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Participation of Developing Countries in Global Value Chains

IMPLICATIONS FOR TRADE AND TRADE-RELATED POLICIES

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Abstract

Participation of Developing Countries in Global Value Chains: Implications for Trade and Trade-Related Policies

by
Przemyslaw Kowalski, Javier Lopez Gonzalez, Alexandros Ragoussis
and Cristian Ugarte

Although global value chains (GVCs) are often considered a defining feature of the current wave of globalisation, little is known about: i) what drives GVC participation; ii) what the benefits associated to growing participation are; or iii) how developing countries engage and benefit from GVCs. This paper tackles these questions empirically. The evidence indicates there are important benefits to be had from wider participation in terms of enhanced productivity, sophistication and diversification of exports. Structural factors, such as geography, size of the market and level of development are found to be key determinants of GVC participation. Trade and investment policy reforms as well as improvements of logistics and customs, intellectual property protection, infrastructure and institutions can, however, also play an active role in promoting further engagement. A more in-depth analysis of GVC participation and policy context in five developing sub-regions in Africa, the Middle East and Asia highlights key differences and similarities, and can be a starting point for policy makers in the regions to assess their countries' GVC engagement and to consider policy options.

Key words: Global value chains; GVCs; intermediate inputs; upgrading; trade policy; investment; regional trade agreements; developing countries; East and Southern Africa; West and Central Africa; Middle East and North Africa; South Asia; South East Asia.

JEL: F1, F2, F6

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Abbreviations of names of countries and territories

AFG	Afghanistan
AGO	Angola
ARG	Argentina
ARM	Armenia
ATG	Antigua and Barbuda
AUS	Australia
AUT	Austria
BDI	Burundi
BEL	Belgium
BEN	Benin
BFA	Burkina Faso
BGD	Bangladesh
BGR	Bulgaria
BHR	Bahrain
BOL	Bolivia
BRA	Brazil
BRN	Brunei Darussalam
BTN	Bhutan
BWA	Botswana
CAF	Central African Republic
CAN	Canada
CHE	Switzerland
CHL	Chile
CHN	China (People's Republic of)
CIV	Côte d'Ivoire
CMR	Cameroon
COG	Republic of the Congo
COL	Colombia
COM	Comoros
CPV	Cabo Verde
CRI	Costa Rica
CZE	Czech Republic
DEU	Germany
DJI	Djibouti
DNK	Denmark
DOM	Dominican Republic
DZA	Algeria
ECU	Ecuador
EGY	Egypt
ERI	Eritrea
ESP	Spain
EST	Estonia
ETH	Ethiopia
EU	European Union
FIN	Finland
FRA	France
GAB	Gabon
GBR	United Kingdom
GHA	Ghana
GIN	Guinea
GMB	Gambia
GNB	Guinea-Bissau
GNQ	Equatorial Guinea
GRC	Greece
GTM	Guatemala
HKG	Hong Kong, China
HND	Honduras
HUN	Hungary
IDN	Indonesia
IND	India
IRL	Ireland
IRN	Iran, Islamic Republic of
IRQ	Iraq
ISR	Israel
ITA	Italy
JOR	Jordan
JPN	Japan
KEN	Kenya
KHM	Cambodia
KOR	Korea
KWT	Kuwait
LAO	Lao People’s Democratic Republic
LBN	Lebanon
LBR	Liberia
LBY	Libya
LKA	Sri Lanka
LSO	Lesotho
LTU	Lithuania
LUX	Luxembourg
LVA	Latvia
MAC	Macau, China
MAR	Morocco
MDG	Madagascar
MDV	Maldives
MEX	Mexico
MLI	Mali
MLT	Malta
MMR	Myanmar
MNG	Mongolia
MOZ	Mozambique
MRT	Mauritania
MUS	Mauritius
MWI	Malawi
MYS	Malaysia
NAM	Namibia
NER	Niger

NGA	Nigeria
NIC	Nicaragua
NLD	Netherlands
NOR	Norway
NPL	Nepal
NZL	New Zealand
OMN	Oman
PAK	Pakistan
PER	Peru
PHL	Philippines
PNG	Papua New Guinea
POL	Poland
PRK	Democratic People's Republic of Korea
PRT	Portugal
PRY	Paraguay
PSE	Palestinian Authority
QAT	Qatar
RWA	Rwanda
SAU	Saudi Arabia
SDN	Sudan
SEN	Senegal
SGP	Singapore
SLE	Sierra Leone
SOM	Somalia
SSD	South Sudan
STP	Sao Tome and Principe
SVK	Slovak Republic
SVN	Slovenia
SWE	Sweden
SWZ	Swaziland
SYC	Seychelles
SYR	Syrian Arab Republic
TCD	Chad
TGO	Togo
THA	Thailand
TLS	Timor-Leste
TUN	Tunisia
TUR	Turkey
TWN	Chinese Taipei
TZA	Tanzania
UAE	United Arab Emirates
UGA	Uganda
URY	Uruguay
USA	United States
VEN	Venezuela
VNM	Viet Nam
YEM	Yemen
ZAF	South Africa
ZMB	Zambia
ZWE	Zimbabwe

Executive Summary

This report provides an empirical assessment of the determinants of participation in global value chains (GVC) for countries at different levels of economic development, with a particular focus on measuring the extent of GVC participation in countries in Asia and Africa/Middle East. The report discusses the benefits from GVC participation for these regions, and identifies key trade and trade-related policies that would improve a country's ability to integrate into these chains.

This work is particularly relevant in the context of the increasing involvement of developing countries in GVCs and the strong indications that participation can offer new opportunities to integrate into the global economy by allowing firms to join international production networks rather than having to build their own from scratch. It **contributes to the ongoing debate about the extent and desirability of integration into regional and global value chains for developing countries, and the manner in which such integration might be supported** by a range of policy instruments in areas ranging from trade and investment to education and skills, capital availability, infrastructure, trade facilitation and logistics, business environment and public institutions. It also seeks to deepen the understanding of issues related to the notion of "upgrading" in GVCs.

Discussions of outcomes of participation in GVCs have been couched in terms of economic and social "upgrading". The paper seeks to deepen the understanding of economic upgrading which recently, and perhaps mistakenly, has been seen as the need to capture a growing share of domestic value added in exports or to target specific "sophisticated" products or production stages. This however misses the point that the **volume of the activity may matter as much as the domestic value added share or sophistication**; important benefits can be derived from specialising in less sophisticated assembly activities according to comparative advantages and performing them on a large scale.

Overall, the results from this report suggest that both the buying and the selling activities in value chains, where countries tend to either source foreign inputs for export production or provide inputs to foreign partners for their export production—respectively what has been dubbed the **"backward" and "forward" linkages in GVCs—tend to bring about economic benefits**. These relate to enhanced productivity, sophistication and diversification of exports, even if there is some heterogeneity across income groups.

Determinants of GVC participation

Structural characteristics of countries are the main determinants of GVC participation and their relationships with backward and forward engagement are diverse. We find the following elements to be most important:

- **Market size**: The larger the size of the domestic market, the lower the backward engagement of a country, and the higher the forward engagement. The intuition is that countries with a larger market can draw on a wider array of domestic intermediates both in terms of purchases and sales.
- **Level of development**: The higher the per capita income the higher is the aggregate forward and backward engagement. Developed countries tend to source more from abroad and sell a higher share of their gross exports as intermediate products.
- **Industrial structure**: The higher the share of the manufacturing sector in GDP the higher the backward engagement, and the lower the forward engagement.

- **Location**: GVC activity is organised around large manufacturing hubs—the larger the distance to the main manufacturing hubs in Europe, North America and Asia the lower the backward engagement, suggesting that there is a premium to locating close to large 'headquarter' economies.

Trade and other policies can also play a significant role, in particular:

- **Low import tariffs, both at home and faced in export markets, and engagement in regional trading agreements (RTAs)** can all facilitate backward and forward GVC engagement.
- **Inward FDI openness** tends to have a significant association with both backward and forward integration.
- **Logistics performance, including trade facilitation, intellectual property protection, the quality of infrastructure,** as well as the **quality of institutions** are estimated to have strong impacts on GVC integration.

The analysis also shows that structural and policy drivers of GVC participation **can vary significantly by sector and with the level of development.** This suggests that there is a merit in nuancing the analysis of GVC participation on the basis of economic sectors and the level of economic development. For example, drivers of participation that are influenced by policy in the short and medium run seem to be playing a lesser role in determining participation of low income countries as compared to high or middle-income countries. This might imply that in order to overcome a relative disadvantage in structural factors (e.g. in distance to the closest manufacturing hub) a low income country may need to change its position in terms of the policy environment relatively more than a high income country.

Key findings for Asia and Africa/Middle East

Analysis of regional and global export competitiveness in seven key sectors in which our developing sub-regions of Africa/Middle East and Asia display high participation rates (agriculture; processed food products; plastics and rubber; textiles; metal products; electrical and electronic equipment; and motor vehicles) suggests that the Asian regions dominate the more advanced products such as electronic equipment or motor vehicles while African and Middle Eastern regions tend to be competitive in sectors such as agriculture and foodstuffs and in less advanced manufacturing products. Apart from textiles, changes in competitiveness tend to be region and sector specific. Still, **each of the regions has experienced some positive development in competitiveness** and studying their success stories may offer a richer menu of policy lessons for other countries.

In broad terms, there is as yet **little sign of a "factory Africa" emerging along the lines of "factory Asia"** where trade in intermediates is a dominant feature. With some exceptions, mainly in Northern Africa, exports of processed intermediate products by African countries are much less diversified in terms of numbers of products traded and markets served, although there are some positive signs that this might be changing in some countries where the extensive margin of trade (new products) can account for as much as 60% of growth of intermediate exports. Furthermore, survival rates of intermediate trade in Asian countries can be as much as double those in African regions.

In general, **survival rates seem to be linked to higher levels of intra-regional trade**, which suggests that regional integration can be a way of learning by doing and as preparation for competition in global markets. In Asia, South East Asian (SEA) countries outperform the survival observed in the rest of the world and they are clearly more successful in this respect than their South Asian (SAS) neighbours. Exports from the SAS region still face severe risks of failure despite showing promising signs of competitiveness in the mid-term (up to five years after the launch of the export). In Africa, countries in the West and Central Africa (WCA) region struggle in sustaining

their exports for longer periods; only one in every ten export relationships survives beyond the third year. Countries in other African regions also struggle with the sustainability of their exports and this suggests that well-targeted support policies for exporters might be needed. However, some regions like Eastern and Southern Africa (ESA) have shown success in building more stable trade relationships.

Integration between all of the five developing regions is also increasing over time. In particular, SEA seems to be an increasingly important destination for exports of intermediates, particularly for ESA and MENA (Middle East and North Africa). Countries in the ESA region have become the most important destination for WCA's intermediates and MENA has become a major destination for intermediates produced in SAS. Indeed, the increased connectivity between developing countries is confirmed by looking at the major sources of intermediate goods' imports by region. North America and the European Union are losing importance as sources of intermediate inputs for developing countries. Intensifying relationships between African and other European and Central Asian countries as well as between Latin American and Asian countries are also confirmed by the data.

Our analysis provides evidence suggesting that some of the **success stories, across the regions, reflect positive effects arising from sourcing imported intermediate inputs**. Countries should thus include in their development strategies measures that facilitate access to the most competitive inputs in order to stay ahead in the global competitiveness race.

Policy implications for developing regions in Asia and Africa/Middle East

The empirical analysis presented in this report provides a **starting point for policy makers in the regions to assess their countries' GVC engagement** and to consider policy options.

In each of the five developing regions there are examples of countries which are among the world's worst and best performers in policy areas most important for GVC integration. Thus, **there is potential to learn from the policies that work in the best performers in the region or indeed globally**:

- SEA countries tend to **charge the lowest tariffs on imports of intermediates and display the highest shares of imports covered by RTAs**. Their trade policy therefore contributes positively to further GVC integration. However, some SEA countries, such as Viet Nam, face relatively high tariffs and low RTA coverage in their export markets, implying that more emphasis could be placed on negotiating market access with key partners. High import tariffs, higher tariffs faced in export markets and a lower coverage of imports and exports by RTAs are impediments to greater GVC integration and these are seen most clearly in WCA, SAS and in some counties in ESA, while MENA's trade policy performance is closest to that of SEA.

- Although many countries have embraced regionalism, **the depth of the concluded and foreseen agreements varies widely**. In SEA progress is most advanced yet some countries continue to lag behind in terms of their economic development and connectivity and will need to undertake important reforms in order to catch up with the more advanced countries in the region. Finalising the AEC internal market could significantly accelerate this catch-up. SAS countries are still struggling in their efforts to substantially reduce intra-regional tariff barriers to trade. In this context, one element that may be helpful is engaging in a more concerted effort towards regional integration involving a full elimination of intra-regional tariffs and coordination of more concrete regional trade facilitation initiatives. Moreover, existing regional cooperation could usefully be deepened, for example, in the area of services. The different regional economic communities in Africa have contributed to progress in reducing barriers to trade, although intra-regional trade still suffers from relatively high tariffs,

relatively weak trade facilitation, incompatibility of rules of origin across different trading blocks and implementation issues.

- In terms of **revealed openness to inward FDI**, SAS has the lowest ratios of inward FDI to GDP. SEA seems to be relatively closed to inward FDI as is ESA while WCA and MENA display higher degrees of openness. Still, most countries are likely to benefit from a more targeted focus on behind the border measures (e.g. services) which impede further deployment of foreign investment.
- Indicators of **logistics performance, intellectual property protection, the quality of infrastructure** as well as the **quality of institutions** suggest that countries in WCA, SAS and ESA tend to perform worse than countries in MENA and SEA, who themselves also lag behind other countries at similar level of economic development. This suggests that there is ample scope for domestic, regional and multilateral reforms.
- Despite a relatively lower level of development of the domestic services sector in the five developing regions, services—both domestic and foreign sourced—are playing an important role in their economic development and GVC engagement and, given the recent trends, are likely to play an even more important role in the future. It will therefore be important for the policy makers in the regions to identify reforms that will **create the right conditions for the development of a competitive domestic service sector and for the efficient trading of services across borders**.

1. Introduction

The proliferation of global value chains (GVCs) has been put forward as a defining feature of 21st century trade (Gereffi et al., 2001; Baldwin, 2012; OECD, 2013). Driven predominantly by large Multi-National Enterprises (MNEs) in pursuit of efficiency, the "GVC revolution" has brought about increasing specialisation at the task and business function level and has also reached smaller firms. Firms participating in GVCs increasingly draw on the international, instead of national, knowledge, resource and production factor base. As a result, economic activity has become more interconnected and complex, with potentially important implications for economic policies (OECD, 2013).

Although not new—fragmentation and internationalisation of production processes have been observed already for some time—they seem to have recently taken a more global dimension through their increased expansion towards emerging and developing economies. The ability to embrace them has in fact even been put forward as one of the key factors determining convergence of some developing countries' incomes with those of high income countries (Hausmann, 2014). Unbundling of tasks and business functions may have opened opportunities to developing country entrepreneurs and workers to participate in the global economy without having to develop a complete product or value chain (Stamm, 2004; Baldwin, 2012; Escaith, 2014; OECD, 2013) and drawing on foreign knowledge and learning by doing (Hausmann, 2014).

At the same time, value chains tend to be very competitive and versatile; the capacity of developing country workers and firms to participate in beneficial ways is not to be taken for granted (e.g. UNCTAD, 2013b; Primo Braga, 2013; Bamber et al., 2014). Many poorer countries face the challenge of putting in place some pre-conditions for integration into GVCs which include—but are not restricted to—open trade and investment regimes. Development of human capital through education and training, developing infrastructure, improving the availability of capital, improving the business climate; and scaling up the quality of institutions have also been identified as important factors in enabling integration into GVCs (OECD, 2013; Bamber et al., 2014).

While some believe that there is nothing qualitatively new with international value chains—just more trade and division of capital and labour happening at a finer level (e.g. Mankiw and Swagel, 2006)—others argue that the emergence of GVC trade challenges our thinking about the effects of trade and investment (Blinder, 2006; Baldwin, 2009; Grossman and Rossi-Hansberg, 2008). For policymakers, the fundamental question is whether promoting GVC participation is distinct from promoting open markets in general and if so, how they can facilitate value chain participation of firms and workers to improve their countries' economic (and social) performance.

Recent OECD work on Trade in Value Added (TiVA) and Global Value Chains provides new empirical evidence on the internationalisation of production and countries' participation in international production chains (De Backer and Miroudot, 2013; OECD, 2013 and OECD-WTO-UNCTAD, 2013). It also provides broad guidance on how to enhance participation by undertaking reforms in the areas of trade, investment, innovation, skills, and other structural policies.

The principal message for policy makers is that, in the GVC world, export competitiveness is inextricably linked to having access to competitively priced intermediate imports. Moreover, border costs such as import tariffs or inefficient customs procedures get amplified with production processes that involve multiple border crossings (OECD, 2013). International rules, standards and regulations make GVC-related transactions easier. Foreign direct investment, which tends to be very sensitive to policy barriers and red tape, is a key vehicle of GVC participation. Efficient services play a pivotal role in facilitating GVC participation and in transforming it into more beneficial forms through process or product upgrading. The analysis has also demonstrated that there are risks associated with GVC participation, including transmission, through value chains, of macroeconomic and natural shocks, as well as with their greater sensitivity to individual elements of the business environment such as, for example, costs of energy or transport or specific regulations, stressing the importance of policy coherence (OECD, 2013).

The emergence of evidence on the proliferation of GVCs has also brought back some age-old and sometimes difficult discussions about the role that governments can play, be it through trade and investment policy or indeed industrial policy, to promote more inclusive outcomes. Although developing countries are increasingly involved in GVCs, some question the extent and indeed desirability of these new opportunities. They argue that the emergence of value chains, and in particular the asymmetries in the governance structures that underpin these, pose a threat to sustainable economic development in the developing world (e.g. UNCTAD, 2014).

In order to demystify this debate and to inform and help prioritise a range of domestic and trade-related policies, this report lays an empirical foundation for addressing some of the issues discussed above. It does so by: providing a more systematic assessment of the determinants of GVC participation at different levels of economic development; presenting comparative analysis of determinants which can help countries assess their relative performance; discussing the benefits from GVC participation; and proposing policy recommendations for developing countries in Africa/Middle East and Asia. In this way it complements a related OECD project on trade, global value chains and wage inequality in developing and developed countries which aims to look at some of the possible consequences of participation.[1]

To set the scene for the comparative analysis of GVC integration across countries at different levels of development across different regions, the first part of this report uses the recent OECD Trade in Value Added (TiVA) data, as well as supplementary sources of trade in value added data, and empirically links some of the key measures of GVC participation to a number of country-specific structural and policy indicators (Sections 2 and 3). New empirical evidence on how GVC integration relates to upgrading and export performance is provided in Section 4. Key policy implications stemming from the analysis of trade in value added data are summarised in Section 5. To further extend the empirical evidence and policy analysis of global and regional value chains in five developing sub-regions of Africa/Middle East and Asia (Eastern and Southern Africa (ESA), Middle East and North Africa (MENA), Western and Central Africa (WCA), South Asia (SAS) and South-eastern and Eastern Asia (SEA)), Section 6 presents an empirical analysis of developments in regional and global export competitiveness in seven key sectors in which our developing regions tend to display high participation rates (agriculture; processed food products; plastics and rubber; textiles; metal products; electrical/ and electronic equipment; and motor vehicles). It also investigates how the competitiveness developments in these sectors are related to trade in processed intermediate inputs and free trade agreements, and presents a comparison of trends in processed intermediates trade across the five sub-regions. Section 7 is then devoted to discussing the role played by services in GVC participation in Africa and Asia. The concluding Section 8 presents a discussion of the main findings and policy implications for Asia and Africa.

1. See: Lopez-Gonzalez, Kowalski and Achard (2015).

Part I. What determines countries' GVC participation? Evidence from trade in value added data

2. Cross-country differences in GVC participation

2.1 GVC participation and its measurement

There are many ways in which workers or firms can participate in international value chains. They can do so by engaging in one or more of the many types of activities that are performed in different countries in a co-ordinated fashion to bring a product from its conception to its end use (e.g. Gereffi et al., 2001). These may include, for example, farming, extraction of natural resources, research and development, different types of manufacturing, design, management, marketing, distribution or post-sale services. Participating in international value chains will not necessarily mean directly trading goods or services across borders, but rather being linked to such activities through the process of value creation.

Depending on advantages of ownership and relating to costs of co-ordination and contract enforcement, activities along a value chain can be performed by independent economic actors or subsidiaries of the same firm (e.g. through FDI). Certain actors within the chain—often referred to as lead firms—divide the work and responsibilities across different segments of the chain, while others follow the terms set by the lead firms (e.g. buyer-driven chains in textiles and clothing or producer-driven chains in motor vehicles manufacturing in Gereffi and Fernandez-Stark, 2011).

The type of participation will also be determined by the nature of the value creation process itself (e.g. performing a stage in a sequential production process or the assembly of components from multiple sources; e.g. "spiders" and "snakes" in Baldwin and Venables, 2013). Depending on the type of product and geographical location of different activities some value chains will be regional and some will have a truly global nature.

While it may be challenging to capture all the facets of value chain participation empirically, there is a strong interest in understanding how value chain activity can contribute to the economic and social performance of countries, how they may be different from the more conventional types of trade and investment and how policies can maximise benefits associated with value chain participation. It is in this context that considerable efforts have been devoted to devise metrics to capture selected characteristics of GVC participation and performance in GVCs at a more aggregate—country or economic sector—level.

When it comes to measurement of GVC participation, the approach that has attracted the most attention so far is the Hummels et al. (2001) indicator of "vertical specialisation" and its refinement by Koopman et al. (2011). Value chain participation is defined in terms of the origin of the value added embodied in exports both looking backward and forward from a reference country: backward when it comes to foreign value added embodied in exports, and forward when it refers to domestic value added which is used as inputs to produce exports in the destination country.

These indicators of participation have been among the key metrics used in summarising the empirical insights from the recent initiatives aimed at measuring GVC activity using harmonised systems of inter-country input-output tables (ICIOs) as in Timmer et al. (2012), OECD (2013), de Backer and Miroudot (2013) or UNCTAD (2013b).[2] The OECD TiVA database released in 2013 is based on this approach and provides, amongst other indicators, a decomposition of gross trade flows into various types of foreign and domestic value added, it offers calculations of measures of backward and forward participation by country and broad sector[3] (See also Technical Annex).

2. A number of other measures have been proposed in the literature to measure "upstreamness", or the length of chains (see De Backer and Miroudot, 2013, for a summary of different measures proposed in the literature).

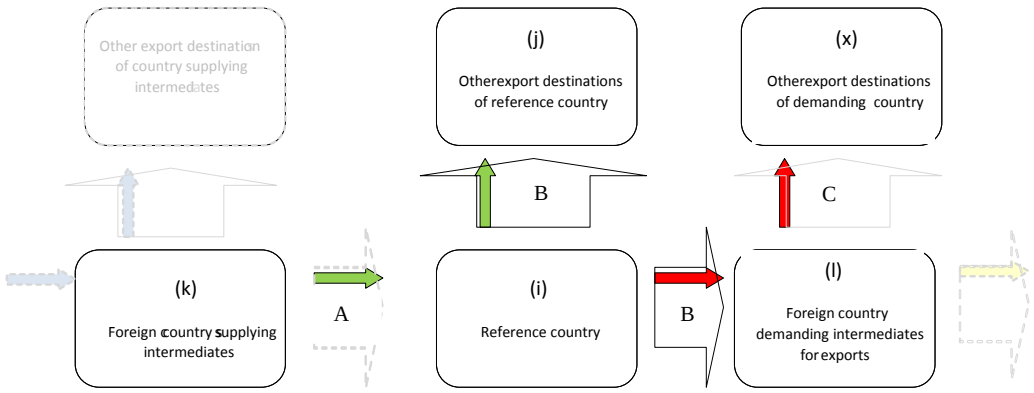
3. These participation indices can be accessed from the following OECD database: http://dotstat.oecd.org/Index.aspx?DataSetCode=GVC_INDICATORS

Broadly, the backward participation index captures the extent to which domestic firms use foreign intermediate value added for exporting activities in a given country. The forward GVC participation index captures the extent to which a given country's exports are used by firms in partner countries as inputs into their own exports. These are the principal measures of GVC activity investigated in this report with a view to establishing their key characteristics and to understand their relationship with factors such as market size, level of development, openness to trade and investment and performance in other policy areas.[4]

While both of these measures are expressed as shares of the reference country's exports, in fact they measure very different forms of engagement. For example, a country that is predominantly assembling products into final goods and subsequently exporting these will have a strong backward participation index but a small forward participation measure. Conversely, a country which predominantly supplies intermediates to an assembler will have a highly developed forward participation indicator but a small backward participation measure. These participation measures therefore give us a metric of engagement in the form of *buying* from (backward participation) and *selling* (forward participation) to GVCs or the demand and supply sides of the value chain activity.

Figure 1 provides a schematic illustration of the backward and forward linkages between the reference and partner countries (the Technical Annex provides the associated algebraic elaboration). The reference country (*i*), which sources foreign value added from country (*k*) to process it to produce exports to destinations (*j*), is in the core of the GVC node— in value terms, it *buys* foreign inputs (A), combines them with domestic value added and sells the resulting output to foreign customers via exports (B). In the case of forward participation on the other hand the reference country (*i*) is the source of value added that its foreign partner (*l*) uses to produce exports (in value terms this link is represented by C) to a third country (*x*)[5]—it *sells* its inputs.[6]

Figure 1. Backward and forward participation: Supply and demand of intermediate inputs



Note: The green arrows denote the foreign value added embodied in imported intermediates used for exports of reference country (i)—the backward linkage. The red arrows denote the value added of the reference country (i) embodied in its exports of intermediates which are used for exports of country (l)—the forward linkage. See Technical Annex for more detail.

2.2 Backward and forward links across countries and regions

When examining actual backward participation across different countries/regions in the OECD TiVA database (Figure 2), the regional dimension of value chain activity is apparent; use of value

4. More recently, Los et al. (2014) are advocating final demand based measure of GVC participation.

5. This can include country *i*.

6. More precisely, category B captures total gross exports of country *i* covering the foreign value added and domestic value added destined for either intermediate or final use in the export markets.

added to produce exports appears to be regionally concentrated. For example; 13% of the total value of Chinese exports comes from neighbouring Asian countries; Mexico relies on 13% value added from the United States and Germany sources 14% of its total value added in exports from neighbouring European countries.

Nevertheless, the global element is still important. Germany, for example, is a strong supplier of value added to many countries outside of the European Union (such as Turkey, South Africa, People's Republic of China or Korea) as is the United States which supplies a significant share of the value added (where the cut-off chosen is over 1.5%) to the exports of all countries except the Russian Federation. These countries, which can be seen to transcend regional boundaries or which are seen to coordinate regional production can be thought of as 'headquarter' economies, whereas those that use rather than sell their value added can be likened to 'factory' economies (Baldwin and Lopez-Gonzalez, 2013).

A significant heterogeneity is apparent in the share of domestic value added embodied in exports. For example, natural resource-rich countries such as Australia, Russia and those in South America tend to have higher (lower) domestic (foreign) value added in their exports. But so do economies such as the United States and Japan, since they can draw on larger domestic markets for their intermediates and engage in more technologically advanced activities. In contrast, smaller countries and 'factory' economies tend to exhibit lower domestic content of exports: 69% and 63% of the value added in exports is domestic in, respectively, the rest of EU and the rest of Asia groupings.

Changes in foreign value added content of exports since 1995 have generally been positive (Annex Figure 1). For some countries, like China or Korea, the increases are quite significant (21 and 17 percentage point rises respectively) while for others, such as the United Kingdom, Russia and Canada, there have been declines implying a growing domestic content of exports. Notably, most of the bilateral declines appear to have concentrated around headquarter economies such as Germany, Japan and the United States with important growth in China and the Rest of Asia grouping. Clearly, the geography of global production is shifting and Asia is right in the middle of this change.

When we look at forward participation or how the sales of value added of each nation are distributed as a share of gross exports (read across rows in Annex Figure 2), we see, for example, that approximately 11% of Germany's gross exports is composed of value added that is sold to the Rest of EU grouping for it to produce exports. Strong forward linkages are seen not just for 'headquarter' economies such as the United States, Germany or Japan, but also for the natural resource rich countries with Russia contributing 45% of its gross exports towards other countries' production of exports. For example the Rest of the EU seems to be an important destination for many of the supplying countries, as are China and the Rest of Asia grouping. These are the "factory" economies which source much value added to produce exports.

Figure 2. Origin of value added in exports - backward participation (2009)
Percentages

Backward participation by origin 2009	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JAP	RoAsia	AUS	NZL	South America	MEX	USA	CAN	RoW
FRA		1.90		1.79															
DEU	3.89		2.14	4.42	1.85	1.58			1.56	1.52									3.17
GBR		1.80		2.15															
RoEU	7.67	1.35	4.57	7.86	4.44	2.36	1.84	2.56	2.62	2.51		3.40		1.86		1.75			5.17
TUR																			
ZAF																			
RUS				2.12	3.56														
IND																			
CHN								1.75		4.76	1.68	3.86				4.00			
KOR									2.93			1.77				1.63			
JAP									4.38	6.00		4.30				2.48			
Rest of Asia								2.25	6.61	5.26	2.35	5.66	2.94	2.27		2.25			
AUS										1.89				2.97					
NZL																			
South America									1.52						1.56				
MEX																			
USA	3.54	2.74	2.75	3.23	1.61	1.65		2.35	3.64	4.59	2.20	5.20	1.73	2.40	2.17	12.97		9.24	2.22
CAN																			
RoW	4.43	3.71	3.13	4.65	4.28	5.23		6.77	4.82	1.22	3.44	5.88	2.83	2.18	2.49	1.88	2.52	3.27	1.77
Domestic	75.25	73.36	82.69	68.64	78.21	83.51	93.16	78.78	67.37	59.36	85.25	63.27	87.49	81.59	88.43	69.67	88.71	8.46	81.76
Imported	24.75	26.64	17.39	31.36	21.79	16.49	6.89	21.92	32.63	4.64	14.79	36.73	12.52	18.50	11.57	3.33	11.29	19.54	18.24

Note: This figure provides a visual representation of backward participation across different countries/regions in the OECD TiVA database. Each entry identifies the share of column nation value added that is used by the row nation in order to produce a unit of gross exports. For example where row nation France meets column nation Germany the 4% gives us the share of value added that France uses from Germany in order to produce a unit of gross exports. Countries are geographically clustered and darker colours within column nations identify larger sources of foreign value added. Entries below 1.5% are omitted to improve readability.

Source: Authors' calculations based on OECD TiVA database.

2.3 What factors may be associated with GVC participation at the country level

While all countries engage in both types of GVC activity to some extent (Figure 3), countries with relatively high backward engagement tend to have lower forward engagement, and vice versa (correlation coefficient of -0.43). The negative correlation is to some extent mechanical[7] but it also suggests that determinants of participation, and thus policy recommendations, could be quite different for the two types of integration. To shed light on these differences the remainder of this section analyses the two indicators against a number of factors which have been posited in the literature to influence the degree and type of GVC integration and for which there exists data. Although the frontier may sometimes seem blurry, these factors can be broadly grouped into two categories: non-policy factors—or factors that are not easily influenced by policy at least in short to medium-term; and policy factors reflected in measures such as trade and investment openness.

Figure 3. Cross-country correlation between backward and forward participation ratios

Source: Calculations based on OECD TiVA database.

Non-policy or "structural" factors

Market size

The gravity theory of trade posits that trade volumes are related positively to the economic mass of trading partners and negatively to the distance between them (Anderson, 1979; Evenett and

7. In the OECD TiVA methodology gross exports are decomposed into the foreign value added (the backward linkage) and the domestic value added which in turn consists of the domestic value added used in partner countries for exports (the forward linkage) as well as the domestic value added used in partner countries for final consumption. The backward and the forward indicator are thus linked by an identity.

Keller, 2002; Anderson and van Wincoop, 2003). As in the case of gross trade, market size is expected to be a strong determinant of the volume of GVC trade, a hypothesis which seems to be supported by the scatter plots of volumes of backward and forward linkages and GDP (Annex Figure 3, Panel A).

However, when we consider the indices of backward and forward GVC integration, where the values of backward and forward linkages are divided by gross exports, the perspective changes (Annex Figure 3, Panel B). Countries with large markets tend to source a relatively low share of foreign inputs for their production of exports. This is because the larger the domestic market the larger the pool of domestic intermediates to source from.[8] This seems to be confirmed by the positive relationship between the forward integration indicator and the market size: the larger the domestic market the larger the share in exports of domestic inputs used by other counties for their exports.

Level of development and degree of industrialisation

The relationship between GVC participation and the level of development can be complex. For instance, on the one hand it may reflect differences in labour productivity, labour costs or, indeed, in domestic capacity and purchasing power. On the other hand the relationship may equally reflect correlations with other factors such as the quality of human capital, access to finance (or capital costs), the quality of institutions and the business climate, which are all related to the level of development while also being important drivers of GVC participation individually.

However, the structure of the economy is also likely to change along the development path and such changes can be reflected in GVC participation rates. For instance, countries at an early stage of economic development tend to specialise in primary products which serve as inputs into production processes (e.g. agriculture or natural resource extraction) boosting primarily the potential for forward engagement. The backward linkages are thought to develop in the early stages of industrialisation when a country engages in factory-type activities such as assembly. In later stages of industrialisation, technological development and ultimately the emergence of an internationally competitive services sector support headquarter-type activities and the forward linkages can thus be expected to dominate again (e.g. Lopez-Gonzalez, 2012; OECD, 2013). When we map these variables, there is not a close correlation between backward participation and per capita income, but countries with higher per capita GDP tend to have higher forward participation ratios (Annex Figure 4).

The degree of industrialisation of the economy, which is proxied by the share of manufacturing value added in GDP, tends to be positively correlated with backward and negatively with forward participation (Annex Figure 5), supporting the stylised development-related structural change path outlined above.

Remoteness

Trade costs, which are often proxied using measures of distance, are fundamental determinants of trade and only few firms exhibit productivity premia that allow facing the costs of selling in foreign markets (e.g. Melitz, 2003). We expect GVC trade to exhibit similar properties. Indeed, as we have seen above, GVC activity is at present highly clustered around three manufacturing hubs, Germany, China, and the United States (Baldwin and Lopez-Gonzalez, 2013). Annex Figure 6 shows that there is indeed a more clearly discernible negative correlation between backward integration and the distance to the closest manufacturing hub (Panel B) than between backward integration and distance to final demand (Panel A).

8. Another mechanism at work could be through the economies of scale which can lower the prices of domestic inputs.

Policy factors

Regional trade agreements and tariffs

Tariffs, particularly those imposed on intermediate inputs, can reduce firms' ability to access foreign inputs, increase costs and may therefore impede growth and development of downstream industries. When production processes entail multiple border crossings as they often do with GVC trade, various trade costs are amplified and can affect the competitiveness of the entire value chain (see Yi, 2003; OECD, 2013; Miroudot et al., 2013). In addition, even though import tariffs are levied on goods and GVCs are concentrated around manufacturing, these will typically embody significant services content (OECD, 2013) and thus the impact of import tariffs will likely extend beyond the goods sectors. Thus, cross-country differences in the levels of import tariffs on intermediate inputs are likely to explain some of the differences in GVC integration.

Backward participation can be expected to be more sensitive to the country's own tariff policy as it involves imports into the country levying the tariff,[9] while forward participation confronts producers with barriers imposed in export markets. This is corroborated by correlations in our data where countries imposing high import tariffs on intermediate inputs tend to have lower indices of backward participation (Annex Figure 7, Panel A) and countries which face high import tariffs imposed on their exports tend to have low indices of forward participation (Annex Figure 7, Panel B).

Trade policy may also have a regional dimension that is highly relevant for GVC participation although it is not entirely clear whether signing of new regional agreements facilitates the formation of new value chains, or whether these agreements actually follow and cement the already-formed value chains.[10] Regional integration through trade and investment agreements in South East Asia, North America and Eastern Europe has been linked to the emergence of large international production networks in these regions (see Kaminski and Ng, 2005 for Europe; Krapohl and Fink, 2013 for ASEAN; or Orefice and Rocha, 2013). Yet, some observers have argued that in East Asia the GVC phenomenon may have actually predated regional integration (e.g. Ramasamy, 2011 and Menon, 2013). In our empirical investigation we control for the relationship between GVCs and RTAs by including both the country's share of intermediate imports and exports covered by an RTA. Both a higher share of imports and exports covered by RTAs are correlated with higher backward participation but also lower forward participation (Annex Figure 8).

Openness to inward FDI

The "GVC revolution" has been driven to a large extent by large Multi-National Enterprises (MNEs) through FDI (OECD, 2013) and it is expected that FDI openness will be strongly associated with the type and extent of GVC participation. For example, greenfield FDI to develop natural resource deposits in capital-scarce countries can foster forward GVC linkages. FDI directed at establishing an export processing facility can boost backward linkages, especially in the case of the so-called "vertical MNEs" which import intermediates for production and export a large share of

9. Some foreign value added will be imported indirectly, i.e. it will originate from countries other than the country from which it is physically shipped by being embodied in the imported product.

10. This issue is difficult to tackle in empirical studies. Whether trade agreements are a result of increasing trade (or wider GVC participation) or whether the causation runs the other way is a hotly debated issue in the empirical literature (see Baier and Bergstrand, 2002, 2004 and 2007 and Baldwin and Jaimovich, 2013). Countries which sign trade agreements tend to have, prior to these agreements, higher volumes of trade and therefore it is hard to ascertain whether it is the agreement which is causing the higher flows or if it is the higher flows that cause the agreement (see Orefice and Rocha, 2013 and Lopez-Gonzalez, 2012).

their production (see Hummels, 2001; Miroudot and Ragoussis, 2009).[11] Mergers and acquisitions by foreign MNEs are also a frequent way for developing country firms to integrate into GVCs. This usually results in more global sourcing of inputs at the outset, entering foreign markets, using new technology and distribution channels, and ultimately developing new products destined for global markets. But FDI may also be market seeking where firms establish themselves in host countries in order to service local markets.

To assess the relationship between countries' performance in terms of FDI openness and GVC participation, Annex Figure 9 presents correlations between our measure of revealed openness to FDI—the share of inward FDI stock as % of GDP—and the GVC participation indices. A positive correlation between FDI openness and backward integration and a negative one with forward integration suggests that in our data inward FDI tends to be associated more with establishing a foreign subsidiary to import foreign inputs for exports processing rather than sourcing the value added from the host country for exports.[12]

Other policies of interest

Other policy factors that can shape GVC integration add up to a potentially long list covering many areas of structural policy including infrastructure, business environment, other NTMs and competitiveness-related policies and institutions. Unfortunately, data coverage differs greatly among them; many policy indicators are just available for a single year, and others only cover a small subset of countries for which trade in value added data is available. This means that their direct inclusion in our empirical model of GVC participation (Section 3) would severely restrict the sample. The way this report handles this difficulty is on the one hand to identify sources of data with best coverage and on the other to explore the modelling frameworks which can better handle a limited number of country-specific observations. The Annex Table 4 presents a detailed description of data sources used for measuring policy performance in these areas while the below description describes the motivation for inclusion of some of them in the analysis.

Logistics performance border-related procedures and infrastructure

Complex production processes that span across several borders require efficient logistics (e.g. Blyde, 2014) and, similarly to tariffs, the costs of such border-related procedures may be magnified in value chain trade.[13, 14]

11. The majority of affiliates tend to be horizontal, selling most of their output to unaffiliated parties in their host countries (see Ramondo et al., 2013).

12. To complement the analysis of the relationship between GVC engagement and FDI the information contained in the OECD FDI Regulatory Restrictiveness Index (FDI Index) is used as one of the factors explaining countries' positioning on GVC indicators. It covers 22 sectors and is currently available for six years: 1997, 2003, 2006, 2010, 2011, 2012 and 2013.

13. An on-going OECD project on the contribution of trade facilitation measures to the operation of supply chains builds on the OECD Trade facilitation Indicators and investigates which specific sets of measures such as, for example fees and charges, document requirements, or automation and procedures, exert the most significant impact on value chains trade in which countries (OECD, 2015).

14. For reasons of data coverage the empirical work in this report builds on the information in the World Bank Logistics Performance Index (LPI) which covers 155 countries across a number of individual years in the period 1997-2013. The index measures logistical friendliness in three main policy-influenced areas: customs, infrastructure and availability of quality logistics services. Saslavsky and Shepherd (2012) used this index in a gravity model of trade to establish relationship between logistics performance and growth of international production networks.

Similarly, access to good quality ports, roads, railways and airports may play a key role. Access to telecommunication technology—apart from benefits of access to knowledge—also allows for the co-ordination of complex and geographically dispersed production processes. The stable supply of electricity may also be very important when many nodes of the chain depend on each other for timely and reliable delivery of inputs.[15]

Education and training, intellectual property protection and research and development

Education and training are another policy area cited among the most important ones for successful engagement in GVCs. Hausmann (2014), for example, argues that participating in GVCs is a way of learning by doing which enables a parsimonious accumulation of productive capabilities that need to be in place in order to get into business. Consequently, focusing on education and training may be an efficient proactive policy governments can pursue to facilitate GVC participation.[16]

Research and development creates intellectual property which can also be an important source of rents and thus value added captured by different value chain actors. Value chain participation often implies close collaboration between these actors and offers a better insight into intellectual property of value chain partners (e.g. through execution of blueprints or assembly of components). Research and development and intellectual property protection policies can thus be expected to be important determinants of the extent and type of value chain links.[17]

Quality of institutions and other policies related to GVC participation

A sizeable literature backs the idea that institutional quality can be an important determinant of value chain trade because it can determine firms' ability to enforce contracts. Levchenko (2007), for example, put forward that institutional aspects can significantly influence trade flows especially in products characterised by significant complexity, in particular those characterised by the level of dispersion of intermediate inputs. Similarly, Costinot (2009) found that in complex industries characterised by high levels of job task complexity good institutions can be an important determinant of trade performance. Nunn (2007) found that good contract enforcement is especially important for the export performance of relationship-specific sectors and can be an important source of comparative advantage.[18]

Access to finance has been established as an important determinant of trade and specialisation (Chor, 2010; Kowalski, 2011) and is likely to be playing an important role in GVC participation.[19]

15. The empirical analysis in this report draws on the different components of the World Economic Forum Global Competitiveness Index to include: (i) a composite indicator of physical transport infrastructure encompassing roads, air transport and ports; and (ii) an indicator of quality of electricity supply. In addition, data on broadband subscriptions from the International Telecommunications Union are used to proxy for the quality of information and communication technology of infrastructure.

16. To proxy for these, the empirical work in this report uses the World Bank Development Indicators data on the share of tertiary graduates in the workforce as well as the International Labour Organisation data on the share of technical occupations in the workforce.

17. In this report they are captured with an inclusion of the World Development Indicators ratio of research and development expenditure to GDP and the World Economic Forum intellectual property protection indicator.

18. The report accounts for the impact on GVC integration of regulatory quality, as measured by a composite indicator of World Bank's Governance Indicators of regulatory quality, rule of law and control of corruption.

19. In this report, it is proxied with the World Economic Form index of access to loans. A composite OECD Product Markets Regulation index is also included to measure the degree to which policies promote or

3. A model-based investigation of cross-country variation in GVC participation rates

The purpose of this section is to provide a model-based assessment of drivers of GVC participation at the country and broad sector level to assess the role of different non-policy and policy factors introduced above.

3.1 The data

GVC participation at the country level is mainly measured using (i) the backward participation ratio and (ii) the forward participation ratio.[20] The principal source of data is the OECD TiVA database that covers 57 countries including some emerging and developing economies (Annex Table 1).[21] Annex Table 2 presents some basic descriptive statistics for our country sample and illustrates that, while the sample contains countries in a relatively broad spectrum of economic sizes, countries with low GDP per capita are underrepresented. To assess the differences in determinants of GVC participation at different levels of economic development, a replication of the exercise is undertaken using supplementary sources of inter-country input-output data on backward and forward linkages from the EORA database (Lenzen et al., 2013) which covers 187 countries in the period 1990-2011.[22]

The selection of explanatory variables follows our discussion of different non-policy and policy factors in Section 2 which have been posited in the literature to influence the degree and type of GVC integration. Explanatory variables considered in the benchmark econometric specification are thus grouped under three broad categories[23]:

Non-policy factors: Market size; the share of manufacturing in GDP; distance to economic activity and distance to key manufacturing hubs.

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inhibit competition. The WDI's total tax rate measures the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions as a share of commercial profits. The OECD unit labour costs are included to control for the productivity-adjusted costs of labour.

20. As described in detail in Section 2.1, these are, respectively, foreign value added embodied in exports and domestic value added which is used as input to produce exports in the destination country, and both are expressed as shares of gross exports. Expressing backward and forward links as a share of gross exports facilitates interpretation and comparison across countries since it adjusts for a parallel movement of these links with the volume of the exporting activity. Indeed, the changes in the GVC integration ratios are inevitably related to changes in volumes of value chain trade and gross exports. For this reason, to better understand the associations between the backward and forward integration ratios and the posited drivers of GVC participation, we conduct a set of auxiliary regressions where the dependent variables are: (a) backward links expressed in value terms (i.e. the foreign value added embodied in gross exports); (b) forward links expressed in value terms (i.e. the domestic value added destined for processing and exports by other countries); and (c) gross exports (i.e. the denominator in the backward and forward integration measures).

21. It can be accessed from the following OECD database: http://dotstat.oecd.org/Index.aspx?DataSetCode=GVC_INDICATORS

22. Issues related to the quality of EORA input-output data and correspondence between GVC indicators derived from the OECD TiVA, EORA and WIOD are discussed in more detail in the Technical Annex. In a nutshell, while the OECD TiVA is the preferred source of data because of the quality of the inter-country input-output data, EORA is the only currently available open source of balanced inter-country input-output data that allows a comparison across different levels of development. Also, on aggregate the EORA data seems to do a satisfactory job at capturing participation. This is however not the case at the sector level (see Technical Annex). We therefore use this data solely in aggregate format.

23. Annex Tables 3 and 4 provide a summary of the data sources.

Core trade and investment policy-related factors: Import tariffs charged on intermediate imports; import tariffs on intermediates faced in export markets; RTA coverage of intermediate's imports and exports[24]; revealed openness to inward FDI.

Other policy-related factors: Due to uneven data coverage, the impact of policies such as logistics and border procedures, quality of transport infrastructure or intellectual property protection is investigated in a separate econometric specification presented in the Technical Annex and summarised in Section 3.4.

3.2 Benchmark econometric specification

The theoretical and empirical literature on determinants of GVC trade is developing rapidly (e.g. Baldwin and Taglioni, 2012; Brooks and Ferrarini, 2012; Cheng and Fukomoto, 2010; Noguera, 2012 and Choi, 2013) but there is still no empirical "gold standard" for investigating the determinants of GVC trade. Many recent empirical studies use the gravity model of trade and substitute gross bilateral trade flows for the recently-developed estimates of bilateral value added trade or trade in intermediates. However, the gravity approach still misses some of the key features of value chain trade[25] and focuses on why countries trade with each other rather than why countries engage in production networks on aggregate. Thus, we begin with a simple econometric specification to assess the extent to which we can explain differences in countries' GVC participation on aggregate paying particular attention to country-specific factors and to the leverage of commercial policies in shaping participation. We later use the gravity approach to benefit from its bilateral character and estimate the impact on GVC participation of policies which we can proxy for fewer countries and years.

Considering the *backward* and *forward integration* indicators discussed above, the empirical models can be broadly specified as follows:

$$BACKWARD_{it} = f(NPOL_{it}^{1}, \dots, NPOL_{it}^{N}, POL_{it}^{1}, \dots, POL_{it}^{M}, \varepsilon_{it})$$

$$FORWARD_{it} = f(NPOL_{it}^{1}, \dots, NPOL_{it}^{N}, POL_{it}^{1}, \dots, POL_{it}^{M}, \varepsilon_{it})$$

where the degree of GVC integration posited to depend on: country-specific indicators of non-policy characteristics of country i in year t ($NPOL_{i}^{1}, \dots, NPOL_{i}^{N}$); country-specific indicators of policy determinants of GVC trade ($POL_{i}^{1}, \dots, POL_{i}^{M}$); and the error term ($\varepsilon_{ij}^{k}$).

This specification directly links with the backward and forward GVC integration indicators that served as a basis for various discussions when the first results of the OECD TiVA work were released in 2013 (OECD, 2013) and when policy makers started considering what their country's scores imply for policy. In addition, the approach circumvents some of the pitfalls of the bilateral gravity model, with backward and forward integration and distance to final demand indices

24. These measures do not directly capture non-tariff-related issues although to some extent the impact of NTM provisions in RTAs might be captured by the measures of RTA coverage of country's exports and imports.

25. For example, exports of value added embodied in, say, gearboxes produced in country A and being assembled together with other car parts by a lead firm in country B into a complete vehicle which is sold to consumers in country C, would only be accounted for in this model as a value added flow between A and C. The model would also account only for policy determinants in countries A and C. One of the most advanced attempts to address this issue in the gravity setting is by Noguera (2012) who incorporates global input-output data in an international trade model to derive a gravity equation which accounts for relations with third countries through which value added travels in the form of intermediate inputs in its journey from the source to the destination.

capturing at least some third-country effects. Despite its simplicity, to the best of our knowledge this kind of exercise has not been attempted so far.

One limitation is the relatively small number of observations driven chiefly by the limited coverage of the left-hand-side variables. Still, bearing in mind that the TiVA data is available for five years for approximately 57 countries, this already gives 285 observations. EORA, which is used as an auxiliary source of inter-country input-output data to increase the coverage of developing countries, reports data for 187 countries in 22 years.[26, 27]

Reiterating the estimations for four broad economic activities (agriculture; mining and extractive industries; manufacturing; and services) lends itself to identifying differences across the determinants of GVC participation across sectors.[28] Additional regressions are also performed for a set of less aggregated manufacturing sectors which are studied in more detail in the sections focusing on value chain trade in the five developing regions in Asia and Africa (Sections 6.2 through 6.4). These include: Agriculture (ISIC 01-05); Food products (15-16); Textiles and Apparel (17-19); Chemicals and minerals (23-26); Basic metals (27-28); Electrical and optical equipment (30-33); and Transport equipment (34-35).

3.3 Results from the benchmark specification

The benchmark model includes only key factors that are expected to drive GVC participation: structural non-policy factors; and trade and investment policy variables. In order to shed light on the relative importance of these factors we perform estimations of the above-specified models using standardised transformations of both dependent and independent variables.[29] Regression coefficients estimated in this way—the so-called "standardised coefficients"—are comparable across different explanatory variables; larger values of coefficients imply larger effects on the dependent variable of typical changes in independent variables. As such, the standardised coefficients give us information on the relative importance of the different factors in explaining the variation in GVC participation observed in our data. Results presented in Table 1 are broadly in line with expectations formed on the basis of the literature and the graphical analysis of correlations in Section 2.3, highlighting a number of messages which are in turn discussed. [30]

26. Another issue is the formulation of backward and forward participation as fractions of gross exports in our key specifications. Shares are bound between 0 and 1and their analysis requires suitable modelling to avoid predictions falling outside these intervals (see Papke and Wooldridge, 1996; Papke and Wooldridge, 2008). However, this turns out to be less problematic with our data. In addition, regressions performed on values of backward, forward and gross exports which do not suffer from this problem are also performed as auxiliary regressions (see Annex Table 5).

27. Endogeneity is a broader concern in this kind of exercise, as a number of unobserved country characteristics can be correlated with value chain trade as well as with some of the explanatory variables included in our model. Controlling for country fixed effects would address this problem to some extent but it would also eliminate precious variation; effects of interest would only be identified using within-country variation over time thereby excluding variables that do not fluctuate a lot over time (such as institutions) or not at all, like distance to manufacturing hubs.

28. OECD (2013) and De Backer and Miroudot (2013) provide an extensive discussion of sectoral specificities that make certain sectors—and thus countries specialised in these activities—more likely to record high or low scores on certain GVC indicators.

29. Standardisation is performed by subtracting the sample mean and dividing by the standard deviation of each variable. The resulting values are often referred to as *z*-scores.

30. Quintile regressions of the core specifications are performed in order to check whether drivers of GVC participation are the same across the different parts of the distribution of backward and forward integration indices. It is also noteworthy that, due to the sequential estimation at specific quintiles, estimates are more robust against outliers relative to ordinary least squares. They are thus a way of

Non-policy factors

Country-specific structural and policy characteristics can account for 59% of the variation in the extent of the backward GVC integration (Table 1). The lower explanatory power of the forward engagement regression (22%) likely reflects the fact that this type of engagement captures the supply side of value chains and covers a diverse range of idiosyncratically specialised countries such as those supplying natural resources (e.g. Russia or Australia), or high tech intermediate inputs (Germany and Japan) as well as specialised services (the United Kingdom and the United States) the determinants of which are likely to differ. In contrast, the backward engagement captures the demand side of value chains which is more closely linked to broad structural characteristics of countries such as market size or degree of industrialisation.

Table 1. Core regression results - backward and forward participation

	Backward		Forward	
	I	II	I	II
Tariffs charged (weighted average)	-0.085	-0.011	-0.141**	-0.092
	(0.059)	(0.057)	(0.059)	(0.077)
Tariffs faced (weighted average)	0.019	0.003	-0.147*	-0.157**
	(0.064)	(0.060)	(0.077)	(0.078)
Share of imports covered by PTA	0.193**	0.195**	-0.093	-0.092
	(0.083)	(0.082)	(0.099)	(0.099)
Share of exports covered by PTA	-0.053	-0.077	-0.005	-0.021
	(0.071)	(0.069)	(0.115)	(0.118)
Revealed FDI openess [1]	0.290***	0.289***	-0.089	-0.089
	(0.072)	(0.069)	(0.060)	(0.061)
Share of manufacturing in GDP	0.388***	0.424***	-0.173**	-0.150**
	(0.056)	(0.053)	(0.070)	(0.071)
Distance to closest manufacturing hub (log)	-0.474***	-0.476***	0.173	0.172
	(0.091)	(0.088)	(0.145)	(0.145)
Distance to economic activity (log)	0.185	0.182	-0.067	-0.070
	(0.115)	(0.113)	(0.166)	(0.165)
GDP (log)	-0.283***	-0.238***	0.154***	0.183***
	(0.063)	(0.059)	(0.037)	(0.040)
Population (log)		-0.145***		-0.095*
		(0.055)		(0.049)
Year fixed effects	Yes	Yes	Yes	Yes
Robust standard errors	Yes	Yes	Yes	Yes
Observations	251	251	251	251
R-squared	0.578	0.594	0.213	0.220

Note: Standardised coefficients.
Source: Estimations based on OECD TiVA database.

We find that, controlling for other factors, the larger the size of the domestic market (proxied here by a natural logarithm of GDP at constant 2005 prices) the lower the backward engagement of a

checking the robustness of performed regressions. The results are available upon request but they show that the effects estimated for the centre of the distribution hold across its other parts.

country, and the higher the forward engagement. The intuition is that countries with a larger market can draw on a larger array of intermediates both in terms of purchases and sales.[31]

The higher the per capita income, the higher the backward and forward engagement; more developed countries tend to both buy and sell a higher share of their gross exports as intermediate goods. In the case of both backward and forward integration, the coefficient on the population variable is negative and statistically significant implying that the smaller the population at a given GDP size, the larger the backward and forward engagement.[32]

As discussed in Section 2.3, GDP per capita is likely to collect the effects of several more specific determinants of GVC participation, which are related to the level of development. Labour productivity, labour costs, economic structure or indeed the impact of some policies or policy outcomes (e.g. logistics performance, intellectual property protection, institutional quality, access to loans or unit labour costs) can be correlated with per capita income. The role of some of these individual factors in shaping GVC participation is considered in more detail in Section 3.4.

The degree of industrialisation of the economy, which is approximated by the share of manufacturing value added in GDP, tends to be strongly positively correlated with backward and negatively with forward participation, supporting the stylised development-related structural change path outlined in Section 2.3 and correlations in Annex Figure 5. Similarly, the regressions confirm that the larger the distance to the main manufacturing hubs in Europe, North America and Asia, the lower the backward engagement while the impact on forward engagement is insignificant, suggesting that there is a premium to locating close to large 'headquarter' economies.

Since these characteristics (both policy and non-policy) are significant determinants of GVCs, and since these differ widely across countries (i.e. Japan which has a higher GDP is expected to have lower participation rates than Luxembourg) one cannot simply compare the level of participation across countries and say that a country with higher participation is "doing better" in GVCs. A better way of assessing how countries are engaging in GVCs is to look at how policy and non-policy characteristics determine participation with the aim of identifying if countries are participating above or below what would be predicted by these characteristics.

Core commercial policy factors

Indeed, our results show a certain potential for commercial and other policies to contribute to GVC integration, which can be quite important in some countries. In particular, engagement in regional trade agreements (RTAs) can facilitate backward GVC engagement. Here it is important to note that low import tariffs and high engagement in RTAs are likely to occur together in the sense that RTAs tend to involve tariff liberalisation between the parties of the RTA. But RTAs often go beyond tariffs and address various non-tariff issues related to goods and services sectors. In this context, it is possible that some countries that have low tariffs (e.g. as a result of unilateral liberalisation) may still have low engagement in RTAs.

31. This is confirmed by the results of the corresponding auxiliary regressions which are not reported here and which consider volumes instead of ratios. It is clear that market size has a positive impact on all three types of trade flows (backward, forward and gross exports). When market size grows all three types of trade flows are expected to grow but the forward linkage will grow proportionally more than gross exports and gross exports will grow proportionally more than the backward linkage.

32. Note that this is the appropriate way of inferring about the sign of the association between backward and forward engagement and per capita income; the coefficient on GDP cannot be interpreted in an analogous fashion as it combines the effects of the size of GDP and GDP per capita. It is for this reason that the "pure" effect of the market size is presented in the column (I) of Table 1, where the population variable is excluded from the estimations.

Overall, the mixed results on the significance of tariffs may reflect the fact that import tariffs are already low and possibly less important than non-tariff measures (NTMs). In addition, supply chain trade often involves multiple crossings of not one, but several, borders. Thus, given that a country's import tariff is only one of many in the sequence of production, it may be difficult to attribute significant impacts on country's GVC participation to its own import tariff policy.[33]

The measure of revealed openness to inward FDI tends to have a significant positive impact on the backward integration while the impact on forward integration is insignificant. This suggests that in the sample of countries covered in our analysis, inward FDI tends to be associated more with importing of foreign inputs for exports processing rather than with exporting the domestic value added for export processing abroad.

Relative contribution of non-policy and policy factors to GVC participation ratios

Focusing on backward participation, which is better explained with our empirical model, two messages can be highlighted. First, structural variables such as country size, distance to manufacturing hubs and degree of industrialisation stand out as relatively stronger determinants of GVC participation compared with variables directly related to trade and investment policy. Thus, the bulk of the variation in GVC participation can be attributed to factors that—at least in the short to medium term—are not directly influenced by policy.

To illustrate this graphically, Figure 4 summarises the relative estimated contributions of non-policy and policy factors to the ratios of backward integration for the countries covered in the OECD TiVA dataset.[34] The line indicates the value of the actual backward participation indices as recorded in the OECD TiVA database. The dark bars show the estimated contribution of factors that i) do not change over time and are common to all the countries in the sample (the constant in the corresponding regressions); and ii) the non-policy factors such as the market size, degree of industrialisation and remoteness. The other elements of the bar indicate the parts of the country scores which can be associated with the included elements of trade policy and openness to inward FDI. The residual captures either the positive or negative factors that influence GVC integration but are unobserved in the regression analysis (i.e. the difference between predicted and observed values).

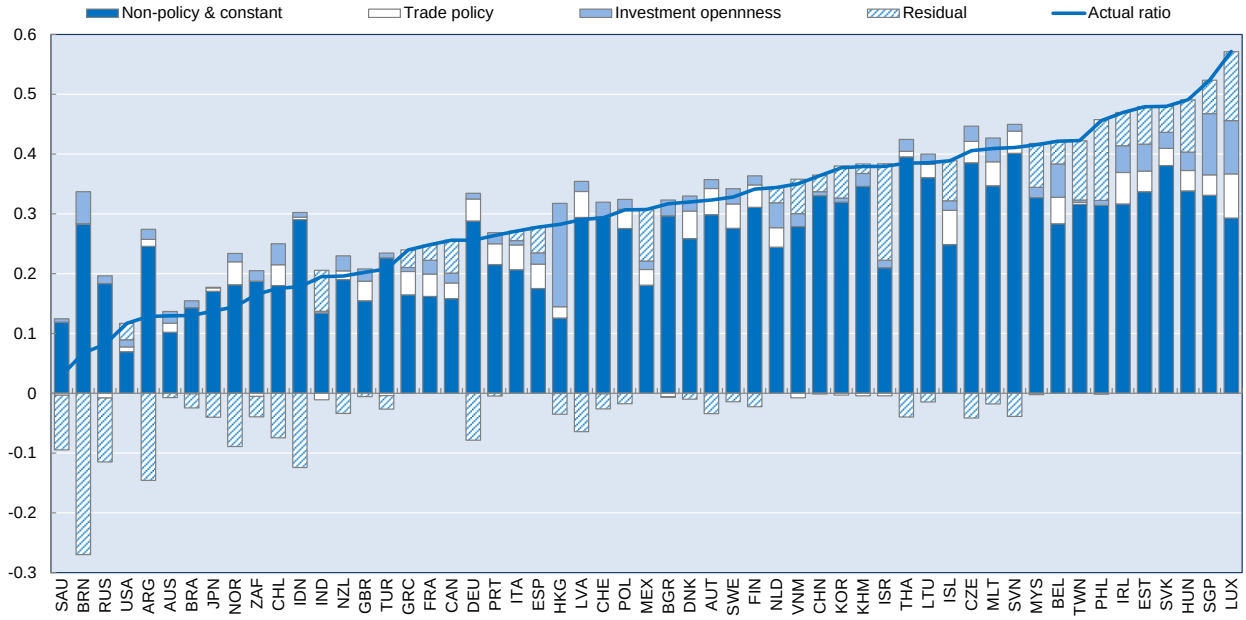
Consider the example of Argentina. Figure 4 shows that according to our model, 27% of this country's gross exports would be predicted to consist of foreign value added. Yet, the actual foreign value added recorded for Argentina in the TiVA database is 13%. The gap between 27 and 13% is due to the factors that we do not control for in our model (such as e.g. cross-country differences in regulations, institutions and other non-tariff barriers) and which appear to lower Argentina's actual backward GVC integration. In the case of Luxembourg—the country with the highest backward participation ratio among the TiVA countries— the actual foreign value added recorded is 57% while our model predicts 44%. The residual therefore suggests that there are factors that are not included in our model that appear to boost Luxembourg's backward participation. The positive and negative residuals may thus give an indication of, respectively, over or under-performance in backward GVC participation relative to other countries.

