been slower than expected, but Europe is still very much engaged in this agenda .Individual countries, ranging from the United Kingdom to many developing countries, even poor countries in Africa have been developing knowledge economy strategies. Countries in Asia, in particular, have also quickly adopted this concept and have begun to implement ambitious knowledge economy plans.
2. The share of food, fuels and minerals in Latin American merchandise exports is twice the average for the world as a whole —see table 3.

Moreover they argue that Latin America should concentrate its efforts on continuing to improve its macro parameters and to invest in its areas of comparative advantage (food, fuel and minerals) rather than to divert its attention to the knowledge economy.

This paper agrees that Latin America needs to continue to improve its macro parameters, and to invest in its areas of natural resource strength. However it also argues that it needs to do much more[1]. The basic argument here is that what will increase income in the short run may not position the region to grow in the longer run. If Latin America continues to specialize in food, fuels, minerals and primary commodities, which have low demand elasticity, it will miss the better growth opportunities that can come from production in products and services which have higher demand elasticity and more possibilities for innovation. In order to improve its growth prospect Latin America needs to invest more in developing education, skills, innovation capabilities and information and communications technology infrastructure and applications—all elements of the knowledge economy. It also has to invest more in traditional physical infrastructure to participate more effectively in international trade.

Knowledge related factors--innovation, tertiary education, and high level skills-- have become more important for international competitiveness and growth. This is very relevant for Latin America because as a region Latin America is falling behind. Part of the reason for its poor performance is that it has not paid enough attention to the increased importance of knowledge in development. Other developing regions, East Asia in particular, have, and are doing much better as a result. As can be seen in Table 1, Latin America had the second lowest growth performance of any region in the 1980-1990 period (the lost decade due to the debt crisis), the third lowest during the 1990-2000 decade, and the lowest performance in the most recent 2000-2005 period. On the other hand, East Asia has consistently had the best growth performance of any region across all three periods.

Table 1: Average Annual Growth of GDP 1980-2005

	1980-1990	1990-2000	2000-2005
East Asia and Pacific	8.0	8.5	8.4
China	10.1	10.6	9.6
Europe and Central Asia	2.4	-0.7	5.4
Latin America and the Caribbean	1.8	3.3	2.3
Argentina	-0.7	4.3	2.2
Brazil	2.7	2.9	2.2
Mexico	1.1	3.1	1.9
Middle East and North Africa	2.0	3.8	4.1
South Asia	5.7	5.6	6.5
India	5.8	6.0	7.0
Sub Saharan Africa	1.6	2.5	4.3
All Low and Middle Income	3.3	3.9	5.3
High Income	3.1	2.7	2.2
US	3.0	3.5	2.6
World	3.2	2.9	2.8

Source: 1980-1990--WDI 2000; 1990-2000, and 200-2005--WDI 2007. The region country groupings are those used by the World Bank and top six categories consist of developing countries.

1. There is a risk that in focusing too much on current allocative efficiency and sticking to its current pattern of production and technological capabilities, it will miss out on innovative (Schumpeterian) efficiency, and growth efficiency. For an elaboration on these distinctions see Dosi, Pavitt, and Soete (1990).

As a result of Latin America's poor growth performance in the 1980s, its share of global GDP declined from 7.2% in 1980 to 5.1% in 1990. Because of somewhat better growth performance than the world average in the 1990s, it gained some global share in that decade. But it has not been able to keep up with the average global growth since 2000, so overall it has only increased its global share to 5.5%. Developing East Asia, on the other hand, more than doubled its share in global GDP between 1990 and 2005. The growth of China, in particular, has been quite spectacular and has accounted for the bulk of that region's increased share[1]. China's GDP has gone from being less than one third that of all of Latin America in 1990, to almost as large by 2005. Given China's continued high rates of growth, by 2007 it was larger than all of Latin America.

2. Elements of the New International Economic Context and Increasing Globalization

Knowledge has always been an important part of economic activity. The focus on the knowledge economy reflects its increasing importance. This is the result of two factors. The first is the increasing speed in the creation and dissemination of knowledge. The second is its greater share of knowledge related activities in production and trade. In addition, due to the reduction of tariff and non-tariff barriers as part of a strong liberalization trend, the world is much more integrated through trade.

2.1 Increasing speed in creation and dissemination of knowledge

Advances in science, combined with the information revolution (itself a product of these advances), are driving an acceleration in the creation and dissemination of knowledge. It is now possible to codify and digitize much of our understanding of science. This permits modeling and simulation, which in turn further speeds up the understanding of science and the creation of new goods and services. The time between basic scientific discovery and commercial application is decreasing. This is particularly evident in biotechnology. The product life cycle of most manufactured products is also shrinking. This is perhaps most evident in the electronic products industry, ranging from computers and mobile phones to consumer electronics[2].

Worldwide there has been an overall increase in spending on research and development. OECD countries together spent almost $700 billion dollars (in purchasing power parity values) on R&D[3]. Adding the developing countries, the total is close to $900 billion (PPP values) a year. China by itself is now spending about $130 billion, India $40 billion, and Brazil$15 billion--to name just few of the main developing countries.

1. In 2005 the share of China's GDP in that of the East Asia and the Pacific Region's total was 74%, about the same share of the GDP of Argentina, Brazil, and Mexico in the total GDP of the LAC region at 71%.
2. But even in more traditional industries such as cars, there in an increase in the number of variety of products. It is now common for consumers to specify the options on the particular brand and model of car they wants to purchase, and have the car made to order.
3. OECD countries in much of the data discussions because there is more systematic and reliable data on them while data for the whole world is very incomplete. The OECD countries account for almost three quarters of world GDP.

In addition, there has been an increase in patenting all around the world both in developed and developing countries.

More generally, there has been an increase in investments in knowledge. A simple proxy for this is investments in R&D, tertiary education, and software. Investments in these three intangibles is as much or more than investments in physical plant and equipment in some advanced countries like the US, Sweden and Finland, and almost as much for OECD countries as a whole[1].

The implication of the speed-up in the creation and dissemination of knowledge is that developing countries need to find effective ways of tapping into the very rapidly growing stock of global knowledge. Those that are more advanced also have to invest more in their own R&D in order to compete with new frontier technological advances.

2.2. Increased importance of technology and knowledge in production and trade

As may have been expected, the technology intensity of manufacturing production has been increasing as R&D has become a more important input into most manufacturing activities. However, R&D and knowledge, in terms of advanced education and skills, are also very important in the service sector. Moreover, services account for 69% of world GDP[2]. Knowledge intensive market service activities are a much higher share of GDP in OECD countries (25%), than the share of medium and high technology manufacturing in GDP (7%)[3]. Agricultural and mining activities also have increasing technology content as many advances in production, processing and distribution involve the use of increasing advance research and development. Thus it should be stressed that the knowledge economy is not just about the manufacturing sector, but about the whole range of economic activities.

The structure of merchandise trade is also moving away from primary commodities to trade in manufactures. As can be seen in Table 2, the share of primary products in merchandise trade has fallen from 23.2% in 1985 to 14.7% in 2004. This is partly because the demand for manufactured products is more income-elastic than for primary commodities. Developing countries that do not have the capability to move into production of manufactured products therefore lose out on the possibility of benefiting from the most dynamic part of merchandise trade. In addition, the technological intensity of trade in manufactured goods is increasing. The share of resource based manufactured products in merchandise trade has fallen from 19.4% to 15.6%. On the other hand, the share of high technology manufactures has doubled from 11.6% to 22.4%.

1. OECD. STI Score Board 2005.
2. The share of services in economic activity increases as economies become more developed. In 2005 the share of services for low income countries (per capita GDP of $875 or less) was 50%, for lower middle income countries (per capita GDP $876 - $3,465) it was 47% (largely because of the lower share in China [40%] which accounts for about half the total GDP of lower middle income countries), for upper middle income countries ($3,466-$10,725) it was 62%, and for high income countries (per capita GDP of $10,726 or more) it was 72%.
3. Knowledge intensive market services exclude government services (which do have many knowledge intensive activities) and include posts and communications, finance and insurance, and business services. The technology intensity of manufacturing is ranked according to the importance of R&D as a share of output, taking into account the R&D embodied in inputs, as determined through input output matrices. For more details see OECD data definitions in OECD STI Scoreboard 2005.

