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The appealing win-win game behind the EU-CELAC bi-regional cooperation in Science, Technology and Innovation and the Academic Summits

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The main purpose of EU-CELAC Academic Summits is not just to cooperate better in higher education and scientific policies but rather to spur and feed the bi-regional cooperation to face the socio-economic challenges that these two likeminded regions that share the same social values could meet better together. Such a strengthening of cooperation in many areas has to be given priority to the integration of their respective national system of innovation and of higher education as well as to a shared effort for reducing the gap between universities and enterprises, especially for their SMEs.

The Third Academic Summit was held in Cordoba from 12 to 17 April 2018 at the invitation of the National University of Cordoba (Argentina). One of the main objectives of this event is to promote the convergence of systems of science, technology and innovation; with a special sesión dedicated to these three áreas. In this session on Science, Technology and Innovation we consider very important to insert our bi-regional and inter-university exchanges in a broader framework to contribute to the identification of the priorities for actions. The purpose of this intervention is limited to suggesting such an overall scheme to improve the debates and the definition of priorities. We don't deal here with the obvious need to spur R&D, innovation and human capital but with the need for incorporating these tools into an analytical framework which indicates the strategic win-win game of bi-regional cooperation oriented towards academic and innovation areas.

The proposed framework is simple and could be presented in a nutshell to policymakers by drawing their attention upon the fact that the urgent need for recovering a higher path of growth for productivity in both regions could be better satisfied by an acceleration of the bi-regional cooperation between universities in order to reduce their gaps with the SMEs and accelerate the diffusion of innovation and technologies in the whole economies. Most of the lagging productivity in both regions come from the insufficient diffusion of technology (mainly in the service and logistic sectors) rather than at the technological frontier and adopting a bi-regional approach allows for exploiting differences and triggering fast synergies to close the gap between the frontier firms and most other firms and sectors.

Let's analyze synthetically the facts upon which this thesis relied and the relations between productivity enhancement and bi-regional cooperation.

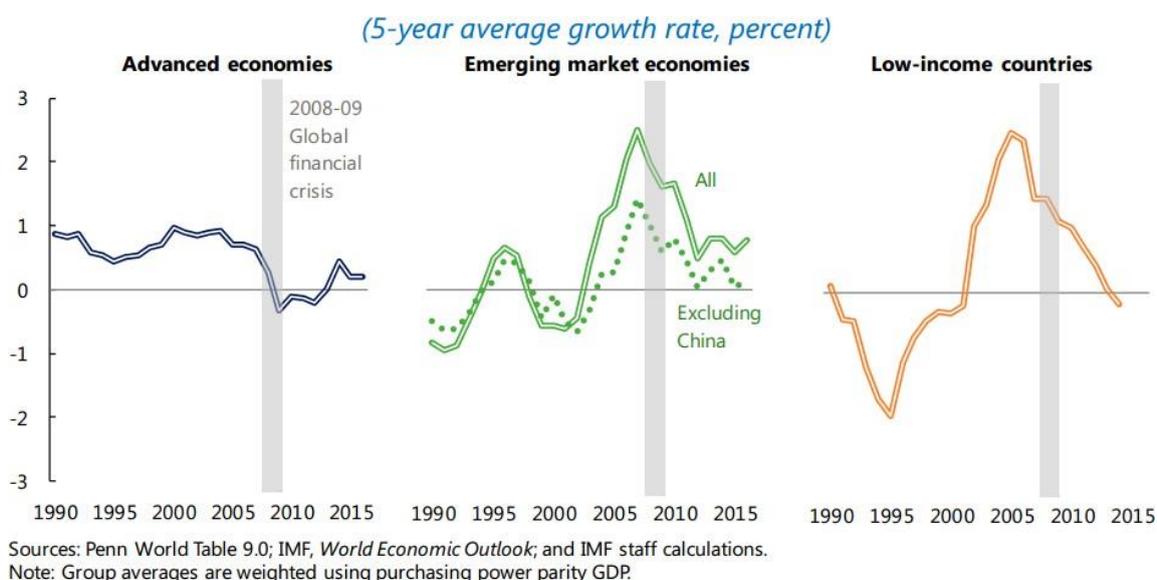
1. The global cancer of the present productivity slowdown

It is an amazing phenomenon that the driving engine of socio-economic prosperity is in trouble and about to stop. In spite of intense debates about possible measurement errors and alternative thesis for giving explanations, facts are more powerful than economists: the total factor productivity is on a downward trend everywhere and approaching stagnation! However, the paradoxical aspect of this reality makes citizens not yet aware of the problem since new technologies and digitalization give to public opinion the feeling of an acceleration of progress and even a threat for their own jobs and rents. Populism draws especially upon these fears to overthrow incumbent governments and intellectual elites, as shown by Trump's elections, Brexit vote, Italian 2018 elections and others are planning to do it. These emotional reactions to changes, although expressing legitimate questions, are channeled to illusionary answers which are about to worsen even more the lack of growth of productivity in our economies.

