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## **Social Policy and Productive Transformation: Linking Education with Industrial Policy**

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## ***Social policy and productive transformation: linking education with industrial policy***

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### *Abstract*

*This paper argues that the dynamics of catching up in developing countries is driven by a circular and cumulative process of social and productive transformation. The paper introduces a concept of capabilities which establishes the link between social and productive transformation, and argues that education plays a central role in shaping social capabilities for productive transformation. The analysis shows that the educational attainment structure rather than educational levels are the most significant determinants of the pattern of industrial development and growth. Education policies therefore are not only challenged with achieving basic education goals but also to develop education attainment structures that open up wide opportunities for diversification, technological upgrading and productive transformation. Education therefore needs to be integrated into a long-term strategy of productive and social transformation that closely coordinates education and industrial policies and provides institutions that coordinate these policies effectively. Finally, the analysis identifies research issues in the area of education policies for generating high performing, job-intensive catching up patterns and processes.*

## ***I. Introduction:***

### ***The new debate in development economics: productive transformation for growth, jobs and development***

The new debate in development economics recognizes productive transformation as the central driver of economic development and growth. The challenge of developing countries aiming at catching up and driving economic development is to promote a high dynamics of productive transformation which is reflected in patterns of diversification and structural change that contribute to achieving fundamental development objectives, in particular productivity and jobs growth, and in a high speed and sustainable processes of structural and technological change.

A central question in this debate is: what are the actors and forces driving the dynamics of productive transformation? Mainstream economics continues to focus on accumulation of productive capacities and the structure of production factors, in particular physical capital, human capital and infrastructure. Catching up is measured in terms of productivity growth. In contrast, economic traditions such as evolutionary, structural and institutional economics as well as the catching up literature highlight productive or dynamic capabilities as another key driver of structural transformation. However, this literature failed to develop a concept of capabilities to explain how capabilities shape productive transformation and where capabilities reside. Dosi, Winter and Nelson (2000, p. 1) note that, “[t]he term ‘capabilities’ floats like an iceberg in a foggy Arctic sea, one iceberg among many, not easily recognized as different from several icebergs nearby”.

It was Abramovitz (1986), an economic historian, who in a seminal paper introduced *social* capabilities in explaining the different catching up performance of today's developed countries. Based on the historical analysis he concludes “...that a country's potential for rapid growth is strong ... when it is technologically backward but socially advanced.” Social capabilities allow countries to rapidly imitate technologies already existing in more advanced countries. Although Abramovitz did not elaborate a concept of capability, the important contribution of this catching up concept is the idea that there are two processes driving the dynamics of catching up - the development of social capabilities and technological development - and that the level of social capabilities determines the pace by which technological development can potentially be achieved. This model also implies that countries without relevant social capabilities will not be able to develop a sustained process of catch up growth.

Against this background, the ILO developed a concept of capabilities for productive transformation. This concept of capabilities establishes an explicit link between social and productive transformation. Hence, capabilities may be labeled “social” in the sense that the capabilities reside in social groups and societies, but they can also be labeled “productive” as capabilities enable firms and countries to manage, direct and accelerate economic change and productive transformation.