Table 2: Changing Structure of World Exports 1985 VS 2004 (US billion)

Products	1985	2004	Annual Growth Rate	1985 %	2004 %
All Products	1,689	7,350	7.6	100.0	100.0
Primary products	391	1,018	4.9	23.2	14.7
Manufactured products	1,244	6,063	8.2	76.8	85.3
Resource based	327	1,148	6.5	19.4	15.6
Low technology	239	1,962	7.9	14.2	15.0
Medium technology	480	2,169	7.8	28.5	29.5
High technology	196	1,643	11.2	11.6	22.4

Source CEPAL-TRADECAN 2005

In addition, in part thanks to advances in information and communications technology, there has been a significant increase in trade in services. Between 1990 and 2005 trade in services increased from 7.6 % to 10.8% of world GDP.

2.3 Increasing Liberalization of Trade

Since the GATT there has been a trend towards increasing liberalization in trade policy among most countries. In developing countries, average tariff levels have fallen from 34.4 per cent in 1980-83 to 12.6 per cent in 2000-2001; in developed countries they have fallen from 8.2 per cent in 1989-92 to 4.0 per cent in 2000[1]. In addition, non-tariff barriers have fallen. There is also a movement towards greater openness in trade in services, including not only financial and business services, but also education[2]. We are moving closer to free trade in manufactured products, but the same does not apply to agriculture. While movement of capital is increasingly free, this is not generally the case for labor, where international mobility has been concentrated among the highly skilled, for which some advanced countries have created special temporary immigration visas, particularly for information technology specialists.

Many services areas that were once considered non-tradable have now become tradable to the extent that they can be digitized and provided remotely, across national boundaries, through the internet. Thus we are moving to a system of freer trade which is bringing increasing competitive pressure to domestic markets the world over.

At the same time, there has been a strengthening in the rules and regulations of the international trading system. Some protectionist trade and industrial policies used effectively by some of the current developed countries as well as some of the Asian high performers to

1. Average weighted tariffs (using each country's imports from the world as weights) in developing countries have fallen from 19.7 per cent 1980-83 to 11.0 per cent in 2000-2001; and in developed countries from 5.8 per cent in 1989-1992 to 3.1 per cent in 2000 (UNCTAD, 2004).
2. See OECD (2004)

promote their industries and services are now not allowed under WTO rules[1]. Moreover, stronger enforceable sanctions against piracy of intellectual property through the TRIPS mechanism of the WTO now exist. As a result, it is now much harder for developing countries to use some of the policies that helped some countries acquire more advanced technology as part of their development strategy.

The challenge for developing countries is therefore to determine how best to be open to international competition while at the same time nurturing the development of their own production capabilities. If they liberalize too early, they run the risk of having their domestic industries wiped out by well established and stronger foreign competitors.

2.4 Increasing Globalization

The reduction in communication and transportation costs combined with trade liberalization has led to a dramatic expansion of trade. Imports and exports as a share of global GDP have increased from 40 per cent in 1990 to 57 per cent in 2005. In addition, the reduction of communications cost and the spread of the mass media have virtually created a "real time world", where events that happen in one place are instantly known worldwide.

The implication of this increased globalization for countries is that they are more exposed to everything that is happening worldwide. It also means that everything happens faster, so in addition to facing more competition, they have to develop greater capability than before to respond rapidly and adequately to new threats and opportunities

3. Major Global Restructuring

Because of the speed up in the generation and dissemination of knowledge, reduction in tariff and non-tariff barriers, and greater integration of the through trade, the global system is in a constant state of restructuring. Three major forces are speeding up this process of constant restructuring. The first is the unbundling of production and services. The second is the doubling of the global labor force, and the third is the increasing role of the multinational corporation.

3.1 The Two Unbundlings

The reduction in transportation and communication costs combined with the digitalization of information has led to the physical disintegration of production. Because of lower transactions costs, different components of a final product are now manufactured in several different countries[2].

1. See Chang (2002) for a good development of this argument.
2. For a good exposition on modular production as applied to electronics see Sturgeon (2002).

The production and supply chains are tracked and controlled in real time thanks to the advances in information technology and global communications. The product may then be assembled in yet another country and then distributed worldwide. The same applies to some services. This means that, to get products or services to the market, it is now more important than in the past to tap into global production and supply chains. Even R&D is being commoditized to some extent as it is being outsourced to specialized centers in different countries, including India and China[1].

This is what is could be called the two great "unbundlings"[2]. It is useful to distinguish them because they have different trajectories and implications. The first unbundling is the end of the necessity to produce goods close to consumers. This has been going on for centuries but has been accelerated by the rapid decline in transportation costs in the last four decades, particularly since the widespread use of containers and bulk carriers. The impact of this has been that much manufacturing production, especially of the more standard and labor-intensive goods, is being transferred to developing countries with lower labor costs, initially mostly for low skilled labor.

The second unbundling is that between services and production. This has been made possible by the rapidly falling costs of telecommunications and the possibility of codifying and digitizing tasks. The impact of this has been that many service tasks supporting manufacturing as well as other services have been outsourced. Increasingly they are also been off-shored to countries with lower labor costs[3]. For simplicity this could be called increased competition in skills and brains from some developing countries such as India, and Russia.

3.2 The Doubling of the Global Labor Force

Moreover, as the formerly inward oriented economies of China, India, and the former Soviet Union have increased their participation in the international trading system, the net effect is that the global labor force has effectively doubled (Freeman, 2006). This has strong implications for developed as well as developing countries. Developed countries are now facing competition from much lower cost workers, which is putting pressure on labor-intensive industries. The doubling of the global labor force has increased the marginal productivity of capital. As a result, that share of value added that is going to capital has increased, while that which is going to labor has decreased. The principal beneficiaries of this globalization and rebalancing of relative wages are the multinational corporations which are the most effective agents at intermediating and taking advantage of differences in global factor prices.

The implication of these developments is that there are increased opportunities for those countries that can position themselves to take advantage of the two unbundlings.

1. For US MNCs, R&D undertaken by foreign affiliates increased from 11 per cent in 1994 to 13 per cent in 2002. For Swedish MNCs it increased from 22 per cent in 1995 to 43 per cent in 2003. For the world as whole, R&D expenditure by foreign affiliates is estimated to have risen from US$30 billion in 1993 to US$67 billion in 2002 – i.e., from roughly 10 per cent to 16 per cent of all global business R&D, US$403 billion (UNCTAD, 2005).
2. The use of unbundling for these trends is attributed to Robert Baldwin (2006).
3. For a current analysis of this based on interviews with over 500 companies around the world see Berger (2006).

The major developing country beneficiary of the first unbundling has been China, which is becoming the manufacturing workshop of the world. The major beneficiary of the second unbundling has been India, thanks to its critical mass of higher educated English speaking technicians, engineers, and scientists. Other economies such as the Philippines Vietnam former Soviet republics with critical mass of highly skilled manpower, and some Caribbean English speaking island economies are also benefiting from digital trade made possible by this second unbundling. Most other developing countries without critical mass in the skills base, English language or the advanced telecommunications and other physical infrastructure (including most of Latin America) have not benefited as much and are having trouble competing on both fronts.

Developed countries are also being impacted by increased globalization and the two unbundlings. The first is more in keeping with the expectations of traditional trade and product cycle theory, which postulated that labor-intensive manufacturing would move to labor abundant countries. Under this theory it was expected that developed countries would stay ahead by moving into more skill- and technology-intensive sectors. However, the second unbundling is a newer phenomenon not foreseen by traditional trade theory. It was not anticipated that services could be traded virtually thanks to advances in information technology[1].

3.3 The Rise of the Global Company and Global Supply Chains

One of the key drivers of globalization and global restructuring with significant implications for developing country strategies is the increased role of MNCs. They are the key producers and disseminators of applied knowledge. They are estimated to account for at least half of total global R&D, and more than two-thirds of business R&D[2]. MNCs disseminate knowledge directly through their operations in foreign countries and through licensing agreements. In addition, they often are the first to introduce new products, processes, or business and management methods in many foreign countries, providing examples and ideas for imitation by domestic companies. They also train workers, managers and researchers who may disseminate some of the knowledge and experience acquired while working for the multinational when they leave to work for another company or set up their own.

