

Innovation and Innovation Policy in the Periphery: Latin America and Central and Eastern Europe Compared

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I Introduction

There are two somewhat contrasting trends in today's world economy that have not been explained satisfactorily: First, despite growing exports and foreign direct investments (FDI; also in medium and high tech industries and services), many developing countries have grave difficulties in upgrading their economic structures and consequently experience stagnating real incomes and growing inequality. (See, e.g., World Bank 2005, Guiliani et al 2004, Palma 2005, Reinert and Kattel 2007, and Amsden 2007) Second, increasing trade in terms of imports from developing countries and outsourcing of jobs to poorer regions has had somewhat similar impact in some of the most developed countries: stagnating real wages and growing income inequality during the last decade; prime examples of such trends are the US and Germany. (See, most recently, Krugman 2008; further also Samuelson 2004)

As to the first trend, Figures 1-4² give a snapshot view of macroeconomic developments in key developing countries during the last decades. What is remarkable in these figures is not the exhilarating raise in FDI and exports (Figures 1-3), but the stunningly obvious divergence in real income growth between Asian economies, on the one hand, and Hungary and Mexico, both key countries for their respective regions as far as FDI and exports are concerned, on the other hand (Figure 4). While China and Korea have seen their GDP per capita multiplied at least 4 times since 1980, Hungary and Mexico have struggled throughout the last decades to stay above the 1980 level. While some argue that the decades after 1980 have been the best development decades in a generation (for instance, Rodrik 2007, 13-14 and Skidelsky 2008),³ it is difficult to deny that there is something similar to 'China price' in the development statistics of the poorer countries from 1980 onwards: if one deducts China's and India's growth from developing countries' data, there is not much left as far as growth and development in the rest of the developing world is concerned (as also Rodrik 2007 admits).

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² Unless states otherwise, all figures are drawn from World Bank WDI Online database; calculations by the authors.

³ To be precise, Rodrik and Skidelsky, similarly to many others, mean in this context mostly poverty reduction.

Figure 1. High-technology exports (% of manufactured exports), 1988-2006.

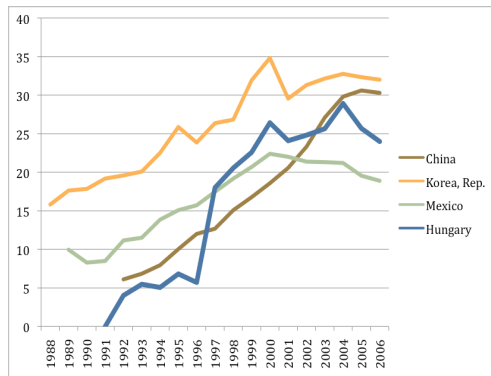


Figure 2. Export value, index (2000 = 100), 1980-2006.

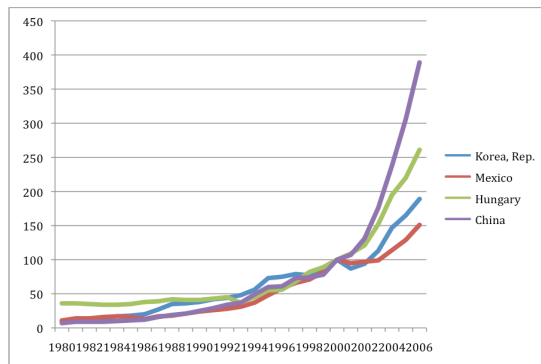


Figure 3. Foreign direct investment, net (BoP, current US\$, billions), 1980-2006.

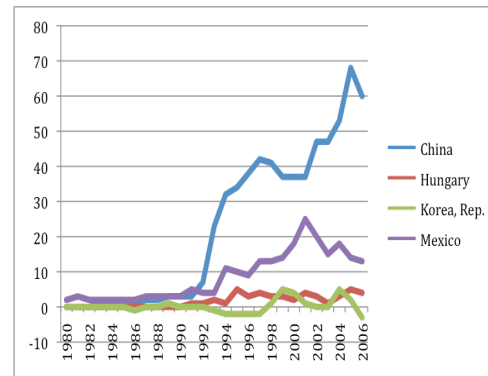
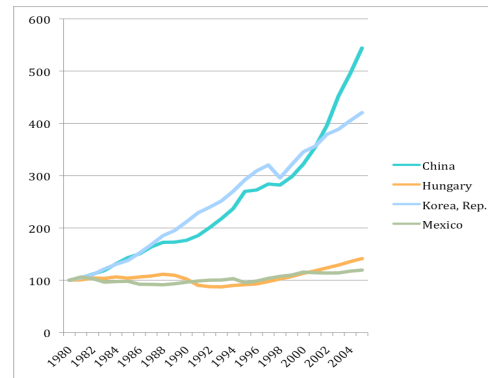


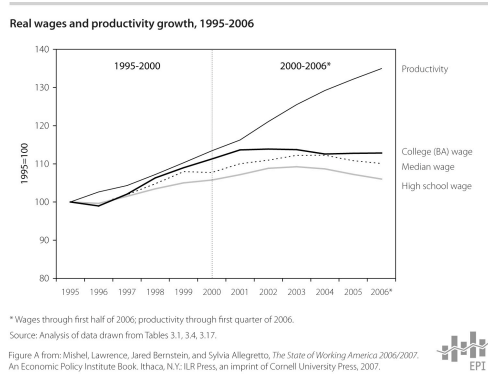
Figure 4. GDP per person employed, index (1980 = 100), 1980-2006.



As the World Bank admits, rest of the developing countries, notably in Africa, Latin America and some of the former Soviet republics (Moldova, Ukraine, the ones in Central Asia) suffer from heavy doses of a cognitive dissonance between promised growth and the reality where most of these countries have been standing still, if they are lucky, or dropping backwards to income levels of earlier decades: “Whereas Latin America’s income per head grew by 10 percent in the entire 25 years from 1980 to 2005, it grew by 82 percent in the 20 years from 1960 to 1980.” (Amsden 2007, 6; also World Bank 2005) According the World Bank’s calculations, the recession many former Soviet republics experienced during 1990s, and are still experiencing, is worse than the Great Depression in the USA and the World War II in Western Europe (both recovered considerably quicker). In fact, for example, “even if Ukraine managed to grow steadily at 5 percent a year, starting in 2002, it would take until 2017 to regain its previous peak – implying a transformational recession of more than a quarter of a century at best.”

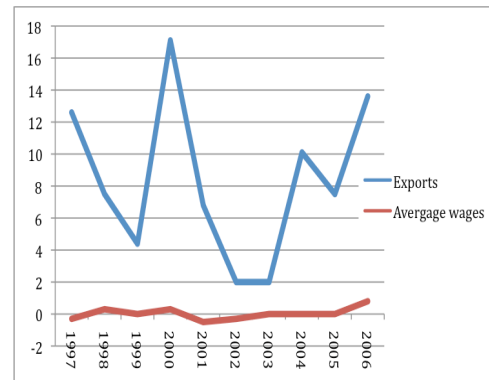
Accompanying such dismal developments in developing countries is another abovementioned trend; Figures 5-7 give, again in a rather simplified way, overview of developments in leading developed countries such as the US and Germany.

Figure 5. Real wages and productivity growth in the US, 1995-2006



Source: State of Working America, www.stateofworkingamerica.org.

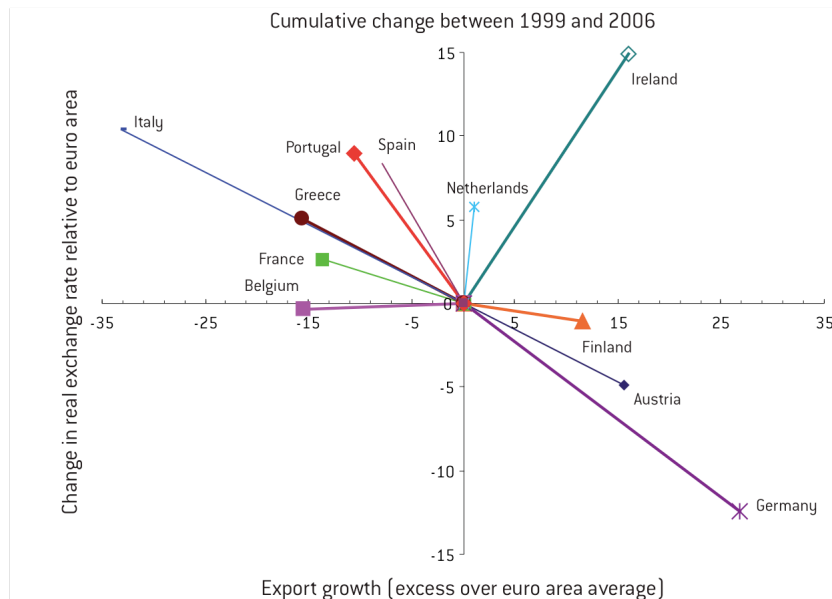
Figure 6. Germany's export and wage growth, % changes on the previous year, 1997-2006.



Source: Statistisches Bundesamt Deutschland, www.destatis.de; calculations by the authors.

While the US economy has been one of the world's top performers in productivity growth over the past 15 years (in fact during the entire post-WWII period⁴), real wage growth has stalled and there is a clear trend towards falling wages (Figure 5). Similarly, while Germany's wage growth flat-lined for most of the last decade, Germany became world's number one exporter with highly impressive annual export growth (Figure 6).

Figure 7. Real exchange rate and relative export performance in euro area, 1999-2006.



Source: Pisani-Ferry et al 2008, 21.

Figure 7 illustrates how such contradictory trends in Germany impact competitiveness of other countries in euro area. Most euro area countries suffer from real exchange

⁴ See State of Working America, www.stateofworkingamerica.org, in particular the comparative productivity table in http://www.stateofworkingamerica.org/tabfig/08/SWA06_Tab8.3.jpg.

rate appreciation, as they cannot compete with Germany's productivity and export growth, and are thus faced with growing downward pressures on their wages.⁵

It seems quite obvious that both these global trends – high level of exports and FDI but low wage growth in developing countries, and high productivity and export growth but stagnating wages in developed countries – are different side of the same coin and it seems equally valid to assume (as, e.g., Krugman 2008 does) that this coin is globalization in the form of increasingly liberalized (financial) markets and trade. Clearly, there are also sweeping technological changes, in particularly in ICT, that have enabled enormous changes in ways value-chains, production and services are geographically located. (Perez 2002, 2004 and 2006) However, below we argue that it is the policy response in many developing countries to globalization and to ICT-led technological change that takes large part of responsibility for the phenomena described above. The policy response has been generally twofold: first, emphasis on Washington Consensus type of macroeconomic stability (low inflation, balanced public budgets etc), and, second, creation of innovation policies targeting mainly high-tech sectors (within sectors or as such, via R&D grants, technology parks etc).

