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SACU in Global Value Chains:

Measuring GVC integration, position, and performance of Botswana, Lesotho, Namibia, South Africa, and Swaziland

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Table of Contents

List of figures

List of tables

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ACRONYMS AND ABBREVIATIONS

AfDB	African Development Bank
BLNS	Botswana, Lesotho, Namibia, and Swaziland
CAGR	compound annual growth
DVA	domestic value added
fob	free on board
FVA	foreign value added
GDP	gross domestic product
GVC	global value chain
I2E	importing to export
IOT	input output table
ISIC	International Standard Industrial Classification
IVA	indirect value added
MRIO	multi-region input output table
ODI	Overseas Development Institute
OECD	Organisation for Economic Cooperation and Development
SACU	Southern African Customs Union
SADC	Southern African Development Community
SUT	supply and use table
TiVA	Trade in Value Added (database)
WIOD	World Input Output Database
WTO	World Trade Organization

1. INTRODUCTION

1.1. Why GVCs matter

Once concentrated among a few large economies, global flows of goods, services, and capital now reach an ever larger number of economies worldwide. Global trade in goods and services increased 10 times between 1980 and 2011, while FDI flows increased almost 30-fold. The sales from foreign-owned firms amount to $26 trillion. As many as 3,000 bilateral investment treaties have been signed to create the framework of deep agreements needed not only to facilitate the global movement of final goods and services but also to internationalize entire processes of production. All these flows have grown over time, creating increasingly dense and complex networks.

One of the most significant reasons behind this transformation in global trade and investment has been the rise of global value chains (GVCs). Falling transport costs, greater global openness and cooperation on trade policy, and the ICT revolution have allowed production processes to be increasingly unbundled and shared across countries. Developing countries now join GVCs to further increase their economic competitiveness and they industrialize by densifying their participation. This is a huge change from the 20th century when countries had to build entire supply chains domestically to become competitive internationally (Baldwin 2006; see Antràs and Rossi-Hansberg 2009 and Ahmad 2013 for an overview of the literature).

An implication of this is that GVCs denationalize comparative advantage, and this changes the options facing developing and developed nations, participants and non-participants. Globally competitive 'lead firms' knit together national comparative advantages to build components in the most cost‐effective locations. Factories in developing nations have become full-fledged participants in international manufacturing networks. These factories are no longer are merely importing parts for assembly, in order to service domestic markets; rather, they are exporting parts and components used in some of the most sophisticated products on the planet. In short, 20th century globalization was about made‐here‐sold‐there goods crossing borders: the trade system helped those nations able to produce finished goods domestically, sell products abroad. But 21st century globalization is also about factories crossing borders, so intra-factory flows of goods, know-how, investment, training, ideas, and people are now international commerce. The trade system now can help nations make things, not just sell things.

1.2. Measuring GVC participation

In this context, understanding a country's current participation in value chains is beneficial to ensuring that its industrial and trade policies can facilitate sustainable productivity gains and increased quality employment within higher value-added sectors. But examining trade participation and performance through a GVC lens requires a revised way of measuring and analyzing cross-border and cross-industry flows in goods and services. In particular competitiveness in specific components and tasks (rather than comparative advantage in end products) is paramount, enabling participation within larger production networks and, in turn, increased value addition generated domestically over time.

Indeed, from a country perspective what matters ultimately is the value addition generated in the country from its export activity, and whether it increases (nominally) over time. This is not a new question for economics. Value addition is a function of productivity, but it is associated with the breadth, variety, and sophistication of tasks and activities in which a country specializes. The concept of domestic value added in exports is, therefore, an essential concept to understand the importance of GVC trade for a country. This concept allows us to distinguish the foreign and domestic content of a country's exports, at it also

accounts for the fact that some of the imported inputs may contain domestic value added that is processed in a foreign location and reimported. *This concept is explained in more detail in Appendix 1*.

Analysis of value added trade is based on the use of input-output tables which, while sacrificing the specificity of using customs classifications on parts or components, allow tracking usage explicitly at a sectorally disaggregated level and differentiating between transactions that are intermediates and those consumed as final demand by firms, governments, or consumers. This has been central to a recent proliferation of studies examining the development of value added in production and trade, starting with Hummels et al. (2001) and more recently elaborated by Koopman et al. (2010), Foster et al. (2011), and Johnson and Noguera (2012), among others.[2]

1.3. The relevance of GVCs for SACU countries

GVCs offer potential new opportunities for the five countries of the Southern African Customs Union (SACU): Botswana, Lesotho, Namibia, South Africa, and Swaziland. With global offshoring continuing to grow and wages rising in China and elsewhere in East Asia, substantial migration of value chains to Sub-Saharan Africa is expected (Lin, 2011). The SACU region – with its abundance of natural capital and surplus labor, along with a relatively high quality infrastructure and institutional environment – may be in a good position to attract GVC-oriented investment. Beyond assembly manufacturing that is typical of GVCs (e.g. apparel, electronics, automotive), the region should also be well-placed to compete as a location for value-addition to agricultural and mineral commodities ("beneficiation"). Both types of investment would not only drive exports and have the potential to create significant employment, but also support productivity upgrading by accessing global technologies and knowledge.