33. Additionally quite a high proportion of this backward linkage may come in the form of services which is likely to be affected less by tariffs.

34. Annex Figure 10 presents equivalent graphical exposition for the forward participation ratio.

Figure 4. Backward GVC participation ratio—relative contribution of non-policy and policy factors

2005



Source: Estimations based on OECD TiVA database.[35]

Overall, although the structural and geographical factors, which are beyond the reach of policy at least in the short to medium term, are the main determinants of GVC participation, the trade and investment variables also explain a non-negligible part of the variation in GVC participation ratios. For example, in the case of Singapore and Hungary, which record respectively the second and the third largest backward participation ratios, trade policy accounts for 6 and 7 percentage points of the actual values of the ratios while openness to FDI accounts for respectively 19 and 6 percentage points. Overall, trade and investment factors can typically explain from a few to as much as 80% of

35. An important caveat with respect to interpretation of the signs of contributions to backward and forward indicators in Figures 4 and Annex Figure 10 is that they should be interpreted together with the regression results in Tables 1 and Annex Table 5. For example, the positive contributions of the FDI openness in Figure 4 reflect the finding that higher stocks of inward FDI are associated with relatively higher ratios of backward GVC integration. In the same vein, the negative contributions of the FDI openness in Annex Figure 10 reflect the finding that higher stocks of inward FDI are associated with relatively lower ratios of forward GVC integration. This does not mean that inward FDI may have a negative impact on GVC flows (on the contrary the auxiliary regressions show that the impact on volumes of backward and forward linkages and gross exports flows are all positive) but rather that the different types of GVC trade are impacted differently; in our sample inward FDI tends to increase trade flows associated with backward integration more than those associated with forward integration. Similarly, the contributions summarised in the trade policy component in Figure 4 collect a number of impacts including those of import tariffs imposed as well as faced by the country in addition to shares of their exports and imports covered by an RTA. The positive contributions to backward integration ratios in Figure 4 reflect the fact that the estimated positive impact of the share of imports covered by an RTA outweighs the other trade policy-related impacts. Likewise, the negative contributions to forward integration ratios in Annex Figure 10 reflect the domination of the negative impacts of tariffs charged on intermediate inputs and those faced on similar products in the export markets (note that both types of tariffs will be positive for every country as well as the estimated negative coefficients in Annex Table 5).

the value of the backward integration indicator. Indeed, for some economies this contribution can be quite high (e.g. 80% for Brunei Darussalam or 68% for Hong Kong, China).

Differentiating across economic sectors

Relationships between structural and policy drivers and GVC participation tend to be sector-specific. We can see this from similar regressions performed separately for four broad economic sectors (agriculture; mining and extractive industries; manufacturing; and services) as well as the seven less aggregated 2-digit ISIC manufacturing sectors, using the same explanatory variables as for the total economy (Annex Table 6 and Annex Table 7).[36] For example, compared to manufacturing, market size plays much less of a role when it comes to explaining the extent of backward integration in the agricultural and mining and extractive sectors, while the level of development plays a larger role, likely reflecting the difference between resource rich and more industrialised economies. On the other hand, the revealed openness to FDI has a more consistently positive impact on backward integration in agriculture, mining and extractive industries, services, as well as most manufacturing sectors. Not surprisingly, the negative relationship between import tariffs and GVC integration is much more pronounced in manufacturing, particularly in chemicals and minerals and basic metals than in agriculture or mining and extractive industries. The strongest determinant of backward participation in the services sector is the revealed FDI openness while distance to manufacturing hubs matters much less as compared to manufacturing.

Differentiating across income groups

Determinants of GVC participation in developing countries may well differ from those in industrialised economies. However, the OECD TiVA has data for only 57 countries and 40 of these are classified as high-income using the World Bank classification, and not one country in this sample belongs to the least developed country grouping. This is an important limitation given the focus of this report on developing countries.[37] An alternative differentiation by income group is therefore undertaken using inter-country input-output data on backward and forward linkages calculated from the EORA database which covers 187 countries in the period 1990-2011. The benchmark regressions, which preserve the same set of determinants of GVC participation, are performed for three different per capita income-based country groupings: (i) high income and (ii) middle and (iii) low income countries.[38] Their results are presented in Annex Table 8. The use of EORA allows us to test whether the model holds equally well for developed and developing countries, which we are unable to do using TiVA data alone.[39]

Considering first the results for all countries, the findings validate the direction of impacts from earlier findings based on the OECD TiVA, although the relative magnitudes of the estimated impacts differ sometimes between the two datasets (see Annex Table 9). However, there are also some

36. It is important to note that backward integration of a sector is the use of foreign value added by that sector, not the use of value added from this sector.

37. Dividing the OECD TiVA country sample into high income and developing countries according to year-specific percentiles of GDP per capita shows that there is very little consistency between the results (Annex Table 8) and further highlights the importance of seeking to incorporate other countries into the analysis.

38. Countries are grouped according to year-specific percentiles of GDP per capita into three categories: high, medium and low income. Mobility between categories is hence allowed across time. In order to facilitate comparisons of coefficients across income groups the standardisation of variables is performed over the entire sample. Results for high-income countries, hence, illustrate the impact in terms of relative position in the entire sample, same as results for developing countries.

39. See the Technical Annex for a comparative analysis of the EORA calculated indicators against those calculated using TiVA and the WIOD (World Input-Output Database).

interesting differences across the income groups which could not be seen using solely the OECD TiVA sample. First, the measures of fit of our regressions show that the set of determinants of GVC participation considered in our approach explains a much larger proportion of variation in GVC participation rates among high income countries (80%) than in middle income and low income countries (respectively, 37 and 34%). This suggests that developing country participation in GVCs could be tied to other unobserved characteristics such as, for example, logistics, infrastructure, trade finance, quality of institutions or other factors.

Moreover, there are some interesting differences in the sign and size of the estimated coefficients. For example, the estimated positive impact of investment openness on backward integration falls with the level of per capita income which means that backward integration is more sensitive to revealed FDI openness in more developed countries. Similarly, the impact of the degree of industrialisation on backward integration is less pronounced in less developed countries. However, the impact of the size of the market is more pronounced in low income countries.

When it comes to differentiating between income groups in terms of forward participation the picture is yet more mixed. The explanatory power of the model is generally weaker, which means that the determinants posited in our approach do not explain this type of participation very well. Still, the size of the market is estimated to play a significantly smaller role in explaining forward participation of low income countries as compared to high income countries. This is likely because forward participation of low income countries is strongly related to export of natural resources. This is consistent with the impact of the degree of industrialisation which is insignificant in high and middle incomes and highly statistically significant and negative in the low income grouping.

Overall, policy factors such as import tariffs imposed, tariffs faced in export markets and revealed FDI openness seem to be playing a lesser role in determining both backward and forward participation of low income countries as compared to high or middle-income countries. This could imply that in order to overcome a relative disadvantage in structural factors (e.g. in distance to the closest manufacturing hub) a low income country may have need to change its relative position in terms of tariffs or FDI openness relatively more than a high income country.

3.4 Assessing other policy factors

As we have already flagged, indicators for the other policy factors that can shape GVC integration covering infrastructure and various forms of NTMs such as business environment, logistics performance, and border-related procedures are typically available only for selected number of countries or years. Including them in our benchmark regressions would therefore significantly limit the number of observations and constrain the econometric analysis. A version of the bilateral gravity model of trade is therefore adopted to overcome these constraints.[40] A detailed discussion of advantages and limitations of this approach can be found in the Technical Annex. Here we focus solely on the results with respect to the policy factors that could not be accounted for in our benchmark regression approach for countries sourcing value added in the form of intermediate inputs for exports (i.e. the equivalent of the backward participation measure in the gravity setting).[41]

Our analysis shows that there are considerable differences in what determines bilateral backward links in developing and developed countries. In developing countries, logistics performance, intellectual property protection, the quality of infrastructure as well as the quality of institutions are estimated to have the largest positive impact on backward GVC integration. In developed countries,

40. The gravity model also provides a more convenient framework to address the endogeneity concerns arising from the unilateral benchmark framework by controlling for characteristics of the source and destination countries in value chain trade. For results of these regressions see Annex Tables 10 and 11.

41. The results for partners, which provide value added in the form of intermediate inputs, are presented in Annex Table 11.

the two policy areas with highest estimated impacts are quality of electricity supply and quality of infrastructure (Figure 5).

Figure 5. The impact on GVC integration of other policies

Note: The figure presents standardised coefficients from Annex Table 11.
Source: Estimations based on OECD TiVA database.

4. GVC participation, productivity, specialisation and "upgrading"

4.1 Benefitting from value chain participation and the concept of "upgrading"

It is not countries but firms which are the main actors in value chains and they engage in these to make profit. Some forms of engagement may be more profitable than others and it is in the firms' own interest to continually reassess whether they are doing their best given their capacities (i.e. knowledge and access to resources and skills). The country or policy maker's perspective on GVC participation is different from the firm perspective in at least two respects. First, it may attach weight not only to capital but also labour gains or—more broadly—other social or environmental outcomes. Second, it takes into account that the policy environment in which these firms operate influences firms' choices and thus the economic, social and environmental outcomes of GVC participation at the country level. Policy makers can therefore try and correct market failures and externalities related to firms' participation in GVCs to attain economically and socially superior outcomes.

Measurement and analysis of outcomes of participation in GVCs have been couched in terms of economic and social "upgrading". A recent review of literature on this topic by Milberg and Winkler (2010) reveals that economic upgrading is usually defined in terms of efficiency of the production

process or characteristics of the product or activities performed, while social upgrading often refers to outcomes related to employment and pay, gender and the environment. Focusing on economic upgrading[42] and considering the oft-cited typology of different paths of upgrading by Humphrey and Schmitz (2002) one can argue that, economically speaking, productivity or efficiency-related measures of upgrading are most encompassing. Humphrey and Schmitz (2002) distinguish between the following types of economic upgrading:

- Process upgrading – where firms are seen to gain in terms of efficiency in producing a given type of output.
- Product upgrading – where firms engage in the production of more sophisticated products.
- Functional upgrading – acquiring new functions (such as for example service provision) within a given value chain.
- Chain upgrading – where firms move into different value chains.

The process upgrading path above explicitly refers to efficiency while the product, functional and chain upgrading refer to the type of activities performed in value chains without an explicit reference to value creation or productivity. Somewhat curiously, the latter three upgrading paths have been interpreted in the upgrading literature to imply that targeting specific "sophisticated" products or production stages is the preferred strategy for "moving up the value chain". For example, the "smiley curve" thesis, which puts forward that the value added generated at the product design and marketing stages may be higher than that at the assembly or manufacturing stages (e.g. Low, 2013), has been interpreted to imply that it may be beneficial to move away from the assembly or manufacturing parts of the chain.

Recently, and perhaps mistakenly, the concept of upgrading has therefore been seen as the need to capture a growing *share* of domestic value added in exports. This idea is partly spurred by the oft-cited iPad case-study (Xing and Detert, 2010 and Kraemer et al., 2011) which underlined the low value adding *share* that assembly occupies in the production process (less than 5% of the sale value of the iPad remains in China) and has been used to justify policy objectives which seek to increase the domestic value added share. This narrow view of upgrading may, however, miss the point that the volume of the activity may matter just as much as the domestic share of the value of the product. Whilst it is indeed true that assembly activities often represent a very small share of the value of the final products being assembled, it is also true that important benefits can be derived from specialising in assembly activities and performing them on a large scale.

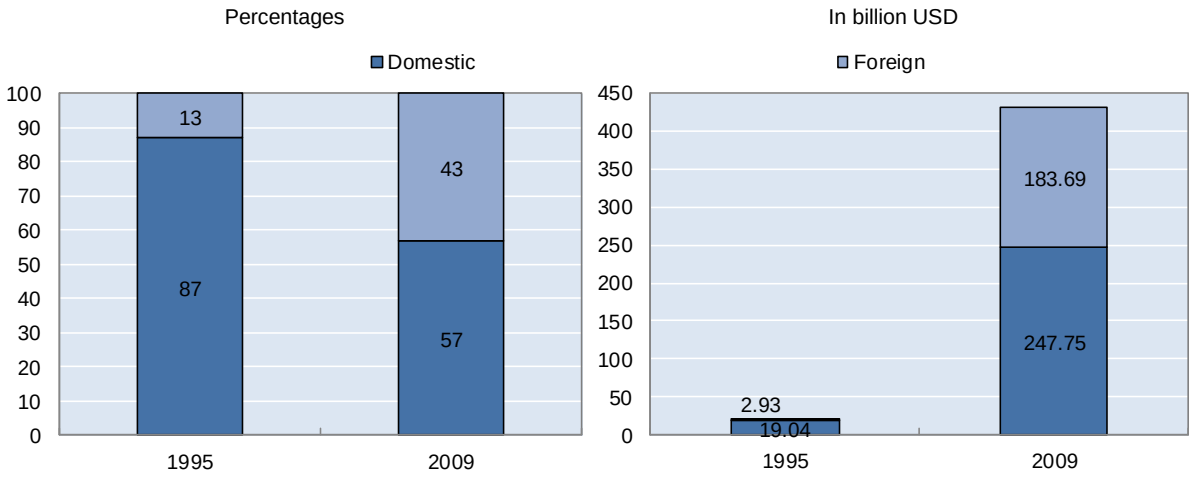
For example, specialisation in assembly of electronic devices has served several firms in Asia well. They have become assemblers *par excellence* and attracted clients such as, Apple, Dell, Amazon, Nokia and Samsung. From a firm perspective, adding 5% of the value of these firms' leading products adds up to a non-negligible sum.[43] As an alternative business development strategy, these assemblers could have instead launched a new mobile phone to rival the larger smartphone producers and to enter the higher extremities of the smiley curve to capture larger shares of the value of the final product, but they would at the same time have to capture a significant market share from the other electronic device producers. What is important, from the point of view of the firm, is therefore the value that is created from its economic activities and not the share that the firm occupies in the value of the final product.

42. Two related on-going OECD projects are devoted among others to the effects of GVCs on jobs (see Timmer, Stehrer and de Vries, 2015) and the effects of GVCs on wage inequality (see Lopez-Gonzalez, Kowalski and Achard, 2015).

43. Another example of this is found in the business model of the British firm ARM Holdings. The firm licences architectures for mobile devices and these are pervasive across the mobile device market allowing the firm a very small share of a single mobile phone but a presence in most of the market.

A good illustration of some of the pitfalls associated with defining upgrading as increasing the domestic value added share of a product can be seen in the case of China. In Figure 6, the domestic content of China's exports of electrical and optical equipment is shown to have fallen from 87 to 57% between 1995 and 2009 yet the volume of domestic value added embodied in exports has increased more than tenfold. This has also led China to grow its domestic share of global value added in exports of electrical and optical equipment from 3% in 1995 to 22% in 2009. While certainly other developments in the Chinese and global economies not accounted for in the figure may have played a role, these figures provide *prima facie* evidence that firms operating in China have increased the foreign content of their products while multiplying their overall sales, profits as well as the wage bill for the workers they employ.

Figure 6. Enjoying a smaller share of a larger pie: electrical and optical equipment in China



Source: Authors' calculations based on the OECD TiVA database.

It is indeed unlikely that profit-maximising firms would switch to alternative products or value chain stages if this is not accompanied by higher productivity.[44] The relevant economic concept here is the principle of comparative advantage which teaches us that some firms—or some countries—will be able to obtain higher overall gains from GVC participation by specialising in what could be considered less sophisticated products, tasks or functions within the chain. Which segments of the value chain will be profitable will be determined jointly by the characteristics of the production process as well as relative skills and resource endowments of firms and countries in question (i.e. the comparative advantage). What this suggests is that productivity may be a preferred unifying characteristic of upgrading in GVCs.

4.2 An estimation of benefits of GVC participation

To shed more rigorous empirical light on how GVC participation may influence the economic performance of countries, this sub-section presents an assessment of the relationships between a number of measures of GVC engagement and outcomes associated with such engagement on the basis of the upgrading discussion above and the availability of data. The first investigated GVC outcome measure is the overall per capita domestic value added embodied in country's exports—a value added measure of benefits (productivity changes) associated with GVC participation. The

44. This is especially if appropriate time frame is considered since some firms may make strategic choices and accept lower initial profitability to maximise profits in long term.

second is the measure of export sophistication as defined by Hausmann and Klinger (2006)[45] and the third measure captures diversification of exported products which is considered an important indicator of competitiveness and quality of integration with international markets (e.g. Cadot et al., 2011).

While, as already discussed, OECD TiVA is the preferred source of data, EORA is used as the source of trade in value added data in this section to maximise the coverage of countries at different levels of development. The non-value added-based measures of upgrading and controls are calculated using the BACI dataset based on UN Comtrade and the World Bank Development Indicators databases.[46]

GVC participation and domestic per capita value added embodied in exports

Changes in per capita domestic value added embodied in exports provide a comprehensive indicator of GVC performance since they capture the gains associated with exporting which accrue to domestic labour and capital. They are related econometrically to changes in the use of foreign value added in exports (the value of the backward linkage)[47] to test for complementarity or substitution between domestic value addition and the use of foreign value added in the form of imported intermediate inputs (Table 2). They are also related to changes in measures of sophistication of imported manufacturing intermediate inputs and primary intermediates to understand if performance in GVCs is contingent on having access to more sophisticated intermediate imports. FDI inflows are also introduced to account for investment linkages as well as a set of control variables such as distance from economic activity, share of imports within RTAs and the log of the GDP per capita (aggregate productivity in the economy).

Since we are interested in the dynamic nature of GVC specialisation and performance, the estimation techniques employed here isolate the impact of changes in explanatory variables on changes in the performance variables through the use of country level fixed effects which serve to restrict the variance of the variables to a temporal dimension only. This also means that we implicitly control for time-invariant country specific characteristics such as geographical location or absolute differences in aggregate technology which are likely to also affect gains from GVC participation.

When investigating the determinants of per capita domestic value added generated from the GVC activity across the entire sample (152 countries and 15 years), we find evidence that across all income groups positive changes in foreign sourcing are associated with positive changes in the domestic value added in exports, thereby suggesting that a greater use of foreign value added is complementary to a growing per capita domestic value added in exports (Table 2, Column 1). We also see that changes in the sophistication of imported non-primary sector intermediates have a positive impact which nevertheless decreases at higher levels of sophistication. Positive changes in per capita GDP also translate into positive changes in per capita domestic value added in exports

45. Hausmann and Klinger (2006) posit that product sophistication can be proxied by per capita incomes of countries which typically export or supply them and that countries exporting more sophisticated products defined in this way tend to grow faster.

46. See Section 6 for a more detailed description of the trade data used in the analysis.

47. This variable is lagged by one year to avoid mechanical changes imposed by the IO structure of the system. There is an implicit linear relationship between domestic and foreign value added in exports (which is determined by the Leontief technology). For example, if the value added in exports is 70% domestic and 30% foreign then we would expect that a 1 unit increase in exports will mechanically lead to a 0.7 unit increase domestic value added in exports and a 0.3 unit increase in foreign value added in exports.

whilst a growing distance from economic activity is seen to have a negative impact on process upgrading.

However, we also find that the experience of countries across different income groups varies (Annex Table 12). For example, where GVC variables are concerned, high-income country gains in per capita domestic value added embodied in exports are mainly driven by a growing use of more sophisticated primary and non-primary intermediates. In contrast, in middle income countries, growing flows of inward FDI appear to be most important whilst in low-income countries it is the sophistication of non-primary intermediates which matters the most.

Table 2. Determinants of domestic content of exports across income groups

VARIABLES	(1) Log of per capita domestic value added in exports	(2) Log of export sophistication	(3) Normalised trade concentration indicator
Backward log of value (lag)	0.0124**		
	(0.00568)		
Backward (ratio)		0.192**	-0.232***
		(0.0914)	(0.0488)
Sophistication of manufactured intermediates (log)	9.427**	6.852**	-4.032**
	(4.288)	(3.222)	(1.720)
Sophistication manufactured intermediates (square of log)	-0.502**	-0.364**	0.211**
	(0.224)	(0.169)	(0.0900)
Sophistication of primary intermediates (log)	0.0310	-0.0663***	-0.00442
	(0.0250)	(0.0185)	(0.00990)
FDI inflows (log)	0.000522	-0.000723**	0.000125
	(0.000458)	(0.000342)	(0.000183)
Imports covered by RTA (share)	0.000755	-0.0170	0.0190
	(0.0351)	(0.0261)	(0.0140)
Per capita GDP at constant prices (log)	0.933***	0.205***	0.0542***
	(0.0384)	(0.0286)	(0.0153)
Distance to economic activity (log)	-2.221***	-0.354	0.347**
	(0.355)	(0.264)	(0.141)
Constant	-31.63	-21.05	15.96*
	(21.24)	(15.94)	(8.513)
Observations	2,050	2,064	2,064
R-squared	0.814	0.374	0.037
Year FE	Y	Y	Y
Reporter FE	Y	Y	Y

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

GVC participation and sophistication of export bundle

The measure of sophistication of export bundles based on the methodology of Hausman et al. (2007) is a proxy for product upgrading. Positive changes in this variable imply growing sophistication of the products being exported. When we investigate whether a country's value chain activity is linked to growing sophistication, we find that a growing backward participation (in terms of the share of foreign value added in exports) is associated positively with the production of more sophisticated export bundles (Table 2, Column 2).[48] Similarly, the use of more sophisticated inputs

48. See Annex Table 13 for differences across income groups.

and higher per capita GDP are also associated with product upgrading although we find evidence that positive changes in FDI inflows are not. Again, we find evidence of a heterogeneous path of product upgrading across income groups where the GVC source of product upgrading in high and middle income countries lies predominantly in engaging in wider fragmentation (positive changes in backward participation). In low-income economies this is not the case.

GVC participation and diversification of exports

Using a measure of the diversification of exports to proxy for functional upgrading,[49] there is evidence that both positive changes in backward participation and the use of more sophisticated non-primary imported intermediates are associated with diversification, as is a growing distance from economic poles of activity (Table 2, Column 3). A growing per capita GDP is associated with concentration. Diversification paths are also seen to differ quite widely across income groups. In high-income countries importing more sophisticated non-primary intermediates leads to more diversified exports, whereas in middle and low income countries it is wider engagement in backward participation (see Annex Table 14).

Overall, the results presented in this section show that gains associated with value chain trade do not accrue to countries in a uniform fashion. Nevertheless, engaging more widely in GVCs, whether by using more foreign value-added embodied in imported intermediates or importing more sophisticated intermediates, does appear to correlate with positive outcomes, even if there is a large heterogeneity across income groups. What this suggests is that there is not a one size fits all way of capturing the gains from value chains since these seem highly dependent on the structure of specialisation and level of development.

49. The link between the measure of concentration and the concept of functional upgrading is made under the proviso that a lower degree of export concentration should be correlated with a more diversified exporting structure and therefore new export functions within the economy. Recalling that the estimations are done in terms of changes, reductions in the degree of concentration should therefore capture new exporting patterns. We use a normalised trade concentration indicator (nTCI) and regress this on the same variables as above. A positive change in the nTCI implies a concentration of exporting activities and therefore we are looking at whether our GVC indicators have a negative coefficient (i.e. they are correlated with diversification).

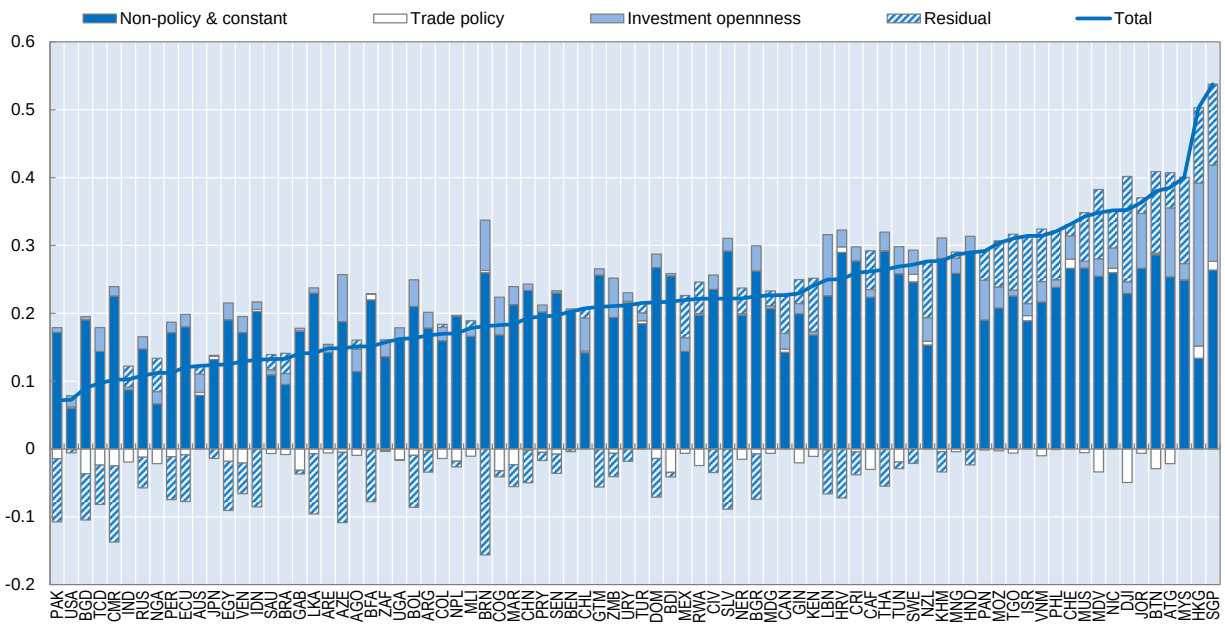
Part II. Global and regional value chains participation in Africa and Asia

5. GVC participation in Africa and Asia: Evidence from the analysis of trade in value added data

The assessment of GVC participation performed with the OECD TiVA and EORA inter-country input-output data sheds light on the relative importance of different factors influencing backward and forward integration. It can be used to gauge the relative performance of individual countries in terms of GVC participation and to summarise the relative contributions of non-policy and policy factors to this performance (Figure 7).

Figure 7. Backward GVC participation ratio—relative contribution of non-policy and policy factors (EORA)

2005



Source: Estimations based on EORA database.

The analysis focused on key non-policy and policy factors in selected countries in the five developing regions of Africa/Middle East and Asia which are the focus of this report: Eastern and Southern Africa (ESA), Middle East and North Africa (MENA), Western and Central Africa (WCA), South Asia (SAS) and South-eastern and Eastern Asia (SEA) (Annex Figures 13 through 21).[50] As was the case with the earlier results here too it is the structural (non-policy) factors, which are hard for governments to affect in the short to medium run, which dominate as determinants of backward participation.[51] We therefore focus our discussion on how the policy elements shape participation.

Concentrating on individual countries in the five developing regions we separate out the contributions to backward GVC integration of trade policies, investment openness and the other factors that have been identified as key determinants of participation and which are captured in the gravity version of our model. We subsequently provide a description related to the role that policy can play according to each element in the focus regions.

50. See Annex Table 15 for a list of sub-regions and countries. The actual country coverage is still dependant on the availability of data.

51. See Annex Figure 12 for equivalent decompositions for forward participation.

5.1 Trade policy

Removing tariff barriers to trade is likely to be important since fragmented modes of production imply multiple border crossings and therefore magnification effects (OECD, 2013). But their removal may be a necessary albeit not sufficient condition for further integration if products are held back at the border by onerous customs procedures or indeed the inability to engage in regional cummulation due to onerous rules of origin. Nevertheless, it is the deep integration measures (WTO+), including broader issues related to trade facilitation, competition policy, investment, intellectual property protection, services and dispute settlement, which are likely to be most conducive to value chain integration (Baldwin, 2013).[52]

In Figure 8 we show the estimated contribution of trade policy in explaining participation rates according to our model. It captures not just conditions in countries in question (i.e. tariffs charged and share of imports covered by FTAs) but also those faced in third markets (tariffs faced and share of exports covered by FTAs).[53] The trade policy variable is therefore to be interpreted as a measure of the net contribution of trade policy to participation where the positive effect of having a more liberal trade policy might be dampened by facing high tariffs in key export markets.

On this front, SEA countries tend to charge the lowest tariffs on imports of intermediates and display highest shares of imports covered by an RTA and this would explain why the trade policy context is seen to be the most favourable to GVC participation across all the focus regions. Nevertheless, some of the SEA countries such as Viet Nam face relatively high tariffs in their export markets for intermediate products and the share of exports covered by an RTA is not much larger than in some countries in SAS and ESA. What this would imply tentatively for Viet Nam is that more emphasis should perhaps be placed on negotiating market access in export markets. At the same time economies like Hong Kong, China or Singapore show some of the highest positive contributions of trade policy.

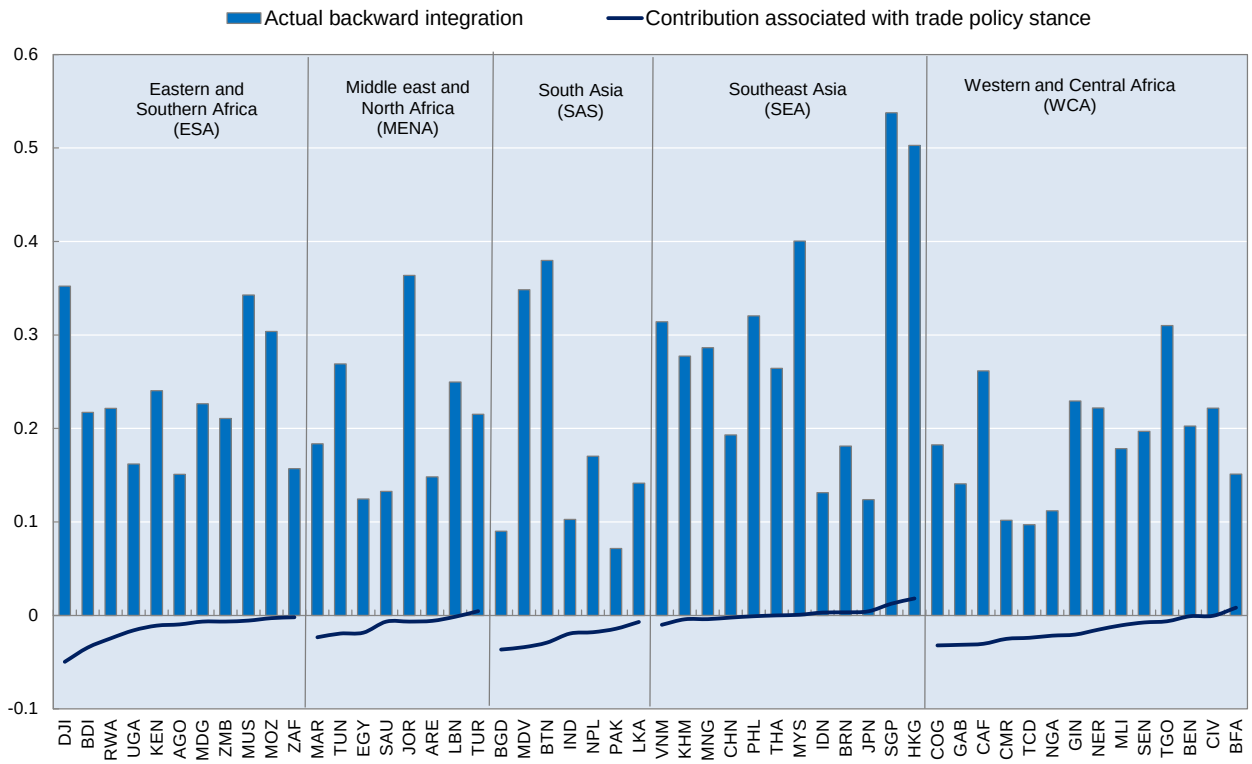
In contrast to the SEA region, the results show that all countries in SAS appear to be performing below what would be predicted by our model in terms of backward GVC participation and the trade policy environment is contributing to this underperformance. In Bangladesh, for example, the estimated impact of reforms that would result in aligning Bangladesh's trade policy stance with that of an average performance in our sample, could boost Bangladesh's participation by 50% with respect to currently observed levels.

Trade policies are also estimated to restrict participation considerably in several countries in WCA and in some countries in ESA. In the case of the Republic of the Congo, for example, we estimate that reforms that would align its trade policy with average performance could boost its participation by approximately 25%. In Burkina Faso or Ivory Coast on the other hand the combination of effects associated with tariffs and RTAs seem to have a relatively neutral impact on the observed levels of participation.

52. There is also a grander debate on whether such WTO+ measures can actually be enforced in a discriminatory way as are tariffs. Indeed once a legal framework for competition policy has been set-up it will be hard for countries to discriminate between different firms and this might imply that the traditional negative impacts of regionalism on third countries might be significantly reduced or eliminated.

53. See the Annex for a wider discussion of FTAs in the focus regions.

Figure 8. Backward GVC participation ratio and model-based measures of performance – Trade policy



Source: Estimations based on EORA database.

In MENA, but for a few countries, performance seems closer to that of SEA which can be attributed not so much to lower levels of import tariffs or faced but rather to a relatively high coverage of imports and exports of intermediates by RTAs. Still, Morocco or Tunisia, for example could boost their GVC participation by 15% or more if they liberalised their trade policies.

One overarching question is the extent to which RTAs have played or can play a role in enhancing participation at the regional level.[54] Some suggest that RTAs can enhance GVC activity (Orefice and Rocha, 2013 and Lopez-Gonzalez, 2012) whereas others argue that this is not the case (see Menon, 2013 for the case of South East Asia).[55] For example, in SEA, the proliferation of GVC activity is said to pre-date the formation of the 'noodle-bowl' but further integration appears to also have come as a consequence of the new agreements it spurred (Cheewatrakoolpong et al., 2013). In contrast, the case in South Asia is one where regional agreements are sought to stimulate economic integration.[56]

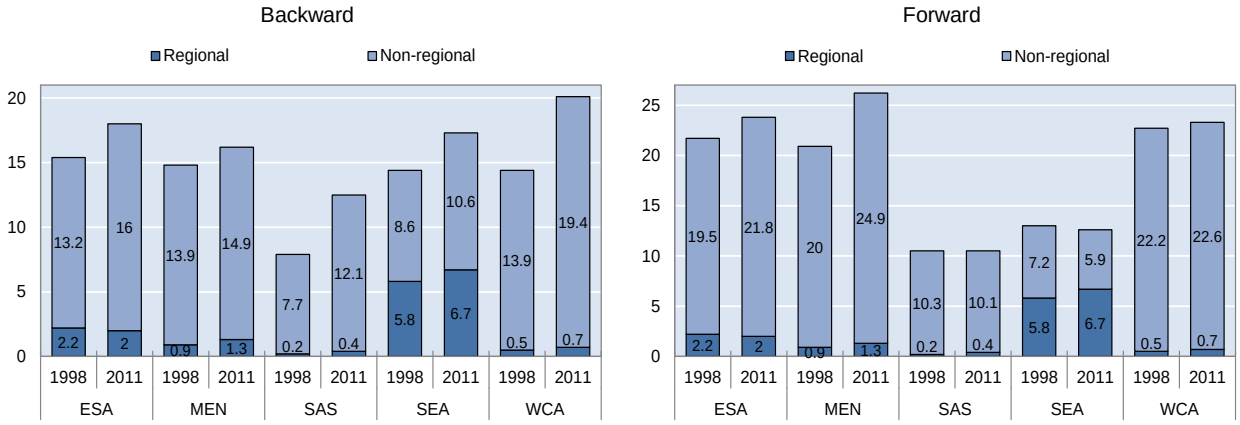
54. Another is the extent to which going regional at the expense of going global is desirable since FTAs are discriminatory by nature.

55. The debate centres on the direction of causation – whether countries that already engage heavily in GVCs are more likely to sign RTAs or if it is the RTA itself that enhances participation – but one does not preclude the other. Indeed this issue relates to demonstrating or isolating the direction of causation. Not taking into account the fact that countries which are more integrated are also more likely to sign trade agreements can lead to biases in the attribution of the impact of FTAs on flows (see Lopez-Gonzalez, 2012 for a discussion).

56. As seen from Section 6 benefits of regional integration are likely to be present but countries' competitiveness is also positively affected by sourcing from non-regional partners where a larger

One telling sign that FTAs may help can be seen from Figure 9. The contribution of intra-regional GVC integration in SEA, the region that supports the most comprehensive and deepest agreements, really stands out in comparison with other regions. ESA is second in terms of intra-regional value chain activity and here too there are agreements such as the East African Community (EAC) and the Southern African Development Community (SADC) which although less ambitious than those in ASEAN also have achieved a strong element of integration. Lagging behind are MENA, WCA and South Asia where the regional integration efforts have been less ambitious.

Figure 9. Intra and extra-regional participation in GVCs



Note: Shading identifies the share of linkage which is from the region.
Source: Own calculations using EORA database.

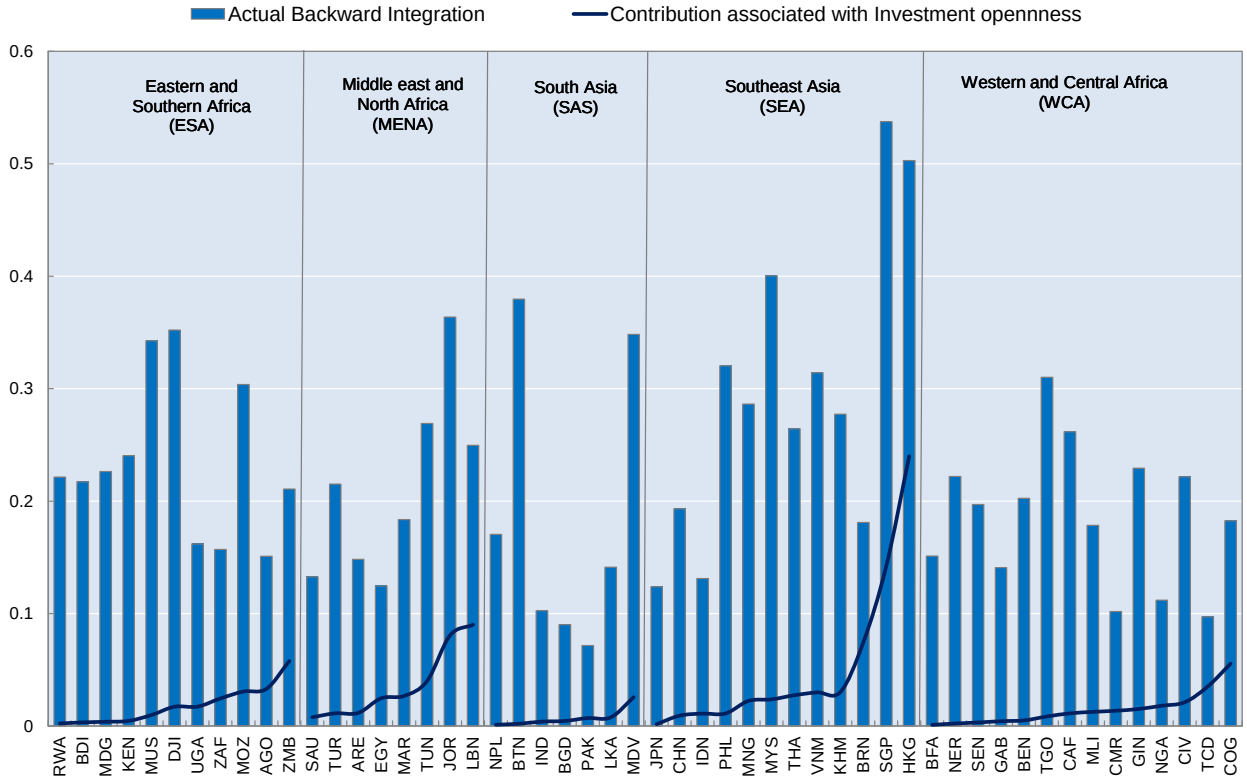
5.2 Inward FDI openness

FDI openness and backward GVC participation are closely related (Section 3) and the premium here can be large. For some countries in SEA, FDI openness is found to increase participation by over 20 percentage points but in others, such as Viet Nam, Cambodia or China, which are relatively closed to inward FDI the contribution is found to be much smaller (Figure 10). SAS has the lowest ratios of inward FDI to GDP (Annex Figure 21) amongst the regions and thus the lowest estimated contributions to GVC integration. But there is also some heterogeneity within the region with the lowest openness ratios observed in Nepal, Bhutan as well as India, while the Maldives and Sri Lanka are regional top performers on this indicator.

In Africa, WCA countries tend to have the lowest FDI-to-GDP ratios of African regions although the best performers in this respect, such as the Republic of the Congo, are on par with best performers in ESA and average performers in SEA. For several countries in ESA contributions associated with investment openness are not far off what seems to be the norm in SEA but as in any other region, there are countries which are relatively closed (e.g. Rwanda) and there are countries which are relatively open (e.g. Zambia, South Africa) and these regional comparisons, as well as comparisons of specific restrictions, can give an indication of the extent to which participation could be facilitated through appropriate FDI policies.

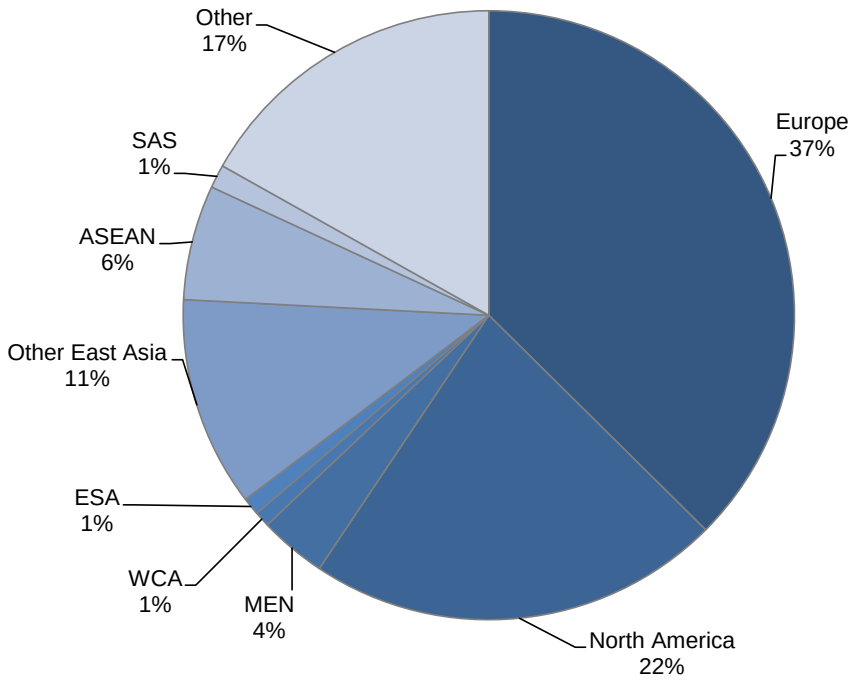
pool of competitively priced intermediates might be found. This highlights the importance of combining regional initiatives with increased multilateral liberalisation.

Figure 10. Backward GVC participation ratio and model-based measures of performance – Investment openness



Source: Estimations based on EORA database.

Figure 11. World distribution of FDI inward stocks 2013



Note: Other East Asia includes China, Chinese Taipei, Hong Kong (China), Macao (China), Korea, Japan and Mongolia.
Source: Authors' calculations based on the *World Investment Report (2014).*

Figure 11 identifies the geographical concentration of global FDI flows. Here we see that ASEAN accounts for over 6% of world FDI inward stocks in 2013 –up from 3% in 1990. South Asia, on the other hand, is still comparatively small representing 1.2% of world inward stocks (up from 0.3% in 1990). The rest of Asia takes the lion's share of the inward FDI stocks in the region but it has actually witnessed a relative decline (from 12% of global flows in 1990 to 11% in 2013). In Contrast, the African regions account for less than 2% of global inward stocks.

Although the above suggests that ASEAN is performing relatively well, looking inside the region reveals a large degree of heterogeneity. Singapore accounts for more than 50% of the region's stocks and Indonesia and Thailand represent 15% and 11%, together as much as the combined sum of the rest. This heterogeneous performance may reflect the different perceived conditions in the region as seen in the OECD's FDI regulatory restrictiveness indicator. The latter ranks Singapore, Cambodia and Japan as the least restrictive with averages below the OECD however other SEA countries such as the Philippines and China rank very high in terms of restrictiveness. These last two are also seen to rank relatively low in their FDI openness ratios (OECD, 2014a).[57] South East Asia, with a few exceptions, is therefore a relatively restrictive region when it comes to FDI, yet it has still managed to attract a considerable share of world FDI. What this suggests is that if it manages to streamline barriers to foreign investors it would be able to profit even more from the positive spillovers associated with FDI inflows.

In South Asia, India draws the highest percentage of FDI inward stocks in the region (80% of the region and nearly 1% of the world) with Pakistan taking 10% (0.1% of the world) and the remaining countries sharing the little that remains. Here too heterogeneity is the norm rather than the exception and although it is hard to tell how restrictive the other SAFTA members are, since these are not in the OECD's FDI regulatory restrictiveness indicator database, we see from Figure 10 that these score relatively low in terms of their investment openness ratios. India, who is also seen to score low on this indicator also has a high FDI regulatory restrictiveness indicator (twice as high as the non-OECD average).

5.3 Other policy factors

Investigating positive or negative gaps between the actual backward integration ratios and the ones predicted by all the structural and trade and investment factors taken into account in our model (Figure 12) we see that, while there are some regional tendencies, in each of the five developing regions there are examples of countries with large negative and positive deviations.[58]

By definition, it is hard to say what the unexplained factors behind these deviations may be, but the results of the additional analysis presented in Section 3.4 provide some clues. Trade facilitation, logistics performance, infrastructure, intellectual property protection and the quality of institutions are estimated to have the largest positive impact on GVC integration in developing countries. In what follows we look at these elements in order to try to assess how performance across the regions has fared.

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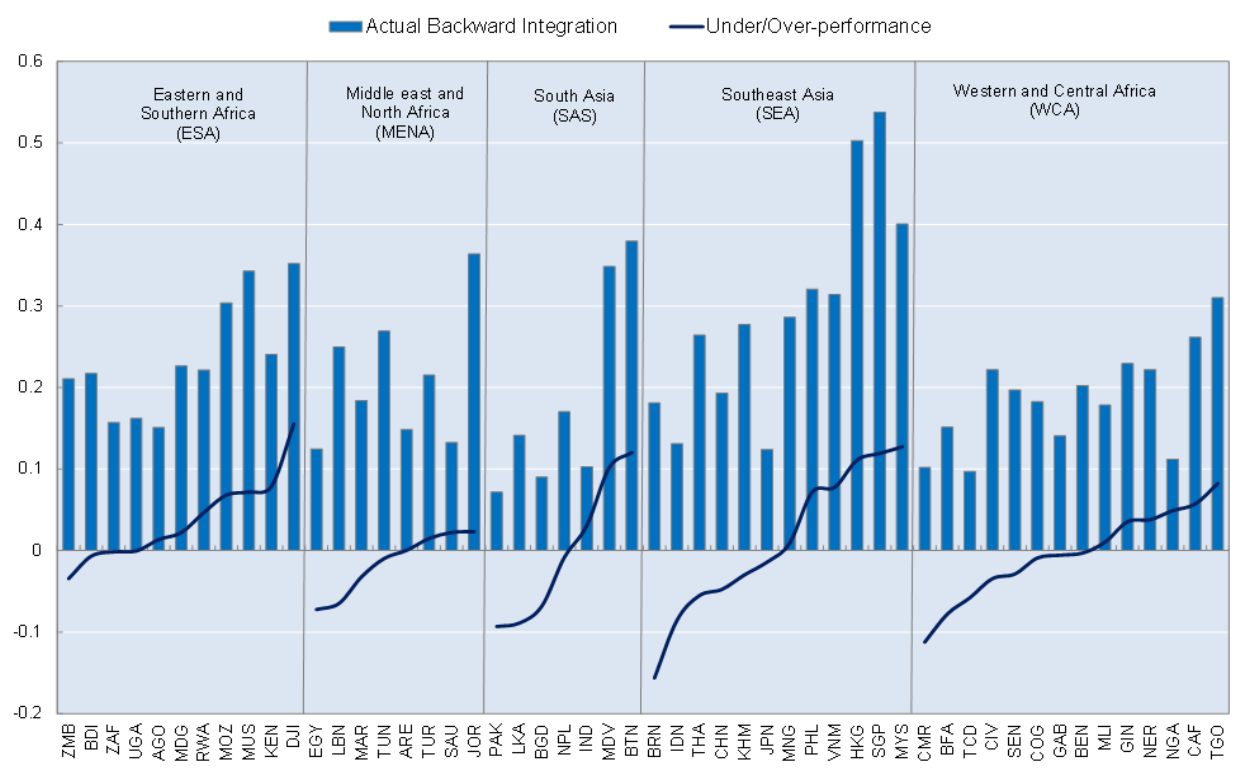
57 OECD (2014a) notes that there remain many barriers to foreign investment in ASEAN. In particular provisions related to limits on foreign ownership are relatively common. The example of Lao PDR and Viet Nam, where foreign ownership is limited to 20% and 49% respectively is evidence of some of these restrictions. In China access to foreign firms seeking to sell in the domestic market often requires similar joint ownership requirements.

58. As argued above, these can be seen as additional estimated measures of respectively over or under-performance in GVCs. A negative (positive) gap means that there are factors other than the structural and policy factors accounted for in this exercise that lower (boost) the country's GVC participation.

Figure 12. Backward GVC participation ratio and model-based measures of performance – factors not accounted for in the model (residual)



Source: Estimations based on EORA database.

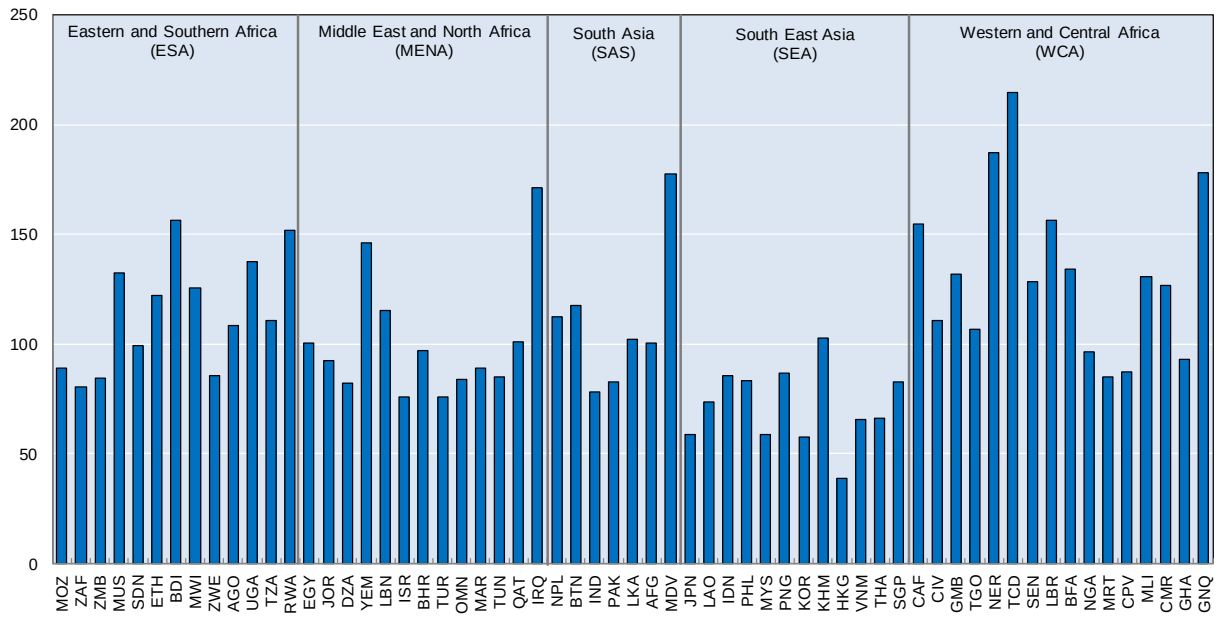
Trade Facilitation, logistics and infrastructure

Trade facilitation involves a range of issues (such as commercial, transport, regulatory or financial procedures) which aim to reduce trade-related transaction costs thereby facilitating the smooth functioning of international trade. With goods crossing more borders as a result of enhanced GVC activity, trade facilitation has become central to the well-functioning of GVCs. To put things into perspective only 0-10% of trade costs are estimated to be tariffs with 10-30% being represented by natural trade costs (i.e. geographical and cultural factors). The remaining 60-80% relate to policy non-tariff measures such as indirect costs of trade procedures, maritime connectivity and services, business (regulatory) environment, currency fluctuations and availability and use of ICT services (UNESCAP, 2014).

The heterogeneity of trade costs across and within the regions is highlighted in Figure 13 where SEA is seen to witness the lowest costs of the developing regions under investigation, factor which is likely to contribute to its GVC prowess. Although much of this might be due to non-policy related factors such as economies of scale in shipping (Haddad, 2007), it also reflects the important investment in the region on physical infrastructure (e.g. according to World Bank (2010) Viet Nam invests around 8-10% of its GDP in physical infrastructure) and the carefully devised master plan on ASEAN connectivity which explicitly aims to tackle trade facilitation issues.[59]

59. Of particular relevance to promoting regional and global participation in production networks is the "Master Plan on ASEAN connectivity" which delimits a set of actions that ASEAN countries have committed to implementing in view of enhancing connectivity thereby supporting the goals of the EAC blueprint. In addition to its focus on upgrading physical infrastructure and multimodal transport systems, its institutional infrastructure dimension, with agreed frameworks on the facilitation of transit

Figure 13. Trade costs across regions



Note: Bars show *ad valorem* equivalents of trade costs calculated from Arvis et al. (2012) using the trade cost measure proposed in Novy (2010). Since the data is bilateral, here we show trade weighted values per country for the year 2010.

Source: Authors' calculations based on ESCAP-World Bank Trade Cost Database.

Investment in infrastructure and trade facilitation in South East Asia may have contributed to the low intra-regional trade costs shown in Table 3 although distances also play a role since these are trade-weighted measures. Nevertheless SEA still has some way to go in catching up with the trade costs seen in the EU or indeed North America.

Table 3. Region by region trade weighted trade costs

	E27	ESA	MEN	NAM	SAS	SEA	WCA
E27	34.35						
ESA	111.99	103.72					
MEN	75.96	90.99	48.28				
NAM	65.52	124.98	72.17	14.81			
SAS	94.79	161.9	60.76	88.59	92.04		
SEA	87.99	155.14	69.39	71.93	103.63	68.79	
WCA	106.67	93.73	112.36	105.36	99.61	162	104.25

Note: Figures show *ad valorem* equivalents of trade costs calculated from Arvis et al. (2012) using the trade cost measure proposed in Novy (2012). Data is trade weighted average costs of trade by region for the year 2010.

Source: Authors' calculations based on ESCAP-World Bank Trade Cost Database.

and inter-state transport as well as the National Single Window, is likely to bring about important efficiency gains. This not just in terms of connecting regional partners to each other but also in connecting these to other global poles of activity. This should help attract further investment (both domestic and foreign) thereby providing impetus for greater value chain integration.

In contrast, South Asia, which spends much less on physical infrastructure and where regional coordination of trade facilitation is lacking, is seen to have the highest intra-regional trade costs after the African regions. The quality of infrastructure is below average in all countries except Sri Lanka and this is likely to hamper integration not just domestically (connecting more remote regions) but also regionally and internationally. Here investment in the maintenance and upgrading of existing and new infrastructure could provide an important boost to economic activity particularly in countries such as Nepal, Bangladesh and Pakistan where the quality is lowest.

Beyond connectivity issues such as the presence of physical and institutional infrastructure the South Asia region faces important challenges not least in dealing with energy shortages (World Bank, 2010) which may impede the smooth functioning of GVCs. Electricity supply in the region is amongst the lowest of all regions. Here the worst performer in SEA, Cambodia, is seen to be on par with India thereby highlighting a key difference between South and South East Asia.

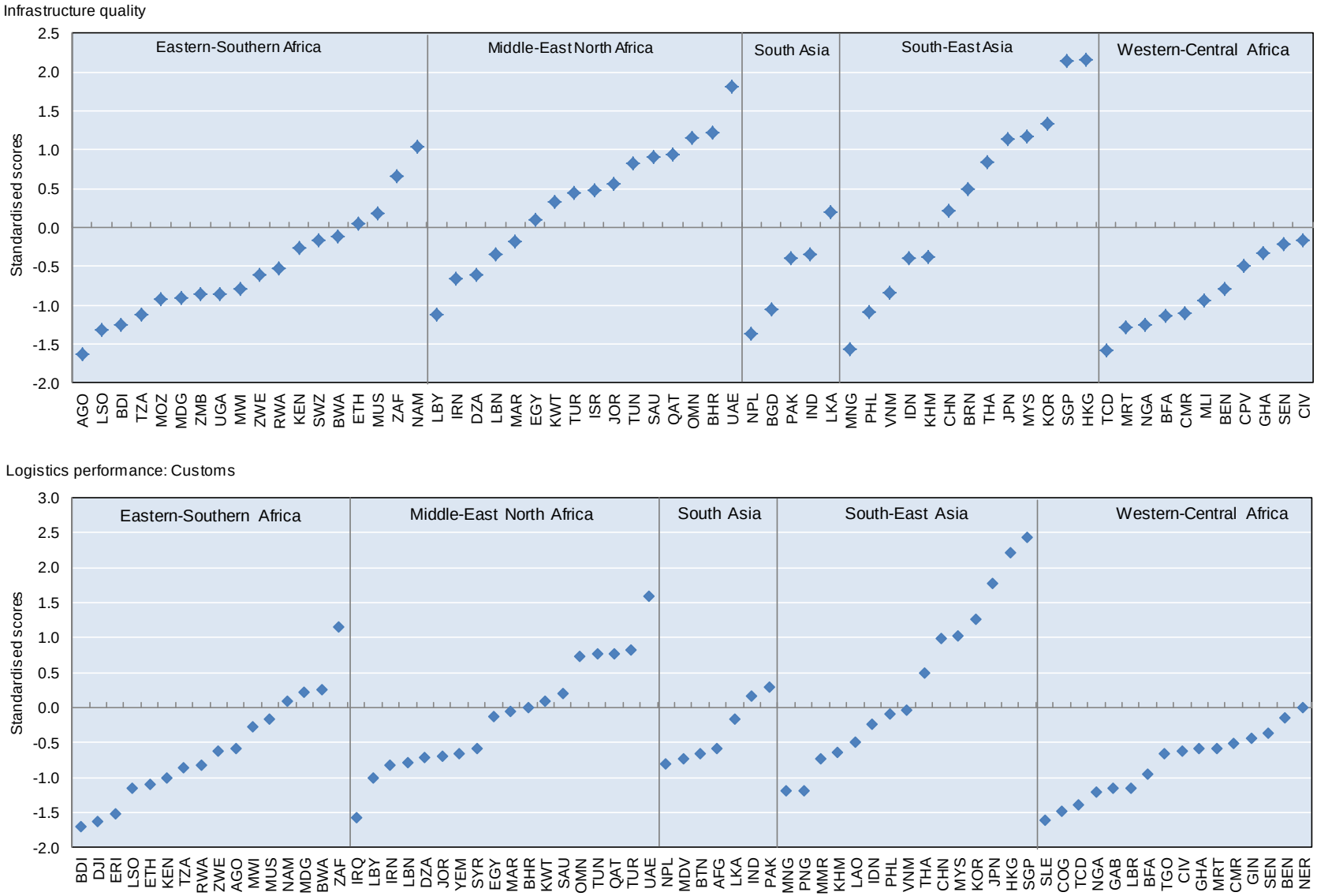
In terms of logistics performance in Asia there is also a wide heterogeneity both within and across the regions. India's performance stands, comparatively, between that of Thailand and Indonesia but the other South Asian countries are amongst the lowest performers in Asia with landlocked Afghanistan, Bhutan and Nepal scoring particularly low (Figure 14). The World Bank (2010) notes that for Nepal to trade goods with India it takes around 200 signatures whilst trading from India to Nepal requires around 140. But these bottlenecks are not exclusive to the landlocked countries as in one important border between Bangladesh and India trucks are often required to wait over four days in order to cross the border (World Bank, 2010).

In ASEAN, Singapore, Malaysia and Thailand lead the way in terms of logistics performance although only the first shows similar levels to those witnessed in the best performing rest of Asia economies (Japan and Hong Kong, China). Indonesia, Viet Nam and the Philippines are a little behind but still ahead of many South Asian countries. Unsurprisingly, given their lower level of development and late entry into ASEAN, three of the four CLMV countries show the lowest performance in the region.

Remoteness is also a critical factor that impedes further GVC participation of Sub-Saharan African countries. Furthermore, the cost of trading across borders in Africa is substantially higher than in other regions: according to the World Bank Doing Business indicators in Sub-Saharan Africa it takes an average of 38 days to import and 32 days to export goods across borders (World Bank, 2012). Calculations of ad-valorem equivalents of trade costs for each of the regions in our sample confirms the burden that firms face both to trade outside and inside the region; the cost of trading intra-regionally in ESA and WCA is about twice, three and six times the equivalent cost of shipping goods within MENA, the European Union, and North America respectively (Table 3).