On the trade side, it is estimated that affiliates of foreign firms account for one-third of total world exports[3]. If the value added of production in their home countries is added, to the value added produced by affiliates, it is estimated that MNCs represent about 27 per cent of global GDP[4]. However, the influence of MNCs is greater than this. They affect a much larger share of GDP if one takes into account backward and forward linkages, as well as their role in demonstrating new technologies and putting pressure on domestic firms to upgrade production processes.

1. For a discussion of the possible impact of these trends on the US, particularly the impact of off shoring services, on the US see Blinder (2006) and Grossman (2006).
2. In 2003, the top six MNCs (Ford, Pfizer, Daimler Chrysler, Siemens, Toyota, and General Motors) spent more than US$5 billion each (nominal $). Only five developing countries came near to US$5 billion or more per year (Korea, China, Taiwan [Province of China], Brazil, and Russia) – see UNCTAD (2005).
3. In 2006, the exports of affiliates of MNCs were approximately US$4,707 billion out of total world merchandise and non-factor service exports of US$14,120 billion (UNCTAD, 2007)
4. UNCTAD (2005, various years).

In addition, MNCs are now operating much more as independent global agents[1]. Rather than responding to the needs of any country, even their original home country, their objective is to operate globally in the best way to increase returns to their investors, whoever they are and wherever they may be. This will increasingly put them at odds with the interests of their home countries (as they shift even high value, high skill jobs and functions, including research, out of their home base) as well as host countries (as one location is pit against another and resources are redeployed to wherever it is more profitable).

One of the implications of the increased role of MNCs in the generation of knowledge and in production and distribution of goods is that developing countries now need to pay more attention to how to attract and make the most effective use of foreign investment. Even Korea and Japan, which were the countries that made least use of FDI, have had to open up in the 1990s in order to get access to some cutting-edge technology that foreign firms are not willing to license. However, FDI to developing countries is very heavily concentrated in just a few of them. The top ten developing countries account for 65 per cent of the total FDI going to developing countries[2]. FDI goes to where it finds the most attractive profit opportunities, either to get access to natural resources, to supply local markets, or to use those locations as export platforms for other markets. Most evidence shows that offering special tax and other incentives is usually not sufficient to offset major economic disadvantages perceived by foreign investors. Therefore, countries that cannot offer intrinsic advantages to attract FDI are going to have to find alternative ways of getting access to relevant foreign knowledge. These can include buying some of the technologies through arms-length transactions, technical assistance, copying and reverse engineering, and own technological development, but these pose their own sets of challenges.

Another implication of this for developing countries is that they have to become integrated into global supply chains normally controlled by multinational producers or distributors (like Wall-Mart or other large retailers). Entry into production controlled supply chains is usually at the simpler levels such as making simple manufactured goods, producing simple components, or assembling subcomponents. Both getting into and moving to higher value added activities in vertical supply chains can be difficult. For the first, the supplier must demonstrate capability to produce to high standards of quality and timeliness in delivery; for the second, strengthened technological capabilities are required[3].

Entering supply chains controlled by distributors such as Wal-Mart is also difficult. Usually production runs have to be large. Suppliers must also be able to maintain quality and timeliness. All three of these requirements make it difficult for smaller countries with smaller firms to enter these supply chains[4]. Their producers generally do not have the scale to produce the volumes required (Wal-Mart is sourcing over 25 billion dollars worth of goods from China, cuts out middlemen, and goes directly to the producers). In addition, a buyer like Wal-Mart exerts continued pressure on the suppliers to reduce costs and improve quality and speed of delivery.

1. For an excellent perspective on this from the CEO of IBM, see Palmisano (2006).
2. The economies, in decreasing order of FDI inflows in 2005 are: China, Hong Kong (China), United Arab Emirates, Brazil, Russia, Bermuda, Colombia, Mexico, and Taiwan—see UNCTAD (2006).
3. For a good exposition on supply chains and the difficulty of moving up see Kaplinksy (2005).
4. For example, according to a recent interview with the handicraft store chain Ten Thousand Villages, the main reason why there are so few handicraft products from Africa is that producers in African countries have trouble producing to the scale, quality, and timely delivery required.

It should be noted that there are only a few companies from developing countries which have managed to create and sell globally under their own brand names[1]. This indicates how difficult and expensive it is to develop own brand and distribution systems.

4. New Elements of Competitiveness

Competitiveness used to be based on static comparative advantage. Today, competitiveness does not just depend on the cost of factors of production, or on a specific technological advantage. Rather, it depends on, a supportive enabling environment, high level skills and learning, continuous innovation, and efficient communications and transport infrastructure. These are the fundamental requirements of a knowledge economy. Each of these aspects is discussed below in greater detail.

4.1. The Economic and Institutional Regime

In the context of rapid technical change and continuous global restructuring it is important for countries to be able to react quickly to changing opportunities. They have to have strong elasticity of response. That means that they must have flexible capital and labor markets. They also have to have capable governments that can help to restructure the economy and deal with the adjustment difficulties. That includes the basic institutions such as government, rule of law, efficiency of capital and labor markets, ease of setting up or shutting down business. It also includes the ability of the government to create consensus and the ability to help people who fall through the cracks in the system.

4.2. Education, Skills, and Life Long Learning

Technological advance is very complementary with higher skills and more education[2]. As a result, education and skills are becoming more important in international competitiveness. MNCs make their location decisions partly based on the education and skills of the local workforces. This means that countries need to make more investments on increasing education and skills. Globally, there has been an increase in average educational attainment. There has been a strong increase in the number of persons with higher education. Because of the knowledge revolution, there is a need for people to learn a diverse range of new skills. This has given rise to what Peter Drucker termed the "knowledge worker" (Drucker, 1994). The knowledge worker is not just the PhD with very narrow and advanced education. S/he is the technician and the graduate of the junior college. In the United States, 35 per cent of students in tertiary education are older than the typical college age cohort of 18-24.

1. Some of the most famous are companies such as Samsung, LG, and Hyundai from Korea; Acer from Taiwan; China Mobile, China Netcom, Founder, Lenovo, SAIC, Tsingtao Beer, and ZTE Corp from China; Bajaj, Bharat, Cipla, Dr. Reddy' Labs, Infosys, Ranbaxy, Reliance, Satyam, Tata, and Wipro from India; Gerdau, Embraer, Natura, Perdigão, Sadia, and Votorantim from Brazil; and CEMEX, FEMSA, and Modelo from Mexico.
2. See for example De Ferranti et al. (2002)

Many are workers who are coming back to get their college degrees, or workers who already have college degrees but are coming back to obtain specialized training certificates or more advanced degrees. Thus there is a need to think in terms of systems of life-long learning.

This implies that developing countries need not only to expand primary education, but that they also need to expand the access and quality of secondary and tertiary education. This may be difficult given tight budgetary constraints, so many developing countries will have to rely more on tuitions and private provision of higher education. China, for example has increased enrollments at the tertiary level from 4% of the relevant cohort in 1995 to 21% in 2006. It now has more students at the tertiary level than the US[1]. To finance such a massive increase it charges tuitions that cover 30 to 40% of the cost of providing tertiary education. In addition, it has over 4 million students in private higher education institutions.

Increasing higher education may bring the risk of losing people to the brain drain if graduates cannot find good jobs locally. Thus developing country governments have to think through their higher education strategies more carefully. In addition, governments need to think of education and training as integrated systems for life-long learning and to start designing systems that will have multiple providers and multiple pathways to different levels of certification and qualification. They also have to make more effective use of distance education technologies, particularly the potential of internet based education and training services which can be delivered anywhere, anytime at any pace[2].

4.3. Innovation

In this context of rapid development and dissemination of new knowledge, innovation is becoming a more critical element of competitiveness. Firms have to be constantly innovating to avoid falling behind. This does not necessarily mean that they have to be moving the technological frontier forward. Only the most advanced firms do that. However, all firms need to be at least fast imitators and adopt, use and improve new technology in order not to fall behind. This puts a great deal of pressure on firms' technological capabilities. Moreover, innovation is not just a matter of new products or new processes and ways to produce them, but also better organization and management techniques, and better business models which facilitate doing business[3]. An example of what is essentially a very simple innovation is containerized cargo, which has greatly facilitated shipping manufactured products and dramatically cut down freight costs. An example of business innovation is the development of consumer product companies such as Dell, which subcontract production according to their design and specifications to third parties, eliminate distributors, and sell directly to the final consumer. Another example of a business innovation is Wal Mart's monitoring of consumer demand from points of sale through electronic cash registers, linking that information to central ordering directly to producers all around the world, thereby eliminating intermediaries in production and distribution.

