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Participation in global value chains and varieties of development patterns

Bruno Carballa Smichowski, Cédric Durand[®] and Steven Knauss[★]

This paper relates participation in global value chains (GVCs) to development patterns at the country level. It accounts for the diversity and interdependence of development through a cross-country analysis for 51 countries between 1995 and 2008. We identify three patterns of socio-economic development related to various degrees and modes of GVC participation: a social upgrading mirage, the reproduction of the core and unequal growth. This result is achieved thanks to the introduction of two new elements to the literature: first, the introduction of new macroeconomic indicators of GVC participation and economic gains that are explicitly based in a theoretically consistent definition of GVCs; second, the identification of a variety of interdependent development patterns related to GVC participation through the use of principal component analysis and cluster analysis.

Key words: Global value chains, Development, PCA
JEL classification: F63

1. Introduction

Since the mid-2000s, international institutions, development agencies and governments have embraced the global value chains (GVCs) framework to refine their development policies (Werner *et al.*, 2014), often providing cross-country measurements of GVC involvement to nurture their analyses and recommendations. While some have perceived this popularisation of the GVC framework as a contribution to the emergence of enlightened post-Washington consensus development policies (Gereffi, 2014), others point to the disbanding of the critical content of the global chains perspective and its cooptation in service of the neoliberal agenda (Neilson, 2014). Both sides, however, agree that the framework's journey from the academic universe of critical scholarship to the world of policy making has been accompanied by significant alterations in the conceptualisation of GVCs and GVC-related dynamics.

The mainstream story of GVC development patterns used to point to a baseline *rosy scenario* whereby any country that increases its participation in GVCs should experience an improvement in its economic and social situation (OECD, WTO and

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UNCTAD, 2013; UNCTAD, 2013; Kowalski *et al.*, 2015). The theoretical mechanisms underpinning this *rosy scenario* were generally not made explicit but nonetheless derived from comparative advantage arguments about the benefits of specialisation and the opportunities for knowledge spillovers (Romer, 1993). They could be summarised as follows: a country increasingly engaged in GVCs benefits from a productivity spillover thanks to learning processes and cheaper inputs; this translates into greater domestic value-added and trickles down to the whole economy through higher profits and investment, higher wages and higher tax collection, which altogether contribute to improved socio-economic outcomes. This idea has been challenged both theoretically and empirically (Milberg and Winkler, 2013; Quentin and Campling, 2018) and nuanced by the World Bank itself (Taglioni and Winkler, 2016, p. 4).

One major problem arising from the adoption of the GVC perspective by policy institutions concerns the diffusion of GVC-related macroeconomic indicators. These measurements are mobilised to build stylised facts and carry out econometric analyses assessing that GVCs provide potential mechanisms for countries to improve income, employment and/or productivity (OECD, WTO and UNCTAD, 2013; UNCTAD, 2013; Kummritz, 2016; Kummritz *et al.*, 2017; World Bank, 2017). Even when it is acknowledged that free market policies are insufficient in and of themselves to automatically bring the benefits of GVC participation, the concepts and indicators used by the international institutions are purely descriptive and disregard the relational understanding of GVCs elaborated by the scholarly work. This is a major issue as the emphasis of the interdependence of development dynamics along GVCs is arguably one of the single most important specificities of chain analysis.¹ Due to this mis-conceptualisation, cross-country macroeconomic analyses obscure the variety of socio-economic outcomes and the compossibility² of uneven development patterns along the chains.

The main contribution of this article is to account for the diversity and interdependence of development through a cross-country analysis for 51 countries between 1995 and 2008. We identify three patterns of socio-economic development related to various degrees and modes of GVC participation: a *social upgrading mirage*, the *reproduction of the core* and *unequal growth*.

This result is achieved thanks to the introduction of two new elements to the literature: first, we elaborate new macroeconomic indicators of GVC participation and economic gains that are explicitly based in a theoretically consistent definition of GVCs; second, we identify a variety of compossible development patterns related to GVC participation through the use of principal component analysis (PCA) and cluster analysis that relate these new GVC indicators to socio-economic development variables. To the best of our knowledge, these techniques have not been used previously in the GVC literature

Section 2 begins by clarifying our conceptualisation of GVCs. In our view, GVCs represent a specific form of the division of labour: a GVC delineates a geographically—and often also legally—fragmented economic space where incomplete commodities are functionally integrated and valorised through a unified labour process. One

¹ For example, Milberg (2008) and Palpacuer (2008) follow this relational perspective when they explicitly link GVC dynamics of uneven development to financialisation. Lee and Gereffi (2015) stress the uneven distribution of upgrading opportunities that benefits lead firms at the expense of the bulk of suppliers.

² By compossibility, Bob Jessop refers to ‘the importance of structural coupling, co-evolution, and mutual complementarities- exclusivities among’, national Varieties of Capitalism (2014, p. 54).

achievement of this definition is that it allows for a precise delimitation of the frontiers of GVCs. Using the OECD's trade in value-added (TiVA) database, we are then able to propose a more appropriate methodology to measure GVC participation and value capture than those currently employed in the literature (Section 3). Section 4 introduces common indicators of economic and social upgrading (investment rate, median income, labour share, Gini index, employment rate) and conducts a PCA and a cluster analysis for 51 countries between 1995 and 2008. Our results, discussed in Section 5, indicate interdependent yet asymmetrical relationships between countries, suggesting that development patterns in GVCs need to be understood as constitutive parts of a global process of uneven development, in sharp contrast to the rosy scenario offered by policy institutions.

2. Clarifying GVC boundaries

Over the past few years, research inspired by the value chains perspective has attained a new dimension. While the GVC literature used to be limited to an accumulation of case studies, with a degree of bias toward success stories (Bair, 2009), a growing strand of research mobilises the framework to build cross-country analyses at the macro or industry level (Milberg and Winkler, 2013; UNCTAD, 2013; Miroudot and De Baeker, 2014; Timmer *et al.*, 2014; Durand and Miroudot, 2015; Gangnes *et al.*, 2015; Taglioni and Winkler, 2016; Kummritz *et al.*, 2017). This represents a significant improvement in the way knowledge on GVCs could inform policies, and is a welcome development insofar as the GVC literature has suffered from a long acknowledged micro–macro aggregation problem (Dallas, 2014).

Unfortunately, however, the attempts of GVC measurement are built on shaky theoretical ground as we will elaborate further (Section 3.2). To be fair, this difficulty in policy-related measurement reflects, in part at least, the theoretical limitations of the GVC framework itself (Yeung and Coe, 2015). GVCs are most of the time defined in the literature in a descriptive manner, for example as ‘the full range of activities that firms and workers perform to bring a product from its conception to end use and beyond’ (Gereffi and Fernandez-Stark, 2018, p. 306).³ This kind of definition is symptomatic of the difficulty to move beyond ‘a typological description of the immediate outer manifestations of the determinations at stake’ and ‘to provide an explanation of the very specific phenomenon that it sets to investigate’ (Starosta, 2010, p. 435). As far as the issue of macro-level indicators is concerned, the consequences of these theoretical limitations is that GVC approaches do not provide a clear-cut conceptual understanding of the boundaries of GVCs, which is a prerequisite to building any consistent measurement.