The adequate concept and measure is that of “**total factor productivity**” – **TFP** - (or multi-factor productivity) i.e. the growth of output produced in an economy that is relative to the growth of inputs required to produce that output. It therefore provides a simple but powerful indicator of economic efficiency or “cost reduction” for an economy as a whole. Specifically, it is calculated as a residual between the output growth and the identified input growth: the total factor productivity growth is derived by calculating the growth in domestic output unexplained by the growth in all inputs in the production process, not just labor which benefits from the contribution of the other factors. It is the only sustainable source of long-term economic growth and social progress. Without productivity growth, an economy will slowly grind to a halt and to social and financial troubles. It is the only growth factor that does not suffer from diminishing returns as homogeneous inputs typically do. TFP growth represents the so-called externalities, which arise from technological progress and innovation.

According to IMF estimations and data for TFP from 1990 to 2016 (chart 1), the slowdown in productivity is generalized and parallel in advanced economies, the emerging ones and less developed countries. This downward trend had started before the global financial crisis in advanced economies, but since this past crisis, it has been observed everywhere and it is now worrying with a growth rate close to zero in advanced economies and less developed ones, but also in the emerging economies without China. The EU is affected too, even more than the US economy. The CELAC region is suffering from a longer and deeper stagnation, which, according to convergent alternative models for measuring TFP, indicates that the region has not been registering any growth since the end of the 1990s.

Chart 1: Total Factor Productivity (TFP) Growth 1990-2016



Source: IMF Staff Discussion Note, April 2017, *Gone with the Headwinds: Global Productivity*, Gustavo Adler, Romain Duval, Davide Furceri, Sinem Kiliç Çelik, Ksenia Koloskova, and Marcos Poplawski-Ribeiro,

According to IMF analyses, this marked deceleration in TFP growth contributed on average to about 40 percent of the output loss in advanced economies, explaining significantly the difficulties for returning to a higher growth path.

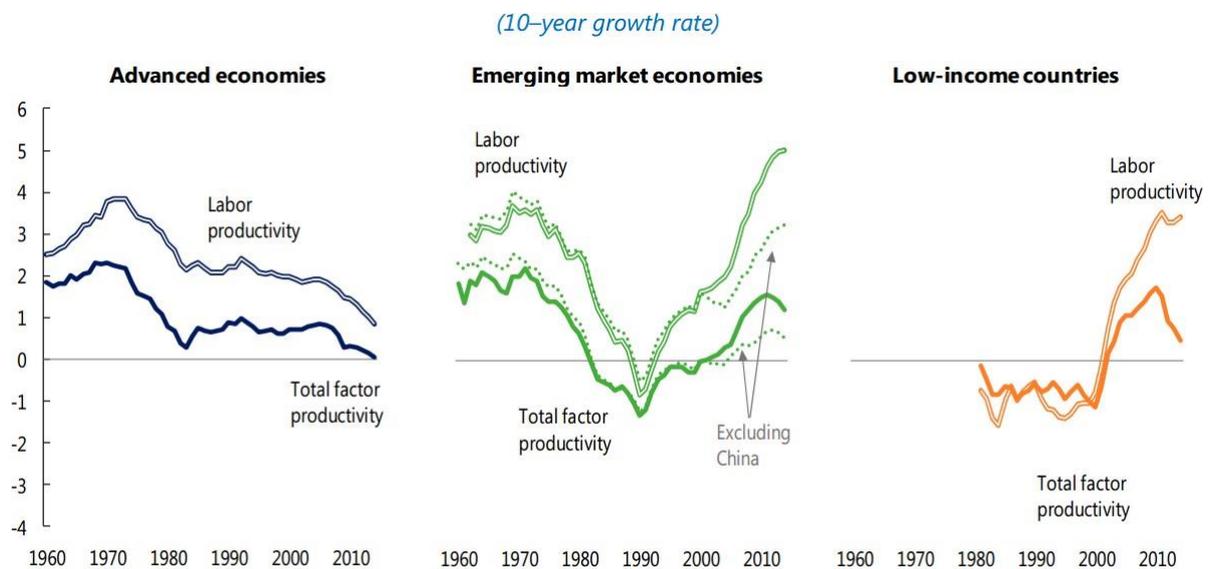
If sustained, low productivity growth would have profound adverse implications for progress in global living standards, the sustainability of private and public debts, social protection systems, and the ability of macroeconomic policies to respond to future shocks and to the ageing costs.

Of course, there are running discussions about possible mismeasurement issues, especially related to the increasing importance of ICT related services and products, as they may not be properly accounted for in national accounts statistics. Nevertheless, evidence so far indicates that, while mismeasurement exists—including because TFP is measured as a residual after all—it is unlikely to account for the magnitude of the observed general slowdown in TFP growth¹, all the more that these statistical errors tend to cancel out across sectors and by aggregating economies in bigger areas. Furthermore, the most significant error comes from an unmeasured aspect that reduces effective productivity much more: the fact that non-renewable resources and factors are totally ignored in absence of reliable

¹ Indeed, underestimation of GDP growth is not in doubt, but a stable measurement error in the GDP growth rate would not cause productivity growth to slow. The appropriate question is not that errors do exist but to know whether measurement error got larger around the time the estimated rate of productivity growth slowed. Some sophisticated empirical works were done for adding all the possible adjustments for taking on board underestimation of the US GDP growth (quality improvements, free access to information, new services provided by internet, re-domiciliation of intellectual royalties for fiscal optimization, unmeasured investment in intangible assets, decline in input prices as a result of outsourcing, measurement error in the deflators for computers and communication equipment etc.), but the change in measurement error accounts for less than one-tenth of the slowdown in the United States productivity growth rate. See Byrne, Fernald, and Reinsdorf (2016)

green GDP measures. Considering the negative spillovers (i.e. negative output reducing effective value added) of our production process, it makes productivity considerably lower and decreasing. In a longer-term perspective, the phenomenon is even much more pronounced as shown by conventional measures and our Charts.