While across the region there is significant interest in facilitating integration into GVCs as well deepening integration of regional value chains (RVCs), there remains limited evidence of the extent of current integration, either globally or regionally. The most systematic assessment to date comes in the *African Economic Outlook* (AfDB 2014), which notes that the wider Southern Africa is currently leading the continent in terms of GVC participation, accounting for 40% of Africa's combined backward and forward integration, driven primarily by South Africa. In discussing the relevance of GVCs for the five SACU countries individually, the aforementioned *African Economic Outlook* summarizes the main GVC-related constraints and opportunities for each African country, including short profiles of the SACU countries (see Box 1). Substantial analysis has also been carried out within the more qualitative GVC literature of particular value chains in the SACU countries, including South Africa's automobile sector (c.f. Barnes and Kaplinsky 2000; Black 2001; Barnes and Morris 2008) and horticulture industry (c.f. Barrientos and Visser 2012), and Lesotho's and Swaziland's apparel industries (c.f. Morris, Staritz and Banes 2011; Staritz and Morris 2013). However, with the exception of South Africa, which is featured in the recently released WIOD and OECD/WTO TiVA multi-region input-output databases, little empirical data on GVC participation, positioning, and performance is available for the other SACU countries.

Box 1: African Economic Outlook's assessment of current and potential value chains for SACU countries

Drawing on the African Economic Outlook's country notes (AfDB 2014), the region's most recent trade policy review (WTO Secretariat 2009), as well as a cursory review of country strategy documents, the SACU countries have, when compared to other African countries, made greater inroads in terms of value chain integration.

Botswana has a relatively open economy, and has benefited substantially from its natural resource boon. The sectors in which Botswana is most engaged in global trade are mining, vehicles, textiles, beef and tourism, with

[2] A third approach lies in using customs data on processing trade (Gorg 2000, Swenson 2013, Baldwin and Lopez-Gonzalez 2013).

diamonds to the US, Europe, and Japan as the largest export commodity. Currently its manufacturing exports are only growing slowly and have low domestic value added and high import content. Increasing value addition from mining (by, for example, carrying out more processing and manufacturing domestically) as well as the growing tourism sector are seen to have substantial potential.

The clothing, textile, and livestock value chains are of central importance for Lesotho. Clothing accounts for 60% of total exports and employs 80% of the country's manufacturing labor force, functioning as the largest employer outside of government. Currently, Lesotho's clothing sector participates primarily within US-based buyer-driven GVCs but there is scope to expand further the recently growing market share in South Africa, given Lesotho's geographical advantages over Chinese imports. Livestock is currently the largest contributor to agricultural value added and could be further developed as an export sector. This will, however, require overcoming significant challenges including poor nutrition and low quality products, weak market links, and limited access to financial services. For textiles, there are concerns about inadequate skills.

Despite recent efforts at diversification – particularly in the fish and meat processing and mineral industries – Namibia currently remains relatively minimally integrated into value chains. The country's extraction and processing of minerals is the main growth driver but given its relative capital-intensity, it has only limited employment impacts. While constrained by skills shortages (especially at the mid-level) and regulatory obstacles, Namibia's proximity to South Africa and its well-developed infrastructure offers potential to connect to regional and global supply chains. This has motivated the recent development of export-processing zones and the granting of special manufacturing incentives.

South Africa is unique on the continent for the scale of its participation (and in some cases leadership) within GVCs, including the automobile, mining, finance, and agriculture sectors. In manufacturing (and particularly automobiles) it serves as an assembly hub for Africa, and this industry accounts for more than 6% of GDP. Mining, which is predominantly locally owned, is even more significant, accounting for 19% of GDP while the sector has substantial spillovers into financial services and housing. The finance and retail industries also have substantial presences in other African countries. According to the AEO, South Africa's advantages pertain particularly to skills, research capacities, as well as well-developed and dense networks of local supply industries and services.

Despite Swaziland's declining attractiveness to foreign investors (following the investment boom of the 1990s), the role of GVCs remains significant and investment stock remains high considering the size of the economy. Its main exports include sugar and sugar products, forestry, processed fruit, textiles, soft drinks, and some diverse manufactures. Value addition is hampered by the only limited stages of production that the country engages in and, in turn, a heavy reliance on South Africa for goods and services inputs.

Source: http://www.africaneconomicoutlook.org/en/countries/

1.4. Objectives and structure of this note

This note is intended provide an overview of SACU countries' participation and performance in GVCs, drawing on several data sources and indicators, and most importantly the recently released 189-country Eora multi-region-input-output (MRIO) database (Lenzen et al. 2012, 2013). Following this introduction, the note is structured in five additional sections. Section 2 discusses in greater detail the scope of the report, including the data sources and methodological approaches, as well as their respective limitations. Section 3 looks at structural integration in trade, including the degree to which SACU countries import and export intermediates. Section 4 analyzes trends in value-added exports as a first step in exploring GVC participation. Section 5 hones in on the core measures of GVC participation and a brief analysis of SACU countries' position in GVCs. Finally, Section 6 concludes by bringing together the main findings from the analysis.