1. In addition, 40% of the students are in engineering and math and science.
2. For the broad architecture of the kind of systems that need to be set up in developing countries, as applied to China, see Dahlman, Zeng and Wang (2007).
3. Palmisano (2006, p.132), the CEO of IBM, for example, writes, "Real innovation is about more than the simple creation and launching of new products. It is also about how services, are delivered, how business processes are integrated, how companies and institutions are managed, how knowledge is transferred, how public policies are formulated - and how enterprises, communities, and societies participate in and benefit from it all".

Innovation in the context of a developing country should be thought of as products or services or forms of organization that are new to local practice, not necessarily to global practice. Therefore it is useful to distinguish three sources of innovation. One is acquiring technology that already exists abroad. A second is the creation of relevant new knowledge. The third is the dissemination and effective use of this new knowledge throughout the economy.

The implication of this for companies is that they have to make greater efforts to keep up with new technologies and new forms of business organization and production and distribution networks. This requires more investment in their technological capability to search for, acquire and adapt technology to their needs and in managing production and distribution systems. For those that are closer to the frontier, it means that they need to put more effort into real cutting edge innovations in technology and business. Similarly developing countries need to put more effort into acquiring technology that already exists on disseminating it throughout their economies. As they get closer to the frontier they need to put more effort into creation knowledge that is new to the world. The East Asian economies have done very well at acquiring and disseminating knowledge. They are now beginning to put more effort into generating their own knowledge[1].

4.4. Information and Communications Technologies

Information technology is becoming a fundamental enabling infrastructure of the new competitive regime. "Supply chain management requires speed across global space to accomplish what a factory accomplished internally with the assembly line. Information and communications technologies (ICT) are the tools that allow flexible accumulation to function"[2]. ICT is a critical part of what enables the organization and coordination of global production networks and the integration of global supply chains. It is also an essential element for monitoring what the consumers are buying and what they want, and passing that information seamlessly along to producing units which often are not even owned by brand name manufacturers. This real-time information on the changing needs of the market, indeed even direct interaction with the consumer (as in the examples of made to order computers or automobiles), as well as internal electronic exchange and management between different departments and division within firms and among firms, their suppliers and distributors, are becoming essential new ingredients of the global economy.

There are several implications for developing countries. At the national level, there need to be modern and low cost communication systems as well as good training in the skills necessary to use these networks. For the development of e-business, there need to be appropriate legal and regulatory systems including e-signature as well as secure digital communications and safe payment systems. At the level of the firm, investments in training and hardware as well as in restructuring business processes are also necessary in order to take advantage of the reduction in transactions costs and time that can be obtained through these technologies[3].

1. See Dahlman(2000a)_for an elaboration of this and a comparison of the different innovation strategies of China and India.
2. Ciscel and Smith (2005, p.431).
3. Studies from many countries show that efficiency gains are much larger when investments in hardware are accompanied not only by training but also by changes in organizational processes and procedures to take advantage of the potential offered by the new technologies (see OECD, 2005).

4.5. Logistics, Transportation, and Distribution

In this new context of increased globalization, rapid technical change, and shorter product life cycles, modular production and outsourcing, and the need to get components and products to the customer quickly, logistics (transportation, distribution channels, and warehousing), which connects manufacturing and retailing, is becoming another critical factor for competitiveness[1]. Therefore, transportation infrastructure – roads, railroads, airports, seaports and transportation companies, with coordination enabled by IT – is critical for countries to participate effectively in the global market[2].

The implication of this for many developing countries is that, even if they can produce competitively, it may still be very difficult for them to get into global value chains because of high transport costs. Typically, developing countries have very poor transportation infrastructure. In addition, they frequently do not have the volume to warrant bulk transport systems nor the frequency of service required to make the transportation costs competitive. This works against small countries far from the main markets. Most countries in Africa have very poor shipping or air links with the rest of the world, and few of these have direct links with key markets. This means that there are usually many stops and several transshipments before products get to their final destination. This increases both transportation costs as well as the inventory costs for goods in transit.

Part of the cost advantage of China is not just low wages and that it has over 200 million underemployed workers in agriculture that can be brought into industrial production, but that it has developed large scale and low cost transportation infrastructure. Combined with frequent shipping and air service to major world markets, it can place its goods virtually anywhere, for a fraction of the costs of most other developing countries.

5. Benchmarking Latin American Countries in the Global Knowledge Economy and International Competitiveness

There are various methodologies for benchmarking countries. The World Bank developed one explicitly for the benchmarking countries in the knowledge economy. This will be covered first. That benchmarking will be complemented by two indicators of global competitiveness. As a proxy for competitiveness, the third section will track the changing share of different regions of the world in trade, and the final one will project the relative size of different countries based on historical performance.

1. For an exposition on how the traditional factory production system has been replaced by logistics and the implications that has for workers see Ciscel and Smith (2005).
2. For a good exposition of this and of how some regions in the US are organizing public private partnerships to create this enabling infrastructure see Kasarda and Rondinelli (1998).

5.1. Relative Global Position of Latin American Countries in the Knowledge Economy

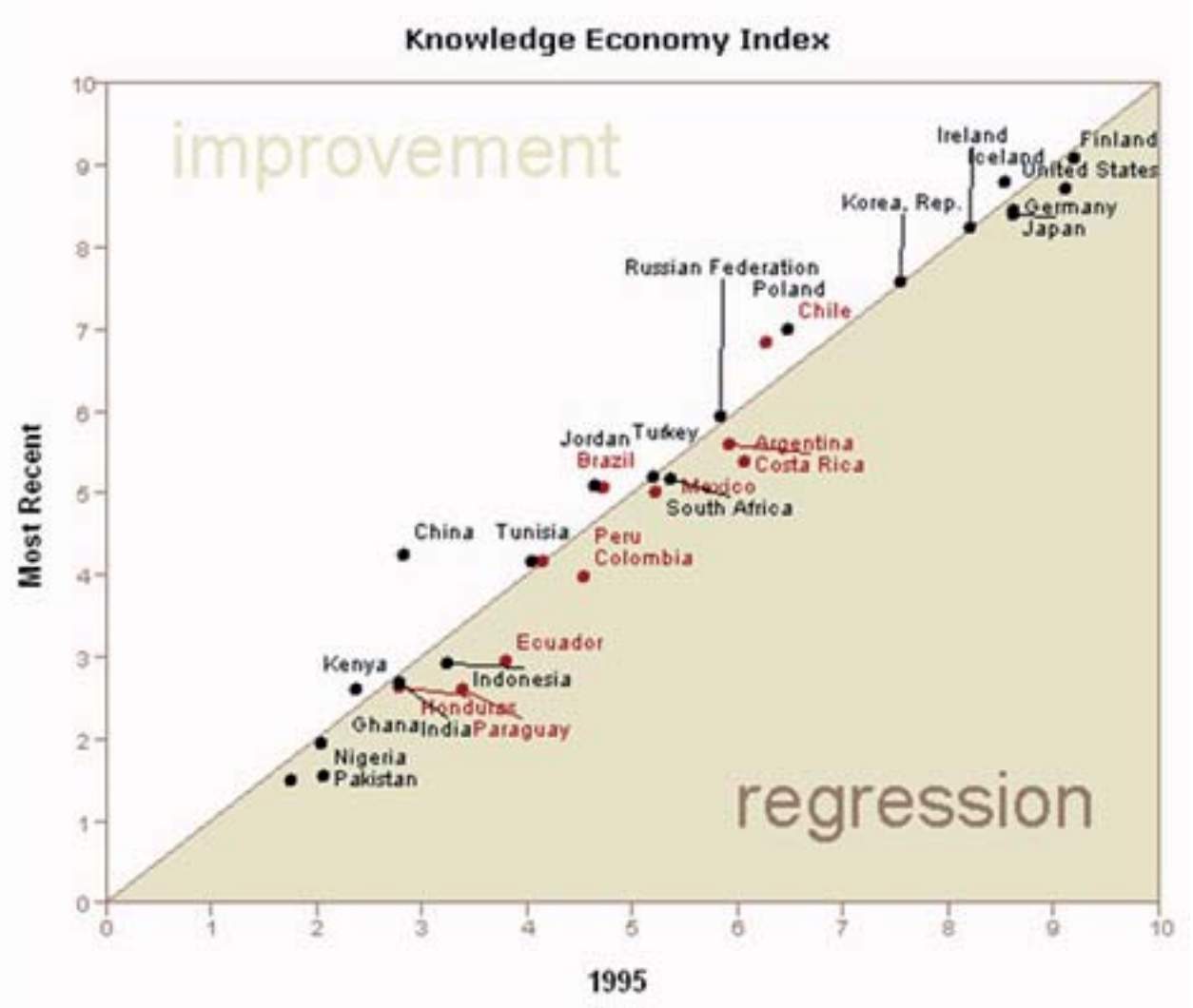
The KAM is based on four pillar of the knowledge economy. These correspond to the factors outlined in the framework above, except that it does not have the infrastructure and logistic factor. For each of the factors there is a set of about 20 indicators[1]. Globally the top five performing countries are the Nordic countries (Denmark, Sweden, Finland Iceland, Norway) followed by the US, Australian, Netherlands, Canada and the United Kingdom. The Latin American countries rank in the middle to low range. The best performing are Barbados (37th) and Chile (39th) followed by at a distance by Costa Rica (48th), with the worst performing being Haiti (116th out of 132 countries ranked). Thus there is a wide dispersion in the performance of Latin America. As a whole, the Latin American Region's performance has deteriorated slightly in the most recent period compared to its ranking in 1995[2]. Figure 1 show the relative position of ten of the most important Latin American countries in the most recent period relative to 1995 and relative to the rest of the world. Latin American countries that have made significant improvements include: Barbados, Chile, and Brazil; those that have regressed the most are Venezuela, Paraguay and Argentina.