Another popular framework used to analyse GVCs is the transaction costs approach where the frontiers of the chains are drawn by the distinctiveness of the economic relations involved in GVCs vis-à-vis other economic relations (Antras, 2014, p. 119). However, the assumption that transaction arrangements are efficient considering the characteristics of production processes and asset specificities is highly problematic (Pitelis, 1994).

³ This definition is very close to the canonical one given in the 2001 *Handbook for Value Chain Research* (Kaplinsky and Morris, 2001, p. 4), testifying to the resilience of this conception.

A more promising venue is to consider GVCs as a ‘form of industrial organization’ (Milberg and Winkler, 2013, p. 19). This is the direction taken by Taglioni and Winkler when they write that GVCs consist of:

complex networks of production, in which participating firms are specialists in one activity and external international sourcing arrangements imbue inter-firm trade with characteristics similar to intra-group trade: better control from the center, higher levels of bilateral information flow, tolerance of asset specificity, and harmonization and immediate integration of business processes that increase the potential for foreign activities to integrate seamlessly with activities performed at home. (Taglioni and Winkler, 2016, p. 12)

This describes a hierarchised network of firms with complementary assets and skills that coordinate through various cooperation mechanisms. The emphasis on the control from the centre points to asymmetric economic relations related to uneven control over the production process itself, within the legal frontier of the firm (within dispersed affiliates of transnational corporations [TNCs]) and beyond the legal frontier of the firm (with sub-contracting and retailing networks).

This emphasis on the production process takes us beyond the organisational approach and its classical triptych of markets, hierarchies and networks. In other words, although the legal organisational boundaries between production units may shift from hierarchical to market arrangements, one can also look at GVCs as a form of the division of labour where the relations of production mediate the question of the size of individual units of production and their modes of coordination. In this transnational economic space—whether or not directly internal to a TNC—economic powers are unevenly distributed and geographically dispersed between productive entities that contribute to the making of a commodity. GVCs then design a transnational economic space where the process of valorisation occurs.⁴

Within value chains, ‘incomplete commodities’ are functionally integrated in order to make complete commodities, which will be sold and used beyond the chain. Integration is the key issue here (Nathan and Sarkar, 2011). The criterion to consider a product as an incomplete commodity is that its potential value realisation outside the chain would be lower than within it. To put it differently, GVCs exhibit network externalities: because of their complementarity, the diverse products circulating within a value chain have a higher value when they are combined than if they were sold separately, which welds the dispersed entities together. This complementarity manifests a profound unity at a deeper level: the integration of the fragmented components in the chain is supported by a variegated set of command mechanisms through which lead firm(s) shape the labour process (technology, labour standards, etc.). This degree of involvement in the integration process, that is the ability to shape the labour process, is an economic form of power whose manifestation is that transfer prices along the chain gives lead firm(s) the ability to capture part of the profits generated by the dispersed entities. The frontier of a given value chain is reached where this economic power of integration terminates, that is when price mechanisms become disconnected from the command over production parameters. Arriving at the boundary of a GVC, a product

⁴ Elements of this analysis were previously traced in Aglietta’s analysis of sub-contracting networks (Aglietta, 1979); on the related issues of possession and economic property relations, see Bettelheim (1970) and Poulantzas (1976).

becomes a (full) commodity whose conditions of exchange are governed by institutionally shaped market mechanisms.

In sum, a GVC organises an institutional and economic production and valorisation space where one (or a small number of) lead actor(s) exert(s) economic power to (partially) centralise profits and control(s) to some degree the labour process over geographically and often legally dispersed productive units. Defining GVCs as a form of the division of labour delineating a transnational space of production and valorisation allows us to establish a theoretical distinction between trade within and outside of GVCs that is not arbitrary (contrary to the two borders rule) and that goes beyond legal formalism (it encompasses both intra-firm international trade and trade between firms). This clear conceptualisation of the frontiers of GVCs paves the way for the elaboration of theoretically grounded GVC indicators.

3. Measuring the gains from GVC participation: a reappraisal

The ‘rosy scenario’ posits a uniform and positive relationship between a country’s increasing GVC participation and seeing increased economic gains. However, the indicators routinely used in the literature to assess such a relationship have often been elaborated by scholars affiliated with major policy institutions, whose interests are rather in immediate policy challenges than in the subtleties of GVC scholars’ theoretical refinements. The result is that usual measurements poorly reflect the analytical breakthroughs of the GVC academic research.

This section will lay the groundwork for a more theoretically informed use of indicators than that found in the current literature. After a brief discussion of the strengths and limitations of micro approaches (Section 3.1), we move to propose new macro indicators of GVC participation (Section 3.2) and the resulting economic gains in terms of value capture (Section 3.3), drawing on our understanding of GVCs as a specific form of the division of labour. We present the key differences between the standard measurements and our own indicators, along with cross-country descriptive statistics highlighting the advantages arising from measurement based on our conceptual and empirical proposals vis-à-vis standard measurements.

3.1 *Micro approaches to development in GVCs*

While a major strength of the case study method is its ability to zoom in on the relevant object of study and to provide more rounded insights that may be overlooked by macro indicators, a corresponding limitation is the difficulty in drawing any general conclusions from an accumulation of individual cases. In the case of GVCs, there are concerns that this limitation has in the past been aggravated by a ‘selection bias problem’ toward studying examples of successful upgrading (Bernhardt and Milberg, 2013, p. 490). However, this potential bias has been partially corrected by research that addresses the relationship between GVC participation and upgrading at the micro-level.

Of particular relevance is the paper by Phillips (2013), whose study of forced labour in Brazilian agriculture demonstrates that a marked deterioration in social standards may result, not from exclusion from GVC networks, but rather from the incorporation on unfavourable terms into GVC networks, what she calls ‘adverse incorporation’. This possibility is precisely what is missing from the rosy scenario of the policy institutions, whose indirect measurements of trade data overlook the novel forms of labour

relations—a form of contractual ‘neo-bondage’—easily picked up by Phillips’ focus on the incorporation of Brazilian agriculture into GVCs.

Other notable cases illustrate further advantages of the academic literature’s micro-orientation. In constructing their object of study in different ways, for example, [Kraemer et al. \(2011\)](#) and [Ding and Hioki \(2018\)](#), both studying the global smartphone industry, are able to reveal very different facets of the prospects for upgrading involved. Kraemer et al. start with a flagship final consumer product—various high-end smartphones—and trace the value-added accruing across different firms and countries for all stages of its production, uncovering the extremely skewed distribution of value-added toward the lead firm and the difficulty of upgrading for suppliers. Ding and Hioki, by including all smartphones—the high-end segment as well as the medium-range market—in their case study, are able to show how the continued dominance of global lead firms in the high-end segment has coexisted with significant upgrading in the emergence of a new wave of vertically integrated Chinese firms serving the domestic medium-range market.

Yet for all the additional richness provided by the case study methodology, the glaring problem remains of the inability to draw general conclusions. As the example of the smartphone GVC case studies demonstrates, even in a single industry case studies may paint contrasting pictures, and it can be difficult to say which tendency—toward adverse incorporation or upgrading—generally prevails.