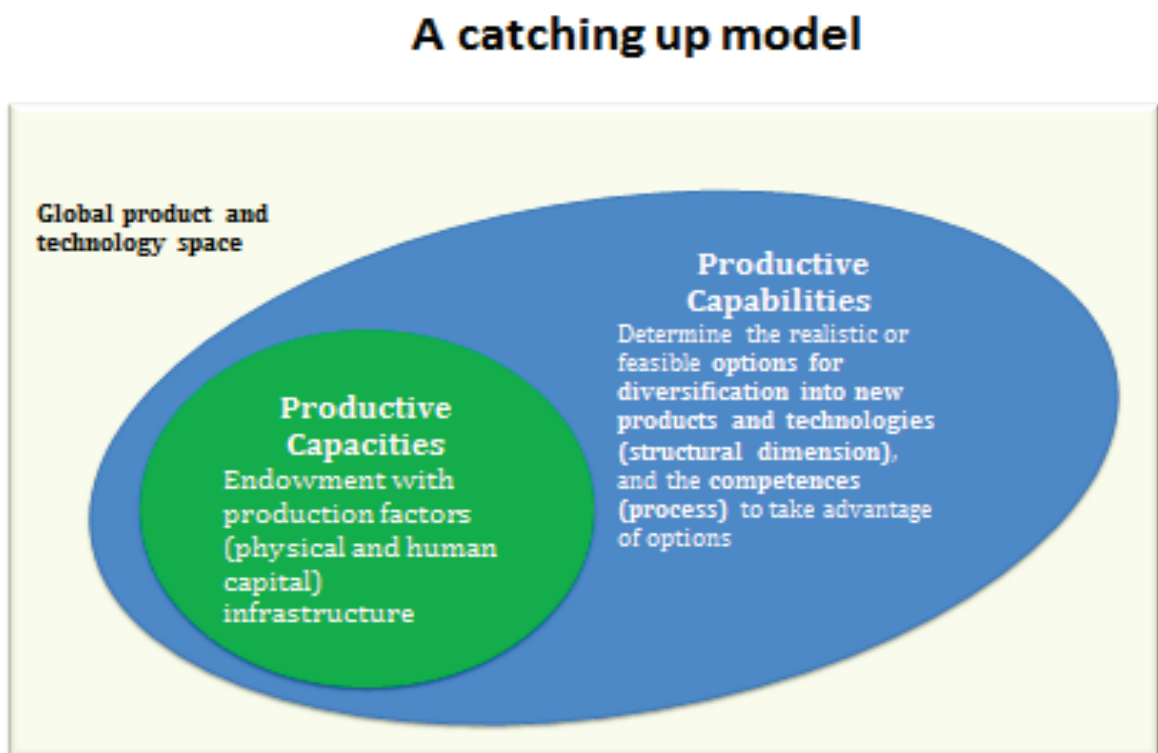
## ***II. A theory of capabilities for productive transformation – linking social and economic development***

The theory of capabilities for productive transformation developed by the ILO consists of two main components. First, a concept of catching-up is elaborated which defines catching up as a dynamic and sustained process of productive transformation. The dynamics of productive transformation is reflected in two dimensions: One the one hand, it is reflected in the patterns of diversification “... not all goods are alike in terms of their consequences for economic performance” (Hausmann et al., 2007, p. 1), and in the patterns of technological change. Some patterns of structural and technological

change and specialization in certain goods contribute more than others to improvements in productivity, income and wages, the generation of more productive and higher quality jobs, and opportunities for learning in the production process.” High performing patterns result in higher productivity, the creation of more productive and better jobs and employment patterns that result in rising wages and poverty reduction. On the other hand, the dynamics of productive transformation is reflected in the process dimension. High performing processes demonstrate rapid imitation of new products and fast adoption of advanced technologies, and are sustained for a long period thereby allowing countries to move from low to middle and advanced income levels. In short, high performing catching up is expressed in patterns of structural and technological change that help countries to achieve fundamental development goals in a rapid and sustained process.

The dynamics of productive transformation is driven by both, the accumulation of productive capacities and development of capabilities. These are two fundamentally different but interrelated concepts. Productive capacities are expressed in the products and technologies a country already masters and they are created through investment in physical and human capital and infrastructure. In contrast, capabilities determine those products and technologies that a country may be able to imitate and adopt, but are not yet part of its production portfolio. Capabilities shape the dynamics of the productive transformation process by determining the feasible patterns or the options for structural change and diversification (what products, what technologies), and by determining the competences of firms and the economy to take advantage of these options in a rapid and sustained process. Capabilities shape both dimensions of catching up – the structural change and the process dimension.

**Figure 1: A catching up model**



**Second, a knowledge-based concept of social capabilities** is developed. **Capabilities to drive and govern productive change are embedded in various collective, shared or aggregate forms of knowledge at the levels of enterprises, the labour force, economies and societies.** Hence, while productive capacities reside in the “material” sphere of the economy (in tangible production factors and infrastructure), productive capabilities exist in the “non-material” or in the intangible sphere of knowledge.<sup>1</sup>

**The options or the range of feasible patterns of structural and technological change are determined by the knowledge structure** of the labour force or society. Options are embedded in the particular nature, mix, diversity, variety and complexity of general, technical, occupational, business and cultural knowledge elements. Each social group such as the team of an enterprise or society as a whole develops a particular knowledge mix, and this mix determines the mix of products and technologies a country may realistically produce. Shared and socially provided knowledge systems are critical in determining knowledge structures at collective levels. Such shared knowledge systems relate in particular to the national curriculum taught in the formal education and training system and the quality of teaching, the type and level of technologies applied in the production system, as well as cultural knowledge and other belief systems (e.g. ideologies, philosophies, religions) provided through social networks, such as families and communities. These formal and informal knowledge systems are major determinants of the nature, diversity and complexity of knowledge structures embedded in social groups.