Remoteness in the case of Africa cannot only be thought of in terms of geographical distance; critical elements related to the quality of infrastructure and also the burdensome border procedures that delay shipments to and from Africa exacerbate this. Figure 14 illustrates that, with the exception of South Africa and a few smaller partners, most countries in the region score below the world average in logistics performance and quality of infrastructure. Landlocked countries may be disproportionally affected by the unreliability of supply routes, as firms face high levels of uncertainty over the supply of inputs and their production costs. According to anecdotal evidence, firms in Burundi and Zimbabwe, for example, are forced to hold inventories of imported inputs covering up to one year of production in order to prevent stocking-out.

Figure 14. Infrastructure quality and efficiency of customs procedures in Africa and other regions



Source: World Competitiveness Indicators 2010; World Bank Logistics Performance Index (customs) 2009.

Institutional quality and intellectual property protection

The absence of corruption, political stability, the credibility of reforms and policy initiatives are often put forward as pre-conditions for international business, lowering the risk faced by suppliers, investors and exporters. For example, Mengistae (2010) identifies that in the recent past, greater political stability in Zambia and Mauritius have had drastically positive and visible impacts on investment flows while, on the other hand, major declines in the control of corruption seem to have led to a sharp fall in FDI in Namibia and Swaziland in the early 2000s.

With the rising complexity of international transactions the role of institutions is becoming increasingly important (Nunn and Trefler, 2013; Blyde, 2014). Uncertainty in international contractual arrangements can lead to sub-optimal trade and investment decisions and hold-ups and institutions can step in to provide appropriate contracting environments to help ease difficulties thereby even becoming a source of comparative advantage (Nunn, 2007 and Levchenko, 2007).[60] Indeed, institutional quality is closely associated with backward participation as was seen in Section 3.4.

In South Asia institutional quality is below the world average in all countries except Bhutan. India ranks second in the region (showing an institutional quality a little above that of China) and Afghanistan, Pakistan, Nepal and Bangladesh score particularly low (Figure 15). However levels of institutional quality are similar in the CLMV countries in ASEAN suggesting that it is not just South Asia which needs to work on upgrading the quality of its institutions. South East Asian countries such as Indonesia, Thailand and the Philippines are also seen to trail behind and might take lessons from other ASEAN members in view of increasing the quality of their institutions.

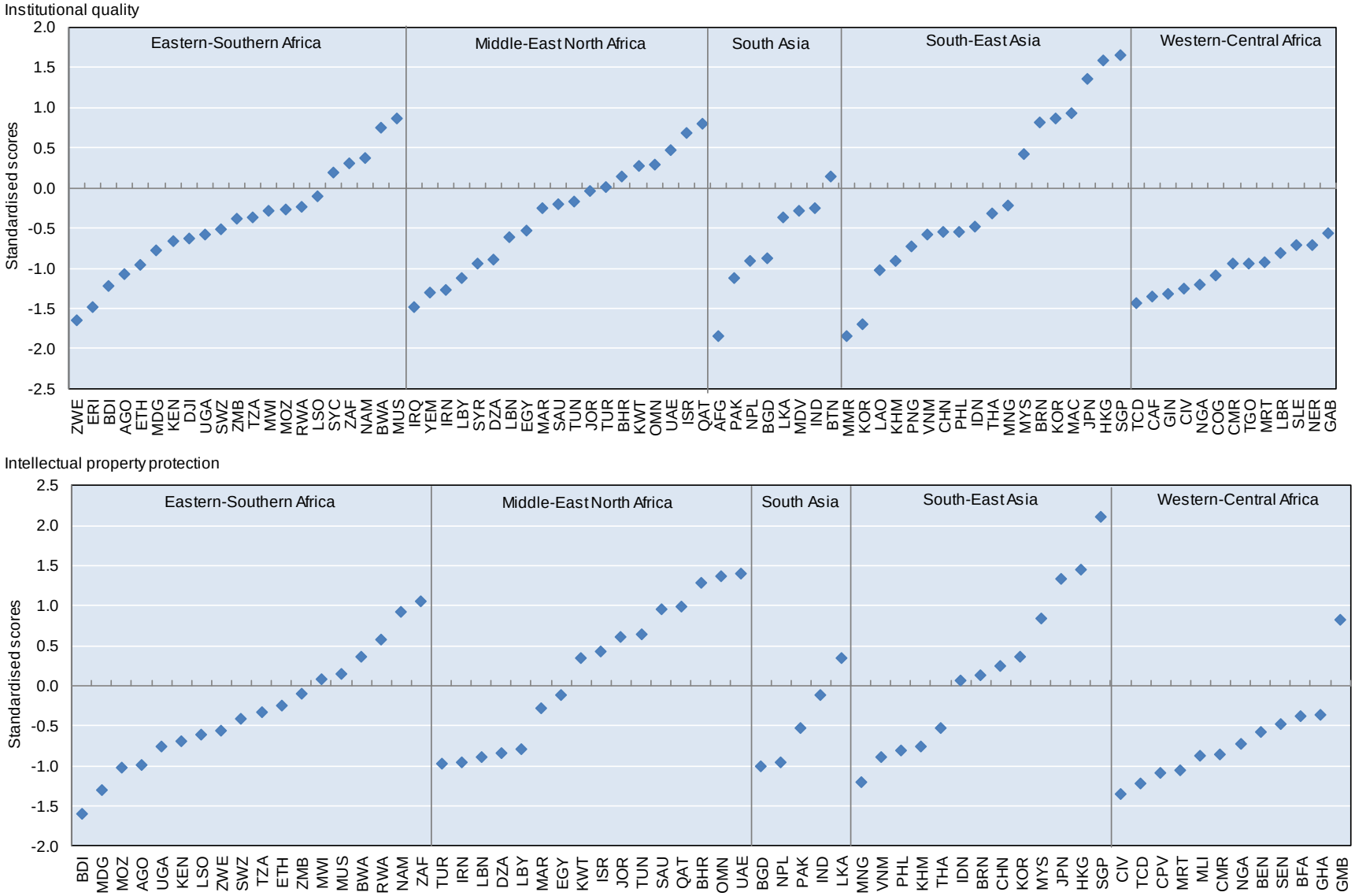
WCA stands out as the region with consistently low scores on the institutional quality indicator. In ESA and MENA some countries such as Botswana, Namibia and South Africa and Qatar, UAE and Oman perform above the average in the sample (Figure 15).

While prescriptions for improvements of the institutional quality seem natural in the countries that are falling behind, such recommendations have been made in the past and it is not clear to what extent they are actually feasible in for example Sub-Saharan Africa (e.g. Mkandawire, 2001). Some commentators are sceptical as to whether the European integration model that has been based on considerations of economic feasibility and potential is appropriate in Africa. They posit that perhaps trade facilitation and regulatory cooperation in areas related primarily to the conduct of business, underpinned by security improvements at the domestic level, may be more appropriate in Africa (e.g. Draper, 2012).

Where intellectual property protection is concerned, a factor identified in Section 3.4 as an important determinant of backward participation, performance is also mixed (Figure 15). The only economy that ranks above average in South Asia is Sri Lanka whilst in SEA China, Indonesia, Malaysia, Brunei, Korea, Japan and Hong Kong, China are good performers. Apart from the Gambia, countries in WCA have again the lowest scores across all the regions while in ESA and even more in MENA there are number of countries that record decent performance.

60. But their role is not limited to trade as they also matter for economic performance in general (Acemoglu et al. 2001 and 2002)

Figure 15. Institutional quality and intellectual property protection



Source: World Governance Indicators 2010.

6. The importance of intermediate merchandise inputs in key value chains in Africa and Asia

In the preceding sections, we have established the key factors that shape GVC participation in developing and high income countries. We found that while structural factors such as the size of the market, level of economic development and geographical location are some of the key determinants of GVC participation, there is potential for commercial and other policies to contribute to GVC integration. Our results imply also that, in order to overcome a relative disadvantage in structural factors (e.g. in distance to the closest manufacturing hub), some countries may need to focus even further on improving their policy environment to enhance their GVC participation as compared to other countries. We have established that in addition to trade and investment policy reforms, other issues such as logistics performance, intellectual property protection, the quality of infrastructure as well as the quality of institutions may have particularly strong impacts on GVC integration in developing countries. We have also indicated which countries in the five developing regions have the greatest potential to support GVC integration through further trade, investment and other trade-related reforms.

To perform this analysis for a larger number of developing countries than are currently available in the OECD TiVA dataset in an attempt to capture differential impact across development groups we have extended the analysis to inter-country input-output data from the EORA dataset. While EORA offers a wider coverage of developing countries, the quality of underlying input-output and trade data is inferior to that of TiVA where great care is taken to harmonise the trade and input-output data. Having compared consistency of GVC participation indicators across TiVA, EORA and WIOD we have concluded that on aggregate, the EORA database performs adequately at capturing backward participation (see Technical Annex). However, when we look at the sectors that underscore this participation we find very big differences therefore suggesting that the EORA database should only be used at the aggregate level in our analysis.

Therefore, to extend the sectoral analysis to the countries and regions which are not available in TiVA this section uses detailed trade data (at the HS 6-digit level of aggregation capturing over 5 000 products) for the period 1998-2011 to refine the empirical evidence and policy analysis of key value chains in our five developing regions. Having outlined the main trends in intra and extra-regional trade, the analysis concentrates on the following economic sectors associated with relatively high GVC participation rates: agriculture (HS chapters 01-15); processed food products (HS 16-24); plastics and rubber (HS 39-40); textiles (HS 50-63); metal products (HS 72-83); electrical and electronic equipment (HS 85) and motor vehicles (HS 87).

Focusing on trade data, while not as comprehensive as combining trade and input-output data as in the OECD TiVA approach,[61] has considerable data availability and detail advantages. In particular, it does not require the use of input-output tables which are not available, or are artificially created in some datasets, for many smaller developing countries. At the same time the approach is very much in the spirit of the OECD TiVA work; classifying detailed trade data into intermediate and final trade has been a key step in developing the OECD ICIO model (De Backer and Miroudot, 2013). A similar approach to studying GVCs using trade data has also been employed by Beltramello et al. (2012).

61. In particular, the use of gross trade data implies that we cannot properly capture forward and backward value chain linkages in terms of value added as in the first part of this report. The familiar caveats that led to the creation of the TiVA database therefore apply: i) the data are measured in gross terms and therefore double-counting is pervasive; and ii) the use element is lost since we cannot determine what sector is using the intermediate and whether this is for production to satisfy domestic or foreign demand. Nevertheless, the analysis can already provide understanding of developing economies value chain participation at a more refined level of aggregation.

Global and regional trends in competitiveness are first considered in order to understand and focus the subsequent analysis on the most relevant components of trade related to GVCs—intermediate inputs. To do this, products at the HS 6-digit level have been classified into 11 types of goods —an aggregation which is based on, but more disaggregated than, both the United Nations' classification of Broad Economic Categories (BEC) and the OECD's STAN Bilateral Trade Database by industry and end-use (BTDIxE). Intermediate products are broken down to: primary intermediates, processed intermediates, and fuels.[62]

The main source of trade data is the latest version of the BACI dataset which is based on the official data compiled by United Nations Statistics Division (see Gaulier and Zignago, 2010). Yet, it also benefits from several consistency and reconciliation[63] checks implemented at the 6-digit level of the Harmonized System. This dataset allows us to cover export and import relationships to and from approximately 240 economies over the period 1998-2011.

6.1 Main trends in intra and extra-regional trade

Our analysis of the evolution of shares for each of the eleven broad product categories in the period 1998-2011 (Annex Table 17) shows that globally the share of processed intermediate, consumption and capital goods has diminished over time while the share of fuels has almost tripled reflecting the surge in fuel prices (e.g. Lutz and Hicks, 2013).[64] Nevertheless, primary and processed intermediates still account for approximately 45% of world trade. Primary intermediates have seen their share rise, while the share of processed intermediates has fallen since the late 1990s.[65] A comparison of compound annual export growth rates indicates that fuels had the highest rate of export growth which was well above that of total trade (Annex Table 18). However, exports of processed intermediates accelerated in recent years and were the largest contributor to total export growth between 2004/05 and 2010/11 accounting for almost a half of it (Annex Figure 28).[66]

Comparison across the different exported product categories and time periods reveal some well-known patterns (Annex Table 19). Exports of the MENA region are concentrated around fuel exports which account for approximately two thirds of the value of exports, and this concentration has increased over time. WCA follows a similar pattern, albeit in this region exports are equally heavily concentrated around the extraction of mineral resources which are included among primary

62. In addition, six separate subcategories of products which cannot be unequivocally classified into capital or consumption goods are considered (i.e. medicaments, personal computers, cars, mobile phones, precious metals, and miscellaneous). This disaggregation of trade flows into these categories is very close to the BTDIxE classification used in the TiVA dataset and the differences are due to the distinction of specific categories of intermediate goods where we distinguish primary and processed intermediates (see Annex Table 16 for details of this classification).

63. Reconciliation procedures imply that reported exports from country A to country B equal imports reported by country B from country A. To do this, bilateral trade flows at the HS 6-digit level were harmonized between exporters and importers according to official data reported to UN Comtrade. Import and export flows were made comparable after subtracting an estimation of trade costs at the product level. A reliability index, which depends on the accuracy of trade flows reported by countries, was then used to calculate the final values. This procedure allowed to significantly extend the coverage of trade data to 240 countries instead of 150 in UN Comtrade.

64. See Annex Table 28 for data on exported products according to these categories

65. This, again, is mostly due to higher commodity prices (e.g. Lutz and Hicks, 2013) which mean that growth in exports of commodities has risen at a faster pace than that of processed intermediates (which have nonetheless grown during the period of analysis).

66. Capital goods show also a significant dynamism, even though most of these trends point towards more regional specificities than world tendencies.

intermediates; more than 70% of the value of WCA's exports is associated either with fuels or primary intermediates, and the region shows little signs of diversification into other activities. In fact, SEA is the only developing region not to have exports concentrated in fuel or mineral resources.

To provide a first insight into the degree of forward and backward connectivity with value chains across the regions in Africa and Asia we analyse revealed export and import intensity indices.[67] SEA is the only region showing high and increasing export intensity in processed intermediates. Export intensities are also relatively high for ESA and SAS but are stagnant or decreasing over time, most likely due to an expansion of exports of minerals and fuels. MENA and WCA are the regions with the lowest export intensities for intermediates even though a significant expansion can be observed in most recent years in the case of the latter. In these two regions, less than 20% of exports are intermediate goods as compared to around a half across the world.

SEA is also the only region showing high and growing specialisation in exports of capital goods and several specific categories of capital/consumption goods such as cars and phones. In general, as compared to Asia, exports of African regions tend to be less concentrated around the categories of specific capital/consumption goods. Only ESA records an increasing share of exports related to cars and precious metals.[68] At the same time, exports of both Asian sub-regions, SEA and SAS, tend to be concentrated in consumption goods. Combined with the high participation in intermediates' trade, these trends in consumption and capital goods, are the main features of the Factory Asia seen from the trade data perspective. African countries have rather dissimilar export structures which might suggest that conditions for the birth of a Factory Africa are still not there.

The corresponding import intensities (Annex Table 21) indicate relatively intense imports of capital goods by African regions. This could either suggest an on-going process of industrialisation or a shortage of domestically-produced capital goods and therefore a strong reliance on foreign technology embodied in imported capital goods (although we cannot exclude that some of these capital goods are being imported for consumption).[69] The latter hypothesis seems to be supported by the contrasting picture observed in the Asian regions where imports of capital or capital/consumption goods are not as intense. As far as imports of processed intermediates are concerned, again SEA and SAS display higher intensities although the contrast between Asia and Africa is less striking than with exports: apart from WCA other African regions seem to engage in imports of processed intermediates equally intensely as do SEA and SAS.

Overall, we find clear evidence that African countries remain exporters of natural resources and appear to lag behind in terms of participation in international trade of processed intermediate inputs. Asian economies, and particularly those in SEA, seem to have successfully implemented production processes relying on imports of intermediate and primary goods that enable exports of consumption (and some capital) goods.

67. These are calculated by dividing the import (export) share of a given product category in a given region's total imports (exports) by the corresponding share in trade of all regions. Values above one indicate products which are imported (exported) by the region more intensely than the average in the world (see Annex Tables 20 and 21).

68. The former is likely a reflection of a car production in South Africa and may not represent a region-wide trend.

69. While analysing these sub-regions separately in the future, it will be worth understanding what kind of capital goods are imported as well as what are the main constrains to industrialisation.

6.2 How has competitiveness evolved?

We use the indicator of revealed comparative advantage (RCA) proposed by Balassa (1965)[70] to measure competitiveness in international and regional markets across our five focus regions and seven focus sectors over the period 1998-2011.[71] The indicator shows whether the export structure of a country or region is more specialised in a particular grouping of goods in comparison to the world. Cases where countries show higher export shares for certain products in their export bundle than the corresponding share for the world are interpreted as cases of 'revealed' comparative advantage or competitiveness.[72] Looking at changes in this indicator allows us to see whether countries or regions have lost, gained or maintained competitiveness across the different focus sectors.

The RCA indices are calculated separately for extra-regional and intra-regional exports called, respectively, global and regional RCAs. Whether the global and regional RCAs occur at the same time is interesting because it is sometimes argued that success in global markets must be preceded by a regional one. On the other hand, there are several industries where markets are global and where global competitiveness may be independent, or may indeed precede, regional competitiveness.

Table 4 summarises the global and regional RCAs for the five developing regions in the seven key sectors and shows that global and regional competitiveness is indeed often jointly observed albeit at a diminishing rate. Of the 21 regional sectors which displayed either regional or global competitiveness in 2010/11, 12 were competitive at both regional and global level, down from 16 in 1998/99. In fact, in our five developing regions in the more recent period there are clearly more cases of global competitiveness without accompanying regional competitiveness than in the earlier period. However, this result does not necessarily imply that competitiveness can be achieved without regional inputs and this is the issue which we delve into in subsequent sections.

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70. $$RCA_{g,c} = \frac{Exports_{g,c} / \sum_g Exports_{g,c}}{Exports_{g,world} / \sum_g Exports_{g,world}},$$

where: $Exports_{g,c}$ captures the total exports of good g by country c and $Exports_{g,world}$ are the total exports of good g in world trade.

The common interpretation is that countries showing a higher export share of good g in their export bundle than the corresponding share for the world have 'revealed' themselves to have a comparative advantage. Although a commonly used measure, the RCA indicator has its proponents and detractors. For example, Richardson and Zhang (2001) suggest that since it embeds trade policies (as it uses trade flows which are themselves affected by trade policy) the measure can capture the trade competitiveness of countries. On the other hand, detractors argue that the measure is to be used with caution since it is not easily comparable across goods nor does it lend itself to ordinal ranking. However, comparability across countries and within countries and products is straight forward and it is in this context that we use it.

71. We rely on the BACI dataset based on the official data compiled by United Nations Statistics Division (see Gaulier and Zignago, 2010). We remove from the analysis traded goods under chapters 25 to 27 of the Harmonized System (mineral exports) for practical reasons (to avoid price increases affecting the denominator of the indicator) and also because the scope for policy interventions in these sectors is rather limited. Additionally, in order to reduce the sensitivity of our results to trade fluctuations in a given year, our analysis uses biannual average volumes of bilateral trade at the HS 6-digit level for each year considered.

72. The distinction can be made between comparative advantage and competitiveness to emphasise that trade outcomes will not only reveal countries' natural endowments and predispositions, i.e. sources of comparative advantage, but also policies which can affect the competitive position of firms.

Table 4. Cross tabulations of comparative advantage in world and regional markets

Comparative advantage in 1998/1999

		Regional RCA		
		No	Yes	
Global RCA	No	14	4	18
	Yes	1	16	17
		15	20	35

Comparative advantage in 2010/2011

		Regional RCA		
		No	Yes	
Global RCA	No	14	5	19
	Yes	4	12	16
		18	17	35

Source: Own calculations using BACI database.

In order to summarise the observed trends, Table 5 classifies changes as 'positive' when competitiveness is gained or sustained at either regional or global level over time.[73] 'Negative' changes denote situations where either regional or global competitiveness has been lost during the period of analysis.[74]

Two main messages can be drawn from these data. First, Asian regions dominate the technology-intensive manufacturing sectors considered here while African and Middle Eastern regions tend to be competitive in sectors such as agriculture and foodstuffs and lower-tech manufacturing products. Still, each region experiences some positive developments suggesting that policy makers have success stories in their regions that can be followed and studied in more detail:[75]

- SEA—probably the most dynamic region in global value chains—records a consolidation of competitiveness in electronics and motor vehicles while lowering engagement in regional markets for metal and textiles products.
- SAS either sustained or developed regional or global competitiveness in five out of seven of the key sectors and has not lost it in any of the key sectors.
- MENA has been losing competitiveness in agriculture and foodstuffs but it has maintained it in a range of manufacturing sectors such as plastics and rubber, textiles and metal products.
- ESA has sustained its regional and global strength in agriculture, foodstuffs as well as metal products but has been experiencing losses in plastics and rubbers and well as textiles.
- WCA has also maintained its competitiveness in agriculture and food stuffs but has also developed it in plastics and rubber and metals.

73. Only sectors showing a RCA higher than one either at the beginning or the end of the period in one of the two dimensions (global or regional) are listed here. Only changes in the global and regional dimensions where would have gained, sustained or lost comparative advantage are shown in this Table. Detailed RCA values can be found in the Annex Table 22.

74. Sometimes a loss of competitiveness in a given sector may be related to the reorientation of export activities. Also, we could expect to observe a reorientation of comparative advantage from a regional focus to a global focus or the other way around. In practice however, such reorientation of export activities is not observed.

75. One caveat of the above analysis is its degree of aggregation. Indeed specialization is likely to happen at the product rather than the industry level and we may not be picking this up due to it being hidden in the aggregate figures. We therefore run a similar analysis at the HS 4-digit level. The findings confirm that none of the African regions have actually developed competitiveness in electronics and in the case of SEA, China is the country concentrating more of the regional competitiveness. The latter can be generalized for other sectors based on this disaggregated analysis and it points out that regional competitiveness is mainly driven by the regional "giant(s)".

Table 5. Relevant sectors for the analysis based on comparative advantage

Sector	Region	Regional trade	Exports to RoW	Outcome
Agriculture	ESA	Sustained	Sustained	**Positive**
	MEN	Sustained	*Shrinkage*	*Negative*
	WCA	Sustained	Sustained	**Positive**
	SAS	Sustained	Sustained	**Positive**
Foodstuffs	ESA	Sustained	Sustained	**Positive**
	MEN	Sustained	*Shrinkage*	*Negative*
	WCA	Sustained	Sustained	**Positive**
	SAS	Sustained		**Positive**
Plastics & rubber	ESA	*Shrinkage*		*Negative*
	MEN	Sustained	Sustained	**Positive**
	WCA		Rise	**Positive**
	SEA	Sustained		**Positive**
Textiles	ESA	*Shrinkage*	*Shrinkage*	***Negative***
	MEN	Sustained	Sustained	**Positive**
	WCA	*Shrinkage*	*Shrinkage*	***Negative***
	SAS	Sustained	Sustained	**Positive**
	SEA	*Shrinkage*	Sustained	***Negative***
Metal products	ESA	Sustained	Sustained	**Positive**
	MEN	Sustained	Sustained	**Positive**
	WCA		Rise	**Positive**
	SAS	Rise	Rise	**Positive**
	SEA	*Shrinkage*		***Negative***
Electr. equipment	SEA	Sustained	Sustained	**Positive**
Motor vehicles	SAS	Rise		**Positive**
	SEA		Sustained	**Positive**

Source: Own calculations using BACI database.

Second, apart from textiles, changes in competitiveness tend to be region and sector specific, suggesting that the causes may have also been region and sector specific:

- In *agriculture and foodstuffs*, SEA did not have and has not developed competitiveness at either the regional or global level and the same was the case for SAS in foodstuffs at the global level. MENA lost global competitiveness while sustaining it regionally while both ESA and WCA have managed to sustain competitiveness both regionally and globally.
- The *plastics and rubber* sector has seen quite some churn in Africa with ESA losing regional competitiveness and WCA gaining it globally but not regionally. MENA continues to be a significant player in this sector at both the regional and global level, and SEA remains competitive at the regional level.
- *Textiles* is an interesting sector in the sense that all five of our focus developing regions were regionally and globally competitive in this sector in 1998/99 and only SAS and MENA have

sustained these positions.[76] ESA and WCA lost competitiveness at both regional and global level and SEA maintained it at the global level.[77]

- All regions except SEA have recorded positive developments in *metal products* with ESA and MENA sustaining both regional and global competitiveness, SAS gaining regional and global competitiveness and WCA gaining global competitiveness. SEA has lost competitiveness at the regional level.
- Only SEA was competitive both regionally and globally in *electronic equipment* and it has sustained this position.
- SEA has also sustained global competitiveness in the second more advanced sector—*motor vehicles*—while interestingly SAS has developed competitiveness in this sector at the regional level.

6.3 What role has been played by imported intermediate inputs?

Having established the trends in global and regional competitiveness we now turn to looking at what drives these changes and in particular at what role intermediate imports may play in this. The conjecture is that the availability of affordable and reliable inputs could be a *sine qua non* condition to the successful establishment of export activities.[78]

First, based on the OECD STAN Bilateral Trade Database by Industry and End-Use (BTDIxE), we calculate the share of imported intermediate products in total imports recorded in each of the seven sectors and relate this to measures of global competitiveness (the RCAs). There is a clear positive correlation between imports of intermediates and global competitiveness for *textiles* and *electronic equipment* (Annex Figure 22). The Asian regions dominate with much higher shares of imported intermediates correlating with strong competitiveness. However, the association between these variables does not appear to hold for *agriculture*, *foodstuffs*, *plastic and rubber*, and *metal products*. Second, to account for the possibility that it is the more technologically advanced and sophisticated imported intermediates that determine competitiveness, we juxtapose a measure of sophistication of imported intermediates with our measure of global competitiveness.[79] There is some evidence to support the hypothesis that intermediates with high technological content can enhance the competitiveness of exported goods (Annex Figure 23).

To verify these associations more formally and to control for other factors, we perform a regression analysis linking measures of global competitiveness to some of these likely important determinants (Table 6). We do this across 15 economic sectors (including the seven key sector

76. The mid of the 1990s marked the beginning of significant changes in the textile industry as the end of the Multi-Fibre Agreement implied a major shift towards liberalization in this domain and despite a negotiated transition under the WTO Agreement on Textiles and Clothing until 2004, major changes revealed by our data analysis are part of the consequences of the completion of these agreements (see Kowalski and Molnar, 2009).

77. This means that the share of textiles in intra-regional exports of SEA countries has declined and is now below the share of textiles in global exports—SEA countries export other products more intensely within the region, while maintaining specialisation in exports of textiles to markets out of the region.

78. For the activities under scrutiny in this analysis, this notion corresponds to the availability of cotton yarn for the manufacturing of t-shirts or semi-conductors for the assembly of mobile phone or any other electrical/electronic equipment.

79. Import sophistication is calculated using Hausman et al. (2006) PRODY indicator calculated at the 6-digit level of aggregation. The measure identifies the comparative advantage weighted per capita GDP of exported products. To calculate the sophistication of imports we weigh this PRODY using import weights across different regions.

discussed previously) and 10 regions (including the five developing regions in Africa and Asia) of the world. All regressions include fixed effects controlling for country, region and period-specific factors.

Table 6. Determinants of competitiveness in global markets

	RCA in world markets			
Share of intermediate inputs in aggregate imports	3.469***		3.461***	2.833***
	(0.669)		(0.690)	(0.674)
Sophistication of imported intermediates			-0.0204	0.369
			(0.443)	(0.432)
Sophistication of exported goods				-1.661***
				(0.333)
Share of intermediate inputs in regional imports		1.437**		
		(0.558)		
Share of intermediate inputs in imports from out of the region		2.299***		
		(0.632)		
Constant	0.288	0.238	0.479	12.41***
	(0.430)	(0.441)	(4.157)	(4.650)
Observations	300	300	300	300
R-squared	0.312	0.311	0.312	0.370

Note: All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

The findings confirm the positive relationship between higher shares of intermediates in imports and global export competitiveness. An increase of 10 percentage points above the average proportion of intermediates in each sector is associated with a non-negligible increase of 0.35 in the RCA measure of competitiveness. In terms of whether intermediates are to be sourced from within the region or from outside, we find a significant and stronger impact of global sourcing over regional sourcing. This result remains across all specifications. This implies that regional initiatives aimed at facilitating access to intermediate inputs, while welcome, can only do so much in boosting competitiveness; inputs sourced globally tend to have a much larger impact.

We also find that importing more sophisticated products does not in fact guarantee gains in competitiveness and that, perhaps counterintuitively, export sophistication leads to lower competitiveness (Table 6). However, this result likely reflects the possibility that it is more difficult to gain large market shares in sophisticated products. The good news—and this is in line with the discussion of product upgrading in Section 4—is that countries need not assume that they must seek sophistication in order to gain from trade.[80]

80. Annex Tables 23 and 24 provide a similar analysis but focused on regional competitiveness where the key results presented for global competitiveness here are confirmed. In addition, the RCA index does not have an ordinal order by definition and in that sense, it is worth checking the robustness of the above results of the regression analysis by re-iterating it for a dichotomous RCA variable denoting either the presence or lack of competitiveness. Annex Tables 26 and 27 show the results corresponding to Annex Tables 24 and 25 and generally show very similar results.

6.4 What intermediate sourcing strategies have been adopted?

The results above demonstrate the positive role that importing intermediate inputs has on competitiveness and, in particular, importing from outside the region. Countries should therefore include in their development strategies measures that facilitate access to the most competitive inputs in order to stay ahead in the global competitiveness race. But what strategies tend to work better than others and where have successful developing country producers sourced their inputs from? To shed light on this question we concentrate on sectors where the developing regions covered by this study have either sustained or gained competitiveness (Table 5) and investigate the nature of changes in intermediate import sourcing patterns in terms of concentration of types of imported intermediate products and partners from which these products are sourced. We do so by computing Herfindhal concentration ratios.[81]

Increasing concentration across the types of intermediate products sourced seems to be the norm (Annex Figure 24, Panel A) and suggests increasing specialization in GVCs; the range of imported intermediates decreases as firms increasingly focus on activities which bring about highest benefits. This is supported by simple counts of types of imported inputs which show slight decreases.

However, when it comes to partners from which these inputs are sourced, concentration ratios suggest a more mixed picture revealing that several regions have extended sourcing of their intermediate inputs to a larger group of countries (Annex Figure 24, Panel B).[82] The likely reason for this is that firms are looking for more affordable and diversified sources of inputs and the falling costs of trade and communication are allowing them to source from a broader range of countries.

The analysis of sourcing strategies is supplemented by first aggregating the product and origin dimensions of imported intermediates and then decomposing them into two categories: (i) the intensive margin which corresponds to the share of imported intermediate inputs that can be attributed to the growth of bilateral intermediate import flows that were already active at the beginning of the period; and (ii) the extensive margin which corresponds to new intermediate import relationships that were not observed at the beginning of the period.[83]

The results show that except for SEA, all other regions have relied heavily on the discovery of new sources of intermediates (Annex Figure 25). In most cases, the extensive margin, which mainly relies on new sources for intermediates, accounts for almost 20% of imported intermediates growth observed during the period and it is the second major source of import growth behind the intensification of already existing import relationships. As far as SEA countries are concerned, it is clear that competitiveness in this region has been sustained through long-lasting production networks at the regional level since, as we have shown earlier, this is the only region where intermediate goods are mainly sourced from regional partners.

It is as important to understand what drives the positive developments as it is to understand what has gone wrong in those sectors showing a decline in competitiveness. Looking at the African

81. Concentration is calculated using Herfindhal indices which correspond to the sum of squared import shares by country or product. A higher value of this index means that the import structure of intermediates is more concentrated. The evidence from concentration ratios is supplemented by counts of the number of intermediate imported goods and the number of sources at the beginning and the end of the period.

82. The counts show this tendency even more clearly.

83. In order to better describe phenomenon occurring under both margins, each margin is decomposed into three components. For the intensive margin, import growth for increasing export volumes, decreasing import volumes and ceased activities are split. For the extensive margin, import growth generated by imports of already imported goods but sourced from new sources, imports of new products sourced from countries already exporting other products and imports of new products from completely new sources are separately considered. This analysis is also performed at the HS 6-digit level of aggregation.

regions and their declining sectors shows that while intermediate imports have still grown faster than imports of final goods, the intermediate growth rates have been much lower than those observed for other regions. Even if these sectors aimed to improve their competitiveness through the diversification of sources of intermediate product, as shown by the decomposition of intermediate imports' growth, diversification of sources explains relatively less of the import growth. Combined with the fact that import growth has not occurred in those sectors that are performing well, this suggests that diversification is not straightforward and can only be beneficial if it brings the right mix of intermediate inputs to the region.

Additionally, our findings suggest that import relationships in sectors whose attractiveness shrank over time have a lower survival rate than sectors sustaining or gaining market shares (Annex Figure 27). Thus, there may be a domino or contagion effect in terms of productivity. The duration and 'health' of intermediate import relationships is a good indicator of the likelihood that manufacturing sectors achieve and sustain attractiveness in world markets while keeping the pace for continuous improvement, upgrading and sophistication of their products.

6.5 Regional orientation in processed intermediate products

Intra-regional exports represent approximately 10% of total exports for the African regions. Asian regions show two contrasting patterns (Annex Table 19), in SEA, intra-regional exports account for more than 30% of exports while in SAS they account for only 6.5% - the lowest share of all developing regions considered here. The shares of intra-regional exports are particularly high in processed intermediate goods in all regions except WCA. Somewhat surprisingly, this finding is valid even for a resource-driven region like MENA, where fuels usually dominate the export basket. Yet, even in this region, intra-regional trade is dominated by processed intermediates. In WCA, which is an exception, intra-regional trade is dominated not by processed intermediates but by consumption and capital goods. While some intra-regional trade in the detailed categories of capital/consumption goods is observed in SEA this is not the case in SAS or the African regions.[84]

With respect to extra-regional exports, the patterns clearly differ between African and Asian economies. Asian economies display a tendency to export consumption, processed intermediates and capital goods while African countries are still specialised in exporting primary intermediates and fuels (i.e. raw materials). ESA is the only African region where one third of extra-regional exports are composed of processed intermediates and this suggests a certain level of integration into value chains in terms of provision of processed intermediates at the international level.

Concerning the type of extra-regional imports, it is worth noting that around two fifths of the import value is related to processed intermediates in ESA which is in line with what is observed for the rest of the world (as depicted in Annex Table 19). WCA which was already identified as a less connected economy in terms of exporting processed intermediates stands out again with a relatively low content of processed intermediates in its import basket. Consumption and capital goods are the two categories of products imported more intensely form out the WCA region.

Asian countries, particularly SAS, rely strongly on imports of natural resources and other basic requirements for production and these represent a significant share of their extra-regional imports. Finally, in significant contrast to the African regions, neither SEA nor SAS import significant shares of consumption goods from outside the region. African countries also have relatively higher shares of extra-regional imports of capital goods.

84. Although the value of intra-regional sourcing of imports equates to intra-regional exports, these are evaluated against changes and it is therefore important to look at how intra-regional sourcing of import shares have evolved (Annex Table 19). Here SEA is the region with the highest share of intra-regional sourcing (40%), around 17% of imports are regionally sourced for MENA countries, around 10% of imports originated from within the region in ESA and WCA, and this proportion falls to 5% in SAS.

The findings highlight some of the main differences in integration and development paths and underline the challenges associated with competing in international markets. On the one hand, a path seems to be emerging in SEA where deeper integration and growing intra-regional trade have been the driving engine allowing countries to specialise and where favourable conditions for trade in intermediate goods within the region was a key element. On the other hand, the path of SAS, which seems to be relatively less dependent on coordinated regional partnerships and more reliant on access to an inexpensive labour force, seems to have enabled the establishment of export-oriented industries such as textiles.

When looking at the evolution of major destinations for processed intermediates exports during the last decade for each of the regions under study (Annex Figure 29), there is evidence of an increasing intra-regional orientation of exports of processed intermediates. One striking fact here is the low forward connectivity of South Asian economies, where exports within the region still account for less than 10% of total exports of intermediates. A clear downward trend can be observed in the case of developed countries destinations such as the European Union (E27) and the members of the North America Free Trade Agreement (NAM). Other European and Central Asian countries (ECA) are gradually becoming an important destination for intermediate exports from African countries while for the Asian regions a similar pattern seems to be observed with respect to Latin America.

Connectivity between all of the five developing regions is also increasing over time. In particular, SEA seems to be an increasingly important destination for exports of intermediates, particularly for ESA and MENA. However, ESA has become the most important destination for WCA's intermediates and MENA has become a major destination for intermediates produced in SAS.

Indeed, the increased connectivity between developing countries is confirmed by looking at the major sources of intermediate goods' imports by region (Annex Figure 30). NAFTA and the European Union are losing importance as sources of intermediate inputs for developing countries. Intensifying relationships between African and other European and Central Asian countries as well as between Latin American and Asian countries are also confirmed by the import data. SEA countries show the most marked change in replacing traditional/developed countries as source of intermediate inputs for developing countries. This is most clearly visible from the doubling of the shares of SEA's intermediate inputs originating from the African regions. MENA has become a markedly more important source of intermediates for ESA, WCA and SAS.

Despite these positive developments, two potential challenges are suggested by the data. The first concerns increasing the connectivity between African economies which display a propensity to trade with extra-regional partners and which could take a greater advantage of trading with their neighbours to learn by trading in a less competitive environment and to profit from geographical proximity. A second challenge involves increasing connectivity between SAS countries and the rest of the developing world. For the moment SAS producers seem to be buying inputs mainly from the SEA countries, processing them and selling their products to the developed world. While this is positive, enhancing the ability of SAS producers to broaden their market base will bring further benefits over time.

6.6 What role for FTAs?

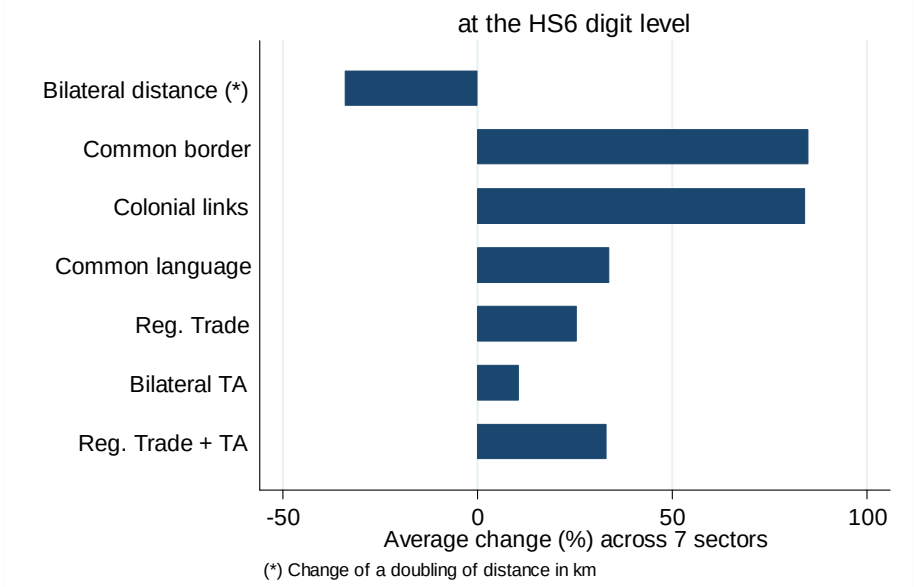
Although the analysis above shows how trade in intermediates distributes across regional and non-regional partners, it does not take into account other possible determinants of regional trade such as difference in the size of markets or indeed geography. In what follows we formalise the analysis through the use of a gravity model so as to better understand how trade with regional partners has evolved and what the role of trade agreements in shaping such trade could be.

The proliferation of trade agreements has been concurrent with the international fragmentation of production and therefore it is important to understand their role in shaping regional trade patterns,

particularly in intermediates. Specific questions include: i) what impact have trade agreements had on trade flows?; ii) do these affect intermediate goods differently?; and iii) is there a premium to signing agreements with regional partners?[85]

The analysis shows that trade with countries in the same region (Reg. Trade in Figure 16) is around 25% higher than trade with non-regional partners (after controlling for typical geographical factors, country-product-year characteristics and discounting the effect associated to there being an FTA with a regional partner). FTAs with any partner (Bilateral TA), whether in the same region or not, also increase trade by around 10%, but FTAs with regional partners do so by 33% (Reg Trade + TA). Since these effects are multiplicative (see note in Figure 17) cumulative what this tells us is that there seems to be an important premium, in terms of trade flows, related to signing an FTA with a regional partner.

Figure 16. Impact of FTAs on regional trade flows

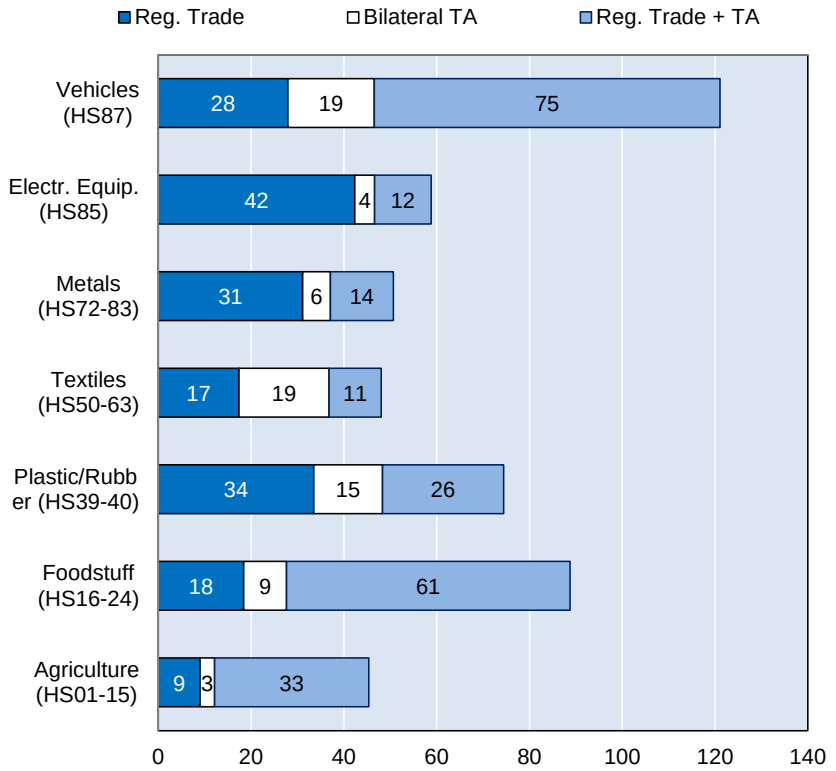


Source: Authors' calculations based on BACI database.

The impact of FTAs is however different for each product category analysed, as is highlighted in Figure 17. Where regional trade is concerned, it is the electrical and optical equipment sector which is traded most intensively amongst regional partners (i.e. there is on average 42% more trade with partners in the same region than there is with the average partners outside the region) but the highest impact of an FTA arises in the textile and vehicles sectors where there is an average 19% return in terms of signing an agreement. Finally, the highest premium to signing an agreement with a partner in the same region arises in the vehicle sector, where trade is boosted by an additional 75% (this sector is closely followed by foodstuff where the corresponding figure is 61%).

85. The estimations are run for the seven industries that are the focus of earlier section. They use country-product-year fixed effects so as to control for multilateral resistance and other unobserved variables that do not vary within this dimension. This methodology should also attenuate biases caused by unobserved heterogeneity related to capturing the impact of FTAs on trade flows (see Baier and Bergstrand, 2001, 2004 and 2009 for a description of the problem and Lopez-Gonzalez (2012) for a similar application to intermediate goods trade).

Figure 17. Impact of FTAs on regional trade by sector



Note: Bars identify contribution of different elements to increasing trade with regional partners. For example, for sector HS87- Vehicles: i) trade with regional partners in this sector tends to be 28% higher than with non-regional partners (Coefficient on Reg. Trade); ii) An FTA with any partner leads to an additional 19% trade (Coefficient on Bilateral TA.); and iii) Having an FTA with a regional partner increases trade by an additional 75% (Coefficient on Reg. Trade + TA). The cumulative impact of signing an FTA with a regional partner will boost trade by over 120% (i.e. the values are multiplicative but are presented here individually for clarity; this means that the combined impact is greater than the simple sum of the individual effects).

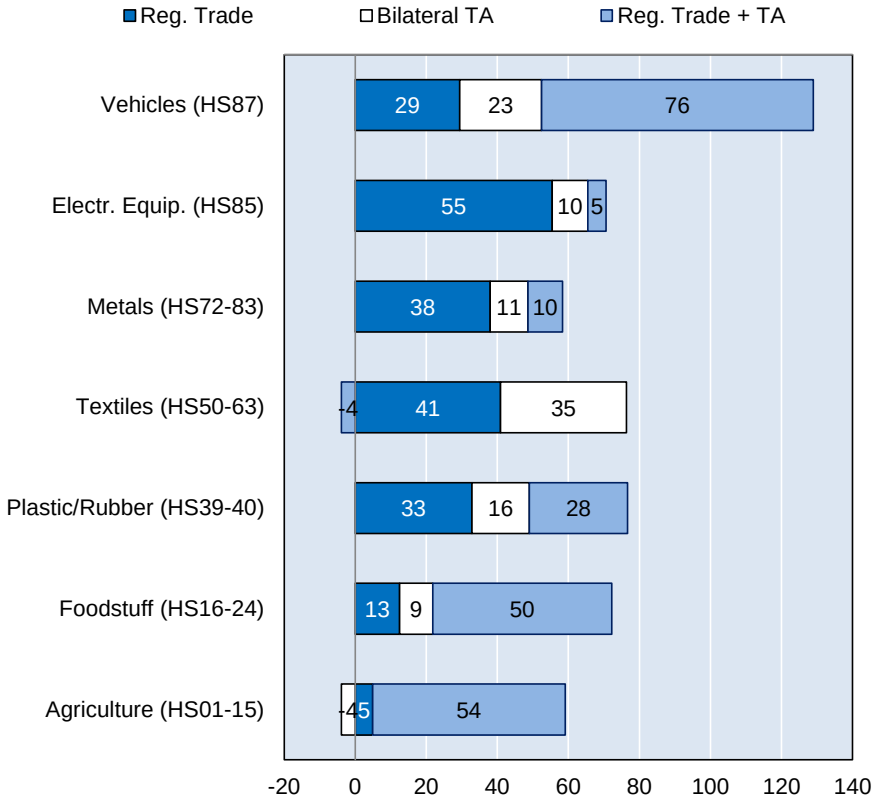
Source: Authors' calculations based on BACI database.

Comparing these results to those obtained from looking at trade in processed intermediates within these sectors (Figure 18) and focusing the discussion mainly on the manufacturing sectors we see that[86]:

- Processed intermediate goods trade with countries in the same region is more intense than that observed for aggregate trade;
- The impact of an FTA, with any partner whether in the same region or not, also tends to be larger; but
- The premium associated to signing an agreement with a partner located in the same region relative to that witnessed for total trade varies across sectors. For example, FTAs with regional partners increase processed intermediate trade in electrical equipment and metals by less than was seen in the case of aggregate trade and it is actually found to reduce trade in the textiles sector.

86. We focus on the manufacturing sectors since these are likely to be most sensitive to trade in processed intermediates.

Figure 18. Impact of FTAs on regional trade in processed intermediates by sector



Note: Bars identify contribution of different elements to increasing trade with regional partners. See figure 17 for interpretation.

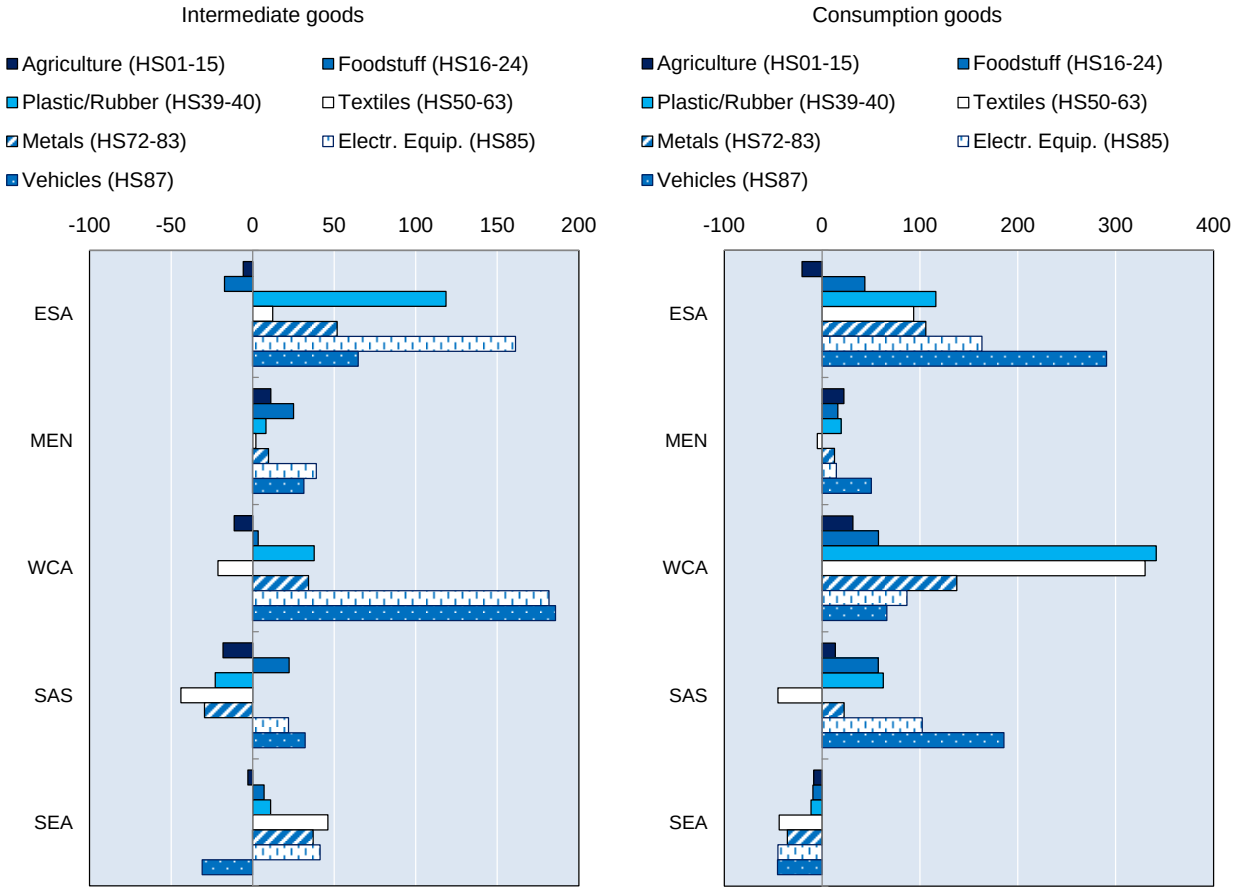
Source: Authors' calculations based on BACI database.

Since trade agreements are found to have a higher impact on trade flows of intermediate goods than on aggregate trade flows, one key element to further develop regional value chains may be that of engaging in regional trade agreements, that is to say, with partners located in the same region.

The regional orientation of intermediate and consumption goods trade across the different sectors and regions analysed reveals some interesting insights (Figure 19).[87] In SEA there is an important regional orientation of intermediate goods trade but the opposite is observed when consumption goods are considered, attesting to the common perception that SEA has engaged in complex production networks aimed at selling consumption goods to third markets. In SAS we see the opposite trend, in most sectors, intermediate trade is mainly conducted extra regionally but consumption goods are traded regionally and this likely supports the findings that there is very little by way of regional value chains in South Asia. The case of the African regions and MENA is different again. Here we see that there is a strong regional orientation in both trade in intermediates and in consumption goods.

87. This Figure shows the decomposition of the Reg.Trade coefficient in Figure 18 across the different regions. It marks the orientation of regional trade net of whether there is a trade agreement or not.

Figure 19. Orientation of trade towards regional partners across different sectors



Note: Positive values identify higher average trade with partners in the same region than with the rest of the world. The sign of the coefficients is more important than the size since these are to be evaluated at mean levels and these means vary across the different regions and sectors therefore making these comparisons tricky.

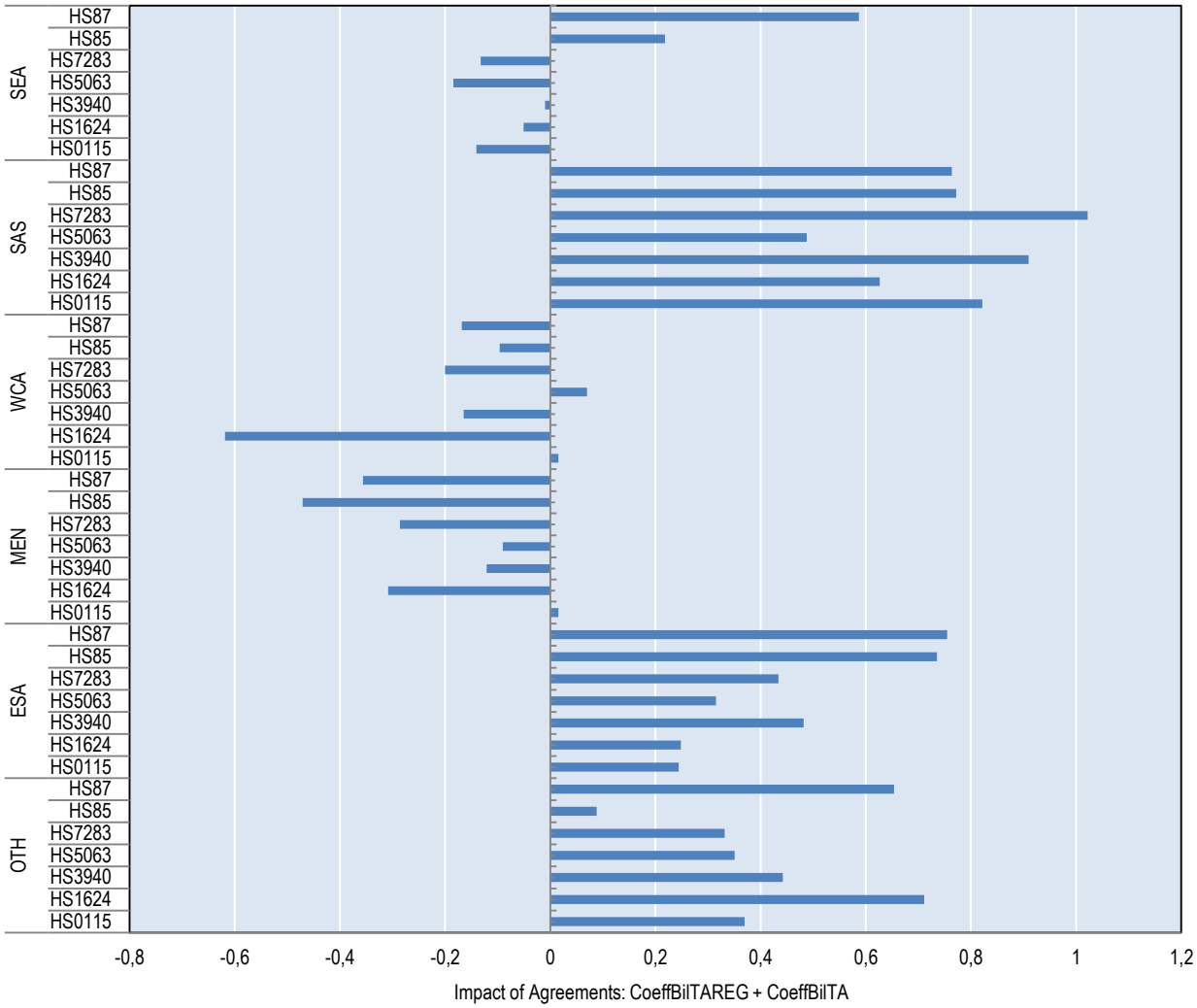
Source: Authors' calculations based on BACI database.

Finally, in Figure 20 we show the estimated impact of signing a trade agreement with a regional partner on processed intermediate goods trade. Positive values in the figure show that there is a regional orientation in terms of trade flows.[88] There is a very clear positive effect of FTAs with regional partners in ESA and in SAS whilst in MENA and WCA we observe the opposite. The case of SEA is mixed where agreements with regional partners have managed to increase trade in vehicles and electrical equipment but they have not done so for the other sectors where trade might be more intense with extra regional partners.

88. The figure essentially maps the coefficients obtained from the dummy variable capturing regional trade across the different regions thereby showing whether there is a regional orientation or not.

Figure 20. Impact of signing an FTA with a partner within the region

Intermediate goods at the HS6 digit level



Source: Authors' calculations based on BACI database.

6.7 *Diversification*

The analysis performed so far suggests a need to explore key factors that could drive expansion of the range of export activities and diversification of export and import bundles, particularly in the African regions and SAS. Indeed, the number of exported products as well as the number of destinations to which a country is able to export, are important measures of competitiveness and quality of integration with international markets (e.g. Cadot et al., 2011). They are indicative of products for which national producers have acquired the necessary skills and, in the case of exports of intermediate inputs, of reliability of the country as a source of inputs. On the import side, the degree of diversification of imports of intermediates can be a good proxy for country's openness to imports of intermediates and for the competitiveness of producers who rely on foreign intermediate inputs. This section presents a discussion of the evolution of the diversification profiles of countries in each of our five regions as far as it concerns trade in processed intermediates.

ESA, WCA and SAS are the regions where the least change is observed.[89] In ESA, South Africa is the most diversified economy in terms of intermediates and it is probably the most connected with international GVCs, thereby providing an important value chain connection to more global markets for other less advanced countries in the region. Kenya, Nigeria, Ghana and Mauritius are the countries showing the highest potential to catch up with South Africa while most other countries in the region are still below world averages. A similar, even though less marked, trend can be observed in SAS where India is among the most competitive economies as far as diversification of intermediates is concerned. Pakistan and Sri Lanka are the two countries of the region that show the greatest potential for catching up.

SEA and MENA are the two regions recording some of the most pronounced changes (Figures 21 and 22). In SEA, the largest changes are observed for Viet Nam and the Philippines; they reduced half of the gap to other well performing and well integrated economies in their region like Thailand, Indonesia, Malaysia or China. However, a gap between top and bottom performers is emerging over time with intermediate exports of some smaller countries such as Myanmar remaining persistently concentrated. In MENA, countries like Egypt, Tunisia, Oman and Qatar made significant progress. It is also noteworthy that the countries that are lagging behind are those with relatively high endowments of natural resources. While this might suggest a possibility of a "natural resource curse" (e.g. Frankel, 2010) making itself visible also in the context of integration with value chains, it may also show limitations of the diversification argument, especially in countries which have a strong comparative advantage in natural resources.

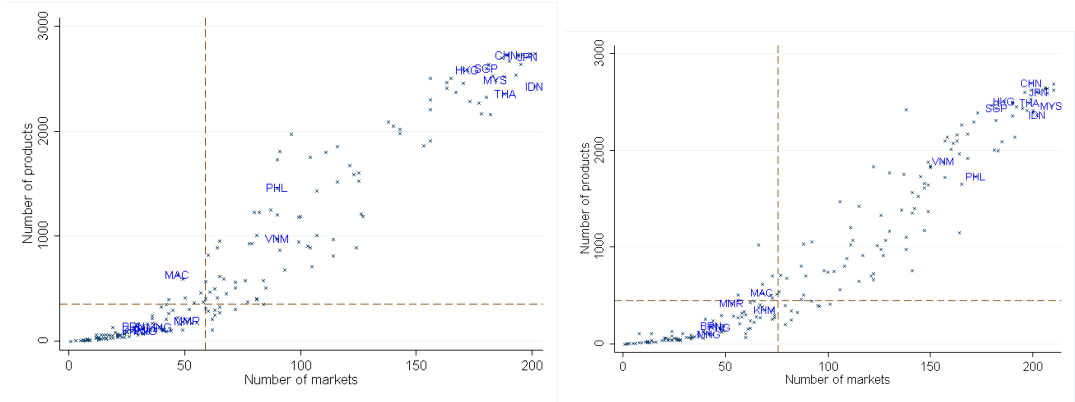
On the import side, the availability and active search for cheaper inputs would be reflected by the number of intermediate products that are imported by countries and the number of sources that are included in the export bundle. Our results show that the average value of the number of imported products and the number of import sources are larger than was the case for exports. The reason for this might be related to the fact that countries diversify risks by importing from different sources at the same time and that production in value chains implies combining inputs form several sources. However, it also shows that countries differ less with respect to what they buy from value chains as opposed to what they sell to them, a point made as well in the analysis based on inter-country input-output earlier on in this report.

Concentrating on dynamics in SEA and MENA, Viet Nam and the Philippines again seem to be most interesting examples of rapid intermediate import diversification. As a group, the MENA region also shows an interesting dynamic which might be at the origin of the gains in competitiveness observed in intermediates' exports.

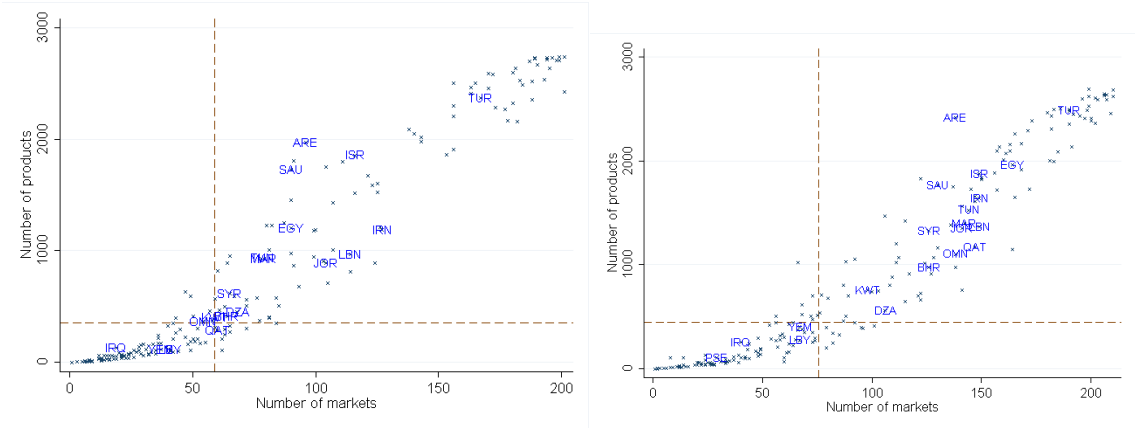
89. Therefore we present a unique snapshot for these regions based on the most recent data (2010/11)—Annex Figure 31 and 32.