Here, we have chosen to concentrate on the macro-level, on the same ground where the measurements of the policy institutions are to be found. This decision is what will best allow us to develop indicators, based on our conceptualisation of GVCs that is more in tune with the insights of the academic literature, that can be directly contrasted with those found in the mainstream and can therefore best judge the applicability of the rosy scenario of GVC participation and economic development.

3.2. *GVC participation measurement*

The standard way of measuring GVC participation in the macro literature derives from the two borders rule: GVC trade covers the portion of a given product that crosses at least two frontiers ([Hummels et al., 2001](#), p. 76). Country participation in GVCs is then measured in terms of vertical specialisation with a backward and a forward dimension: the backward component (VS)—foreign value-added content of total exports—assesses how dependent a country’s export sector is on foreign inputs; the forward component (VS1)—domestic value-added in third countries’ exports—shows how domestic exports rely on other countries’ exports. VS and VS1 are sometimes taken separately as independent measures in order to see whether participating as a buyer or as a seller can have a different impact ([Taglioni and Winkler, 2016](#); [Kummritz et al., 2017](#)). More commonly, VS plus VS1 are taken together as a share of exports to measure a country’s total (backward and forward) participation in GVCs.

The combination of VS and VS1 as a proxy for GVC trade leaves considerable room for further precision⁵ in light of the conceptualisation of the frontiers of GVC activity offered in this article. [Table 1](#) highlights the differences between the products included

⁵ [Wang et al.’s \(2017\)](#) recent move away from the two border rule for characterising GVC trade represents an important step among trade economists in recognising the limitations of the VS+VS1 definition of GVC participation.

Table 1. Standard versus authors' measurement of traded products included in GVC trade

Approach	Numerator			Denominator
	Products	Imports	Exports	
Standard vertical specialisation	All products	Re-exported intermediate inputs (VS) <i>Intermediate inputs absorbed domestically and finished products not included</i>	Intermediate inputs re-exported by the importer (VS1) <i>Intermediate inputs absorbed by the importer and finished goods not included</i>	All exports
Author's GVCs as a form of the division of labour	Non-primary products	All intermediate inputs <i>Finished products not included</i>	All intermediate inputs and final products	GDP

in our proposed measurement of participation in GVCs as a form of the division of labour and the standard VS + VS1 measure of vertical specialisation.

Deriving from the accounting strategy delineated in equation (1), the full measure that we use for the rate of GVC participation is as follows:

Equation 1: GVC participation rate as a form of the division of labour

$$\frac{(XDVA) * (1 - ppX) + ipM * (1 - ppM)}{GDP} \quad (1)$$

Where 'XDVA' is domestic value added in gross exports, 'ppX' is the share of primary products in total exports, 'ipM' is gross imports of intermediate products and 'ppM' the share of primary products in total imports

The key differences between our measurement of GVC participation and the standard measure concern the exclusion of primary products and the relaxation of the two borders rule.

It is the norm in GVC inspired macro studies to include primary products trade in GVC measurement. However, some recent studies have begun to exclude certain groups of primary commodities (Taglioni and Winkler, 2016, p. 88; Kummritz *et al.*, 2017). Revealingly, the reason for this exclusion is that natural resource-intensive countries introduce a bias in aggregate measurements and international comparisons, but this point is not theoretically articulated. There is a problem of consistency here: either what is important is the two borders rule, in which case the composition of trade is not relevant to measure GVC participation; or, if it is relevant to differentiate among the products traded, then the specificities of trade within GVCs must be explained and, in this case, there is no reason to maintain the two borders rule.

The reason we exclude primary products is straightforward: our understanding of GVCs as a specific form of the division of labour and its emphasis on a degree of transnational command over production do not concern most of primary products trade.

One last difference between our measure of GVC participation and the standard in the literature is that we opt for a ratio that divides by GDP rather than following the usual practice of dividing by gross exports. This is because our purpose is not seeing how much of world trade has become GVC trade, but rather looking at the developmental effects of the GVC division of labour. From this point of view, it is more relevant

to gauge the level of GVC openness in relation to the economy itself. In other words, our indicator can be interpreted as a measure of the value involved in GVC trade relative to the value created in a country, that is relative to the size of a country's economy.

Figure 1 illustrates the differences between our indicator and the standard VS+VS1 measure. It displays the value of a given country's GVC participation according to the