High options for productive transformation, however, are not enough. Countries also require the competences to translate options into productive capacities and to exploit the options. Evolutionary economics shows that **competences are embodied in routines at the level of enterprises, and in institutions at the level of the society and economy.** Routines and institutions determine the abilities of firms and economies to exploit options by being able to perform such tasks as searching for new investment opportunities, coordinating different tasks, transferring and adopting technological and organisational routines to new economic contexts, managing finance and investment, innovating, identifying and solving problems, and learning.

Again, the knowledge-based catching up concept suggests different forms of collective knowledge to determine the competences embodied in routines and institutions. Firstly, firms and societies need to adopt (codifiable) rules or principles, and secondly, they need to develop collective (tacit) procedural knowledge of how to use and apply these rules in a competent and “smart” way. Routines and institutions evolve as social groups and societies learn in a process of experience and practice both the “knowing that” (the rules and principles) and the “knowing how to do” (the tacit procedural knowledge).

In short, **capabilities represent the link between social transformation and economic transformation.** Successful catching up requires both, options and competences for productive transformation. Societies need to transform their knowledge structure – e.g. through education, training, learning in industries and social networks – and they need to develop routines and institutions that support the translation of options into investment and productive transformation. For example, cooperatives are suggested to have played a central role in sustained agricultural and rural development in countries such as Germany, Switzerland, Finland etc., (e.g. because the value added produced in agriculture and in rural enterprises remained to a large extent in the rural areas. Also social security institutions are considered as capabilities for productive transformation as they guide behaviour of economic actors, e.g. enhancing risk taking and investment in new products, or in human capital, in particular in education and training or in

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<sup>1</sup> This distinction between the material and the knowledge sphere in explaining economic development goes back to List (1909 [1841]), and was highlighted more recently by the “new” economic historians such as McCloskey, Goldstone and Mokyr (see Nübler, forthcoming).

mobility in labour markets. Schumpeter (1911) argues that a society's "entrepreneurial spirit" and "pioneer" entrepreneurship form a central driver of the process of "creative destruction and productive transformation, and that those societies achieved high levels of entrepreneurial spirits that have developed social institutions that reward entrepreneurial activities.

### ***III. The various roles of education in productive transformation – transforming knowledge structures and shaping human capital***

Education policies play a critical role in enhancing social capabilities for productive transformation as it is a powerful instrument to transform the knowledge structure of the labour force and enhance the mix and diversity of the knowledge base. The high value of education for economic development lies in its ability to teach the labour force advanced technological concepts and skills even when the economy is still at a low level of technological development and learning in industries and in the production sphere is limited. Education allows countries that still specialize in low-technology products to enrich the knowledge base of the labour force, to transform the knowledge structure and to develop the options to enter more sophisticated products and technologies or even leapfrog into advanced technological knowledge communities. In traditional societies without formal education systems and science, technological knowledge is largely shaped by learning in social networks and learning by doing at the work place, both change the labour force's knowledge systems only gradually and in a path-dependent process. In contrast, education allows to infuse fundamentally new knowledge elements into society and therefore, to adopt and imitate advanced products and technologies.

Another high value of formal education in traditional societies is that it can be a powerful instrument to change belief and cultural knowledge systems. Belief systems are socially constructed, and provide commonly shared attitudes, values, preferences and work ethics. They influence preferences, choices and behaviour of individuals and therefore, belief systems play an important role in technological and economic development. For example, evidence shows that educational, training and occupational choices of individuals are not only determined by wages and working conditions, but they are strongly guided by the value and the prestige which societies ascribe to different types of education, fields of study, occupations (Denzau and North (1994; Brock and Durlauf (2001). Productive transformation into new technologies and industries can only be accelerated and sustained if social and cultural belief systems support educational, training and occupational choices that are in high and rising demand in the economy.