Annex Table 1 presents the breakdown of the overall knowledge economy index and its four sub-components for Latin America and for the five main Latin American countries, as well as for some comparators[3]. Latin America as a region has fallen behind in the overall knowledge economy index as a whole in three of the four subcomponents. It made a very slight improvement in the innovation index. Overall it has fallen most with respect to the economic incentive and institutional regime. Among the main countries, Brazil and Chile are exceptions in that they have improved their position. Chile has improved across all four sub-indicators; Brazil has improved in the functional ones but fell back considerably on the economic incentive and institutional regime (Annex Table 1).

(See Figure 1, next page)

1. These are structural and qualitative variables that are drawn from the World Bank's own data sets such as the World Development Indicators, the Cost of Doing Business as well as external data sets such as the World Economic Forum, IMD, Freedom House, etc. Because the data cover a wide range of values in different units, all the 81 variables are normalized on a scale of 0 (weakest) to 10 (strongest) and the 131 countries are ranked on an ordinal scale.
2. The 22 Latin American countries included in the ranking are: Argentina, Barbados, Bolivia, Brazil., Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.
3. These are Finland, East Asia, and three of the key East Asian economies.

Figure 1: Knowledge Economy Index for 10 Latin American Countries: Changes Between 1995 and most Recent Period Relative to the World



Note: Countries appearing above the 45 degree line have improved their position in the most recent period (2005-2006) relative to their position in 1995. Countries below the line have lost ground. A country can improve in absolute terms but still fall behind in relative terms if other countries improve faster.
Source: www.worldbank.org/Kam (accessed 6/26/2007)

On the other hand, countries in East Asia and the Pacific improved their relative performance, although this was not uniform across the sub-indices. Among the large EAP countries, China is the exception in that it improved across all the sub-indices. Finland lost a bit overall, as the rest of the world began to narrow the lead it had in ICT, but nonetheless remains one of the top global performers.

5.2. Benchmarking in terms of International Competitiveness

The World Economic Forum produces a Global Competitiveness Index. In its latest report released October 31, 2007 it tracks performance on more than 110 indicators grouped into twelve pillars:, The pillars include: institutions, infrastructure, macroeconomic stability, health and primary education, higher education and training, goods market efficiency, labor market efficiency, financial market sophistication, technological readiness, market size, business sophistication and innovation. According to this new index, the most competitive economy is the US followed by Switzerland, Denmark, Sweden Germany and Finland. The East Asian NIES also perform very well—Singapore (7th), Korea (11th), Hong Kong (12th), and Taiwan (14th). China is ranked 34th and India 48th.

Table 3: Competitiveness Rankings by WEF and IMD

WEF 2007/8 (Out of 2007 sample of 131 countries)	WEF 2007/8 (Using 2006 sample of 125. Number in parenthesis is change in position in 2007 relative to 2006) 2007 vs.	2006	IMD 2007 (out of 55)
Chile (26)	26 (+1)	27	Chile (26)
Barbados (50)	47 (-7)	41	Colombia (38)
Mexico (52)	49 (+3)	52	Mexico (47)
Panama (59)	56 (+4)	60	Brazil (49)
Costa Rica (63)	59 (+9)	68	Argentina (51)
El Salvador (67)	63 (-10)	53	Venezuela (55)
Colombia (69)	65 (-2)	63	
Brazil (72)	68(-2)	66	
Uruguay (75)	71 (+8)	79	
Jamaica (78)	74 (-7)	67	
Honduras (83)	77 (+13)	90	
Trinidad & Tobago (84)	78 (-2)	76	
Argentina (85)	79 (-9)	70	
Peru (86)	80 (-2)	78	
Guatemala (87)	81 (+10)	91	
Dominican Republic (96)	88 (+5)	93	
Venezuela (98)	90 (-5)	85	
Ecuador (103)	94 (0)	94	
Bolivia (105)	96 (+4)	100	
Nicaragua (111)	102 (-1)	101	
Paraguay (121)	112 (-4)	108	
Guyana (126)	117 (-4)	113	

Sources www.wef.org for WEF 2007/8, and /www.imd.ch for IMD 2007

The most competitive LAC economy among the 131 surveyed is Chile. It is ranked 26th, having improved one position from its ranking in 2006. However, there is big gap between Chile and the next highest ranked LAC economy. That is Barbados at 50th after losing 7 positions compared to its 2006 ranking. It is followed by Mexico at 52nd, followed by Panama at 59th, Costa Rica at 63rd, El Salvador at 67th, and Colombia at 69th. Brazil comes in at 72nd and Argentina at 85th, both having lost positions relative to 2006.

The International Institute for Management Development (IMD) produces a World Competitiveness Index. This index is based on 321 criteria organized under four main areas: economic performance, government efficiency, business efficiency, and infrastructure—the last three of which include many innovation, education, and ICT and physical infrastructure variables. Its latest report was released March 2007. It only covers 55 countries, including six LAC countries. The most competitive country is also the US, followed by Singapore and Hong Kong. China is ranked 15th and India 27.th

Among the LAC countries, the best performance is again by Chile at 26th, in the middle of this smaller sample. The second highest ranked LAC country is again much further down, Colombia (38th) followed at a distance by Mexico (47th), Brazil (49th), Argentina (51rst) and Venezuela (55th), at the bottom. The relative rank order of the six Latin American countries in the IMD ranking is the same as in the WEF which indicates a certain degree of convergence in the evaluations by the two different indices.

Overall, the relative poor rankings of the Latin American economies in the knowledge economy indicators as well as the two competitiveness rankings do not present a very positive scenario for the future growth and competitiveness of countries in the region. This is substantiated by closer look at the past trade performance of the region.

5.3. Trade Structure and Technology in Latin America vs. Other Regions

As can be seen in Table 5, Latin America has increased its share in global merchandize exports almost by 30% between 1990 and 2005. However this is much smaller than the overall increase of 64% all low and middle income countries over the same period, or the 153% increase in the share of East Asian countries. Most impressive is the 300% increase in the share of China, which rises from a little more than one third of the total of Latin America, to more than one third higher.

Table 4: Shares of Global Merchandise Exports by Regions and Countries
1990 vs. 2005

	1990	2005
East Asia and Pacific	**4.5**	**11.4**
China	1.8	7.3
Europe and Central Asia	**..**	**7.3**
Latin America and the Caribbean	**4.2**	**5.4**
Argentina	0.4	0.4
Brazil	0.9	1.1
Mexico	1.2	2.0
Middle East and North Africa	**2.3**	**2.2**
South Asia	**0.8**	**1.2**
India	0.5	0.6
Sub Saharan Africa	**2.0**	**1.8**
All Low and Middle Income	**17.9**	**29.3**
High Income	**82.0**	**70.7**
US	11.3	8.7

Source: WDI 2007

On the export side Latin America continues to be relatively specialized in natural resource based industries (Table 5). Between 1980 and 2005 Latin America increased the share of manufactured in merchandise exports, but at slower rate than developing countries as a whole. China and India, on the other hand have moved mostly into exports of manufactures. These account for 70% of India's merchandise exports and 92% of China's.