Chart 2: Long-term view of Total Factor Productivity Growth, 1960–2014



Sources: Penn World Table 9.0; IMF, *World Economic Outlook*; and IMF staff calculations.

Note: Purchasing power parity GDP weighted average of largest 20 economies per income group is reported.

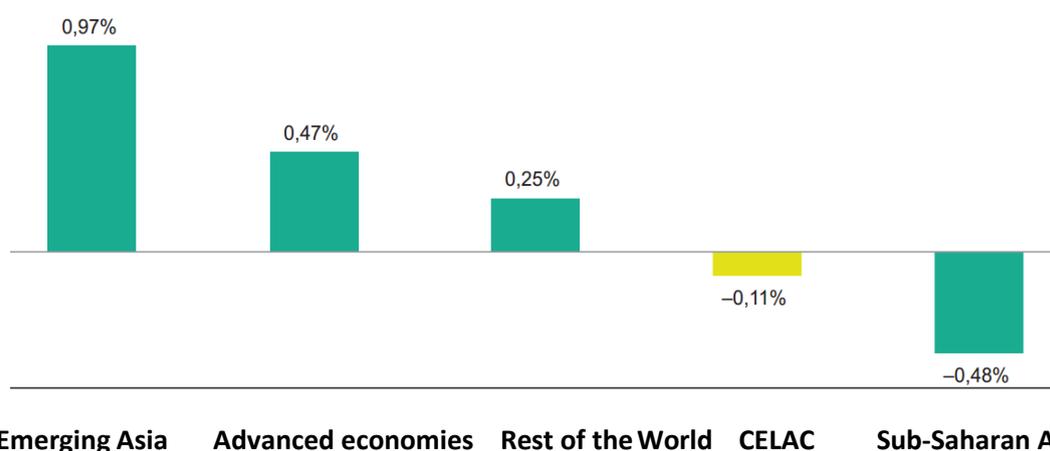
Source: IMF 2017, op. cit.

Therefore, the visible stagnation or downturn in TFP should become a top priority for all policymakers.

2. TFP performance for CELAC region in Comparison with other groups of economies

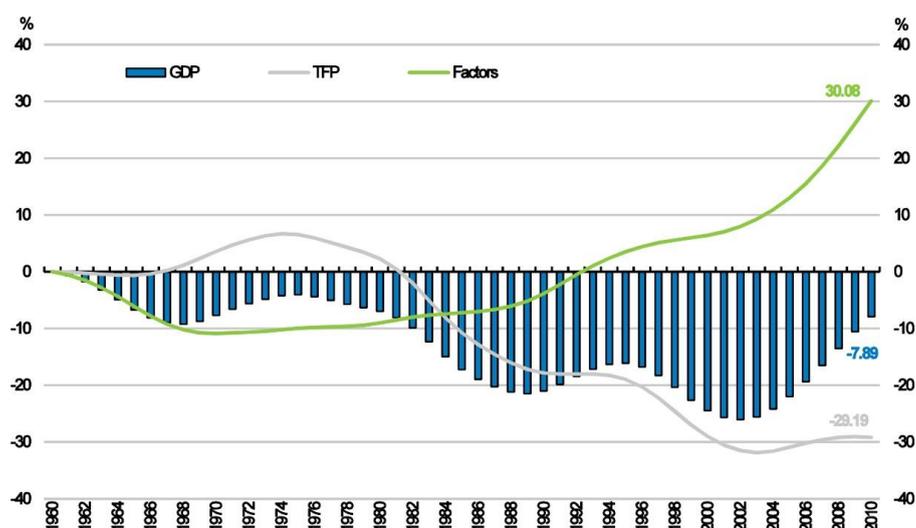
CELAC economies are also affected by the same cancer as other regions but at a higher degree of toxicity. During the same long-term period as shown in Chart 2, the TFP growth for the CELAC economies is even worst since it is negative (-0.11% per year), only the very poor region of Sub-Saharan Africa registers a worse performance (-0.5%). Chart 3 shows the annual TFP growth rate for the period 1960 to 2017.

Chart 3: CELAC region - Long-term annual growth rate of Total Factor Productivity Growth, 1960–2014



Source: IDB, Informe macroeconómico de América Latina y el Caribe de 2018 (Penn Tables)

Chart 4: CELAC region, relative evolutions of GDP, TFP and Factors accumulation with respect to the US economy 1960-2010



Source: OECD, *Boosting Productivity and Inclusive Growth in Latin America*, 2018, taken from Fernandez Arias 2014