Thirdly, education and training produce the human capital required for efficient use of technologies. Human capital is defined as investment in those skills and knowledge that are needed in enterprises and the labour market and therefore raise productivity. Human capital is productive capacity. The concept of human capital assumes technologies as given, and takes a labour market perspective. Given the demand for specific skills of individuals at a particular point in time, (or the anticipated demand of planned technological change), the function of the education and training system is to produce the right set of skills to match demand and supply.

To conclude, education is instrumental in enhancing both social capabilities for productive transformation (transforming collective knowledge structures) and human capital for high productivity (matching skills supply with skills demand).

### ***IV. Educational attainment structures determine feasible options for productive transformation: a typology and empirical evidence***

How does education shape productive transformation? Recent research has shown that the aggregate level of education – the indicator normally used by growth economists to

measure human capital - can only to a limited extent explain economic growth (Nübler 2013). The ILO therefore has developed a different approach and methodology to assess the impact of education on economic development. It argues that educational attainment structures determine the pattern and speed of productive transformation and thereby growth.

The educational attainment structure (EAS) developed in a particular country indicates the nature and complexity of formal knowledge accumulated in the labour force. EAS are defined by the share of the different educational categories (no school attendance, primary, lower secondary, upper secondary, tertiary) in the labour force. Since individuals build up conceptual and procedural knowledge in a cumulative process, each educational category reflects particular sets of knowledge elements, with higher education levels reflecting higher levels of complexity and specialization. Hence, the shares of the different educational categories indicate the nature and diversity of formal knowledge in the labour force.

The research has developed a **typology of educational attainment structures** (Nübler, 2013). Comparative analysis across countries as well as case studies of high-growth countries demonstrate that the educational attainment structure shapes the feasible patterns of technological and structural transformation. It is through this link that education determines industrial development and productive transformation, which in turn has an important influence on the country's growth performance.

These findings have important implications for education policies and underline the need to see productive transformation, education and industrial policies as closely related.

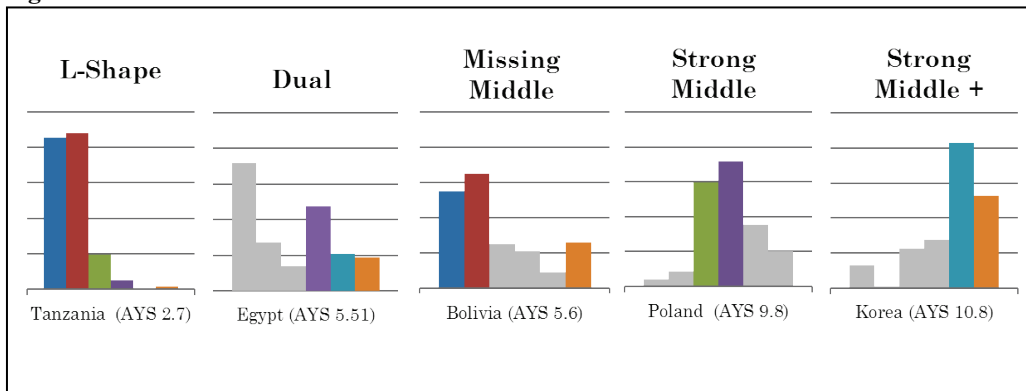
Based on the Barro-Lee dataset which provides information on the share of the labour force (older than 15 years) with no schooling, incomplete primary, complete primary, lower secondary, upper secondary and post-secondary as highest educational attainment, Nübler (2013) developed a typology of educational attainment structures which allows to analyse a country's options space. By sorting these six educational categories in increasing order, the different lengths of the six bars suggest five different educational structures (see box 1 and figure 1).

#### **Box 1: Typology of educational attainment structures**

- 1) **L-shape** educational structures with the median category being non-schoolers or (complete and incomplete) primary education show extremely low shares of upper and post-secondary education. **L+** structures have the shape of an L-curve but with higher shares of upper and post-secondary education.
- 2) **Dual** structures may be described as the composition of two distinct education structures of two groups (such as rural and urban). It shows high levels of non-schoolers and incomplete primary education, but low shares of primary (like the L). Secondary and post-secondary categories show a structure more similar to the one described below as a strong middle structure, that is, it includes high shares of lower, upper and post-secondary education.
- 3) **Missing middle** structures demonstrate high shares of primary and/or lower secondary education, very low shares of upper secondary education and high shares of post-secondary. Higher average years of schooling are achieved largely by an increase in the share of post-secondary education.
- 4) **Strong middle** structures take the form of a bell curve with the median on primary, lower