Table 5: Changing Structure of Merchandise Exports 1980 VS 2005

	Food		Agricultural Raw Materials		Fuels		Ores and Metals		Manufactures	
	1980	2005	1980	2005	1980	2005	1980	2005	1980	2005
LAC	32	15	4	2	31	22	12	7	20	54
Argentina	65	47	6	1	3	16	2	3	23	31
Brazil	46	26	4	4	2	6	9	10	37	54
Chile	15	19	10	7	1	2	64	56	9	14
Colombia		18		5		40		1		36
Mexico	12	5	2	1	67	15	6	2	12	77
East Asia	na	6	na	2	na	8	na	3		81
China	na	3	na	1	na	2	na	2	na	92
South Asia	28	11	10	2	3	9	5	6	54	72
India	28	9	5	2	0	11	7	7	59	70
All Low and Middle Income Countries	24	9	8	2	35	17	8	5	22	64
High Income Countries	11	6	4	2	7	8	4	3	73	78
US	18	7	5	2	4	3	5	3	66	86
World	13	7	4	2	11	10	5	3	65	75

Source: WDI 2000 and 2007

Moreover, the main Latin American countries remain heavily reliant on natural resource and resource based manufacturing exports. Table 6, which uses the same classification as Table 2, shows that Chile (91%), Argentina (76%), Brazil (54%) are still relatively specialized in exports of natural resources and natural resource based manufactures (55% of the total, and very weak on high technology manufactures which average of 29% for the world . Mexico is the exception. It drastically reduced the share of oil in its exports and increased that of manufactures. However this was based largely on its special maquila industry exports which was basically a labor intensive assembly and re-export operation using imported inputs and very little backward integration.

Table 6: Exports by Technology Intensity 2004 (% distribution)

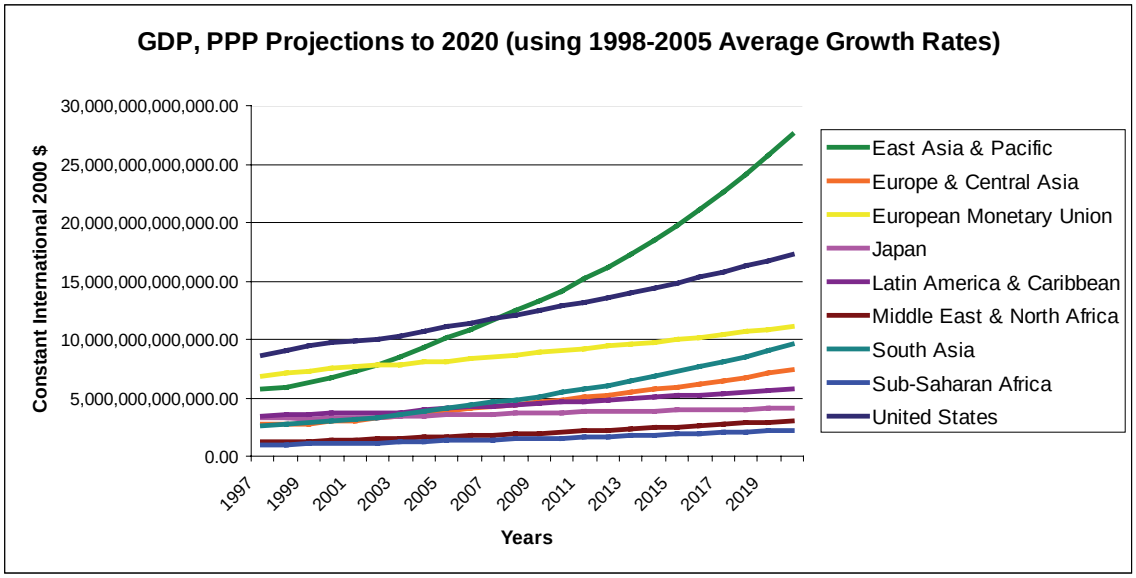
	Argentina	Brazil	Chile	Mexico	China	India	World
Natural Resources	51.4	32.6	41.5	14.6	3.2	15.6	14.7
Resource based manufactures	24.5	21.9	49.2	6.4	6.9	29.8	15.6
Low technology manufactures	7.4	11.0	2.1	13.5	39.2	35.5	15.0
Medium technology manufactures	14.1	24.9	5.5	37.5	19.0	12.8	29.5
High technology manufactures	1.7	7.9	0.5	24.2	30.5	5.4	22.4
Other	0.9	1.7	1.2	3.8	1.1	0.9	..
Total	100	100	100	100	100	100	100

Source: CEPAL-TRADECAN

5.4. Projections of Future Shares of GDP

It is useful to project the future size of different regions of the world based on their past growth rates. This is done in Figure 2 using the average growth rates between 1998-2003 for the projections.

Figure 2: The Rise of East Asia



Source: Author's projections based on WDI 2006

As can be seen, based on this assumption, East Asia is already larger in PPP terms than the European Monetary Union countries and is set to catch up with the US by the end of 2008. This is in large part due to their greater integration into the global system and their more proactive knowledge strategies involving investing heavily in education at all levels, investing in information technology, and not only drawing heavily on existing global knowledge, but also beginning to invest in creating knowledge[1]. Latin America, on the other hand, is left very far behind.

These are just projections based historical growth rates. The past is not a perfect predictor, and we are not in a linear world. It is quite possible that China and India will not be able to maintain their very high growth rates. However these projections are meant to drive home the point that unless Latin America is more pro-active to improve its growth prospects it will be left behind. That is why it is important to focus on what can be done to improve its growth prospects.

6. Summary and Recommendations

6.1. Summary

This quick overview of the knowledge economy has attempted to explain why the knowledge economy is relevant for Latin America. The basic argument is that the effective creation and use of knowledge is becoming more important in economic activity and therefore needs to be factored in more explicitly into development strategy. This can be seen in the increase in the speed in creation and dissemination of knowledge, and the increasing importance of medium and high technology products and knowledge intensive services in GDP and in exports.

The paper also presented a framework for thinking about the key elements of a knowledge economy. It used a methodology for benchmarking the relative position of countries for taking advantage of the knowledge economy to assess where Latin American countries stand. It complemented this by benchmarking Latin American Countries in terms of two competitiveness indicators. It found that Latin American countries are in the middle to bottom range of countries, and that the region has been losing its position relative to the rest of world and to East Asian countries in particular.

The paper also found that while the exports of the rest of the world are moving towards more knowledge intensive products and services, Latin America is specializing more in natural resources. Furthermore, it found that Latin America is falling behind compared to the rapid progress being made in other parts of the world, East Asia in particular.

What are the implications for Latin America? The first is to develop a broader long term strategy in terms of the new context of the knowledge economy. The second is to improve on the key elements of the knowledge economy.

1. For details on the strategies of China and India see Dahlman and Aubert (2001), and Dahlman and Utz (2005). For more details on India's innovation strategy see Dutz et al (2007)

6.2. Developing a Broader Long Term Strategy for the New Context

As noted, Latin America is specializing in natural resource and commodity exports[1]. This is in part the result from the recent more favorable terms of trade for such exports that has occurred because of the large demand from China.

There is nothing wrong with taking advantage of favorable prices and a comparative advantage of natural resource endowments. Latin America should continue to take advantage of this strength and favorable terms of trade. In fact Latin American countries should increase the value of these exports by applying more knowledge to enhance their values as has been done by countries such as Finland, Canada, Australia and the United States[2].

However natural resource based strategies are not enough. The problem is not just that there are cycles in the prices commodities, but that the income elasticity of demand for natural resources is low. As people or countries' income grow, demand shifts to diversified products and services

Also given the rapid pace of change, increasing globalization and competition, and greater uncertainty in the international environment, countries need the ability to respond to new threats and opportunities. This requires flexible capital and labor markets, more responsive governments, as well as the functional enablers of the knowledge economy- education, ICT, innovation capability, and ability to coordinate across different areas.