In theory, macroeconomic stability should open the way for foreign direct investments, and it has (see as an example Figure 3 above); innovation policy should enable upgrading and diversification, and it has not (see, e.g., Guiliani et al 2004, McDermott 2005, Tiits et al 2008, and detailed discussion in the next section). We will argue that while innovation and industrial policies in the developing countries tend to mimic Western solutions such policies are generally ill fitted for their respective economic structures that have been significantly changed by Washington Consensus policies. As we will argue below, the developing countries policy response ends up solving problems that are not there and not dealing with upgrading and diversification issues they need to face. However, by now economists and policy makers are starting to realize that without the latter, increased trade and globalization end up being a race to the bottom for many countries, jobs and industrial sectors.

In short, we will argue below that there are three reasons for the contrasting global trends described above: First, techno-economic paradigm change connected, second, with macro-economic environment created by the Washington Consensus policies and, third, innovation and industrial policies created by many developing countries. All of these changes took place in 1990s and this historical coincidence (compounded by the collapse of the Soviet Union) created enormous dynamic forces in the global economy that explain the described trends. We will also try to show what needs to be done in order to give these dynamic forces a somewhat different direction for a more equitable form of global capitalism to take shape.

⁵ As Kregel argued already in 1999, "If the rest of Europe does not follow Germany in keeping wage increases down to the target inflation rate (which is lower than the rate of productivity growth) the result will be exactly the same as if their nominal inflation rates were excessive relative to the inflation rate in Germany, and they will be losing intra-EU competitiveness. ... Alternatively, Germany might be said to be exporting its unemployment to the rest of the EU member countries. The other members of EMU can only allow their nominal wage levels to evolve independently of Germany to the extent they can rely on productivity growth in excess of that in Germany. If productivity growth is roughly constant across countries, they will have to reduce their growth of wages below current inflation and productivity growth levels in their tradable sectors to defend their employment levels. The result will be that beggar-thy-neighbor nominal exchange rate depreciations are replaced by beggar-thy-neighbor reductions in wage costs and prices." (Kregel 1999)

In order to do this, we try to show in this essay how Latin American (LA) and Central and Eastern European (CEE) innovation policies, despite the remarkable differences in history and geography, are converging and exhibiting very similar features and failing on very similar issues. This is obviously not an easy comparative task in terms of methodology and data. Indeed, first methodological obstacle is whether one can and should compare LA and CEE in the first place? Despite huge differences, we argue that there are also significant similarities: 1) both regions experienced rapid liberalization in late 1980s and in 1990s after decades of high protectionism; 2) both regions are geographically peripheral to big and developed markets (the US and the EU respectively); 3) during 1990s, both CEE and LA received and followed highly similar policy advice in terms of economic and innovation policies, but also in the areas of public administration reform; 4) in both regions economic integration into much wealthier economic areas (EU, NAFTA) is crucial economic driver. These and further similarities make the comparative approach highly interesting, especially as LA is seen largely as a failure (see, e.g., Amsden 2007, 6; also Chang 2007), CEE in turn is seen as a success story; so for instance, at the end of 2005, *Business Week* ran a cover story (incidentally for one of the last issues of its European edition) titled “Central Europe – Rise of a Powerhouse”.

However, both CEE and LA are, first, in themselves highly diversified regions and, second, there are hardly any studies or datasets that include both regions. Availability of comparative data is clearly a problem for this study. Thus, we propose to look at the following data and stylized facts: 1) Dynamics of economic structure of the economy, value-added in industry and services since 1990 or earliest available (using World Bank data); 2) stylized facts from literature and case studies on outsourcing, clustering, enclave economies, regional inequality, etc; 3) historical overview of macroeconomic and in particular innovation policy developments since 1990s. There is one further key area, namely the developments in policy design and management, in short the impact of administrative reforms on innovation policy, that we cannot deal with any great detail here due to lack of significant empirical studies. The impact of integration into the EU and NAFTA respectively will be treated rather briefly.

II Stylized facts of economic development in LA and CEE since 1990.

In this section we try to briefly describe which changes took place in late 1980s and 1990s in LA and CEE. Both regions saw massive changes in policy environment and both regions can be called model cases of applying the Washington Consensus policies of ‘liberalize, privatize, stabilize’ (more on policies in the next section). As we saw in Figures 1-4 above, while such policies were increasingly successful in attracting FDI to CEE and LA, and considerably increasing exports (also in high technology), they have had much more limited impact on real wage growth, especially in LA. In addition, Figures 8-14 depict these developments in somewhat greater detail.⁶ Figures 8-10 would indicate that LA and CEE countries followed

⁶ The data for CEE countries is understandable not complete, thus we have reverted to using countries available. However, countries like Hungary and Estonia, mostly used in these Figures, are highly exemplary for CEE developments and are largely seen as key success stories from CEE. They also represent geographically different areas, Hungary being Central European and Estonia North-Eastern European country. Where possible, we have also included other countries. In the case of LA, we have also followed in most Figures some key countries such as Mexico and Brazil. We have used South Korea as a ‘control case’ of highly successful catching up country, and we have also used in some of

roughly the same path of deindustrialization in which both employment in industry and industry's value added in GDP dropped and services followed exactly the opposite path: growing employment and value added share in GDP. However, if we look at the levels of productivity (value added per capita in this case), we see that its growth in LA and CEE was nowhere near that of Korea during the period 1990-2005. This can be taken as proxy for growing technological complexity and diversity, and this seems to be lacking in CEE and LA countries' development dynamics.

Indeed, Figures 11-12 show a long-term development of both industry and services productivity in LA and CEE, and here we can see how Korea has in industry caught up and actually surpassed middle income economy Spain and is also catching up in services. However, both CEE and LA clearly lag in productivity and especially during 1990s these regions fell actually behind rather than caught up.

Figures 13 and 14 depict different options to measure GDP per capita. Here we see very similar trends to productivity developments: first, Korea has clearly caught up with countries like Portugal; second, CEE countries saw a drastic drop in GDP per capita during the 1990s and while some countries like Estonia have recovered by early 2000s, the recession was for most CEE (and other former Soviet republics) severe. Indeed, if we look at the case of Moldova on Figure 14, we see that it was considerably richer than China in 1980, but by 2006 China's per capita GDP is almost twice that of Moldova. We can also see on Figure 14 that Korea was poorer than Brazil, Peru and Estonia in 1980, and by 2006 it has grown to be significantly more wealthy than Brazil and Peru while Estonia's growth in the last few years has been also impressive (this goes back to considerable consumption and real estate boom in mid-2000; see discussion below).

the Figures Portugal and Spain as 'control cases' of middle income countries that integrated into the world and in particular into the European markets roughly at the same time as LA and somewhat earlier than CEE.

Figure 8. Changes in industry, 1990-2005.

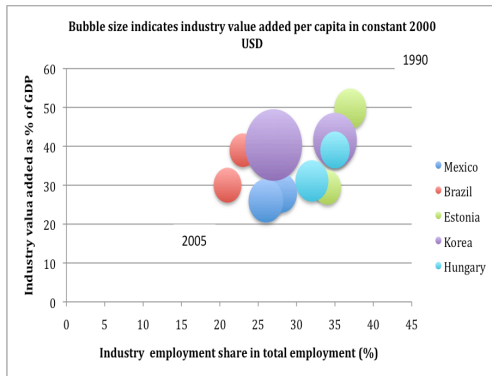


Figure 9. Changes in services, 1990-2005.

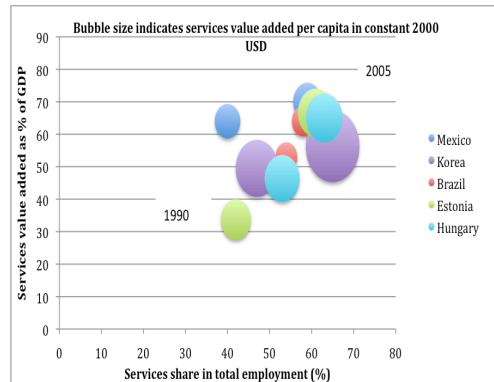


Figure 10. Industry value added (% of GDP), 1965-2006.

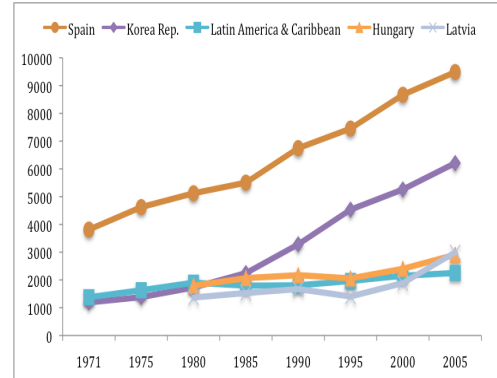
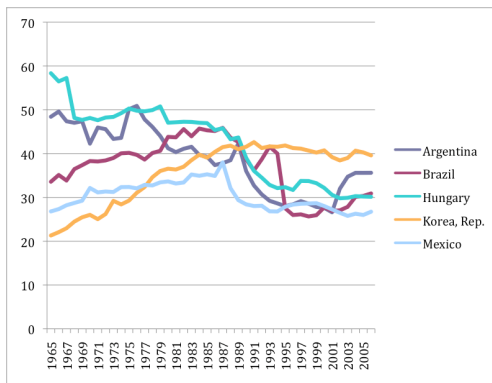


Figure 13. GDP per person employed, index (1980 = 100), 1980-2006.

Figure 11. Industry value added per capita (millions), constant 2000 USD, 1971-2005.

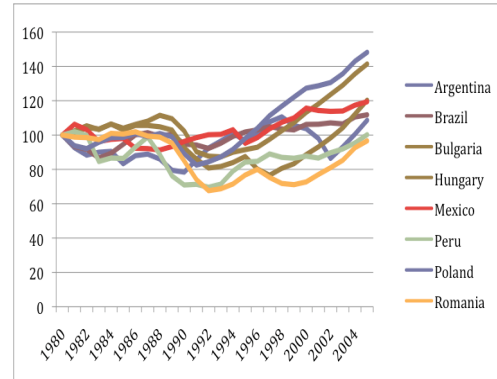
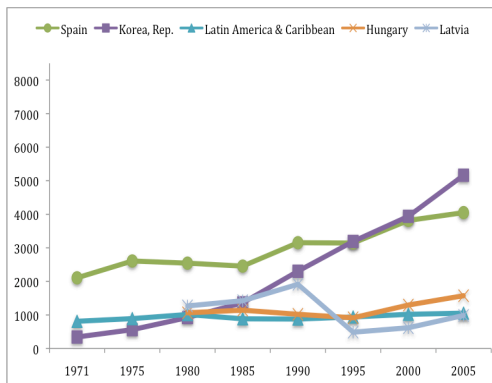
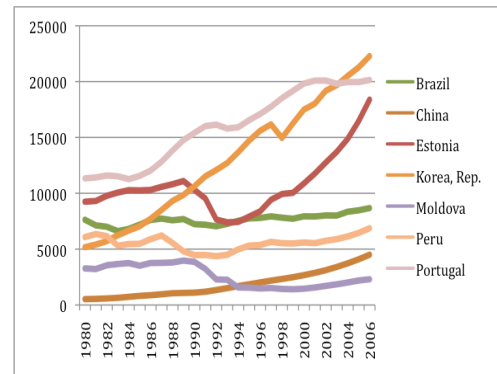


Figure 14. GDP per capita, PPP (constant 2005 international \$), 1980-2006.