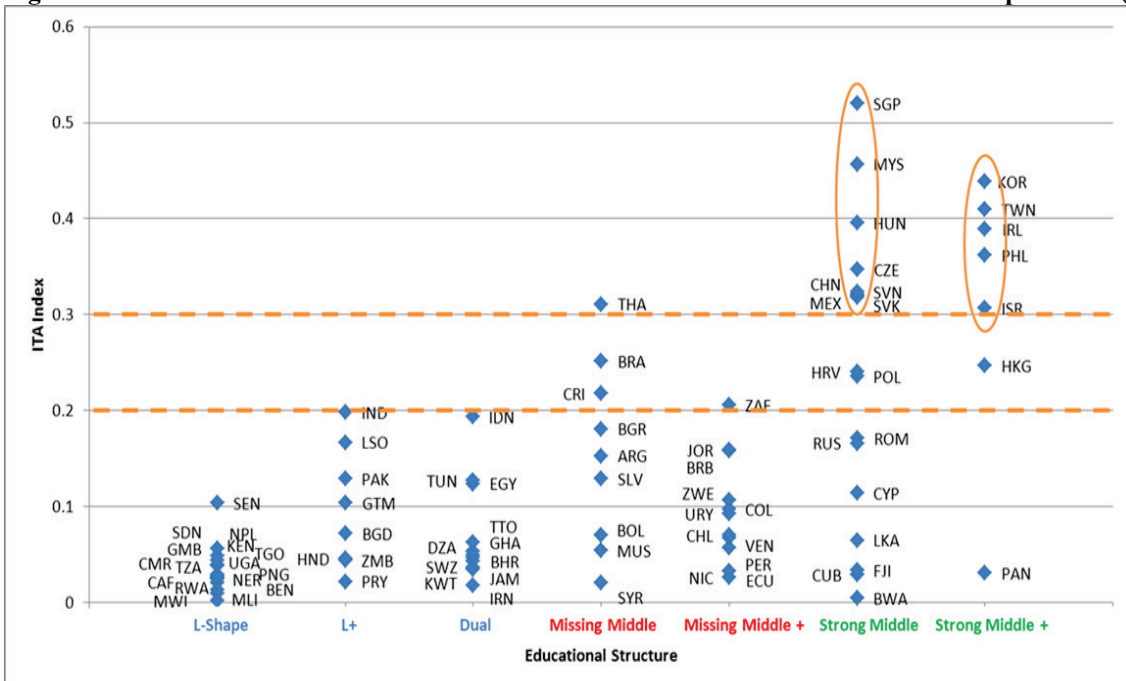
**Figure 2: Main educational attainment structures**



Source: Nübler 2013 based on Barro & Lee 2000

The following analysis explores **the link between educational attainment structures and industrial development**. In the following the (a) strong middle, (b) missing middle,) and (c) L-shaped EAS and their options for productive transformation are discussed.<sup>2</sup> (see figure 2). Cross country studies analysed the level of industrial development, measured by the Industrial and technological advance indicator (ITA), a combined index measuring the share of manufacturing in the economy (Industrial advance index IAI), and the share of medium and high technology products within manufacturing (technological advance index TAI).

**Figure 3: Educational attainment structures and industrial development (ITA)**



Source: Nübler 2013 based on Barro & Lee, 2000; UNIDO, 2005

**“Strong middle” EAS** are those with high shares of the middle education categories (lower and upper secondary education). These provide the widest range of options for developing and diversifying into manufacturing activities. Such structures dominate in

<sup>2</sup> See Nübler (2013) for a more detailed typology embracing six different educational attainment structures (Nübler 2013)

Asian countries and in particular in the successful catching-up countries. Analysis of countries with high growth rates over a significant length of time shows that these countries expanded education in a particular sequence during the catching-up phase, first increasing the share of primary, followed by lower secondary and finally upper secondary education as the highest educational share in the labour force. This approach built up a broad base of formal knowledge and created options for developing a wide industrial base, as indicated by a high share of manufacturing in total GDP (Nübler, 2013).