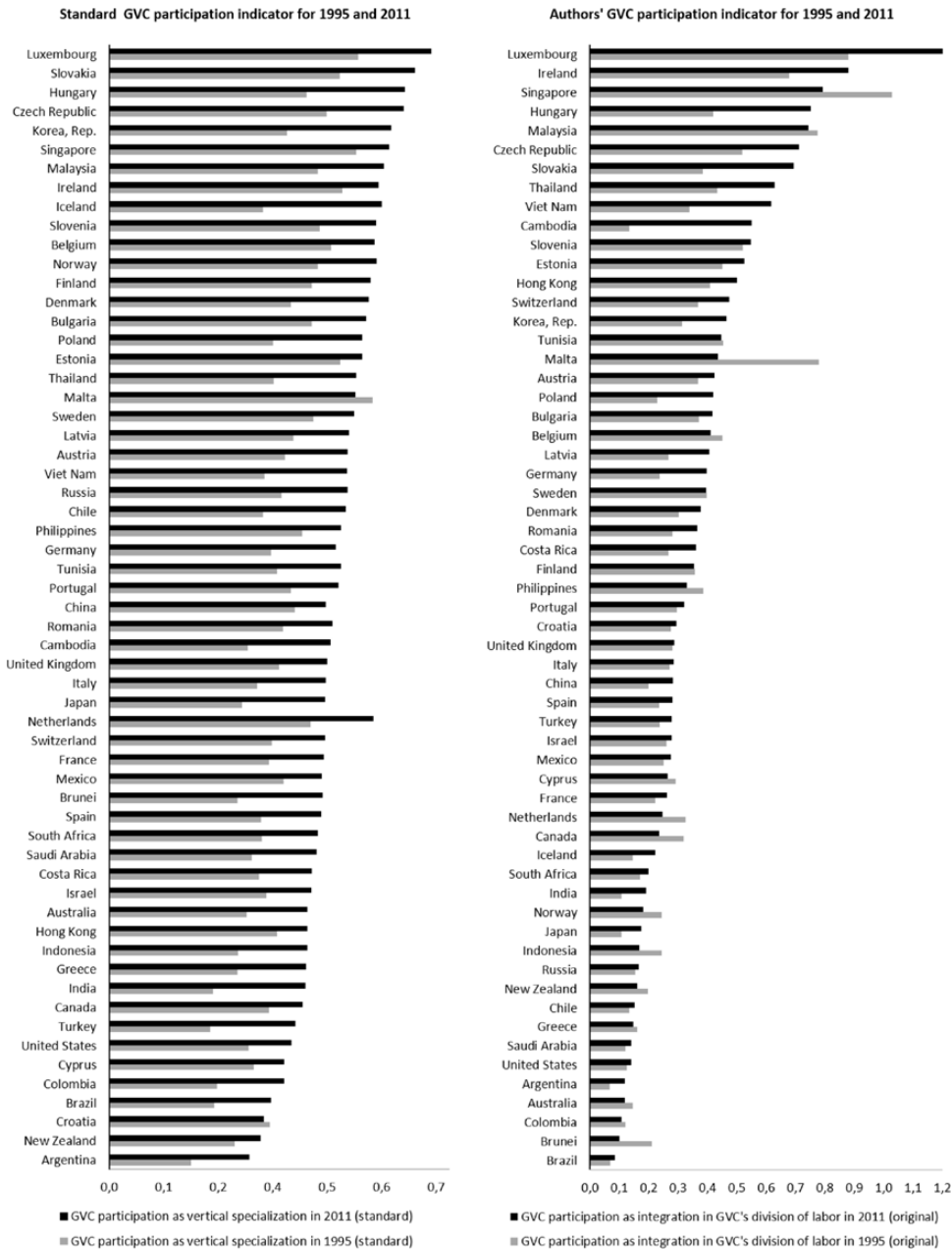


Figure 1. Standard and authors' measurement of countries' participation in GVC trade in 1995 and 2011.

different indicators, for the longest possible time span and greatest amount of countries that the existing TiVA data permit. That is, for 59 countries for the period that goes from 1995 to 2011.

The countries are ranked in order of their 2011 participation values. We do see some similarities between the two indicators, for example the 10 leading countries according to both indicators share seven countries in common. The differences between the two graphs, however, demonstrate the greater precision of our indicator in capturing GVC dynamics.

First, as expected, our indicator offsets the effects of the 2000s commodity boom. This is reflected in the slower growth, on average, of GVC participation seen throughout the countries in our indicator in comparison with the standard indicator. The difference is particularly noticeable for major commodity exporters such as Australia, Brazil, Russia, Indonesia, South Africa and, in a particularly extreme case, Brunei. Beyond the commodity issue, our measure more easily identifies a limited number of countries that dramatically increased their involvement in GVCs, namely Germany, China and a handful of mostly East Asian and Eastern European countries.

3.3 GVC value capture measurement

Although the measurement of economic upgrading in GVCs is not as standardised in the literature as it is in the case of GVC participation, the most commonly used indicator is based on the domestic value-added share of exports (Milberg and Winkler, 2013; UNCTAD, 2013; Taglioni and Winkler, 2016). The logic of this type of indicator sees economic upgrading as something that is done relative to others, in keeping with the academic literature's emphasis on climbing the value-added ladder. It thus also implies the possibility of downgrading, as the measure highlights the amount of value-added in trade being retained by one country as opposed to being lost to others. For this reason we call it a 'value capture' measure, as opposed to other approaches to upgrading (including some seen in Table 2 below) that place the emphasis on upgrading as an absolute rather than a relative endeavour.

Table 2 summarises the most recent approaches to measuring value capture in GVCs.

Our understanding of economic upgrading agrees with the most common approach of utilising a value capture measure, but innovates in taking domestic value-added in exports as a share of total GVC trade, which for us includes imported intermediates and excludes primary products (see Section 3.2 above), rather than merely as a share of exports.

The formula that emerges to calculate our measure of economic upgrading from GVC participation, therefore, is as follows:

Equation 2: $XDVA$ in GVC trade

$$\frac{(XDVA) * (1 - ppX)}{(XDVA) * (1 - ppX) + ipM * (1 - ppM)} \quad (2)$$

Where ' $XDVA$ ' is domestic value added in gross exports, ' ppX ' is the share of primary products in total exports, ' ipM ' is gross imports of intermediate products and ' ppM ' the share of primary products in total imports

As the reader will notice, the numerator of equation (2) corresponds to the total value captured by a country when exporting non-primary products (i.e. the total value

Table 2. *Standard versus authors' measurement of value capture in GVCs*

Indicator	Formula	Sources	Strengths/limitations
Domestic value-added share of exports	XDVA/X	Taglioni and Winkler (2016); UNCTAD (2013)	Considers DVA gains in relation to exports but not in relation to GVC trade
Domestic value added in exports (per capita)	XDVA/ population	Kowalski <i>et al.</i> (2015)	Typically increases for all with increased GVC participation
Domestic value added by industry	DVAi	Kummritz <i>et al.</i> (2017)	Very distant to GVC trade
Import content of export expansion ratio	$IC_t - IC_{t-1} \star (X_t/X_{t-1} - 1)$	Jiang and Milberg (2013)	Considers DVA gains in relation to exports but not in relation to GVC trade
Domestic value added in GVC trade	XDVA / (GVCX + GVCM)	Author	Captures DVA gains in relation to total GVC-related trade

captured by a country through GVC-related trade) and the denominator to the total value of GVC-related trade as defined above (the numerator of equation 1).

The reason for including domestically absorbed intermediate imports in the denominator stems directly from our above conceptualisation that sees all secondary goods and services trade (excluding the import of finished products) as GVC trade. This type of GVC import represents a real cost that could offset some of a country's gains in terms of capturing value through GVC exports. In the case of some countries where the cost of such imports is particularly high due to an underdeveloped domestic input sector, omitting domestically absorbed intermediate imports from the denominator of the value capture measure would therefore give an unrealistically high GVC gain rate. Including such real costs of GVC participation as well as the gains from domestic value-added in exports provides a more precise measure of the real gains from participation.

Figure 2 illustrates the differences between our value capture measure, taking XDVA as a share of total GVC trade, and the most commonly used value capture indicator that only takes XDVA as a share of gross exports. As with Figure 1 in the previous section, the same 59 countries are ordered by their 2011 values while also providing their 1995 values.

Here, the most striking thing to notice is again the greater precision of our indicator in identifying the value captured *in GVCs* by netting out the overall non-GVC dynamics of the overlapping commodity boom period. Notice, for example, that 8 out of the top 10 countries in terms of 2011's value capture by the more standard measure are major commodity exporters, with primary products ranging from 65% of total exports (Brazil) to 97% (Brunei), far above the sample average of 37% for 2011. Their high levels of value capture are therefore misleading, since this is value captured overwhelmingly through the commodity boom and not through participation in GVCs. In contrast, with our indicator, these countries are concentrated among the *bottom* ten countries in 2011, reflecting the weak involvement of their domestic production