2. SCOPE AND METHODOLOGY

2.1. Data sources and background to the Eora database

This note makes use of several data sources to carry out the analysis. Aggregate trade data and data on trade in intermediates (Section 3) comes from UN Comtrade, as does the analysis of upstreamness (Section 5). In addition, the note draws on indicators of domestic value added embodied in gross exports based on the Francois et al. (2013) database[3]. The most important data source for the analysis of GVCs, however, is the Eora database – this is discussed in more detail below.

The simplified Eora database is disaggregated into 189 countries and 26 sectors per country (including a 'rest of world' sector that captures statistical discrepancies)[4]. It is thus the only MRIO database that has relatively comprehensive coverage for sub-Saharan Africa. This makes it well suited for longitudinal analysis of value chain integration of developing countries not included in other datasets.[5] The Eora database, much like the OECD/WTO's TiVA database, uses available information to produce measures of trade in value-added for all countries. In order to produce a contiguous and continuous dataset, values has been interpolated for countries lacking necessary data. Eora has a historical time series spanning 1990-2011 based on an iterative process using an initial year estimate for 2000, overlaying estimates for 1999 and 2001, respectively with new data, and then re-balancing. In the past year, some analysis derived from the Eora database has been published in the *African Economic Outlook* (AfDB 2014) and the *World Investment Report* (UNCTAD 2013).

As such, the Eora dataset allows for an approximate replication, albeit at a somewhat lower level of precision, of the kind of analysis undertaken for other countries using the WIOD or TiVA databases. Appendix 1 provides a more detailed discussion of the development of different MRIOs, and Eora specifically. In terms of key indicators, this report draws on the methodologies first developed by Hummels, Ishii, and Yi (2001) in measuring vertical specialization and in turn formalized by Koopman, Powers, Wang, and Wei (2011) (and later Koopman, Wang, and Wei 2014) to derive some of the most commonly used trade-in-value-added indicators, including domestic and foreign value-added, as well as value added embodied in other country's intermediate inputs – i.e. forward and backward integration (see Appendix 2). Thus far most of these indicators have only been available publically for developed and other emerging economies through the WTO-OECD TiVA database and the WIOD database (both released in 2013).

2.2. Scope of coverage: geographical and sectoral

In order to provide a meaningful context for comparative analysis with the five SACU countries, 14 'peer countries' in sub-Saharan Africa, South Asia, and Latin America have been selected. For each of the five SACU countries, decomposed value-added measures (using f.o.b. prices, in current USD) are provided over 11 years (2000, 2006, and 2011) and placed next to peer countries in order to provide a relevant context for these countries' GVC integration. The peers include:

[3] Backward linkages in the Francois et al. (2013) database serve as a reasonable proxy for the domestic value added embodied in exports, as the share of re-imported intermediates is generally negligible. This analysis draws on input-output data available from the GTAP dataset.

[4] This is the condensed version of Eora with countries that have more than 26 sectors in their input-output or supply-use tables having their accounts simplified. However, this does not apply to Botswana, Lesotho, Namibia and Swaziland, which all have just 26 sectors even in the expanded Eora database.

[5] In comparative analysis with the WIOD dataset, Eora was found to provide broadly similar results when calculating foreign and domestic value added, albeit with a slight upward bias (which is to be expected as the greater number of highly heterogeneous developing countries, many of which have been subsumed in WIOD's rest of world matrix) (UNCTAD 2013).

- Southern African Development Community (SADC) neighbors with resource-rich economies: Mozambique, Tanzania and Zambia
- Other African countries that have been reasonably successful at integrating into GVCs: Kenya, Mauritius, and Rwanda.
- A selection of Asian and South American low- and middle-income countries with economic and/or geographical structures that are similar to one or more SACU country: Argentina, Bolivia, Cambodia, Chile, Lao PDR, Paraguay, Peru, and Thailand.

Key sectors for each country are also analyzed. Here selection drew on whether the relevant sector was tradable, as well as how significant they were as export sectors (an overview of this is provided in Section 3.1 and Appendix 3). Based on Eora's 26-sector classification system[6], the following fourteen sectors were selected for closer consideration for each of the SACU countries:

1. Agriculture
2. Fishing
3. Electrical and machinery
4. Financial intermediation and business services
5. Food and beverages
6. Hotels and restaurants
7. Metal products
8. Other manufacturing
9. Petroleum, chemicals, and non-metallic minerals
10. Post and telecommunications
11. Textiles and wearing apparel
12. Transport
13. Transport equipment
14. Wood and paper

2.3. Assessment of reliability of Eora data at the national and sectoral level

In most cases Eora results provide a reasonably accurate estimate for key indicators of GVC competitiveness at the country level, and of relative performance of different sectors, both within a country and in relation to comparator countries. Further, they are likely to provide a largely reliable approximation of the sectoral decomposition of value added and the direction of value-added trade, as well as trends for these indicators over an 11-year time period (especially as all three data-points are derived from the same source and methodology). Thus, in the absence of national input-output tables (IOTs) and supply-use tables (SUTs), and despite uncertainties (particularly at the sectoral level), Eora provides the best available and internationally comparable dataset for calculating key value-added trade indicators, though they are best complemented by more nuanced sectoral analysis drawing on alternative methodologies (e.g. producer surveys, firm-level analysis, and case studies).

