


Economic upgrading in global value chains: concepts and measures

Marília Bassetti Marcato* 

Carolina Troncoso Baltar** 

* Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil
E-mail: marilia.marcato@ie.ufrj.br

** Universidade Estadual de Campinas, Campinas, SP, Brasil
E-mail: cbaltar@gmail.com

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ABSTRACT

This paper has critically documented a vast literature addressing the multi-layered outcomes associated with participating in global value chains (GVCs). In particular, this paper reviews and synthesizes the definitions and quantitative measures of one particular dimension of the GVC analysis that is two-fold: the *economic* and *social upgrading*. More specifically, we discuss the economic perspective of upgrading, which is usually associated with “moving into higher value-added stages”, and it is commonly assumed to be followed by positive spillovers regarding technology and productivity. This paper emphasizes the important diversity of definitions and measures within the GVC literature, considering it as a reflection, to a certain extent, of the absence of a systematic theoretical apparatus in the GVC literature. The paper concludes with some considerations on the role of policymakers in promoting social upgrading as an important topic in the GVC research agenda.

KEYWORDS: Global value chains; Economic upgrading; Social upgrading.

1. Introduction

The increasingly interconnected global economy has posed significant challenges to theorization in the field of economics. Over the last decades, the global economy has become more integrated through trade simultaneously to the disintegration of production processes led by firms outsourcing their non-core activities both domestically and abroad (FEENSTRA, 1998). While global value chains (GVCs) are an expression of this unprecedented fragmentation of production processes, it also became a practical and useful explanatory framework for understanding how firms and countries are engaged in the process of value creation, enhancement and capture.

GVCs are commonly used as an analytical tool for understanding not only how firms and countries participate in the global economy but also how would be the policy environment needed for an efficient allocation of resources (KAPLINSKY; MORRIS, 2003). The recent developments in value chain theorization have transformed a heuristic device into an analytical tool, providing a logical structure for studies at the country and firm levels¹. To analyze the emerging pattern of global trade, the GVC approach provides a view of global industries from two contrasting vantage points: *top down* and *bottom up* (GEREFFI; LEE, 2012). The central concept for the *top-down* view is “governance”, which focuses mainly on the power relationships between firms that set the parameter to other firms in the chain, and the key concept for the *bottom-up* view is “upgrading”, which is usually related to the possibility of moving up in the value chain and focuses on the strategies used by countries, regions or firms to maintain or improving their positions in the global economy (FREDERICK, 2014; GEREFFI; FERNANDEZ-STARK, 2011; GEREFFI; LEE, 2012).

The aim of this paper is to reflect upon some of the conceptual aspects of GVC theorization to further understand the complex balance between opportunities and risks commonly associated with greater integration into GVCs. In particular, this paper reviews and synthesizes the definitions and means of measurement of one particular dimension of the value chain analysis, which has two perspectives: the

1 Gereffi (1994) created a scheme to comprehend and describe the structure, dynamics, and relationships among firms in a value chain, i.e. the four building blocks (input-output structure; territoriality; governance and institutions). One can understand this four building blocks into a two-part research approach: value chain mapping, which uses input-output structure and geography to describe the structure of the chain; and value chain analysis, which uses governance and institutions to evaluate the current economic organization of the chain, in terms of actors, places and processes, and how it might evolve in the future (FREDERICK, 2014).

economic and social upgrading. More specifically, we discuss the economic perspective of upgrading, which is usually associated with “moving into higher value-added stages”, and it is commonly assumed to be followed by positive spillovers regarding technology and productivity. Therefore, we emphasize the economic mechanisms in the process of GVC participation that have enhanced productivity growth.

It is usual to assess the concepts of both economic and social upgrading by using different measures under distinguished levels. These different measures are applied to several case studies, challenging the possibility of extracting general conclusions about the outcomes of GVC participation. This two-fold dimension is consistent with the attempt to contribute to the organization of a formal theoretical apparatus within the GVC literature, given the notable diversity of definitions and measures. Given the scope of this article, we decided not to address the social dimension of upgrading, even though we recognize its importance for academic debate and its political implications, and we intend to explore it in future work.

This paper emphasizes the important diversity of definitions and measures within the GVC literature, considering it as a reflection, to a certain extent, of the absence of a systematic theoretical apparatus in the GVC literature. By reviewing the main definitions and quantitative measures addressed in the GVC literature, this paper highlights that no single measure could be used to determine the benefits and risks usually associated with GVC integration. Further, it is argued that not only the outcomes associated with GVC participation are not homogeneous among firms and countries, but also economic upgrading does not drive to social upgrading automatically and regardless of the context, indicating the important role to be played by policymakers.

The analysis proceeds in four sections, including this introduction and its concluding remarks. Section 2 addresses the widespread outcomes related to GVC integration regarding economic upgrading, discussing its concepts and the potential connections between GVC participation and increased productivity. Section 3 outlines the measures of economic upgrading. Section 4 presents a systematization of this discussion, addressing its policy implications in general terms and the need for developing better quantitative measures of GVC participation to explain the effects of countries' integration into GVCs.

2. Economic upgrading: concepts

One of the main reasons why value chain analysis is valuable is its capacity to assess who is participating in GVC, whether households, firms, sectors, regions or

countries, and a particular challenge is to unravel analytically and empirically what are the outcomes associated with increasing participation in GVCs. Even though the analysis does not allow establishing causality² (TAGLIONI; WINKLER, 2016), the strategy of deepening integration into GVCs has been seen as an opportunity for countries to improve their competitiveness by greater access to global markets. Thereby, the economic gains of participating in GVCs are conceived in the GVC literature regarding *economic upgrading*.