Figure 12. Services value added per capita (millions), in constant 2000 USD, 1971-2005



In the following sub-section we will take a closer look at LA and CEE through some stylized facts and trends.

II.1 Developments in CEE⁷

At the end of the 1980s, Eastern European and former Soviet economies were generally highly industrialized; many of these economies were on a similar industrialization and growth path as the East Asian economies. Indeed, according to the World Bank data, countries like Estonia, Latvia and Hungary were ahead of Korea during in the early 1980s in terms of industrial value added per capita (see Figure 11 above). After the fall of the Berlin Wall, most CEE and other former Soviet economies saw deep dives in their growth rates and in industry as well as service sector value added. It took more than a decade for most CEE countries to reach the growth and development levels of 1990; many, however, still severely lag behind their development levels of 1990.⁸

It can be argued that such a level of industrialization was mostly artificial; that it was created by highly inefficient and wasteful planning, and not by market forces; that it was created by military and strategic needs, rather than comparative or competitive advantages. Indeed, arguably such a line of thought was and still is prevailing in discussions of Soviet industry (see, e.g., Kovacs and Marton 1992). Alternatively, it can be argued that the rapid de-industrialization witnessed in most CEE countries (and, more drastically, in former Soviet republics) after 1990 was, at least partially, a process of natural de-industrialization: many industrial jobs move to lower-cost locations and are replaced by service jobs.

However, one of the most striking features of post-Soviet development in the 1990s was the rapid primitivization of industrial enterprises or even the outright destruction of many previously well-known and successful companies. This happened because of the way Soviet industrial companies and the industry in general were built up and ran in a complex web of planning and competition.⁹ In addition, as we will show below, policy framework created for the transformation of these companies in the 1990s completely misunderstood the nature of industrial companies and partially actively sought to demolish them (e.g. Sachsian shock therapy; see also Kregel et al. 1992).

It has been one of the gravest misunderstandings of Soviet economy to simply dismiss it as a thoroughly planned economy where private initiative and competitive forces played no role whatsoever. On the contrary, perhaps the most defining feature of Soviet industrial enterprise was its complexity. If we look at a typical industrial company with its relationships to government offices, suppliers, consumers, and 'competitors', it is clear that success came through managing well the increasingly complex web of relationships and, in particular, (arguably peculiar) feedback linkages

⁷ This section builds on Tiits et al 2008 and Reinert and Kattel 2007.

⁸ For instance, countries like Ukraine, Moldova, and most central Asian countries fell from middle income economies to poor countries and by now represent failed or fragile economies; see further Reinert, Amaizo and Kattel 2008

⁹ For studies of Soviet industry, see Berliner 1976, Bergson 1978, and case studies like that of Skoda by Margolius and Meisl and of East Germany's industry by Stokes 2000 and of Czech industry by Kosta 2005. For case studies on company level transition to capitalism, see Radosevic and Yoruk 2001.

along the value-chain (particularly in terms of quality control). Essentially, a Soviet industrial company was what we today call an industrial cluster of various companies and activities that create external economies useful to all or at least most cluster members. In Soviet reality, this often meant very strong vertical integration (if one produced carpets, one often also produced machinery for carpet production) and huge companies that operated under what might be called artificial economies of scale (and to a lesser degree of scope). These economies of scale depended largely on planned demand. Such very strong vertical integration meant that the most successful and progressive Soviet companies often built their own ICT labs (however rudimentary) in 1980s or, as in the case of a few Estonian agricultural complexes, invested into early biotechnological technologies in late 1980s. However, taken together, scale economies, strong vertical integration and planned demand created enormous barriers to entry that protected such companies from virtually any competition. The latter can be understood as a negative externality that prevented almost any spin-offs from these companies.

A sudden opening of the markets and abolition of capital controls made these industrial companies extremely vulnerable. The partially extreme vertical integration meant that if one part of the value chain ran into problems due to the rapid liberalization, it easily brought down the entire chain. However, foreign companies seeking to privatize plants were almost always interested in only part of the value-chain (a specific production plant, infrastructure or location) and thus privatization turned into publicly led attrition of companies and jobs.¹⁰ The previously protective barriers to entry turned into truly negative externality in form of almost complete lack of experience in competing in a free market economy.¹¹ And since many companies were rather broadly specialized, it was almost inevitable for many if not most of them to run into problems as foreign competition was instant after opening of markets.

Liberalization of markets and prices meant that for many domestic companies, demand was cut down and thus companies with the highest relative fixed costs to variable costs (these tend also to be the technologically most advanced ones) were hit the hardest as their balance sheets worsened very quickly. If a company had a lot of machinery and equipment to be amortized, i.e. there have been recent investments into upgrading, then it is particularly harshly hit if its demand drops and if it is under financial stress because of liabilities to newly founded banks. Thus, by definition, the most advanced industries were hit by rapid liberalization first and also the hardest. This is called Vanek-Reinert effect¹² and it can be observed in Latin America in the 1980s (see more below) and, again, in the 1990s in CEE and other post-Soviet countries. Due to the particular nature of their industries, CEE and other former Soviet industries experienced a particularly drastic form of the Vanek-Reinert effect in the early 1990s and, as we have seen above, many economies have not recovered from this yet. As a result, the share of CEE and other former Soviet republics' share in world manufacturing plummeted from 19.3% in 1980 to 2.7% in 2001. (UNCTAD 2004)

¹⁰ Frost and Weinstein 1998, and Young 1994 offer excellent examples of how Western companies such as ABB, Gerber and others privatized Soviet companies.

¹¹ Radosevic and Yoruk 2001 show how previous contacts with Western companies were crucial to company survival in Hungary in early 1990s.

¹² First articulated in Reinert 1980.

Such a drastic change made it relatively easy to actually *replace* Soviet industry: with the macroeconomic stability and liberalization of markets, followed by a rapid drop in wages, many former Soviet economies became increasingly attractive as privatization targets and outsourcing of production (we will return to policies in the next section). Indeed, one of the most fundamental characteristics of CEE industry (and services) since 1990 has been that the majority of companies have actually engaged in process innovation (e.g. in the form of acquisition of new machinery) in seeking to become more and more cost-effective in the new market place. The relatively lax neo-liberal labour regulations have also been helpful in this. That is, innovation in CEE is very often of the kind that brings lower prices to consumers (both within the value chain and in the end market).

In addition, innovations not only change the organizational forms of companies (e.g. using ICT allows for more flexible organizational structure), but moreover different organizational forms are conducive for different innovations. Recent research shows that highly developed Nordic countries tend to have a significantly higher degree of companies with lean manufacturing and learning organization techniques (worker independence in decision-making etc) than Southern European countries. (Lorenz and Lundvall 2006) CEE companies tend to similarly focus on less worker independence, simple production tasks and work organization. Thus, the industrial change during the 1990s strongly lessened the demand for skills, R&D and product development. As a result, many CEE countries left educational, science and R&D systems largely intact and now face an increasing gap between skills offered by the education system and skills needed by companies to climb the value ladder.

Even though we have argued that both CEE and other former Soviet economies saw a drastic industrial decline after 1990, and that broadly speaking, both groups of countries followed, particularly in the early 1990s, very similar policies of liberalization, it remains unclear why so many former Soviet republics (like Ukraine, Moldova, Central Asian countries) fared much worse than CEE. Part of the answer lies in the long-term cultural and political past: countries like Hungary, the Czech and Slovak Republics, and even the Baltic countries had experienced independence and also successful economic development during the interwar period; Estonia, for instance, was a richer and stronger economy in the late 1930s than Finland. Another explanatory piece in the puzzle is that the political reforms and the relative (legal and political) stability these brought to many CEE countries are in stark contrast to the political upheavals and the rampant corruption evident in Belarus, Ukraine and Russia. (Bracho and Julio López 2005 offer an excellent case study of Russia) Yet, additional, and perhaps one of the most significant, explanations lie in the different trade patterns and the geographical vicinity to developed markets.

CEE countries' trade (both in terms of export and import) specialization moved very quickly towards Western Europe, while the rest of former Soviet economies, trade specialization, particularly in terms of export markets, remains regionally dominated and, which is very significant, strongly resource-based. These economies experience terms of trade that, as Hans Singer argued more than 50 years ago, forces these countries into more and more stronger specialization into activities where innovation expresses itself in either lower prices and thus lower margins or, in the case of resource-based activities, in exorbitant concentration of wealth in the hands of very few. (Singer 1950)

CEE countries, in turn, have profited from trading with European economies, which often brings the need to manage production (e.g. in an outsourcing factory) in terms acceptable to Western partners, particularly in terms of quality and time. What has essentially happened in CEE is that these countries specialize in industrial (and often also in service) activities where wage levels have become too high in Western Europe and where there are huge parts of the value chain where the Taylorist mass production paradigm can still be employed with relative ease. Thus, the drastic primitivization and loss of skills and demand for skills during the 1990s is easily overlooked as new Zara, Ikea etc factories keep popping up all over CEE economies.