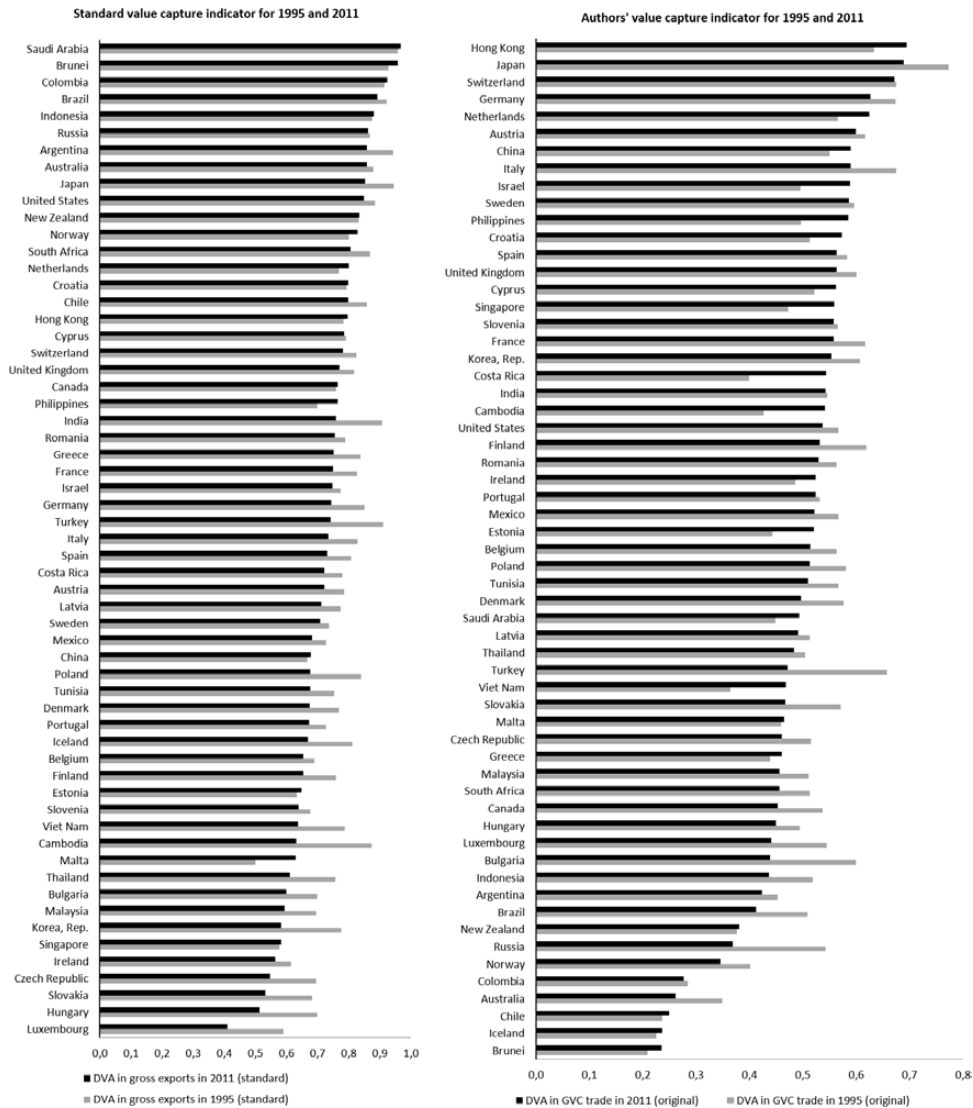


Figure 2. *Standard and authors' measurement of countries' value capture in GVC trade in 1995 and 2011.*

in GVC trade. Our indicator shows that the countries that gained the most relative to their involvement in GVC trade are high-income industrialised countries plus China while, among countries ranking in the middle, one finds developing countries and peripheral European countries.

Aside from the primary products issue, the other significant advantage arises from the fact that the denominator of our indicator includes both intermediate imports and exports, in sharp contrast to other measurements of value capture relating domestic value-added to exports alone. Consequently, our indicator is able to weigh countries' gain against their reliance on intermediate imports. This difference shows up in Figure 2, as countries with a notorious trade deficit, such as the United States and

Greece, score much lower in value capture while major trade surplus countries such as Japan and Germany shoot toward the very top of the list.

A final indication of the greater precision of our indicators for value capture, and also for GVC participation, can be seen by looking at the standard deviation for the countries' rate of change between 1995 and 2011, which is considerably larger by our measure both for GVC participation (49.9% versus 19.7% for the standard measure) and value capture (14% versus 9.9%). In other words, we are better able to capture the heterogeneity of participation and country gain trajectories throughout the period, allowing us to more accurately contrast the divergent fates of countries in the GVC era while at the same time reducing the theory-measurement gap.

Overall, our novel measurement of GVC participation and value capture does a better job of identifying variety among country performances and avoids confounding non-GVC phenomena. This provides a stronger foundation for the econometric analysis of GVC development patterns.

4. Data analytics

As the aim of this contribution was to show the diversity of GVC integration patterns, we cannot rely on cross-national macro regressions that mask the heterogeneity of relationships among the variables by sub-groups of countries (Rodríguez and Rodrik, 2000). We therefore perform a PCA, a methodology that is perfectly suited to capture the heterogeneity of relationships between economic and social variables among groups of countries. In addition to our GVC-related measures, the variables included are: the investment rate, which captures another facet of economic development beyond that of value capture, and four social outcome variables that speak to the multi-dimensional nature of 'social upgrading' (Milberg and Winkler, 2013, p. 251). The social variables are the rate of employment, median income, the Gini index and labour's share of income.⁶

We combine these various data to run our PCA for 51 countries for the period from 1995 to 2008 (Section 4.1). We use the results to perform a cluster analysis that leads to the identification of three groups of countries that represent three GVC-related *development* patterns (Section 4.2).

4.1. Principal component analysis

4.1.1 Outline of the evolution of the variables

Before performing the PCA, we take a look at the direction in which the analyzed variables evolved in order to provide a first glance of the general trends for the 51 countries in our dataset.

Table 3 shows some general trends in the variations of the raw variables analyzed. As expected, participation in GVCs increased for the vast majority (84%) of countries, on average by 29%. On the other hand, value capture decreased for 73% of them, although the mean decrease is negligible (−4%). The investment rate, the employment

⁶ The sources used, treatments chosen and the robustness of the results concerning different choices can be found in the [Supplementary Appendix](#). [Supplementary Appendix](#) also provides a discussion of the relative impact of the various elements informing our choice of the novel indicators presented in Section 3.

Table 3. Distribution of country evolution and mean percentage change between 1995 and 2008 for each indicator

	Participation	Value capture	Investment rate	Labour share	Employment rate	Gini (−1)	Median income
Countries with positive evolutions	84%	27%	67%	22%	63%	53%	88%
Countries with negative evolutions	16%	73%	33%	78%	37%	47%	12%
Mean change	29%	−4%	10%	−6%	2%	0%	37%

Particularly important coordinates and contributions are highlighted in bold.

rate and especially median income increased for most countries and on average. The two variables chosen to measure inequality, the labour share and the Gini index, tell different stories. Measured in terms of labour share, inequality increased in 78% of countries and rose by 6% on average, whereas using the Gini coefficient, inequality rose in roughly half of the countries and did not evolve on average. This reinforces our decision to include both variables to measure inequality.

4.1.2 Treatment of data in order to perform the analysis

Taking percentage increases of variables alone throughout the period under consideration might have made comparisons between countries misleading since the starting values of variables vary significantly between countries. For this reason, we decided to create an index of each variable that weighs the percentage increases between 1995 and 2008 by the value of each variable at the beginning of the period under analysis, that is, its value in 1995. Additionally, in order not to privilege social upgrading variables in our analysis, we created a composite index of the four social variables, with all four social variables (employment rate, median income, Gini index and labour share) weighted equally. We are therefore left with four index variables to conduct the PCA, that is, GVC participation ('PART_INDEX'), value capture ('VALCAPT_INDEX'), investment ('INVESTMENT_INDEX') and the social upgrading composite ('SOCIAL_INDEX'). The results are robust with respect to these choices of treatment, as is further discussed along with more details of the treatment method in the online appendix.