Upgrading, which is commonly referred to as “industrial upgrading” or “economic upgrading”³, is defined by Gereffi (2005, p. 171) as “the process by which economic actors – nations, firms, and workers – move from low-value to relatively high-value activities in global production networks”. Cattaneo *et al.* (2013) consider upgrading as a dynamic movement, highly associated with increased benefits from one stage of production to another within the value chain. It is often implicitly assumed that the benefits from GVC participation are not equally distributed among all production stages and a position in higher-value-added activities generates larger economic benefits, including higher incomes, high-wage employment, and positive spillovers regarding technology (OECD, 2013). Once countries and firms are integrated into GVCs, upgrading their position in value chains may raise as the best long-term strategy for preserving and capturing more gains of participation in GVCs (CATTANEO *et al.*, 2013). Therefore, the positioning of a producer within a GVC and the nature of the value chain are taken as important aspects to understand the distribution of risks and opportunities of GVCs’ participation (GEREFFI; LUO, 2015).

But upgrading is not always about “moving up the value chain”. According to Kaplinsky and Morris (2003, p. 38), it is important to understand the challenge of upgrading from a wider perspective, which involves “changes in the nature and mix of activities, both within each link in the chain, and in the distribution of intra-chain activities”. In other words, it is about “making better products, making them more efficiently, or moving into more skilled activities” (GIULIANI;

2 According to Taglioni and Winkler (2016), it is not simple to establish the exogeneity of GVC participation. The causality between GVC participation and country performance could run in both directions, whether one consider GVC integration as endogenous to the developments in the economic environment.

3 The GVC literature initially referred to “industrial upgrading”, as most of the analysis used to focus on labor-intensive manufacturing, such as garments and footwear (GEREFFI, 2005). But in recent years, the concept of “economic upgrading” has been used as a broader definition, which is not restricted to a specific manufacturing and is more suitable to analysis across sectors, including agriculture and services (BARRIENTOS; GEREFFI; ROSSI, 2010; ROSSI, 2013).

PIETROBELLI; RABELLOTTI, 2005, p. 552). Economic upgrading has often been associated with increasing competitiveness in higher value-added products, tasks, and sectors (TAGLIONI; WINKLER, 2016), and may be identified as “directly related to increases in competitiveness in value added process and with national gains in productivity and labor qualifications” (SALIDO; BELLHOUSE, 2016, p. 9). Put it simply, upgrading refers to “the improvement of a firm’s productivity and competitiveness through the creation of technological and managerial capacity to ensure its inclusion in GVCs” (UNIDO, 2015, p. 21).

The GVC literature has mainly focused on the ability of producers to engage in more knowledge-intensive activities and on their ability to learn, i.e. the enhancement of technological capabilities for developing new products or processes. In this sense, upgrading is also understood as the ability to innovate to increase the value added of products and processes (GIULIANI; PIETROBELLI; RABELLOTTI, 2005; HUMPHREY; SCHMITZ, 2002; KAPLINSKY; READMAN, 2001). As such, there is a logical contradiction when the concept of upgrading is used as a synonym for innovation, yet it is also understood as the outcome of an innovation process, resulting in several empirical studies of upgrading mixing up causes and effects (MORRISON; PIETROBELLI; RABELLOTTI, 2007). Although the capacity to innovate is associated with the producers’ ability to increase value added, it is necessary to compare it with the innovation efforts of their rivals, whether to truly increase both value added and market share. This means that if the rate of innovation is lower than of its rivals, the outcome may be declining value added and market share (KAPLINSKY; READMAN, 2001).

Upgrading is also not exclusively about transitioning from an agricultural to a services economy, as traditional international trade and development views (“old paradigm”, as named by GVC literature) suggest (TAGLIONI; WINKLER, 2016). But, according to the authors, it is about achieving higher value-added production via skills and know-how, capital and technology, and process upgrading. This means a rupture with the old sector-based paradigm focused on final goods and moving a step forward to a new paradigm focused on intermediates. From a developing country perspective, economic upgrading overcomes the old paradigm based on exploring their comparative advantage on cheap labor costs to become a path to pursue development build on skills and value-added (ROSSI, 2013).

There are four relevant trajectories that firms can adopt to upgrade (HUMPHREY; SCHMITZ, 2002; KAPLINSKY; MORRIS, 2003), namely: i) *process upgrading*: occurs when firms are increasing value-added shares in existing

GVC tasks by having a better organization of internal processes than those of rivals or by introducing new technologies, which turn possible to process more complex tasks, resulting in efficiency gains and reduced per-unit costs, in other words, it is productivity growth in current activities; ii) *product upgrading*: firms are producing new products in the existing value chain (higher value-added products) or even improving old ones faster than their rivals, in a process that usually involves moving into more sophisticated product lines, more skilled jobs or the acquisition of technology capability; it can be measured as the value added per unit of output; iii) *functional upgrading*⁴: occurs when firms increase the overall skill content of activities, i.e. firms are increasing value added by changing the activities that are performed by the firm or by moving the locus of activities to new segments of a GVC associated with higher value-added; it can be measured as a higher share of value added in the output of the final product; and iv) *chain (or inter-sectoral) upgrading*: participating or moving horizontally to new GVCs that produce higher value-added per unit of output and requires similar knowledge and skills.

The literature on GVCs emphasizes the case studies of *functional upgrading*, i.e. moving to higher value-added tasks. From a dynamic perspective, the trajectory of functional upgrading process is made of steps from assembly typical of export-processing zones to original equipment manufacturing (OEM) to original brand name manufacturing (OBM) and original design manufacturing (ODM) (GEREFFI; FERNANDEZ-STARK, 2011). One may say that there is a hierarchy in upgrading, as firms are moving from assembly to ODM in a process that reflects their developed capabilities. In other words, the degree of disembodied activities increases in a trajectory from process upgrading to product, through functional and finally chain upgrading (KAPLINSKY; FAROOKI, 2010; KAPLINSKY; MORRIS, 2003).