This very poor performance of long-run TFP growth translates or “explains” statistically the impossibility for CELAC economies, as a whole, to catch up with the advanced economies and to follow the emerging ones. The observed growth rate for the GDP of CELAC area is the result of an improvement of labor absorption (demographic dividend and women inclusion i.e. more productive workers) and human capital (better education) combined with an investment increase. However, these efforts were more than compensated by a loss in efficiency i.e. the bad TFP performance (30% less than the US). Alternatively, this appears also in the fact that in the CELAC region, any additional investment yields less than in the advanced economies or the emerging ones. For example, in South Korea the capital stock increased two times faster than GDP between 1960 and 2017 while in Brazil the capital stock increased three times faster than GDP for the same period. But this gap in “capital deepening” is not due to a better effort of investment in Brazil with respect to Korea, but to a lower growth of GDP for the same effort of investment i.e. to a lower efficiency of Brazilian economy, apart from that in Brazil, labor inputs also contributed positively to output increases. The IDB² calculated that if the CELAC would have invested at the same rate than in Emerging Asia (+7% in CELAC investment ratio) and if the efficiency of the investment would have been the same (capital output ratio of 3.5 versus 5 in CELAC), the level of CELAC GDP would be six times higher in 2017 than the observed GDP of 2017.

The diagnostic appears clear: the CELAC economies as a whole are less efficient than the advanced and emerging economies, their scarce resources dedicated to investment are more wasted than elsewhere, and in the next future the demographic dividend as well as the environment’s deterioration are about to turn into additional negative factors for growth. A radical change is needed both for reversing the general slowdown in TFP and for solving the specific inefficiency of the CELAC economies.

Before considering any possible options for meeting this double challenge, a reference framework needs to be set up in order to identify the mechanisms or relation at work which determines TFP.

3. What do economic theory and empirical results tell about TFP determinants and the observed global slowdown?

Total productivity reflects economic efficiency. Efficiency depends on a lot of identified factors that we could group in three interrelated categories:

1. Human capital, physical capital, intangible capital (R&D).
2. Innovation and the ability to adopt and implement it.
3. Institutional factors like the governance quality ensuring to fight against rent-seeking and distortion of competition and implementing the rule of law with macroeconomic stability and security, which in turn acts upon social cohesion, both explaining investment (factors 1) and accumulation of knowledge as well as the adoption of new technologies (factor 2).

Recent researches on productivity slowdown allow for understanding the mechanism of this slowdown which is not so mysterious as it seems at first glance when combining the three mechanisms synthetically described below:

First, the global financial crisis and its transformation into a real crisis created adverse conditions upon investments (tightening credit conditions for corporates with vulnerable balance sheets, lower

² IDB 2018, Informe macroeconomico... op. cit.

demand prospects with heightened financial, economic and policy uncertainty), this implies automatically a slower capital-embodied innovation and intangible investment (R&D expenditure becomes pro-cyclical) which directly affects productivity growth and indirectly by hampering the optimal resource reallocation across industries (that is, disproportionately larger contractions of high-productivity sectors, market dislocations and also higher uncertainty is found to lower the share of ICT in total capital in industries that depend more on external finance).

Second, in a longer-term view, the slowdown already visible before the crisis—especially in advanced economies—is driven in part by the waning of the ICT revolution and slower innovation (there is a clear fading ICT-related boom, with negative spillovers on TFP both intra-sectors through competition effects, and inter-sectors through quality of inputs for other sectors), population aging (there is also a negative relation between the age structure of the working population and TFP growth), slowing global trade (International trade grew twice as fast as GDP before the global crisis and is barely keeping pace with global GDP after 2012, reducing competition effects and innovation needs) increased income inequality and lower human capital formation.

Third, a significant reason – especially for the EU and the CELAC economies - for the loss of momentum in TFP relies in the slowing of the pace at which innovations spread throughout economy: a breakdown of the diffusion mechanism. Indeed, a striking fact to emerge is that the productivity growth of the most productive firms globally remained robust in the XXI t century but the gap between those high productivity firms and the rest has risen.

4. The common features between the EU and CELAC performances in TFP

The EU and CELAC regions share the same TFP disease as the rest of the world, but with a common distinctive feature with respect to the US economy. When comparing the EU to the US TFP growth, the main part of the European lag comes from the lower productivity performance in European service sectors, as a result of low competitive pressures and heterogeneous regulations which blunt the incentives to adopt best practices. When comparing the CELAC economies with the US and the EU ones, this disadvantage is even bigger and constitutes a major obstacle to the catching-up process and the necessary improvement in their competitiveness for facing the global and social challenges their economies are condemned to solve quickly. Inefficiencies come mainly from services but are also affecting manufacturing since in globalization the competition in tasks (not any more in products) makes efficient services the key for participation to Global Value Chains (GVCs). Inefficiencies in services result from distortions in incentives for innovation and protection rules favorable to inefficient firms, both in the CELAC and the EU. But with big differences between the EU and the CELAC. These differences offer a wonderful opportunity for bi-regional alliances and cooperation, mutually beneficial. TFP potential growth is enormous for both regions by organizing technological transfer between the EU and the CELAC in a strategy for SMEs joint competitiveness on GVCs.

This handicap in services is really the key of the needed productive transformation the CELAC economies (as well as the EU ones) requires. Services, in the broadest sense, including the logistic and infrastructures ones, are the basic determinants of a fruitful and dynamic participation to Global Value Chains (GVCs) which would allow the increase of TFP and so putting both regions on a higher growth path.