However, a few caveats relating particularly to the accuracy of the Eora data are in order. Firstly, it is important to bear in mind that Eora's MRIO tables are modeled based on existing sources – national accounts data, Comtrade import and export data, among others – when national input-output or supply-use tables were not available. Further, in order to achieve the MRIO's overall balancing requirements, raw data on imports and exports has frequently been adjusted, with the overall focus on representing large data items and fulfilling balancing conditions for large countries. Eora's optimization approach attempts to strike a balance between the frequent conflicts between country-wise total exports and

[6] Correspondence to ISIC classifications can be found in Appendix 3.

imports and trade balances but this can lead to substantial uncertainties, particularly for small values (such as for the four SACU countries Botswana, Lesotho, Namibia and Swaziland that have not developed national input-output tables). Given these slight imbalances, total gross exports are at times marginally larger and/or smaller than the value added constituting it, and the sum of domestic and foreign value added as a share of gross exports is generally not exactly equal to total gross exports at the national and particularly sectoral level. As a result, indicators of domestic, foreign and indirect value as shares of exports use total exported value added as the denominator, rather than gross exports. This better reflect the relative importance of foreign and domestic contributions to exported value added[7].

In order to provide an indicative assessment of Eora's reliability, data on exports and imports were compared to results from the Comtrade database (using ISIC Rev. 3, which was also used to create the correspondence for Eora). Furthermore the standard deviation of each sector's non-exported output is also presented. This can be found in Appendix 4. Based on this comparative analysis, Eora results presented in this report should be interpreted with some caution.[8]

Particularly, due to concerns about data quality for the SACU economies, as well as to a lesser extent the price fluctuations for mineral products, the mining and quarrying sector was omitted from analysis and dropped from the MRIO, with subsequent analysis based on a 25 sector summarized table for each country[9].

[7] The Eora Frequently Asked Questions provide an explanation for the causes of these imbalances: "data on country-wise total exports and imports fundamentally conflicts with global trade balances. One cannot achieve a balanced global multi-region input-output table whilst at the same time respecting data on exports and imports. This means that in a real MRIO table, either balancing conditions must be violated or raw data mis-represented." Under ideal balancing conditions, national ratios of Gross National Expenditure + exports versus Gross Domestic Product + imports should be 1, i.e. in an IO table the total of all inputs to a sector a given sector (i.e. the column values) should equal the total value of that sector's outputs (i.e. the row values). However, due to data conflicts, this is in most cases a few per cent more or less than 1.

[8] Eora developers state that "results will generally be uncertain at the sectoral level and for small sectors, but not necessarily uncertain for small countries, especially not for small countries with high-quality IO data" (Lenzen et al. 2013, p. 39).

[9] In the case of Botswana, however, diamonds are classified under manufacturing and is, therefore, included in the analysis

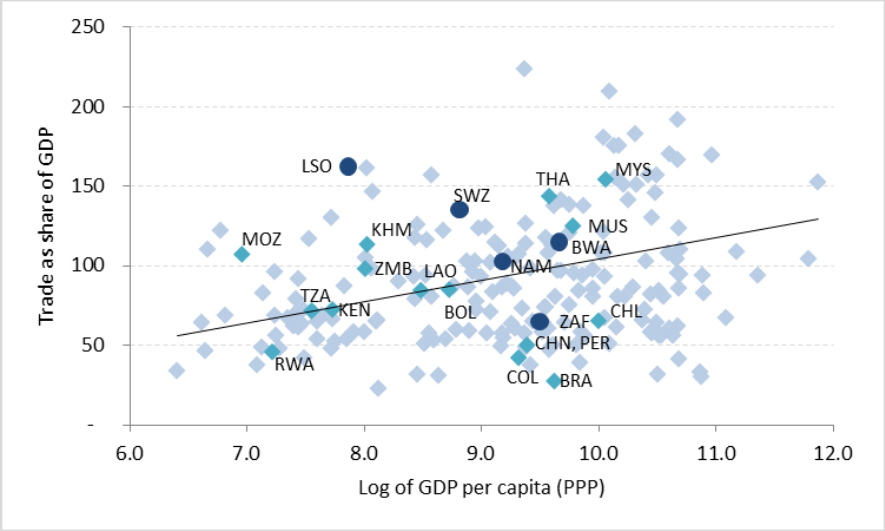
3. SACU EXPORTS AND STRUCTURAL INTEGRATION IN GLOBAL TRADE NETWORKS

Before analyzing value added trade and participation in GVCs, it is worth profiling briefly the nature of exports for the SACU countries and their integration into global trade networks. Moreover, as the analysis of value added trade remains an inexact science, particularly for smaller countries (i.e BLNS). Therefore, there it is useful to get a broad picture of potential GVC participation from the available aggregate trade data.