4.1.3 Results

Following the Kaiser criterion, we retain three axes (F1, F2 and F3) in the PCA. The information contained in these axes concentrates 83.14% of the variables' information. Table 4 shows the coordinates of the variables for each axis and Table 5 the contributions of each variable to each axis. Particularly important coordinates and contributions are highlighted in bold. Figure 3 shows the correlation circle on axes F1 and F2 that resulted from the PCA.

Table 4 shows that the right side of axis F2 is strongly characterised by the variable VALCAPT_INDEX and that the variable SOCIAL_INDEX is highly represented on one side of axis F3. Both PART_INDEX and INVESTMENT_INDEX are associated with the right side of axis F1. Although these two variables have coordinates of

Table 4. Factor loadings of each variable for axes F1, F2 and F3

	F1	F2	F3
PART_INDEX	0.76	0.36	0.20
VALCAPT_INDEX	0.03	0.91	−0.15
INVESTMENT_INDEX	0.78	0.36	
SOCIAL_INDEX	−0.19	0.08	0.97

Particularly important coordinates and contributions are highlighted in bold.

Table 5. Contributions of the variables to axes F1, F2 and F3 in percentage points

	F1	F2	F3
PART_INDEX	47.4	12.0	4.1
VALCAPT_INDEX	0.1	75.2	2.3
INVESTMENT_INDEX	49.7	12.2	0.1
SOCIAL_INDEX	2.8	0.6	93.5

Particularly important coordinates and contributions are highlighted in bold.

0.36 and 0.37, respectively, in axis F2, they should not be interpreted as being associated with axis F2, since, as shown in Table 5, the share of their information contained in axis F2 is small. Finally, as shown in the lower-right cell of Table 5, the variable SOCIAL_INDEX is highly correlated with axis F3. The variable factors map being two-dimensional, this correlation cannot be visualised in Figure 3.

Some preliminary conclusions can be made. First, the fact that PART_INDEX, VALCAPT_INDEX and SOCIAL_INDEX are represented along different orthogonal axes indicates that these three variables are independent of each other. This result confirms that there is no direct correlation between GVC participation, value capture and social outcomes. Second, INVESTMENT_INDEX and PART_INDEX being both associated with the right side of axis F1 indicates that, in general terms, countries that have increased their participation indexes the most are also the ones that have increased their investment indexes the most. Bearing in mind that the indexes are comprised of the percentage change of the variables in the 1995–2008 period and their starting 1995 values in equal parts, this can be interpreted in two non-mutually exclusive ways: countries that have most increased their participation in GVCs are countries that have also seen the largest increases in their investment rates in percentage terms and/or they are countries that already had large investment rates in 1995.

4.2 Cluster analysis

4.2.1 Methodology

We now turn to a cluster analysis in order to identify groups of countries (classes) for which the four indexes (GVC participation, value capture, investment and social outcomes) evolved in the same direction.

Using both the agglomerative hierarchical clustering (AHC) method and the k-mean clustering method we find three classes translating three distinct GVC development patterns for the 1995–2008 period.

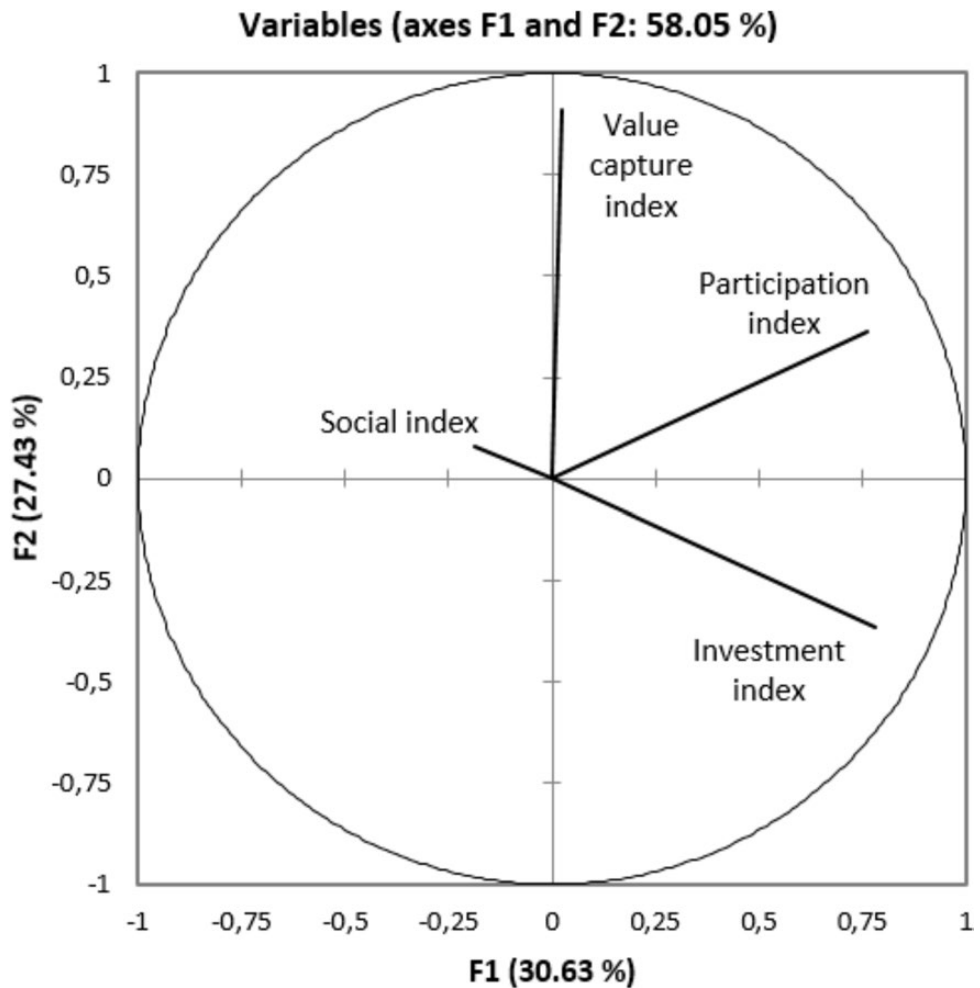


Figure 3. Correlation circle on axes F1 and F2.

4.2.2 Results

Table 6 shows the country composition of each class along with the number of countries in each.

When we performed the same analysis using the traditional GVC participation and value capture indicators instead of the authors' indicators introduced in Section 3, the country composition of the classes was profoundly altered. Moreover, the three classes presented close-to-average values for all variables except for value capture in class 2, which shows that, if traditional GVC and value capture indicators are used, the cluster analysis is inconclusive.