In fact, this common feature to the EU and the CELAC economies is linked to the third mechanism above, the weakening diffusion mechanism of innovation to the whole economy. The reasons are very complex and very different from one region (or country) to the other, however it is interesting to try to apply to them the same analytical scheme in order to identify common issues from idiosyncratic specificities. The lagging TFP in the CELAC should not be a surprise as the diffusion mechanism is precisely what characterized an emerging economy while the so-called “under-development trap” impedes this diffusion and maintains dualistic features inside the same economy. In the CELAC economies, the diffusion mechanism seems especially impaired by the vicious circles of exclusion which are typical of poorer countries. In the EU, the breakdown of the diffusion mechanism cannot be explained by under-development but is due to policies and rent-seeking attitudes which lead to stagnation and economic decline.

With regard to the two first mechanisms presented above in section 3, the impact of the global crisis has played the same role in both regions for dampening the TFP progress through less investment and less innovation. The remedies are very similar but in the EU they deal more with the technological frontier firms and sectors. Since the CELAC economies are much less present at the frontier (top technological firms and sectors), the priority for the CELAC economies is merely to concentrate efforts where the results on TFP should be the highest and the cheapest i.e. to focus their efforts towards the third mechanism: to raise the productivity of laggard firms and to accelerate the technological diffusion to the whole economy, to SMEs and to the labor force, something that necessarily involves universities. The technological gap is not only much easier and faster to close for the followers than for the leaders, but it is a prerequisite for climbing the production chains up to acquiring leading roles. Indeed, the spillovers across firms and sectors are increasing with the catching-up process and are two-ways: modernization by importing leader technology opens the road to local innovation and diversification of technology, creating specific “niches” inside the Global Value Chains (GVCs).

This general predicament is of course easy to say but it takes its attractive operational sense by considering what the bi-regional cooperation could bring inside the strategic alliance that both regions pretended to build together. The major objective should be to dedicate this alliance for improving their joint competitiveness in the globalized world by cooperating to increase the diffusion mechanism for reducing their respective productivity gaps with the technological frontier and the top-firms.

5. Some key-weaknesses in CELAC economies which explain the lagging TFP

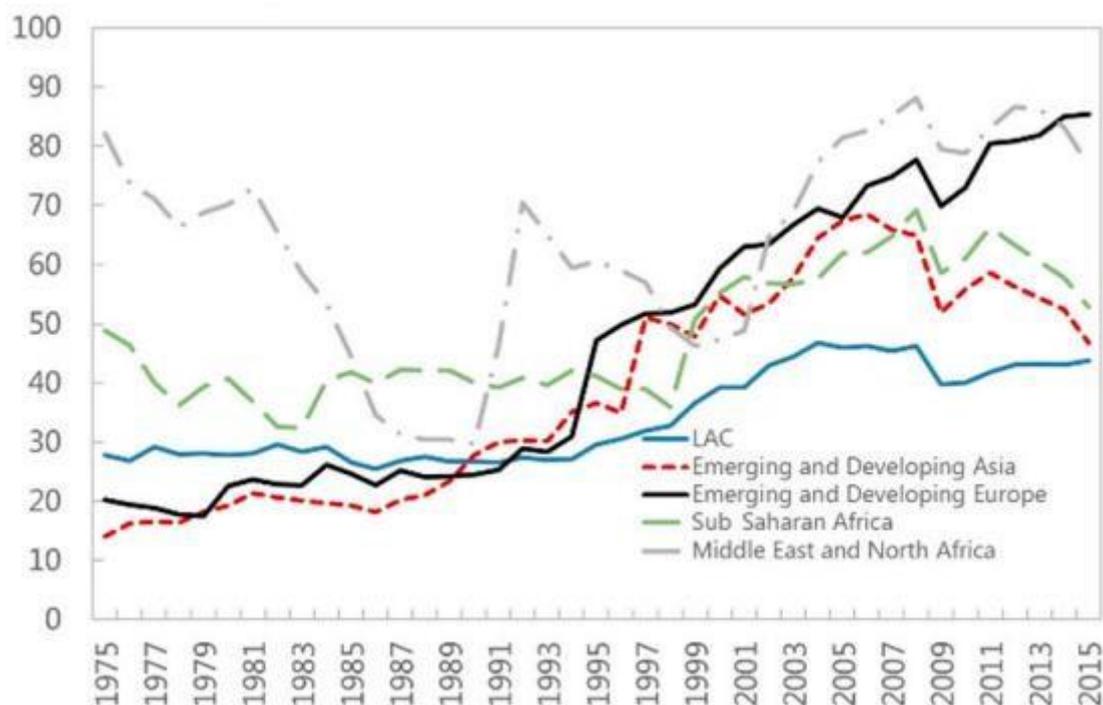
Considering the most important causes for the lagging TFP in the CELAC economies, a simple activation and extension of the existing tools for bi-regional cooperation could do most of the tasks for meeting the challenges both regions are facing.