3.1. Overall trade integration

Trade openness – or trade share of GDP – is a standard measure to assess the importance of trade to a country's economy, and by extension, its integration with global markets. Figure 1 shows trade openness plotted against national wealth (measured as the log of GDP per capita). Traded shares of GDP increase as countries grow wealthier, although regardless of income level small countries tend to have a larger traded share of GDP than large ones – this is because large countries trade more internally, while small countries tend not to have sufficiently large domestic markets. Figure 1 shows that most SACU countries trade above the level that their incomes alone would predict, with Lesotho and to a lesser degree Swaziland among the most trade-dependent countries in the world. Given they have relatively similar populations as Lesotho and Swaziland and large mineral exports, Botswana and Namibia are actually substantially less integrated into global trade. South Africa, meanwhile records a relatively low degree of trade openness in regional terms, but still remains above the level of many of its peers, including China, Brazil, Colombia, and Peru. Overall the region sits in the middle between the highly integrated East Asian economies and the poorly integrated South American ones.

Figure 1: Global comparison of trade openness by national income level



Source: Authors based on data from WDI

3.2. Overview of main traded sectors

The SACU countries can be characterized as having two types of exporters. First, Botswana and Namibia, rely heavily on the mining sector (especially diamonds in the case of Botswana and Namibia) and the exports of raw materials (especially agricultural goods and food/beverages in the case of Namibia). Second, Swaziland and Lesotho have narrow but well-developed industries that drive most export earnings: in the case of Swaziland it is sugar and (related) concentrated beverage syrups; in Lesotho it is apparels and textile. South Africa sits somewhere in the middle, with a large share of exports in mining

(iron ore, gold, platinum, diamonds) but also a well-developed agricultural and manufacturing export sector. Table 1 provides a breakdown of exports by broad industry classification for each country. Thinking about traditional GVCs (vertically integrated production), the most relevant sectors are manufacturing as well as some within agriculture. Here we see that while Botswana and Namibia appear to have large shares of exports in manufacturing, this is mainly explained by the classification of diamonds in the manufacturing sector; removing this tells a very different story. In the case of Botswana, diamonds and crude materials account for more than 85% of total exports; in Namibia it is around 45%. Namibia does, however, have substantial exports in manufacturing and machinery. South Africa is also fairly skewed toward commodity exports, although it still has a large share of manufacturing exports. Swaziland is highly concentrated in food (sugar) and processed sugar in the form of Coca-Cola syrup (classified under chemicals). Lesotho, by contrast, looks quite different from the rest of the region, with more than 60% of exports in manufacturing.

Table 1: Structure of exports by SACU country (2013) – by SITC(2) section (1-digit classification)

	Botswana	Lesotho	Namibia	South Africa	Swaziland
Food and live animals	**2.2%**	**4.1%**	**19.9%**	**7.8%**	**25.4%**
Beverages and tobacco	**0.1%**	**0.1%**	**3.7%**	**1.7%**	**0.3%**
Crude materials, inedible, excl fuel	**9.3%**	**2.5%**	**19.7%**	**18.1%**	**9.3%**
Mineral fuels,lubricants	**0.4%**	**0.1%**	**1.2%**	**10.8%**	**4.2%**
Animal and vegetable oils,fats	**0.0%**	**0.0%**	**0.1%**	**0.3%**	**0.0%**
Chemicals and related products	**0.8%**	**0.1%**	**0.7%**	**7.1%**	**40.7%**
Natural resource / commodity subtotal	***12.8%***	***6.9%***	***45.3%***	***45.6%***	***79.8%***
Manufactured goods-by materials	**82.7%**	**35.6%**	**34.1%**	**25.0%**	**4.3%**
Machinery and transport equipment	**2.7%**	**8.5%**	**16.4%**	**18.8%**	**5.0%**
Miscellaneous manufactured articles	**0.7%**	**48.9%**	**2.0%**	**3.0%**	**10.0%**
Manufacturing subtotal	***86.1%***	***93.1%***	***52.5%***	***46.7%***	***19.3%***
Est manufacturing subtotal – excl diamonds	***10.1%***	***61.0%***	***28.6%***	***41.7%***	***18.2%***
Commodities not elsewhere specified	**1.1%**	**0.0%**	**2.2%**	**7.6%**	**0.8%**
TOTAL	***100%***	***100%***	***100%***	***100%***	***100%***

Source: Authors based on data from UN Comtrade (via WITS)

Turning to imports, Table 2 shows that manufactured goods account for a much larger share of imports than for exports in the region (with the exception of Lesotho). Botswana's figures are again skewed by diamond imports (for aggregation and trading); excluding these, Botswana again appears to be significantly less integrated in manufacturing trade in relative terms than other countries in the region. Other notable differences across countries include the much higher share of machinery and transport equipment imports in South Africa and Namibia and the much higher share of food imports in Lesotho and Swaziland.