But there are other forms of learning processes equally relevant. Additionally to the primary four paths of upgrading, UNIDO (2015) presents three other forms: i) *organizational upgrading* (the organization of producers in business units, e.g. cooperatives or joint business), ii) *territorial upgrading* (the focus is on a certain locality), and iii) *structural upgrading* (which is related to firm size and business structures). Moreover, Fernandez-Stark *et al.* (2014) present two other types of upgrading: i) *entry into a GVC by a new actor*; and ii) *end-marketing upgrading*, which means moving into more sophisticated markets with rigorous standards or into larger markets with mandatory production on a larger scale and price accessibility.

4 According to Barrientos, Gereffi and Rossi (2010), a functional upgrading can occur in at least two different ways: vertical integration (adding new capabilities to a firm or cluster) or specialization (substituting an activity for another).

This last type of upgrading reveals how deeply mistaken is the narrow view of upgrading simply as the need to capture a growing share of a product's value⁵. Most of the authors that propagate this simplistic, and perhaps erroneous, idea make use of the “smile curve” thesis to put forward the idea that it may be better to move away from the assembly stage of the GVC, given its small share of value added to the final products (KOWALSKI *et al.*, 2015).

The smile curve is one of the most reproduced diagrams of the value-added potential of each stage in a value chain. This concept was first articulated around 1992 by the founder of Acer, Stan Shih, to represent Acer's strategy of upgrading from assembly to higher value-added activities in the value chain for computers (LOW, 2013). In the personal computer industry, Shih observed that manufacturing, especially the final assembly, adds smaller shares of value-added to the final product if compared to post- or pre-manufacturing services (e.g. marketing, distribution, sales/after service, or concept, R&D, design, branding, respectively). This idea is presented in a graph with Y-axis for value-added and X-axis for the stages of the value chain, resulting in a curve with the shape of a smile (YE; MENG; WEI, 2015). And after the second unbundling it seems like the smile curve has deepened, increasing the difference among those stages (BALDWIN, 2013).

However, this view of upgrading simply as “moving up the value chain” do not consider the *volume* of the activity, which is as much, or more, crucial as the share of the product (OECD; WORLD BANK GROUP, 2015). Using the manufacture of garments as example, the joint report by OECD and The World Bank Group shows that in spite of just being considered a relatively labor-intensive process with a small share of the total value of the final product, there are important benefits that can be obtained from the specialization of SMEs in this manufacturing activity and their aim to perform on a larger scale. In addition, one should question whether the smiling format would be valid for any country and industry. In this sense, Degain, Meng and Wang (2017) estimated the value-added potential of each production stage in electrical and optical equipment for China's exports and for Germany's automobile exports production. Their results show an inverted smile curve in the German auto industry, which would reflect the higher labor compensation in Germany's auto industry and lower labor compensation in both upstream and downstream industries.

5 See WIPO (2017) and Degain, Meng and Wang (2017).

Some authors understand that the possible paths that firms have undergone through participating in GVCs can be resumed into two broad categories: the *low road* and the *high road* (KAPLINSKY; MORRIS, 2003; KAPLINSKY; READMAN, 2001). It is about two routes to raising international competitiveness that depends on production costs (MILBERG; WINKLER, 2011). The low road is a trajectory of firms that fight to keep competitive based on lowering wages and profit margins. Usually from developing countries, those firms are trapped in low value-addition activities and become engaged in a “race to the bottom”, facing a situation of immiserizing growth⁶ (KAPLINSKY; READMAN, 2001). The low road based on lowering wages is often named “social downgrading”. On the other hand, the high road is about raising productivity and increasing value added as a result of innovation, which is commonly facilitated through knowledge gained from other firms in the GVC (BERNHARDT; POLLAK, 2015). Instead of that built on developing countries’ comparative advantage on cheap labor costs, this path is based on skills and added value, and it is as associated to economic upgrading (ROSSI, 2013). Furthermore, those who pursue a high road exhibit the ability to enter a virtuous circle of participation in GVCs and reach sustained income growth (KAPLINSKY; READMAN, 2001).

But what explains the differences between both roads to competitiveness? One of the possible explanations considers the role of different capabilities of firms to “upgrade”, or in other words, their *ability to learn* (GIULIANI; PIETROBELLI; RABELLOTTI, 2005; KAPLINSKY; READMAN, 2001). Therefore, the next sub-section emphasizes the role of innovation and learning capacities for boosting productivity spillovers from GVC integration.

2.1 Upgrading, productivity and technology spillovers

One of the most discussed dimensions of GVC participation is technology. Several studies show the positive effects of transferring technology and knowledge through GVC participation, which would lead to increased productivity and greater opportunities for economic growth (NATIONAL BOARD OF TRADE, 2013; OECD, 2013; WTO, 2014). The main idea is that moving into higher value-added

6 “Immiserizing growth” was first defined by Jagdish Bhagwati in 1958 as a theoretical situation where economic growth may drive a country to a worse outcome than before the increasing of the overall economic activity, e.g. if producers are competitive only through continual devaluation of the currency, this may lead to a reduction of the international purchasing power of domestic incomes; increased exports can only be paid for by lower wages; if growth is export-led, this may lead to a fall in terms of trade (KAPLINSKY; READMAN, 2001).

stages is commonly followed by positive spillovers concerning technology, productivity and skill upgrading, leading to endogenous technology creation (SHEPHERD, 2015). The different paths of upgrading may not be linear, since it involves learning, the development of national and firm-level capabilities and innovations (NATHAN; SARKAR, 2013). Hence, successful upgrading paths do not depend only on the value-added trade participation and domestic value added, but may also depend on participating in GVCs of increasing technological sophistication (OECD; WTO; UNCTAD, 2013). But what are the economic mechanisms in the process of GVC participation that have enhanced productivity growth?