First, economic openness in the CELAC economies remains insufficient, despite some clear progress. Without getting into details or countries, Chart 4 speaks for itself showing the CELAC economies are the less opened of the regions. Empirical results demonstrate that trade openness is an important factor of TFP through several channels (competition, investments, specialization, technological information and spillovers). IMF research shows that reduction in input tariffs and non-tariff barriers is found to raise strongly TFP levels³, especially where protection is still high. Trade appears to be

³ Ahn, J., E. Dabla-Norris, R. Duval, B. Hu, and L. Njie. 2016. “Reassessing the Productivity Gains from Trade
IRELAC – ICHEC, Montgomery, 4 bd. Brand Whitlock / bureau 526 1150 Bruxelles
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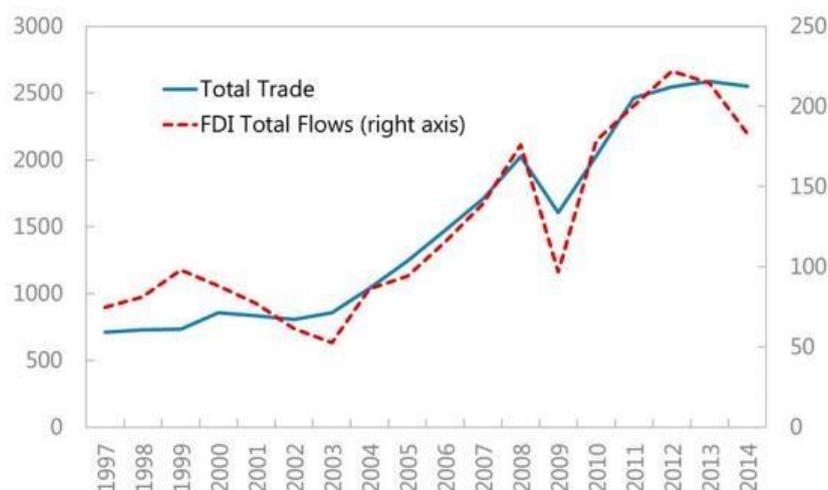
closely correlated to foreign direct investment (FDI) to which the region is not sufficiently open for benefitting from knowledge spillovers of FDI which spur TFP. Chart 5 shows this strong correlation.

Chart 5: Regional comparison of trade openness of CELAC economies 1975 – 2016 (trade flows measured as % of GDP)



Source: IMF, Daniela Estrella Morgan, Trade Developments in Latin America and the Caribbean, 2017

Chart 6: Correlation between Trade and FDI for CELAC (billions of US \$)



Liberalization.” IMF Working Paper No. 16/77; and Dabla-Norris, E., and R. Duval. 2016. “How Lowering Trade Barriers Can Revive Global Productivity and Growth.” IMF Blog.

Source: IMF, 2017, op. cit.

It is obvious that the kind of strategic alliance both regions are trying to implement points precisely to open more their respective markets and their reciprocal flows of investment, one of the keys to TFP improvements.

Second, Chart 7 shows that the region is also the less integrated into Global Value Chains. Globalization produced this fragmentation of the production processes, allowing for firms from less developed economies to join the global production network by specializing in specific activities within the value chain, focusing on those core tasks they are most efficient at without being obliged to create their own whole cluster and network as matured economies were obliged to do in their past stages of development. Recent empirical studies established a direct impact upon TFP and higher participation in GVCs (effects of specialization and scale economies, access to frontier technologies and markets, higher technology inputs, knowledge spillovers through cooperation with providers and suppliers). Economies can participate in GVCs by using imported inputs in their exports (so-called backward linkages) or by supplying intermediates to third country exports (forward linkages). GVC participation varies substantially across different Latin American countries). According to OECD database⁴, Chile has the highest level of total GVC participation of the Latin American economies, accounting for 52% of gross exports (which is mainly driven by forward participation because of its copper exports). However, many other Latin American economies are not well integrated within GVCs compared to other developing Asian and Eastern European economies. For example, the total GVC participation represents only 31% of gross exports in Argentina and 35% in Brazil.

More importantly, regional value chains within Latin America are also much less developed than in Europe, South-East Asia, or North America. Intra-regional links are very low: out of the total foreign value added used for producing exports only 9% was sourced from within the region against 50% in the EU and 40% in Asia⁵. Latin American economies are more integrated with external actors (e.g. China) than intra-regionally but with less transmission to the national economies.

Also, firms in Latin America show a very low propensity to innovate through international collaborations, with 21% of Brazilian and 8% of Chilean large firms and only 2% of Brazilian and 3% of Chilean small firms doing so. These figures are much lower than in the OECD and Asian economies. For example, the share of SMEs collaborating on innovation with higher education or research institutions in the OECD economies is 14.5%, and for large firms it is 37%⁶.

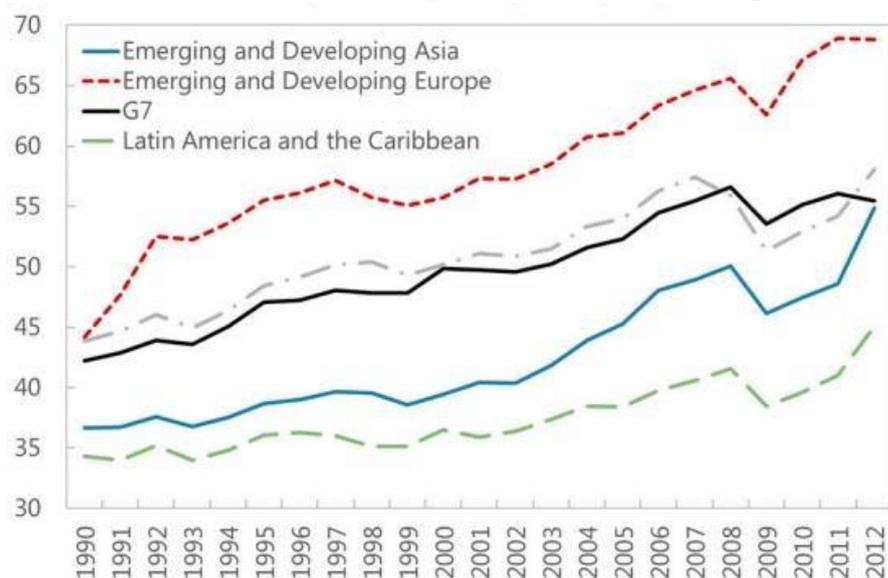
On these aspects too, a bi-regional approach inevitably would bring more regional cooperation first, and also a more inclusive development through the explicit cooperation orientation and tools that are available.