Table 2: Structure of imports by SACU country (2013) – by SITC(2) section (1-digit classification)

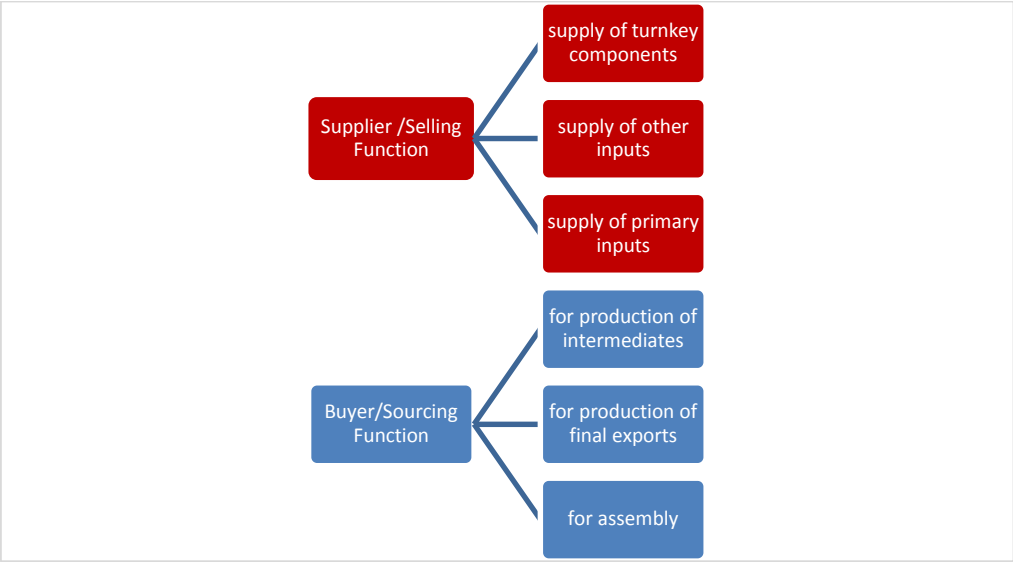
	Botswana	Lesotho	Namibia	South Africa	Swaziland
Food and live animals	8.0%	18.2%	9.3%	4.9%	15.0%
Beverages and tobacco	1.5%	3.2%	3.3%	0.8%	2.1%
Crude materials, inedible, excl fuel	1.7%	2.1%	7.4%	2.1%	1.7%
Mineral fuels,lubricants	0.5%	1.0%	0.4%	0.8%	0.7%
Animal and vegetable oils,fats	17.3%	16.3%	10.0%	21.7%	18.6%
Chemicals and related products	6.5%	8.4%	7.9%	10.4%	14.1%
Natural resource / commodity subtotal	*35.6%*	*49.4%*	*38.3%*	*40.7%*	*52.2%*
Manufactured goods-by materials	37.1%	21.8%	19.2%	10.6%	17.2%
Machinery and transport equipment	19.7%	17.5%	32.9%	34.2%	19.4%
Miscellaneous manufactured articles	6.1%	11.0%	9.4%	8.5%	10.9%
Manufacturing subtotal	*62.9%*	*50.3%*	*61.5%*	*53.3%*	*47.5%*
Est manufacturing subtotal – excl diamonds	*34.0%*	*47.6%*	*57.8%*	*51.6%*	*44.9%*
Commodities not elsewhere specified	1.6%	0.3%	0.1%	6.1%	0.4%
TOTAL	*100%*	*100%*	*100%*	*100%*	*100%*

Source: Authors based on data from UN Comtrade (via WITS)

3.3. Proxying GVC integration: trade in intermediates

Going beyond the broad sectoral classifications, we can also look at trade trends with respect to how goods are normally used – e.g. as inputs into another production process (i.e. intermediate goods) or as end products for businesses or consumers (i.e. consumption goods). The trade in intermediates is fundamental to GVCs, who basic concept is "importing to export" or I2E as Baldwin and Lopez-Gonzales (2013) call it. One country (for example South Africa) exports parts that are incorporated in the exports of another country (for example Germany). This single flow of intermediate goods is the basis of two key measures of supply chain integration, which help understanding better the role of a country in GVCs: on the sales side, it indicates that a country's exporters are selling into a GVC. On the sourcing side, it indicates that the country is buying from a GVC. Patterns on the buying side provide information on the source of technology transfer and the type of GVCs a country is likely to join. This ultimately affects the growth of domestic value added since it affects the nature of the intra-firm know-how applied via GVCs. Patterns on the selling side indicate, instead, the likely exposure to demand shocks. We can distinguish three types of buyer roles in GVCs: for production of intermediate inputs in the value chain, for final production destined as exports, and for assembly. The main supplier functions are also three: supply of turnkey components, supply of other inputs, and supply of primary inputs (see Figure 2).