Figure 21. Changes in number of exported intermediates and served markets

Panel A. Southeast and Eastern Asia



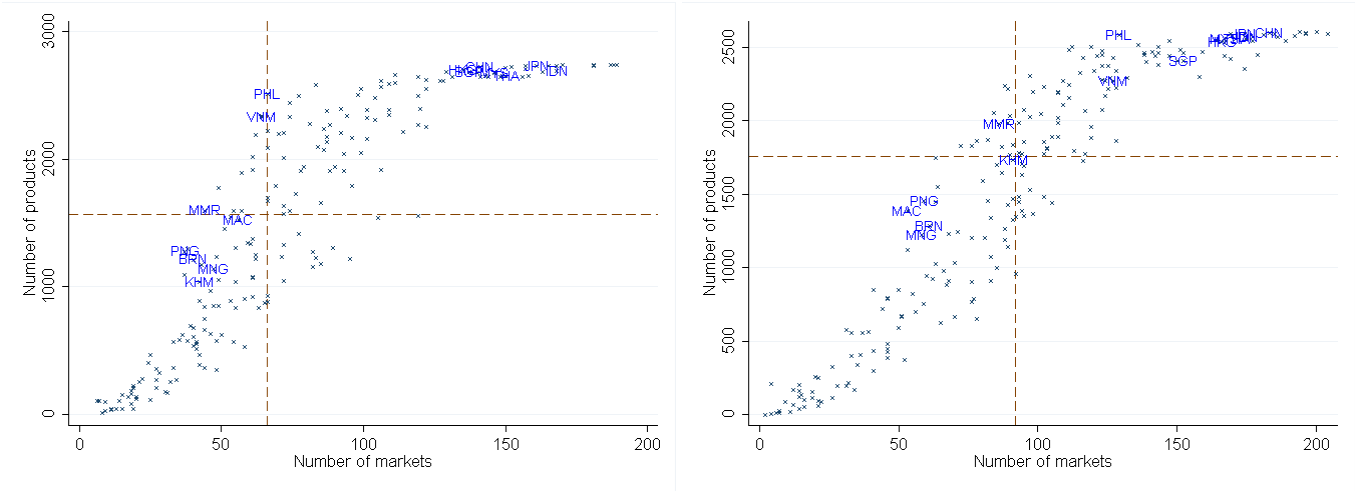
Panel B. Middle East and North Africa



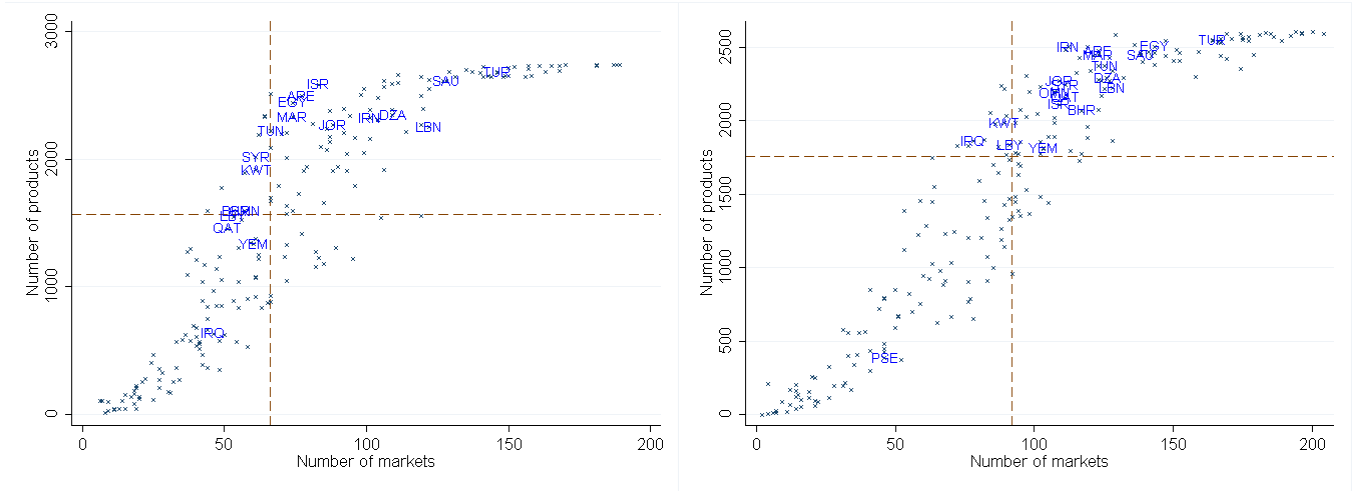
Note: The labelled dots in the four panels show the actual numbers of exported intermediates and served markets for each individual country. The unlabelled dots correspond to all other countries in the world (therefore affording a comparative analysis with respect to other countries). The vertical and horizontal lines correspond to the median number of exported intermediates and the median number of served markets. Median values are used instead of mean values because they split the sample into two groups where the half of less performing countries can be found to the left of the vertical line or below the horizontal line. The left panels show values for 1998 whereas the right panel shows this for 2011.

Figure 22. Changes in number of imported intermediates and markets form which intermediates are sourced

Panel A. Southeast and Eastern Asia



Panel B. Middle East and North Africa



6.8 The importance of new products and new markets

The diversification statistics presented above fall short of providing an indication of how important new discoveries have been for each region in terms of export growth. Yet, Beltramello et al. (2012) show that the emergence of new flows in terms of products traded and destination markets served seems to be particularly important in explaining the growth of exports in intermediate goods. We might observe a significant increase in the number of markets served but these diversification efforts do not bring export growth or changes in competitiveness might be only marginal. On the other hand, diversification might occur through increases in exported goods across countries without necessarily exporting more products or serving more destinations.

In order to unveil whether diversification is bringing more export growth to the regions, we decompose export growth of intermediate products between 2004 and 2011 into two margins: (i) the intensive margin which corresponds to export growth for (bilateral) export flows at the HS 6-digit level that were already active in 2004; and (ii) the extensive margin which corresponds to new export relationships that were not observed in 2004. This decomposition gives us a snapshot of the sources of export growth.[90]

All regions seem to share similar sources for export growth and the intensive margin accounts for 60% of export growth (Figure 23). The contribution of the extensive margin is concentrated around exports to new destinations of products whose production is already mastered by national exporters. This means that diversification and mastering of new products is a difficult and risky activity.

However, it is important to note that the WCA countries have been able to successfully diversify in their extensive margin which accounts for more than 60% of export growth.[91] This could be explained by the fact that countries in the region were the least diversified in the past and they have only recently started moving beyond their traditional exports. They still face the challenge of diversifying further, particularly in terms of new products and we can expect that "new discoveries" will still dominate export growth in the region.

Similar conclusions can be drawn concerning the growth decomposition of exports within each sub-region (Figure 24). However, what seems to be a positive observation at the world level (diversification through the extensive margin) needs to be considered with caution at the regional level. It is a positive trend to discover new products and/or markets but regions need to keep their competitiveness in products they currently specialise in. In fact, competitiveness keeps evolving through time due to changes in technology and preferences and producers need to keep pace with those changes. If they fail to do so, they are condemned to disappear or to not fully benefit from export opportunities.

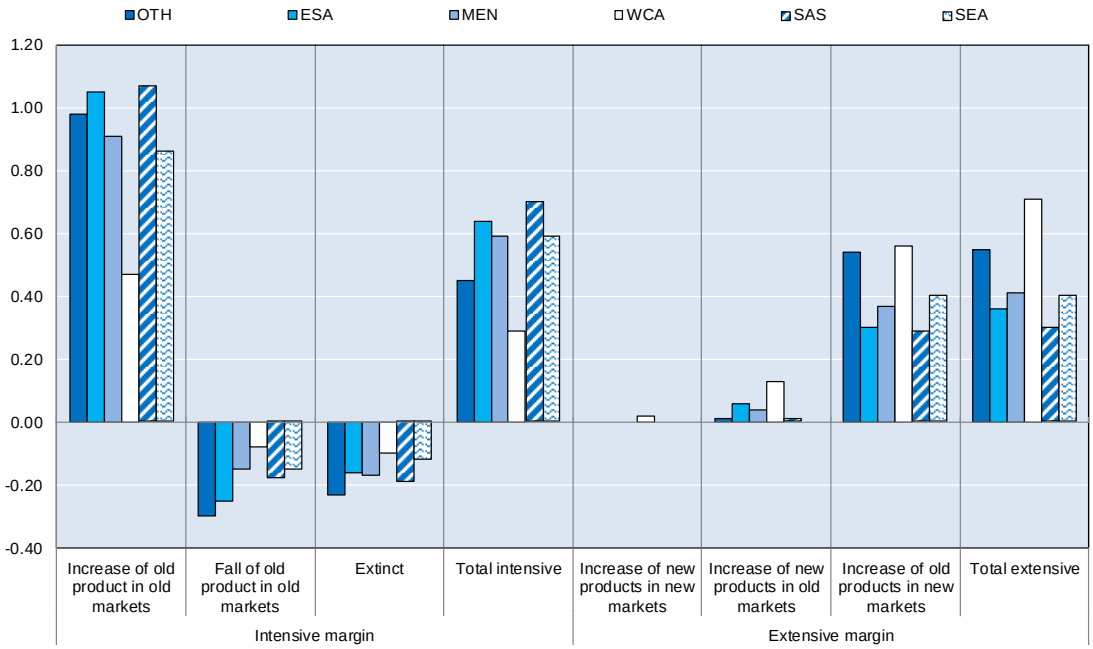
Moreover, regional trade relationships are the place where national exporters can learn to start meeting international standards and they should ensure a reasonable degree of sustainability of these activities. Yet, our results for survival rates in the next section indicate that WCA exporters are failing to sustain exporting activities within the region and this triggers doubts concerning the sustainability of their export strategy. Their success in exporting could in fact be more reminiscent of random discoveries than the outcome of an organized strategy to gain export competitiveness where regional trade is used as an exporter's lab. If this is the case, the WCA exports might remain

90. In order to better describe phenomenon occurring under both margins, each margin is decomposed into three components. For the intensive margin, export growth for increasing export volumes, decreasing export volumes and ceased activities are split. For the extensive margin, export growth generated by exports of already exported goods but shifted to new markets, exports of new products to already served markets and exports of new products to completely new markets are separately considered.

91. This observation, although encouraging, is to be put in the context of very erratic trade flows in the region as seen in the duration analysis in the next section.

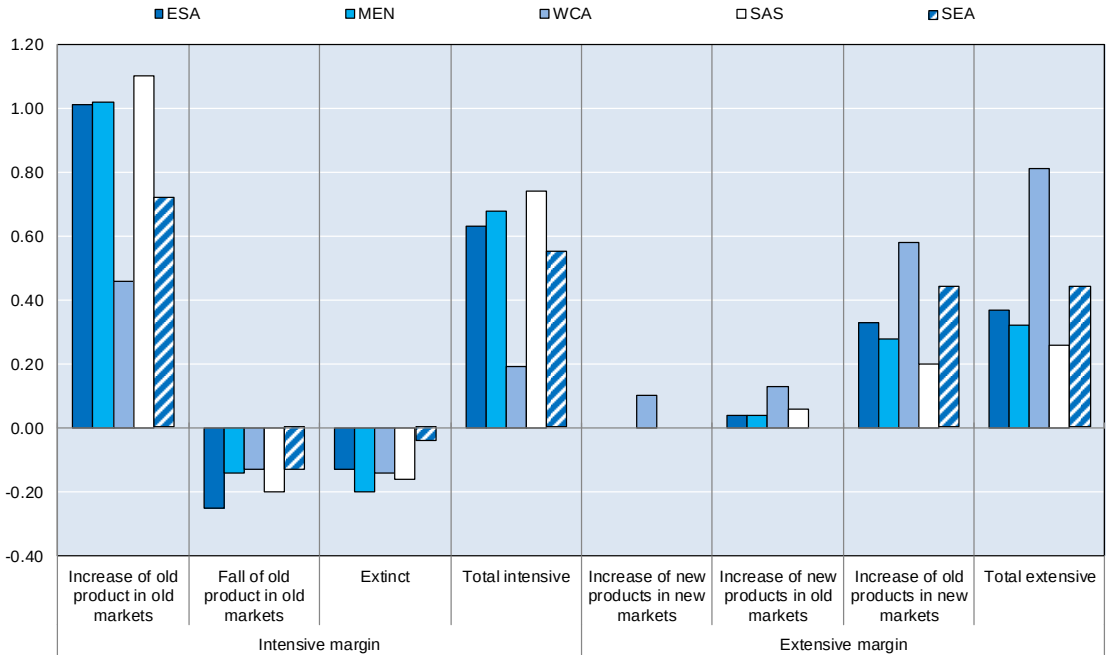
vulnerable and volatile. In comparison, other developing regions seem to better control their continuous success in regional markets.

Figure 23. Intensive and extensive margins for intermediate export growth to the world
(2004/2005-2010/2011)



Source: Authors' calculations based on CEPII's BACI data.

Figure 24. Intensive and extensive margins for intra-regional intermediate export growth
(2004/2005-2010/2011)



Source: Authors' calculations based on CEPII's BACI data.

6.9 Survival of trade relationships

Given that previous indicators were only concerned with success or failure in the diversification of export activities and not their sustainability, a survival analysis is performed for export flows in processed intermediates over the whole period with the aim of evaluating the sustainability of exporting activities for each of the five developing regions (Annex Figures 33 and 34).

Exporting is a risky activity with only one third of exports launched remaining active after three consecutive years. Survival profiles are higher for regional exports, which again suggests that regional markets may be a good place to learn how and what to export. Asian countries show significantly higher survival rates than African countries with their chances of survival being almost double those of African countries after four years (Annex Figure 33). WCA countries struggle in sustaining their exports for longer periods; only one in every ten export relationships survives beyond the third year. Countries in other African regions also struggle to ensure the sustainability of their exports and this suggests that well-targeted support policies for exporters might be needed.

In Asia, SEA countries outperform the survival observed in the rest of the world and they are clearly more successful in this respect than their SAS neighbours. Exports from the SAS region still show severe risks of failure despite showing promising signs of competitiveness in the mid-term (up to five years after the launch of the export). Here, policy efforts might be more related to the consolidation of export activities than to information on export opportunities and requirements as it might be the case in Africa. It is worth noting that some regions like ESA have shown success in building more stable trade relationships.

7. What role do services play in GVC participation in Africa and Asia?

Services facilitate transactions through space (transport, telecommunications) and time (financial services) and are thus of systemic importance. They serve as inputs into all economic activities, and are determinants of the productivity of core factors of production—labour and capital. They are thus pivotal for the broader economic activity as well as efficient functioning of domestic and international value chains. They account for important and growing shares of national incomes and employment and are increasingly in the centre of interest of policy makers in both developed and developing countries. In OECD countries, services account for approximately 80% of employment and 75% of GDP while they account for between 40 and 70% on both accounts in major emerging economies (OECD, 2014). The services sector tends to be smaller in less developed economies (Figure 25) but even in the least developed ones it accounts for between 20% and 60% of GDP and, with faster growth rates than agriculture and manufacturing, it has been a key contributor to the growth of GDP and employment.

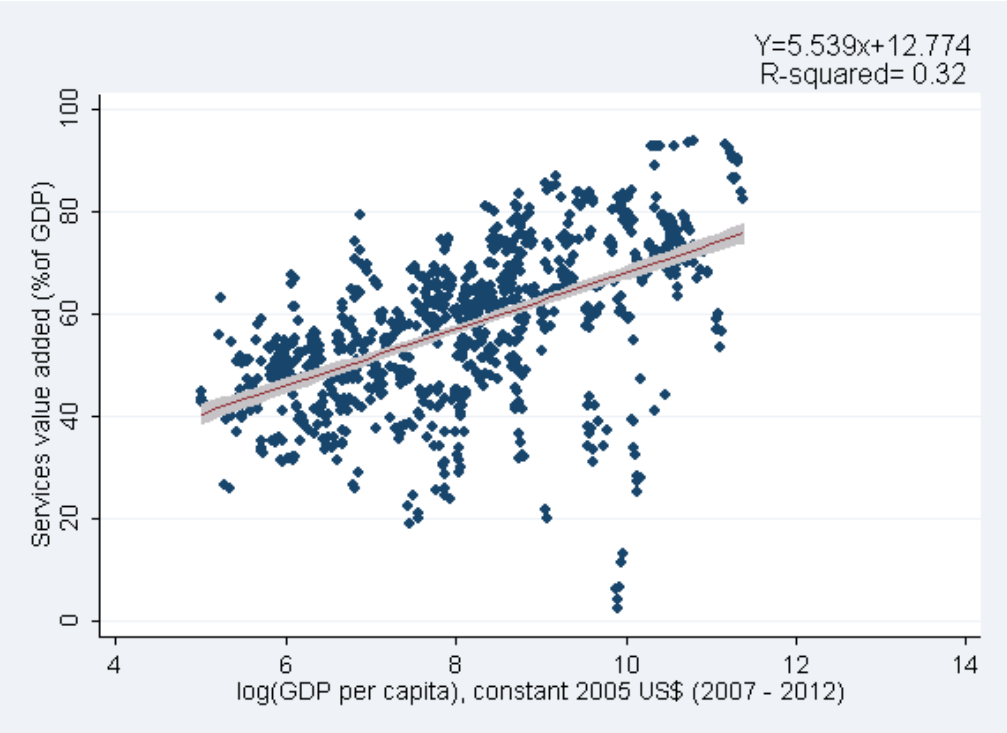
While services used to be traditionally defined as products that cannot be consumed separately from their geographic production,[92] clearly many outputs of modern service industries defy this definition. For example some services are produced and used in different locations (e.g. offshoring of accounting, financial or medical services) and they are often embodied in physical products traded across borders which is not captured well by the traditional services trade statistics (e.g. IT or business services embodied in machinery[93]). In fact, the services sectors have been estimated to

92. See, for example, the national accounts definition in the OECD *Glossary of Statistical Terms* (http://stats.oecd.org/glossary/detail.asp?ID=2431) or Deardorffs' *Glossary of International Economics* (http://www-personal.umich.edu/~alandear/glossary/s.html). However, there are some issues with these definitions. For example, as flagged in the OECD Glossary, some outputs of service industries have characteristics of goods.

93. A telling example here is one of Germany—a country known for its high quality manufacturing products—which nevertheless is partially due to the fact that manufacturing products it exports have a very high content of German business services. As a result, Germany turns out to have revealed

account for almost a half of world's value added trade, including as inputs embodied in traded agricultural, mining and manufacturing products (OECD, 2013). Establishment abroad is another important way in which services are traded with more than 60% of global inflows of FDI concerning investments in services (OECD, 2014).

Figure 25. Services' share in GDP and the level of economic development



Source: Authors' calculations based on the World Development Indicators database.

The international fragmentation of production and the emergence of international supply chains offer opportunities for the development of the domestic services sector through similar channels as they offer opportunities for the goods sectors. In addition, in the case of services that typically require a geographical proximity between providers and users and for those that face particularly high barriers to cross-border trade, the bundling of goods and services in international production processes may have opened trade prospects that did not exist previously. For example, with falling air freight costs, better logistics, and with ICT advancements that help tracking and controlling quality, fruit that used to be traditionally shipped abroad by sea in a raw form can now be washed, cut, packaged and branded before being flown to the destination market. In this way, the domestic washing, cutting and packaging and other associated services are now more easily bundled with the physical product and traded across borders.[94]

When trying to empirically capture the role of services in GVC trade, three principal cases can be distinguished. First, domestic service providers—including individuals with appropriate skills—can be contracted either by domestic or foreign firms to supply inputs and thus become a part of an

comparative advantage in exports of business services when services embodied in exported German machinery are properly accounted for (Koopman et al., 2012).

94. Although, by the same token, services embodied in goods will be subject to the trade barriers facing trade in goods such as tariffs, non-tariff barriers and customs duties and procedures (Cernat and Kutlina-Dimitrova, 2014).

international supply chain. Much in the same way as with goods, this type of GVC participation can offer an opportunity for developing country producers to enter global markets without having to master all the steps required to deliver a whole complex product or service; but also without having to face the stringent barriers to movement of people or commercial presence in order to provide services overseas. For example, local IT service providers or banks can be subcontracted by manufacturing firms, retailers or hotel chains that sell their products internationally. Apart from labour and capital earnings derived from such participation, additional productivity gains can accrue through learning about processes and standards. The services exported in this way—or indeed services exported directly—are used by foreign firms for their own exports and this is what we have been referring to in much of this report as the forward GVC linkage.

Second, GVCs can give domestic service firms access to competitive foreign inputs—both goods and services—which can help them improve the quality of their products. For example, a car rental or a car leasing company is likely to be able to offer better quality service if it can source world class cars or draw on efficient financial, accounting or IT services. This is what we have defined early on in this report as the backward GVC linkage.

Third, inexpensive and good quality service inputs (domestic or foreign) in themselves can enhance competitiveness in agriculture, mining and manufacturing sectors. Indeed, as much as 30% of value added of the manufacturing sector's exports is accounted for by services inputs (OECD, 2013). While this sort of "servicification" is a more general phenomenon and not necessarily strictly related to participating in GVCs it is certainly an important part of it since GVCs rely on well-functioning transport, logistics, finance, communication and other business and professional services to move goods and coordinate production along the value chain (OECD, 2014).

In this context, the remainder of this section draws on available data to explore key empirical services-related aspects of GVC participation in developing countries in Africa/Middle East and Asia. First, it takes stock of the overall economic importance of services in developing countries in Africa and Asia focusing on national accounts and gross service trade data. Second, it draws on the OECD TiVA data[95] to characterise two aspects of services-related engagement in GVCs: (i) the use of developing countries' services by foreign producers—the forward linkages of the services sector; (ii) the use of domestic and foreign services as inputs into exported goods and services thereby trying to characterise the overall importance of services for competitiveness. Finally, it draws on the OECD Services Trade Restrictiveness Index database for the four large emerging economies and supply chain hubs in Asia and Africa (China, India, Indonesia and South Africa) to highlight how the information contained in this index can be used to identify some possible policy options to enhancing services-related GVC participation.

7.1 Importance of services in African and Asian economies

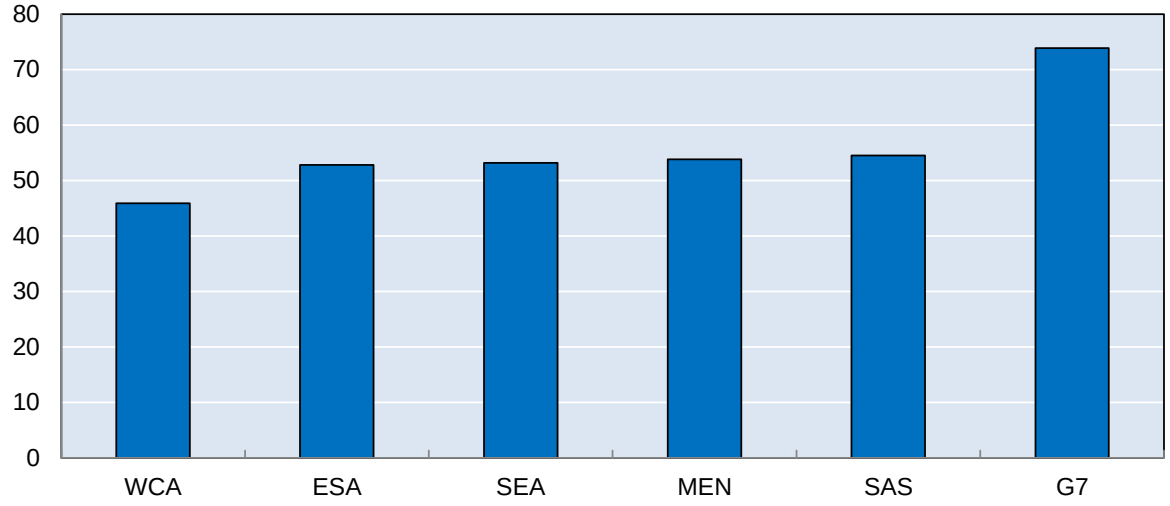
Services tend to account for smaller—but still considerable—shares of developing country economies as compared to developed economies. On average, services contribute between 51 and 55% of domestic value added in SAS, MENA, SEA and ESA and 44% in WCA (Figure 26) which is much lower than the 73% for the G7 grouping. However, in the last decade the sector has been growing three to four times faster in developing regions than in the G7 grouping, with SAS and SEA recording the highest growth rates, followed by MENA, WCA and ESA (Figure 27).

95. Considering the limitations of sectoral dimensions of the EORA dataset (see Technical Annex), we draw mainly the OECD TiVA dataset and focus our discussion on developing countries in Asia and Africa that are included in the database. This gives us fairly good country coverage in SEA but coverage in other regions is extremely limited: we have only India in SAS, only South Africa in ESA, only Saudi Arabia in MENA and no country from WCA.

Interestingly, the gross services trade figures[96] show that the five developing regions have also been expanding their services trade more dynamically than developed regions (Figure 28) and they now record higher services trade-to-GDP ratios[97] (Annex Figure 35). To a large extent, this reflects fast expanding imports of services and widening deficits on services trade account (Annex Figure 36).

Figure 26. Services value added as share of GDP

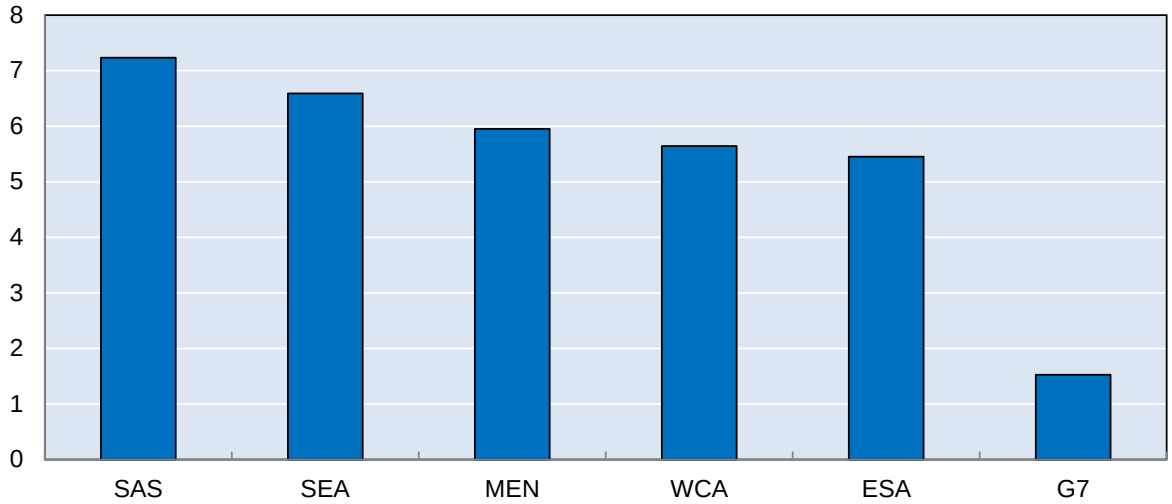
Average across countries for the period 2000-2012



Source: Authors' calculations based on the World Development Indicators database.

Figure 27. Services value added average annual percentage growth for the period 2000-2012

Percentages

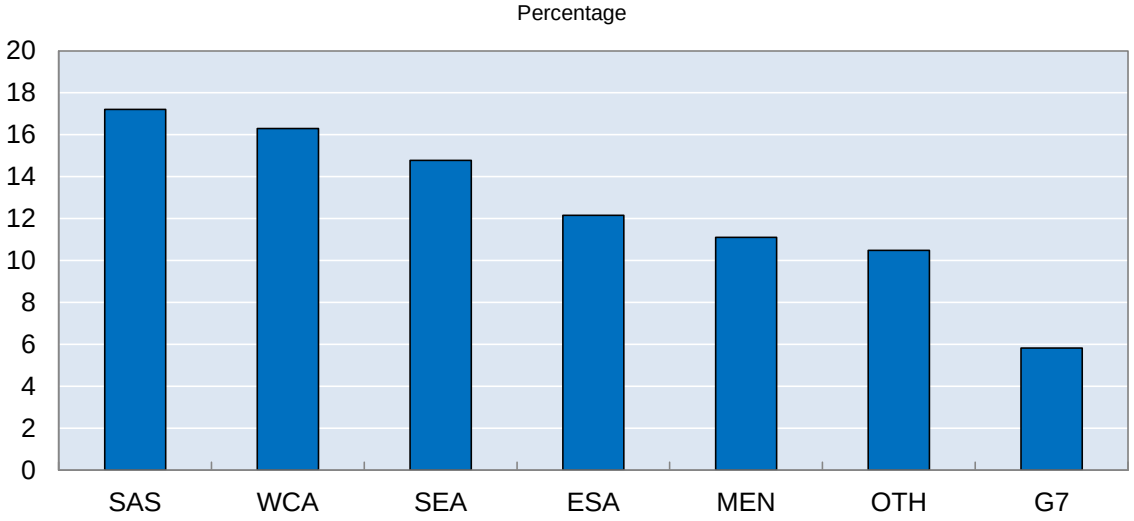


Source: Authors' calculations based on the World Development Indicators database.

96. These refer to sums of imports and exports of services which cover Modes 1 and 2 of services trade as recorded in the IMF Balance of Payments data and reported in the World Development Indicators database.

97. Services trade refers here to the sum of exports and imports of services.

Figure 28. Trade in services average annual growth rate for the period 2000-2012



Note: Trade in service represents the sum of service exports and imports.

Source: Authors' calculations based on the World Development Indicators database.

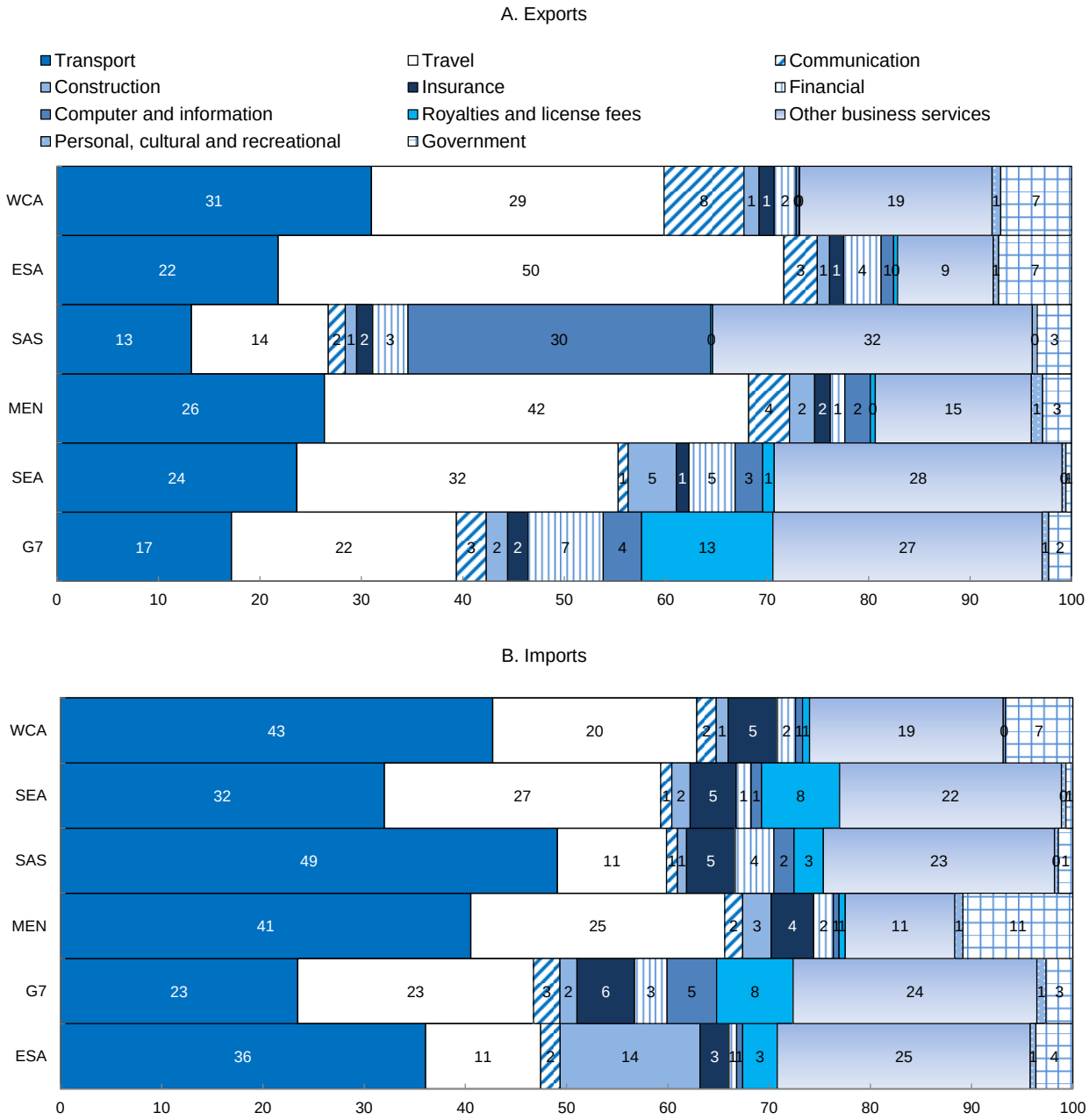
There are some notable differences—but also commonalities—in the composition of services exports and imports across the five developing regions. The majority of African regions' services exports—particularly in ESA—are accounted for by travel and transport while business services account for a relatively small share (Figure 29, Panel A). In SEA and SAS, travel and transport are still important but are overtaken by other business services which account for respectively 28% and 32%, a share which is actually higher than the G7 average. Moreover, driven mainly by India's exports, in SAS computer and information services account for 30% of services exports—a share that is not matched by any other developing region or the G7 grouping. Interestingly, communication services account for a non-negligible 7% of services exports in WCA. Financial services are also an important export category, particularly in SEA and ESA.

On the import side, transport services are the largest category across the five developing regions accounting for 32% of total services imports in SEA to as much 49% in SAS (Figure 29, Panel B). Travel is also important, but much less so than in exports, and business services account for consistently high shares ranging from 11% of services imports in MENA to 25% in ESA. Insurance accounts for between 3 and 5% of services imports, though this is still lower than the average 6% for the G7 countries. Royalties and licence fees account for 8% of services imports in SEA which is on par with the average for the G7 grouping.

While some traditional services categories such as transport and, particularly, travel account for a large share of services exports in the developing regions, the largest increases in exports in the period have actually occurred in other business services, computer and information services, financial services and insurance (Figure 30, Panel A). For example, the three fastest growing services exports were: in WCA personal, cultural and recreational services, royalties and license fees and computer information services; in ESA royalties and license fees and construction services; in MENA financial services and computer and information services; in SEA computer and information services and construction services; and in SAS royalties and license fees, personal cultural and recreational services and government services. As far as growth of imports is concerned, the picture is more varied but, in general, financial services and insurance, construction services, and other business services stand out, although transport and travel also show significant and consistent increases across the regions (Figure 30, Panel B).

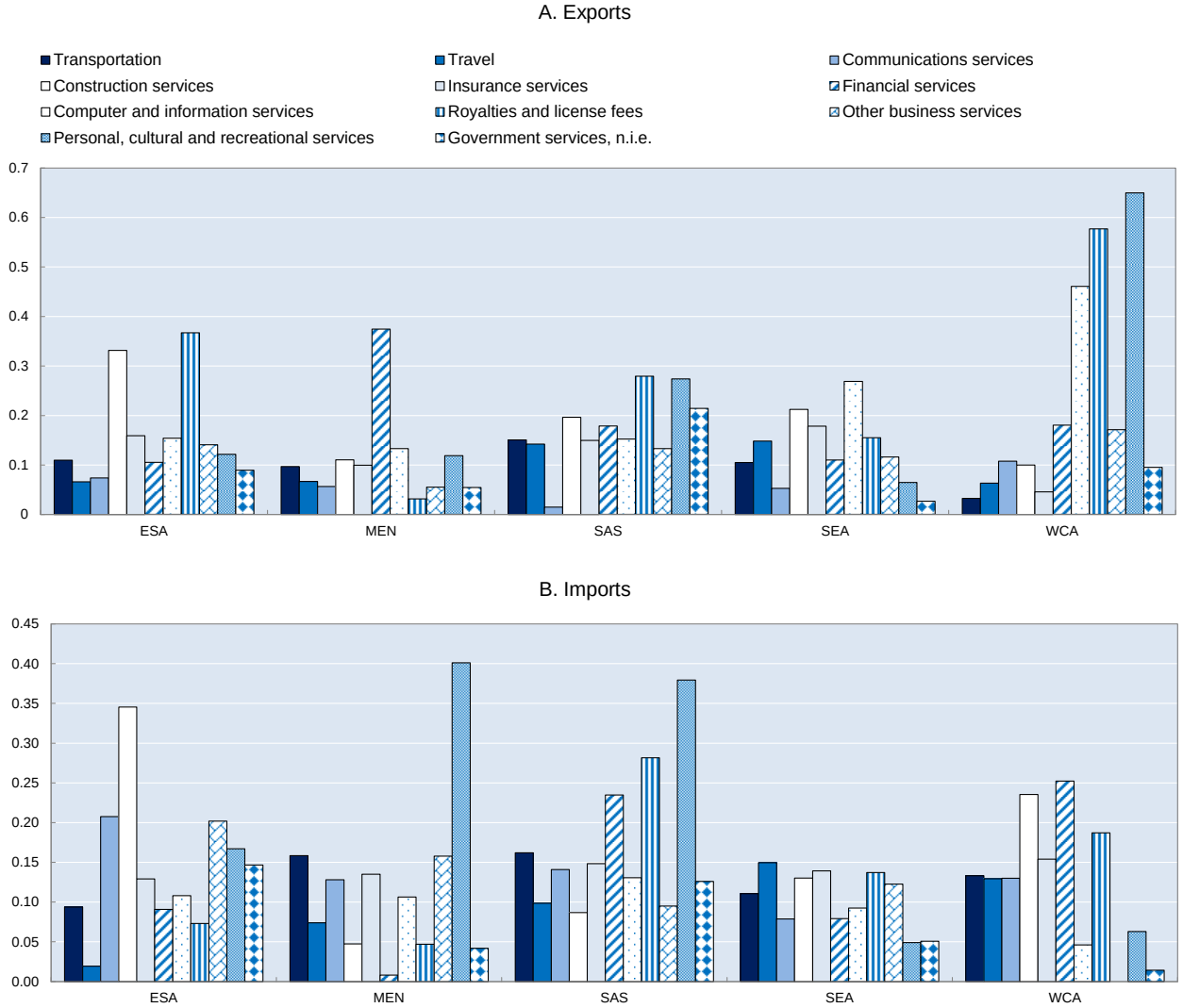
There appears to be a certain degree of geographical concentration taking place in these key regions (Figure 31). For example, South Africa, Kenya and Mauritius tend to dominate services exports in ESA whilst in MENA these concentrate in Egypt, Morocco and Lebanon and in WCA they concentrate in Nigeria, Ghana and Cameroon. In Asia, India dominates services exports across the board although Pakistan and Afghanistan are also contributing in some key sectors in the SAS region. In SEA the concentration across countries is not as pronounced but China, Hong Kong, China and Singapore play important roles in key service categories such as financial services, insurance and other business services.

Figure 29. Composition of gross imports and exports of services of African and Asian regions, 2012



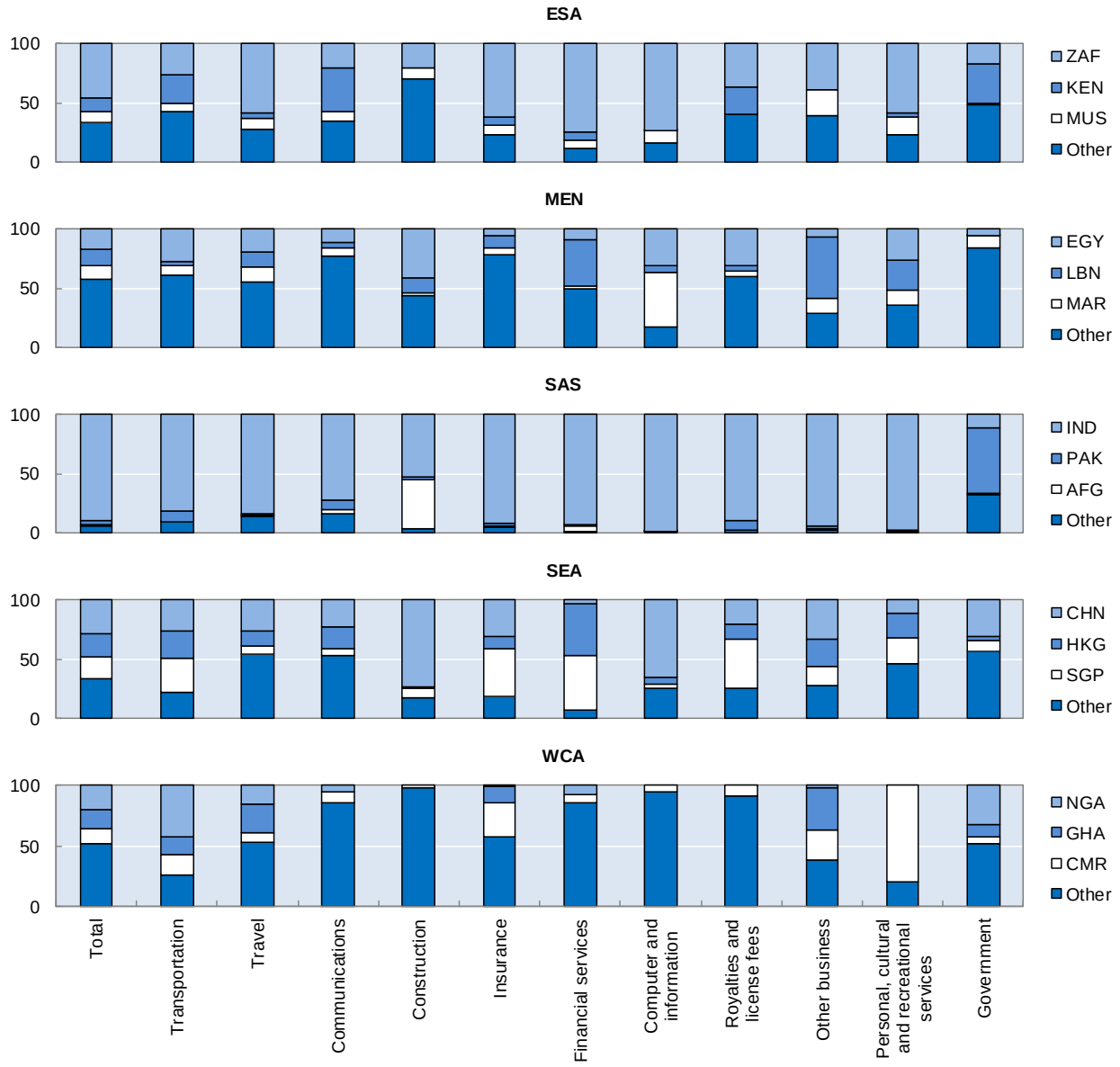
Source: Authors' calculations based on International Trade Centre data.

Figure 30. Growth rates of gross services trade by sector for the period 2007 – 2012



Source: Authors' calculations based on International Trade Centre data.

Figure 31. Top exporters of services by region and services sector, average for the period 2007 - 2012



Source: Authors' calculations based on International Trade Centre data.

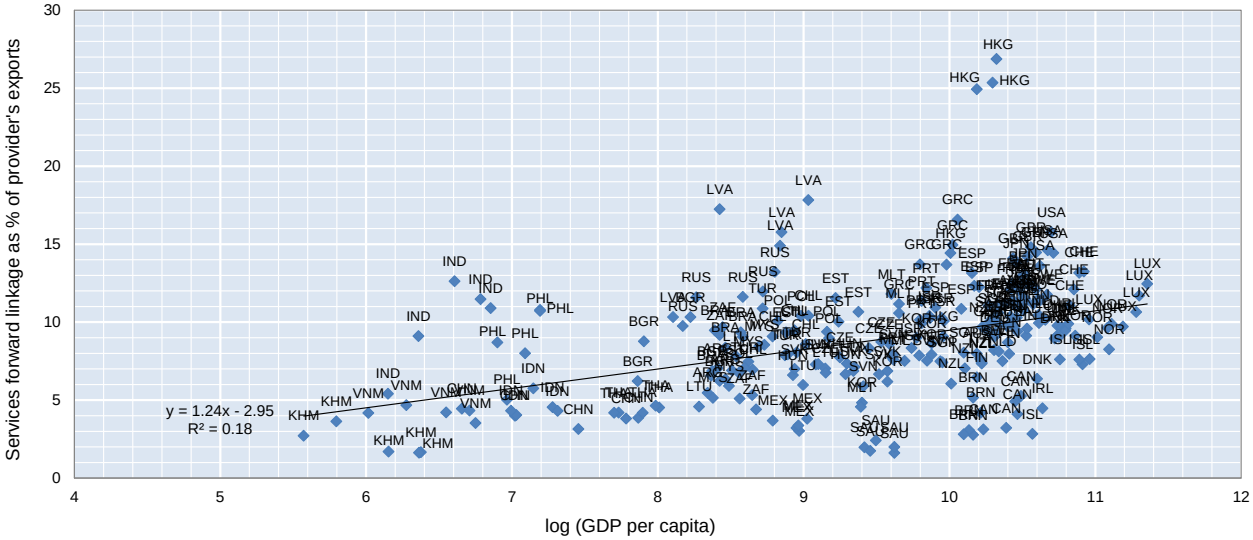
7.2 *Services-related engagement in GVCs*

Supplying services within GVCs

As we have seen above, in richer economies services tend to account for higher shares of economic activity. Income per capita is also strongly correlated with the extent to which countries export services which are in turn used by foreign firms for their own export production— the services part of the forward GVC linkage (Figure 32). However, there are some interesting exceptions to this rule among the countries covered in our analysis. In particular, drawing on a regression line between these elements—the forward linkage and per capita GDP—we see that India and the Philippines in Asia lie above the trend line (with a forward services linkage as high as that of Luxembourg). This could reflect the oft-cited attractiveness of India as a destination of outsourced business services—in fact in our data this category accounts for more than 50% of India's forward

services linkage. In the Philippines, business services also play an important role but wholesale and retail trade and transport, storage, post and telecommunication contribute even more (Figure 33).

Figure 32. Forward linkage associated with services (as % of gross exports) and level of development



Source: Authors' calculations based on the OECD TiVA database.

Services sectors in countries such as China for example—situated below the trend line in Figure 32—do not seem as integrated with international supply chains as would be predicted from their income per capita. In the African region, where we only have data for South Africa, we see that the forward services linkage has shrunk in recent years. In contrast, Malaysia, for example, has increased its level of engagement and has done so by more than would be suggested by the corresponding growth in per capita income.[98]

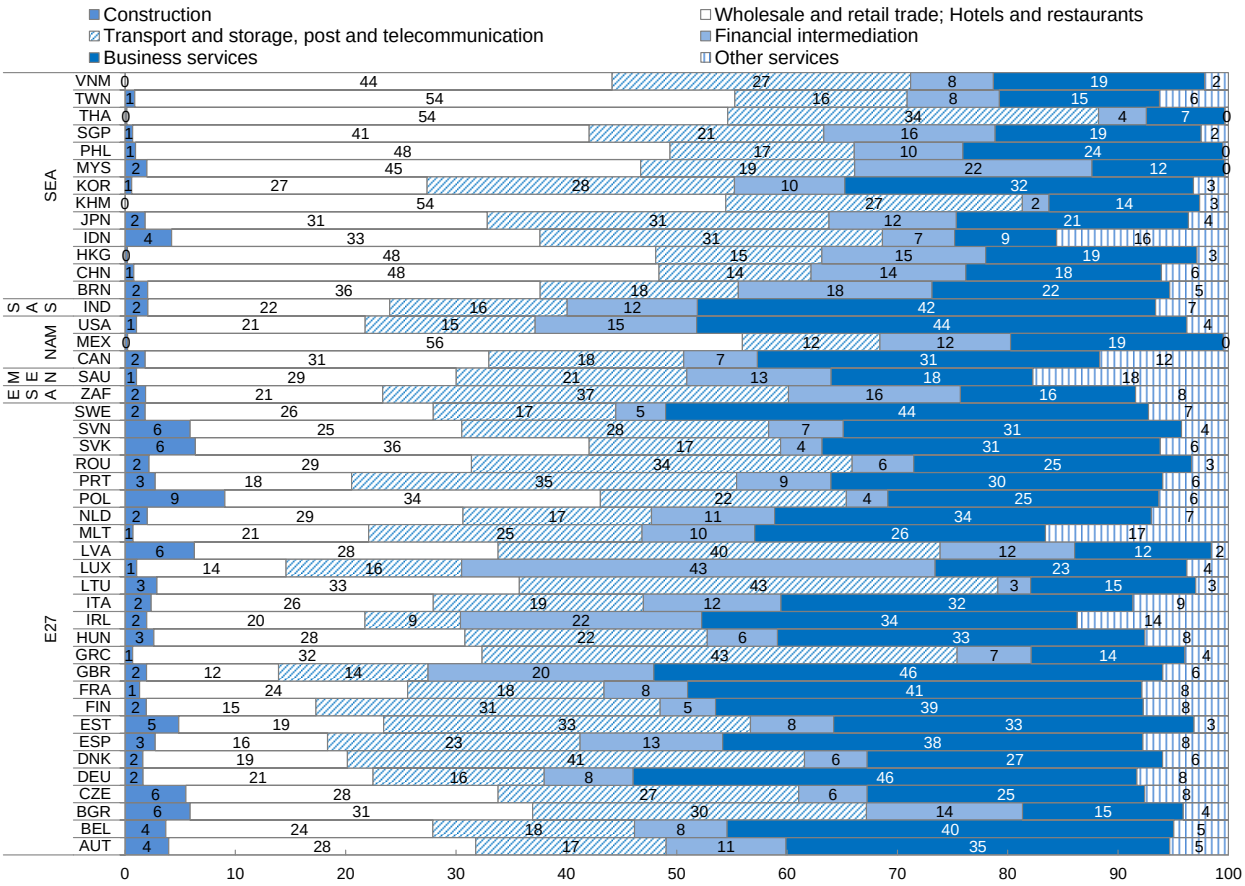
In terms of the composition of the services forward linkage, a certain tendency can be observed for wholesale and retail trade, hotels and restaurants as well as transport, storage, post and telecommunications which account for a larger share of the services forward linkage in developing countries in the Asian regions and in South Africa (Figure 33). This can be contrasted, to a certain extent, with developed countries where it is the business services which tend to account for larger shares. Some deviations from these trends include several individual countries in SEA which record high shares of financial services even as compared to the developed countries in Europe or North America.

In terms of accounting for where the services value added is generated and where it is exported to (for further production of exports), we see that there are strong links within and between regions and in some cases these account for a significant share of GVC trade. For example, almost 30% of South Africa's value added which is used by trading partners in SEA—South Africa's main trading partner in this respect—to produce exports originates from the service sectors (Annex Figure 37). These are mainly transport, storage and telecommunication services (40% of the services forward linkage), wholesale and retail trade, hotels and restaurants (19%), construction (16%) and financial intermediation (15%) (Annex Figure 38). In India, the services content of its forward linkage to SEA exceeds 50% and is composed mainly of business services (44%), wholesale and retail trade, hotels

98. This is a simple regression analysis with one explanatory variable meant to add an illustrative regression line to the presented scatter plot. In future research it could be interesting to incorporate other factors into this analysis and test the statistical properties of this relationship more rigorously.

and restaurants (22%), and transport, storage and telecommunication services (17%) (Annex Figures 37 and 38). Interestingly, in SEA countries services account on average for 50% of the regions forward linkages with the European Union and for almost 30% of forward linkages within the SEA region.

Figure 33. Sectoral composition of services forward linkages, 2009



Source: Authors' calculations based on the OECD TiVA database.

The use of domestic and foreign services in export sectors and export competitiveness

As we have seen above, all of the five developing regions have been dynamically increasing their exports of various services inputs such as computer and information services, and communication and other business services. This suggests not only that the domestic services sector is developing but also that downstream users are likely having better access to more competitive inputs and are thus able to produce more competitive products. At the same time, as we have also documented above, imports of services have also increased and at a faster rate which in turn suggest that demand for services inputs has been exceeding domestic supply.

Both in developed and developing countries, domestic services (either sourced directly from service providers or those embodied in physical inputs sourced from other sectors) account for the bulk of the services value added embodied in countries exports (Annex Figure 39). Still, foreign services play an important role accounting in 2009 for as much as 50% of services value added embodied in exports in Viet Nam, 47% in Singapore, 43% in Thailand, 42% in Malaysia, 38% in China, 34% in the Philippines, 24% in Indonesia, 17% in India and 14% in South Africa.

The development of competitive domestic service sectors tends to be linked to the access to competitive foreign services inputs since these can decrease the production costs of domestic firms in downstream sectors. Additionally, the development of a world-class domestic services sector is unlikely to arise in insolation from best international practices and indeed competition.

Evidence to this effect can be found in Annex Figure 40 where changes in revealed comparative advantage indices, calculated on the basis of non-services domestic value added for all manufacturing sectors and all countries covered in the database, correlate negatively with increases in the domestic service content of exports and positively with changes in foreign services content of exports. Certainly, this simple correlation can in principle just reflect differences between sectors and countries, however, a supplementary regression analysis conducted separately for each of the exporting industries and controlling for effects that are specific to countries and years, confirms the positive effects of foreign services inputs. We find that manufacturing sectors that experience increases in the domestic services content of exports do not experience significant increases or decreases of competitiveness, apart from Chemicals and non-metallic mineral products where this effect is actually negative (Annex Table 29). In contrast, increases in foreign services content of exports are estimated to have led to statistically significant increases in competitiveness in: food products, beverages and tobacco; wood, paper, paper products, printing and publishing; machinery and equipment, nec; electrical and optical equipment; and other manufacturing products.

7.3 Identifying policy options for enhancing integration of services in GVCs in selected countries

Overall, the data on services-related aspects of GVC suggests that despite a relatively lower level of development of the domestic services sector in the five developing regions, services—both domestic and foreign—have been playing an important role in their economic development and, given the recent trends, are likely to play an even more important role in the future. It will therefore be important for the policy makers in the regions to identify reforms that will create the right conditions for development of a competitive domestic services sector and for efficient trading of services across borders.

The newly developed OECD Services Trade Restrictiveness Index (STRI) aims to assess policy making in this respect. It provides a comprehensive portrait of services trade restrictions in 40 countries across 18 sectors. Concerning the five developing regions studied in this report, the STRI covers four large emerging economies (China, India, Indonesia and South Africa). Thus, the coverage is limited but some of these economies are at the centre of regional supply chains in Asia and Africa. Composite indices for these countries as well as the average and the median for the OECD countries summarised in Annex Figure 41 quantify identified restrictions across five standard categories[99] with values between zero and one. Complete openness to trade and investment gives a score of zero, while being completely closed to foreign services providers yields a score of one.[100]

The four economies tend to be less open to services trade than the OECD countries on average in all covered sectors.[101] Taking the example of transport services, which is by far the largest import category and the second largest exported category across the five developing regions, we see that regulations in China, India, Indonesia and South Africa tend to be more restrictive in all four transport sectors (air, maritime, road and rail) as compared to the OECD average. For example we

99. These include: restrictions on foreign entry, restrictions on the movement of people, barriers to competition, regulatory transparency, and other discriminatory measures.

100. For more on the OECD services Trade Restrictiveness Index see: http://www.oecd.org/tad/services-trade/services-trade-restrictiveness-index.htm

101. While other African and Asian countries are not covered in the OECD STRI, according to the World Bank data countries in SEA and MENA tend to have more restrictive services policies than ESA or WCA.

see that while air transport is on average the most closed sector across the OECD countries, the four emerging economies are even more restrictive in this area. Compared to air transport, rail freight is more open in the OECD as well as in China, Indonesia and South Africa, but in India the sector is closed completely. In contrast, computer services or construction are relatively open across all countries, although the four emerging economies still have regulations that are more restrictive to trade than the OECD average.

There are important differences in the degree of restrictiveness across countries and across sectors. Moreover, the composite index reflects different types of restrictions. Taking the air transport sector as an example again, the relatively similar level of openness in Indonesia and South Africa masks the fact that in Indonesia it is the lack of regulatory transparency and in South Africa restrictions to movement of people that matter relatively more.

Designing appropriate reforms that could support both the development of the domestic services sector as well facilitate access to foreign inputs requires a dedicated analysis of the underlying regulations in specific countries and specific sectors. It also requires the analysis of costs and political economy aspects of such reforms. This goes well beyond the scope of the analysis of this report and the stakeholders interested in investigating the potential for services policy reforms to deliver desirable outcomes are encouraged to use the OECD on-line interactive facilities giving access to the indices, underlying regulations, summary country and sector notes, as well a policy simulator.[102]

8. Conclusions and policy recommendations

This study set-out to provide a systematic empirical assessment of the determinants of GVC participation in developing countries, with a particular focus on the regions of Asia and Africa/Middle East. It seeks to contribute to the ongoing debate about the extent and desirability of integration into regional and global value chains and the manner in which such integration can be supported by a range of trade, trade-related and other policy instruments. It identifies the benefits associated with wider participation and thereafter investigates its determinants with a view to providing policy makers with guidelines on how to profit from the growing fragmentation of production.

Benefits of GVC participation

The results from this report suggest that both the buying and the selling activities in value chains can bring about economic benefits therefore suggesting that it is important to understand what determines participation in view of identifying the scope that governments have in shaping it.

It is also important to address the question of economic and social "upgrading". Recently, and perhaps mistakenly, the concept of upgrading has been seen as the need to capture a growing share of domestic value added in exports or to targeting specific "sophisticated" products or production stages. This however misses the point that the volume of the activity may matter as much or even more than the domestic value added content or sophistication; important benefits can be derived from specialising in less sophisticated assembly activities according to comparative advantages and performing them on a large scale.

Determinants of participation

One key finding is that the structural characteristics of countries are the main determinants of GVC participation and their relationships with backward and forward engagement are diverse. We find the following elements to be most important:

102. All these resources can be accessed at: http://oe.cd/stri.

- Market size: The larger the size of the domestic market, the lower the backward engagement of a country, and the higher the forward engagement. The intuition is that countries with a larger market can draw on a larger array of domestic intermediates both in terms of purchases and sales.
- Level of development: The higher the per capita income the higher the forward and the backward engagement. Developed countries tend to source more from abroad and sell a higher share of their gross exports as intermediate products.
- Industrial structure: The higher the share of the manufacturing sector in GDP the higher the backward engagement, and the lower the forward engagement.
- Location: GVC activity is organised around large manufacturing hubs: the larger the distance to the main manufacturing hubs in Europe, North America and Asia the lower the backward engagement, suggesting that there is a premium to locating close to large 'headquarter' economies.

Policy can also play a significant role, in particular:

- Low import tariffs, both at home and faced in export markets, and engagement in regional trading agreements (RTAs) can all facilitate backward and forward GVC engagement.
- Inward FDI openness tends to have a significant association with both the backward and forward integration.
- Logistics performance, intellectual property protection, the quality of infrastructure, as well as the quality of institutions (particularly for developing countries) are estimated to have strong impacts on GVC integration.

Implications for developing regions in Asia and Africa/Middle East

The analysis also shows that structural and policy drivers of GVC participation can vary significantly by broad sector and with the level of development. This suggests that there is a merit in nuancing the analysis of GVC participation on the basis of economic sectors and the level of economic development. For example, drivers of participation that are influenced by policy in the short and medium run seem to be playing a lesser role in determining participation of low income countries as compared to high or middle-income countries. This might imply that in order to overcome a relative disadvantage in structural factors (e.g. in distance to the closest manufacturing hub) a low income country may have need to change its relative position in terms of policy environment relatively more than a high income country.

Analysis of regional and global export competitiveness in seven key sectors in which our developing sub-regions of Africa/Middle East and Asia display high participation rates (agriculture; processed food products; plastics and rubber; textiles; metal products; electrical and electronic equipment; and motor vehicles) suggests that the Asian regions dominate the more technology-intensive products while African and Middle Eastern regions tend to be competitive in sectors such as agriculture and foodstuffs and in low-tech manufacturing products. Apart from textiles, changes in competitiveness tend to be region and sector specific. Each of the regions experiences some positive competitiveness developments which implies that policy makers have success stories in their regions that can be followed and studied in more detail.

The analysis also provides evidence suggesting that these success stories reflect positive effects of sourcing imported intermediate inputs. Countries should thus include in their development strategies measures that facilitate access to the most competitive inputs in order to stay ahead in the global competitiveness race.

The analysis of the policy contexts and drivers of GVC engagement and the rankings of performance on specific policy indicators presented in this report can provide a starting point for policy makers in the regions to assess their countries' level of engagement in GVCs and to consider what policy reforms to undertake.

In each of the five developing regions there are examples of countries which are among the world's worst and best performers in policy areas most important for GVC integration. Thus, there is considerable potential for countries to learn from the policies that work in the best performers in the region or indeed globally.

In terms of trade policy, removing tariff barriers to trade is likely to be important since fragmented modes of production imply multiple border crossings and therefore magnification effects (OECD, 2013). But their removal may be a necessary albeit not sufficient condition for further integration if products are held back at the border by onerous customs procedures or indeed the inability to engage in regional cummulation. Furthermore, it is the deep integration measures (WTO+), including broader issues related to trade facilitation, competition policy, investment, intellectual property protection, services and dispute settlement, which are likely to be most conducive to value chain integration within the region.[103]

In this respect SEA countries tend to charge the lowest tariffs on imports of intermediates and display the highest shares of imports covered by RTAs. Their trade policy therefore supports GVC integration. However, some SEA countries face relatively high tariffs and low RTA coverage in their export markets, implying that more emphasis could be placed on negotiating market access with key partners. High import tariffs, higher tariffs faced in export markets and the lower coverage of imports and exports by RTAs are impediments to greater GVC integration and these are seen most clearly in WCA, SAS and in some counties of ESA, while MENA's trade policy performance is closest to that of SEA.