Looking at the last 25 years, Latin America missed the ICT wave. The East Asian economies caught it and have been working their way up the value chain from assembly or consumer electronics to computers and telephones. Some countries like Korea, Taiwan, and then China, also integrated backward into the production of wafer fabrication and achieved very large economies of scale and chip design. It is very hard for Latin America to catch up on ICT hardware because of the first mover advantage of countries in Asia and the very large economies of scale involved[3]. However, Latin America can and must catch up on the application and use of ICT technology throughout their economies. As noted in the KAM benchmarking, in spite of progress in terms of the absolute number of telephones, computers and internet users per thousand persons, Latin America as a region is falling behind the progress in the rest of the world. Latin America needs to increase the penetration ratio of ICT and to increase the effective application of ICT technologies in government, business and society at large because of the benefits that can accrue from the use of this generic technology.

Latin America is still overly concentrated in agriculture and industry and less developed in services. Latin America needs to move beyond the agricultural and industrial economy to the service economy. As noted, the knowledge economy is more about knowledge intensive services than high technology manufacturing. Knowledge intensive services are critical for the productivity and competitiveness of all economic activities ranging from agriculture and mining to industries and the service sector itself. (OECD 2005b)

1. In this section Latin American will be treated as a whole, although as was clear from the benchmarking exercise Latin America is very heterogeneous in the size, level of development, and readiness to take advantage of the knowledge economy.
2. See for example De Ferranti et al (2002).
3. With the exception of the Intel plant in Costa Rica which was a special case, Latin America did not develop integrated chip production, just assembly based on imported components.

Latin America needs to plan for a post natural resource, post industrial society. The service sector will be key to absorbing labor productively and to raising the overall efficiency of the economy.

Therefore Latin American needs to invest more in services—particularly knowledge intensive services. Services are generally cleaner, more environmentally friendly and less energy intensive. Latin America need to strengthen knowledge intensive services such as finance, business services, logistics, consulting, education, and R&D. These are what are propelling India's recent growth spurt. However some additional service areas with great potential in Latin America which can be leveraged with a higher knowledge content include the following:

- Tourism; especially higher value tourism combined with history and culture as well as eco-tourism.
- Health Care: this has great potential as the population of developed countries ages and people seek retirement communities with warmer climates and reliable health care and good hospitals
- Entertainment: literature, theater, movies, songs. This is an area where Latin America has already established a reputation. It must build on this start and project it globally

Latin America also needs to invest more in potential new technologies such as nano-technology, bio technology and genetic engineering which may be the basis of future long cycles (more of this in the innovation section below).

6.3 Making Improvements in the Key Areas of the Knowledge Economy

As was clear from the knowledge economy benchmarking exercise, Latin America needs to improve in all four pillars, as well as in physical infrastructure. The priority of different elements within these pillars and across them will depend very much on the specifics of each country. The following comments are generic for the overall Latin American situation and would need to be adjusted to the each country.

Improving the economic incentive and institutional regime.
With few exceptions this continues to remain a key priority for Latin American countries. The macro situation in Latin American tends to continue to be worse than in East Asia. The investment rate is low, the cost of capital tends to be higher, and governments and business tend to be much shorter term oriented because of continued macro weakness. In addition the economies tend to be less integrated into the global system. Thus there is still a ways to go on the conventional reform agenda. However, it is necessary to beyond the Washington Consensus set of policy reforms. Governments have to be more proactive, as will be developed below.

Investing in Education. Latin America used to be ahead of most other developing regions in education, but it has lost ground in the last two decades as other regions, East Asia in particular have made very dramatic improvements. The key challenges in education include the following. Most countries still need to expand access to secondary education

and particularly to higher education which is now becoming critical for the greater knowledge based tasks of the knowledge economy. They have to improve the quality of the whole educational system from pre-school to the university. They also have to improve the content and relevance of what is taught in the formal educational system. In addition, they have to move from a focus on just the formal educational system to the development of lifelong learning system. The half life of knowledge is getting shorter because of the speed up in the generation and diffusion of knowledge. People need to constantly learn new skills throughout their lives. This means that there have to be multiple mechanisms for people to be able get additional education and specialized training after they have left formal education. This can be provided at the work site, or in specialized schools and training facilities, or at home or elsewhere. Latin America needs to move to a system of education and training that is any time, anywhere, at any pace. This requires developing as system with multiple pathways and multiple providers. That also requires appropriate regulatory, finance and information systems and making effective use of ICT to deliver education and training services[1].

Strengthening Innovation. Although Latin America has made a small improvement in the KAM innovation index, the variables used in that index are limited to narrow input and output indicators for the creation of knowledge. In the broad conception of innovation developed in the knowledge economy framework presented earlier three components are distinguished—acquiring global knowledge, creating and commercializing knowledge, and disseminating and using knowledge. Compared to the East Asia, Latin America is not doing as well in this area.

On acquiring knowledge from abroad Latin America needs to get more integrated into the global trade. Imports of capital goods and components are one of the main ways to get access to global knowledge embodied in goods. Latin America also needs to make more effective use of foreign investment. Even though Brazil and Mexico have received a lot of foreign investment, that investment has not always brought the most advanced technology or developed the backward linkages as has occurred in East Asia because that region is more integrated into the global production system. Thus Latin American needs to undertake more systemic efforts at having its exporters get into global supply chains and move up the value added ladder as has been done by firms in East Asia.

On the creation and commercialization of knowledge, Latin America is also falling behind. It has not raised the share of R&D to GDP as much as has been occurring in East Asia. In addition, it has not developed the supportive infrastructure of technology parks, business incubators, technology transfer centers, and venture capital to commercialize knowledge as much as is happening in East Asia, particularly in Korea, Taiwan, and China.

Finally on the dissemination and effective use of knowledge again Latin America also needs to do much better. There has not been as explicit an effort as in some Asian countries to disseminate (whether acquired from abroad or domestically produced) and use knowledge as effectively as in East Asia. In any country there is tremendous dispersion of firm productivity across any economy sectors.

1. For a detailed application of this to a major developing country see Dahlman, Zeng and Wang (2007).

Some Latin American countries, such as Brazil, the dispersion of labor productivity between the most efficient and least efficient firms are several thousand times[1]. This is in part because there is generally a less competitive regime, in part because there are fewer programs oriented toward agricultural, industrial and service extension. Finally it is also due to the lower absorptive capability of enterprises in generally because of generally lower educational attainment[2]. Thus there is a lot than can done to disseminate existing technology through demonstration projects, productivity organizations, technical information, consulting, and training services raise average productivity levels as has been done in many Asian countries.

As a result, Latin American needs to make significant progress on all three dimensions of innovation. Efforts to acquire and make more effective use of knowledge that already exists abroad, or even in the country, will have the highest payoffs in the short run and are less risky than efforts to develop globally frontier technologies. However in some sectors some countries in Latin America are close the world frontier. Some of the large countries also have extensive critical mass in public R&D. For them it makes sense to improve the efficiency in the allocation and use of those R&D resources through better management and monitoring of public R&D efforts. In addition, the private sector needs to be encouraged to undertake more R&D, not only to be able to keep up to date with new developments and incorporate them, but to also carry out cutting edge research in areas critical for their competitiveness. Furthermore while in the first instance it makes sense to invest in the areas where Latin America already has a comparative advantage in order to not just maintain, but also to enhance that advantage, it is also important for Latin America to invest in new technological areas such as genetic engineering, bio technology, and nano-technology. The public sector will have to play a greater role in carrying out this type of riskier and more uncertain research. It should be seen as part of an investment portfolio strategy of exploring new areas with potential high returns. These investments are necessary to have the capability to move in rapidly to into those areas that begin to show promising results.

Exploiting ICT. As already noted, Latin America is also falling behind in ICT relative to progress made in the rest of the world. Latin America needs to catch up not only in ICT penetration rates, but even more on the effective use of information technology in government, business, and civil society at large. Information technology has become the basic infrastructure for the knowledge economy. It reduces transactions costs and permits seem less integration of suppliers and production to rapidly changing market needs. It has also spanned the need for a gigantic demand for content ranging from health and education to business and finance data to sports and entertainment.