II.2 Developments in LA¹³

As we have seen in the Figures above, the 1990s were for most LA countries a continuation of trends that go back to early 1980s. As Cimoli, Ferraz and Primi 2005 argue, during the last decade “two different specialization patterns emerged in the post-reform period, the one based on natural resources, basically in the Southern Cone, and the other on labor-intensive activities, especially in Central America and the Caribbean. ... Argentina and Chile, for example, reoriented production structures towards raw materials and natural resources processing activities, while Mexico and many Central American countries moved towards maquila type industries.” (9)

However, while there are clear sub-regional differences, there are, as in the CEE case, clear commonalities among Latin American and Caribbean countries: “the scant pervasiveness and diffusion of knowledge and intangibles in regional production systems”. (Ibid.) As in CEE, also LA countries are persistently specialized into low technology intensive industries and/or production stages (ECLAC 2004). Such specialization patterns “favored the generation of an industrial structure that, ‘per se’, limited endogenous technological capabilities and expresses a scant demand for knowledge, thus implicitly limiting the potential positive stimuli effect towards technological catch up of liberalization and increased competition.” (Cimoli, Ferraz and Primi 2005, 9-10) Indeed, if we look at the technology intensity of export industries (comparing the market share of technology intensive exports with the market share of low technology exports), we see that Asian economies experienced a rapidly increasing share of technology intensive exports while Latin America and the Caribbean, however, register only a modest increment in this (see in detail Cimoli, Peres, Primi 2005, 10-11; see also Reinhardt and Peres 2000; Mortimore and Peres 2001). Yet, if we exclude Mexico, the pattern of the Latin American specialization has not in fact changed over the last decade or more. (Cimoli, Peres, Primi 2005, 10-11) However, as Palma 2005 has impressively argued, while Mexico’s growth in high technology exports has been nothing short of remarkable, “it has been associated with both the collapse of the export multiplier and the ‘de-linkaging’ of the export sector from the rest of the economy; this has produced a situation in which increasing export competitiveness has had little effect on growth and the living standards of the majority of the population.” (943) Moreover, this has led to the rise of enclave economy where relatively high-tech islands of mostly outsourcing factories for global

¹³ This section builds on Cimoli, Ferraz and Primi 2005; see further also Palma 2005, Cimoli 2000, Burlamaqui et al 2007.

networks have hardly any linkages with local companies, educational institutions and policy networks.¹⁴

As we have seen above, similar picture emerges when we look at the share of technology intensive production in total manufacturing value added: “In Latin America during the 1970s an improvement can be observed but since 1982 scarcely any change can be noted. The opening up process favored the modernization of regional production structure and the reorientation of regional specialization patterns, but technological intensive activities still represent only around 30% of total manufacturing value added, approximately 60% of which is due to transport equipment industry. On the contrary, South Korea managed to catch up and even forge ahead. During the nineties both in USA and South Korea more than 60% of manufacturing value added was generated in technology intensive industries.” (Cimoli, Ferraz and Primi 2005, 11)

In addition, by 2000s, around 40% of the 500 largest Latin American corporations where foreign owned, compared to around 30% at the beginning of the nineties (ECLAC 2004). It can be argued that “structural debilities of local economies and competitive pressures originating from liberalization and structural reforms imposed a dilemma for large size, locally owned companies: either to further expand abroad or to sell or transfer ownership to foreign companies.” (Cimoli, Ferraz and Primi 2005, 11-12) As in CEE, “privatization of utilities and commodities also played a major role in reshaping ownership patterns” (ibid., 12).

Again similarly to CEE,

regional firms that managed to integrate into international production chains positioned themselves in low technology activities, while transnational companies kept the lead of production networks, mastering the generation, promoting the diffusion and appropriating the benefits accrued from accumulation of technology and innovation. These companies control and determine the specialization pattern of Latin American owned enterprises through their outsourcing and networking strategies. In effect, regional firms participate in global production systems mainly performing at the lowest hierarchical levels, generally far away from control positions, and, in general, carrying out raw materials processing or basic assembling activities. Indeed, competitive pressures in global markets, where strong actors benefit from increasing returns led international network hierarchies’ leaders, which are mainly located in developed economies, to profit from international trade outsourcing, subcontracting or re-localizing production activities according to static comparative advantages. (Cimoli, Ferraz and Primi 2005, 12; see also Cimoli and Katz 2003)

Such developments and in particular competitive pressures led to increasing number of process innovations in form of rationalizations such as “expansion of components imports, outsourcing of non-core activities, adoption of new organizational techniques, like quality systems controls and just in time management, and the localized introduction of new equipment, especially those of microelectronics base.” (Cimoli, Ferraz and Primi 2005, 12) It is not surprising that in a landscape dominated by foreign companies and weak local scientific and technological infrastructure, there are strong incentives “for companies to increasingly rely on foreign sources of knowledge and, what is even more important, the few results of innovation and

¹⁴ Gallagher and Zarsky 2007 is an excellent case study of Mexico’s IT sector as an enclave economy; for a similar counterpart in CEE, see Kattel and Kalvet 2006a on Estonian ICT sector.

technological upgrading in the region are not appropriated locally but tend to be transferred abroad thus hardly contributing to the development of innovative capacity of Latin American and Caribbean countries.” (Ibid.) Similarly to CEE developments, very little was done in terms of expanding investments in R&D (see further below). In fact,

many Latin American and Caribbean research centers and laboratories of domestic enterprises were closed up during the last decade due to the change in the logic of innovation investments in open economies. In effect, controlling companies, mainly located in advanced economies, benefit from comparative advantages in technology and innovation. ... Indeed, multinational companies concentrate the bulk of research and development activities in their countries of origin or, as recent tendencies suggest, in strongly dynamic economies that are specialized in highly technological intensive industries and that represent huge potential markets for technological produce, like China. (Ibid., 12)

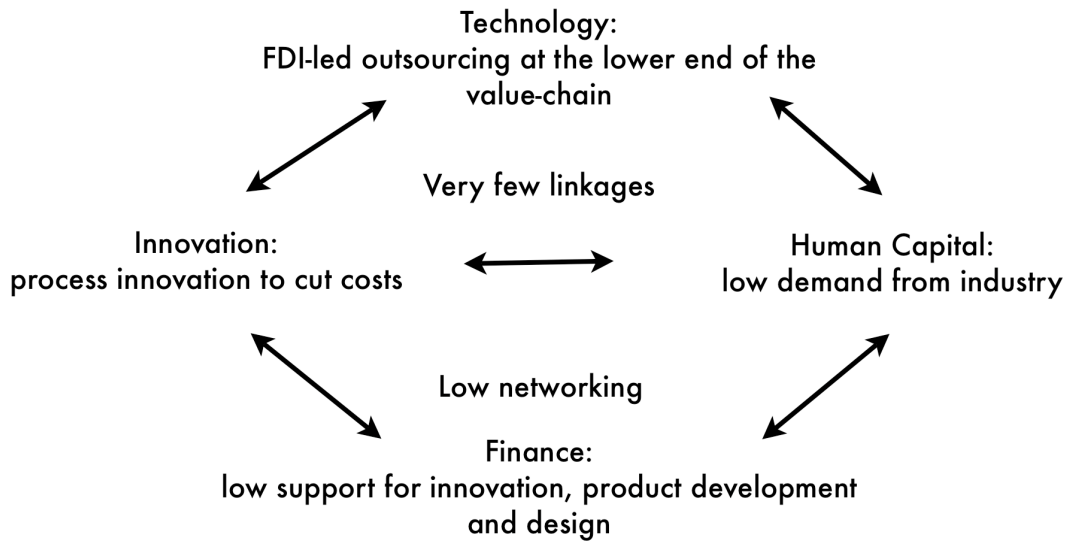
Thus, to sum up, during the decade of economic liberalization, “Latin America and the Caribbean came up with a simple production structure, increasingly fragmented and disarticulated in terms of local capabilities and progressively more outward linked and dependent that absorbs more and more knowledge and technology from abroad thus undermining its endogenous capacity of innovation and knowledge generation and diffusion.” (Cimoli, Ferraz and Primi 2005, 13)

II.3 Summary

Both CEE and Latin American integration to global trade is occurring on largely asymmetric basis.¹⁵ In both cases, “domestic agents participate in international production processes but they are marginal actors in the globalization of scientific and technological activities.” (Cimoli, Ferraz and Primi 2005, 13) Figure 15 attempts to summarize a vicious circle of technological specialization that has emerged both in CEE and LA. Just to remind, this vicious circle has taken shape despite high growth rates in exports.

Figure 15. Summary of stylized facts of economic development and innovation in CEE and LA since 1990.

¹⁵ See further Reinert and Kattel 2007 on taxonomy of economic integrations.



Source: Authors' elaboration.

The key to understand why CEE and especially LA seem to stand still or even fall behind when compared to Asian economies such as South Korea is the way many industrial companies were integrated into the world economy in 1990s. As we argue above, both CEE and LA strongly embraced the idea of FDI-led restructuring and probably the strongest surprise for the entire development community since 1990s has been the dramatic way FDI-led strategies have worked: specialization at the lower end of the value chain with grave difficulties of upgrading and, most importantly, strong enclavization and de-linkaging tendencies. As we will show below, the key why FDI-led strategies worked in such a way lays in a historic coincidence of techno-economic paradigm change and the onslaught of Washington Consensus policies taking place more or less at the same time. Here, however, it is important to see how such FDI-led strategies had major impact on, first, the way most companies in CEE and LA innovate and, second, why there is generally such a low demand for high skills from industry (deepening enclave and de-linkaging effects). These lead, further, to high financing costs of product development and other similar risks for many CEE and LA companies, in opposition to financial institutions and consumption (see also Kregel 2008). Compounding all of the above, networking within industrial sectors and between sectors and educational and R&D institutions is bound to be very low and linkages between companies tend to stay very weak (no real to cooperate within the vicious circle as foreign demand in form of outsourcing is key for company development). As we will show in the next section, most innovation policy initiatives in CEE and LA tend start at the end of the described problems: offering either some sort of financing in order to alleviate the perceived 'market failure' in funding of innovation or try to enhance networking among companies and universities. However, without tackling technological capabilities and structural characteristics of the respective economies, such policies are bound to stay highly ineffectual.

III Economic and Innovation Policies in LA and CEE since 1990.

In this section we describe in detail the macro-economic environment and policies that would explain the stylized facts of CEE and LA development described above. As we mention above, the FDI-led outsourcing was greatly enabled by the change of

the techno-economic paradigm that, however, was spread from core countries such as the US via the Washington Consensus policies to the periphery in a quite peculiar way.

III.1 Techno-economic paradigm change

The idea of techno-economic paradigms as developed by Carlota Perez is summarized in Table 1. The paradigms essentially last somewhere around half a century and consist of a ‘common sense’ of how capitalism of a specific period works and develops. It also describes how technological change and innovation of a given period are most likely to take place: organizational forms and finance that are conducive to innovations, what technological capabilities and skills are needed etc.