Although many countries have embraced regionalism, the depth and coverage of the concluded and foreseen agreements varies widely. In SEA progress is most advanced yet some countries continue to lag behind in terms of their economic development and will need to undertake important efforts in order to catch-up with the more advanced countries. SAS countries are still struggling in their efforts to substantially reduce tariff barriers to trade within the region. The different regional economic communities in Africa have contributed to progress in reducing barriers to trade, although intra-regional trade still suffers from relatively high tariffs, relatively weak trade facilitation measures, incompatibility of rules of origin across the different trading blocks and implementation issues.

In terms of revealed openness to inward FDI, SAS has the lowest ratios of inward FDI to GDP. SEA seems to be relatively closed as is ESA while WCA and MENA display higher degrees of openness. Given the importance of FDI to GVC participation, there is scope here for policy to make a difference.

Indicators of logistics performance, intellectual property protection, the quality of infrastructure as well as the quality of institutions suggest that overall countries in WCA, SAS and ESA perform worse than MENA and SEA on all indicators, which also points towards ample scope for further reform.

Despite a relatively lower level of development of the domestic services sector in the five developing regions, services—both domestic and foreign—are playing an important role in their

103. There is also a larger debate on whether such WTO+ measures can actually be enforced in a discriminatory way as are tariffs. Indeed once a legal framework for competition policy has been set-up it will be hard for countries to discriminate between different firms and this might imply that the traditional negative impacts of regionalism on third countries might be significantly reduced or eliminated.

economic development and GVC engagement and, given the recent trends, are likely to play an even more important role in the future. It will therefore be important for the policy makers in the regions to identify reforms that will create the right conditions for development of a competitive domestic services sector and for efficient trading of services across borders.

Region-specific trade and trade-related policy recommendations

South Asia

In South Asia, a more concerted effort towards regional integration may be helpful.[104] This can be achieved not just by fully eliminating intra-regional tariffs but also by coordinating more concrete regional trade facilitation initiatives looking at both physical and institutional infrastructure. The OECD's Trade Facilitation Indicators suggest that a key common weaknesses in Bangladesh, India, Pakistan and Nepal is the need to further streamline procedures and this could be a priority in terms of devising a more favourable trading environment. One possible suggestion is to use the *Master Plan on ASEAN Connectivity* as a guiding framework in order to identify action points aimed at increasing logistics performance to the levels seen in SEA. This may help countries such as Nepal and Afghanistan, both landlocked and small, to exploit benefits from economies of scale and tap into regional value chains for their development. It will also be to the benefit of India and in particular the regions located close to these countries insofar as they too may achieve greater market access.

Where domestic reform is concerned several issues are of note. The quality of infrastructure is below average in all countries except Sri Lanka and this is likely to hamper integration not just domestically (connecting more remote regions) but also regionally and internationally. Here investment in the maintenance and upgrading of existing and new infrastructure could provide an important boost to economic activity particularly in countries such as Nepal, Bangladesh and Pakistan where the quality is lowest.

Beyond connectivity issues such as the presence of physical and institutional infrastructure the South Asia region faces important challenges not least in dealing with energy shortages (World Bank, 2010) which may impede the smooth functioning of GVCs. Quality of electricity supply in the region is amongst the lowest of all regions. Here the worst performer in SEA, Cambodia, is seen to be on par with India thereby highlighting a key difference between South and South East Asia.

Trade facilitation and better infrastructure are necessary but not sufficient conditions for further participation and these need to be complemented with MFN tariff liberalisation (South Asia continues to have high tariffs relative to other regions) and institutional reform, and further liberalisation of services and investment regimes. This could help attract foreign investment and therefore new technologies complementary to the labour abundance of the South Asian countries. Indeed, in many respects, and particularly in terms of labour endowments, South Asia resembles many South East Asian countries and therefore should be able to attract important GVC activity which may help further development objectives.

South East Asia

SEA has often been lauded for its fast-paced integration into regional and global markets and indeed a lot of progress has been made, but there is still room for improvement. Competitive pressures are likely to grow as other countries increasingly look to joining GVCs and therefore South East Asia needs to continue reforming if it is to remain competitive.

104. Except for Bhutan all countries in South Asia have below world average shares of imports covered by RTAs.

The CLMV countries continue to lag behind in terms of their economic development and will need to undertake important efforts in order to catch-up with the ASEAN-6 countries.[105] The ASEAN Economic Community regional integration effort is likely to help in this process (with Pillar 3 giving particular consideration to the development aspect) but it is finalising the internal market that is likely to be most conducive to this catch-up. ASEAN-6 countries see their CLMV neighbours as important complements to their GVC strategy. They see these as offering new economic opportunities for offshoring parts of their production and therefore 'upgrading' within the value chain. However such ambitious plans require further work, first by eliminating intra-regional tariff barriers to trade and reducing the MFN tariff (so as to avoid costly trade diversion), and second by implementing reform via the finalisation of the internal market so that services and investment can move freely within the region (OECD, 2014).

Although the ASEAN-6 countries are progressing well, there is much that countries like the Philippines, Thailand and Indonesia can learn from Singapore and Malaysia. We see big differences between these in terms of logistics performance, infrastructure and quality of institutions. The continued push for the finalisation of the single market is likely to help convergence and this, coupled with domestic reform aimed at increasing institutional quality and logistics performance, will also be necessary to complement regional efforts.

Africa

While Africa still accounts for a very low share of world trade, the region has exhibited remarkable dynamism over the last decade with trade rising faster than in most developed and developing economies (UNCTAD, 2013a). As highlighted in the report, intermediate goods and services represent a relatively low share of imports and a high share of exports in the region, mainly due to Africa's rich endowments in natural resources, weak industrial production, and the relatively low income base. However trade in intermediates has risen faster than that of final goods.

Nevertheless, many African countries face important challenges in terms of scale and productivity that are necessary to integrate successfully into GVCs. These are exacerbated by fundamental problems related to the quality of infrastructure or indeed institutions. The absence of corruption, political stability, the credibility of reforms and policy initiatives are often put forward as pre-conditions for international business, lowering the risk faced by suppliers, investors and exporters. Dealing with these should be a key priority in order to better integrate into the global economic system.

Additional policy recommendations such as increasing the scope and depth of regional integration as well as pursuing a more active multilateral liberalisation stance to avoid trade diversion and reduce the costs of sourcing competitive intermediates should be pursued in parallel. Indeed the different regional economic communities in Africa have contributed to progress in reducing barriers to trade. It is however in increasingly looking at trade facilitation both in terms of soft and hard infrastructure that most benefits are likely to emerge. The African regions are seen to have the highest trade costs of all regions (both in terms of intra and extra regional trade) and it is here where special focus should be placed.

105. The CLMV countries are Cambodia, Lao PDR, Myanmar and Viet Nam.

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Annex Figures and Tables

Annex Figure 1. Changes in value added in exports 2009

Percentages

	FRA	DEU	GBR	RoEU	TUR	ZAF	RUS	IND	CHN	KOR	JPN	RoAsia	AUS	NZL	South America	MEX	USA	CAN	RoW
FRA			-1.0	-1.1															-0.8
DEU	0.8		-0.9	-0.7	0.5				1.2	0.5									
GBR																			-0.1
RoEU	1.7	3.2	-1.0	0.8	2.1		-0.8	1.2	1.9	0.9	0.5					0.5			
TUR																			
ZAF																			
RUS	0.6	0.5		0.8	2.4					0.6									
IND									0.5			0.6							
CHN	0.8	0.8		0.9	0.9	0.8		1.6		3.7	1.4	2.3	0.7	1.1	0.5	2.9	0.7	0.6	
KOR									1.8							1.3			
JPN			-1.0						2.0	-0.8		-3.7					-0.7	-0.9	
RoAsia								1.5	3.7	3.1	1.3	0.7	1.7	1.0		1.5			
AUS								0.6	0.9	0.8	0.6								
NZL																			
South America									1.3	0.5									
MEX																			
USA	0.7	0.7	-0.7				-0.6	0.8	1.9			-1.0	-1.1	-1.8		-5.2		-5.8	
CAN																			
ROW	2.0	1.7	1.2	1.9	2.2	3.3	-1.3	4.7	3.9	6.8	2.4	3.4	0.7	1.1	0.6	1.1	1.4	2.0	0.8
Imported	6.9	8.0	-3.4	2.9	10.6	4.7	-3.8	12.3	20.8	16.9	7.9	1.4	0.7	1.1	1.0	3.8	2.9	-4.0	-0.2

Note: This figure shows the corresponding percentage point changes in foreign value added content of exports that have arisen since 1995. For example, the 4% value added that Germany supplied to France has witnessed a 1 percentage point increase since 1995. Entries below 1.5% are omitted to improve readability.
Source: Authors' calculations based on OECD TiVA database.

Annex Figure 2. Destination of value added in exports – forward participation (2009), percentages

Percentages

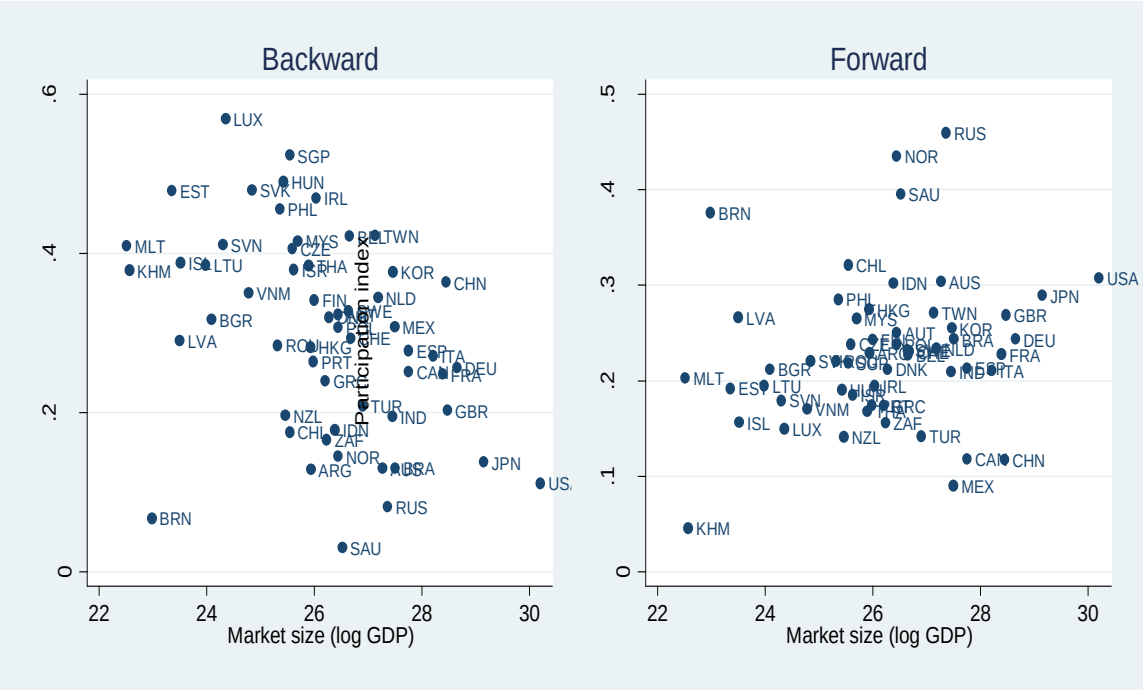
	FRA	DEU	GBR	RoEU	TUR	South Africa	RUS	IND	CHN	KOR	JPN	RoAsia	AUS	NZL	South America	MEX	USA	CAN	RoW	Total
FRA		3.77		9.08																21.13
DEU				11.27															2.45	22.84
GBR		3.72		10.67															2.68	25.09
RoEU		4.05		7.86																20.78
TUR		2.74		5.04															2.72	15.94
ZAF				3.28					4.22											17.33
RUS	2.13	4.79		18.98					3.90			2.77							4.43	44.93
IND				4.66					3.06			3.57							3.04	20.35
CHN				2.48								3.43								13.43
KOR				2.89					9.37			5.03								24.39
JPN				3.82					9.09	3.31		7.92					2.12			32.95
RoAsia				3.34					6.83			5.66								24.68
AUS				2.68					8.36	3.90	2.99	6.12								31.30
NZL				2.12					2.82			2.22	2.50							15.69
South America				4.93					6.46			2.73							3.14	27.52
MEX																	4.74			11.46
USA		2.18		6.56					3.20			4.06				2.06		2.33	2.17	28.54
CAN																	5.76			15.23
RoW	3.57	6.51	2.64	20.83				2.61	9.32	6.07	3.22	10.11					5.55		3.52	32.00

Note: Entries below 1.5% are omitted to improve readability.
Source: Authors' calculations based on OECD TiVA database.

Annex Figure 3. Market size and GVC participation, 2005

A. Volumes

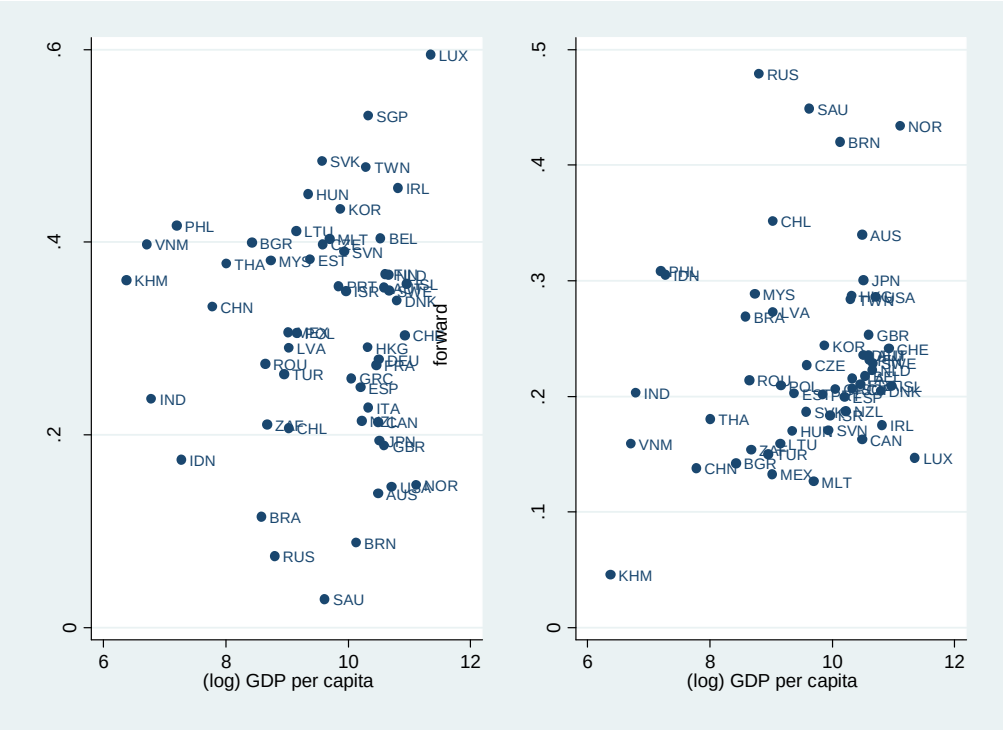
B. Ratios



Source: Calculations based on OECD TiVA database and WDI.

Annex Figure 4. Level of development and GVC participation

A. 2008



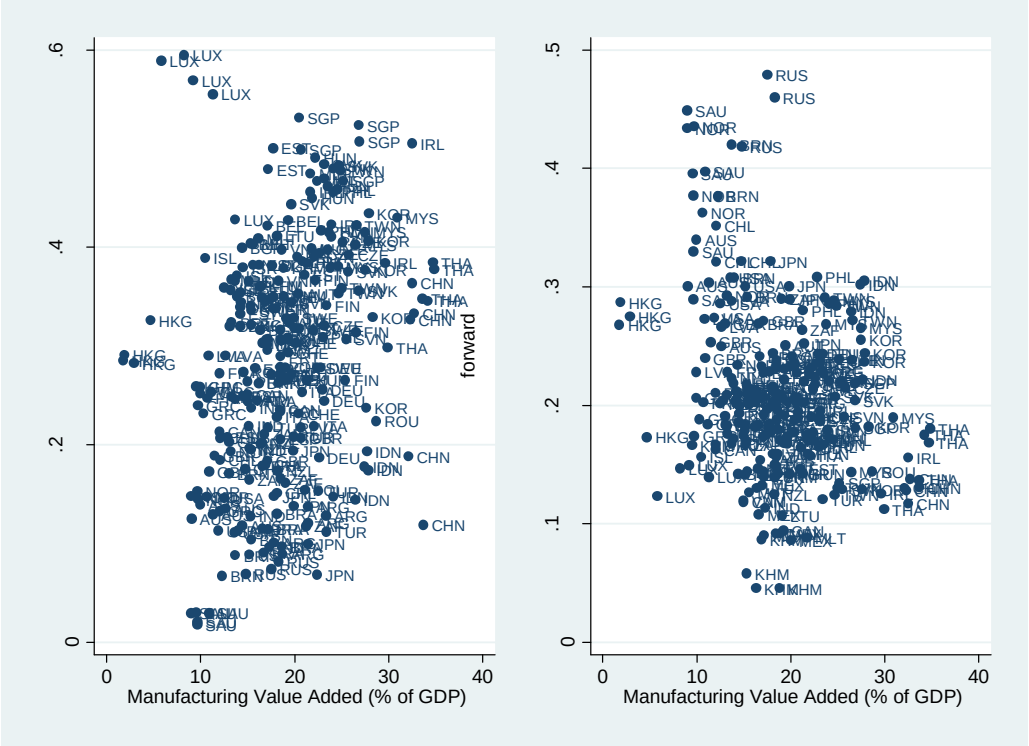
B. 1995-2009

Source: Calculations based on OECD TiVA database and WDI.

Annex Figure 5. Industrialisation and GVC participation

A. 2008

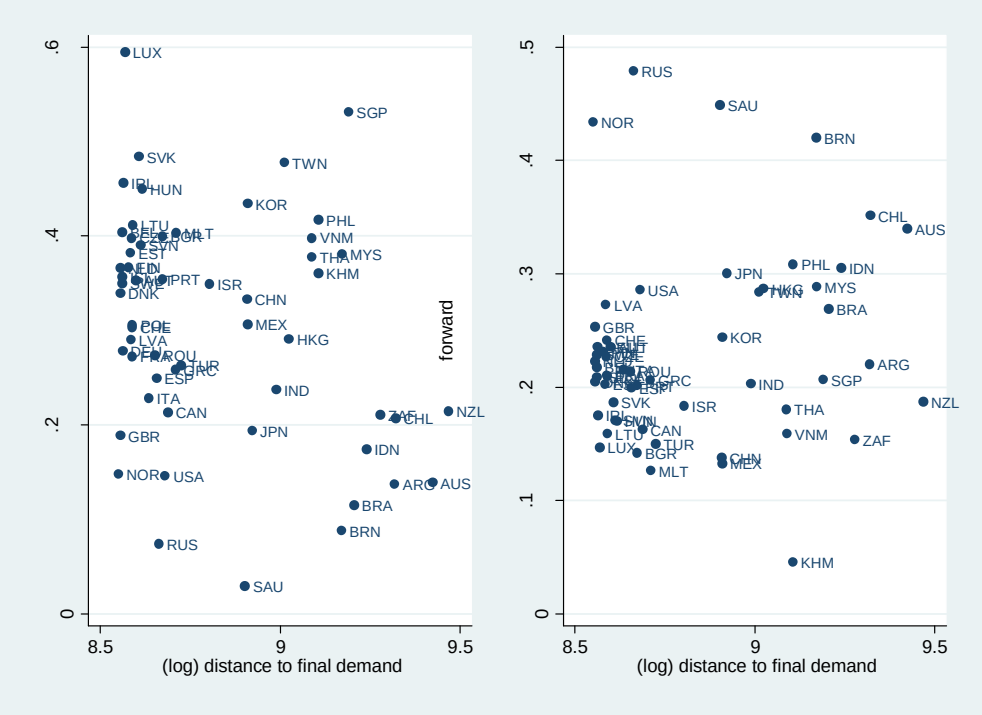
B. 1995-2009



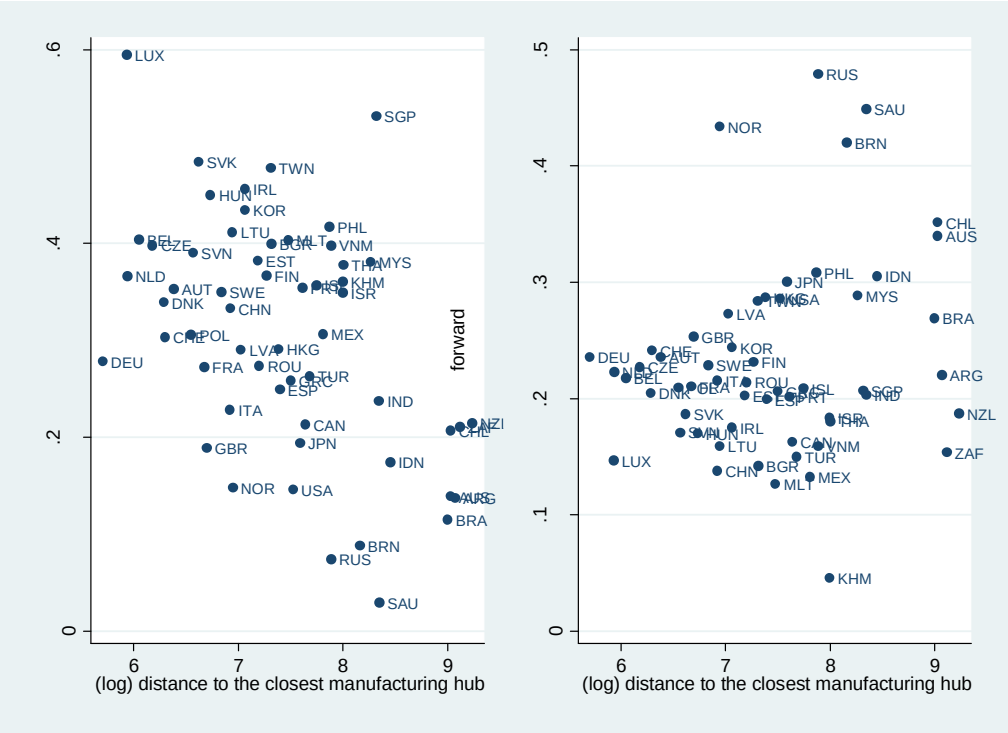
Source: Calculations based on OECD TiVA database and WDI.

Annex Figure 6. Remoteness and GVC activity

A. Distance to final demand



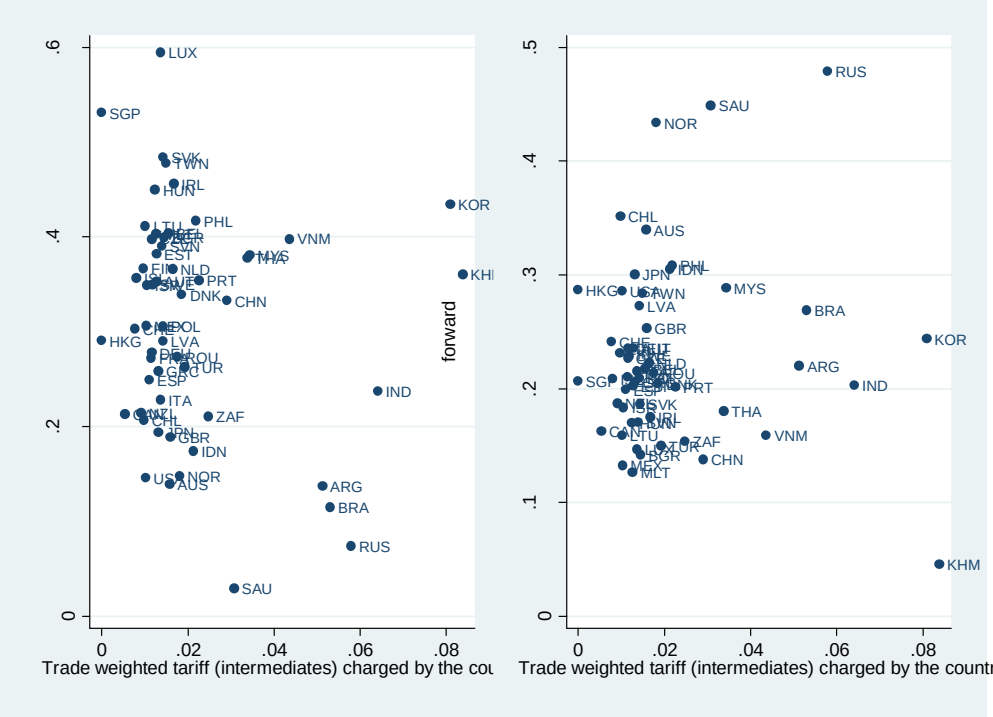
B. Distance to the closest manufacturing hub



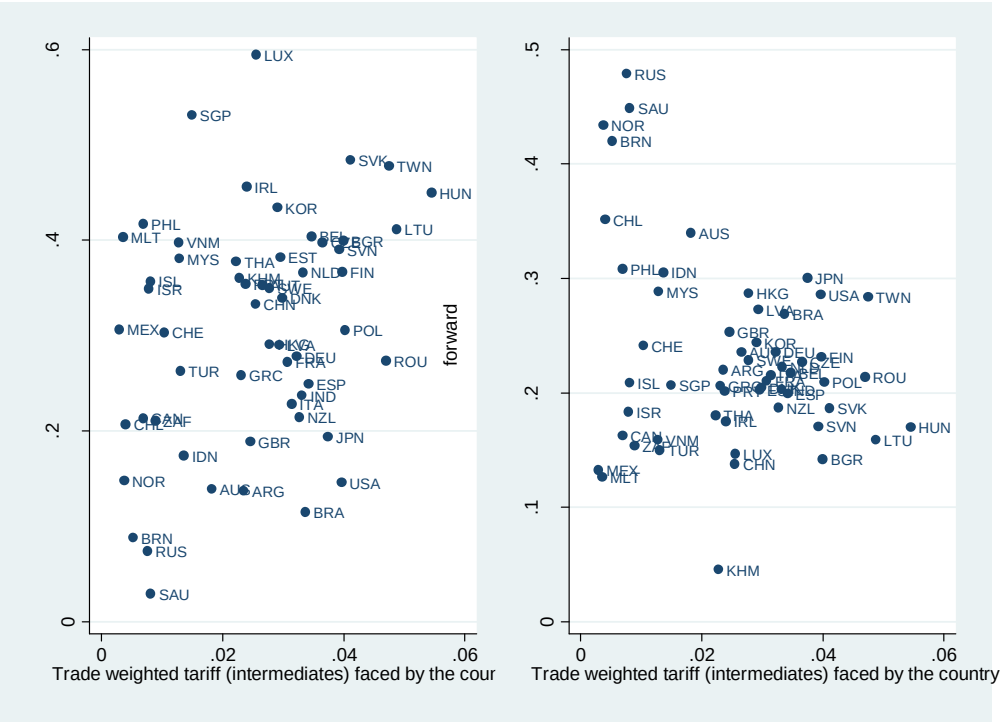
Source: Calculations based on OECD TiVA database and CEPII.

Annex Figure 7. Import tariffs charged and faced and GVC integration

A. Import tariffs charged



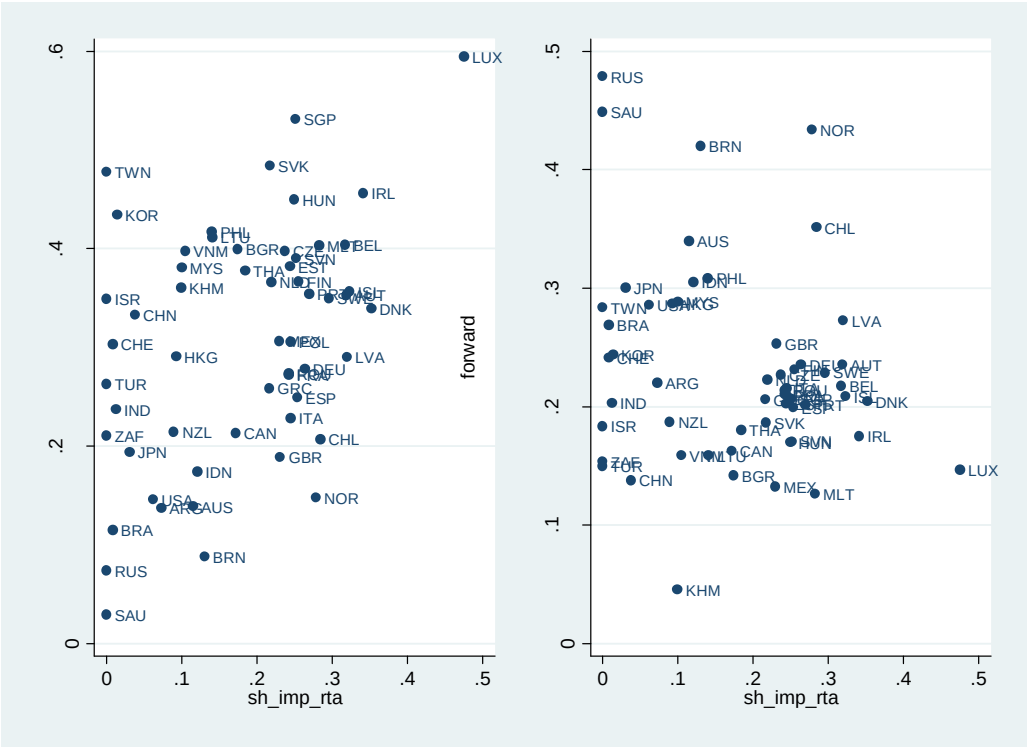
B. Import tariffs faced



Source: Calculations based on OECD TiVA database.

Annex Figure 8. Participation in RTAs and GVC integration

A. Share of imports covered by an RTA (2008)



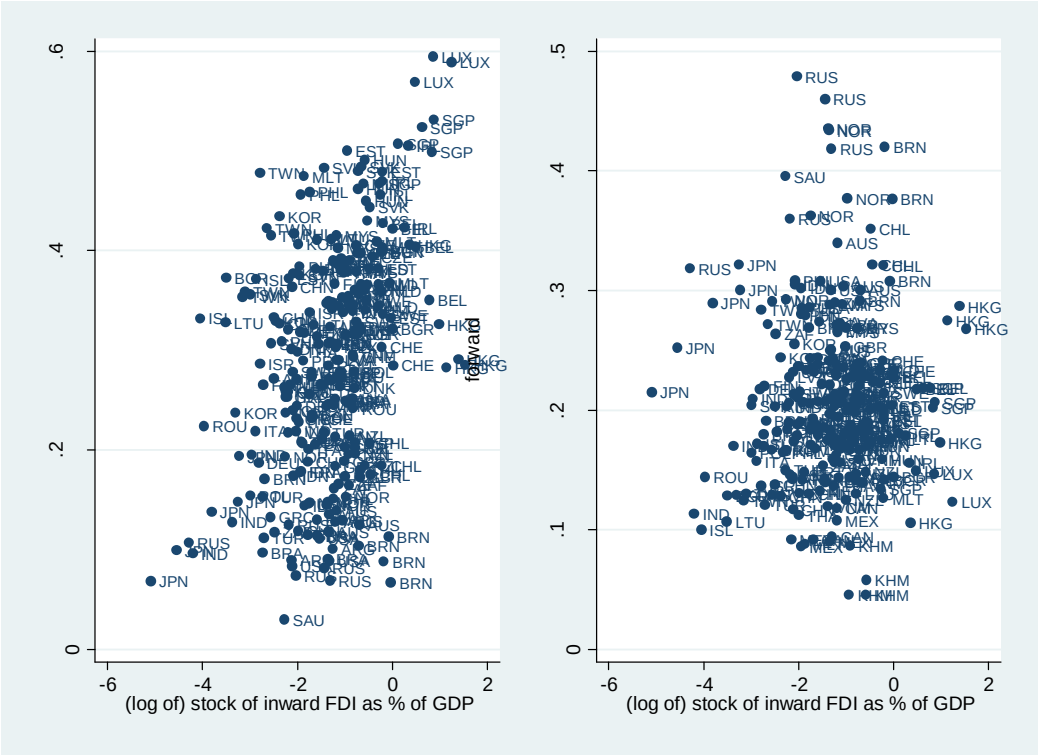
B. Share of exports covered by an RTA

Source: Calculations based on OECD TiVA database and WTO.

Annex Figure 9. Openness to inward FDI and GVC integration

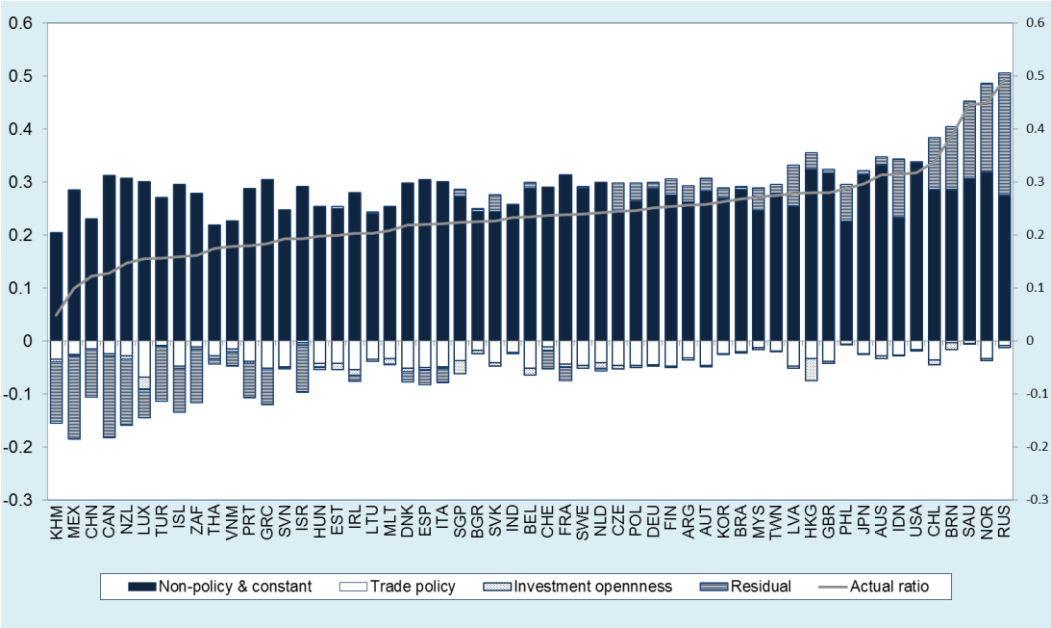
A. 2008

B. 1995-2009



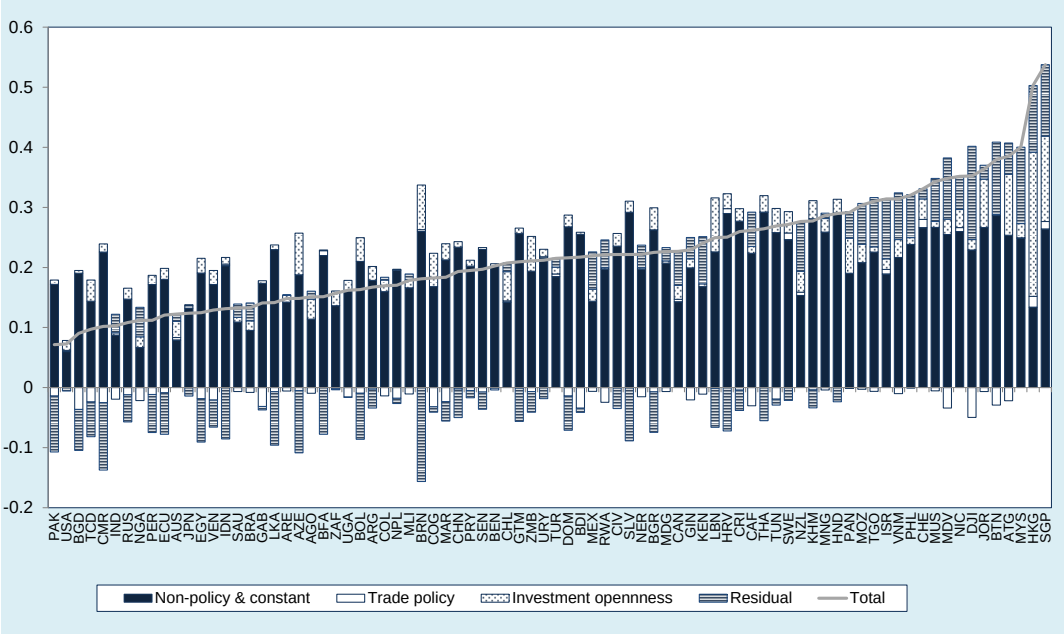
Source: Calculations based on OECD TiVA database and UNCTAD.

Annex Figure 10. Forward GVC participation ratio—relative contribution of non-policy and policy factors 2005



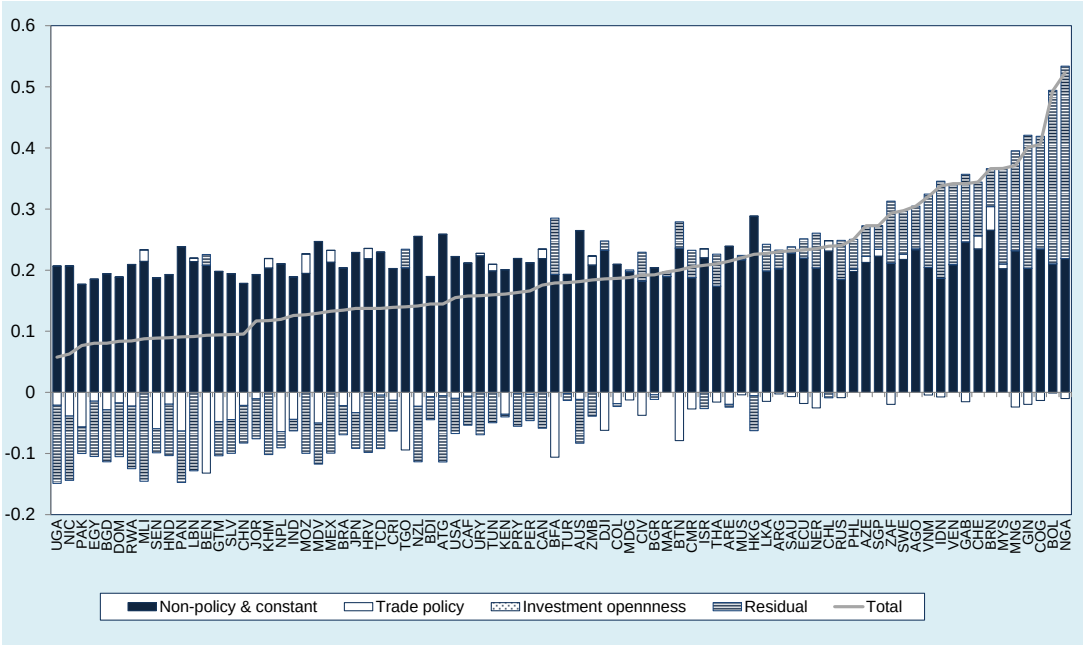
Source: Estimations based on OECD TiVA database.

Annex Figure 11. Backward GVC participation ratio—relative contribution of non-policy and policy factors 2005



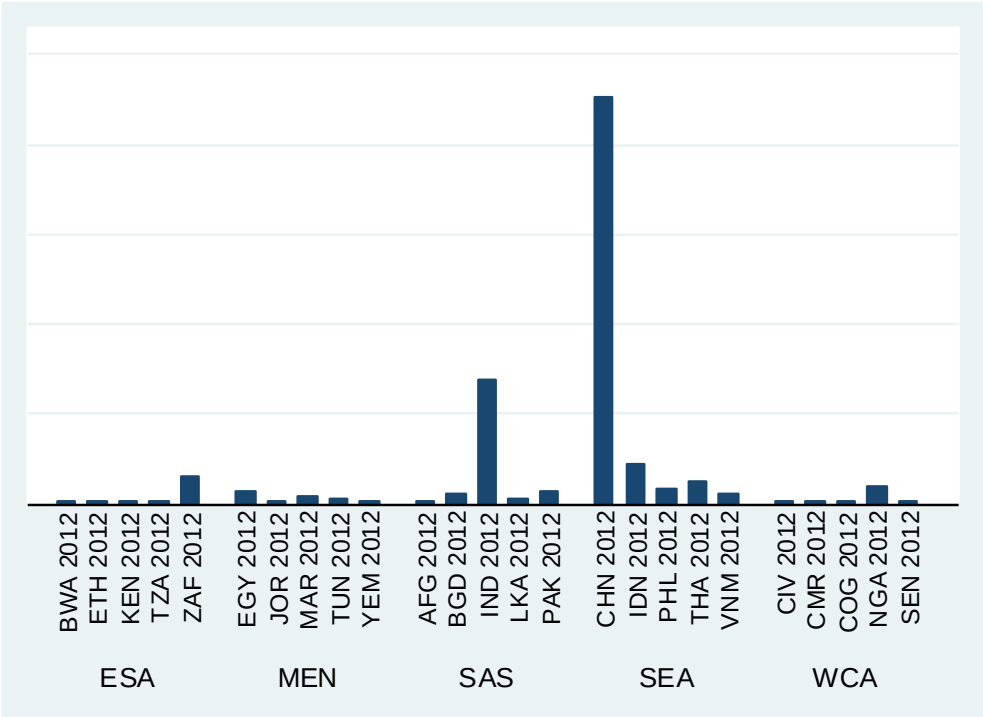
Source: Estimations based on EORA database.

Annex Figure 12. Forward GVC participation ratio—relative contribution of non-policy and policy factors 2005



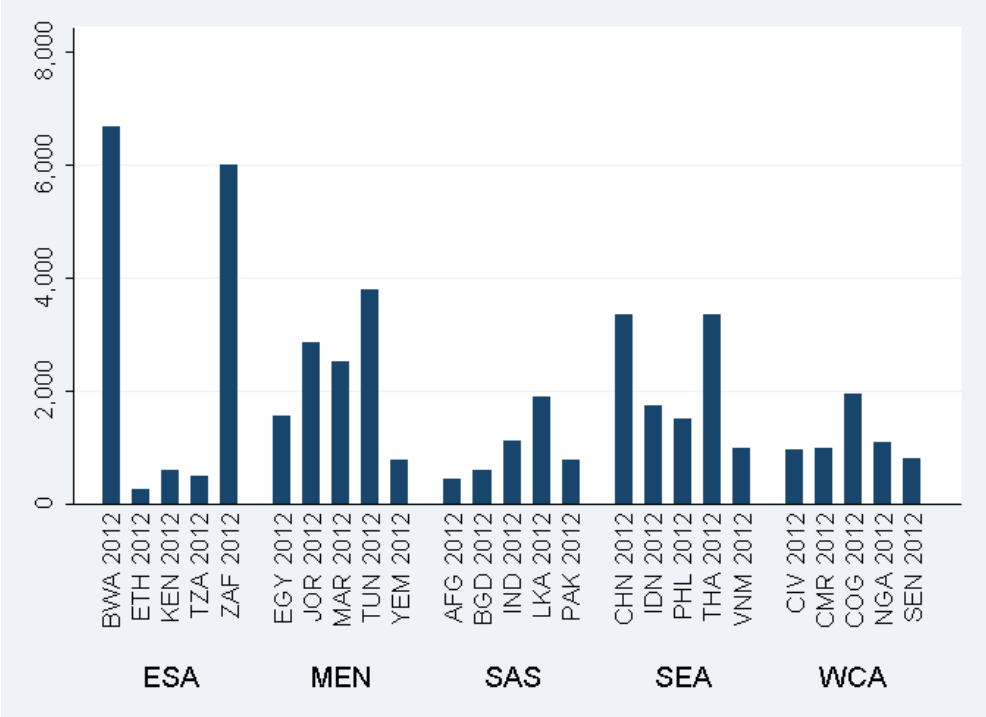
Source: Estimations based on EORA database.

Annex Figure 13. Market size across five developing regions in Africa and Asia



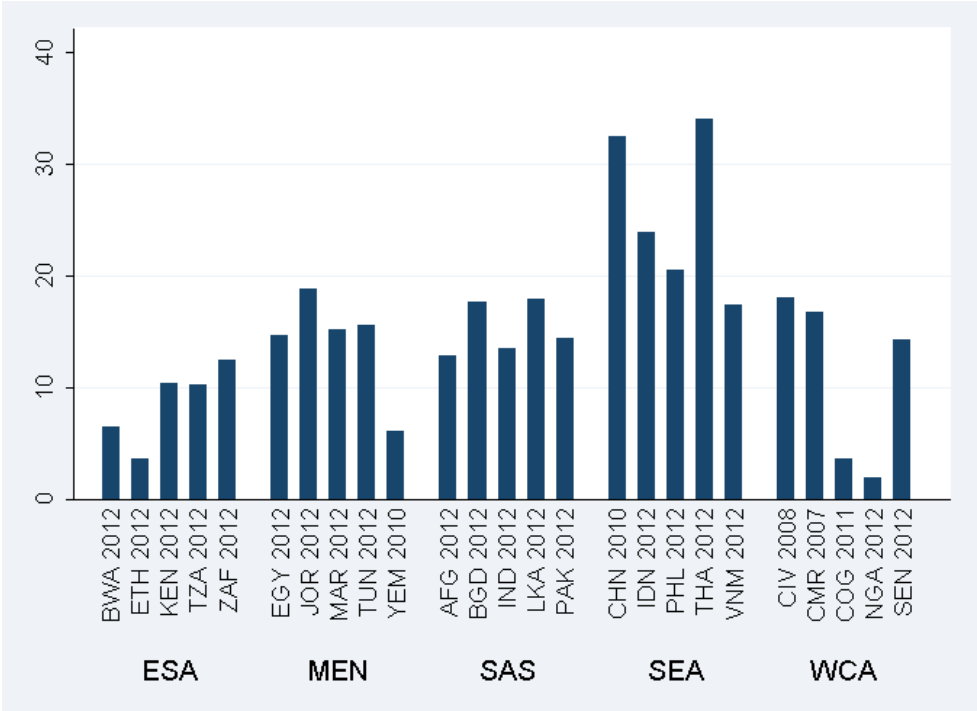
Source: Calculations based on WDI.

Annex Figure 14. GDP per capita across five developing regions in Africa and Asia



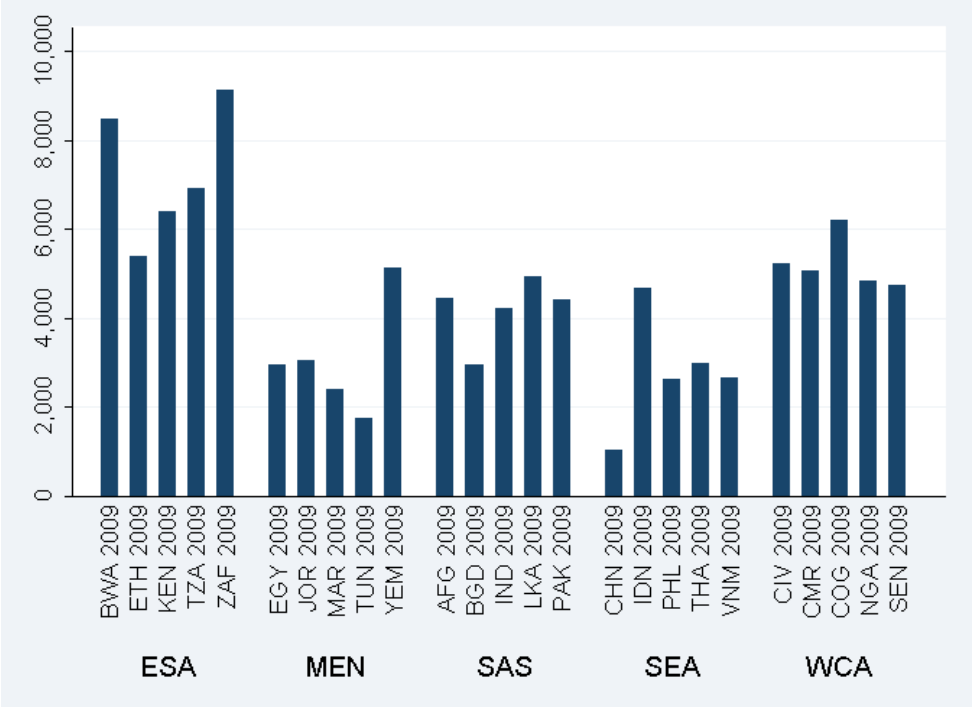
Source: Calculations based on WDI.

Annex Figure 15. Manufacturing value added as % of GDP across five developing regions in Africa and Asia



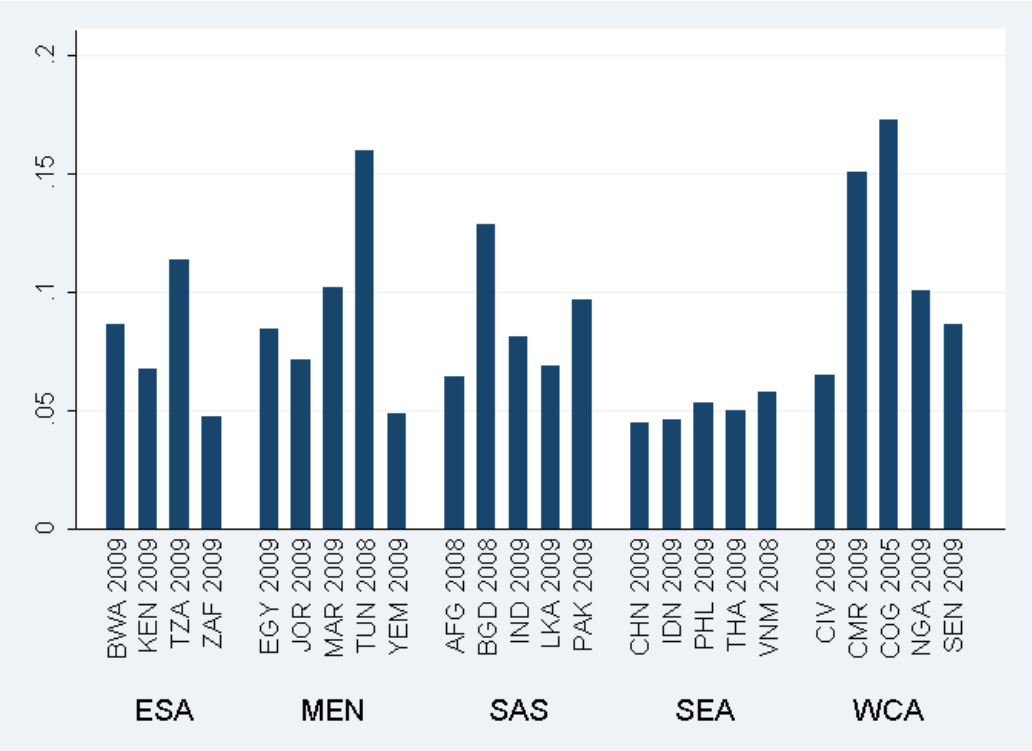
Source: Calculations based on WDI.

Annex Figure 16. Distance to closest manufacturing hub across five developing regions in Africa and Asia



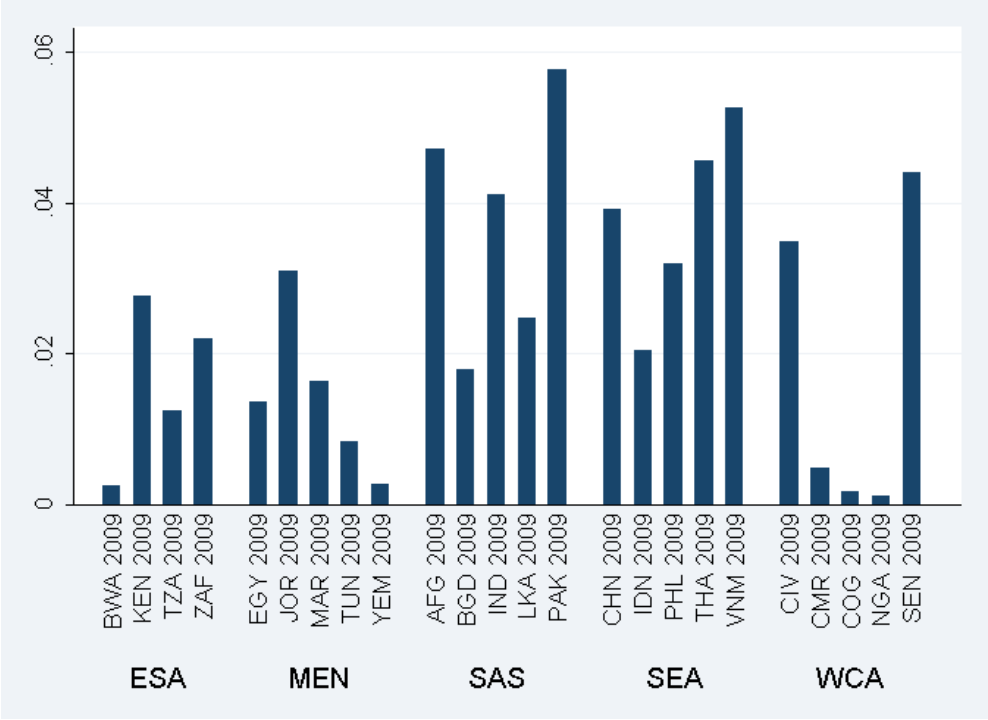
Source: Calculations based on CEPII.

Annex Figure 17. Import tariffs charged across five developing regions in Africa and Asia



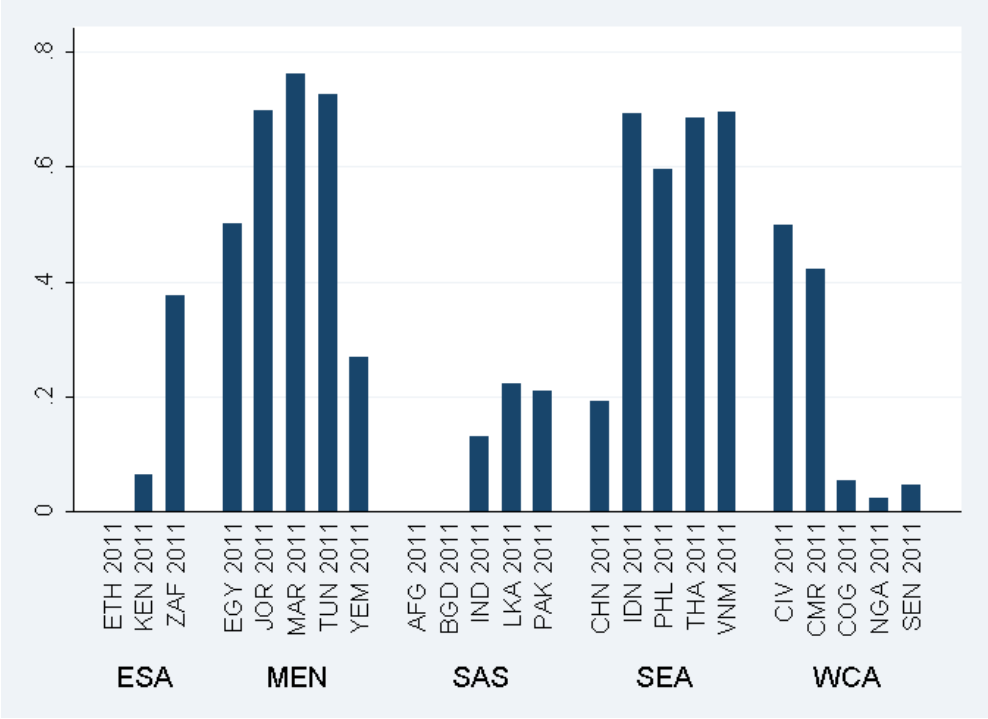
Source: Calculations based on BACI and TRAINS.

Annex Figure 18. Import tariffs faced across five developing regions in Africa and Asia



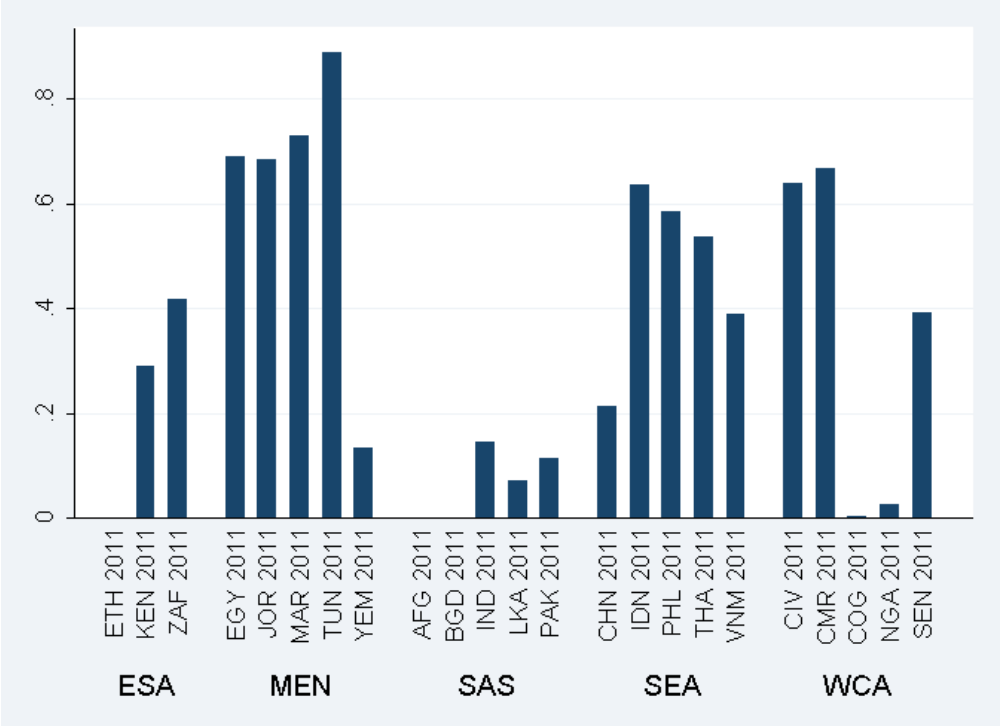
Source: Calculations based on BACI and TRAINS.

Annex Figure 19. Share of imports of intermediates covered by an RTA across five developing regions in Africa and Asia



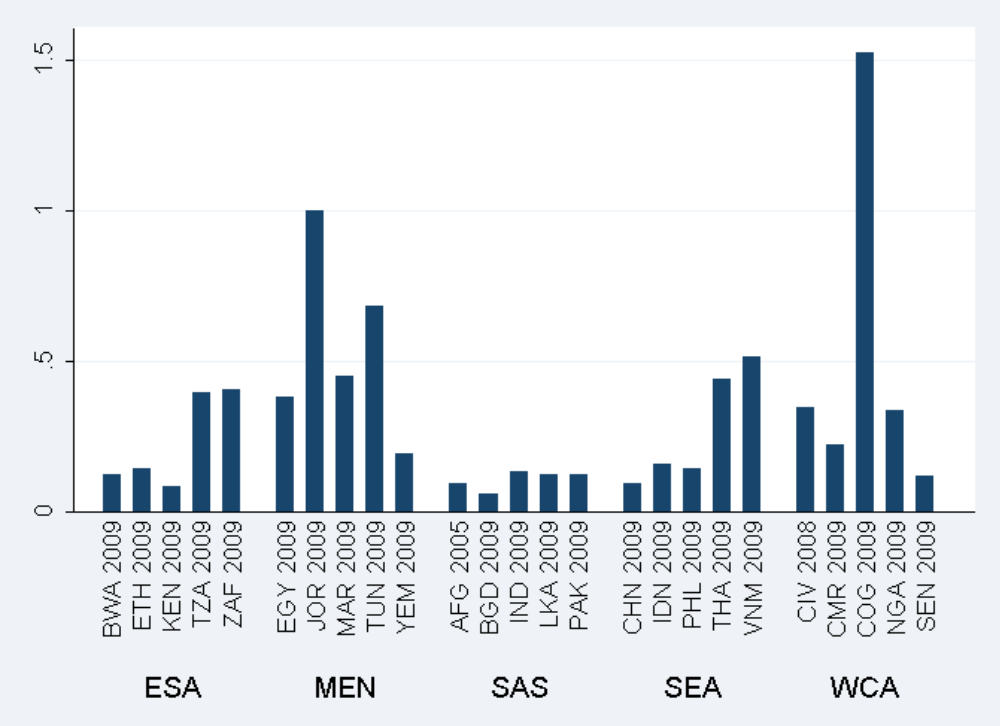
Source: Calculations based on BACI and De Sousa.