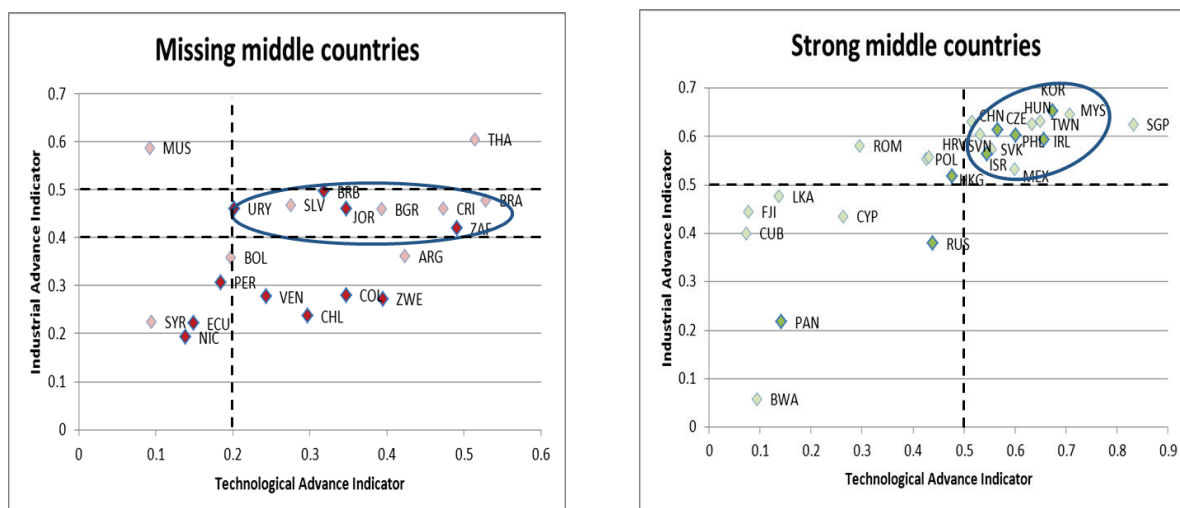
Governments played an important role, using various instruments, in shaping these favourable education structures. The Republic of Korea provides an interesting case of enforcing quotas limiting the entry of secondary education graduates to the tertiary level, both in private and public schools. The government was keen to expand the share of secondary education to prepare the labour force for entering targeted industries that demanded a high share of clerks, technicians, machinists, etc. – all occupations that require secondary education (Cheon 2014). At the same time, figure shows that some countries with a strong middle EAS, in particular islands and small states translated the capabilities into the production and export of commercial services (finance, IT related services, tourism etc. )

**“Missing-middle” EAS** are those with low shares of secondary education but high shares of primary and tertiary education. Tertiary education shares in missing-middle structures exceed upper-secondary shares. Missing middle structures provide limited options for developing a broad manufacturing base as the labour force lacks the broad supply of complementary occupations required in addition to managers, professionals, engineers etc. Rather, the relatively high tertiary education share provides options to develop advanced services (R&D, finance, tourism, IT enabled services, back office etc.)

A comparison of the strong and missing middle EAS in terms of industrial structure shows that these two educational attainment structures result in different patterns of industrial development.

Figure 3 compares the different structures of industrial development between strong and missing middle countries. These two country groups, in contrast to the L-shaped and dual EAS, have achieved higher levels of industrial development. It demonstrates that the strong middle structures allow countries to achieve highest levels of industrial development by expanding both the manufacturing base (IAI) as well as the technological levels within manufacturing (TAI), the missing middle countries face strong limits in expanding the manufacturing base, and industrialise by expanding sophistication. Most important, even the highest performing missing middle countries cannot achieve the levels of sophistication within manufacturing that can be achieved by the strong middle countries.

**Figure 4: Patterns of industrial development in countries with missing and strong middle educational attainment structures**