⁴ OECD, *Boosting Productivity and Inclusive Growth in Latin America*, op. cit.

⁵ Cadestin, C., J. Gourdon and P. Kowalski (2016), "Participation in Global Value Chains in Latin America: Implications for Trade and Trade-Related Policy", OECD Trade Policy Papers, No. 192

⁶ OECD, op. cit.

**Chart 7: Global Value Chain participation index by region
(Share of domestic and foreign value added in gross exports)**

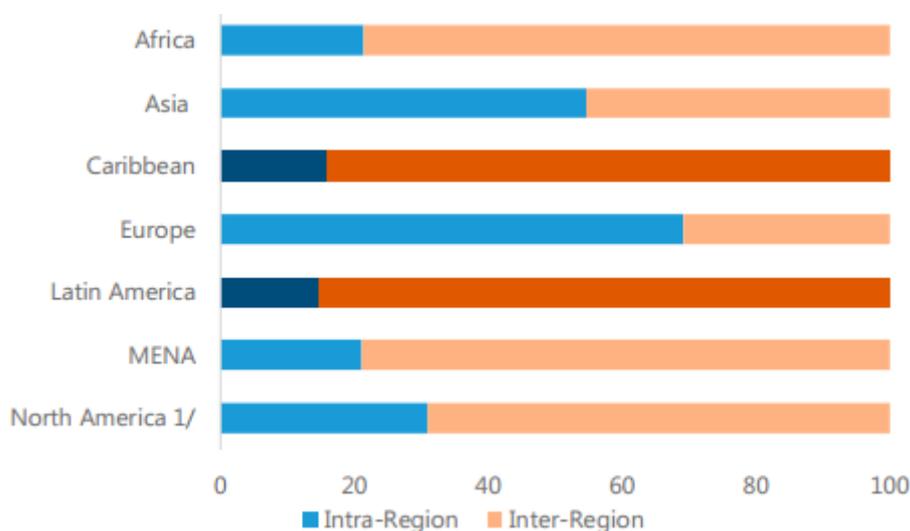


Source: IMF, 2017, op. cit.

Third, regional integration is lower than in other regions, even Africa has now a higher share of intra-regional trade than the CELAC area. This feature is a mayor handicap for productivity increase and for competitiveness and incorporation to dynamic GVCs.

One of the constant guidelines of the EU agreements is to incentive regional integration with specific methods and tools.

**Chart 8: Intra-regional exports versus inter-regional by region
(In % of total exports 2015)**



Source: IMF Country Report No. 17/66, March 2017

Although not the only weaknesses are affecting negatively the TFP growth in the CELAC, these three categories are precisely those that could be solved through a strategic alliance with the EU along the lines exposed in the next section.

6. The win-win game of a EU-CELAC cooperation addressing the laggard TFP

According to our analytical scheme, the priority for both the EU and the CELAC economies should be to deal with the weakening in the technological diffusion mechanism. Indeed, in the EU the TFP issue relies rather in the too low productivity in the service sectors. In the CELAC the issue is much deeper because the gap is higher and more generalized to the whole economy: the rising gap between frontier firms and the rest of the of the economy dominated by inefficient SMEs is bigger. The positive appealing aspects is that focusing the efforts upon the pace at which the innovations spread throughout the economy by dealing with SMEs could yield much more TFP jumps than to try to develop new technologies for the frontier firms. Furthermore – and more importantly – the easiest way to do it is through a mutually profitable bi-regional cooperation since it is based upon technological exchanges, regional benchmarking, joint-researches and joint-ventures, which are powerful ways to spur catching-up.

Our argument is structured as follows:

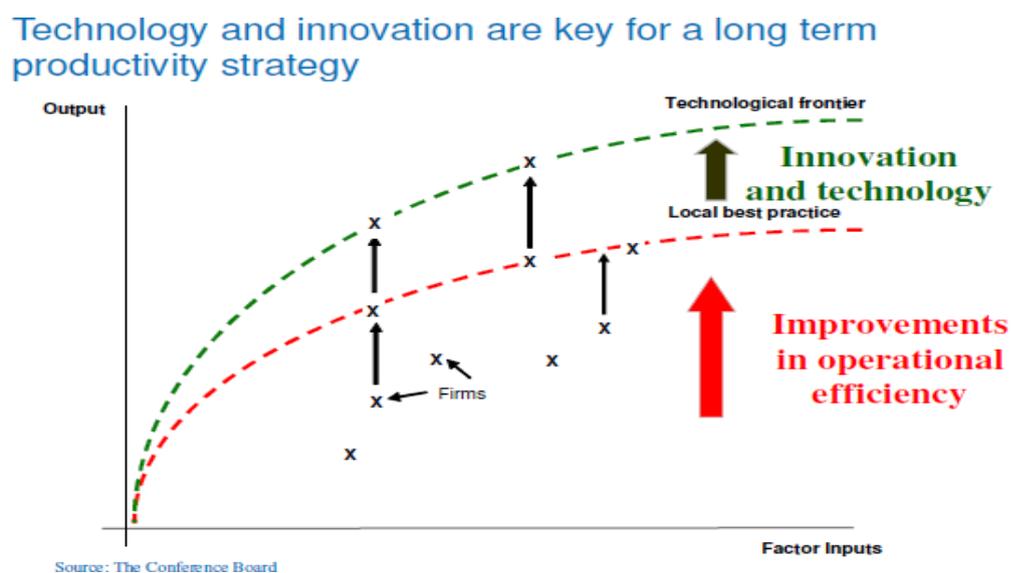
- Based upon the big change induced by globalization provoking the acceleration of the law of comparative advantages, a systematic fragmentation of tasks and outsourcing has resulted worldwide of the whole production chain, including the part R&D (knowledge).
- Exchanges of experiences between the EU and the CELAC allows for making obvious common interests to strengthen the GVCs to which both producers belong:
- 1) weakest/smallest producers benefit more from being brought into a GVC for technological transfer and access to market which is fast, cheap and with a lever effect in the local environment,
- 2) wide productivity gaps allow for complementarity opportunities to be exploited in mutual interests along the GVC in a double dynamic: lower costs for inputs for the most advanced partner, opportunities for outsourcing beneficial to both partners (new jobs in both regions as competitiveness increases along the GVC, Germany case with Eastern European economies)

Indeed, the actual way to spur productivity simultaneously in both regions is by using the profit-seeking-drive of firms (and also universities) looking at differences and complementarities that the respective GVCs participation of these regions offer: the EU needs anyway more competitive inputs for remaining competitive in its specialties and it could find them in the CELAC economies by contributing to adjust the technological and know-how necessary for reducing the costs, while the CELAC needs more incorporation to dynamic GVCs on which its members could develop new specialties and benefit from better access to more sophisticated technologies and markets. A closer bi-regional cooperation - focusing applied research and helping SMEs to internationalize – could speed up the technological catching-up in both regions (moving towards the production frontiers) and even provide the resources for feeding the creation of new technological leadership (moving-up the production frontier).

Chart 9 presents a dynamic synthesis of what the EU-CELAC Strategic alliance should do:

The red frontier is the local best technology but most local firms are far from this frontier. Improving their effective use of technologies would move them upwards (red arrow of TFP jumps). The green frontier represents the top productivity performers trying to displace upwards the technological frontier. The incorporation of more SMEs from both regions into GVCs would allow a double upwards movement: increasing efficiency with existing technologies with an improvement in competitiveness of the whole GVC which could therefore benefit from more resources for R&D displacing upwards the technological frontier with positive feedbacks for the whole chain and for both regions. The recipe consists in focusing SMEs reciprocal contacts and ventures through universities bi-regional cooperation on local grounds for improving their operational efficiencies and technological catching-up, increasing their ability to integrate GVCs. The increased profits from acceding jointly to cheaper and better inputs for the joint GVC (upwards movement of red arrow) should allow for accelerating R&D dedicated to pushing upwards the joint technological frontier (upwards move of green arrow).

Chart 9: Dynamic upwards moves of TFP through Bi-regional University-SMEs cooperation along joint-GVCs



Source: Conference Board

7. Conclusions

Bi-regional cooperation initiatives should give a special priority to match European Universities with that of the CELAC, and simultaneously to organize the connection of SMEs from both regions for spurring their mutual internationalization and their technological and managerial evolution. Academic Summits have opened the way, but they should now be strengthened both at policy and company levels.

The basic idea justifying such a stronger cooperation of academics, governments and private firms from the EU and the CELAC relies upon the very fact that the patterns of technology adoption,

reallocation, and productivity growth within and between firms in both advanced regions and lagging ones of these two regions, are directly complementary for strengthening respective competitiveness on world markets. The successful integration of the Central and Eastern European countries into the EU economy in more advanced countries' production networks (especially through the German/Austrian firms strategies) shows the ideal road to follow and to apply for the relations between the EU and the CELAC economies. Ideal conditions of such a “win-win game” for both regional partners (the EU & the CELAC) could be organized along the same lines and would lead to a significant improvement in Total Factor Productivity as a combined result of more global competition pressures but inside a more cooperative scheme at bi-regional and regional levels.

The EU and the CELAC share the same values and socio-economic objectives more than with any other regions, making the CELAC area the best candidate for a successful alliance with the EU. This is not just a political discourse argument, but a strategic reality: the CELAC countries offer sufficient differences and divergences for creating attractive synergies as any other LDCs or emerging countries, but at the same time they offer simultaneously the closest similarities between social objectives and the kind of societies in which citizens want to live which are necessary for mutual trust into a binding strategic alliance.