Annex Figure 20. Share of exports of intermediates covered by an RTA across five developing regions in Africa and Asia



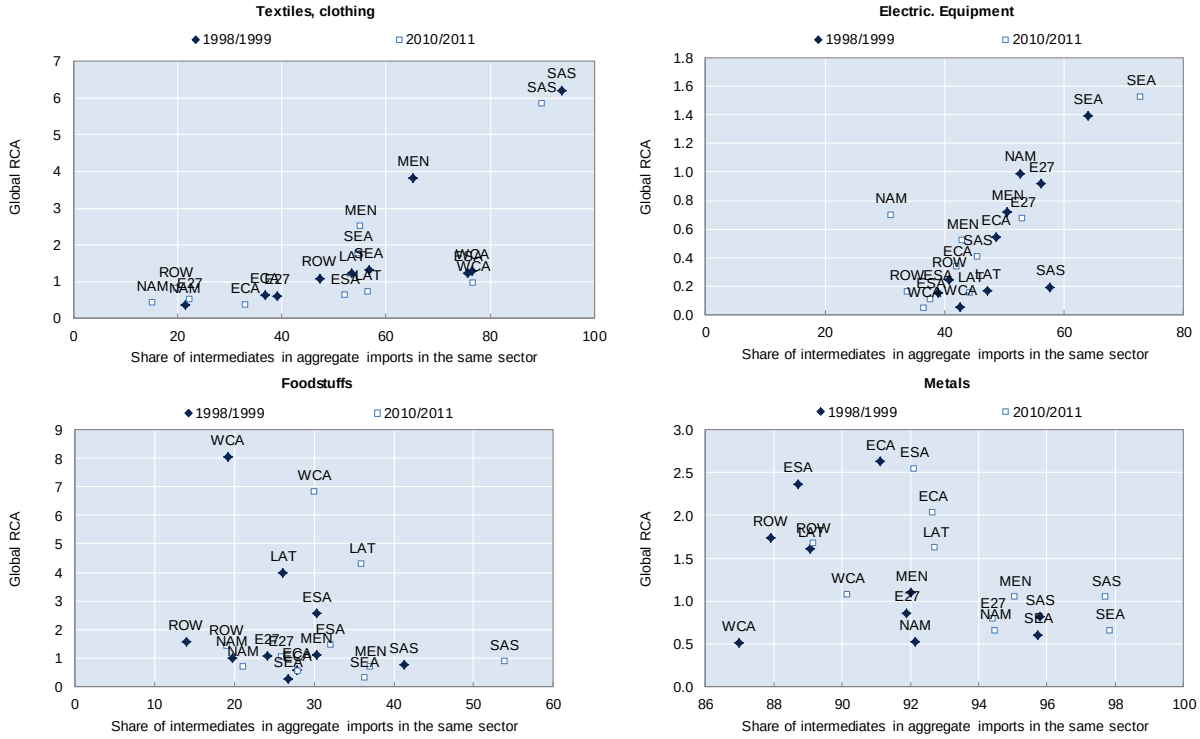
Source: Calculations based on BACI and De Sousa.

Annex Figure 21. Revealed openness to inward FDI across five developing regions in Africa and Asia

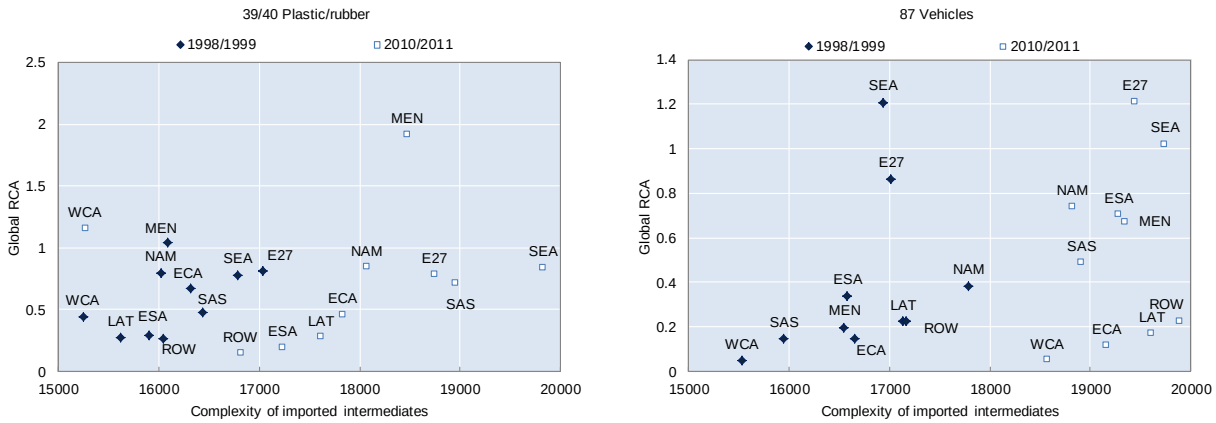


Source: Calculations based on UNCTAD.

Annex Figure 22. Competitiveness and imports of intermediate products

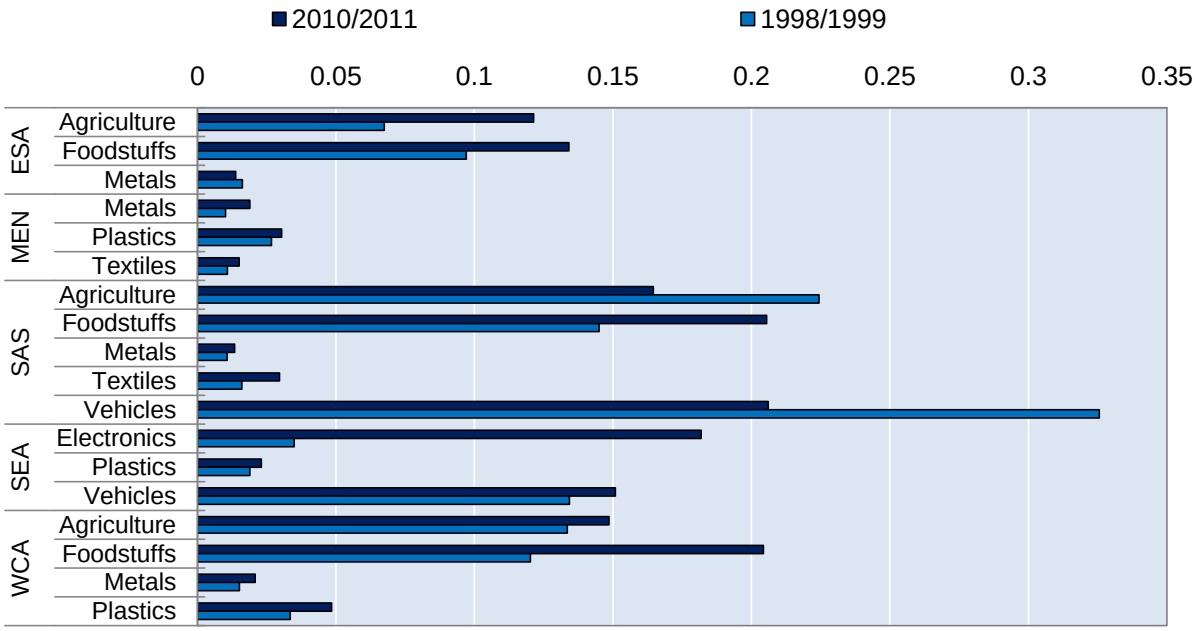


Annex Figure 23. Revealed comparative advantage and complexity of intermediates

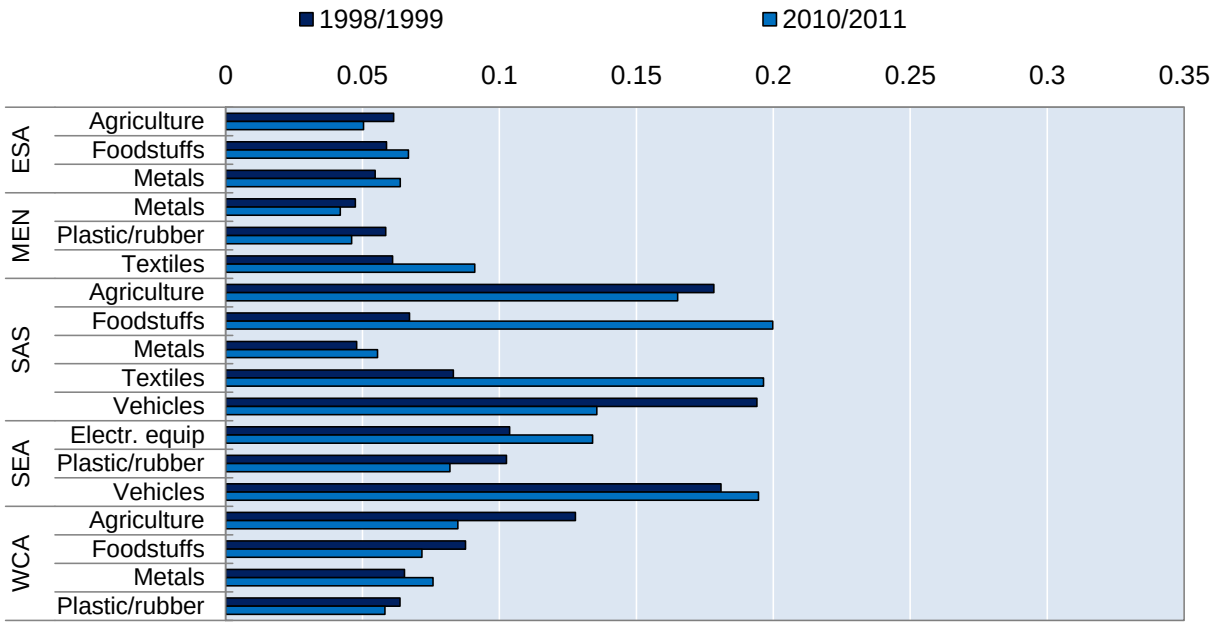


Annex Figure 24. Concentration of intermediate imports in successful activities

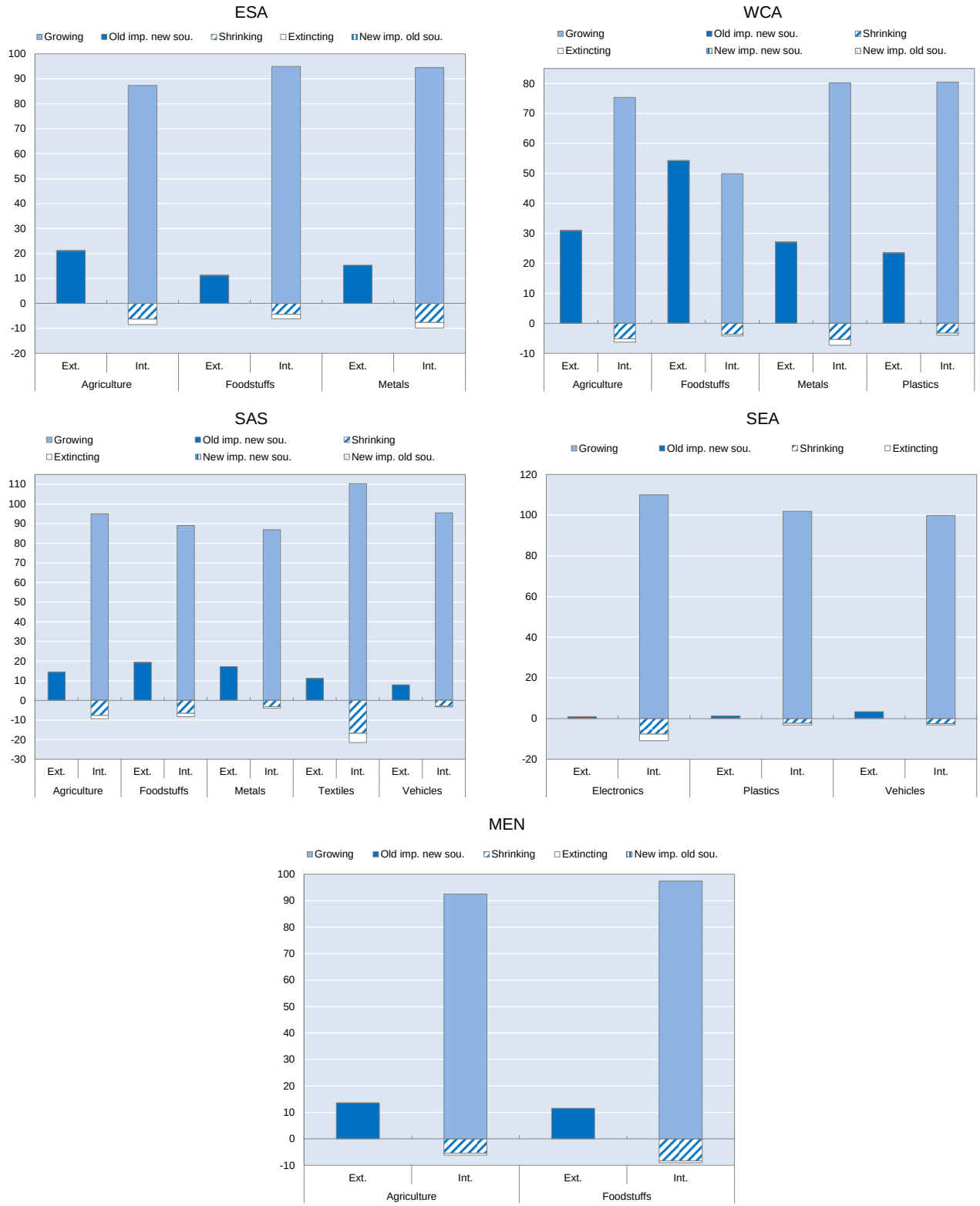
A. Concentration across the types of products imported



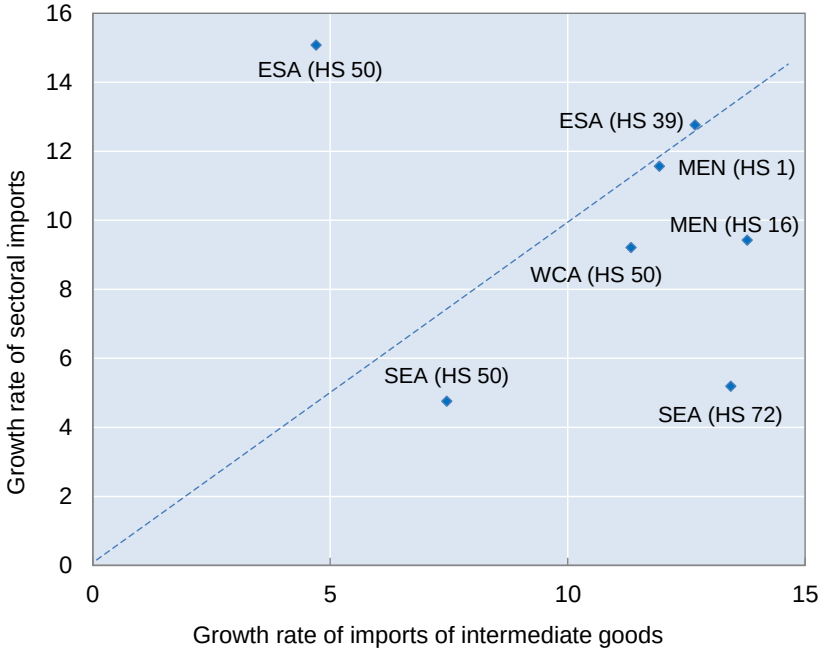
B. Concentration across partners from which inputs are being sourced



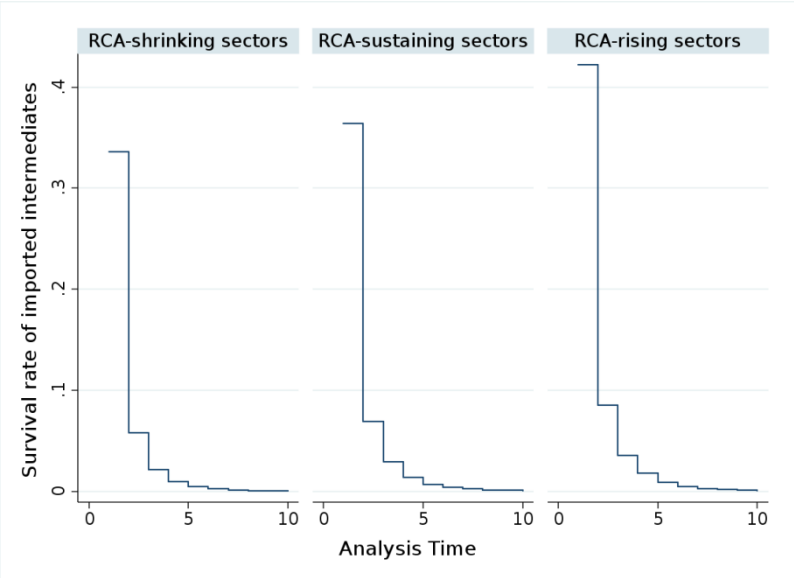
Annex Figure 25. Decomposition of growth in intermediate imports by sector and region



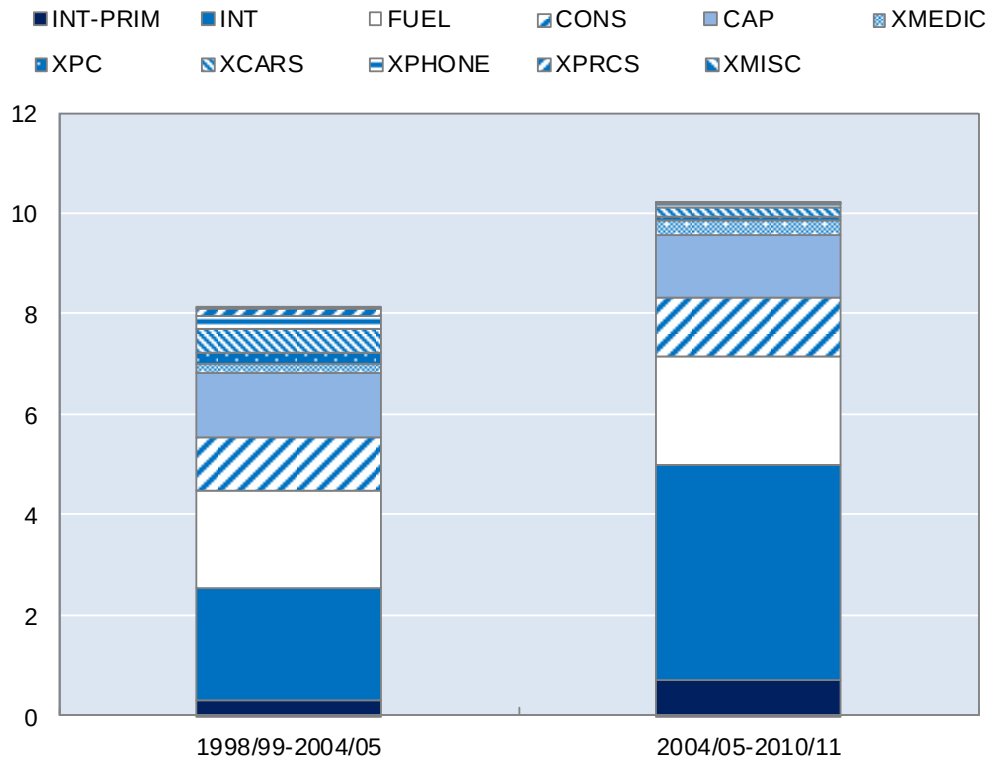
Annex Figure 26. Intermediate goods' dynamics in sector shrinking their comparative advantage



Annex Figure 27. Survival rates of intermediate imports by performance in RCA

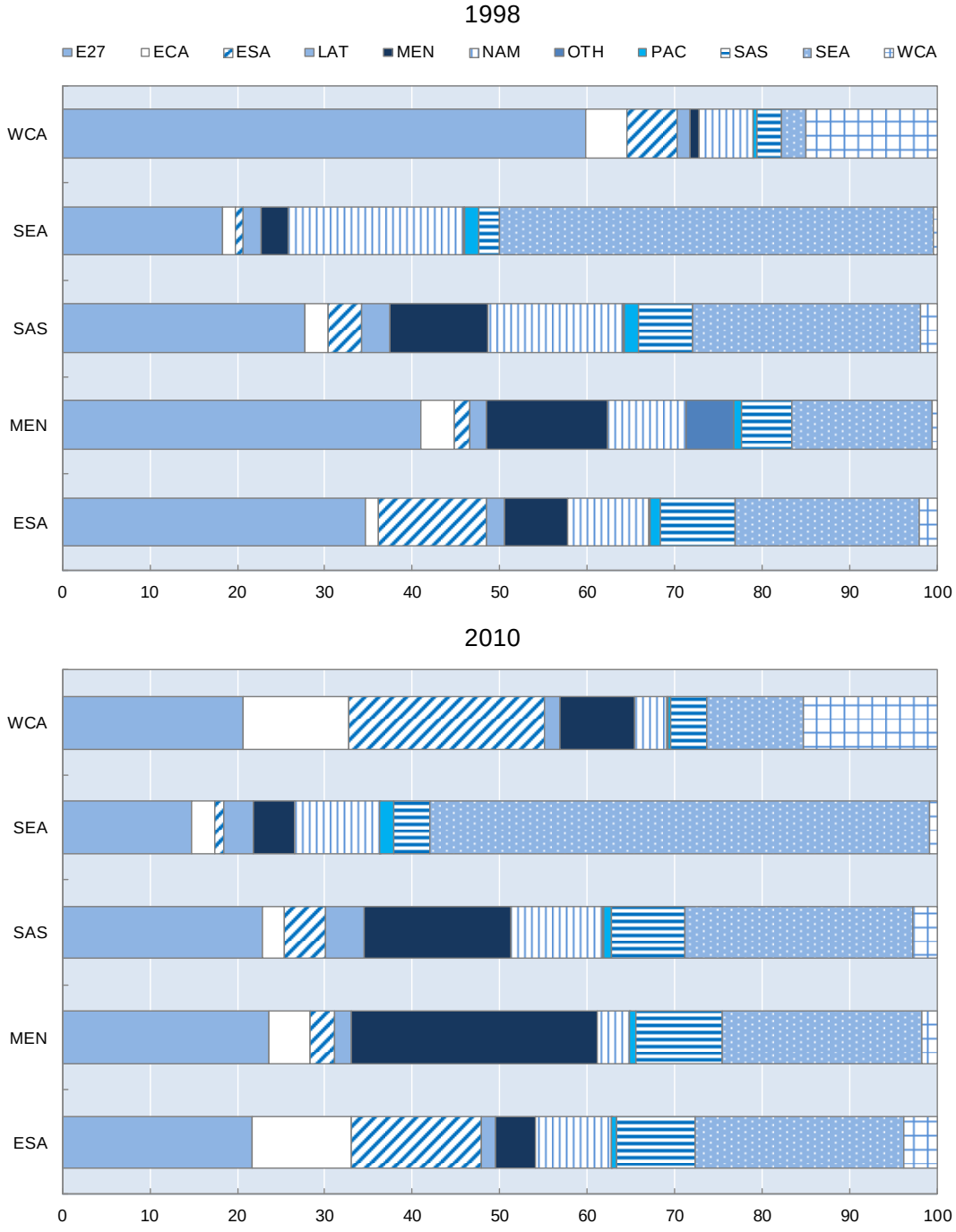


Annex Figure 28. Contributions to total export growth in the world by type of goods



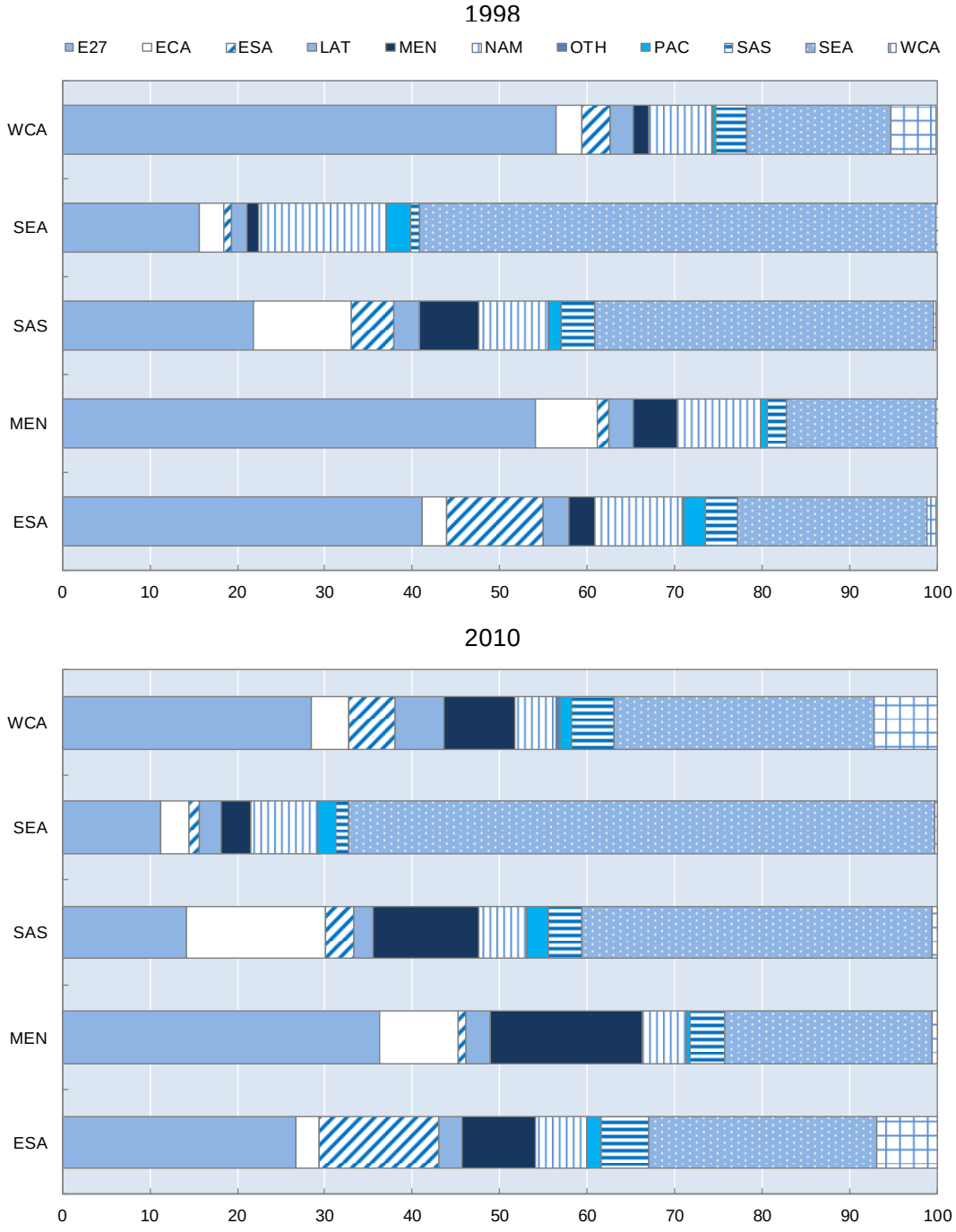
Annex Figure 29. Market orientation of intermediate goods' exports

Percentages



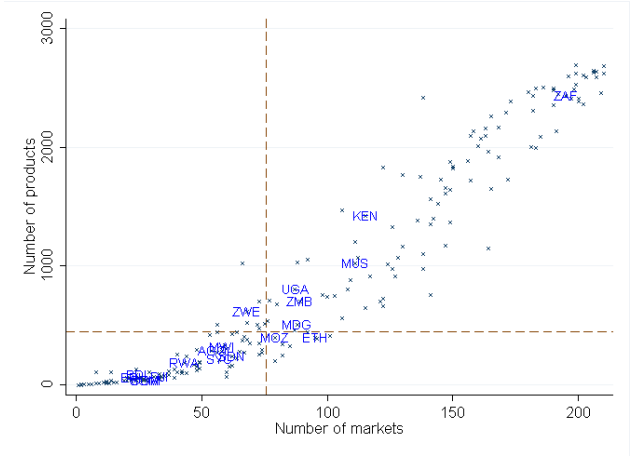
Annex Figure 30. Sources of intermediate goods' imports

Percentages

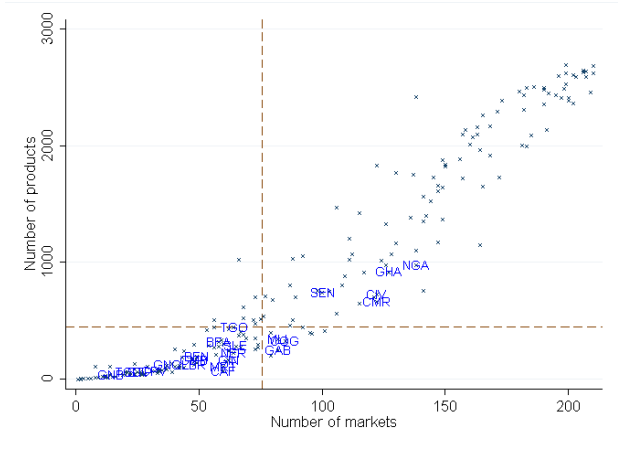


Annex Figure 31. Number of exported intermediates and served markets

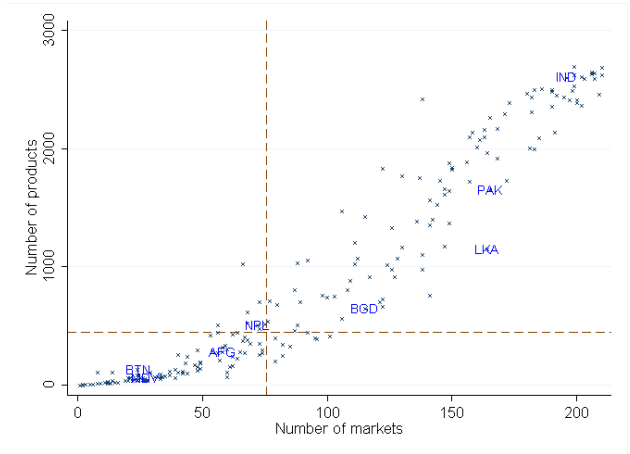
A. Eastern and Southern Africa



B. Western and Central Africa



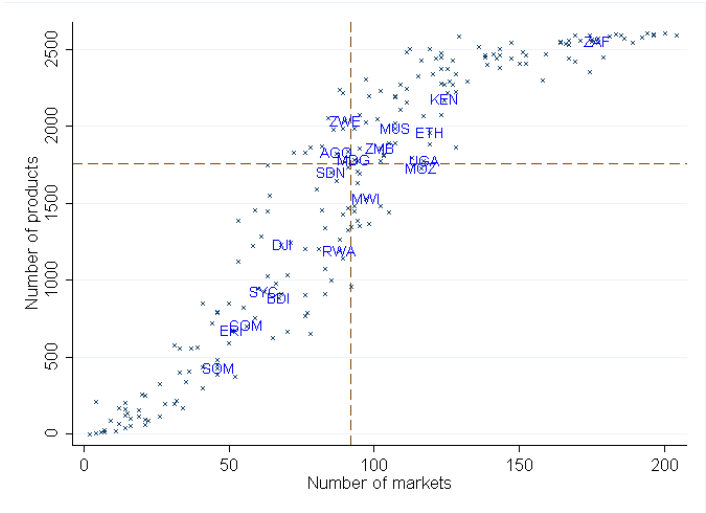
C. South Asia



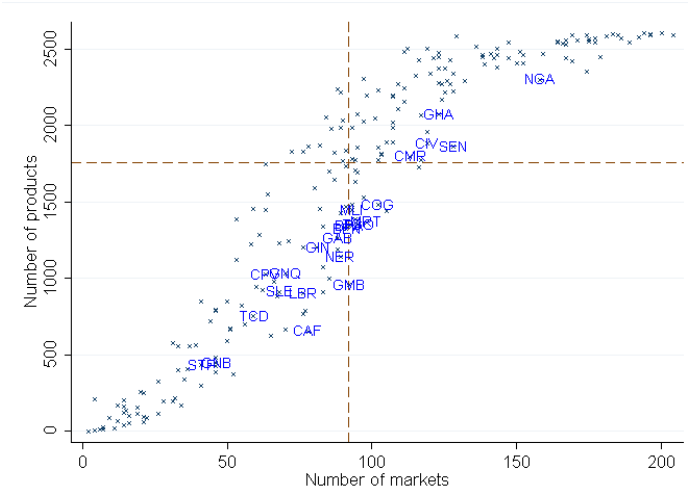
Note: The labelled dots in the three panels show the actual numbers of exported intermediates and served markets for each individual country in, respectively, ESA, WCA and SAS. The unlabelled dots correspond to all other countries in the world (therefore affording a comparative analysis with respect to other countries). The vertical and horizontal lines correspond to the median number of exported intermediates and the median number of served markets. Median values are used instead of mean values because they split the sample into two groups where the half of less performing countries can be found to the left of the vertical line or below the horizontal line.

Annex Figure 32. Number of imported intermediates and served markets from which intermediates are sourced

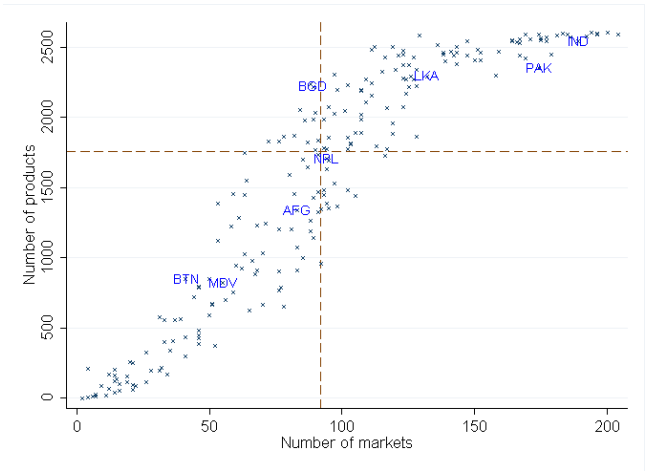
A. Eastern and Southern Africa



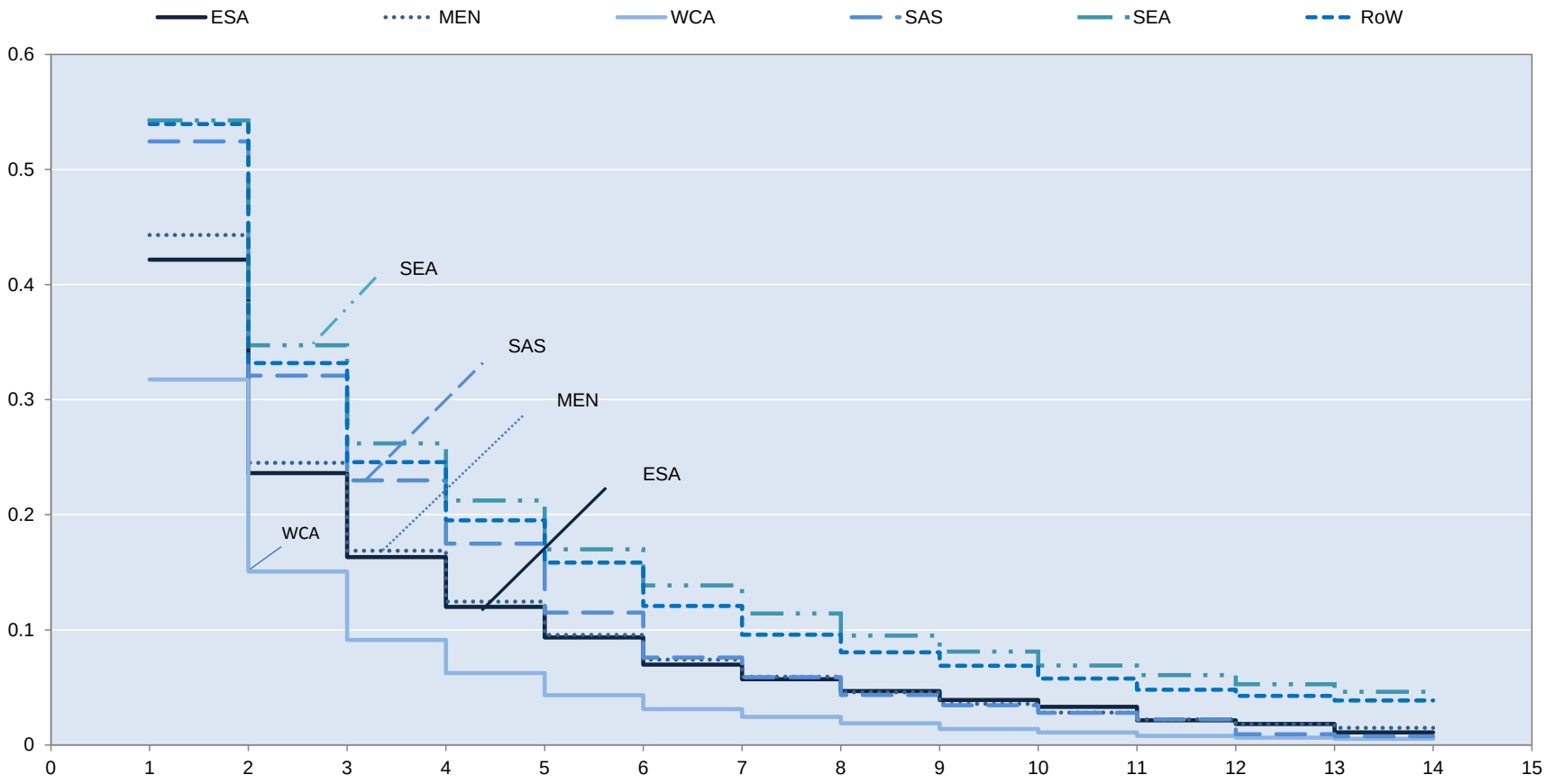
B. Western and Central Africa



C. South Asia

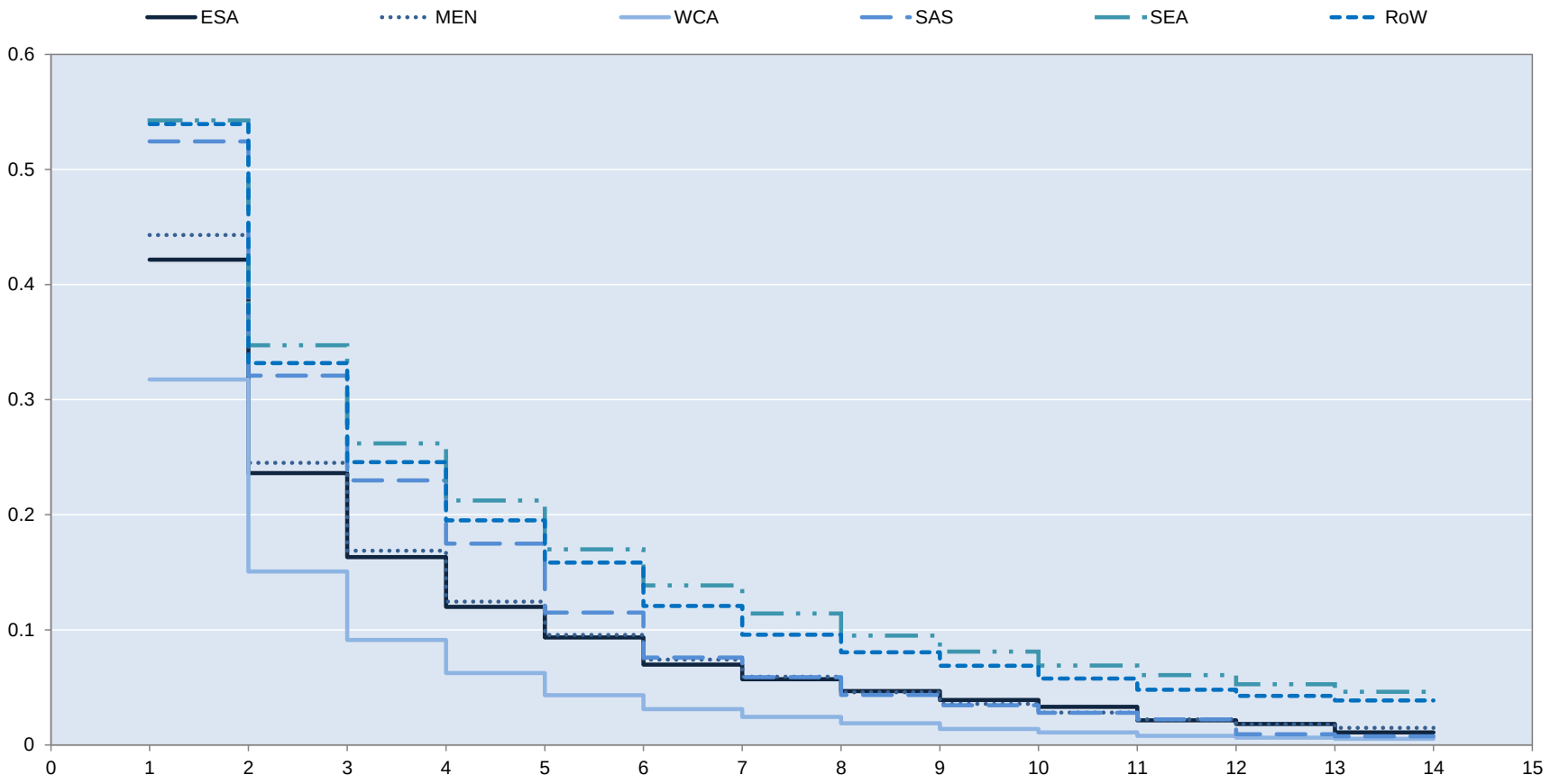


Annex Figure 33. Survival rates of intermediate exports to the world



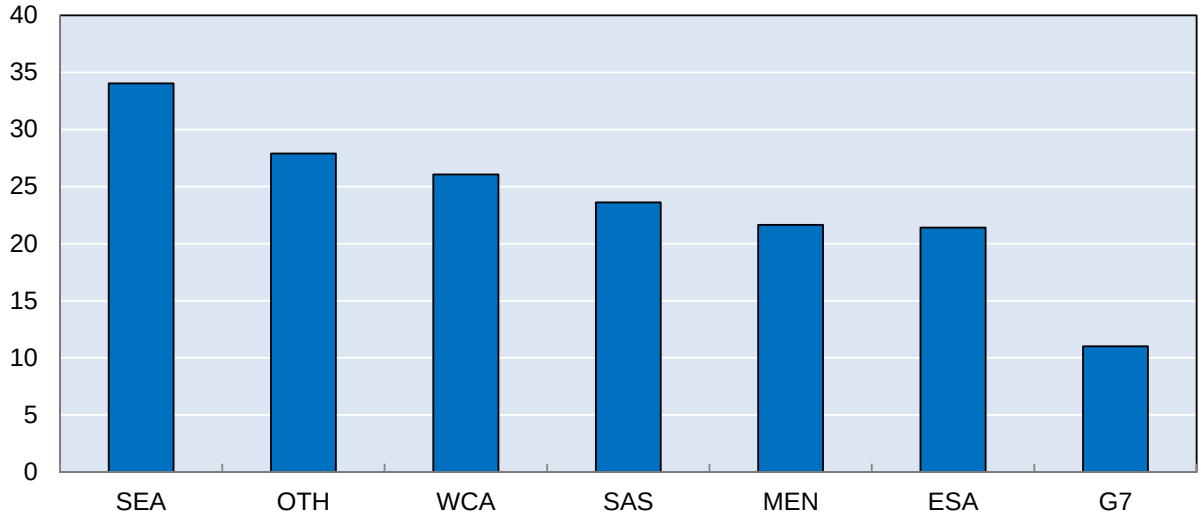
Note: This Figure shows the survival rates for consecutive years of exporting calculated using all the years included in our sample. The maximum duration of an export spell is 14 years and export flows that are launched more than once over the period are considered as different export spells. The process described in these figures has no memory.

Annex Figure 34. Survival rates of intermediate exports to the region



Note: This Figure shows the survival rates for consecutive years of exporting calculated using all the years included in our sample. The maximum duration of an export spell is 14 years and export flows that are launched more than once over the period are considered as different export spells. The process described in these figures has no memory.

Annex Figure 35. Trade in services as % of GDP, average for the period 2000-2012

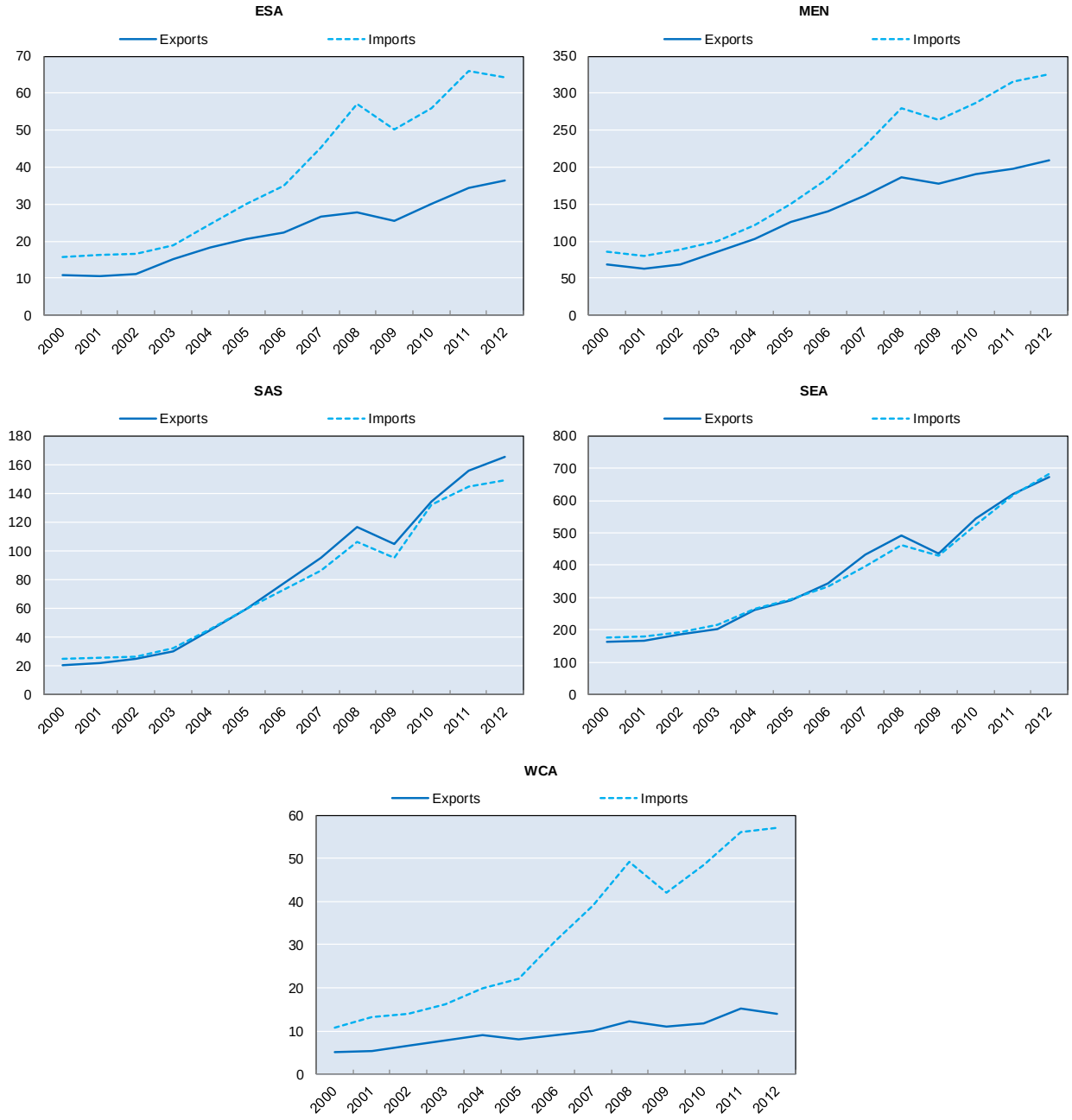


Note: Trade in services represents the sum of service exports and imports divided by the value of GDP.

Source: Authors' calculations based on the World Development Indicators database.

Annex Figure 36. Regional imports and exports evolution for the period 2000 - 2012

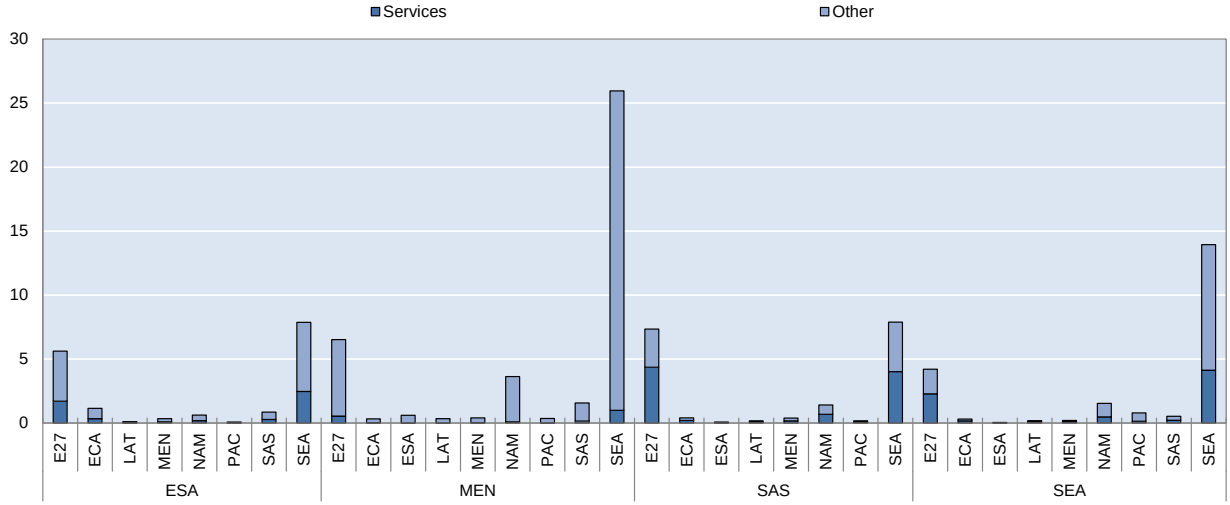
Current USD, thousands



Source: Authors' calculations based on International Trade Centre data.

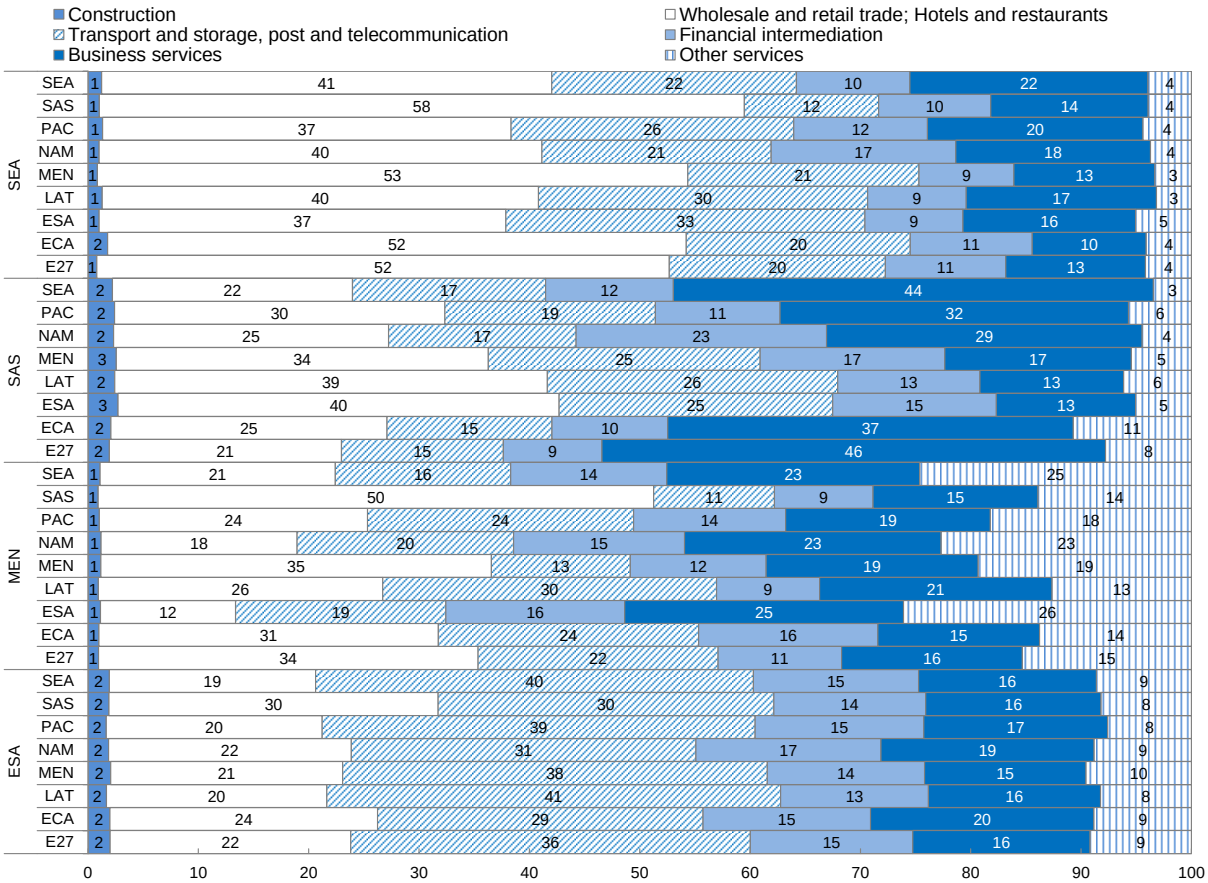
Annex Figure 37. Direction and broad composition of forward linkages

Countries' average forward linkage by origin region and destination region as share of countries' total exports, 2009



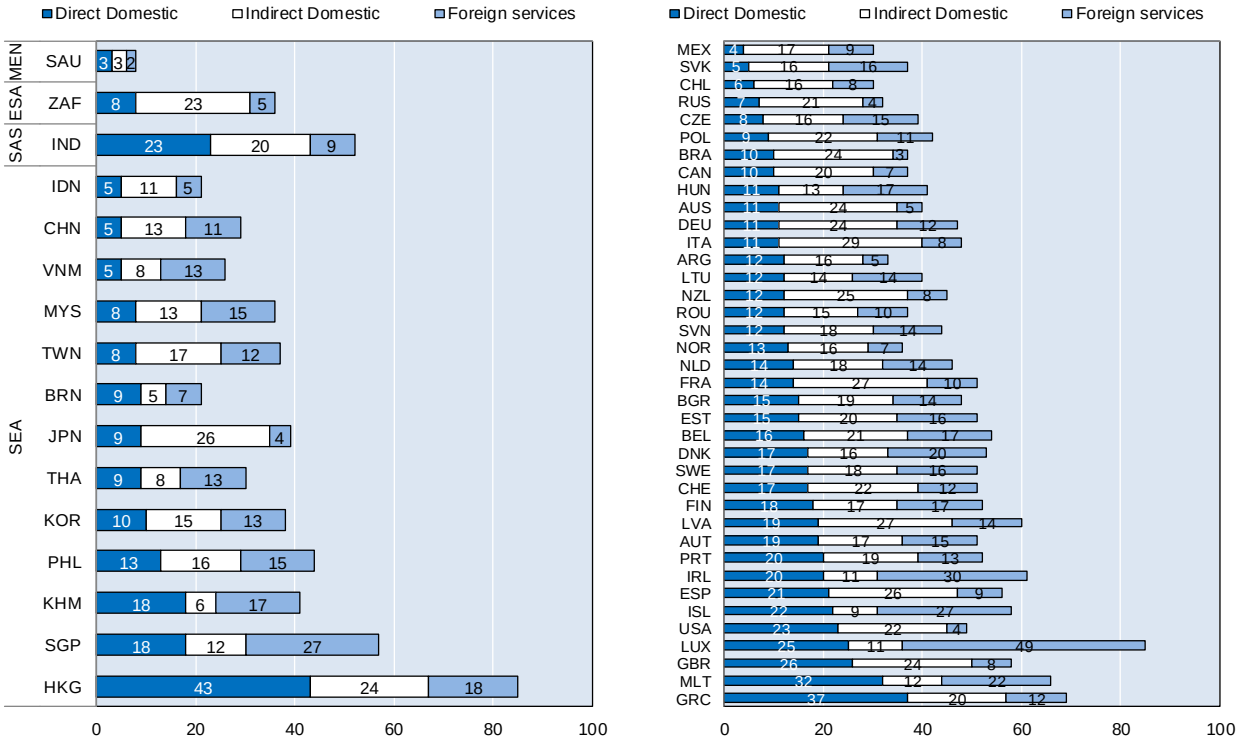
Source: Authors' calculations based on the OECD TiVA database.

Annex Figure 38. Decomposition of forward services linkages by product and destination



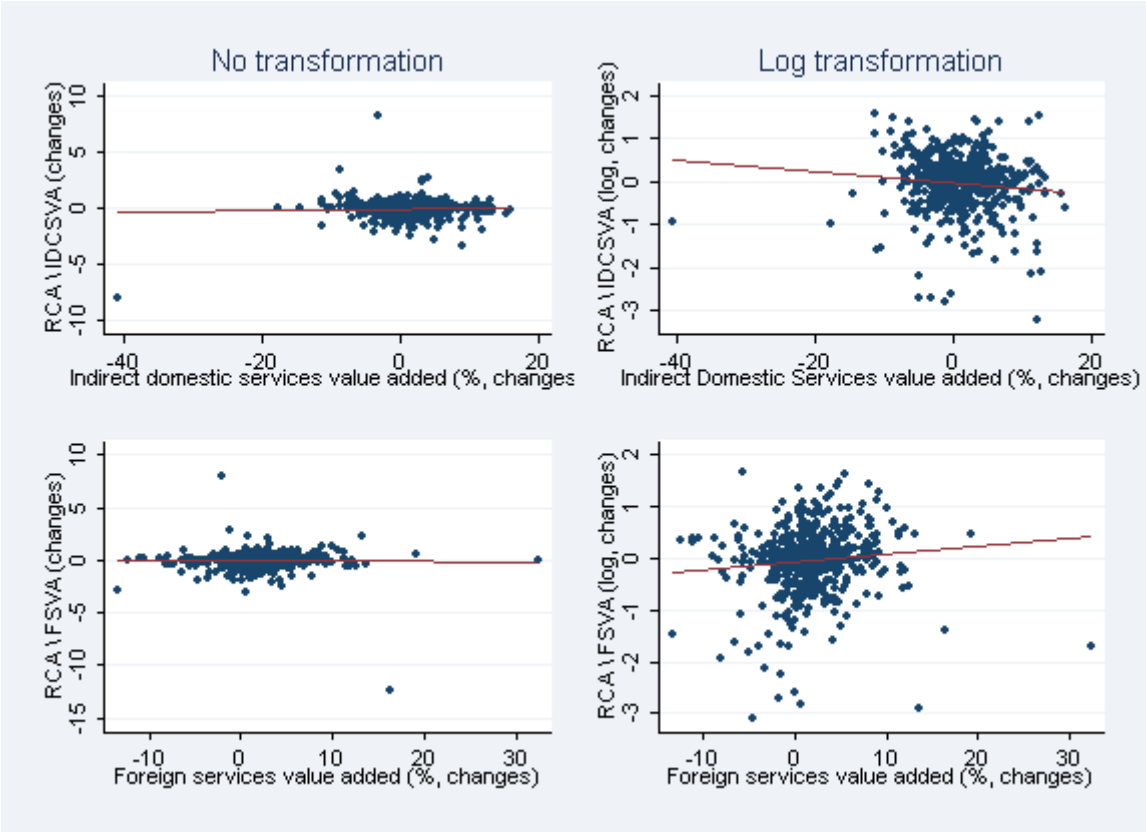
Source: Authors' calculations based on the OECD TiVA database.

Annex Figure 39. Direct, indirect domestic and foreign services value added in exports, 2009



Source: Authors' calculations based on the OECD TiVA database.