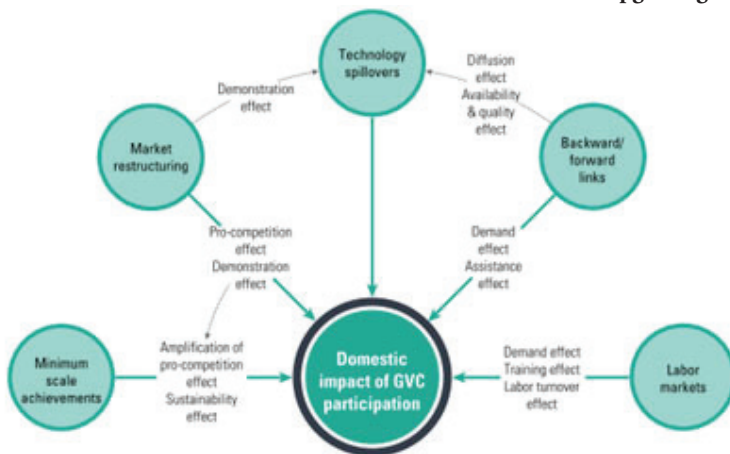
According to OECD (2013), besides the general impacts of globalization on productivity as a result of greater access to foreign knowledge and technology, the scope for specialization and economies of scale, and the impacts of international competition on improving efficiency, GVCs participation has an additional effect: it may increase productivity by facilitating access to cheaper or better-quality intermediate inputs. By analyzing the OECD countries, the report claims that those countries with higher share of imported intermediate goods present on average higher productivity, which would be the result of three effects: i) *a price effect*: lower prices of intermediates as the result of stronger competition among producers of intermediated; ii) *a supply effect*: greater variety of intermediates available; iii) *a productivity effect*: increased intermediate imports may spur innovation by improving access to foreign knowledge. As firms within countries deepen their access to GVCs, this affects their potential for learning and productivity growth.

Thereby, GVC integration has also affected technology and knowledge transfers. Piermartini and Rubínová (2014) shows that technology and knowledge transfers tend to be higher across countries that are more connected within GVCs. Shepherd (2015) examines some vectors through which technology transfer may take place within GVCs, explicitly and implicitly, ranging from inward FDI, technology licensing, imported intermediates and capital goods, to demand effects. Furthermore, Amiti and Konings (2007) shows that imported intermediates are related to higher technology transfers if compared with imports of final goods.

GVC integration has strong potential for productivity gains via several transmission channels (“dynamic productivity effects”), even though static labor productivity is negative for employment creation (i.e. when the same amount of value added is created with fewer workers) (TAGLIONI, WINKLER, 2016). This said, Taglioni and Winkler (2016) have identified the main transmission channels for economic and social upgrading (Figure 1), namely: i) *forward links*: sales of GVC-

linked intermediates to the local economy, resulting in an upsurge of production and/or productivity in downstream sector; ii) *backward links*: GVC-linked purchases of local inputs, rising production and/or productivity in several upstream sectors; iii) *technology spillovers*: improved productivity of local firms in the same or related downstream/upstream sectors as a result of GVC production; iv) *skill demand and upgrading*: similar to iii), but connected through training of and demand for skilled labor; v) *minimum scale achievements*: for example, when GVC participation stimulates investments in infrastructure that would otherwise not be profitable and that may spur local production in other sectors.

FIGURE 1
The main transmission channels for economic and social upgrading



Source: Taglioni and Winkler (2016).

To begin with, the backward and forward links creates a *demand effect* and an *assistance effect* in the host country, i.e. lead firms to tend to require more or better inputs from local suppliers and can assist local suppliers through knowledge and technology sharing, advance payments, and others forms of assistance. Both backward and forward links also generate technology spillovers, improving the production of local firms through two mechanisms: *diffusion effect* (diffusion of knowledge and technology) and *availability and quality effects* (GVC participation increases the availability and quality of inputs in the buyer’s industry). In addition, GVC participation can result in pro-competitive market-restructuring effects that extend to nonparticipants of the GVC. Put it simply, the *pro-competition effect* occurs when GVC participation increases competition for the limited resources in the country,

resulting in an overall increased average of productivity. There is also a *demonstration effect*, which reveals that knowledge and technology spillovers can upsurge from direct imitation or reverse engineering by the local participant or non-participant firms. The minimum scale achievements also amplify pro-competition effects, by stimulating investment in infrastructure and backbone services that would not be realized if it was not for the scale generated by GVCs. This created infrastructure also spurs local production in other sectors. Furthermore, the minimum scale achievements have also a *sustainability effect*, i.e. it reinforces the ability of the country to sustain GVC participation over time (TAGLIONI, WINKLER, 2016).

Following Taglioni and Winkler's (2016) argument, the last mechanisms analyzed are related to how GVCs benefit labor markets. The authors highlighted three effects: i) *demand effect*, i.e. GVC participation involved higher demand for skilled labor; ii) *training effect*, i.e. the local firms engaged in GVCs are more likely to receive training; and finally, iii) *labor turnover effect*, which shows that the knowledge embedded in the workforce of participating firms may move to other local firms.