Table 1:

<i>Technological revolution</i>	<i>New technologies and new or redefined industries</i>	<i>New or redefined infrastructures</i>	<i>Techno-economic paradigm</i> <i>‘Common-sense’ innovation principles</i>
<i>Core country</i>			
FIRST: From 1771 <i>The ‘Industrial Revolution’</i> Britain	Mechanized cotton industry Wrought iron Machinery	Canals and waterways Turnpike roads Water power (highly improved water wheels)	Factory production Mechanization Productivity/ time keeping and time saving Fluidity of movement (as ideal for machines with water-power and for transport through canals and other waterways) Local networks
SECOND: From 1829 <i>Age of Steam and Railways</i> In Britain and spreading to Continent and USA	Steam engines and machinery (made in iron; fueled by coal) Iron and coal mining (now playing a central role in growth)* Railway construction Rolling stock production Steam power for many industries (including textiles)	Railways (Use of steam engine) Universal postal service Telegraph (mainly nationally along railway lines) Great ports, great depots and worldwide sailing ships City gas	Economies of agglomeration/ Industrial cities/ National markets Power centers with national networks Scale as progress Standard parts/ machine-made machines Energy where needed (steam) Interdependent movement (of machines and of means of transport)
THIRD: From 1875 <i>Age of Steel, Electricity and Heavy Engineering</i> USA and Germany overtaking Britain	Cheap steel (especially Bessemer) Full development of steam engine for steel ships Heavy chemistry and civil engineering Electrical equipment industry Copper and cables Canned and bottled food Paper and packaging	Worldwide shipping in rapid steel steamships (use of Suez Canal) Worldwide railways (use of cheap steel rails and bolts in standard sizes). Great bridges and tunnels Worldwide Telegraph Telephone (mainly nationally) Electrical networks (for illumination and industrial use)	Giant structures (steel) Economies of scale of plant/ vertical integration Distributed power for industry (electricity) Science as a productive force Worldwide networks and empires (including cartels) Universal standardization Cost accounting for control and efficiency Great scale for world market power/ ‘small’ is successful, if local

<i>Technological revolution</i> <i>Core country</i>	<i>New technologies and new or redefined industries</i>	<i>New or redefined infrastructures</i>	<i>Techno-economic paradigm</i> <i>'Common-sense' innovation principles</i>
FOURTH: From 1908 <i>Age of Oil, the Automobile and Mass Production</i> In USA and spreading to Europe	Mass-produced automobiles Cheap oil and oil fuels Petrochemicals (synthetics) Internal combustion engine for automobiles, transport, tractors, airplanes, war tanks and electricity Home electrical appliances Refrigerated and frozen foods	Networks of roads, highways, ports and airports Networks of oil ducts Universal electricity (industry and homes) Worldwide analog telecommunications (telephone, telex and cablegram) wire and wireless	Mass production/mass markets Economies of scale (product and market volume)/ horizontal integration Standardization of products Energy intensity (oil based) Synthetic materials Functional specialization/ hierarchical pyramids Centralization/ metropolitan centers–suburbanization National powers, world agreements and confrontations
FIFTH: From 1971 <i>Age of Information and Telecommunications</i> In USA, spreading to Europe and Asia	The information revolution: Cheap microelectronics. Computers, software Telecommunications Control instruments Computer-aided biotechnology and new materials	World digital telecommunications (cable, fiber optics, radio and satellite) Internet/ Electronic mail and other e-services Multiple source, flexible use, electricity networks High-speed physical transport links (by land, air and water)	Information-intensity (microelectronics-based ICT) Decentralized integration/ network structures Knowledge as capital / intangible value added Heterogeneity, diversity, adaptability Segmentation of markets/ proliferation of niches Economies of scope and specialization combined with scale Globalization/ interaction between the global and the local Inward and outward cooperation/ clusters Instant contact and action / instant global communications

Source: Perez 2006; see also Perez 2002.

New ICT-based techno-economic paradigm, coming to full force in 1990s, has engendered key changes in production processes in almost all industries (including many services and agriculture): outsourcing and breaking up of various production functions has created strong de-agglomeration pressures for previously highly industrialized centers and cities. As we have seen above, this has led to enormous growth in developing country exports but also to growing inequalities. Particularly not highly developed and peripheral areas and/or regions have experienced growing (regional) income inequality; and virtually everywhere one can see the share of wages in GDP declining as a result of lowered welfare regulations as well as because of loss of middle income jobs.¹⁶ Essentially this means that gains from technological change and innovation do not 'travel' geographically so easily anymore as the mass-production consensus of large production units and mass employment has scattered in many places in favor of highly specialized networks that operate and source production and knowledge often supra-regionally or even globally. On the other hand, it is relatively easy to fall into a vicious circle of increasing competition, pressure to cut costs and lower wages, trying to lure foreign investors with extensive concessions (in taxes etc). At the same time, ICT-led paradigm also enables creation of niche markets that have a potential to become supra-regional or even global, for instance hospitals specializing into specific heart surgery etc. (See, e.g., Prahalad 2006 for interesting case studies)

¹⁶ Samuelson 2004 and Krugman 2008 provide fruitful discussion of these issues.

Thus, the ICT-led paradigm is increasing pressures for de-agglomeration, de-linkaging and de-diversifying and this has become the key challenge to many smaller and/or peripheral nations/areas as here such pressures are naturally already quite high. However, it is not so much the issue of size as such (e.g., scarcity in human capital) that has become important again, but rather a combination of geographic location and economic specialization patterns. This can be summarized as a position a nation or a region holds in international value chain. For instance, while Finland is both geographically peripheral and demographically relatively small (ca 5 million inhabitants), its place in international mobile phone value chain is distinctly very high. However, also Finland is seeing a growing outflow of R&D activities into regions with lower costs and larger agglomeration effects such as India. We argue that ICT-led paradigm significantly amplifies such de-agglomeration effects.¹⁷

It can be argued that such logic of spreading global production networks that create de-agglomeration and de-linkaging effects is not inevitable to the ICT-paradigm (Perez 2006). This may indeed be true, however the global macroeconomic environment – namely, the policies of Washington Consensus – create significant incentives to instate policies that enable the adverse effects of ICT-paradigm to be particularly strong.

III.2 Washington Consensus policies

There are certainly various intellectual and ideological reasons behind the raise of Washington Consensus, one of the key ideas behind it, however, was “a return to the 19th century strategy based on open trade via the elimination of internal development institutions to allow comparative advantage trade financed by external resources to act as an engine of growth.” (Kregel 2008) Just as in the 19th century the key driver behind such ideas is the problem of financing growth. Indeed, also Washington Consensus became essentially obsessed with question of how to generate sustainable financing for development.¹⁸ Classical development economists such as Ragnar Nurkse argued that financing of development based on trade as engine of growth was only possible in 19th century because England was mainly trading with resource rich colonies largely populated by emigrants from England and Europe (that is, with highly skilled work force). (Nurkse 1961) Nurkse and other development pioneers were very keen in warning that without such preconditions, development strategies based on increased trade and foreign investments will rarely if ever work and will result in what we would today be called a lock-in into resource-based and low technology areas. However, financial globalization that took off after the collapse of Bretton Woods system in 1970s offered an apparently irresistible combination of perceived problems and solutions: developing countries needing funding for development projects (such as import substitution industrialization) and increasing amount of private investments floating around in search of investment opportunities in the affluent countries. The calculation behind Washington Consensus policies was thus relatively straightforward: need for investments in developing countries and need for investment opportunities in developed countries can be matched with internationally similar macro-economic policy regime that welcomes outside private

¹⁷ Kattel, Kalvet and Randma-Liiv 2009 discusses these issues in more detail.

¹⁸ Williamson’s original 1990 list of policies that Washington can more or less agree on concentrates mainly on financial issues; see Williamson 2000

funding that, in turn, can have a multiplier effect through increased trade that brings more funding and so on a virtuous circle is born.

Behind this lay however a key assumption about Latin American technological development that was later applied also to CEE. Namely, state enterprise (and by default, import substitution industrialization and planned economy respectively) have created inefficient and artificial industrial structure and specialization (i.e. arguments that not every country needs its own aero industry etc). Inefficiency is here clearly based on Ricardian comparative advantage thinking. Thus, Washington Consensus policies became essentially the vehicles to deliver industrial restructuring and, in particular in the case of CEE, replacement of what were perceived to be highly inefficient companies.

However, there were two essential problems ignored in devising such policies to deliver restructuring: First, integrating regions with relatively different levels of development will lead, as the classical development economists predicted, to unleashing of Vanek-Reinert effect and thus to serious de-industrialization. And second, not all (or even nearly majority) of foreign private lending went into domestic upgrading investment, but rather into consumption through financial institutions. This is again something predicted by Nurkse and others as demonstration effect: consumers in developing countries tend to emulate consumption patterns of developed countries (e.g. buying latest fashion mobile phones etc). Thus, increased financial fragility through deteriorating balance of payments is almost certain to accompany such policies. As Kregel argues about LA,

External financing of import-substituting investment, if successful, may improve a country's net trade balance in the long run, but it initially does not generate any additional foreign exchange earnings to meet debt service. In addition, increased domestic investment in consumption goods production will increase imports of foreign capital goods and the resulting increase in activity may stress domestic supply, also increasing imports of consumption goods and putting pressure on prices. (2008)

He goes on to conclude that

a rapid increase in external financing (much of which was not used for import substitution at all), such as the one that occurred in the 1970s, places a heavy burden on a country's balance of payments that can only be financed by increased foreign borrowing. This appears to have been the case in Latin America in the 1970s as increased borrowing was used to meet increasing debt service in a sort of Ponzi scheme. ... The problems that were faced by import substitution industrialization were caused as much by the inappropriate and potentially incendiary mix of financing domestic import substitution industrialization through private external financial flows as in the inherent difficulties in building sufficiently large domestic markets to support competitive domestic industry and avoid rent-seeking behavior. (2008)

Almost a quarter of a century later we see these phenomena being repeated in CEE all over again: fast growth in FDI in 1990s was accompanied by negative current account balances in all CEE countries (Tiits et al 2008) and by the mid-2000s all CEE countries experience strong consumption and real estate led boom that brings most of these countries on the brink of a Ponzi scheme. (See, e.g., Fitch 2007a, 2007b and 2007c) Indeed, most CEE countries are highly dependent on foreign investments and private borrowing (usually in foreign currency) and thus they are caught in a macroeconomic dead end with appreciating exchange rates, negative current account balances and growing private indebtedness. Thus, restructuring of industry in 1990s into a lower end outsourcing activities is accompanied by increased imports,

overvaluation of exchange rate and thus by financial fragility and loss of competitiveness.

Coupled with the change of techno-economic paradigm, Washington Consensus policies emphasising FDI-led growth have created for both LA and CEE a truly toxic situation where initially liability destruction was strong and quick but followed by slow asset creation. Thus, “the failure of the Consensus reform policies lies in the fact that they provided support for the ‘destruction’ of inefficient domestic industry, but failed to provide support for the ‘creative’ phase of ‘creative destruction’ of a real transformation of the productive structure through higher investment and technological innovation.” (Kregel 2008)

In sum, in our current context two observations are key: First, whatever its intellectual roots and its current health, the Washington Consensus became essentially the vehicle delivering the techno-economic paradigm change globally. Second, the main policy vehicles of the Consensus— such as financial globalization and FDI-based growth policies – have failed to deliver growth and instead magnify the negative effects of the ICT paradigm. In combination, both have huge impact on the way innovation takes place in many companies, especially in developing countries and poorer regions, and the way most countries see and define the policy space available to them.

Washington Consensus policies were highly effective in destroying admittedly outdated industrial capacities in the developing world, yet they were also similarly spectacularly ineffective in creating new capabilities and opportunities. Two poster countries for globalization, China and India, that together account for large part of developing country growth and poverty reduction, are also two distinct exceptions to rule as neither followed the Consensus policies as diligently as did many others.