**Source: Own elaboration based on UNIDO, 2005**

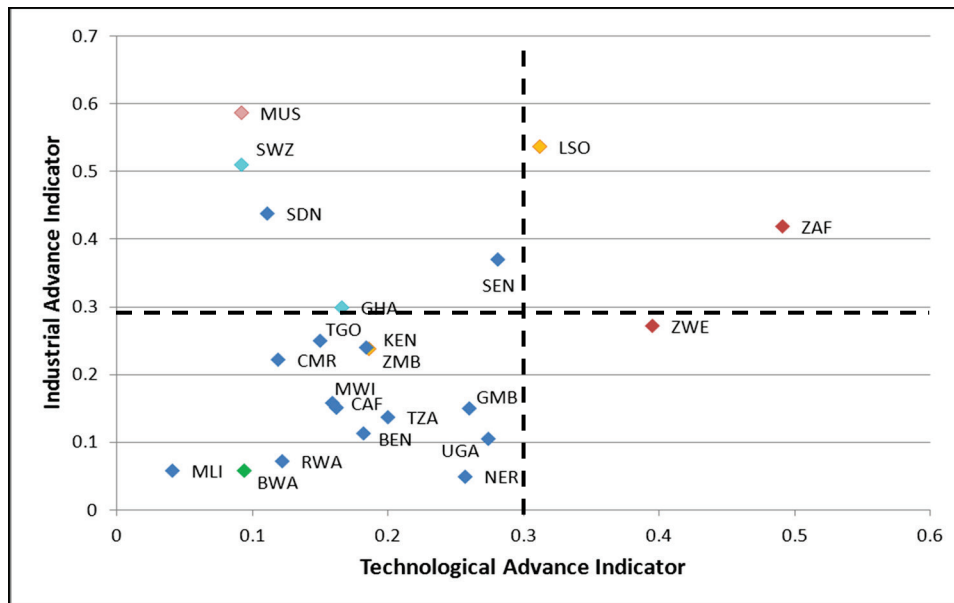
Missing-middle EAS are found mainly in Latin American countries but also in Thailand and South Africa. Such structures allow countries to grow into the middle-income levels, but not to develop the high and sustained dynamics of catching-up that characterize strong middle EAS.

Education policies in these countries face the challenge of transforming the EAS from a missing to a strong middle structure if they aim to develop options for a broad manufacturing base and for subsequent technological deepening thereof. This requires promoting initially lower secondary education and, at a later stage, upper secondary education. Depending on the existing structure, this may entail shifting resources from tertiary to secondary education and decreasing the share of tertiary education.

**“L-shaped”** EAS are characterized by large shares of non-schooling and primary education, but very low shares of lower and upper secondary and tertiary education (see figure 4). These structures are found largely in the least developed countries (LDCs). Sub-Saharan African countries have developed mainly the L-shaped educational attainment structure with the median educational category being non-schoolers or (complete and incomplete) primary education, and extremely low shares of upper and post-secondary education. In addition to the African countries, only two Asian countries, Nepal and Papua New Guinea, show the L-shaped structure.

Policies in many poor countries over the past 20 years, in particular those guided by the Washington Consensus, focused on basic education to the neglect of secondary and tertiary education. These countries, as a consequence, are unable to develop even low-technology, labour-intensive industry such as garment manufacturing (Nübler, forthcoming). The L-structure provides very tight options to widen the industrial base and developed a significant share of manufacturing in the economy. It also limits their capabilities to develop medium and higher technology goods within manufacturing. Hence, the low levels of formal knowledge at the secondary and also post secondary education level prevents countries from industrialising, entering value chains and shifting into higher value added products, learn to compete in higher quality segments of products, and to diversify within and across technological regimes. Figure 4 shows that countries with the L-shape educational attainment structure have achieved lowest educational attainment levels and they are related to lowest ITA levels. These countries (marked in blue colour) demonstrate either very low IAI levels ( $IAI < 0.2$ ) or very low TAI levels ( $TAI < 0.2$ ), and many show low levels in both dimensions of industrial development. In contrast, those African countries which were able to transform their education structure (non-dark blue dots in graph) also achieved higher ITA levels.. Senegal provides an exception with an IAI and TAI well above these thresholds which results in an ITA of 1.5.