But learning in GVCs is not automatic, nor all countries can benefit from technology and skills dissemination within GVCs (UNCTAD, 2013; UNESCAP, 2015). GVCs can also act as barriers to learning for local firms, limiting learning opportunities to few firms and locking firms into low technology and low value-added activities.

Some scholars consider that the different paths of upgrading are not linear, involving learning, the development of national and firm-level capabilities, and innovations (NATHAN; SARKAR, 2013; OECD; WTO; UNCTAD, 2013). Shepherd (2015) suggests that GVC participation may support technology upgrading in developing countries *under proper circumstances*, depending on several factors, such as social structure, policy environment, and most importantly, the domestic governance institutions (especially the rule of law and contract enforcement). UNIDO (2015) reveals that the positive effects of GVC participation regarding technological learning and innovation depend on governance patterns and power relationships that characterize the GVC, as well as on the domestic capabilities of the firm. Nathan and Sarkar (2013) argue that the role of developing country firms as suppliers is not restricted to receiving technology and learning how to use it. Beyond knowledge using, there is also the possibility of knowledge-changing capabilities, which would enable both catch-up through reverse engineering and innovation. This possibility is determined not only by the firm- or industry-level capabilities, but also by national scientific and innovation capabilities and

incentives. Thereby, without sufficient investment in skills, technological progress and GVC participation will not be translated into productivity growth (OECD; WTO; UNCTAD, 2013).

Finally, it is important to highlight the effort of recent studies to establish links between the theoretical framework of National Innovation Systems and GVCs (PIETROBELLI; RABELLOTTI, 2011; DE MARCHI; GIULIANI; RABELLOTTI, 2018; SZAPIRO *et al.*, 2016; LEE; SZAPIRO; MAO, 2018; FAGERBERG; LUNDEVALL; SHROLEC, 2016). In fact, this research agenda is even more promising considering the analyzes applied to developing countries. Lee et al. (2018) point to the importance of building a local innovation system to be able to perform economic upgrading, and highlight the limitations associated with strategies that seek to achieve economic upgrading, especially in the case of developing countries, from a greater insertion in GVCs. Humphrey and Schmitz (2002) argue that MNCs tend to prevent their suppliers in developing countries from catching up. Some studies show that companies with successful upgrading experiences in developing countries are either market-oriented or export their products to other less developed economies (BAZAN; NAVAS-ALEMAN, 2001), making cheaper products to occupy bigger market-shares and value their brands (WEIDNER; ROSA; VISWANATHAN, 2010). Overall, this strand of research has showed some signs that GVC participation may have a limited contribution to industrial modernization of developing countries.

3. Measuring economic upgrading

No single measure can be used to determine the benefits and risks usually associated with GVC integration. Hence, it is usual to assess the concept of economic upgrading by using different measures under distinguished levels. These various measures are applied to several case studies, challenging the possibility of extracting general conclusions about economic upgrading. This section assesses a set of different metrics on how GVC participation may impact the economic performance of producers, focusing on quantitative measures of economic upgrading.

According to Milberg and Winkler (2011), economic upgrading has been measured mostly through notions of *productivity growth*, *international competitiveness*, and *unit prices*⁷. This reveals that economic upgrading is mostly seen in terms of

⁷ According to the authors, a closer look at the precise definitions of these concepts may reveal some dichotomy in relating them to social upgrading.

efficiency of the production process and the peculiarities of the product and tasks developed by producers. According to the authors, by taking productivity growth (i.e. increasing output per worker⁸) as a *proxy* for economic upgrading, it is common to use *output* and *value added* mutually when measuring at the national level. As the authors present accounting as the basis of a recent set of measures of economic upgrading, and following their argument, *international competitiveness* is usually measured by relative *unit labor costs*, with greater competitiveness when unit labor costs are lower. The unit labor costs in foreign currency terms is defined by the equation:

$$R = W \left(\frac{1}{\pi} \right) E \quad (1)$$

Where W is wages, π is labor productivity and E is the nominal exchange rate. From the total differential of the equation of unit labor costs, it becomes clear that a decline in the growth rate of relative unit labor costs (i.e. improvements in international competitiveness) can be the result of several events, such as a decline in wage growth, an increase in productivity growth, or from currency devaluation.

$$\widehat{R} = \widehat{W} - \widehat{\pi} + \widehat{E} \quad (2)$$

Where \widehat{R} is the growth rate of relative unit labor costs, \widehat{W} is the growth rate of wages, $\widehat{\pi}$ the growth rate of labor productivity, and \widehat{E} the growth rate of the exchange rate. Hence, in the presence of these different factors of competitiveness, it would be a difficult task to associate a better trade performance with economic upgrading. Therefore, looking for a measure of upgrading in accordance with the previously discussed concept of upgrading, Milberg and Winkler (2011) consider one of the first studies that measured economic upgrading by using unit prices *and* market share, Kaplinsky and Readman (2005).

Some studies emphasize the producer's ability to learn. Kaplinsky and Readman (2005) consider the relative innovative performance as a reflection of upgrading, which is measured in terms of unit-prices in accordance with data on market shares. As a first step, the authors distinguished the capacity to innovate (to produce something new or with increased efficiency) from the capacity to upgrade, i.e. to innovate faster or better than rivals. Therefore, their measure of upgrading focuses

8 By measuring labor productivity (π) as output (Q) per worker (L), we have the growth in labor productivity (π) as the growth in output (π) surplus the growth in employment (π) (MILBERG; WINKLER, 2011).

on outcomes rather than processes and inputs, using unit prices and market share as an indicator of competitiveness.