To understand the specific features of these three country groupings, we now turn to their intrinsic characteristics. We proceed by calculating the mean value of the four variables used in the PCA for each class and we compare them to the sample mean. The rationale for this method is simple: when the mean of one of the variables for a

Table 6. Country composition of the classes (World Bank country abbreviations)

Class	1	2	3
	Argentina	Austria	China
	Australia	Brazil	Costa Rica
	Belgium	Switzerland	Czech Republic
	Canada	Colombia	Estonia
	Chile	Germany	Finland
	Denmark	France	Croatia
	Spain	United Kingdom	Hungary
	Greece	Israel	India
	Indonesia	Italy	Ireland
	Iceland	Japan	South Korea
	Norway	Cambodia	Luxembourg
	New Zealand	Netherlands	Mexico
	Portugal	Philippines	Malaysia
	Russian Federation	Sweden	Poland
		Turkey	Romania
		United States	Slovakia
			Slovenia
			Thailand
			Tunisia
			Vietnam
			South Africa
Number of observations	14	16	21

class is significantly higher/lower than the mean of all countries in the sample we can say that a high/low value of that variable is characteristic of the class. Given that the raw variables were standardised in order to build the indexes, the mean of the sample is equal to 0 for each index. Figure 4 shows the result of these calculations in a radial graph. Shapiro–Wilk, Anderson–Darling, Lilliefors and Jarque–Bera normality tests run at a significance level of 0.05 for each variable and class conclude that, for each class, all the variables follow a normal distribution; it is therefore safe to interpret the mean of each variable for each class shown in Figure 4 as representative of its corresponding class. The individual countries included in each class are listed in Table 6.

4.2.3 Interpretation of the results

As Figure 4 shows, class 1 is characterised by a very small increase in GVC participation and value capture, an average increase in investment and a high increase in social variables. Taking into account the country composition of the class, two different trajectories that converge into the same GVC development pattern can be construed.

The first one corresponds to a ‘GVC resource curse’ and applies to countries like Argentina, Australia, Canada, Chile, Indonesia, Iceland, New Zealand, Norway and Russia. Here, the countries are net primary commodity exporters that benefited from the historically exceptional increase in the international prices of commodities. Given the definition of our indicators, this implies a disengagement from GVCs and a loss in value capture coming from GVCs. Investment did not particularly evolve due to this dynamic but, on the contrary, the policies implemented and social dynamics that took place between 1995 and 2008 contributed to the use of these commodity-related

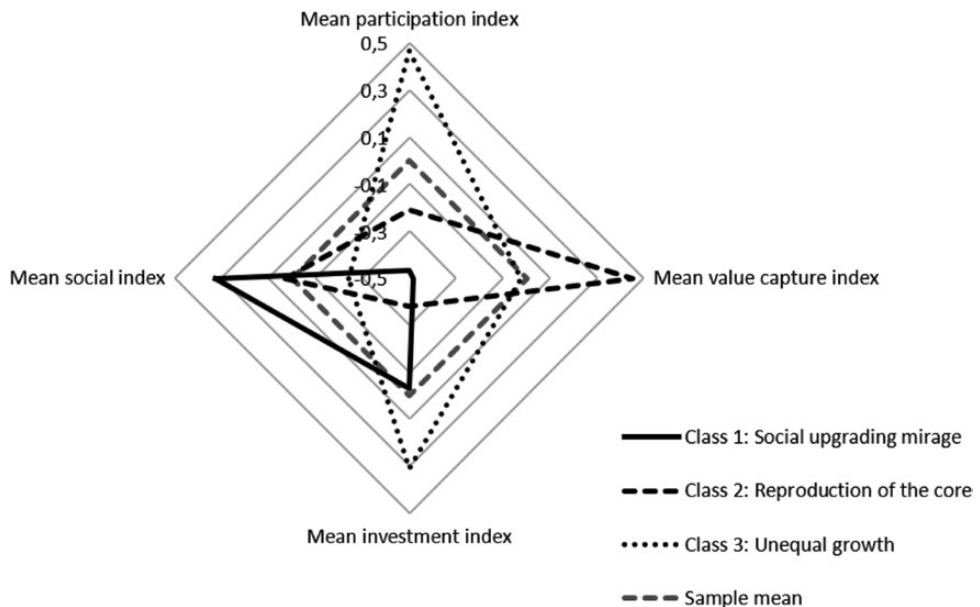


Figure 4. Mean value of each variable by class and for the sample.

income gains to obtain social improvements in terms of equality, median income and employment.

The second trajectory found in this first cluster is that of peripheral European countries that benefited up to the 2008 crisis from foreign financial inflows which allowed for temporary social improvements (Stockhammer *et al.*, 2016). These countries lagged behind in GVC participation and economic upgrading, which led to underperformance in terms of GVC-related value capture. Yet, this same process brought about a flow of financial-related income that was distributed in a way that led to an increased median income and decreased inequality. In the case of Greece, Spain and Portugal, they benefited from capital inflows with their integration in the Eurozone and, by that means, were able to undergo a process of social upgrading. Nonetheless, this process adversely affected their competitiveness and resulted in a lag in GVC participation and economic upgrading. The severe economic crises these countries are undergoing since 2008 illustrate the mirage-like quality of the non-GVC led social upgrading path of class 1.

Class 2 is characterised by medium to low scores in GVC participation and investment rates coupled with an average score in the social variable and a very positive evolution in terms of value capture. The countries that constitute this class are mainly developed countries.⁷ This suggests a trajectory characterised by a slow increase in GVC participation but in which participation was increasingly concentrated in the tiers of value chains that are able to capture more value. Given that these countries

⁷ Some of the countries in this class (Brazil, Colombia, Cambodia, Philippines and Turkey) are developing countries with heterogeneous development patterns. Their belonging to class 2 illustrates the limitations of cluster analyses conducted based on observations' factor scores in a PCA. Nevertheless, the homogeneity of the development pattern among the developed countries of class 2 that is explained in this section accounts for two thirds of the observations of the class, which makes our characterisation of the 'reproduction of the core' development pattern reliable.

have been developed for decades if not centuries, they already had developed productive structures that allowed them to achieve highly profitable positions in GVCs without a sharp increase in investment. That this class of countries' social index score is at the sample mean suggests, looking back at Table 3, that their populations benefited from an increase in median income compatible with their sharp increase in GVC-related value capture but that employment did not significantly increase and inequality did not change or even increased, depending on the specific case.

In this sense, we can think of this dynamic as a reproduction of the core trajectory: the most developed countries in 1995 did not increase their GVC participation as much as others during the globalisation boom, yet they were able to capture more value than the others. They were thus able to reproduce their dominant position in the global economy through GVC trade without producing much in terms of social upgrading for their populations.

Class 3 is characterised by very high scores in GVC participation and investment rates, a slight decrease in value capture and low scores in social terms. This can be characterised as a pattern of 'unequal growth'. The countries that compose this class are mainly developing countries in Asia and Eastern Europe that in many cases were starting to undergo a process of integration into global capitalism after decades of socialist or developmental regimes. Their economies opened sharply and they joined the globalisation boom by participating strongly in GVCs, which, consequently, implied sharp increases in their investment rates that bolstered their productive structures. Value capture, however, slightly decreased in contrast to countries of class 2 ('reproduction of the core'). Moreover, in terms of social upgrading this GVC development pattern was not beneficial overall: inequalities increased more than in any other group of countries and growth in the employment rate was virtually null (less than 1% on average), clearly the slowest compared to the other two classes. However, median income saw an average increase, sometimes even a spectacular one in countries such as China where, as is known, the 1978–2015 period saw real average income per adult grow 38-fold, putting even the bottom 50% of the population's average income growth at around 4.5% per year despite their share of national income being roughly halved due to sharp increases in inequality (Piketty *et al.*, 2017).