**Figure 5: Industrial and Educational attainment structures in Sub-Saharan Africa**



Source: Author's elaboration based on Barro & Lee, 2000 and UNIDO, 2005

#### ***V. The case of Costa Rica: the evolution of social capabilities and productive transformation***

Costa Rica provides an interesting example of a country which achieved high synergies in terms of social and economic development for many decades, but this development path has changes as the country shifted towards a new development paradigm in the 1980s. Costa Rica had a long tradition, expressed in a social consensus and policies since the 19<sup>th</sup> century, to promote education for the achievement of social objectives, in particular to promote democratisation of society, and to achieve basic education and literacy for all. At the same time, the country also developed secondary and tertiary education, financed in particular by the funds freed by the abolishment of the army in 1948. As a consequence, by 1960, the country had developed a strong middle education structure. When Costa Rica became member of the Central American Common Market in 1963, all the other member countries still had the L-shaped education structure (Honduras, Guatemala, Nicaragua, El Salvador ). As a result, Costa Rica was able to attract most of the technologically advanced manufacturing activities, to rapidly increase export of these goods within the common market, and to experience by far the highest growth rates until the collapse of the common market by the end of the 1970s. Furthermore, during the 1960s and until the mid 1970s, Costa Rica increased its investment in lower and subsequently in secondary education, thereby rapidly transforming the knowledge structure, and enhancing the options for shifting into increasingly sophisticated products. Costa Rica was able to translate these options into economic growth. It developed powerful institutions that were able in the 1990s to attract substantial FDI and to rapidly increase exports of more sophisticated goods. Until the 1990s, institutions and policies created an EAS which created synergies in achieving social and economic objectives (Nübler forthcoming).

Since the end of the 1970s/ beginning 1980s, when Costa Rica experienced a severe debt crisis, public expenditures for secondary education were cut by 50 per cent, which resulted in a rapid drop of secondary graduates. Furthermore, Costa Rica liberalised its education system. A private education system was mushrooming which resulted in a

rapid increase in tertiary education. As a result of the change in economic development paradigm (shifting from Import Substitution Industrialisation and a public education system to market liberalisation and privatisation), the educational attainment structure in Costa Rica changed from a strong middle education into a missing middle EAS. This has changed the options for productive transformation fundamentally, shifting options from developing a broad based manufacturing into options for a narrow manufacturing base, and a narrow service sector with most employment at the low end of value added activities and a small range of activities at the advanced end of the technology spectrum. This pattern of educational and productive transformation from strong middle to missing middle has also resulted in increasing income inequality in a country which traditionally had lowest inequality in the region. It seems that the education system in Costa Rica has failed to achieve both its social and economic development objectives with poverty rate still at 20 percent, low levels of productivity in domestic enterprises (which remain largely at the low end of economic activities since the country has failed to develop strong institutions that could support domestic enterprises in learning from foreign enterprises, enter value chains, develop high performing collective routines to be able to compete).

### ***Conclusions***

Getting the educational attainment structure right, and strengthening and reshaping these structures for a sustained process of social and productive transformation, represent key policy challenges in a catching-up context.

Education policies face the challenge to support both social and economic development objectives. Education is important for achieving firstly, social objectives such as developing citizenship, democratisation and of societies, equality in access to opportunities and nation building, secondly, dynamic economic development objectives through enhancing collective capabilities that generate a wide scope for diversification into a broad range of products and technological change, thirdly, providing human capital that match the existing (or anticipated) demand for particular skills required for efficient use of given production technologies.

In the light of scarce resources in many developing countries, and in particular in low income countries, trade-offs may arise between social and economic objectives. Governments therefore have to strike a good balance in the light of overall development goals and aspirations of their societies. For example, education policy makers have to make choices between investing in basic education for all with a focus on primary education, and investing in lower, secondary and also in post-secondary education to transform EAS and to create options for productive transformation and development of manufacturing.

Economist still face significant knowledge gaps on the link between education and productive transformation and they need to gain a better understanding of how education is shaping patterns and paths of productive transformation, and the role of institutions in shaping educational transformation and fostering the dynamics of the interrelated social and economic transformation processes. Further research needs to analyse in particular the role of different actors, forces and processes that shape educational attainment structures, and they need to understand critical political economy issues that will arise when aiming at reforming education policies that reshape educational attainment structures in order to enlarge options for job-enhancing productive transformation patterns. For example, existing educational attainment structures tend to reflect income and wealth distribution in society, and missing middle EAS are often found in countries with high inequalities. Educational reforms aiming at

transforming EAS from missing middle to strong middle structures may face strong resistance from influential groups within these societies.

Furthermore, institutions are critical in aligning and coordinating education, R&D, training and industrial policies. Studies show that successful catching up countries developed a long-term development strategy combined with strong coordination mechanisms between relevant ministries such as Ministries of Education, Training, Industries, Trade, Planning, and Economic Development, between public and private actors, and between education, R&D, productive and labour market sphere. Finally, research needs to explore how successful developing countries were able to trigger and accelerate high performing processes of social and organisational learning and the role of “meta” institutions in supporting a “learning to learn” process.

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