Put it simply, a producer has experienced economic upgrading when it shows that it: i) *increased its export unit values*⁹ *relative to the industry average*, and ii) *increased its world export market share*. On the other hand, a combination of falling unit prices and falling market share within the respective GVC is taken as downgrading process. Other combinations would end up in ambiguous results¹⁰. This metric of upgrading was applied by Kaplinsky and Readman (2005) to a particular economic activity – wooden furniture, during the 1990s, given their methodological purpose of capturing upgrading in a specific sector in different countries using trade statistics in general.

Following Kaplinsky and Readman's (2005) definition, Bernhardt and Pollak (2015) consider the growth differential between a country's export unit values and the global industry average as one indicator¹¹, and complement their analysis by adding the change in world export market shares. These two indicators can show evidence of different paths of upgrading, e.g. product, functional and process upgrading (BERNHARDT, 2013). However, using these indicators may not allow distinguishing which type of upgrading is associated with the competitiveness performance, nor capturing directly the inter-sectoral upgrading¹². Their analysis of upgrading dynamics was applied to four manufacturing GVCs (apparel, wood furniture, automotive, and mobile phones), ranging different degrees of technological sophistications, as well as different governance structures, and a sample size of around 35 countries. The results indicate a notable variation across the four GVCs, with economic upgrading revealing to be more common in complex sectors with a higher degree of technological sophistication, and conversely, economic downgrading in low-tech sectors. In addition, developing countries, which have been gaining

9 Export unit values are seen as proxies for product quality and “are calculated by dividing the total value of a country's exports (of a certain commodity or product group) in a given period by the quantity or volume of these exports” (BERNHARDT; POLLAK, 2015, p. 9).

10 According to Kaplinsky and Readman (2005), when market share decreases (increases) and unit value rises (falls) relative to industry average, the result depends on the degree of price increase (falling), on the degree of falling (rising) market share and the opportunity cost of the resources invested in exports.

11 growth differential is used in order to avoid a measurement bias and to adjust for sector-wide inflation. The authors consider that because export unit values are a nominal concept, it can be driven by increases in input factor and other productions costs (reflecting, for example, an increase in the technology gap relative to the frontier), what would lead to misunderstanding increases as economic upgrading.

12 According to Bernhardt and Pollak (2015, p. 10), economic downgrading within a sector may not be an undesirable outcome, “but may be a manifestation of the country's economy undergoing a process of structural change, i.e. a shift in the composition of economic activities towards sectors with higher value-addition”.

importance as producers and exporters, have been more likely to experience economic upgrading¹³. To sum up, the authors conclude that “the promise of economic upgrading through participation in GVCs does not materialize for everyone”, as they find that only a quarter of the cases in their sample had experienced economic upgrading (BERNHARDT; POLLAK, 2015, p. 31).

Similarly, Bernhardt and Milberg (2011) present economic upgrading as a combination of growth in world export market-shares and export unit values. When taken them separately, an increase in the world export market-shares shows that a country's exports are internationally competitive and an increase in the export unit value indicates the production of higher-value products. However, an increasing export unit value may also reflect rising production costs, which would lead to a loss of international competitiveness (BERNHARDT, 2013). Thus, upgrading in a given sector takes place when *both* conditions are experienced simultaneously. The authors focused on four sectors (Apparel, Horticulture, Mobile phones, and Tourism), varying in terms of technological intensity, and for each sector they analyzed a set of eight to ten developing countries for the period 1990-2009. In respect to the economic upgrading, their findings show that multiple patterns can be traced across sectors, although two parallel can be extracted: first, an association between economic upgrading and growth in world export market share in all sectors, except apparel; second, export market share was generally associated with declines in export unit values. The authors also found that economic downgrading does occur, but social downgrading would be more common.

Following the approach used by Bernhardt and Milberg (2011), Salido and Bellhouse (2016) recently focused in the case of Mexico, analyzing four aggregated sectors (agriculture, manufacturing, mining, and tourism). The authors slightly modify the Bernhardt and Milberg analysis by adding the measurement of the national productivity to capture data on labor and production, regardless the external sector performance. According to the authors, this approach that includes productivity data would provide a more dynamic view of the changes in the Mexican economy.

Another set of measures of economic upgrading is used by Taglioni and Winkler (2016): i) *growth of domestic value added embodied in gross exports*; ii) *level of domestic value added*; iii) *productivity* (labor or total factor productivity). Even though the first variable is only available at the sector level, the others can be measured at the firm level. All three measures of economic upgrading were used as dependent variables,

13 Bernhardt and Pollak (2015) suggest that advanced economies are less likely to undergo economic upgrading than developing countries because of their loss of world market share to dynamic emerging market economies.

and then related to various measures of GVC integration at the sector level (the “GVC links”). By using statistical methods or econometric analysis, the authors aim to explain the impacts of GVC participation, more specifically: i) if the intensity and nature of GVC links are important aspects of growth in domestic value added that is exported; ii) the effects of GVC integration, as buyer or seller, on domestic value added, considering the mediating role of national policy¹⁴; iii) the effects of GVC participation of an industry on a firm’s productivity¹⁵.

On the other hand, Kowalski *et al* (2015) are critical to analysis that simply defines upgrading as increasing the domestic value added share of a product¹⁶. Thereby, claiming for more rigorous empirical works on how GVC participation may impact the economic performance of countries, the authors use three different forms of measuring the outcomes of GVC participation: i) *the overall per capita domestic value added embodied in a country’s exports*; ii) *the sophistication of export bundles*; and iii) *the diversification of exported products*. Their empirical analysis is mostly based on OECD Trade in Value Added (TiVA) data, but EORA database is also used to maximize the covered countries, as well as the BACI dataset (based on UN Comtrade and the World Bank Development Indicator databases) for non-value added-based measures and controls. The entire sample is composed of 152 countries and 15 years.