To summarise, this analysis shows that there is no single story concerning the relationship between GVC participation and outcomes relating to value capture, investment or social standards at the country level. On the contrary, three distinct configurations of relationships among these variables were identified for sub-groups of countries in our dataset, indicating three development patterns that we have identified as a social upgrading mirage (that includes a GVC resource curse for some countries), a reproduction of the core and a pattern of unequal growth.

5. Discussion

Based on the conceptual and methodological achievements of Sections 2 and 3, the PCA and cluster analyses conducted in Section 4 question the idea that the internationalisation of production processes fosters development or provides policy space to address developmental challenges. It relates and contrasts three broad development patterns found in GVCs between 1995 and 2008: a *social upgrading mirage*, the *reproduction of the core* and *unequal growth* (Table 7). Our findings echo earlier work by

Table 7. *The compossibility of three observed development patterns*

	Reproduction of the core	Unequal growth	Social upgrading mirage
	Rentier’s integration	Productive integration	Non-GVCs led dynamics
GVC participation	+/-	+	–
VA capture	+	+/-	–
Productive development	–	+	+/-
Socio-economic outcomes	+/-	–	+

Milberg and Winkler (2013, pp. 198–202) in showing that relations between GVC outcome variables differ significantly depending on the specific grouping of countries considered, with the difference being that Milberg and Winkler formed their country groupings through pre-selected institutional categories whereas ours emerge through the process of statistical analysis.

Strikingly, our analysis does not show any *rosy scenario* where GVC participation goes along with relative improvements in terms of value capture, productive development and socio-economic outcomes. Rather, it shows an apparent compossibility between three regimes revealed by the polarisation in each of the dimensions of our typology, which suggests that development patterns in GVCs need to be understood as constitutive parts of a global process of uneven development. This finding reconnects with one key insight of the original research on global commodity chains: the relational character of development patterns along the chains (Hopkins and Wallerstein, 1977).

In the case of the *reproduction of the core* pattern, a category that comprises most of the biggest, high-income economies, value capture is disconnected from productive development measured in terms of investment. It echoes the possibility that GVC participation could lead to greater value capture thanks to the exercise of market power. Such market power could be related to economic barriers to entry, for example arising from the concentration of intangibles, and/or to an asymmetric political structure resulting in the protection of standards and intellectual property rights (Durand and Milberg, 2020). In such cases, benefits from GVC participation do not result from higher productivity but from the ability to extract rent from foreign actors, an idea already raised by dependency theorists (Palma, 1978). For example, the ability of global buyers to benefit from cheaper inputs could be completely disconnected from any productive improvement, in which case its overall impact will depend on the distribution and the uses of the gains (Milberg, 2008).

The counterpart of this privilege of the core is a process of *unequal growth* where increases in the quality or quantity of output resulting from productivity gains are more than compensated by diminishing prices, resulting in lower value capture. In such cases greater productive efficiency does not translate into greater economic gains but rather leads to social downgrading as previous uses of resources have been disrupted by the involvement in GVCs (Kaplinsky et al., 2002; Mohan, 2016). This second kind of pattern corresponds to the fate of mainly developing countries that experienced a rapid insertion in GVCs along with important productive development and, in the meantime, poor social outcomes. Even as median income improved—sometimes

spectacularly as in the case of China—growing personal and functional income inequality and/or poor employment performances point to a pattern of partially skewed development associated with growing involvement in GVCs.

It is important here to stress that even when value capture improves, social upgrading is far from evident, depending on the internal unfolding of class relations. Indeed, if economic gains are captured by capital, they could fuel higher inequality and limit the spillover effect that should increase the population's income. Moreover, higher profits do not necessarily translate into higher investment—they could result in higher financial payments, which means that the overall impact on employment is not straightforward. Thus, as a result of greater inequality or unproductive uses of profits, greater value capture resulting from GVC participation can be associated with social downgrading. Conversely, positive social outcomes necessitate that labour, which represents the bulk of the population, manages to capture part of the gains, either directly through higher wages or, indirectly, through tax-funded public welfare. For such an outcome to occur, the key mechanisms are a higher labour demand resulting from productive uses of profits and workers' ability to mobilise some structural and/or associational power (Wright, 2000).

Interestingly, the best social outcomes revealed by our analysis occurred in countries that stayed relatively insulated from GVC dynamics. We nonetheless call this configuration a *social upgrading mirage* because it rests on external conditions of possibility which are, on the one hand, the commodity boom of the 2000s and, on the other hand, the massive financial inflows in countries from the peripheral European countries during the first decade of the Euro. These conditions favoured overall improvements in terms of median income, employment and sometimes inequality, but unfortunately they later proved unsustainable as these countries were among the most heavily hit by the reversal of the commodity boom and the 2008 financial crisis and its destabilising effect on the European monetary area.

With this overall picture in mind we can come back to the importance of our initial conception of GVCs as a specific form of the division of labour. One of the core elements of this conceptualisation is that within the boundaries of GVCs, the economic ability to capture the gains and the ability to frame the productive processes are unevenly but interdependently distributed. This allows for an original understanding of the diversity and complementarity of uneven development patterns along value chains. Uneven development patterns typically result from the fact that GVCs delineate transnationally fragmented labour processes, often dispersed among formally independent entities that are nonetheless to some degree economically unified under a dominant locus of valorisation. Positions of market power reflect some degree of control over labour processes that descends along the chains and allows value capture at considerable geographical removal from the countries where productive development takes place. This focus on fragmented-unified valorisation processes also sheds a new light on social outcomes. They cannot directly be deduced from GVC participation and can only be understood if one takes into account the distribution of capitals' powers along the chain in addition to other dimensions such as the institutional set of constraints and regulations or the position of labour at the point of production. In this perspective, the complementarity between the three development patterns described by our empirical investigation is a reflection, at the inter-country level, of a strongly hierarchised organisation of the world economy that is spreading at a more granular level among unequal power nodes within trade, financial and policy networks.

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Focusing on GVC dynamics at the macro-level, our PCA and cluster analyses indicate three main patterns of development in GVCs between 1995 and 2008: *a social upgrading mirage*, *the reproduction of the core* and *unequal growth*. Contrary to the mainstream narrative about the expected positive effects of GVC participation, we show a more nuanced reality where gains from GVC participation are unevenly distributed between and within countries and point to the interdependence the diverse GVC development patterns reflecting the specificities of the global division of labour within value chains.

This paper thus identifies economic mechanisms that are difficult to disentangle through case studies and does not suffer from the inability of common econometric analysis to account for heterogeneous trajectories. We hope that it will contribute to new avenues for theoretical discussion and empirical inquiry within the GVC community.

Supplementary data are available at *Cambridge Journal of Economics* online.
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