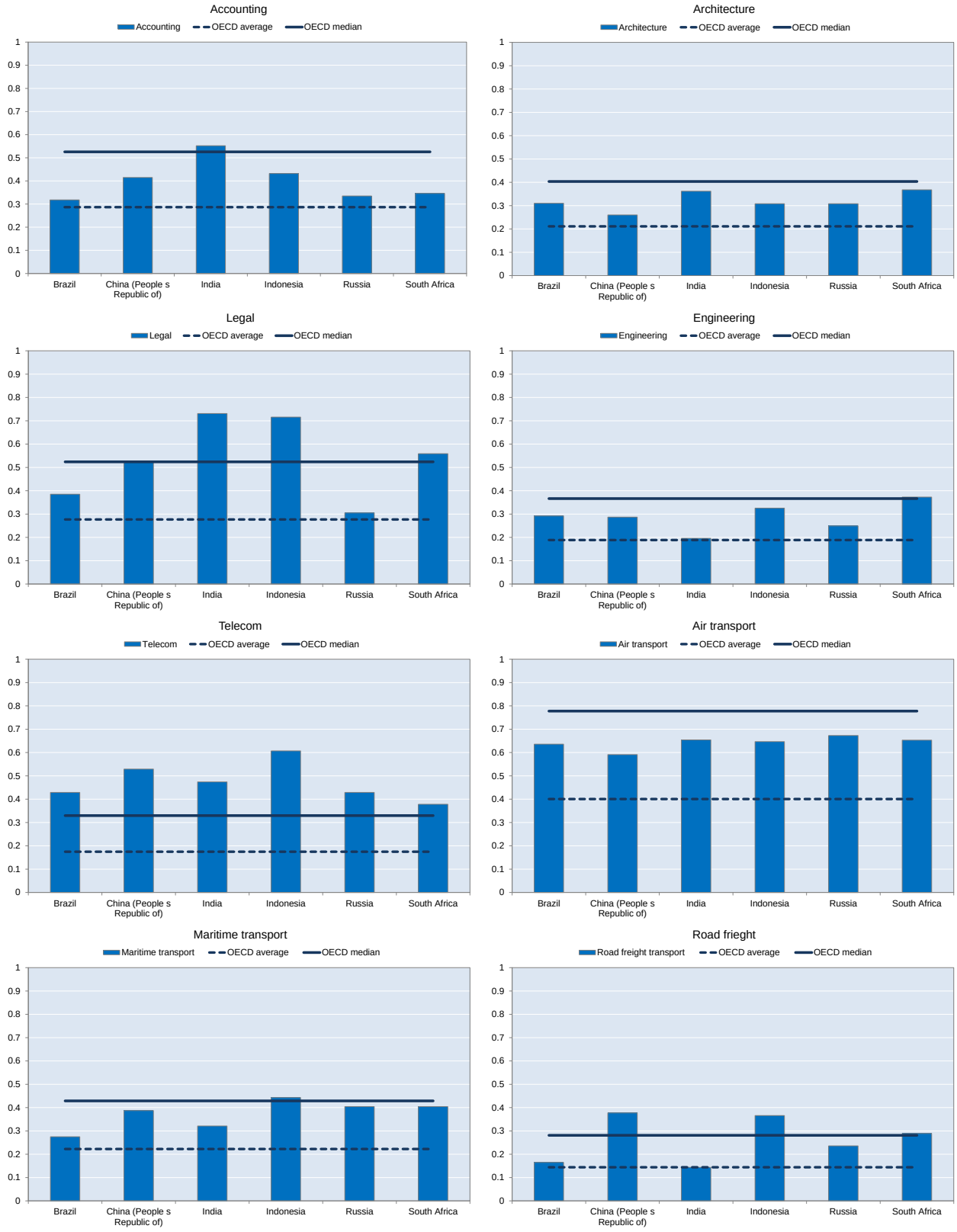
Annex Figure 40. Relation between Revealed comparative advantages free of services value added and services participation changes, 1995 – 2009



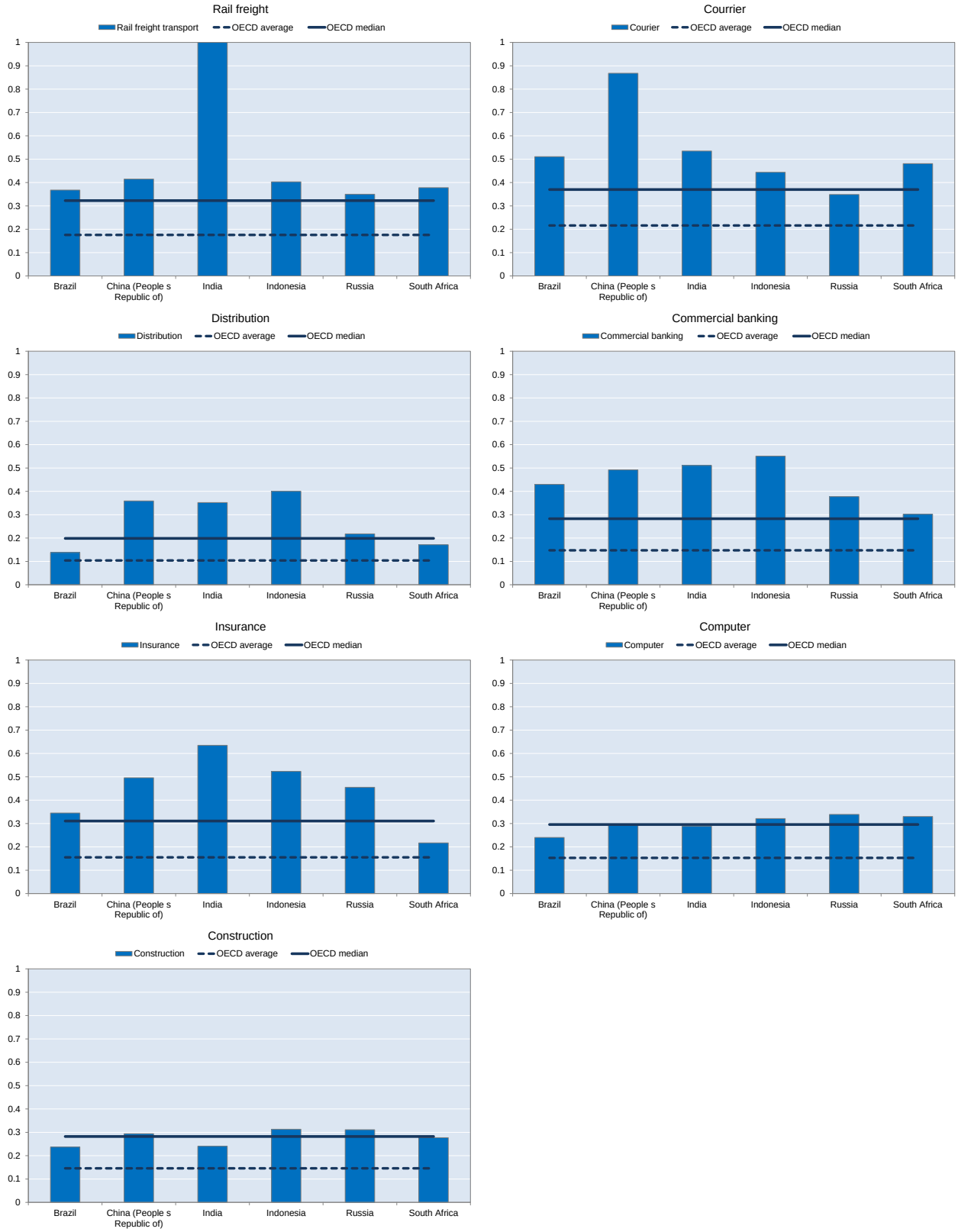
Note: RCA\IDCSVA and RCA\FSVA correspond to Revealed Comparative Advantages free of respectively indirect domestic services value added and foreign services value added. Values correspond to the difference of the value between 1995 and 2009 for each sector, each country. If $RCA_{i,j} > 1$ or if $\log(RCA_{i,j}) > 0$, country i has a revealed comparative advantage in industry j. Indirect domestic services value added and foreign services value added are expressed as percentage of sectors' gross exports.

Source: Authors' calculations based on the OECD TiVA database.

Annex Figure 41. Services trade restrictiveness in Brazil, China, India, Indonesia, Russia and South Africa



Annex Figure 41 (*cont*). Services trade restrictiveness in China, India, Indonesia and South Africa



Source: Authors' calculations based on the OECD STRI database.

Annex Table 1. OECD TiVA country and industry coverage

A. Country coverage

OECD countries
Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States
Other EU countries
Bulgaria, Latvia, Lithuania, Malta, Romania
High-income and emerging economies outside OECD area
Argentina, Brazil, Brunei Darussalam, Cambodia, China (People's Republic of), Hong Kong (China), India, Indonesia, Malaysia, Philippines, Russia, Saudi Arabia, Singapore, South Africa, Chinese Taipei, Thailand, Viet Nam

B. Industry coverage

Agriculture – primary products
Agriculture, hunting, forestry and fishing
Low-tech industries
Wood, paper, paper products, printing and publishing Food products, beverages and tobacco Textiles, textile products, leather and footwear Manufacturing nec; recycling
Medium-low tech industries
Mining and quarrying Basic metals and fabricated metal products
High and medium-high tech industries
Transport equipment Chemicals and non-metallic mineral products Machinery and equipment, nec Electrical and optical equipment Electricity, gas and water supply Construction
Services
Wholesale and retail trade; Hotels and restaurants Transport and storage, post and telecommunication Financial intermediation Business services Other services

Source: OECD TiVA Database.

Annex Table 2. Key country statistics on the selected sample

	OECD TiVA dataset					World				
	Mean	Minimum	Median	Maximum	Countries	Mean	Minimum	Median	Maximum	Countries
GDP per capita	22,199	471	18,050	80,900	56	11,539	144	3,340	147,000	193
GDP (Billion USD)	785	5.98	240	13,100	56	238	0.02	14	13,100	193
Export Intensity	0.53	0.10	0.42	2.29	56	0.44	0.06	0.38	2.29	182
Import Intensity	0.50	0.12	0.38	1.99	56	0.49	0.12	0.44	1.99	182

Source: World Development Indicators (2005). Export and import intensity are calculated as ratios to GDP.

Annex Table 3. Data sources: Core variables

Variable name	Source	Description
UNCTAD_stock_inward	UNCTAD	Inward Stocks of FDI (constant 2005 USD)
WDI_GDP_capita_constant	World Development Indicators - World Bank	GDP per capita (constant 2005 USD)
WDI_GDP_constant	World Development Indicators - World Bank	GDP (constant 2005 USD)
WDI_exports	World Development Indicators - World Bank	Exports of goods and services (constant 2005 USD)
WDI_pop_tot	World Development Indicators - World Bank	Population (Total)
WDI_shmanufac	World Development Indicators - World Bank	Manufacturing Value Added (% of GDP)
dist_activity	CEPII	Weighted distance to activity
distance	CEPII	Distance to the closest 'factory'
sh_exp_rta	WTO database on RTA and TiVA	Share of exports covered by an RTA
sh_imp_rta	WTO database on RTA and TiVA	Share of imports covered by an RTA
tariff_charged	Tariff data from Miroudot et al (2013) and TiVA	Trade weighted tariff charged by the country
tariff_faced	Tariff data from Miroudot et al (2013) and TiVA	Trade weighted tariff faced by the country
tariffint_charged	Tariff data from Miroudot et al (2013) and TiVA	Trade weighted tariff (intermediates) charged by the country
tariffint_faced	Tariff data from Miroudot et al (2013) and TiVA	Trade weighted tariff (intermediates) faced by the country

Annex Table 4. Data sources: Other policies of interest

Variable	Source	TiVA Years	TiVA Countries	Scale	Description
Access to loans (index)	World Economic Forum (Global Competitiveness Report)	2008-2009	55	1-7 discrete	Survey responses to: how easy it is to obtain a bank loan in your country with only a good business plan and no collateral (1 = impossible, 7 = easy).
Broadband subscription (per '000 population)	International Telecommunications Union (ITU)	2000-2009	53	continuous positive	
FDI Regulatory Restrictiveness Index	OECD	1995-2009	50	0-1 continuous	Index measuring statutory restrictions on foreign direct investment in four domains: Foreign equity limitations; Screening or approval mechanisms; Restrictions on the employment of foreigners as key personnel; Operational restrictions, e.g. restrictions on branching and on capital repatriation or on land ownership. Information is gathered by sector and is also aggregated at the country level (which is used in this exrecise). Data are available for 1997, 2003, 2006, 2010, 2011, 2012, and 2013. When the year is not available the closest available observation in time is used.
Infrastructure, availability and quality	Composite PCA score based on a set of World Economic Forum Indicators (Global Competitiveness Report)	2008-2009	56	continuous	The following survey responses are subjected to Principal Component Analysis: How would you assess the quality of overall infrastructure; roads; air transport; ports in your country? [1 = extremely underdeveloped; 7 = extensive and efficient)
Institutional quality	Composite PCA score based on a set of Worldwide Governance Indicators (WGI)	1995-2009	55	continuous	The following indicators are subjected to Principal Component Analysis: Voice and Accountability; Political Stability and Absence of Violence; Government Effectiveness; Regulatory Quality; Rule of Law; Control of Corruption. The score refers to the first PCA component. The World Governance Indicators is a survey dataset summarizing the views on the quality of governance provided by enterprise, citizen and expert respondents. Data are reported by the World Bank and cover the period 1996-2009. When the year is not available the closest available observation in time is used.
Intellectual property protection (index)	World Economic Forum Indicators (Global Competitiveness Report)	2008-2009	55	1-7 discrete	Survey responses to: how would you rate intellectual property protection, including anti-counterfeiting measures, in your country? (1 = very weak; 7 = very strong)
Logistics Performance Index (customs)	World Bank	2005-2009	55	1-5 continuous	Index based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. Six dimensions of trade are covered, of which one is used in this exrecise: The efficiency of customs and border management clearance ("Customs"). Data are reported by the World Bank for 2007, 2010, 2012, 2014. When the year is not available the closest available observation in time is used.
Product Market Regulation	OECD	1995, 2005, 2008	40	1-6 continuous	Composite Index measuring the degree to which policies promote or inhibit competition in areas of the product market where competition is viable.The inputs cover formal regulations in the following areas: state control of business enterprises; legal and administrative barriers to entrepreneurship; barriers to international trade and investment. Data are available for 1998, 2003, 2008 and 2013. When the year is not available the closest available observation in time is used.
Quality of Electricity supply (index)	World Economic Forum Indicators (Global Competitiveness Report)	2008-2009	55	1-7 discrete	Survey responses to: how would you assess the quality of the electricity supply in your country? [1 = insufficient and suffers frequent interruptions; 7 = sufficient and reliable]
R&D expenditure (% GDP)	World Development Indicators	2000-2009	51	0-100 continuous	
Tax rate (total)	World Development Indicators	2005-2009	53	0-100 continuous	Total tax rate measures the amount of taxes and mandatory contributions payable by businesses after accounting for allowable deductions and exemptions as a share of commercial profits.
Technical occupations (share of worlforce)	International Labour Organisation (ILO)	1995-2008	55	0-1 continuous	Calculations based on ILO occupations data from LABSTAT. The share of technical occupations aggregates the following categories: 3 Technicians and associate professionals; 6 Agriculture, animal husbandry and forestry workers, fishermen and hunters; 7 Craft and related trade workers; 8 Plant and machine operators and assemblers; 9 Elementary occupations
Tertiary graduates (share of workforce)	World Development Indicators	1995-2009	51	0-100 continuous	
Unit Labour Costs	OECD	1995-2009	31	continuous positive	Level of Unit Labour costs in constant USD (2005). Unit labour costs are calculated as the ratio of total labour costs to real output, or equivalently, as the ratio of average labour costs per hour to labour productivity (output per hour).

Annex Table 5. Auxiliary regression results: Backward, forward and gross exports volumes

	Backward		Forward	
	I	II	I	II
Tariffs charged (weighted average)	-0.085	-0.011	-0.141**	-0.092
	(0.059)	(0.057)	(0.059)	(0.077)
Tariffs faced (weighted average)	0.019	0.003	-0.147*	-0.157**
	(0.064)	(0.060)	(0.077)	(0.078)
Share of imports covered by PTA	0.193**	0.195**	-0.093	-0.092
	(0.083)	(0.082)	(0.099)	(0.099)
Share of exports covered by PTA	-0.053	-0.077	-0.005	-0.021
	(0.071)	(0.069)	(0.115)	(0.118)
Revealed FDI openess [1]	0.290***	0.289***	-0.089	-0.089
	(0.072)	(0.069)	(0.060)	(0.061)
Share of manufacturing in GDP	0.388***	0.424***	-0.173**	-0.150**
	(0.056)	(0.053)	(0.070)	(0.071)
Distance to closest manufacturing hub (log)	-0.474***	-0.476***	0.173	0.172
	(0.091)	(0.088)	(0.145)	(0.145)
Distance to economic activity (log)	0.185	0.182	-0.067	-0.070
	(0.115)	(0.113)	(0.166)	(0.165)
GDP (log)	-0.283***	-0.238***	0.154***	0.183***
	(0.063)	(0.059)	(0.037)	(0.040)
Population (log)		-0.145***		-0.095*
		(0.055)		(0.049)
Year fixed effects	Yes	Yes	Yes	Yes
Robust standard errors	Yes	Yes	Yes	Yes
Observations	251	251	251	251
R-squared	0.578	0.594	0.213	0.220

Source: Calculations on OECD TiVA database.

Annex Table 6. Broad sector regression results: Backward participation ratios

Backward

	Agriculture		Mining		Manufacturing		Services*	
	I	II	I	II	I	II	I	II
Tariffs charged (weighted average)	-0.063	-0.027	-0.159**	-0.170**	-0.049	-0.005		
	(0.050)	(0.038)	(0.063)	(0.073)	(0.057)	(0.058)		
Tariffs faced (weighted average)	-0.066**	-0.043	-0.002	-0.003	-0.181***	-0.187***		
	(0.029)	(0.029)	(0.045)	(0.044)	(0.038)	(0.039)		
Share of imports covered by PTA	0.05	0.049	-0.126	-0.126	-0.139	-0.146	0	-0.009
	(0.173)	(0.174)	(0.111)	(0.112)	(0.162)	(0.162)	(0.049)	(0.049)
Share of exports covered by PTA	0.069	0.038	-0.033	-0.032	0.232*	0.209		
	(0.143)	(0.146)	(0.109)	(0.110)	(0.129)	(0.129)		
Revealed FDI openess 1	0.240*	0.235*	0.668***	0.669***	0.214*	0.211*	0.264***	0.259***
	(0.137)	(0.138)	(0.090)	(0.091)	(0.121)	(0.118)	(0.092)	(0.092)
Share of manufacturing in GDP	0.029	0.047	0.164**	0.159**	0.07	0.097	0.091*	0.101*
	(0.077)	(0.077)	(0.074)	(0.078)	(0.084)	(0.075)	(0.051)	(0.052)
Distance to closest manufacturing hub (log	-0.055	-0.075	-0.159*	-0.158*	-0.549***	-0.561***	-0.161	-0.171*
	(0.138)	(0.137)	(0.088)	(0.088)	(0.180)	(0.173)	(0.096)	(0.095)
Distance to economic activity (log)	-0.032	-0.018	0.005	0.005	0.342*	0.346*	0.067	0.077
	(0.160)	(0.159)	(0.125)	(0.126)	(0.203)	(0.195)	(0.107)	(0.106)
GDP (log)	-0.058	-0.036	-0.066***	-0.071***	-0.293***	-0.258**	-0.147**	-0.134**
	(0.069)	(0.061)	(0.023)	(0.023)	(0.105)	(0.098)	(0.060)	(0.058)
Population (log)		-0.125***		0.017		-0.131**		-0.053**
		(0.030)		(0.032)		(0.051)		(0.026)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered standard errors (country and se	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	235	235	226	226	2105	2105	1368	1368
R-squared	0.388	0.422	0.566	0.566	0.381	0.396	0.291	0.296

Excluding energy.

Source: Calculations on OECD TiVA database.

Annex Table 7. Detailed sector regression results: Backward participation ratios

	Backward participation													
	Agriculture, Hunting, Forestry, Fishing		Food, beverages and tobacco		Textiles, wearing apparel, leather		Coke, petroleum chemicals, rubber, plastics		Metals		Machinery, equipment, precision instruments		Motor vehicles and transport equipment	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Tariffs charged (weighted average)	-0.063*	-0.027	-0.002	0.008	-0.028	0.051	-0.067	0.013	-0.03	0.067	-0.128	-0.028	0.049	0.138**
	(0.035)	(0.028)	(0.025)	(0.020)	(0.063)	(0.058)	(0.074)	(0.090)	(0.074)	(0.076)	(0.089)	(0.089)	(0.068)	(0.059)
Tariffs faced (weighted average)	-0.066***	-0.043*	0.028	0.021	-0.297***	-0.283***	0.137	0.127	-0.01	-0.015	-0.385	-0.389	-0.365**	-0.342**
	(0.022)	(0.022)	(0.030)	(0.030)	(0.087)	(0.084)	(0.160)	(0.153)	(0.176)	(0.170)	(0.274)	(0.261)	(0.150)	(0.139)
Share of imports covered by PTA	0.05	0.049	0.159	0.157	0.099	0.097	-0.265*	-0.274*	-0.312**	-0.298**	-0.088	-0.095	0.105	0.087
	(0.117)	(0.118)	(0.102)	(0.100)	(0.112)	(0.107)	(0.141)	(0.141)	(0.126)	(0.121)	(0.120)	(0.117)	(0.149)	(0.145)
Share of exports covered by PTA	0.069	0.038	0.086	0.063	0.002	-0.038	0.286**	0.275**	0.338***	0.287**	0.084	0.05	0.204*	0.169
	(0.099)	(0.102)	(0.092)	(0.092)	(0.103)	(0.100)	(0.129)	(0.131)	(0.115)	(0.113)	(0.125)	(0.123)	(0.112)	(0.110)
Revealed FDI openess 1	0.240***	0.235***	0.326***	0.323***	0.159*	0.159*	0.305***	0.307***	0.1	0.098	0.227***	0.223***	0.105*	0.097*
	(0.079)	(0.080)	(0.087)	(0.087)	(0.094)	(0.092)	(0.074)	(0.072)	(0.076)	(0.075)	(0.064)	(0.061)	(0.058)	(0.056)
Share of manufacturing in GDP	0.029	0.047	0.076	0.094	0.003	0.049	0.075	0.105*	-0.115*	-0.071	0.178***	0.220***	0.145**	0.177***
	(0.046)	(0.046)	(0.057)	(0.057)	(0.061)	(0.057)	(0.063)	(0.061)	(0.060)	(0.055)	(0.065)	(0.059)	(0.066)	(0.060)
Distance to closest manufacturing hub (log)	-0.055	-0.075	-0.234**	-0.237**	-0.811***	-0.817***	-0.377***	-0.384***	-0.841***	-0.859***	-0.807***	-0.844***	-0.379***	-0.391***
	(0.081)	(0.081)	(0.105)	(0.104)	(0.122)	(0.115)	(0.125)	(0.121)	(0.111)	(0.107)	(0.128)	(0.122)	(0.120)	(0.112)
Distance to economic activity (log)	-0.032	-0.018	0.071	0.071	0.627***	0.618***	0.143	0.14	0.589***	0.585***	0.506***	0.527***	0.230*	0.213*
	(0.094)	(0.094)	(0.118)	(0.117)	(0.137)	(0.130)	(0.144)	(0.142)	(0.132)	(0.129)	(0.145)	(0.140)	(0.132)	(0.124)
GDP (log)	-0.058	-0.036	-0.159***	-0.138***	-0.280***	-0.220***	-0.245***	-0.207***	-0.386***	-0.331***	-0.457***	-0.400***	-0.281***	-0.219***
	(0.037)	(0.032)	(0.044)	(0.042)	(0.068)	(0.061)	(0.059)	(0.056)	(0.061)	(0.054)	(0.081)	(0.075)	(0.061)	(0.053)
Population (log)		-0.125***		-0.083**		-0.220***		-0.126**		-0.188***		-0.197***		-0.221***
		(0.020)		(0.040)		(0.046)		(0.060)		(0.055)		(0.066)		(0.056)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	235	235	235	235	235	235	235	235	234	234	235	235	234	234
R-squared	0.388	0.422	0.47	0.48	0.426	0.474	0.416	0.429	0.527	0.558	0.497	0.52	0.383	0.432

Source: Calculations on OECD TiVA database.

Annex Table 8. Drivers of participation by income group using OECD TiVA

	Backward						Forward					
	Total		High-income		Developing *		Total		High-income		Developing *	
	I	II	I	II	I	II	I	II	I	II	I	II
Tariffs charged (weighted average)	-0.117	-0.045	0	0.018	-0.197*	-0.217*	-0.117	-0.061	-0.095	0.147	-0.099	0.002
	(0.093)	(0.090)	(0.142)	(0.147)	(0.098)	(0.109)	(0.086)	(0.112)	(0.244)	(0.147)	(0.149)	(0.201)
Tariffs faced (weighted average)	-0.003	-0.017	-0.046	-0.046	0.009	0.015	-0.304*	-0.315**	-0.148	-0.16	-0.676**	-0.705***
	(0.084)	(0.079)	(0.105)	(0.106)	(0.108)	(0.111)	(0.152)	(0.153)	(0.210)	(0.183)	(0.236)	(0.242)
Share of imports covered by PTA	0.21	0.207	0.233	0.233	-0.173	-0.18	-0.059	-0.061	-0.249*	-0.254*	0.539**	0.576**
	(0.136)	(0.134)	(0.175)	(0.176)	(0.135)	(0.129)	(0.162)	(0.164)	(0.138)	(0.138)	(0.234)	(0.224)
Share of exports covered by PTA	-0.073	-0.096	-0.312**	-0.307**	0.118	0.126	-0.024	-0.041	0.323	0.396**	-0.914***	-0.953***
	(0.123)	(0.119)	(0.129)	(0.134)	(0.165)	(0.169)	(0.206)	(0.214)	(0.221)	(0.191)	(0.292)	(0.308)
Revealed FDI openess 1	0.268**	0.269**	0.390***	0.387***	0.685	0.712	-0.113	-0.113	-0.177*	-0.213**	-0.568	-0.701*
	(0.118)	(0.111)	(0.090)	(0.090)	(0.431)	(0.424)	(0.098)	(0.102)	(0.091)	(0.095)	(0.422)	(0.386)
Share of manufacturing in GDP	0.388***	0.423***	0.720***	0.719***	-0.06	-0.056	-0.202	-0.175	-0.370**	-0.378**	-0.03	-0.051
	(0.099)	(0.093)	(0.094)	(0.095)	(0.114)	(0.116)	(0.132)	(0.138)	(0.179)	(0.155)	(0.126)	(0.132)
Distance to closest manufacturing hub (log)	-0.483***	-0.484***	0.289	0.271	-1.035***	-1.015***	0.164	0.163	-0.657*	-0.895**	0.206	0.107
	(0.159)	(0.151)	(0.292)	(0.307)	(0.208)	(0.213)	(0.197)	(0.198)	(0.380)	(0.402)	(0.152)	(0.132)
Distance to economic activity (log)	0.191	0.187	-0.541*	-0.523	0.852**	0.831**	-0.006	-0.009	0.759*	1.003**	0.183	0.289
	(0.196)	(0.192)	(0.309)	(0.325)	(0.336)	(0.332)	(0.245)	(0.244)	(0.382)	(0.390)	(0.280)	(0.211)
GDP (log)	-0.280**	-0.239**	-0.224***	-0.149	-0.198	-0.353	0.154**	0.186***	0.135**	1.132**	-0.825**	-0.041
	(0.114)	(0.108)	(0.079)	(0.352)	(0.301)	(0.532)	(0.061)	(0.066)	(0.053)	(0.444)	(0.383)	(0.763)
Population (log)		-0.139*		-0.401		0.046		-0.107		-5.276**		-0.23
		(0.074)		(1.824)		(0.109)		(0.071)		(2.324)		(0.209)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered standard errors (country and year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	231	231	124	124	65	65	231	231	124	124	65	65
R-squared	0.588	0.603	0.713	0.713	0.722	0.724	0.255	0.264	0.348	0.436	0.53	0.556

Note: * countries in the first and second percentile of the world GDP per capita distribution each year.

Source: Calculations on OECD TiVA database.

Annex Table 9. Drivers of participation by income group using EORA

	Backward								Forward							
	Total		High-income		Middle-income		Low-income		Total		High-income		Middle-income		Low-income	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Tariffs charged (weighted average)	-0.095***	-0.054*	-0.046	-0.019	-0.132**	-0.135***	-0.071	-0.069	-0.126***	-0.116***	-0.316***	-0.206***	0.031	0.036	-0.135**	-0.107
	(0.029)	(0.030)	(0.037)	(0.041)	(0.052)	(0.052)	(0.047)	(0.052)	(0.030)	(0.032)	(0.060)	(0.070)	(0.042)	(0.042)	(0.065)	(0.065)
Tariffs faced (weighted average)	0.084***	0.082***	-0.266***	-0.251***	-0.004	-0.005	0.067*	0.066*	-0.196***	-0.196***	-0.438***	-0.380***	-0.292***	-0.291***	-0.124**	-0.129***
	(0.029)	(0.028)	(0.081)	(0.082)	(0.065)	(0.065)	(0.036)	(0.036)	(0.033)	(0.033)	(0.107)	(0.103)	(0.056)	(0.056)	(0.049)	(0.048)
Share of imports covered by PTA	0.115*	0.065	-0.210***	-0.260***	0.089	0.088	0.206***	0.206***	0.203***	0.191***	0.360*	0.159	0.532***	0.533***	0.019	0.012
	(0.061)	(0.058)	(0.063)	(0.069)	(0.185)	(0.185)	(0.063)	(0.063)	(0.060)	(0.059)	(0.188)	(0.190)	(0.131)	(0.130)	(0.076)	(0.076)
Share of exports covered by PTA	-0.088	-0.086	0.018	0.092	-0.044	-0.041	-0.06	-0.061	-0.094	-0.093	-0.29	0.009	-0.581***	-0.586***	0.134	0.121
	(0.067)	(0.066)	(0.074)	(0.089)	(0.184)	(0.183)	(0.064)	(0.063)	(0.064)	(0.064)	(0.198)	(0.208)	(0.133)	(0.133)	(0.097)	(0.098)
Revealed FDI openess 1	0.489***	0.484***	0.852***	0.842***	0.680***	0.678***	0.161***	0.162***	0.015	0.014	-0.017	-0.058	0.021	0.025	0.043	0.05
	(0.053)	(0.052)	(0.056)	(0.055)	(0.162)	(0.163)	(0.050)	(0.050)	(0.047)	(0.047)	(0.056)	(0.046)	(0.138)	(0.138)	(0.186)	(0.185)
Share of manufacturing in GDP	0.228***	0.303***	0.652***	0.658***	0.559***	0.558***	-0.006	-0.007	-0.173***	-0.156***	-0.189*	-0.164*	-0.059	-0.058	-0.259***	-0.264***
	(0.070)	(0.075)	(0.051)	(0.051)	(0.164)	(0.164)	(0.063)	(0.063)	(0.049)	(0.054)	(0.097)	(0.085)	(0.095)	(0.095)	(0.097)	(0.097)
Distance to closest manufacturing hub (log)	-0.07	-0.121*	0.449***	0.391***	0.05	0.078	-0.292***	-0.290***	-0.170***	-0.182***	-0.106	-0.340***	0.041	-0.011	-0.347***	-0.329***
	(0.070)	(0.065)	(0.102)	(0.106)	(0.191)	(0.213)	(0.077)	(0.078)	(0.061)	(0.061)	(0.126)	(0.124)	(0.141)	(0.155)	(0.091)	(0.092)
Distance to economic activity (log)	-0.146	-0.106	-0.524***	-0.465***	-0.271	-0.298	0.126	0.124	0.195***	0.205***	0.057	0.293**	0.035	0.085	0.627***	0.607***
	(0.094)	(0.089)	(0.084)	(0.091)	(0.261)	(0.281)	(0.115)	(0.115)	(0.069)	(0.068)	(0.118)	(0.116)	(0.173)	(0.185)	(0.124)	(0.127)
GDP (log)	-0.149***	-0.112***	-0.106***	-0.021	-0.747***	-0.897***	-1.039***	-0.871	-0.056***	-0.047***	-0.069***	0.272***	-0.119	0.156	0	1.807*
	(0.012)	(0.009)	(0.009)	(0.043)	(0.133)	(0.274)	(0.219)	(1.061)	(0.012)	(0.012)	(0.016)	(0.054)	(0.082)	(0.195)	(0.224)	(0.971)
Population (log)		-0.134***		-0.438**		0.046		-0.019		-0.032**		-1.762***		-0.085*		-0.204**
		(0.018)		(0.216)		(0.058)		(0.104)		(0.014)		(0.288)		(0.048)		(0.097)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered standard errors (country and year)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	834	834	202	202	325	325	307	307	834	834	202	202	325	325	307	307
R-squared	0.336	0.368	0.859	0.862	0.338	0.338	0.315	0.315	0.147	0.149	0.315	0.389	0.24	0.244	0.147	0.153

Note: * Countries in the first, second and third percentile of the world GDP per capita distribution each year.

Source: Calculations on EORA database.

Annex Table 10. Gravity results on bilateral Value-Added flows by development status

	Value-Added flow		
	Total	High-income	Developing *
GDP	0.094***	0.074***	0.621***
	(0.002)	(0.002)	(0.018)
GDP **partner**	0.191***	0.208***	0.167***
	(0.002)	(0.003)	(0.005)
Distance	-0.053***	-0.076***	-0.074***
	(0.003)	(0.005)	(0.008)
Distance to closest manufacturing hub	-0.047***	-0.094***	-0.061***
	(0.005)	(0.010)	(0.010)
Distance to closest manufacturing hub **partner**	-0.009*	-0.007	-0.026**
	(0.005)	(0.007)	(0.013)
Distance to economic activity	0.060***	0.121***	0.103***
	(0.005)	(0.009)	(0.013)
Distance to economic activity **partner**	0.038***	0.049***	0.068***
	(0.005)	(0.007)	(0.013)
Contiguous countries	0.084***	0.150***	0.009
	(0.003)	(0.003)	(0.006)
Former colonial relationship	0	0.010***	-0.002
	(0.002)	(0.003)	(0.006)
Common coloniser	-0.014***	-0.014***	-0.013**
	(0.002)	(0.003)	(0.006)
Pair belonging to the same country in the past	-0.009***	-0.041***	0.036***
	(0.003)	(0.003)	(0.007)
Tariffs in intermediates from the origin country	-0.013***	-0.001	-0.046***
	(0.002)	(0.004)	(0.006)
RTA	0.027***	0.026***	0.006
	(0.003)	(0.004)	(0.007)
Share of manufacturing in GDP	0.058***	0.038***	0.031***
	(0.003)	(0.004)	(0.007)
Share of manufacturing in GDP **partner**	0.010***	0.006*	0.026***
	(0.003)	(0.003)	(0.006)
FDI Openness	0.014***	0.001	0.136***
	(0.003)	(0.003)	(0.020)
FDI Openness **partner**	-0.003	-0.001	-0.008
	(0.003)	(0.003)	(0.006)
Fixed Effects (sector × year)	Yes	Yes	Yes
Observations	189,432	102,924	55,926
R-square	0.092	0.134	0.085

Source: Calculations on OECD TiVA database.

Annex Table 11. Policy-related drivers of Value-Added flows in a gravity setting

		Value-Added flow		
		Total	High-income	Developing
Unit Labour Costs	Coefficient	-0.007	-0.002	
(OECD)	Std Error	-0.007	-0.012	
	Coefficient **partner**	-0.033***	-0.039***	
	Std Error **partner**	-0.007	-0.012	
	Observations	54,360	44,352	2,070
	R-square	0.156	0.161	0.417
Product Market Regulation	Coefficient	-0.031***	-0.107***	-0.038
(OECD)	Std Error	-0.009	-0.016	-0.054
	Coefficient **partner**	-0.005	0.023**	-0.049
	Std Error **partner**	-0.009	-0.012	-0.033
	Observations	36,072	21,456	6,660
	R-square	0.119	0.163	0.107
Logistics Performance Index (customs)	Coefficient	0.076***	0.081***	0.070***
(World Bank)	Std Error	-0.004	-0.005	-0.012
	Coefficient **partner**	0.030***	0.017***	0.038***
	Std Error **partner**	-0.004	-0.004	-0.008
	Observations	109,314	68,472	40,842
	R-square	0.097	0.147	0.09
Tax rate (total)	Coefficient	0.055***	-0.007	0.01
(World Development Indicators)	Std Error	-0.004	-0.006	-0.009
	Coefficient **partner**	0.010**	0.012***	0.005
	Std Error **partner**	-0.004	-0.005	-0.008
	Observations	108,522	68,022	40,500
	R-square	0.099	0.146	0.09
Access to loans (index)	Coefficient	-0.004	-0.001	0.031*
(World Economic Forum)	Std Error	-0.006	-0.006	-0.017
	Coefficient **partner**	0.004	-0.005	0.016
	Std Error **partner**	-0.006	-0.006	-0.011
	Observations	73,746	46,854	26,892
	R-square	0.096	0.147	0.09
Intellectual property protection (index)	Coefficient	0.065***	0.079***	0.098***
(World Economic Forum)	Std Error	-0.005	-0.007	-0.018
	Coefficient **partner**	0.031***	0.018***	0.043***
	Std Error **partner**	-0.005	-0.005	-0.011
	Observations	73,746	46,854	26,892
	R-square	0.098	0.15	0.092
Quality of Electricity supply (index)	Coefficient	0.048***	0.103***	0.050***
(World Economic Forum)	Std Error	-0.005	-0.01	-0.014
	Coefficient **partner**	0.045***	0.030***	0.065***
	Std Error **partner**	-0.005	-0.005	-0.011
	Observations	73,746	46,854	26,892
	R-square	0.098	0.15	0.092
Broadband subscription (per '000)	Coefficient	0.056***	0.069***	0.062***
(ITU)	Std Error	-0.004	-0.006	-0.019
	Coefficient **partner**	0.027***	0.012**	0.043***
	Std Error **partner**	-0.004	-0.005	-0.008
	Observations	136,782	88,416	48,366
	R-square	0.104	0.139	0.095

		Value-Added flow		
		Total	High-income	Developing
Technical occupations (share)	Coefficient	-0.017***	-0.029***	0.011**
(ILO)	Std Error	-0.003	-0.008	-0.005
	Coefficient **partner**	0.001	0.002	0
	Std Error **partner**	-0.003	-0.005	-0.006
	Observations	104,940	59,778	28,440
	R-square	0.104	0.131	0.09
R&D expenditure	Coefficient	0.031***	0.022***	0.046
(World Development Indicators)	Std Error	-0.004	-0.004	-0.047
	Coefficient **partner**	0.021***	0.004	0.052***
	Std Error **partner**	-0.004	-0.004	-0.009
	Observations	103,608	72,234	31,374
	R-square	0.109	0.146	0.098
Tertiary graduates (share of workforce)	Coefficient	0.018***	0.027***	0.003*
(World Development Indicators)	Std Error	-0.002	-0.004	-0.002
	Coefficient **partner**	0.029***	0.036***	0.023***
	Std Error **partner**	-0.002	-0.003	-0.002
	Observations	93,366	64,926	20,970
	R-square	0.112	0.127	0.122
Servics Trade Restrictiveness Index	Coefficient	-0.037***	-0.001	-0.018
(World Bank)	Std Error	-0.012	-0.026	-0.021
	Coefficient **partner**	-0.028**	-0.012	-0.054**
	Std Error **partner**	-0.012	-0.012	-0.023
	Observations	23,886	14,256	9,630
	R-square	0.117	0.198	0.105
Infrastructure, availability and quality	Coefficient	0.062***	0.090***	0.087***
(Composite Index based on	Std Error	-0.005	-0.006	-0.015
World Development Indicators)	Coefficient **partner**	0.033***	0.020***	0.045***
	Std Error **partner**	-0.005	-0.006	-0.011
	Observations	73,746	46,854	26,892
	R-square	0.098	0.151	0.092
Institutional quality	Coefficient	0.028***	0.047***	0.080***
(Composite Index based on	Std Error	-0.003	-0.005	-0.011
World Development Indicators)	Coefficient **partner**	0.015***	0	0.032***
	Std Error **partner**	-0.003	-0.004	-0.006
	Observations	189,432	102,924	55,926
	R-square	0.093	0.135	0.086
FDI restrictiveness Index	Coefficient	0.031***	0.101***	-0.046***
(OECD)	Std Error	-0.004	-0.009	-0.014
	Coefficient **partner**	0.013***	0.037***	-0.027**
	Std Error **partner**	-0.004	-0.005	-0.011
	Observations	127,728	74,592	34,704
	R-square	0.105	0.145	0.094
FDI restrictiveness Index	Coefficient	0.039***	0.015***	-0.003
*without FDI openess in the main specificatio	Std Error	-0.003	-0.005	-0.009
(OECD)	Coefficient **partner**	0.029***	0.035***	0.008
	Std Error **partner**	-0.003	-0.003	-0.009
	Observations	135,522	98,046	37,476
	R-square	0.102	0.13	0.104

Source: Calculations on OECD TiVA database.

Annex Table 12. Determinants of domestic content of exports across income groups

Dep var: Per capita domestic value added in exports (log)	(1) All	(2) High-Income	(3) Middle-Income	(4) Low-Income
Backward log of value (lag)	0.0124**	0.00031	0.0127	0.0221
	-0.00568	-0.00787	-0.00821	-0.0243
Sophistication of manufactured intermediates (log)	9.427**	28.86**	5.384	32.37**
	-4.288	-11.47	-8.061	-16.31
Sophistication manufactured intermediates (square of log)	-0.502**	-1.505**	-0.302	-1.712**
	-0.224	-0.594	-0.419	-0.867
Sophistication of primary intermediates (log)	0.031	0.0661*	0.0199	0.0117
	-0.025	-0.0397	-0.0362	-0.0651
FDI inflows (log)	0.000522	-3.89E-05	0.00141**	-0.00198
	-0.000458	-0.000588	-0.000638	-0.00157
Imports covered by RTA (share)	0.000755	-0.0388	-0.126***	0.151
	-0.0351	-0.0497	-0.0465	-0.128
Per capita GDP at constant prices (log)	0.933***	1.262***	0.976***	0.344***
	-0.0384	-0.068	-0.0533	-0.107
Distance to economic activity (log)	-2.221***	-3.060***	-2.667***	-1.163
	-0.355	-0.527	-0.459	-1.317
Constant	-31.63	-121.9**	-7.335	-146.4*
	-21.24	-56.11	-39.53	-77.68
Observations	2,050	669	1,001	380
R-squared	0.814	0.85	0.868	0.668
Number of rep	152	49	75	28

Note: Fixed effects at the country level. Year dummies included but not reported.

Annex Table 13. Determinants of product sophistication across income groups

Dep var: log of export sophistication	(1) All	(2) High-Income	(3) Middle-Income	(4) Low-Income
Backward (share)	0.192**	0.477***	0.327***	-0.358
	-0.0914	-0.0972	-0.096	-0.319
Sophistication of manufactured intermediates (log)	6.852**	-2.632	1.788	-6.216
	-3.222	-4.489	-4.875	-17.45
Sophistication manufactured intermediates (square of log)	-0.364**	0.146	-0.0986	0.32
	-0.169	-0.232	-0.253	-0.927
Sophistication of primary intermediates (log)	-0.0663***	-0.0365**	-0.0299	-0.182***
	-0.0185	-0.0155	-0.0216	-0.0694
FDI inflows (log)	-0.000723**	4.60E-05	0.000419	-0.00629***
	-0.000342	-0.000231	-0.000384	-0.00169
Imports covered by RTA (share)	-0.017	0.0424**	0.0112	-0.194
	-0.0261	-0.0193	-0.028	-0.135
Per capita GDP at constant prices (log)	0.205***	0.250***	0.130***	0.331***
	-0.0286	-0.0263	-0.0324	-0.114
Distance to economic activity (log)	-0.354	0.312	-0.301	-0.306
	-0.264	-0.21	-0.274	-1.411
Constant	-21.05	16.26	2.841	41.17
	-15.94	-21.97	-23.88	-83.12
Observations	2,064	673	1,008	383
R-squared	0.374	0.667	0.531	0.301
Number of rep	152	49	75	28

Note: Fixed effects at the country level. Year dummies included but not reported.

Annex Table 14. Determinants of product diversification across income groups

	(1)	(2)	(3)	(4)
Dep var: normalised TCI	All	High-Income	Middle-Income	Low-Income
Backward log of value (lag)	-0.232***	-0.0396	-0.288***	-0.260*
	-0.0488	-0.088	-0.0629	-0.136
Sophistication of manufactured intermediates (log)	-4.032**	-10.79***	-0.965	-4.552
	-1.72	-4.063	-3.197	-7.463
Sophistication manufactured intermediates (square of log)	0.211**	0.550***	0.0537	0.245
	-0.09	-0.21	-0.166	-0.396
Sophistication of primary intermediates (log)	-0.00442	0.0350**	-0.00655	-0.0311
	-0.0099	-0.014	-0.0142	-0.0297
FDI inflows (log)	0.000125	9.58E-05	-0.000145	0.00140*
	-0.000183	-0.000209	-0.000252	-0.000725
Imports covered by RTA (share)	0.019	0.0162	-0.0372**	0.252***
	-0.014	-0.0174	-0.0184	-0.0576
Per capita GDP at constant prices (log)	0.0542***	0.024	0.0768***	0.0418
	-0.0153	-0.0238	-0.0212	-0.0485
Distance to economic activity (log)	0.347**	0.148	0.348*	0.683
	-0.141	-0.19	-0.18	-0.603
Constant	15.96*	51.05**	0.888	15.23
	-8.513	-19.89	-15.66	-35.54
Observations	2,064	673	1,008	383
R-squared	0.037	0.061	0.065	0.112
Number of rep	152	49	75	28

Note: Fixed effects at the country level. Year dummies included but not reported.

Annex Table 15. Developing regions in Africa/Middle East and Asia coverage

Eastern and Southern Africa (ESA)	
25 countries and territories	Angola, Botswana, Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Seychelles, Somalia, South Africa, South Sudan, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe
Middle East and North Africa (MENA)	
20 countries and territories	Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Palestinian Authority, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, Turkey, United Arab Emirates, Yemen
Western and Central Africa (WCA)	
24 countries and territories	Benin, Burkina Faso, Cameroon, Cabo Verde, Central African Republic, Chad, Congo, Democratic Republic of the Congo, Cote d'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo
South Asia (SAS)	
8 countries and territories	Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka
Southeast Asia (SEA)	
20 countries and territories	Brunei Darussalam, Cambodia, China (People's Republic of), Democratic People's Republic of Korea, Hong Kong (China), Indonesia, Japan, Korea, Lao People's Democratic Republic, Macau (China), Malaysia, Mongolia, Myanmar, Papua New Guinea, Philippines, Singapore, Chinese Taipei, Thailand, Timor-Leste, Viet Nam.
Rest of the World	
118 countries and territories	(Not listed here)

Annex Table 16. Product classification

INT-PRIM	Primary products used as intermediates	Several products in HS chapters 01, 05-10, 12-15, 18, 23-28, 31, 35, 39-41, 43-45, 47, 50-53, 55, 63, 70-72, 74-76, 78-81, 85, 89
INT	Processed intermediates	Several products in HS chapters 02-04, 11-13, 15-19, 21-25, 27-45, 47-56, 58-60, 63, 65-76, 78-88, 90-96
FUEL	Mineral fuels and oils	HS 2701xx, 2702xx, 270300, 270400, 270500, 270900, 271000, 2711xx, 271600
CON	Household consumption	Several products in HS chapters 02-04, 06-11, 15-24, 30, 32-40, 42-44, 46, 48-52, 54-59, 61-71, 73-74, 76, 82-85, 87-97
CAP	Capital goods	Several products in HS chapters 01,71,73,76,82-91,93-96
XMEDIC	Medicines/medicaments	HS 3004xx
XPC	Personal computers	HS 8471xx
XCARS	Passenger motor automobiles	HS 8703xx except 870310
XPHONE	Mobile phones	HS 852520
XPRCS	Precious and valuable goods (pearls, diamonds, precious and semi-precious stones)	HS 7101xx, 7102xx, 7103xx
XMISC	Other miscellaneous commodities not classified elsewhere (coins, tanks and armoured vehicles, parachutes, water vessels, revolvers and swords)	HS 711810, 871000, 8804xx, 880510, 880520, 890600, 930200, 930700

Annex Table 17. Shares in world trade for the period 1998-2011

	1998 - 1999	2004 - 2005	2010 - 2011
INT-PRIM	3.8	3.8	5.2
INT	44.7	38.2	39.8
FUEL	6.9	13.3	16.9
CONS	17.7	16.1	13.9
CAP	15.8	15.8	14.3
XMEDIC	1.3	1.6	2.2
XPC	3.6	3.3	2.2
XCARS	5.6	5.7	4
XPHONE	0.7	1.6	1.1
XPRCS	0	0.7	0.4
XMISC	0.1	0.1	0.1
Total	100	100	100

Annex Table 18. Export growth by sector and contributions to total export growth in the world

	Export growth		Contribution to total export growth	
	1998/1999 - 2004/2005	2004/2005 - 2010/2011	1998/1999 - 2004/2005	2004/2005 - 2010/2011
INT-PRIM	8.3	16.3	0.3	0.7
INT	5.4	11	2.2	4.3
FUEL	20.6	14.7	1.9	2.2
CONS	6.4	7.7	1.1	1.2
CAP	8.1	8.3	1.3	1.3
XMEDIC	11.4	16.4	0.2	0.3
XPC	6.5	3	0.2	0.1
XCARS	8.7	3.9	0.5	0.2
XPHONE	22.9	3.7	0.2	0.1
XPRCS	0	2.8	0.1	0
XMISC	7.7	10.2	0	0
Total			8.1	10.2

Annex Table 19. Export and import shares by destination in 2010-2011

Panel A

	ESA	MEN	WCA	SAS	SEA
INT-PRIM	0.8	0.4	0.5	0.9	1.4
INT	4.5	5.2	3.1	2.9	18.38
FUEL	1.8	2.7	2.7	0.8	4.05
CONS	1.8	2.3	2.5	1.2	4.48
CAP	1.2	0.7	2.5	0.4	5.6
XMEDIC	0.1	0.1	0	0	0.06
XPC	0.1	0.1	0	0	1.61
XCARS	0.1	0.2	0.2	0.1	0.41
XPHONE	0	0	0	0	0.62
XPRCS	0	0	0	0	0.01
XMISC	0	0	0	0	0
Total	10.26	11.67	11.52	6.45	36.62

	ESA	MEN	WCA	SAS	SEA
INT-PRIM	7.7	3.6	4	14.6	3.8
INT	43.4	44.4	27.1	44.8	50.2
FUEL	17.4	23.5	23.7	12.2	11.1
CONS	17.7	19.6	21.6	19.1	12.2
CAP	11.3	5.9	21.5	6.5	15.3
XMEDIC	0.6	0.8	0.3	0.6	0.2
XPC	0.5	0.6	0.1	0	4.4
XCARS	1.2	1.3	1.6	2	1.1
XPHONE	0.1	0.2	0	0.2	1.7
XPRCS	0.1	0.2	0.1	0	0
XMISC	0	0	0	0	0
Total	100	100	100	100	100

	ESA	MEN	WCA	SAS	SEA
INT-PRIM	13.1	1.5	17.5	7.8	1.12
INT	29.6	13.2	15.7	31.3	24.72
FUEL	30	65.3	49.1	14	2.26
CONS	6.9	4.8	3.9	29.3	13.68
CAP	3.5	1.9	2	4.1	12.62
XMEDIC	0.1	0.6	0	2.9	0.21
XPC	0.1	0.1	0	0.1	4.6
XCARS	2.1	0.5	0	1.4	2.57
XPHONE	0.1	0.1	0	1.2	1.48
XPRCS	4.3	0.4	0.2	1.4	0.09
XMISC	0.1	0.1	0	0	0.02
Total	89.74	88.32	88.47	93.54	63.37

	ESA	MEN	WCA	SAS	SEA
INT-PRIM	14.6	1.7	19.8	8.3	1.8
INT	33	14.9	17.8	33.4	39
FUEL	33.4	73.9	55.5	15	3.6
CONS	7.7	5.5	4.4	31.3	21.6
CAP	3.8	2.2	2.2	4.4	19.9
XMEDIC	0.1	0.6	0	3.1	0.3
XPC	0.1	0.1	0	0.1	7.3
XCARS	2.4	0.6	0	1.5	4.1
XPHONE	0.1	0.1	0	1.3	2.3
XPRCS	4.8	0.4	0.2	1.5	0.1
XMISC	0.1	0.1	0	0	0
Total	100	100	100	100	100

Annex Table 19. Export and import shares by destination in 2010-2011 (*cont.*)

Panel B

	Imports out of the region				
	ESA	MEN	WCA	SAS	SEA
INT-PRIM	3.3	6.3	5.1	4.7	8.0
INT	35.4	35.0	30.7	42.8	23.2
FUEL	12.3	5.3	9.7	30.2	14.8
CONS	12.1	11.9	17.7	4.1	3.8
CAP	16.6	15.2	22.4	9.0	6.7
XMEDIC	1.7	1.5	1.5	0.3	0.7
XPC	1.3	1.3	0.5	0.9	0.3
XCARS	3.5	4.9	3.1	0.5	1.3
XPHONE	1.3	1.2	0.4	1.3	0.3
XPRCS	1.1	0.7	0	2.2	0.2
XMISC	0	0.2	0.1	0	0
Total	88.6	83.3	91.4	96.1	59.2

	Imports out of the region				
	ESA	MEN	WCA	SAS	SEA
INT-PRIM	3.7	7.6	5.6	4.9	13.4
INT	39.9	41.9	33.6	44.6	39.1
FUEL	13.9	6.3	10.6	31.4	24.9
CONS	13.6	14.3	19.4	4.3	6.4
CAP	18.7	18.3	24.5	9.4	11.3
XMEDIC	2.0	1.8	1.7	0.3	1.1
XPC	1.5	1.5	0.6	1.0	0.5
XCARS	4.0	5.8	3.4	0.5	2.2
XPHONE	1.5	1.5	0.4	1.3	0.6
XPRCS	1.2	0.9	0.0	2.2	0.3
XMISC	0	0.2	0.1	0	0
Total	100	100	100	100	100

Annex Table 20. Regional export intensities by category of goods through time

	Export intensity in 1998/1999				
	ESA	MEN	WCA	SAS	SEA
INTPRIM	3.96	0.62	5.41	1.40	0.45
INT	0.92	0.37	0.26	0.80	0.92
FUEL	2.94	12.66	11.42	0.10	0.67
CONS	1.19	0.91	0.45	3.21	1.33
CAP	0.30	0.23	0.18	0.19	1.03
XMEDIC	0.11	0.13	0.01	0.57	0.08
XPC	0.10	0.10	0.01	0.06	2.85
XCARS	0.23	0.05	0.03	0.06	0.85
XPHONE	0.12	0.20	0.01	0.04	0.80
XPRCS	n.a.	n.a.	n.a.	n.a.	n.a.
XMISC	0.19	0.34	0.95	0.14	0.18

	Export intensity in 2004/2005				
	ESA	MEN	WCA	SAS	SEA
INTPRIM	2.20	0.37	2.69	1.85	0.36
INT	0.93	0.41	0.21	0.89	1.01
FUEL	2.63	6.68	7.14	0.56	0.54
CONS	0.83	0.64	0.30	2.57	1.16
CAP	0.31	0.24	0.21	0.23	1.14
XMEDIC	0.05	0.06	0.02	0.64	0.08
XPC	0.05	0.09	0.01	0.06	3.52
XCARS	0.37	0.15	0.01	0.13	0.73
XPHONE	0.20	0.39	0.03	0.04	2.31
XPRCS	8.99	1.70	1.75	6.07	0.20
XMISC	0.22	0.22	6.31	0.11	0.11

	Export intensity in 2010/2011				
INTPRIM	2.12	0.28	2.73	1.28	0.32
INT	0.84	0.45	0.50	0.83	1.12
FUEL	2.34	5.13	3.78	1.14	0.48
CONS	0.64	0.51	0.43	2.18	1.11
CAP	0.32	0.18	0.30	0.31	1.32
XMEDIC	0.04	0.19	0.01	0.86	0.07
XPC	0.09	0.13	0.02	0.14	4.92
XCARS	0.43	0.13	0.04	0.31	0.64
XPHONE	0.16	0.16	0.03	1.94	3.75
XPRCS	8.87	0.78	0.75	2.86	0.17
XMISC	0.66	0.56	0.35	0.26	0.25

Annex Table 21. Regional import intensities by category of goods through time

	Import intensity in 1998/1999				
	ESA	MEN	WCA	SAS	SEA
INTPRIM	0.10	0.08	0.09	0.03	0.16
INT	0.06	0.06	0.02	0.04	0.48
FUEL	0.16	2.25	0.76	0.01	0.61
CONS	0.08	0.07	0.03	0.11	0.61
CAP	0.02	0.02	0.00	0.01	0.43
XMEDIC	0.02	0.02	0.00	0.07	0.04
XPC	0.02	0.01	0.00	0.00	0.86
XCARS	0.01	0.01	0.01	0.01	0.49
XPHONE	0.01	0.02	0.00	0.00	0.18
XPRCS	n.a.	n.a.	n.a.	n.a.	n.a.
XMISC	0.01	0.17	0.00	0.00	0.33

	Import intensity in 2004/2005				
	ESA	MEN	WCA	SAS	SEA
INTPRIM	0.11	0.11	0.08	0.07	0.16
INT	0.08	0.14	0.02	0.06	0.54
FUEL	0.14	1.95	0.44	0.06	0.44
CONS	0.08	0.17	0.06	0.13	0.68
CAP	0.04	0.05	0.01	0.02	0.57
XMEDIC	0.01	0.03	0.00	0.08	0.05
XPC	0.01	0.05	0.00	0.00	1.40
XCARS	0.02	0.05	0.00	0.01	0.48
XPHONE	0.02	0.09	0.00	0.00	0.88
XPRCS	0.02	0.26	0.00	0.08	0.03
XMISC	0.00	0.01	0.02	0.00	0.02

	Import intensity in 2010/2011				
	ESA	MEN	WCA	SAS	SEA
INTPRIM	0.08	0.09	0.06	0.06	0.18
INT	0.09	0.19	0.05	0.07	0.74
FUEL	0.16	1.43	0.12	0.10	0.32
CONS	0.09	0.18	0.06	0.14	0.75
CAP	0.06	0.06	0.05	0.03	0.81
XMEDIC	0.01	0.05	0.00	0.12	0.06
XPC	0.03	0.07	0.00	0.01	2.26
XCARS	0.03	0.05	0.01	0.04	0.54
XPHONE	0.02	0.07	0.00	0.22	2.25
XPRCS	0.06	0.04	0.00	0.02	0.02
XMISC	0.08	0.08	0.03	0.01	0.40

Annex Table 22. Values of revealed comparative advantage by sector and region

		1998/1999		2010/2011	
Sector	Region	RCA global	RCA region	RCA global	RCA region
01-15 Agriculture	ESA	3.15	2.24	1.88	2.10
01-15 Agriculture	WCA	2.95	3.31	1.52	2.58
01-15 Agriculture	MEN	1.49	3.18	0.89	2.01
01-15 Agriculture	SAS	2.22	5.16	1.79	3.33
16-24 Foodstuffs	ESA	2.56	2.72	1.44	2.56
16-24 Foodstuffs	WCA	8.06	2.80	6.83	2.57
16-24 Foodstuffs	MEN	1.11	1.45	0.68	1.88
16-24 Foodstuffs	SAS	0.76	2.10	0.88	2.31
39-40 Plastic/rubber	ESA	0.29	1.17	0.19	0.86
39-40 Plastic/rubber	WCA	0.44	0.54	1.16	0.83
39-40 Plastic/rubber	MEN	1.04	1.35	1.92	1.75
39-40 Plastic/rubber	SEA	0.78	1.27	0.84	1.23
50-63 Textiles	ESA	1.23	1.12	0.63	0.79
50-63 Textiles	WCA	1.28	3.44	0.96	0.99
50-63 Textiles	MEN	3.82	2.08	2.51	1.02
50-63 Textiles	SAS	6.22	2.45	5.83	3.51
50-63 Textiles	SEA	1.31	1.68	1.77	0.99
72-83 Metals	ESA	2.36	1.61	2.55	1.72
72-83 Metals	WCA	0.51	0.80	1.07	0.60
72-83 Metals	MEN	1.10	1.89	1.05	2.29
72-83 Metals	SAS	0.81	0.92	1.04	1.22
72-83 Metals	SEA	0.60	1.11	0.65	0.95
85 Electr. equip.	SEA	1.39	1.71	1.53	2.07
87 Vehicles	SAS	0.14	0.58	0.49	1.15
87 Vehicles	SEA	1.21	0.22	1.02	0.40

Annex Table 23. Regional or extra-regional imports for competitiveness?

	RCA in world markets		
Share of intermediate inputs in aggregate imports	3.469***	3.019***	2.801***
	-0.669	-0.677	-0.675
Complexity of imported intermediates from the region		-1.244***	-1.181**
		-0.338	-0.53
Complexity of imported intermediates from out of the region		0.694*	0.508
		-0.383	-0.385
Complexity of exported goods to the region			0.833
			-0.68
Complexity of exported goods to out of the region			-1.072***
			-0.364
Constant	0.288	5.701	8.989*
	-0.43	-4.1	-4.953
Observations	300	300	300
R-squared	0.312	0.347	0.367

All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, *

Annex Table 24. Determinants of RCA in regional markets

	RCA in regional markets			
Share of intermediate inputs in aggregate imports	1.379***		1.424***	1.247***
	(0.444)		(0.458)	(0.464)
Complexity of imported intermediates			0.120	0.229
			(0.294)	(0.297)
Complexity of exported goods				-0.467**
				(0.229)
Share of intermediate inputs in regional imports		0.213		
		(0.373)		
Share of intermediate inputs in imports from out of the region		0.905**		
		(0.423)		
Constant	1.368***	1.483***	0.250	3.608
	(0.286)	(0.295)	(2.761)	(3.202)
Observations	300	300	300	300
R-squared	0.362	0.354	0.362	0.372

All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Annex Table 25. Regional or extra-regional intermediate imports for regional competitiveness

	RCA in regional markets		
Share of intermediate inputs in aggregate imports	1.379***	1.002**	1.072**
	(0.444)	(0.437)	(0.442)
Complexity of imported intermediates from the region		-1.136***	-1.406***
		(0.218)	(0.347)
Complexity of imported intermediates from out of the region		0.764***	0.814***
		(0.248)	(0.252)
Complexity of exported goods to the region			0.255
			(0.446)
Complexity of exported goods to out of the region			0.203
			(0.239)
Constant	1.368***	5.127*	2.927
	(0.286)	(2.651)	(3.245)
Observations	300	300	300
R-squared	0.362	0.426	0.429

All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Annex Table 26. Becoming a source for world imports—alternative measure of RCA

	Gaining RCA in world markets			
Share of intermediate inputs in aggregate imports	3.565***		3.551***	3.002***
	(0.933)		(0.951)	(0.966)
Complexity of imported intermediates			-0.0463	0.301
			(0.627)	(0.645)
Complexity of exported goods				-1.585***
				(0.492)
Share of intermediate inputs in regional imports		1.881**		
		(0.762)		
Share of intermediate inputs in imports from out of the region		2.401***		
		(0.874)		
Constant	-0.989*	-1.193**	-0.559	11.06
	(0.563)	(0.584)	(5.845)	(6.939)
Observations	300	300	300	300

All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Annex Table 27. Becoming a source for global imports—alternative measure of RCA

	Gaining RCA in world markets		
Share of intermediate inputs in aggregate imports	3.565***	3.224***	2.901***
	(0.933)	(0.969)	(0.976)
Complexity of imported intermediates from the region		-1.366***	-1.893**
		(0.490)	(0.766)
Complexity of imported intermediates from out of the region		0.517	0.369
		(0.530)	(0.546)
Complexity of exported goods to the region			1.887*
			(0.980)
Complexity of exported goods to out of the region			-1.261**
			(0.524)
Constant	-0.989*	7.107	7.549
	(0.563)	(6.027)	(7.249)
Observations	300	300	300

All regressions include sector, region and time fixed effects. Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

Annex Table 28. Top 10 exported products by category in 2010/11

INT-PRIM

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	260111	109.02	0.74
2	260300	49.79	0.34
3	120100	44.14	0.30
4	100190	37.45	0.25
5	720449	30.93	0.21
6	260112	29.40	0.20
7	740400	28.85	0.20
8	100590	26.80	0.18
9	90111	22.26	0.15
10	400122	21.57	0.15

INT

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	854230	243.11	1.65
2	710812	202.31	1.37
3	847330	111.44	0.75
4	740311	68.28	0.46
5	852990	64.62	0.44
6	854140	63.48	0.43
7	851790	60.27	0.41
8	300210	52.66	0.36
9	880330	46.80	0.32
10	870899	45.93	0.31

FUEL

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	270900	1296.75	8.78
2	271000	760.60	5.15
3	271111	110.90	0.75
4	271121	108.19	0.73
5	270112	89.59	0.61
6	271112	30.11	0.20
7	270119	25.91	0.18
8	271113	24.80	0.17
9	270400	10.06	0.07
10	271119	8.69	0.06

CONS

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	711319	30.08	0.20
2	640399	28.69	0.19
3	392690	28.28	0.19
4	610910	25.45	0.17
5	611020	23.17	0.16
6	940360	22.97	0.16
7	620342	22.77	0.15
8	220421	21.98	0.15
9	620462	20.02	0.14
10	210690	19.60	0.13

CAP

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	880240	109.73	0.74
2	851780	90.43	0.61
3	852812	80.52	0.55
4	890190	64.29	0.44
5	847989	63.60	0.43
6	901380	61.54	0.42
7	850440	45.92	0.31
8	852540	42.89	0.29
9	870421	42.73	0.29
10	844359	41.89	0.28

XMEDIC

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	300490	256.31	1.73
2	300439	18.62	0.13
3	300420	15.93	0.11
4	300431	8.55	0.06
5	300432	6.50	0.04
6	300450	4.53	0.03
7	300440	4.49	0.03
8	300410	3.31	0.02

Annex Table 28. Top 10 exported products by category in 2010/11 (*'cont*)

XPC

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	847130	134.93	0.91
2	847170	71.21	0.48
3	847150	37.37	0.25
4	847160	31.37	0.21
5	847149	17.31	0.12
6	847180	15.99	0.11
7	847141	10.09	0.07
8	847190	7.13	0.05
9	847110	0.05	0.00

XCARS

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	870323	222.62	1.51
2	870332	119.36	0.81
3	870324	118.28	0.80
4	870322	66.21	0.45
5	870333	32.57	0.22
6	870331	19.66	0.13
7	870321	12.15	0.08
8	870390	3.20	0.02

XMISC

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	890600	5.00	0.03
2	871000	2.02	0.01
3	880520	0.90	0.01
4	711810	0.76	0.01
5	930200	0.65	0.00
6	880510	0.23	0.00
7	880400	0.19	0.00
8	930700	0.06	0.00

XPRCS

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	710231	33.31	0.23
2	710239	22.57	0.15
3	710210	3.17	0.02
4	710391	1.18	0.01
5	710122	0.68	0.00
6	710399	0.52	0.00
7	710221	0.47	0.00
8	710121	0.46	0.00
9	710310	0.41	0.00
10	710110	0.07	0.00

XPHONE

Rank in 2010/11	HS codes	Value in 000s million USD	Share in WLD exports
1	852520	158.49	1.07

Annex Table 29. Regression by sectors of log(RCA)

	RCA(log)								
	15T16	17T19	20T22	23T26	27T28	29	30T33	34T35	36T37
Indirect domestic services value added (as % of sector's exports)	-0.012	-0.014	0.004	-0.016**	-0.002	-0.006	0.009	-0.009	0.014
Foreign services value added (as % of sector's exports)	0.035**	0.003	0.065***	0.007	-0.001	0.032***	0.023**	0.005	0.034***
Fixed effect									
Time	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Country	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	2.050***	0.899***	-0.871***	0.037	-0.209	-1.496***	-2.615***	-0.022	-1.457***
Observations	285	285	285	285	284	277	285	284	283
R-squared	0.934	0.951	0.942	0.864	0.918	0.941	0.958	0.948	0.91

Note: Ordinary least square; Fisher test on fixed effects.