The first measure captures the benefits related to exporting that spread to domestic labor and capital. In other words, it would be a value added measure of productivity changes associated with GVC participation (similar to *process upgrading*). With the aim of testing econometrically for complementarity/substitution between domestic and foreign value added in imported inputs, and to better understand the relationship between GVC performance and access to more sophisticated intermediate inputs, Kowalski *et al* (2015) estimate the correlation of this first variable with: i) changes in the use of foreign value added in exports; and ii) changes in measures of sophistication

14 The policy variables used in their analysis were able to assess a country’s ability to join GVCs and its ability to upgrade, e.g. a country’s infrastructure, foreign presence, legal institutions, and innovation capabilities.

15 The authors merged the Farole and Winkler (2014) data set with two sector measures of structural integration in GVCs, i.e. BONwin (i.e. buyer’s perspective) and BONwout (i.e. seller’s perspective). For the description of these variables (chapter 6), the baseline of the estimation equation (annex 7B), and an application of this model to Bulgaria (annex 7C), see Tagliani and Winkler (2016).

16 They illustrate their questioning with the case of China’s electrical and optical equipment: with a domestic content of exports falling from 87% to 57% between 1995 and 2009, and the volume of domestic value added embodied in exports increasing more than tenfold, China had grown its domestic share of global value added in exports of electrical and optical equipment (from 3% to 22%). These developments show that profit-maximizing firms operating in China had increased the foreign content of their products meanwhile increasing their production. Therefore, the authors suggest that product or functional paths of upgrading are scarcely possible if not followed by higher productivity.

of imported manufacturing intermediate inputs and primary intermediates. They find evidence that foreign value added is *complementary* to increasing per capita domestic value added in exports; changes in the sophistication of imported non-primary sector intermediates have a positive impact (though it decreases at higher levels of sophistication), as well as positive changes in per capita GDP; and, on the other hand, a growing distance from economic activity have a negative impact.

The second variable is based on the methodology of Hausman *et al.* (2007) and it is considered a *proxy* for product upgrading. By measuring its changes, becomes possible to identify the path of increasing (or decreasing) sophistication of exported products. Empirical evidence suggests that growing backward participation (i.e. a bigger share of foreign value added in exports), using more sophisticated inputs and higher per capita GDP, are positively associated with producing more sophisticated export products; however, positive changes in FDI inflows are not. The third measure, which is based on the presumption that lower degree of export concentration has a positive correlation with a diversified exporting structure, is considered a *proxy* for functional upgrading. By measuring the diversification of exported products, it is possible to assess a country's competitiveness and quality of integration with international markets. The empirical evidence on the third measure shows that diversification can be associated with positive changes in backward participation and the use of more sophisticated non-primary imported intermediaries, meanwhile, concentration is associated with growing per capita GDP (KOWALSKI *et al.*, 2015).

Furthermore, Kowalski *et al.* (2015) have found different paths of process, product and functional upgrading across income groups, respectively: i) most of the gains in per capita domestic value added embodied in exports from high-income countries are driven by a growing use of more sophisticated primary and non-primary intermediates, while it is the sophistication of non-primary intermediates that matters the most for low-income countries and the growing flows of inward FDI in the case of middle income countries; ii) engaging in wider fragmentation as the basis of most of the product upgrading in high/middle-income countries; and iii) high-income countries importing more sophisticated non-primary intermediates results in more diversified exports, whilst middle/low countries shows a wider engagement in backward participation. Put it simply, their results show no regularity when it comes to the spread of gains associated with value chain trade. However, a wider GVC participation, e.g. by using the more foreign content of intermediates imports or importing more sophisticated intermediates, is assumed to correlate with positive outcomes. Thereby, the possibility of gaining from GVC participation appears to

be highly associated with the structure of specialization and level of development (KOWALSKI *et al.*, 2015).

To sum up the measures of economic upgrading, Table 1 shows a non-exhaustive list of measures of economic upgrading that have been discussed in this section at different levels of analysis (country, sector or GVC, and the firm level).

TABLE 1
Synthesis of the measures of economic upgrading

Dimensions	Quantitative Measures of Economic Upgrading
<i>Country-level</i>	Productivity growth (labor or total factor)
	Value added growth
	Profits growth
	Increased capital intensity
	Export growth
	Growth in export market share
	Unit value growth of output
	Unit value growth of exports
	Unit cost growth of labor
	Per capita domestic value added embodied in a country's exports
	Sophistication of export bundles
	Diversification of exported products
<i>Sector or GVC-level</i>	Productivity growth (labor or total factor)
	Value added growth
	Profits growth
	Export growth
	Growth in export market share
	Growth of domestic value added embodied in gross exports
	Unit value growth of output
	Unit value growth of exports
	Increased capital intensity
	Increased skill intensity of functions (assembly/OEM/ODM/OBM/full package)
	Increased skill intensity of employment
	Increased skill intensity of exports
Level of domestic value added	
<i>Firm-level</i>	Increased skill intensity of functions (assembly/OEM/ODM/OBM/full package)
	Developing skills to manage the supply chain
	Composition of jobs
	Increased capital intensity/mechanization
	Product, process, functional, chain upgrading
	Level of domestic value added
Productivity growth (labor or total factor)	

Source: Own elaboration based on Milberg and Winkler (2011).