Strengthening Physical Infrastructure. Although this was not explicitly addressed in this paper, Latin American has also been falling behind in trade related infrastructure, particularly when compared to East Asia. Part of the reason for this has been the lack of government resources stemming from the maco crisis. However, another part is that Latin America has not explicitly tried to insert itself into the global trading system as much as other parts of the world. To compete effectively in the real time modern world of globalized production and distri-

1. See for example Rodriguez et al (forthcoming 2007) which finds that the average difference between the most productive firms and the median averages ten times even when the most productive is adjusted downward considerably. This compares with an average of five times in India.
2. For a detailed use of this framework applied to Brazil see Alberto Rodriquez et al (2007).

bution chains it needs to modernize and expand all kinds of infrastructure ranging from ports, and airports to high speed internet and customs and regulatory procedures.

Bibliography

Aubert, J.-E., et al. (2007). Towards Knowledge Economies - Advanced Strategies for Development, Washington, DC: World Bank Institute.

Baldwin, R. (2006), "Globalization: The Great Unbundling(s)", paper contributed to event on Globalization Challenges to Europe and Finland organized by the Secretariat of the Economic Council, Prime Minister's Office (June).

Berger, S., (2006), How We Compete: What Companies around the World are Doing to Make it in Today's Global Economy, New York: Random House.

Blinder, A. (2006), "Off shoring: The Next Industrial Revolution?" Foreign Affairs, Vol.85 (2) (March-April).

Brinkley, Ian (2006). Defining the Knowledge Economy-Knowledge Economy Programmed Report. London: The Work Foundation.

Ciscel, D. H. and B. E. Smith (2005). "The Impact of Supply Chain Management on Labor Standards: The Transition to Incessant Work", Journal of Economic Issues, Vol.39 (2), 429-437.

David, Paul. "The Dynamo and the Computer: a Historical Perspective on the Modern Productivity Paradox". American Economic Review, 80 (2); 355-361.

Dahlman, Carl J. (2007a) "China and India as Emerging Technological Powers". Issues in Science and Technology (quarterly magazine of the US National Academies of Science-Spring 2007 issue).

Dahlman, C. J., D., Zhihua Zeng, and S. Wang (2007b). Enhancing China's Competitiveness Through Life Long Learning. Washington DC: World Bank.

Dahlman, Carl J., and Jean-Eric Aubert. China and the Knowledge Economy: Seizing the 21rst Century. Washington DC: World Bank.

Dahlman Carl J., and Anuja Utz. India and the Knowledge Economy: Leveraging Strengths and Opportunities." Washington DC: World Bank.

De Ferranti, D. et al. (2002). Closing the Gap in Education and Skills. Washington DC: World Bank.

Department of Trade and Industry (1998). Our Competitive Future Building the Knowledge Driven Economy .London: U.K. Department of Trade and Industry.

Dutz, Mark, et al. (2007), Unleashing India's Innovation: Toward Sustainable and Inclusive Growth. Washington DC: World Bank.

Drucker, P. (1994). "The Age of Social Transformation", Atlantic Monthly, Vol.274 .

Economist, The (2006), "The New Titans: A Survey of the World Economy", Special supplement in September 16th edition.

Evans, D., R. Kaplinsky, and S. Robinson (2006). "Deep and Shallow Integration in Asia: Towards a Holistic Account", IDS Bulletin, Vol. 37 (1).

Freeman, R. (2006). "Labor Market Imbalances: Shortages, or Surpluses, or Fish Stories?" paper prepared for Boston Federal Reserve Economics Conference – "Global Imbalance – As Giants Evolve", June 14–16, Chatham, Massachusetts.

Grossman, G. and E. Rossi-Hansberg (2006), "The Rise of Off shoring: It's not Wine for Cloth Anymore," conference paper, Reserve Bank of Kansas, August 23.

Houghton, John; and Peter Sheehan (2000). A Primer on the Knowledge Economy. Melbourne: Center for Strategic Economic Studies, Victoria University.

Humphrey, J. and H. Schmitz (2006), "The Implication's of China's Growth for Other Asian Countries", Institute of Development Studies, Brighton, UK.

Kaplinsky, R. (2005). Globalization, Poverty, and Inequality. Cambridge: Polity Press.

Kasarda, J. D. and D. A. Rondinelli (1998), "Innovative Infrastructure for Agile Manufacturers," Sloan Management Review, Vol. 39 (2), 73–82.

OECD (2005a), Science, Technology and Industry Scoreboard 2005. Paris: OECD.

OECD (2005b). Education at a Glance 2005 Paris: OECD.

OECD (2004), Internationalization of Higher Education: Opportunities and Challenges, Paris: OECD. OECD (2001). The New Economy: Beyond the Hype. Paris: OECD

OECD (2000). A New Economy? Changing Role of Innovation and Information Technology in Growth. Paris: OECD.

OECD (1996). The Knowledge Based Economy. Paris: OECD.

Page, J., et al. (1993), The East Asian Miracle: Economic Growth and Public Policy, World Bank, Washington DC.

Palmisano, S. (2006) "The Globally Integrated Enterprise" in Foreign Affairs (May- June).

Perez, C. (1992), Technological Revolutions and Financial Capital: The Dynamics of Bubbles and of Golden Ages. London: Edward Elgar.

Rodrik, D. and A. Subramanian (2004), "From Hindu Rate of Growth to Productivity Surge: The Mystery of the Indian Growth Transition", National Bureau of Economic Research, Working Paper 10376 (March).

Rodriguez, Alberto, et al.(forthcoming 2007) Knowledge and Innovation for Competitiveness. Washington DC: World Bank.

Stiglitz, J. and S. Yusuf (2001), Re-Thinking the East Asian Miracle, Oxford University Press and the World Bank.

Sturgeon, T. (2002), "Modular Production Networks: A New American Model of Industrial Organization." Industrial and Corporate Change, Vol.11 (3), 451-496.

Tan. W. B.; C. W. E. Lui; and C. M. Loh,(1992), "The Use of Information Technology by the Port of Singapore Authority", World Development, December pp.1785-1795.

UNCTAD (2004), Development and Globalization Facts and Figures, Geneva.

UNCTAD (2005), World Investment Reports 2005: Transnational Corporations and the Internationalization of R&D, New York and Geneva.

UNCTAD (2006), World Investment Report 2006: FDI from Developing and Transition Economies-Implications for Development, New York and Geneva.

UNCTAD (various years), World Investment Reports. New York and Geneva.
Governing the Market, Princeton: Princeton University Press.

UNESCO (2005). Towards Knowledge Societies.

Westphal, L., W. Y. Rhee, and G. Purcell (1981), "Korean Industrial Competence: Where It Came From", World Bank Staff Working Paper 469, Washington DC.

World Bank (2007), World Development Indicators 2007, Washington DC.

World Bank (2006b), Latin America and the Caribbean's Response to the Growth of China and India: Overview of Research Findings and Policy Implications, Washington, DC: World Bank.

Zhen-Wei Qiang. Christine (2007). China's Information Revolution: Managing the Economic and Social Transformation. Washington DC: World Bank.

Annex Table 1: Knowledge Economy Index—Latin America and Selected Countries

	Overall	Economic & Inst. Regime	Innovation	Education	ICT
LAC					
2006	4.66	4.43	4.66	4.25	5.29
1995	4.86	4.99	4.62	4.39	5.43
Argentina					
2006	5.41	3.19	6.15	6.71	5.59
1995	6.07	5.81	6.02	6.39	6.06
Brazil					
2006	5.10	4.03	5.17	5.57	5.61
1995	4.73	4.68	5.05	3.85	5.33
Chile					
2006	6.86	8.84	5.82	6.18	6.59
1995	6.27	7.18	5.70	5.87	6.33
Colombia					
2006	4.00	3.55	3.31	4.48	4.64
1995	4.44	4.81	3.29	4.53	5.55
Mexico					
2006	5.04	5.09	4.96	4.38	5.72
1995	5.22	6.14	4.80	4.42	5.52
East Asia					
2006	6.03	5.64	7.13	4.57	6.77
1995	6.18	6.06	6.84	4.71	7.12
Korea					
2006	7.60	5.70	8.30	7.57	8.82
1995	7.56	6.53	7.59	8.12	8.01
Taiwan					
2006	8.12	7.78	8.97	6.95	8.99
1995	8.06	8.43	8.84	6.88	8.09
China					
2006	4.26	4.10	4.78	3.93	4.24
1995	2.83	2.20	3.93	3.47	1.71
Finland					
2006	9.12	8.79	9.71	9.16	8.84
1995	9.21	8.46	9.56	9.15	9.66

Source: www.worldbank.org/Kam (accessed 6/26/2007).