Figure 2: Seller and buyer functions



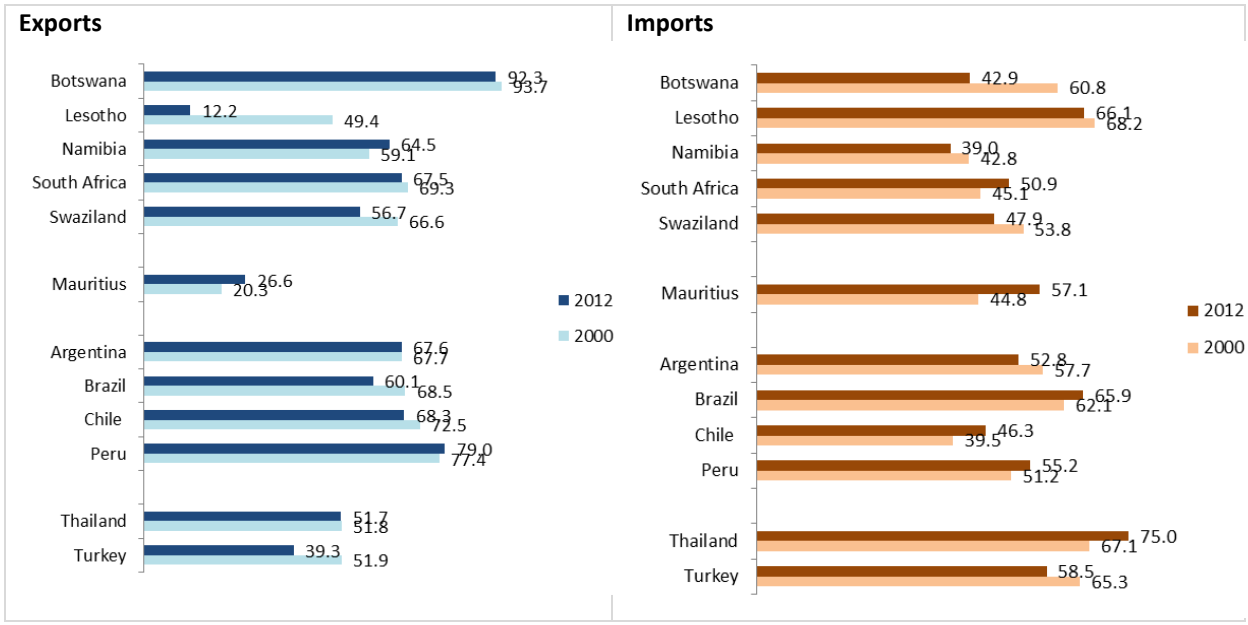
Source: Taglioni and Winkler (Forthcoming).

Figure 3 provides an aggregate view on the share of intermediates in SACU trade. We can see that share of intermediates in exports varies substantially across countries and over time. With the notable exception of Lesotho, all SACU countries have more than half their exports in intermediates. Botswana records more than 90% of exports in intermediates, but this is skewed by the categorization of diamonds, which alone accounts for more than 70% of exports. Both Lesotho and Swaziland show substantial declines in the share of their exports in intermediate goods – in the case of Lesotho, the share of intermediates fell dramatically from almost 50% in 2000 to just 12.2% in 2012. But while intermediates tend to proxy for production chain integration, in the case of Swaziland and Lesotho, the decline in intermediates is actually likely to be the result of GVC integration. Specifically, it is the result of participation in the apparel GVC, where both countries specialize in final stage assembly. Indeed, as shown in Table 3, apparel exports – where Lesotho, in particular, became concentrated in the 2000s, are largely consumer products (rather than intermediates) and Lesotho and Swaziland have the lowest share the intermediates in exports among all peer countries.

In the case of South Africa, the share of intermediates in total exports fell slightly between 2000 and 2012. This comes despite a significant increase in the share of intermediates exported in the transport equipment sector (up from 13% to 22%). Similarly, intermediate exports have grown rapidly in the food and beverages sector (up from 15% to 23%), but South Africa still sells more consumer food and beverages products than most peers, perhaps indicative of a strong GVC position in this sector. South Africa's virtual exit from global GVCs in apparel and footwear may be evidenced by the decline in intermediate exports from close to 10% in 2000 to just 1.6% in 2012.

Botswana's high share of intermediate exports is clearly distorted by diamonds. The sector-specific data in Table 3 shows that Botswana has among the lowest share of intermediate exports across virtually all sectors. Namibia shows a similar trend, with the one exception being their small electronics sector, which experienced a strong shift toward intermediate products (while Botswana's exhibited the opposite shift).

Figure 3: Intermediates as a share of gross exports and imports (2000, 2012)



Source: Authors based on data from UN Comtrade (via WITS)

Integration matters as much for imports as exports. Data in Figure 3 shows that the majority of peer countries increased the share of imports in intermediate goods. In SACU, by contrast, only South Africa increased imports of intermediates. The other four countries experienced declining relative imports of intermediates, some significantly so: Botswana's intermediates fell from 60.8% of imports in 2000 to just 42.9% in 2012; Swaziland's fell from 53.8% to 47.9%. Overall, SACU countries, with the exception of Lesotho, come out lower than most peer countries in their reliance on imported intermediates. Again, the situation varies substantially by sector, although Botswana and Namibia fall well below the peer average in every sector[10].