There is no quantitative measure of economic upgrading that can encompass all its dimensions. In this sense, we emphasize that this section sought to recover the main quantitative indicators of economic upgrading used in the literature of GVCs, pointing precisely to the incompatibility between them and problematizing the different measures reported, i.e. pointing to pros and cons when it was possible. This aspect challenges the possibility of comparing results from different studies, as well as making direct associations with different concepts of economic upgrading¹⁷. Overall, there are several challenges for measuring and analyzing economic upgrading, such as the quality of the data available, the level of analysis and its comparability, and the fact that most of the case studies suffers from a bias towards examples of successful upgrading (BERNHARDT; MILBERG, 2011; SALIDO; BELLHOUSE, 2016). Beyond those limitations, the analysis of upgrading focused on value added does not address the question of distribution of value added among profits, wages, and taxes, or even different types of labor¹⁸ (MILBERG; WINKLER, 2013). In addition to the problems related to which variable to choose, the authors highlighted the issue of magnitude.

In this sense, to address how much change in a given variable is enough to constitute upgrading or downgrading, they used a cross-national evidence to measure “absolute” and “relative” upgrading¹⁹ (MILBERG; WINKLER, 2011). The view of upgrading restricted on firm-level competitiveness was soon criticized for its narrow view of development, as it missed how the gains from upgrading are distributed to workers and improved working conditions (WERNER; BAIR; FERNÁNDEZ, 2014). Thus, GVC scholars started to distinguish between two different dimensions of upgrading: economic and social upgrading. Finally, the relationship between both dimensions of upgrading is the main study subject of the current research frontier of GVC studies, overcoming the first generation of studies focused on the relationship between governance and upgrading.

17 It is important to emphasize that there are few firm-level analyzes that do not encompass particular cases (such as the well-known Iphone value chain article), what can be partially explained by the difficulty of finding free-access databases at the firm level.

18 According to Milberg and Winkler (2011), this distribution is essential to the analysis of the relationship between economic and social upgrading.

19 “We calculate an “upgrading ratio”, z , as the ratio of the growth in value added per person engaged to the growth in exports and define three measures of upgrading, as follows: if $z > 1$, it indicates “strong absolute upgrading”; if $z > 1/3$, it indicates “weak absolute upgrading”; if $z > 1/\beta$ (where β is the slope coefficient in the regression), it indicates “relative upgrading” (MILBERG; WINKLER, 2011, p. 350).

4. Concluding remarks

This paper has critically documented a vast literature addressing the multi-layered outcomes associated with participating in GVCs, contributing to the organization of a formal theoretical apparatus within the GVC literature. In this sense, this paper has emphasized the need for developing better quantitative measures of GVC participation to explain the effects of countries' integration into GVCs.

There are concerns that the economic gains from greater integration in GVCs may not be translated into improvements in living standards. In that sense, the narrow view of upgrading regarding firm-level competitiveness misses how the gains are distributed to workers regarding wages and improved working conditions. For that reason, several scholars start to distinguish between two different dimensions of upgrading: *economic* and *social* upgrading, and even more importantly, most of the recent analysis focuses on how both dimensions are related to each other. Understanding how economic and social upgrading are related is a necessary step forward in the direction of more suitable industrial and commercial policies in agreement with the sustainable development goals (SALIDO; BELLHOUSE, 2016). To economic upgrading translates as sustainable development, policymakers should be concerned with the distribution of the opportunities and outcomes for GVC participation among all segments of society, and this means formulating social policies to create a balanced distribution of the gains that leads to social cohesion (TAGLIONI; WINKLER, 2016).

For that reason, considering the absence of a single measure, this paper has systematically analyzed the different measures applied to several case studies concerning economic upgrading. Thus, the existence of several measures at different levels reflects, to a certain extent, the absence of a formal theoretical apparatus in the GVC literature. Considering that economic upgrading may drive to social upgrading, but not automatically, the role of policymakers in promoting social upgrading is an important topic in the GVC research agenda.

There are some strategic questions that policymakers should formulate when it comes to upgrading. By facing the challenge of maximizing the benefits from GVCs participation and choosing which type of economic upgrading they want to pursue, policymakers should focus on strengthening existing GVC-domestic economy links, which usually are associated with greater diffusion of knowledge, technology, and know-how from foreign investors or trade partners abroad, along with strengthening domestic firms' absorptive capacity (TAGLIONI; WINKLER,

2016). In that sense, both economic upgrading and GVC densification are key-factors to transform GVC participation into sustainable development.

This means that the effort is not only about becoming more competitive in higher value-added activities but also about engaging more local actors, both firms and workers, in the GVCs. Thereby, this may suggest that moving into higher value-added activities may not always result in large value addition for a country, and more importantly, in some cases it may come from performing in lower value-added activities on a large scale.

Overall, GVC participation is not all about benefits. The GVC literature has recognized its mixed impacts, as GVC participation alone may not ensure development benefits and, as a matter of fact, it may entail a number of potential downsides. Beyond the several obstacles to access GVCs, producers are exposed to several risks once they are actively participating in GVCs. From greater interdependencies across economies that reveal greater exposure to external shocks and supply disruptions, through exacerbated inequalities and environmental degradation, to labor markets deterioration and narrow learning capacities, GVC participation can lead to multiple negative impacts (STURGEON; MEMEDOVIC, 2011; UNESCAP, 2015; WTO, 2014). More importantly, governments are unable to control these risks directly, because GVC participation is the outcome of firm's choices. However, this does not imply that policymakers cannot influence firm's judgment and strategies.

Finally, GVC analysis does not tell the whole story. Even in theoretical terms, a systematic framework on the specificities of GVCs is still missing. In general lines, there is a significant number of empirical studies of different value chains, without any substantial causal explanation for understanding economic development within this new geographical pattern of value creation and capture in the global economy. Therefore, one must consider that GVC framework has several limitations and must not be taken as a panacea for economic development.

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