Source: Authors' calculations based on the OECD TiVA database.

Technical Annex

Measuring GVC participation

In the OECD TiVA database backward and forward GVC participation rates are calculated using the OECD Inter-Country Input-Output database on the basis of the following equation:

(1) $VAE = \hat{V}[I - A]^{-1}X$

Where V is a diagonalised *ni x ni* matrix of *n* countries (n={1,2… 41}) and *i* sectors of activity (i={1,2… 35}) with elements $v_{ni} = {V_{ni}}/{Y_{ni}}$ capturing the direct value added (V) share of sector *i* in country *n* in the output (Y) of the industry. The $[I - A]^{-1}$ is the Leontief inverse matrix which represents the interlinkages that arise within and between countries. The elements of this matrix capture the input share of output better known as the technical coefficients ($a_{ni} = {I_{ni,j}}/{Y_{ni}}$ where I is the gross use of intermediate inputs of industry *i* from industry *j* in country *n*). X is then a vector of gross exports with elements x_{ni} (the gross exports of industry *i* in country *n*). The product of this equation gives us an *ni x ni* matrix decomposing the value added embodied in exports according where it ultimately originates. By summing the non-diagonal elements of this matrix across column nations we get a metric of the foreign value added of exports. Presenting this value as a share of gross exports then gives us our measure of backward participation.

The forward participation indicator is calculated from the same baseline matrix but rather than summing across column nations we do so across the non-diagonal elements of the row nation. Similarly, we divide the value obtained by total gross exports of the row nation to obtain the value added content of gross exports that is used by foreign nations to produce their exports.

In algebraic terms, the decomposition of a country's gross trade flows into domestic and foreign value added can be presented as follows:

$$EXGR_{ij}^{u} = EXGR_DVA_{i}^{u} + EXG_FVA_{ik}^{us} \quad (1)$$

Where:

$EXGR_{ij}^{u}$ are the gross exports of products of industry *u* of country *i* to country *j;*

$EXGR_DVA_{i}^{u}$ is the domestic value added provided by industry *u* in country *i* (either directly or indirect in the form of domestic intermediates);

$EXG_FVA_{ik}^{us}$ is the foreign value added supplied by the source sector *s* of source country *k* and used by the sector u in country *i* for producing exports—this is the value that can be used for calculating backward participation indicators for the country *i* and forward indicators for the country *k.*

Thus, every gross export flow is decomposed into its domestic value added content and foreign value added content. The foreign content is reported across the four dimensions of source country (k) and sector (s), and using country (i) and sector (u). The backward GVC participation indices at the sector and country level, respectively, are then defined as follows:

$$BWD_{i}^{u} = \frac{\sum_{sk} EXG_FVA_{ik}^{us}}{\sum_{j} EXGR_{ij}^{u}} \quad (2)$$

$$BWD_{i} = \frac{\sum_{usk} EXG_FVA_{ik}^{us}}{\sum_{ju} EXGR_{ij}^{u}} \quad (3)$$

Note that country *i*, akin to country *k*, can itself be a source of intermediates that are used for producing exports in its trading partners. However, to calculate the forward GVC participation indices for country *i* in this framework we need an equivalent breakdown of gross exports of countries to which country *i* exports intermediates used for producing exports to yet another set of countries *x*. These trading partners are indexed by *l* in the following decomposition of gross exports.

$$EXGR_{lx}^{u} = EXGR_DVA_{l}^{u} + EXG_FVA_{li}^{us} \tag{4}$$

Forward participation rates at the source sector and country level, respectively, are then calculated as follows:

$$FWD_{i}^{s} = \frac{\sum_{ul} EXG_FVA_{li}^{us}}{\sum_{j} EXGR_{ij}^{u}} \tag{5}$$

$$FWD_{i} = \frac{\sum_{uls} EXG_FVA_{li}^{us}}{\sum_{j} EXGR_{ij}^{u}} \tag{6}$$

where $EXG_FVA_{li}^{us}$ is the foreign value added supplied by the source sector *s* of source country *i* and used by the sector *u* in country *l* for producing their own exports.

A number of observations are warranted. Trade flows that are used to calculate the backward and forward GVC integration indicators for one reference country (country i) involve four other countries: the source of intermediates (country k), the destination of exports (country j), the destination of intermediates for exports (country l), and the destination of exports of country l (country x). Moreover, the backward links involve three countries (k,i and j) and the reference country i is at the centre of the these links being a user of intermediates form k and an supplier of exports to j. The forward links also involve three countries (i, l and x) but the reference country i is at the "periphery" of this chain being only a supplier of intermediates to l.

Tariff and RTA controls

Tariff measures on intermediate goods

Tariffs are drawn from the UNCTAD-TRAINS and Comtrade databases, which record tariffs and gross import flows by country of origin for over 170 countries. The TRAINS database provides information on ad valorem tariffs at the disaggregated 6-digit level according to the Harmonized System (HS) nomenclature, but also aggregated at the 4-digit industry level, by reporter and partner country. Only tariffs on intermediate products are retained for the analysis. Treatment procedures of Miroudot, Rouzet and Spinelli (2013) are followed in filling in missing values using rates reported for different types of tariffs, or rates reported in different years.[106] Like the input-output data, tariff data cover 1995, 2000, 2005, 2008 and 2009, and are aggregated to the industry detail of the OECD ICIO model, weighting each 6-digit product by its share of bilateral trade in the corresponding industry as reported by the importer. The procedure follows Miroudot et al. (2013) closely. Lastly, the data are aggregated at the country level by weighting with respect to intermediate imports when it comes to backward participation and exports to forward participation. The weighted average corresponds to a rough measure of the revenue from tariff expressed as a ratio of total trade of intermediates.

In constructing the data at the industry level the structure of inputs in each industry is taken into account. Foreign value incorporated in gross exports is used to weigh the tariffs by partner and origin sector when it comes to backward participation. At each year, T_{ju} is the weighted tariff measure that is used to control for stringency of tariffs over inputs used by industry *u* in country *j*

106. Bilateral preferential rates are used when available; otherwise missing values are replaced with the applied Most Favoured Nation tariffs.

$$T_{ju} = \frac{\sum_i \sum_s t_{jik} * F_{jisu}}{\sum_i \sum_s F_{jisu}}$$

where F_{jisu} corresponds to foreign value sourced from country *j* industry *s* and embodied in gross exports of industry *u*, country *i*; t_{jik} corresponds to tariff rate charged by country *j* on products from country *i* and industry *s*. For forward participation, the aggregation is designed to reflect the stringency of tariffs imposed to exports of intermediates from industry *i* in country *k*

$$T_{ik} = \frac{\sum_j \sum_u t_{jik} * F_{jisu}}{\sum_j \sum_u F_{jisu}}$$

RTA index

Information on RTAs is collected from the WTO Regional Trade Agreement Information System (RTA-IS). The database covers all RTAs in force until 2012, and only information for TiVA economies is used for the regressions. Aggregation to a single value per country and year is made by multiplying a binary indicator for the existence of an agreement with foreign value added of the RTA partner used in exports of the reference country when it comes to backward participation. The sum of the products is then expressed as a ratio of total foreign value used in exports of the reference country. In order to construct the same indicator for forward participation we multiply the binary indicator for the existence of an agreement with domestic value used in exports of the RTA partner. The sum of the products is then expressed as a ratio of total domestic value used in exports of third countries.

Similarly to the tariff measure, when constructing the data at the industry level the structure of inputs in each industry is taken into account. At each year, RTA_{ju} is used to control for RTA coverage over inputs used by industry *u* in country *j*

$$RTA_{ju} = \frac{\sum_i \sum_s RTA_{jik} * F_{jisu}}{\sum_i \sum_s F_{jisu}}$$

$$RTA_{ik} = \frac{\sum_j \sum_u RTA_{jik} * F_{jisu}}{\sum_j \sum_s F_{jisu}}$$

The notation is the same as for trade-weighted tariffs above except that variation in source industries for backward participation and using industries for forward participation is not full; we are only able to distinguish whether the RTA covers goods, services or both, which is then taken into account.

Econometric specifications

Linear specification

Ratios of backward and forward GVC participation, which are bounded between 0 and 1, are modelled using linear ordinary least squares regressions (the resulting predictions do not fall outside the bounds). The relationships between the GVC participation ratios and their determinants are estimated using the following linear-log equation:

$$r_{it} = a + \mathbf{y_{it}}\boldsymbol{\beta} + d_t + \varepsilon_{it}, \qquad r_{it} \in [0,1]$$

where the dependent variable r_{it} corresponds to the participation ratio of country *i* at year *t* and $\mathbf{y_{it}}$ is a vector of country characteristics, log-transformed when not expressed in ratios. d_t is a set of dummy variables capturing year fixed effects. The estimations control for heteroskedasticity through clustering of standard errors at the country and year level.

Decomposing the vector of explanatory variables into two vectors of covariates that are trade policy-related (P) and non-policy-related (N) allows subsequently the decomposition of fitted values into two categories:

$$\hat{r}_{it} = \left(a + \mathbf{y_{it}^N}\widehat{\boldsymbol{\beta}}^{\mathbf{N}}\right) + \mathbf{y_{it}^P}\widehat{\boldsymbol{\beta}}^{\mathbf{P}} + \varepsilon_{it} \text{ when } d_t = 1$$

Simultaneous quantile regressions at different levels of the quantile distribution involve a single estimation of the entire variance–covariance matrix of the estimators by bootstrapping. Each equation can be expressed as follows

$$r_{it} = a + \mathbf{y_{it}}\boldsymbol{\beta} + d_t + \varepsilon_{it}, \ \ \text{Quant}_\theta(r_{it}|\mathbf{y_{it}}) = \mathbf{y_{it}}\boldsymbol{\beta}_{\boldsymbol{\theta}}, \qquad \theta \in (0,1)$$

where $\theta \in \{0.1, 0.25, 0.5, 0.75\}$ and $\boldsymbol{\beta}_{\boldsymbol{\theta}}$ is the vector of coefficients at one specific quantile of the distribution.

Explaining backward and forward links in a bilateral gravity trade model

Results of the following specification of the bilateral gravity model are considered in Section 3.4:

$$INTVAI_{ij}^k = f(geography\ \&\ culture_{ij}^1, \dots, geography\ \&\ culture_{ij}^C, FTA_{ij}, GDP_i, GDP_j, NPOL_i^1, \dots, NPOL_i^N, POL_i^1, \dots, POL_i^M, NPOL_j^1, \dots, NPOL_j^N, POL_j^1, \dots, POL_j^M, \varepsilon_{ij}^k);$$

where: ($INTVAI_{ij}^k$) denotes the value of imports of value added embodied in intermediate inputs by exporting sector *k* in country *i*, originating from country *j*—the "imports of intermediates"*;* ($geography\ \&\ culture_{ij}^c$) is a set of *C* bilateral or unilateral indicators of geographical distance, contiguity, colonial relationship, common coloniser, or belonging to the same country in the past; (FTA_{ij}) is an indicator variable denoting the existence of a free trade agreement; (GDP_i, GDP_j) are exporting and importing countries' GDPs; ($NPOL_i^1, \dots, NPOL_i^N$ and $NPOL_j^1, \dots, NPOL_j^N$) are country-specific indicators of other non-policy characteristics of countries *i* and *j* such as distance to manufacturing hubs, and distance to economic activity; ($POL_i^1, \dots, POL_i^M$ and $POL_j^1, \dots, POL_j^M$) are country-specific indicators of policy determinants of GVC trade in countries *i* and *j* such as openness to FDI and tariffs; and (ε_{ij}^k) and (ε_i^k) are error terms.

A major caveat is worth underscoring. Bilateral value added flows depend not only on bilateral trade costs but also on costs with third countries through which value added transits from source to destination. Besides difficulties in interpreting gravity results in a standard fashion, empirical complications also arise in trying to capture these indirect effects. As shown by Noguera (2012) their relative importance can be high, although it varies significantly across countries and types of trade costs. The standard gravity equation overall is expected to fit less well value-added flows compared with gross exports. In order to improve the fit, the equation requires modifications with: (i) measures of economic mass reflecting gross output instead of GDP (see Baldwin and Taglioni, 2011); (ii) terms that reflect distance with third countries (Noguera, 2012); and (iii) effects that capture the input-output structure of the economy.

The design of our bilateral empirical equation only partly addresses these problems as it aims at minimising departures from the benchmark empirical specification. In particular, GDP is maintained as economic mass variable for consistency with the previous framework, while distance to large manufacturing hubs and investment openness are introduced separately as controls in the main specification. All country-specific variables enter the equation twice, first for the reference country and second for the partner that is the source of value-added. Controlling for country and partner fixed effects eliminates variation that is precious in identifying drivers that do not fluctuate a lot over time (such as institutions) or not at all, like distance to manufacturing hubs, therefore they are not included in this specification. Multilateral resistance is controlled for using weighted distance to economic activity for

both the source and destination of value-added. Results are moreover reported for the restricted samples of developing and high-income countries.

As illustrated in Annex Table 10 and 11, the model yields intuitive results on core variables: economic masses increase value-added flows between two partners, and distance reduces them. The results on additional controls support the conclusions that were reported earlier. In particular, market size, distance, and degree of industrialisation stand out as the leading determinants in the entire sample. The level of standardised coefficient for market size in developing countries is dominating all other drivers suggesting again that structural factors are much more important. Of policy related determinants, tariffs and investment openness make a greater difference in developing countries, which is consistent with MNEs in high-income countries either serving functions that do not require an intensive use of intermediates, or are concentrated in economies that are less GVC intensive possibly due to large size.

In terms of standardization of variables, in order to minimize some of the biases associated with a sequential introduction of the policy variables of interest, which vary considerably in country and time coverage, each covariate is standardised prior to the regressions.

Comparing GVC indicators across different sources of ICIOs

A comparison of results obtained from calculating GVC indicators from three different baseline Inter-Country Input-Output tables (ICIOs): i) TiVA; ii) WIOD; and iii) EORA is undertaken. The ultimate aim is to assess how well the EORA database—the database with the highest number of countries covered but also with a high incidence of inputted values—captures the backward and forward linkages relative to the sources of data which are based on a limited number of higher quality input-output tables, namely the OECD TiVA and the WIOD databases.

The compilation and reconciliation methods used in the WIOD and OECD TiVA databases are relatively well documented and hence what drives differences between these is relatively well understood (namely the balancing where WIOD relies on balancing national accounts whereas TiVA on balancing trade). EORA is not so much a data collection but a data imputation exercise. It uses national IO tables for more countries (74 countries at various intervals in time) and balances these all the while extra- or intrapolating values for countries that do not have an IO table through cross-entropy methods. This means that the data can be far removed from what is actually happening in a country. For example, Lao PDR has poor quality trade statistics and no IO table and the EORA project uses its algorithms for filling in the table values and instead ‘generates’ this information for this country. The advantage of the EORA database is thus that it has wider country coverage and this is particularly relevant for the analysis of GVC activity in developing and least developed countries. But this greater coverage has to be weighed against the pitfalls of using the data which for developing and least developed countries overwhelmingly comes from imputations and not actual observations.

The OECD TiVA and WIOD database coverage is heavily influenced by the quality of IO tables and therefore there is a form of ‘selection’ into these databases. EORA is most accurate for the countries for which there are good IO tables and indeed many of the underlying IO and supply-use tables in EORA come from the OECD’s STAN or from the IDE-Jetro databases. Therefore when comparing indicators calculated across these different ICIOs it is important to bear in mind that a relatively good match between these, for the countries that are common to all three databases, does not necessarily imply that the EORA is ‘validated’ since the underlying data for their calculation is similar. Testing the performance of the EORA database therefore also requires looking at how well it performs for the countries that are not common to the three datasets. It is nevertheless important to begin with a benchmarking exercise looking at how the EORA indicators match with those of the other databases.

Characteristics of the ICIO databases

Table A below highlights the characteristics of each database in an effort to understand differences in coverage or methodology used in their compilation. WIOD is the database with the lowest country coverage but it is OECD TiVA that has the most limited time coverage. In contrast, EORA has a wider country and time coverage OECD TiVA has 17 more countries than WIOD, mainly in Latin America, Africa and South East Asia.

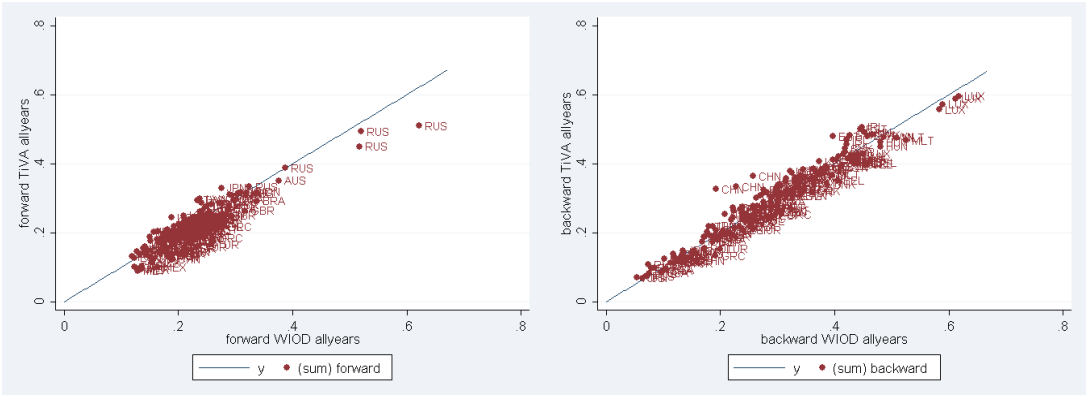
Table A. Key Characteristics of TiVA, WIOD and EORA databases

	TiVA	WIOD	EORA
Number of countries	57	40	187
Time coverage	1995, 2000, 2005, 2008, 2009	Annual 1995-2011	Annual 1990-2011
Differences with respect to			
- *TiVA*	N/A	not in WIOD: ARG, BRN, CHE, CHL, HKG, ISL, ISR, KHM, MYS, NOR, NZL, PHL, SAU, SGP, THA, VNM, ZAF	N/A
- *WIOD*	Not in TiVA: CYP (there as partner not as reporter)	N/A	N/A
- *EORA*			N/A
Balancing	Trade flows	National accounts	National accounts

Backward and forward indicators across the different databases

The comparative analysis looks first at how measures of GVC participation deviate from each other across the three databases. Figure A begins with a comparison of the WIOD and TiVA measures for all common years and countries. As can be seen the fit between these two databases is very good, particularly for the backward linkage. Yearly correlation coefficients oscillate between 0.9 and 0.99. Where the forward linkage is concerned the fit between these databases is less good and there seems to be a downward (upward) bias of the WIOD (TiVA) database.

Figure A. WIOD vs TiVA all common years and countries



Where EORA and TiVA-based measures are concerned, Figure B shows a relatively good fit with respect to the backward linkage but a rather poor fit with respect to the forward linkage. This is surprising because the numerator of this indicator on a bilateral level is the same and therefore if the backward is consistent, one would expect the forward linkage to be consistent too.[107] A similar pattern when comparing the EORA database with the WIOD database in Figure C is found.

Figure B. EORA versus TiVA all common years and countries

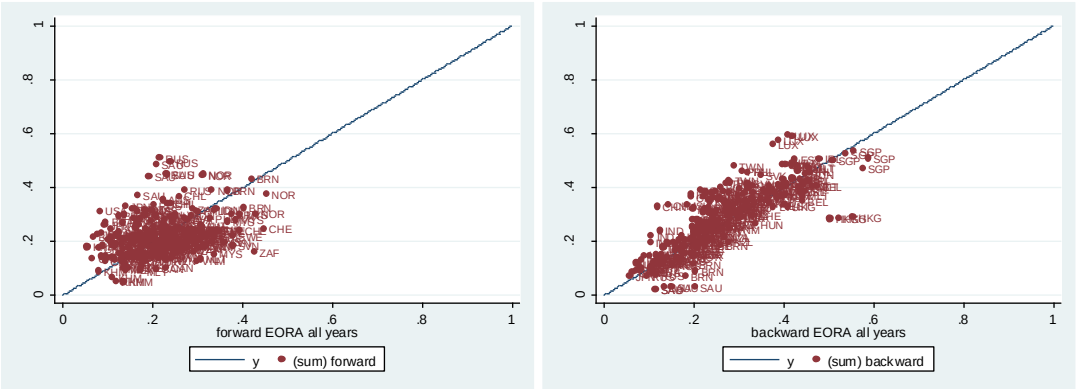
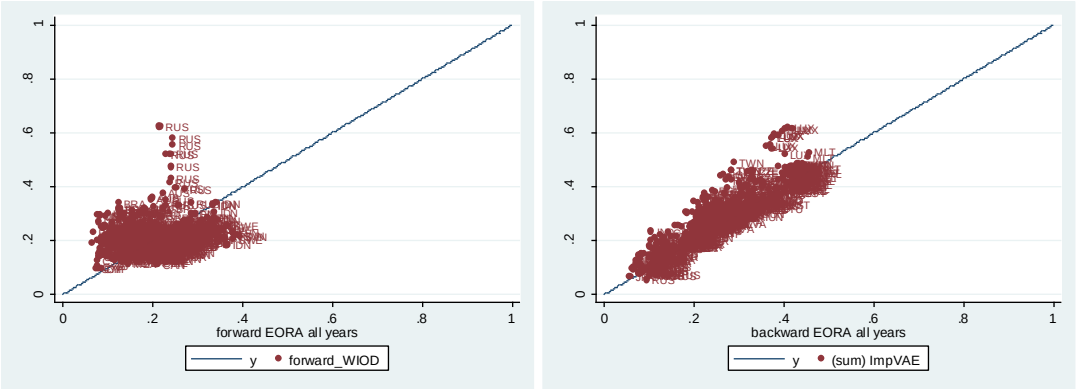


Figure C. EORA versus WIOD all common years and countries

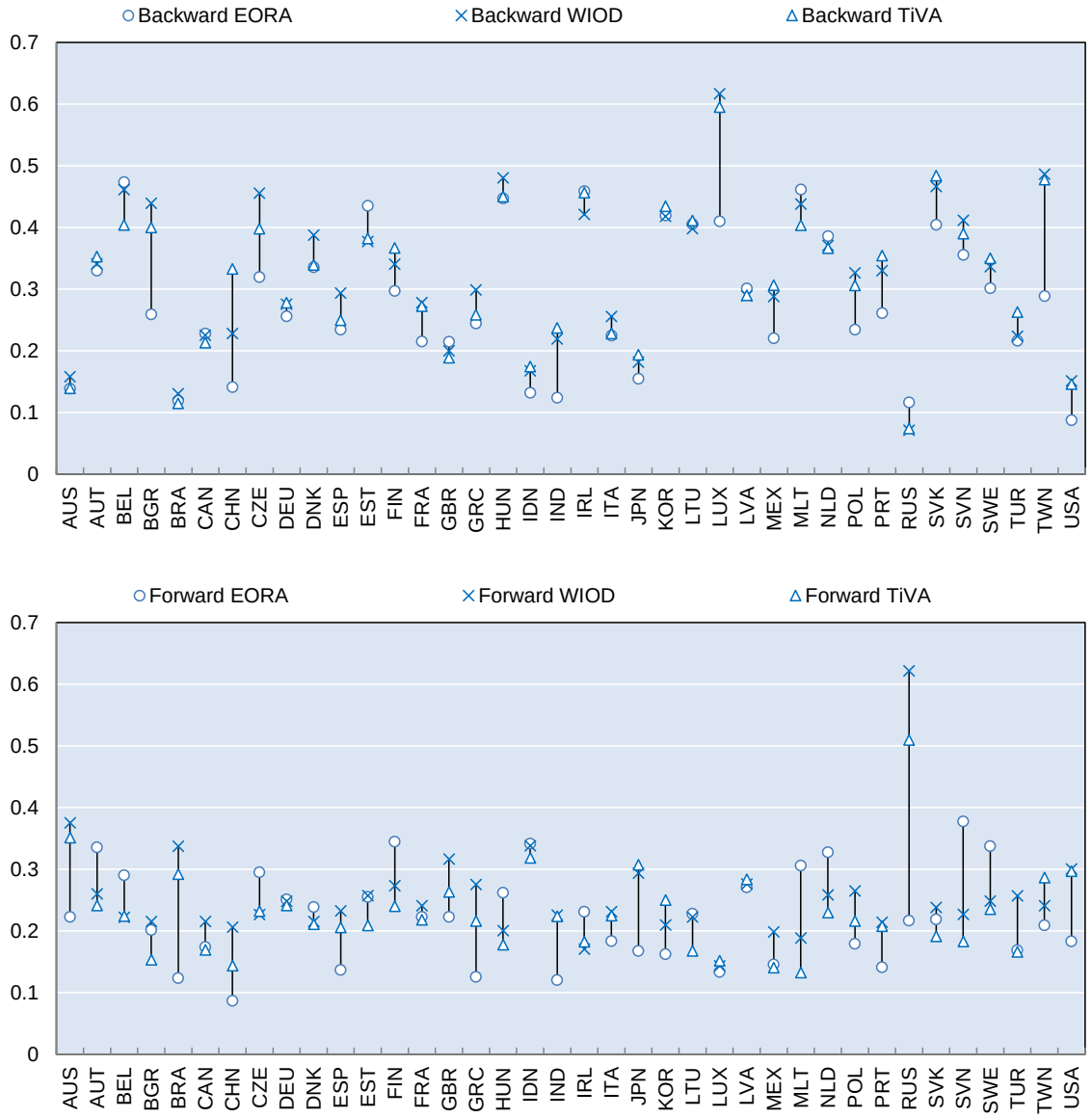


The top panel of Figure D looks at how the three databases compare for backward linkages in 2008 whilst the bottom panel compares forward linkages. At this finer level of granularity there are some notable differences between the indicators and here it is possible to spot some countries where the difference between the EORA and TiVA measures is high. For instance, China's measure of backward linkage in EORA is 0.28 whilst in TiVA this is 0.48 (and this is very close to the WIOD values). For Slovenia a large difference also appears with EORA suggesting a value of 0.25, TiVA: 0.4 and WIOD, 0.44.

Where the forward linkages are concerned (bottom panel of Figure D) the disparities are often big. For example, for Russia EORA is 0.21, TiVA 0.51 and WIOD 0.62. Differences are also apparent for Slovenia as well as China where EORA reports 0.08, TiVA 0.14 and WIOD, 0.2.

107. We have checked these results and they seem to be consistent. Further research should be undertaken to establish the cause of this discrepancy. The comparison of the forward linkage between WIOD and TiVA also has a worse fit than the backward linkage.

Figure D. Backward and forward measures across different databases for 2008



Further tests on aggregate GVC measures

In the section above like-for-like measures across the different databases were compared. The problem with this is that these are not expected to differ too much since countries that overlap in TiVA, WIOD and EORA all have relatively good IO tables and often these different databases will use tables from the same sources. Below a different exercise, to see how well the EORA database captures GVC activity in non-TiVA countries, is undertaken. In what follows, the predictions are based on the estimated determinants of backward linkages discussed in the main body of the paper.

Using the TiVA database to make out-of-sample predictions about country backward participation in EORA

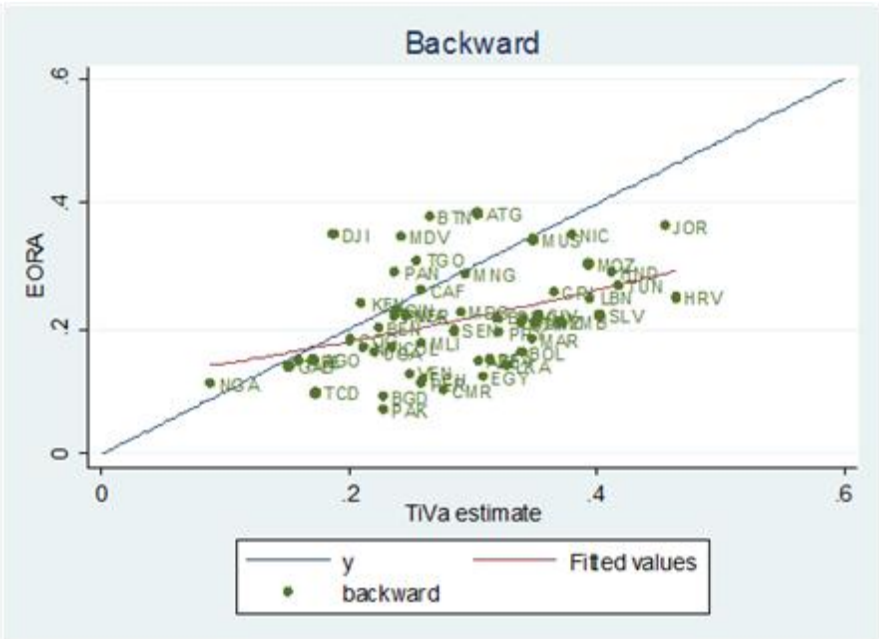
The first check involves using the TiVA database to make out-of-sample predictions and then compare these against the values obtained from the EORA database. Three steps are required for such checks. First, a regression on the determinants of backward participation using the TiVA database under the following specification is undertaken:

$$BACKWARD_{it} = Tariffscharged_{it} + Tariffsfaced_{it} + shareimpRTA_{it} + shareexpRTA_{it} + RevFDIOpenness_{it} + sharemanufGDP_{it} + Dist\ to\ manufhub_{it} + disteconact_{it} + GDP_{it} + pop_{it} + e_{it}$$

Second, the coefficients obtained are applied to data from countries outside the TiVA sample so as to get predictions on their backward linkage. Finally, these predictions are compared to the measures obtained from the EORA database.

The results of this exercise are shown in Figure E. They lie relatively close to the 45 degree (equivalence) line although a downward bias is observed with respect to the EORA calculations. One plausible cause for this—assuming that EORA data are correct—is that countries in TiVA tend to be larger than countries outside (in terms of GDP) and that there is a strong correlation between size and backward engagement therefore the coefficients in the TiVA estimate are downward biased.

Figure E. Backward participation from EORA vs TiVA estimates

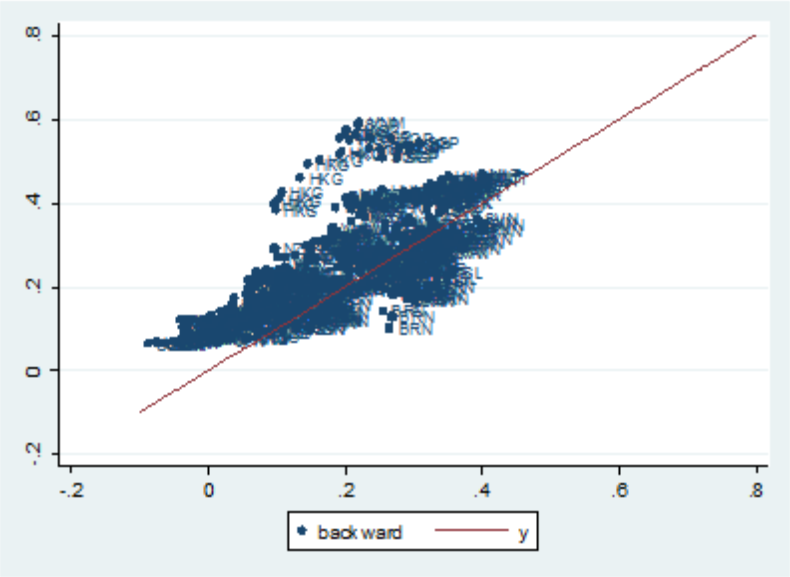


Using the EORA database to make predictions about TiVA country backward participation

Another approach is to perform a similar comparison but using estimates of backward linkages derived on the basis of EORA data and comparing how well these correlate with the actual observed TiVA measures. However, in order to make it a more stringent test, TiVA countries from the EORA data are removed to see how well countries outside TiVA can be used to predict TiVA country backward participation. The steps here are similar to those above. First, an estimation of the backward participation using the determinants from the main part of the report described in Section 3 for all non-TiVA countries in the EORA database (using the equation above) is undertaken. Second, the coefficients obtained from this specification on TiVA country data are used to predict TiVA country

backward participation. Finally, the EORA-based estimates are compared against measures observed in TiVA. The results from this exercise are presented in Figure F where a relatively strong correlation (coefficient of 0.7, R-sq of 0.49) appears. Still, there are some important outliers such as Hong Kong or Singapore.

Figure F. Backward participation from TiVA vs EORA estimates (from non-TiVA countries)

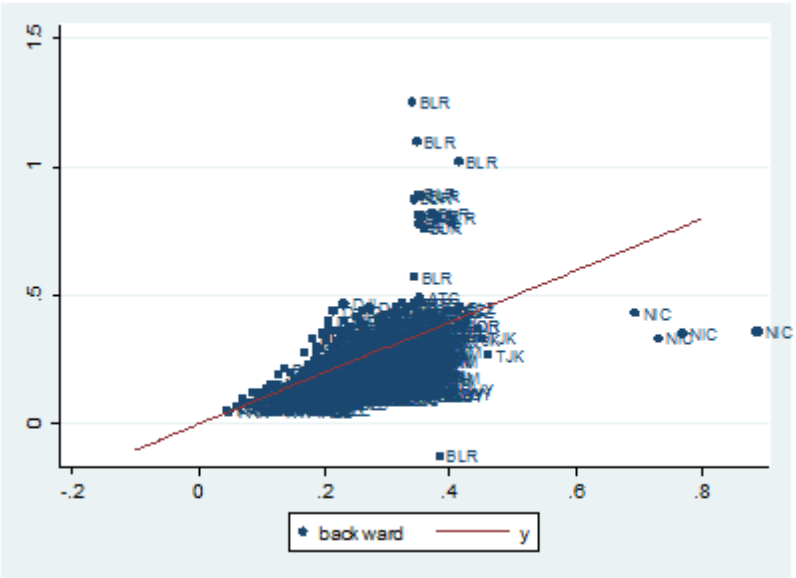


Using the EORA database to make predictions about non-TiVA country backward participation

The final check uses the predictions for the non-TiVA countries of the EORA database using TiVA country coefficients only (the reverse of above). Here a similar step-wise approach is used. First, an estimation of backward participation using the determinants described in the main part of the report for all TiVA countries in the EORA database is undertaken. Second, the coefficients are extracted and applied to non-TiVA country data from EORA to predict non-TiVA country backward participation. Finally, the EORA estimates for these countries against the EORA observed measures are compared. Again, the results appear to cluster near the 45 degree line although there are observable outliers such as Belarus or Nicaragua (Figure G).

More generally, the database has several key outliers which can be spotted from values that are above 1 in terms of backward participation. These tend to be ex-soviet countries and we conjecture that this is because of large transit of natural gas or petroleum.

Figure G. Backward participation from EORA vs EORA estimates (from TiVA countries)



Comparing the IO tables

The analysis above is *somewhat* encouraging in that it suggests that aggregate results obtained from the EORA database are not too far off the mark. But from this analysis it is not clear how reliable the IO tables embedded in the database are for individual countries. For example, it is possible that on aggregate the tables point to comparable levels of backward participation, as we have shown, but that the sectoral distribution of this value added in exports is different. To verify this, an analysis that aims to calculate the distance between matrices using the fobrenius norm is undertaken.

$$F_{A,B} = \sqrt{T(A-B)*(A-B)'}$$

where Matrices A and B represent Leontief inverses of the total or domestic matrices of countries and are selected to capture either different countries within a database (as a benchmarking exercise) or to compare databases after these have been harmonised to include the same amount of rows and columns. The indicator is strictly positive but unbound, higher values capture larger distances between matrices.

The intuition behind this fobrenius distance measure is not straightforward and therefore a benchmarking exercise to understand how the values of the norm correspond to the differences in the actual structures of economies that are being compared is advisable. For this purpose the fobrenius norm is used to compare the domestic Leontief matrices between countries in the STAN database. The largest difference is between Cyprus[108] and Russia in the mid-1990s with a value of 5.11. This is followed by Russia-China where the distance is 5.10 and the United States and Russia with a distance of 4.7 in the mid- 90s. Where low values are concerned, the smallest difference arises between Italy and Spain in the

108. Footnote by Turkey: the information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognizes the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of United Nations, Turkey shall preserve its position concerning the "Cyprus" issue.

Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

mid-90s with a distance of 0.67 which is similar than that between France and Germany (0.68). These figures give us a point of comparison when carrying out distance calculations between the different databases.

Distance between matrices across different databases.

To calculate the distance between matrices across different databases a sectoral harmonisation exercise is needed. To understand how well the EORA captures sectoral activity the EORA matrices are to be compared to those of either STAN or GTAP which are more established sources of IO data. The aggregation of the original data is harmonised into a common nomenclature which is possible due to the common ISIC classification across these databases. The EORA country tables are 26x26, those of GTAP are 57x57 and the STAN 37x37 so when comparing EORA against GTAP the industry classification is reduced to 18x18 matrices; and when looking at EORA versus STAN there is a 20x20 common classification.[109]

For this exercise two comparisons are undertaken, first EORA-GTAP and second EORA-STAN. This is done for the year 2007 (GTAP benchmark year) and countries whose baseline IO table is close to this year are chosen. The first entry in the first column of the table below shows the distance between the United States Leontief inverse in EORA against that derived from the GTAP table. The asterisk marks countries for which the EORA database has an estimated table (not derived from national IO sources).

The EORA-GTAP comparison using the total Leontief inverse, in the first column, shows that the differences are less pronounced for the USA and for India although the numbers appear to be comparatively high relative to our benchmark, i.e. differences in the USA table across databases (1.67) is higher than the differences between France and Germany (0.67). Whilst this is not very encouraging, it is possible that biases have been introduced due to the aggregation procedure. The entries with the highest differences are those of Viet Nam, Laos and Tunisia.

Turning to the other comparisons, there is evidence of quite significant differences but it is worthwhile noting that the magnitude and indeed the drivers of these differences are hard to tell. Indeed the biases introduced due to the aggregation/elimination of sectors may be driving the higher numbers (as compared to the benchmark). Further analysis could look at standard deviations of the distance measures both in the benchmark as well as the EORA-GTAP and EORA-STAN for common countries. Much more work can be done on this and indeed one extension would be to compare STAN and GTAP matrices but this is beyond the scope of this investigation.

The bottom line is that on aggregate, the EORA database seems to do a relatively good job at capturing participation. However, the reported differences in the Leontief matrices from the above exercise suggest that the EORA database should only be used at the aggregate level until further robustness measures point otherwise.

109. There are two problematic sectors in the EORA database; ‘Other’ and ‘re-import, re-export’. Since it is hard to attribute these to any particular ISIC sector we completely remove them from the analysis by deleting both row and column from the matrix. To the extent that these sectors may be re-classified into other sectors, we expect the cross-database distances to be somewhat higher that the within database distances.

Table B. Frobenius distance between EORA and GTAP/STAN 2007

	Leontief		Technical coefficient matrix	
	EORA-GTAP	EORA-STAN	EORA-GTAP	EORA-STAN
United States	1.67	1.45	2.05	
Brazil	2.17	2.29	1.91	
China	2.36	2.14	1.68	
Tunisia*	3.52		2.11	
Viet Nam	3.85		2.28	
Laos*	3.51		2.54	
Tanzania*	2.65		2.34	
India	1.73	1.89	2.01	

Table C. EORA sectors

Sector Name	ISIC Rev.3 correspondance
Agriculture	1, 2
Fishing	5
Mining and quarrying	10, 11, 12, 13, 14
Food and beverages	15, 16
Textiles and wearing apparel	17, 18, 19
Wood and paper	20, 21, 22
Petroleum, chemicals and non-metallic mineral products	23, 24, 25, 26
Metal Products	27, 28
Electrical and machinery	29, 30, 31, 32, 33
Transport equipment	34, 35
Other manufacturing	36
Recycling	37
Electricity, gas and water	40, 41
Construction	45
Maintenance and repair	50
Wholesale trade	51
Retail Trade	52
Hotels and restaurants	55
Transport	60, 61, 62, 63
Post and telecommunication	64
Financial Intermediation and business activities	65, 66, 67, 70, 71, 72, 73
Public administration	75
Education, health and other services	80, 85, 90, 91, 92, 93
Private households	95
Others	99

Measuring export specialisation: The Balassa's measure of revealed comparative advantage (RCA)

The indicator of revealed comparative advantage (RCA) proposed by Balassa (1965) reveals whether the export structure of a country shows a higher or lower share for a particular grouping of goods in comparison to the export structure observed in world trade.

$$RCA_{g,c} = \frac{Exports_{g,c} / \sum_g Exports_{g,c}}{Exports_{g,world} / \sum_g Exports_{g,world}},$$

where: $Exports_{g,c}$ captures the total exports of good g by country c and $Exports_{g,world}$ are the total exports of good g in world trade.

The common interpretation is that countries showing a higher export share of good g in their export bundle than the corresponding share for the world have 'revealed' themselves to have a comparative advantage.[110] Although a commonly used measure, the RCA indicator has its proponents and detractors. For example, Richardson and Zhang (2001) suggest that since it embeds trade policies (as it uses trade flows which are themselves affected by trade policy) the measure can capture the trade competitiveness of countries. On the other hand, detractors argue that the measure is to be used with caution since it is not easily comparable across goods nor does it lend itself to ordinal ranking. However, comparability across countries and within countries and products is straight forward and it is in this context that we use it.

FTAs in the focus regions

ASEAN Economic Community (AEC)

The AEC is an ambitious project that rests on four pillars. The first is to establish a single market and production base not just by guaranteeing the free flow of goods, capital and skilled labour but also by further liberalising investment (through more predictable and transparent rules coupled with national treatment) and services (by promoting the liberalisation of the financial sector and applying recognition of professional qualifications). The second pillar—creating a competitive economic region, then seeks to further harmonise rules related to competition policy, IPR protection, taxation and the development of infrastructure. These are likely to create a supply chain trade-friendly institutional setting helping the region to better integrate production structures. In the third pillar equitable economic development is sought where particular heed is paid to SME development and to the development aspects and the needs or constraints of the heterogeneous group of countries that compose the ASEAN region (i.e. consideration for Cambodia, Lao PDR, Myanmar and Viet Nam; the CLMV countries). The final pillar is geared towards further integration with respect to non-members where participation in global supply networks is explicitly mentioned as a goal.

AEC progress on first pillar issue has been fast-paced, although tariffs are still present in CLMV countries, but advancement on competition policy and IPR has lagged (Menon, 2013).[111] Although the AEC scorecard suggests that completion is at 78% in 2012, challenges in view of final completion for the 2015 deadline remain.[112] External challenges are also pressing. In particular the overlapping

110. This happens when the indicator is above 1. When the indicator is below 1 countries are said to have a comparative disadvantage.

111. Tariffs between ASEAN-6 countries are virtually zero (with some exceptions for rice) and progress has also been made by CLMV countries whose average tariff is just above 2.5%.

112. The scorecard tracks the transposition of commitments into national law rather than implementation per se and therefore it is hard to tell the extent to which this figure is representative. Additionally, the implications of the concessions, in terms of slower implementation commitments, granted to CLMV countries on the basis of their development needs are hard to evaluate and may result in the formation of a

commitments across different agreements run the risk of confusing businesses.[113] The negotiating process of 'ASEAN+' FTAs (the so-called ASEAN plurilaterals) require partner countries to negotiate liberalisation commitments with each individual ASEAN member rather than negotiating with a homogeneous bloc.[114] Not only does this increase the costs of negotiation but it also leads to there being a panoply of rules of origin in order to avoid trade deflection (see Cadot and Ing, 2014).[115] The presence of two agreements for a single dyad of countries is also not uncommon and this means that exporters often have a choice in terms of use of preferences or indeed rules of origin to trade with one ASEAN country.[116]

The nature of the ASEAN plurilateral agreements is also relatively diverse in terms of coverage of deep integration issues.[117] For example, the ASEAN-Australia-New Zealand (coming into force in 2010) and the Korea (2010) FTAs appear to be the most comprehensive including elements of services, investment and even trade facilitation whilst that with India (2010) is the most shallow making little to no reference to services or investment. That with China (2006) is mixed containing some investment and services provisions. While the agreement with Japan (2008) is relatively shallow it is worth noting that many countries have concluded individual bilateral agreements with Japan and these tend to contain an important array of deep integration measures such as the inclusion of dispute settlement or indeed technical regulations (TBT and SPS).

SEA has often been lauded for its fast-paced integration into regional and global markets and indeed a lot of progress has been made, but there is still room for improvement. Competitive pressures are likely to grow as other countries increasingly look to joining GVCs and therefore SEA countries need to continue reforming if they are to remain competitive.

The CLMV countries continue to lag behind in terms of their economic development and will need to undertake important efforts in order to catch-up with the ASEAN-6 countries. The regional integration effort is likely to help in this process (with pillar 3 of AEC giving particular consideration to the development aspect) but it is finalising the internal market that may be more conducive to this catch-up. Anecdotal evidence from the region suggest that ASEAN-6 countries see their CLMV neighbours as offering new economic opportunities for offshoring parts of their production and therefore 'upgrading' within the value chain and important complements to their GVC strategy. Such regional fragmentation could bring about win-win outcomes for ASEAN countries. However such ambitious plans require further work, first by eliminating intra-regional tariff barriers to trade and reducing the MFN tariff (so as to avoid costly trade diversion), and second by implementing reform via the finalisation of the internal market so that investment can move freely within the region (OECD, 2014).

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region running at two different speeds. Under the agreement CLMV countries are given concessions in terms of their liberalisation commitments.

113. The mega-regionals such as the TPP may also provide conflicting rules on standards and particularly IPR (see Winters, 2014 for a general discussion of TPP rules).

114. These agreements contain time derogations for CLMV countries which are given an extra three years in terms of their tariff liberalisation commitments.

115. Trade deflection is when trade enters an FTA via the member with the lowest tariff. It is to avoid this sort of practice that rules of origin are put in place. Cadot and Ing (2014) show that the impact of RoO in ASEAN is equivalent to an *ad valorem* tariff of 3.4% and higher in some sectors such as textile and apparel, leather, footwear and automobiles.

116. For example, New Zealand has an agreement with Thailand since 2005 and in 2010 it signed AANZFTA (ASEAN-Australia-New Zealand FTA) which also comprises Thailand. Currently, negotiation for RCEP are on the way also including these two countries Therefore notionally three different agreements could be in place by the end of the decade.

Although the ASEAN-6 countries are progressing well, there is much that countries like the Philippines, Thailand and Indonesia can learn from Singapore and Malaysia. We see big differences between these in terms of logistics performance, infrastructure and quality of institutions. The continued push for the finalisation of the single market is likely to help convergence and this coupled with domestic reform aimed at increasing institutional quality and logistics performance will also be needed in order to complement the regional efforts.

South Asian Free Trade Area (SAFTA)

In stark contrast to the AEC, SAFTA is currently still struggling in its efforts to substantially reduce internal tariff barriers to trade.[118] Negative lists (nearing 20% of tariff lines although being reviewed every four years) remain and although there is a commitment to reducing NTBs in the region progress has been very slow (Rahman, 2010).[119] Moreover, the agreement relates only to trade in goods with no clear pathways towards deeper integration. This has led a recent UNCTAD (2012) report to qualify South Asia as "the least integrated region in the world".

It is nevertheless hard to tell whether the low degree of regional value chain activity (as is highlighted in Figure 9) is a direct result of the shallowness of the agreements in force or whether it is due to other shared structural characteristics which are not conducive to further regional integration such as the similarity in factor abundance or specialisation in the production of similar products (i.e. textiles, garments and agricultural products).[120]

Geopolitical issues may be stymieing further integration in the region, and it is therefore no surprise that some countries are increasingly looking outside the region for preferential partners. As we saw earlier India and Pakistan (the largest partners in SAFTA) are amongst the most prolific in Asia in terms of current and foreseen trade agreements.[121] However, the smaller members are struggling to open markets and therefore their fate, in terms of greater international market access, might be tied not only to the success of India and Pakistan in opening new markets but also conditioned to the success of the SAFTA agreement in dealing with tariffs and behind the border measures.[122]

118. World Bank (2010) suggests that Bangladesh, Maldives and Nepal retain positive tariffs on 65-75% of imports from the region with Sri Lanka and India not trailing too far from this figure at around 51% and 38% each. Pakistan also maintains a Positive list with respect to India.

119. See Raiham et al. (2014) for an analysis of the impact of NTMs in SAARC.

120. Traditional theories of comparative advantage would suggest that there is little scope for regional specialisation under these circumstances, however, this might be different in a world where GVCs are pervasive and specialisation can occur at different segments of similar products' value chain.

121. India is still negotiating the RCEP as well as with the EU, Australia, Canada, EFTA, Egypt, the GCC, Israel, New Zealand, SACU and Thailand. It has concluded agreements with Chile (2007), Japan (2011), ASEAN (2010), Korea (2010), Malaysia (2011), MERCOSUR (2009) and Singapore (2005). Pakistan is negotiating with the GCC, Mercosur, Morocco, Singapore, Turkey, ECOTA and the United States and has agreements in force with the likes of China (2007), Indonesia (2013), Malaysia (2008), Iran (2006) and Mauritius (2007) according to the ARIC-ADB database.

122. A growing linkage between South and South East Asia is also emerging via the new agreements of India and Pakistan. India signed a rather shallow agreement with ASEAN which came into force in 2010 but has individual agreements with Malaysia (2011), Korea (2010) and Singapore (2005) which incorporate elements of deep integration such as provisions on investment as well as services. With negotiations under way with Thailand, the EU, EFTA, Canada, India is seeking an ambitious RTA agenda. Pakistan has also sought access to the east and has concluded agreements with China (2007) and more recently Malaysia (2013) which incorporate services and investment provisions but it has a rather shallow agreement with Indonesia (2013). Pakistan is also negotiating with the GCC, Mercosur, Morocco, Turkey and the United States amongst others

In this context, one element that may be helpful is that of engaging in a more concerted effort towards regional integration.[123] This means not just a full elimination of intra-regional tariffs but also coordination of more concrete regional trade facilitation initiatives looking at both physical and institutional infrastructure. The OECD's Trade Facilitation Indicators suggest that a key common weaknesses in Bangladesh, India, Pakistan and Nepal is the need to further streamline procedures and this could be a priority in terms of devising a more favourable trading environment. One possible suggestion would be to use the *Master Plan on ASEAN Connectivity* as a guiding framework in order to identify action points aimed at increasing logistics performance to the levels seen in SEA. This may help countries such as Nepal and Afghanistan, both landlocked and small, to exploit benefits from economies of scale and tap into regional value chains for their development. It will also be to the benefit of India and in particular the regions located close to these countries insofar as they too may achieve greater market access (World Bank, 2010).

Much remains to be done in the region both in terms of regional and global integration but countries should be aware that the process is long and wrought with challenges. Trade facilitation and better infrastructure are necessary but not sufficient conditions for further participation and these need to be complemented with MFN tariff liberalisation (South Asia continues to have high tariffs relative to other regions) and institutional reform aimed at increasing the low quality of these and also driving further impetus for service and investment liberalisation. This could help attract foreign investment and therefore new technologies complementary to the labour abundance of the South Asian countries. Indeed, in many respects, and particularly in terms of labour endowments, South Asia resembles many South East Asian countries and therefore should be able to attract important GVC activity which may help further development objectives.

Regional Economic Communities in Africa

Many African countries face important challenges in terms of scale, remoteness and productivity that are necessary to integrate successfully into global markets. Productivity levels experienced in Sub-Saharan Africa (SSA) remain substantially lower than other developing regions and virtually unchanged since the mid-1990s (IMF, 2012). Low productivity is aggravated by a multitude of problems besides scale such as credit shortage, the absence of skills to support economic activity, even power outages and limited access to water (e.g. Oseni, 2013).

However, demographic factors such as population growth as well as the rise of the middle class in Africa present opportunities that could mitigate, at least partly, some of the scale and productivity disadvantages of the continent (see AfDB/OECD/UNDP, 2014). Over the past decade, the number of middle-class consumers in Africa has increased to 34% of Africa's population or nearly 350 million (AfDB, 2011). Moreover, almost two thirds of Africa's total population is aged under 25, and the population itself is predicted to double by 2050 (see AfDB/OECD, 2014). With the right skills, infrastructure and business environment, Africa could potentially establish itself as an important player in global manufacturing and perhaps even services. Countries in WCA and ESA in particular can go a long way in improving business conditions in order to help the potential demography-driven economic boom to materialise.

The different regional economic communities in Africa have contributed to progress in reducing barriers to trade, although intra-regional trade still suffers from relatively high tariffs and technical barriers to trade. Protection has been reported to be sometimes greater within the region than between Africa and the rest of the world. For example, UNCTAD (2013) estimated that an African exporter to

123. Except for Bhutan all countries in South Asia have below world average shares of imports covered by RTAs.

markets outside the continent faces an average protection rate of 2.5%,[124] while the exporter faces an average applied protection rate of 8.7% if the same good is exported to an African market.

The share of intra-regional exports has remained relatively steady at around 10% of total exports over the last decade; a figure that is starkly lower to what is observed in South East Asia or Latin America where regional trade is typically over 20% of total exports. More thorough analyses show that African Economic Communities trade below potential, but the gap between actual and potential trade seems to have narrowed upon implementation of in the East African Community (EAC) (De Melo and Tsikata, 2014). This underperformance is likely due to the challenges associated with regional integration in the continent.

The main Regional Economic Communities currently operating in Africa (often with overlapping memberships) are the following:

- Community of Sahel-Saharan States (CEN-SAD)
- Intergovernmental Authority on Development (IGAD)
- Common Market for Eastern and Southern Africa (COMESA)
- East African Community (EAC)
- Economic Community of Central African States (ECCAS/CEEAC) including the Economic and Monetary Community of Central Africa (CEMAC)
- Economic Community of West African States (ECOWAS) including the West African Economic and Monetary Union (UEMOA)
- Southern African Development Community (SADC) with a subgroup of countries forming the Southern African Customs Union (SACU)

According to the African Union (2013) EAC is the most advanced community in the integration stages. After five years operationalizing its Customs Union, the EAC launched its Common Market Protocol in 2010. COMESA launched its Customs Union in 2009. ECOWAS and SADC have made progress in building their free trade areas (FTA). ECCAS launched its FTA but is facing significant challenges in implementing it. UMA, CEN-SAD and IGAD are still in the stage of cooperation amongst their Member States.

In October 2008, the heads of states of the COMESA, the EAC and SADC met in Uganda to discuss further integration of the three regional trading blocs a summit later referred to as the “Tripartite Summit”. The key issues for the three blocks were regional trade liberalization (with major challenges including the harmonization of rules of origin applied in the three blocks), but also infrastructure development and a legal and institutional framework between members. Further integration has not been realized to date because of substantive divisions in the process of harmonizing the existing regulations applied in the three blocs.

Design features could be a key reason why these agreements yield less than satisfactory outcomes in terms of intra-African trade, although structural features (i.e. similarity of economic structures and endowments) are also likely to play a role. Differences in rules of origin (ROOs) between the regional blocs, an oft-cited reason for the low engagement in GVCs, may restrict trade in intermediates and the

124. The low tariffs African exporters face outside the region is largely due to the preferences African exporters enjoy under the Generalized System of Preferences, the "Everything But Arms" initiative and the African Growth and Opportunity Act (AGOA).

failure of further integration initiatives in the region, such as the tripartite free trade area (see African Union, 2013), may exacerbate this.[125]

A promising recent development that should continue to be supported is the Technical Working Group established by the African Union (see African Union, 2013) to assess the compatibility of rules of origin across the three blocks of the tripartite agreement. Full engagement of governments in this effort seems imperative as harmonisation could bear fruits in a relatively short-term.

Insufficient provisions for non-tariff barriers to trade are another design failure preventing RTAs in Africa from realising their full potential. According to OECD (Meyer et al., 2010) only one of the eight agreements surveyed in Africa refers explicitly to the WTO Technical Barriers to Trade Agreement, while provisions for eliminating TBT-related barriers or harmonising technical regulations are formulated mostly in broad and non-prescriptive terms.[126]

Beyond the technical problems and challenges that regional initiatives might have to deal with, the level of commitment and motivation of African governments in pushing reforms is often questioned. According to the United Nations Economic Commission for Africa (UNECA, 2012), for example, one of the main challenges underpinning the acceleration of Africa's continental integration is the lack of progress in mainstreaming integration programs, protocols, decisions and activities into national development strategies of member states. The reason for this inactivity could well lay in the benefits governments expect from progress on that front. Asked about the significance of regional integration to different sectors of the economy, the majority of 32 governments in the region, responding to a UNECA survey, supported the view that integration does not significantly contribute to job creation and creation of regional value chains (UNECA, 2012). Benefits from existing and future liberalisation initiatives could thus be enhanced by improving implementation and mainstreaming of integration programmes into national regulation and development strategies.

Mistrust in benefits from the liberalisation process could perhaps explain conflicting strategies from governments, even in the most developed of the African countries. For example, in South Africa local content requirements for MNEs are in place, as part of an explicit import substitution and industrialisation strategy; incentives for the establishment of multinational enterprises are currently being revised, while in parallel the government expresses commitment to regional developmental integration one of the three main pillars of which is market integration with neighbouring SACU members (DTI, 2013).[127]

125. Comprehensive analysis by Kalamba (2009) shows that the SADC rules of origin are modelled similarly to the European Union rules, while the EAC rules those in COMESA (closely resembling to each other), are substantially different to the rules of origin applied to the SADC.

126. The importance of both the rule of origin harmonisation and the elimination of TBTs was identified early in the case of other developing regions such as East Asia, and a thorough multi-stage process of tackling these impediments was undertaken in the last decade (see ASEAN Blueprint for example); although the distance to catch up with might have been shorter than the one currently faced by African countries (see Keane et al., 2010).

127. These kinds of policies are usually motivated by the desire to move away from exporting raw natural resources to capturing more of the value added and engaging in downstream processing. The strategy has varied a lot in the region, with some governments introducing so-called 'beneficiation' policies, whereby action is taken to take advantage of the opportunities presented by rich mineral endowments and to develop industrial activities (see DTI, 2013). These policies have proved rather controversial in South Africa, with the main argument against them being that the skills, technology and inputs required to process raw materials and market finished products is very different from those required to mine or grow them; hence transition is not a natural process (Hausmann et al., 2008). Cross-country empirical evidence seems to support this view as it appears even more difficult for countries to move downstream in their export development when the production structure is dominated by raw materials than for other manufactured goods (Hausmann et al., 2008).

Moreover, despite the fact that Africa's trade with traditional partners such as the European Union and North America remains at close to 62% (the European Union only still represents more than 40% of Africa's trade – almost three times that of China), numerous countries including South Africa are establishing closer ties with emerging economies by eliminating barriers primarily towards the BRICs.[128] While the BRIC-Africa interaction presents undoubtedly feasible avenues for mutual advantage, it will be important to ensure that these commercial opportunities are pursued in a non-discriminatory and rules-based manner.

128. It is noteworthy that South Africa unilaterally cancelled more than a dozen Bilateral Investment Treaties with European Union members in mid-2013, in an effort to eliminate preferential treatment of investors that was deemed no longer be consistent with the country's development objectives (see AfDB, 2013).