The conclusions one can draw from this are mainly twofold: First, financial globalization in terms of capital account liberalization and increased reliance on foreign direct investments (FDI) have little correlation with actual sustained growth (see Rodrik and Subramanian 2008 summary of empirical studies and evidence); as argued above, FDI seems to create increasingly enclave economies. Second, emphasis on macro-economic stability has allowed for unprecedented growth in consumer spending and foreign private lending creating ‘Minsky moments’ of financial fragility in many developing countries in recent decades. (Minsky 1982 and 2008; Kregel 2004)

In addition, many of the successful industrial policy tools of the mass-production paradigm – state-led industrialization or import substitution industrialization – have been discredited and become politically tainted because of the Washington Consensus.

In sum, the international policy environment the Washington Consensus has created is a highly fertile ground for the negative effects of the techno-economic paradigm change to come into full force without counterbalancing it by domestic or international policy initiatives. We argue below that these effects are significantly compounded by innovation policies enacted in many developing countries, most notably in LA and CEE. These policies misunderstand the nature of restructuring that has taken place in CEE and LA.

III. 3 Innovation Policies in LA and CEE

The rise of China and India as key global players

is transforming current global patterns of technology generation and control. Multinationals outsourcing strategies are no longer merely based on existing comparative advantages of host countries. Alongside outsourcing of pure assembling activities, following the maquiladora pattern, multinationals are growingly expanding and internationalizing research and development activities in order to keep up with boosting demand for new technologies of emerging and dynamic future markets where adequate scientific and technological infrastructure, including the supply of qualified human resources exist. ... On the one hand rising China has the potential to wipe out the bulk of Mexican and Central America manufacturing exporting activities, i.e. the maquila industries (as it is currently happening), and on the other hand, the increasing tendency to outsource research and development to emerging markets may generate adverse incentives to carry out science and technology activities in the region, thus further underpinning regional backwardness in terms of technological upgrading potentialities. (Cimoli, Ferraz and Primi 2005, 12)

To fully be able to reap any benefits from international division of labor, CEE and LA countries need “effective national innovation systems that enable recipient economy to retain potential emerging benefits, to promote high level human capital formation on a continuum basis, to strategically manage intellectual property rights systems and to own capabilities of mastering physical and cultural distances with headquarters.” (Cimoli, Ferraz and Primi 2005, 13) This, in brief, is what respective innovation policies should aim at. However, as we will show in this section, both LA and CEE have not tackled these challenges in their innovation policies over the last decade.

While there are significant historical differences between CEE and LA, we argue that in both regions there was a convergence of innovation policy ‘best practice’ during 1990s. Table 2 summarizes the switch from one policy model to the other, currently prevailing one.

Table 2. Changes in innovation policy models.

Basic characteristics	Linear supply model	Linear demand model
Main perspective	Public sector as main S&T provider	Private sector as main S&T bargain hunter
Pattern of knowledge diffusion	Hierarchical	Non-hierarchical
Policy proposals	Selective and centralized supply S&T policies	Horizontal and demand boosting S&T policies
Management criteria of S&T institutions	Predominance of public sector and academies	Predominance of private sector and market mechanisms

Source: Cimoli, Ferraz and Primi 2005, 16.

While 1980s could be characterized both in CEE and LA as innovation policy models where state’s role in science, technology and R&D was highly important and central, it is clear that Soviet innovation policy was certainly more extreme in this model as it lacked market mechanisms and private initiative. The linear supply model, prevailing until the 1990s, is both highly hierarchical and deeply linear in its understanding of innovation: in this model, the latter thrive because of scientific discoveries and

advance. The key change shaping in late 1990s both in CEE and LA innovation policies is the switch toward market-based approach in a sense of both emphasis on competitive grants system as a organizational form of how funding agencies work and also in the sense of almost complete reliance on private sector initiative. The focus on few and large endeavors is replaced by a horizontal perspective and incentive based mechanisms rather than command and control are put into practice. Nonetheless, it is important to notice that both models persist in conceiving innovation as a linear process; the former inducing to an overlap of the concepts of innovation and information accessibility, and the latter supposing that technological dynamism is merely confined in the private and business sector domain.

In the linear supply model, knowledge and innovation were supposed to flow from government and public institutions (supply-side) to the productive apparatus (demand-side). The theoretical background of these science and technology policies derived from the assumption that knowledge was a public good, i.e. non rival and non excludable in consumption. From this perspective, government and public agencies were natural knowledge providers. Knowledge was supposed to naturally flow and circulate among economic agents once it had been slotted in the economic system by public institutions. In other words, there was a strong belief that scientific progress would automatically turn into technological innovation.

Starting from the nineties, the demand for technology became the main criteria in the definition of policy priorities and allocation of resources. The faith in market mechanisms resulted in neutral and horizontal policies planned to minimize state interference with market behavior. Main concerns were favoring of technology transfers, investments in quality and efficiency and the provision of technological services following a logic of “commercialization” of knowledge and technology (ECLAC 2004; Casalet 2003; Jaramillo 2003; Pacheco 2003; Vargas Alfaro and Segura Bonilla 2003; Yoguel 2003; Radosevic and Reid 2006; Tiits et al 2008) Such approach mimics in many ways innovation policies in developed countries and is often theoretically justified with market failure approach. (See, for instance, Rodrik 2007)

III.3.1 Innovation Policy in LA¹⁹

During the import substitution phase a linear supply model of technology policy prevailed. The research and development activities were mainly carried out by big public enterprises operating in strategic sectors like telecommunications and transport, and by public research institutes and universities working in the areas of agriculture, energy, mining, forestry and aeronautical, among others, thus manifestly following an selective industrial approach (ECLAC 2004). According to governmental priorities Latin American countries, especially the larger ones, started to build up research institutes and commissions in strategic sectors. In Argentina, for instance, the National Atomic Energy Commission (CNEA) was set up in 1954, followed by the National Institute of Industrial Technology (INTI) and the National Institute of Agricultural Technology (INTA) in 1957. Both were responsible for the provision of technology services (Yoguel 2003). Correspondingly, in Mexico the National Institute for Nuclear Research (ININ), the Electrical Research Institute (IIE),

¹⁹ This subsection is based on Cimoli, Ferraz and Primi 2005.

the Mexican Institute of Water Technology (IMTA) and the Mexican Petroleum Institute (IMP) were set up to promote technological innovation and development in the respective industries (Casalet 2003; ECLAC 2004). Consistently with a selective industrial focus, Brazil created a series of sectoral institutions. In the early fifties was established the Aerospace Technology Centre (CTA), while almost twenty years later, in 1973, was set up the Agricultural Research Enterprise (EMBRAPA). (See also Burlamaqui et al 2007)

According to the predominant logic of state intervention as an engine of growth, many public enterprises established their own research centers like ELETROBRAS' Electrical Energy Research Centre (CEPEL) and the Leopoldo Américo M. de Mello Research and Development Centre (CENPES) run by PETROBRAS (ECLAC 2004; Pacheco 2003).

The linear supply model contributed to the creation of S&T infrastructure, thus seeding into the basis for future technological upgrading. At the same time, the model was weak in coordinating different sectoral agencies leading to overlapping initiatives and consequent waste of resources (Capdevielle, Casalet and Cimoli 2000; ECLAC 2004; Yoguel 2003)

The linear supply model of science and technology policy came to an end with the structural reforms and a new and different model slowly emerged. Indeed, in the first years of the structural reforms the room for science and technology policy interventions shrank. During the initial years of reforms, S&T policy was simply marginalized in the management of economic policy. Slowly a change in perspective emerged and market mechanisms became the basic reference behind priority setting and resource allocation. S&T policies became neutral and horizontal in nature thus losing their previous selective makeup.

The science and technology policy model of the nineties emphasized the role of markets incentives and of demand side in priority setting. The support for technological upgrading and private sector innovation focused on areas where perceived market failures occurred; i.e. public policies priority was merely correcting information asymmetries between economic agents. This stance towards public policies meant placing knowledge and innovation on an equal footing with information accessibility. In effect, a conceptual linearity associated with the process of knowledge generation and technology diffusion persisted. Knowledge was supposed to follow bottom-up non-hierarchical pattern, in a setting where the key engine for innovation and knowledge generation is the autonomous initiative of the private sector expressing demands as a major technology booster (Cimoli and Primi 2004).

The shift towards the linear demand model of technology policy entailed institutional and organizational changes. The reorganization of the S&T institutional architecture brought about modification of domain areas and management styles of existing institutions as well as the creation of new institutional bodies. In Argentina, for instance, the restructuring of S&T institutional infrastructure led to an increase in coordination among different bodies, partly overcoming what represented a structural limit of the previous period. In Mexico, in turn, the priority was the decentralization

of S&T institutional management, according to the different technological and specialization patterns of various Mexican regions.

Beyond countries' peculiarities, the reorganization of institutions generally brought about:

i) increments in resources and in the relevance of those S&T agencies dedicated to capture private sector demand for technology and knowledge, ii) an incipient interest towards greater articulation and coordination between private and public sector, resulting in cross-countries augmented interest in universities-enterprises connections and, iii) changes in competencies and objectives of agencies. S&T priorities shifted from basic research to the provision and commercialization of technological services, mainly oriented to support production process management and quality control. Reward systems and management styles of S&T institutions changed as well, moving towards practices that are more in line with market mechanisms and incentive schemes, privileging performance based models of evaluation and allocation of priorities. Accordingly, the role of international financial institutions as source of financing for S&T augmented.

III.3.2 Innovation Policy in CEE²⁰

After the collapse of the Soviet Union, as we have argued above, the industry collapsed in many CEE countries and many S&T institutions experienced rapid decline in funding that led to collapse of academy of sciences system where research was not at universities but in specialized academy institutes. (See, e.g., Dobbins 2007) In innovation policy, we can detect three more or less distinct phases after the fall of Berlin Wall: First, early to mid 1990s are characterized by a clear lack of any policy initiatives in CEE, market-led reforms of economic restructuring were seen as the main innovation policy vehicles. Second, with opening of the accession talks with the European Union, CEE countries started to harmonize their legal and institutional infrastructure with the EU's *acquis communautaire* that led to significant changes in standardization (food and safety regulations etc) and thus spurred upgrading in many sectors. And third, with the beginning of EU's financial help (through such funding mechanisms as PHARE and pre-structural funds and later, from 2004 onwards, EU's structural funding) and largely because of EU's pressure, all CEE countries started to develop innovation policy strategies and increasingly also agencies (Radosevic and Reid 2006 offer a very good overview).²¹

Havlik et al. (2001) demonstrate that the adoption of the EU *acquis communautaire* has had a much stronger impact on the modernization of CEE industry than official (often rudimentary) innovation policy during 1990s. Here, we see essentially a form of "unconscious innovation policy", whereby, with the introduction of new regulation, the industry is forced to choose whether to modernize their products and production facilities rather drastically, to subject themselves to mergers with bigger players with greater economies of scale, or to close down altogether. However, it is important to note that such harmonization with Western European standards made outsourcing and relocation of production much easier. (See Tiits et al 2008, 76-77)

²⁰ This subsection builds on Tiits et al 2008.

²¹ CEE innovation policies and institutional framework is rather well documented in European Innovation Scoreboard 2006.

Similarly to LA, innovation and R&D policies emerging in CEE in late 1990s and in particular with looming EU accession in early 2000s, were rife with linear understanding of innovation and often in a rather mystified way. Innovation was seen as something close to science and invention, and that there is a more or less linear correspondence between scientific discovery and high innovation performance; and that innovations behave like Nokia's mobile phones and thus search for the latter became the holy grail of CEE innovation policy. Thus, and again similarly to LA, CEE innovation policies tend to concentrate on high technology sectors, on commercializing university research, technology parks for start ups etc. This is best reflected in policy measures that allocate the pre-structural and structural funds from the EU (in many cases this is the main funding source of innovation in CEE, indeed it can be argued that it has crowded out local funding as budgetary constraints and tax cuts are followed through; see Radosevic and Reid 2006 and Kattel and Suurna 2008 for the summary main strategic documents and policy measures). Existing policy measures and implementation agencies are rife with coordination problems (both within the public sector and between the public sector and private sector actors and education and S&T institutions).

However, particularly since mid 2000s there is a mild change towards including existing (low/mid-technology and outsourcing) industries into innovation policy making. In some countries, for instance Estonia, EU accession triggered a very significant policy change which brought innovation policy onto the agenda very strongly; in others, for instance in Slovenia and Hungary, the changes in policy focus occurred earlier and were more vocal. However, the changes were and are often accompanied by relatively little increase in actual funding and, as importantly, by relatively little public attention and discussion of policy strategy. The existing case studies seem to also reveal that the Regional Innovation Strategy initiatives have had an equally limited impact on the economic development of target regions. All in all, the policy analysis and strategic planning capacity existing in CEE at the regional level seem to be even weaker than policy intelligence at the national level (Euro-Coop 2007).

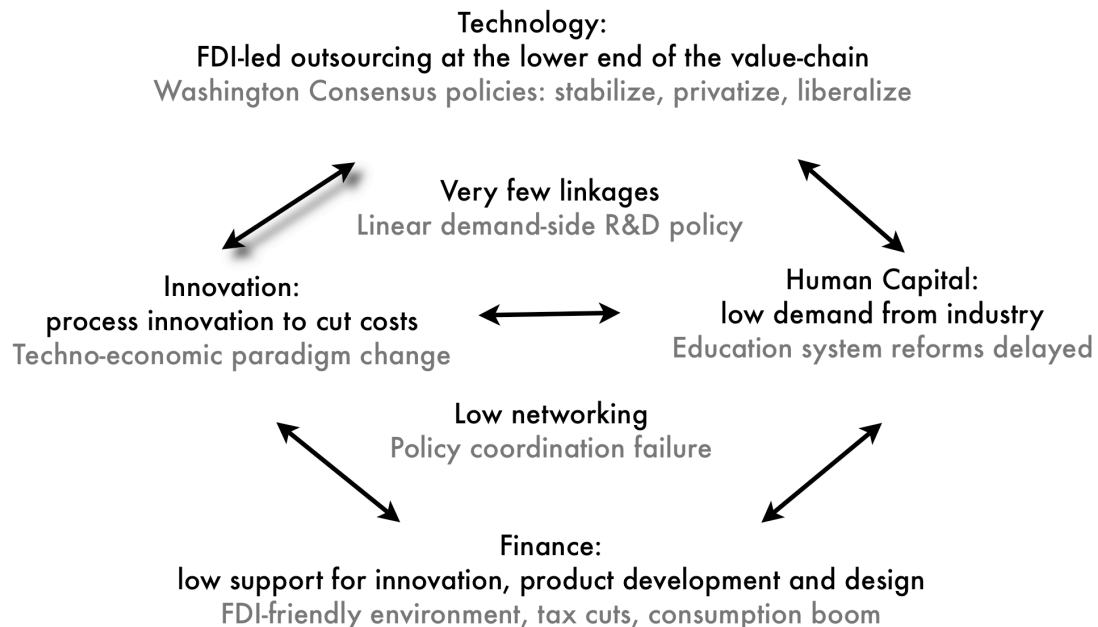
III.4 Summary

As we have seen both in LA and CEE innovation policy were in the early and mid-1990s plagued by what could be termed as a misunderstanding of innovation as something normatively and economically always positive. It is of course true that successful introduction of new products and services allows an enterprise with a relatively strong market position to sustain and strengthen its competitive position by commanding higher prices in a specific market. Yet since Hans Singer's (1950) work, it is quite clear that innovation can also have a negative impact, especially when one operates in a sub-contracting or services industry facing severe cost competition and diminishing returns. Particularly in agriculture and simpler services, innovation is often an emulation of competitors (e.g. using similar machinery) or a process readily available to all (e.g. ICT in hotel industry). These bring lower prices to consumers, but also a so-called "commodity hell" to many companies, to their wages and profits. This – essentially creative destruction management (Drechsler et al 2006) – was not at all heeded in innovation policies of LA and CEE in 1990s and 2000s. This lack was compounded by the decade long and still continuing 'celebration' of the industrial restructuring delivered through Washington Consensus policies. Indeed, few policy

makers have realized what are the real consequences of the industrial structuring of CEE and LA countries.

Figure 16 summarizes the stylized facts and key trends and policies in CEE and LA over the last decade and a half.

Figure 16. Stylized facts with corresponding key trends and policies.



Source: Authors' elaboration.

It is important to note how techno-economic paradigm ('common sense' how knowledge is created, organized and managed in companies) and the global macroeconomic environment created by the Washington Consensus policies are two key variables shaping what kind of companies thrive in the periphery and what kind of innovation takes place in many of these companies and, in sum, how both these developments impact local educational, R&D, S&T etc environment.

It is also important to note that many innovation and industrial policies actually enacted in LA and CEE deal with only fraction of the existing companies as the policies tend have a strong high-tech bias. At the same time, high technology is key characteristic of most sectors in LA and CEE.

In sum, both LA and CEE innovation realities and policies are characterized by following trends: first, the actual industrial restructuring and upgrading are driven by integration into wealthier economic areas (NAFTA and the EU, respectively) mainly through outsourcing; second, Nokiafication or high-tech bias of R&D policies that is based on linear understanding of innovation that assumes that the main goal for innovation policy is to find the one killer application a la Nokia is for Finland; third, main problems that both LA and CEE fail to address are: very weak networking within and between economic sectors, higher education and research; deficient policy design and administrative capacity that leads to coordination problems; and lack of actual industrial policies. (See also Guiliani et al 2004; Radosevic and Reid 2006) In sum, both CEE and LA have been unable to embed their economies into political and

institutional framework (see also McDermott 2002) and thus both are largely influenced by global macroeconomic environment and have little impact on local developments through their own policies.

We have argued that in many CEE countries there are strong changes towards more active role of the state in developing the existing industry since the EU accession; these changes are often taking place in discussion with the EU officials rather in local policy debates. However, more importantly, both LA and CEE innovation and industrial policy changes take place in macroeconomic policy environment that has not really changed since early 1990s. This environment is still based on the assumption that most of the industrial change that took place in 1990s in LA and CEE brought much better competitiveness to most countries and that the reasons lay in neoliberal policies that should be reinforced: lower taxes, balanced budget, lower inflation to lure more FDI to generate more exports. In fact, if we take into account the nature of industrial change described above, especially many CEE economies are close to high financial fragility. This means that LA and CEE countries need to not only rethink and reinforce role of the state and public funding in innovation and industrial policies, but moreover also in macroeconomic policy sphere.

IV Conclusion

The main conclusions of the paper are:

- 1) Given the way globalization negatively impacts both developing and developed countries, there is a clear need for some sort of reshuffling of the global rules of the game, that is global policy solutions. These solutions should enable creative destruction management (see further Kattel and Kalvet 2006b) both in the core and the periphery. For this to take place, developing countries need actively to engage in industrial policies. While this is not a novel insight (see, for instance also Reinert 2007, Rodrick 2007), we argue that current innovation and industrial policies in the developing countries such LA and CEE are in many cases outright counterproductive to their and global development.
- 2) It remains quite unclear how to target (with what policies and what kind of administrative and management set-up) networking and diversification in the periphery. However, from the LA and CEE experience in 1990s and 2000s it seems quite clear that innovation and industrial policies need to be 1) based on sector specific approach, 2) aim to create balance between home and foreign markets in terms of target markets, investments and also management.

References

- Amsden, Alice. 2007. *Escape from Empire. The Developing World's Journey Through Heaven and Hell*. Cambridge, MA / London: The MIT Press.
- Bergson, Abram. 1978. *Productivity and the Social System – The USSR and the West*. Cambridge, MA: Harvard University Press.
- Berliner, Joseph S. 1976. *The Innovation Decision in Soviet Industry*, Cambridge, MA: Harvard University Press.
- Burlamaqui, Leonardo, Jose A. P. de Souza and Nelson H. Barbosa-Filho. 2007. “The rise and halt of economic development in Brazil, 1945-2004: Industrial catching-up, institutional innovation, and financial fragility.” In Ha-Joon

- Chang, ed., *Institutional Change and Economic Development*. London: Anthem, 239-259.
- Casalet, M. 2003. "Políticas científicas y tecnológicas en México: evaluación e impacto", FLACSO, sede México.
- Capdevielle, M., M. Casalet and Mario Cimoli. 2000. "Sistema de innovación: el caso mexicano", Proyecto Instituciones y mercados, Comisión Económica para América Latina y el Caribe (CEPAL)/Sociedad Alemana de Cooperación Técnica (GTZ).
- Chang, Ha-Joon. 2007. *Bad Samaritans. Rich Nations, Poor Policies & the Threat to the Developing World*. London: Random House.
- Cimoli, Mario, ed. 2000. *Developing innovation system: Mexico in the global context*. New York-London: Continuum-Pinter Publishers.
- Cimoli, Mario and J. Katz. 2003. "Structural reforms, technological gaps and economic development: a Latin American perspective", in *Industrial and Corporate Change*, 12, 2, **-**.
- Cimoli, Mario and Annalisa Primi. 2004. "Las políticas tecnológicas para la creación y difusión del conocimiento en América Latina y el Caribe", mimeo, División de Desarrollo Productivo y Empresarial, CEPAL.
- Cimoli, Mario, João Carlos Ferraz and Annalisa Primi. 2005. *Science and technology policies in open economies: The case of Latin America and the Caribbean*. Santiago: ECLAC, available at www.cepal.org.
- Drechsler, W., Backhaus, J.G., Burlamaqui, L., Chang, H.-J., Kalvet, T., Kattel, R., Kregal, J., and Reinent, E.S. 2006. "Creative destruction management in Central and Eastern Europe: meeting the challenges of the techno-economic paradigm shift." In T. Kalvet and R. Kattel, eds., *Creative destruction management: meeting the challenges of the techno-economic paradigm shift*. Tallinn: PRAXIS Center for Policy Studies, 15-30.
- Dobbins, M. 2007. "Comparing higher education policies in central and Eastern Europe", Working Paper ECPR Joint Session, Helsinki, Finland.
- ECLAC. 2004. *Productive development in open economies*, LC/G.2234(SES.30/3, Santiago, Chile.
- European Innovation Scoreboard. 2006. Available from: http://www.proinno-europe.eu/doc/EIS2006_final.pdf.
- Fitch. 2007a. *Risks rising in the Baltic States?* Special report, 6 March.
- Fitch. 2007b. *Bulgaria, Croatia, Romania – how sustainable are external imbalances?* Special report, 20 March.
- Fitch. 2007c. *The Baltic states: risks rising in the trailblazers of emerging Europe?* Special report, 8 June.
- Frost, A and M. Weinstein. 1998. "ABB Poland." *Richard Ivey School of Business*. The University of Ontario.
- Gallagher, Kevin P. and Lyuba Zarsky. 2007. *The Enclave Economy. Foreign Investment and Sustainable Development in Mexico's Silicon Valley*. Cambridge, MA: The MIT press.
- Gerardo Bracho C. and Julio López G. 2005. *The Economic Collapse of Russia*, available at networkideas.org.
- Giuliani, Elisa, Carlo Pietrobelli and Roberta Rabellotti. 2005. "Upgrading in Global Value Chains: Lessons from Latin American Clusters." *World Development*, 33, 4, April, 549-573.

- Havlik, P., Landesmann, M., Stehrer, R., Römisch, R., and Gilsätter, B. 2001. *Competitiveness of industry in CEE candidate countries: composite paper*. Vienna: Vienna Institute for International Economic Studies.
- Jaramillo Salazar, H. 2003. "Políticas científicas y tecnológicas en Colombia: evaluación e impacto durante la década de los noventa", Trabajo realizado para la CEPAL, Bogotá, Colombia.
- Kattel, R. and Kalvet, T. 2006a. *Knowledge-based economy and ICT-related education: overview of the current situation and challenges for the education system*. Tallinn: PRAXIS Center for Policy Studies.
- Kattel, Rainer and Tarmo Kalvet, eds. 2006b. *Creative Destruction Management: Meeting the Challenges of the Techno-Economic Paradigm Shift*. Praxis Center for Policy Studies, Tallinn.
- Kattel, Rainer and Margit Suurna. 2008. "Europeanization of Innovation Policy in Central and Eastern Europe." Paper prepared for EGPA 2008 conference; manuscript.
- Kattel, Rainer, Tarmo Kalvet and Tiina Randma-Liiv. 2009. "Small States and Innovation." In Robert Steinmetz, Baldur Thorhallsson and Anders Wivel, eds., *Small States inside and outside the European Union: The Lisbon Treaty and Beyond*, publisher tbc, forthcoming.
- Kosta, Jiri. 2005. *Die tschechische/tschechoslowakische Wirtschaft im mehrfachen Wandel*, Münster: LIT Verlag.
- Kovacs, Janos Matyas and Marton Tardos, eds. 1992. *Reform and Transformation in Eastern Europe*, London and New York: Routledge.
- Kregel, J. E. Matzner, G. Grabber. (1992. *The Market Shock. An AGENDA for the Economic and Social Reconstruction of Central and Eastern Europe*. Austrian Academy of Sciences / International Institute for Peace, Ann Arbor: University of Michigan Press.
- Kregel, Jan A. 1999. "Currency stabilization through full employment: Can EMU combine price stability with employment and income growth?" *Eastern Economic Journal*, 25, 1, 35-47.
- Kregel, J., 2004. "External financing for development and international financial instability." G-24 Discussion Paper Series, United Nations. Available from: http://www.unctad.org/en/docs/gdsmdpbg2420048_en.pdf.
- Kregel, J. A. 2008. "The Discrete Charm of the Washington Consensus." The Levy Economics Institute of Bard College Working Paper No 533. Available at http://www.levy.org/pubs/wp_533.pdf.
- Krugman, Paul. 2008. "Trade and Wage, Reconsidered", available at <http://www.princeton.edu/~pkrugman/pk-bpea-draft.pdf>.
- Lorenz, Edward and Bengt-Åke Lundvall, eds. 2006. *How Europe's Economies Learn*, Oxford: Oxford University Press.
- Euro-Coop. 2007. *Report about data collection in the partner regions*. Available at <http://www.iccr-international.org/euro-coop/>.
- Margoliu, Ivan and Charles Meisl. 1992. *Skoda*, London: Osprey.
- McDermott, Gerald A. 2002. *Embedded Politics. Industrial Networks and Institutional Change in Postcommunism*. Ann Arbor: University of Michigan Press.
- McDermott, Gerald A. 2005. "The Politics of Institutional Renovation and Economic Upgrading: Lessons from the Argentine Wine Industry", available at <http://www-management.wharton.upenn.edu/mcdermott/files/McDermott-PS-10-06.pdf>.

- Minsky, Hyman P. 1982. *Can 'It' Happen Again? Essays on Instability and Finance*. New York: Sharpe.
- Minsky, Hyman P. 2008. *Stabilizing an Unstable Economy*. New York: McGraw/Hill.
- Mortimore, M and Peres, W. 2001. "La competitividad empresarial en América Latina y el Caribe", *revista de la CEPAL*, n. 4, agosto 2001.
- Nurkse, Ragnar. 1961. *Equilibrium and Growth in the World Economy*. Gottfried Haberler and Robert M. Stern, eds., Cambridge, MA: Harvard University Press.
- Pacheco, C. 2003. "As reformas da Política Nacional de Ciência Tecnologia e inovação no Brasil, 1999- 2002", Trabajo realizado para la CEPAL, Campinas, Brasil.
- Palma, Jose Gabriel. 2005. "The seven main 'stylized facts' of the Mexican economy since trade liberalization and NAFTA," *Industrial and Corporate Change*, 14, 6, 941-991.
- Perez, Carlota. 2002. *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*, Cheltenham, UK: Edward Elgar.
- Perez, Carlota. 2004. "Technological Revolutions, Paradigm Shifts and Socioinstitutional Change", in E.S. Reinert (ed.), *Globalization, Economic Development and Inequality: An Alternative Perspective*, Cheltenham, UK: Edward Elgar, pp. 217-242.
- Perez, Carlota. 2006. "Respecialisation and the deployment of the ICT paradigm: An essay on the present challenges of globalization", in Compañó et al. (eds.), *The Future of the Information Society in Europe: Contributions to the debate*, Seville, Spain, European Commission, Directorate General Joint Research Centre.
- Pisani-Ferry, Jean, Philippe Aghion, Marek Belka, Jürgen von Hagen, Lars Heikensten and Andre Sapir. 2008. *Coming of age: Report on the euro area*. Bruegel Blueprint Series. Available <http://www.bruegel.org/6062>.
- Prahalad, C. K. 2006. "The Innovation Sandbox", strategy+business, available at <http://www.strategy-business.com/press/freearticle/06306>.
- Radosevic, S. and D.E. Yoruk. 2001. *Videoton: The growth of enterprise through entrepreneurship and network alignment*, University College London, Center for the Study of Economic and Social Change in Europe, Working Paper No. 3.
- Radosevic, Slavo and Alastair Reid. 2006. "Innovation Policy for a Knowledge-based Economy in Central and Eastern Europe: Driver of Growth or New Layer of Bureaucracy?" In K. Piech and S. Radosevic (eds.), *Knowledge-Based Economy in Central and East European Countries: Countries and Industries in a Process of Change*, Basingstoke: Palgrave Macmillan, 295-311.
- Reinhardt, N. and Peres, W. 2000. "Latin America's new economic model: micro responses and economic restructuring", *World Development*, 28(9).
- Reinert, Erik S. 1980. *International Trade and the Economic Mechanisms of Underdevelopment*, Cornell University PhD thesis.
- Reinert, Erik S. 2007. *How Rich Countries Got Rich . . . and Why Poor Countries Stay Poor*, London: Constable.
- Erik S. Reinert, Yves Ekoué Amaïzo and Rainer Kattel, *The Economics of Failed, Failing and Fragile States: Productive Structure as the Missing Link*. 2008. The Other Canon Foundation and Tallinn University of Technology Working Papers in Technology Governance and Economic Dynamics, forthcoming.

- Reinert, Erik S. and Rainer Kattel. 2007. "European Eastern Enlargement as Europe's Attempted Economic Suicide?" *The Other Canon and Tallinn University of Technology Working Papers in Technology Governance and Economic Dynamics*, no 14.
- Rodrick, Dani. 2007. *One Economics, Many Recipes. Globalization, Institutions, and Economic Growth*. Princeton: Princeton University Press.
- Rodrick, Dani and Arvind Subramanian. 2008. "Why did Financial Globalization Disappoint?", available at http://ksghome.harvard.edu/~drodrick/Why_Did_FG_Disappoint_March_24_2008.pdf
- Samuelson, Paul A. 2004. "Where Ricardo and Mill Rebut and Confirm Arguments of Mainstream Economists Supporting Globalization", *Journal of Economic Perspectives*, 18, 3, 135-146.
- Skidelsky, Robert. 2008. "Gloomy about Globalization". *New York Review of Books*, 55, 6, April 17, 2008, available at <http://www.nybooks.com/articles/21259>.
- Singer, H., 1950. "The distribution of gains between investing and borrowing countries." *American economic review*, 40 (2), 473-485.
- Stokes, Raymond G. 2000. *Constructing Socialism. Technology and Change in East Germany 1945-1990*, Baltimore and London: Johns Hopkins University Press.
- Tiits, Marek, Rainer Kattel, Tarmo Kalvet and Dorel Tamm. 2008. "Catching up, forging ahead or falling behind? Central and Eastern European development in 1990-2005," *Innovation. The European Journal of Social Science Research*, 21, 1, 65-85.
- UNCTAD. 2004. *Development and Globalization: Facts and Figures*, New York and Geneva.
- Vargas Alfaro, L. and Segura Bonilla, O. 2003. "Políticas industriales, científicas y tecnológicas en Costa Rica y Centro América", Centro Internacional en Política Económica para el Desarrollo Sostenible (CINPE), Universidad nacional, Hereida, Costa Rica.
- Williamson, J. 2002 (1990). What Washington Means by Policy Reform. Available at <http://www.iie.com/publications/papers/paper.cfm?ResearchID=486>.
- World Bank. 2006. *Economic Growth in the 1990s: Learning from a Decade of Reform*. Washington, D.C.: World Bank.
- Yoguel, G. 2003. "La política científica y tecnológica argentina en las últimas décadas: algunas consideraciones desde la perspectiva del desarrollo de procesos de aprendizaje", Trabajo realizado para la CEPAL, Buenos Aires, Argentina.
- Young, A. 1994. "Gerber Products Company: Investing in the New Poland." Harvard Business School case study.