Table 3: Intermediates as a share of gross exports (2012)- selected sectors

	Agriculture	Food & Beverages	Apparel & Footwear	Machinery	Electronics	Transport Equipt
Turkey	25.9	70.8	2.4	46.2	36.0	21.3
Thailand	13.9	16.0	2.0	62.9	63.9	30.0
Peru	54.2	82.9	0.1	41.0	55.8	32.5
Chile	12.3	17.9	11.2	40.1	38.7	31.7
Brazil	65.0	55.7	1.2	46.8	34.8	21.6
Argentina	66.2	72.2	5.6	55.1	65.6	23.4
Mauritius	66.0	84.6	0.0	20.3	43.9	24.8
Swaziland	**7.4**	**70.8**	**0.1**	**8.9**	**75.0**	**2.1**
South Africa	**21.2**	**23.0**	**1.6**	**30.9**	**47.9**	**22.0**
Namibia	**9.4**	**12.6**	**3.1**	**27.2**	**42.9**	**21.2**

[10] The only exception being machinery for Namibia.

	Agriculture	Food & Beverages	Apparel & Footwear	Machinery	Electronics	Transport Equipt
Lesotho	**3.0**	**31.8**	**0.0**	**70.6**	**93.9**	**85.3**
Botswana	**9.4**	**21.9**	**1.4**	**27.0**	**17.5**	**8.8**

Source: Authors based on data from UN Comtrade (via WITS)

Table 4: Intermediates as a share of gross imports (2012)- selected sectors

	Agriculture	Food & Beverages	Apparel & Footwear	Machinery	Electronics	Transport Equipt
Turkey	79.2	70.2	4.9	30.6	40.5	27.0
Thailand	46.3	56.8	6.0	52.8	77.5	67.8
Peru	73.4	42.6	8.4	35.2	35.2	13.2
Chile	51.5	41.5	3.2	32.2	31.1	11.2
Brazil	60.8	26.8	6.1	48.0	67.4	50.5
Argentina	41.4	15.2	2.0	35.9	38.1	39.0
Mauritius	28.1	25.1	5.7	28.3	26.5	11.5
Swaziland	**75.6**	**3.7**	**3.2**	**23.2**	**25.9**	**14.8**
South Africa	**55.4**	**41.8**	**3.0**	**39.6**	**33.0**	**21.2**
Namibia	**30.0**	**28.5**	**1.7**	**45.3**	**41.7**	**15.7**
Lesotho	**89.8**	**52.5**	**0.7**	**21.6**	**22.4**	**28.3**
Botswana	**46.5**	**28.2**	**1.5**	**25.0**	**38.0**	**12.6**

Source: Authors based on data from UN Comtrade (via WITS)

3.4. Positioning in global trade networks

To get a further sense of the region's links into global trade networks, we can look at measures of network centrality. In Table 5, we report two measures of *local centrality* along with two measures of *global centrality*:

- Local centrality refers only to the first order links of each country (neighbors), namely outward "Node Degree" and "Node Strength", where the former measures the centrality in terms of the number of markets reached by SACU countries and the latter the intensity of exports.
- Global centrality measures describe the characteristics of nodes' neighborhood, and in particular assess the extent to which a country trades with partners that are themselves important exporters. "Out-closeness" is a measure of how close a node is with respect to all other nodes, in terms of intensity of export relations. It therefore provides a measure of the relevance of links. "Eigenvector centrality"[11] stresses the relevance of nodes, i.e. it is important to assess if a node is connected to central players or to peripheral ones. Specifically, a node's eigenvector centrality is determined by the eigenvector centrality of its neighbors, so that their centrality is also taken into account. In general, countries displaying high value of eigenvector centrality are the ones which are connected to many other countries which are, in turn, connected to many others. The largest values correspond to countries in large and cohesive (high-density) sub-networks.

[11] Bonacich (1972)

Table 5 presents the results of network centrality measures for SACU for overall trade intermediates and four key sectors that tend to be traded in GVCs: agri-food, apparel, automotive, and electronics[12]. In terms of local centrality, the results indicate that SACU ranked 14th out of 216 countries included in the Comtrade database in 2010 in the Node Degree Index and 39th in the Node Strength Index, suggesting that the region is the top-trading partner for a sufficiently large number of exporters but the intensity of trade volumes is only moderate. It has also improved its relative importance since 2000, while relative strength declined slightly. In terms of global centrality, SACU still ranks well but somewhat lower than for local centrality, with an Out-Closeness ranking of 41 (down 6 places from a decade earlier) and an Eigenvector Centrality ranking of 34. Sectoral rankings are broadly in line with the overall ranking, although the region ranks notably lower in apparel in both local and global centrality and notably higher in electronics (as well as agri-food global centrality).

Table 6 compares South Africa's centrality indexes in 2010 with those of 20 peer countries. The results for total trade suggest that South Africa performs relatively well, but with the exception of Node Degree, tends to be at the lower end of comparisons with BRICS and East Asian peers.

Table 5: Centrality Ranking for SACU, World Ranking

	Local Centrality		Global Centrality	
	Node Degree Index	**Node Strength Index**	**Out-Closeness Index**	**Eigenvector Centrality Index**
Agri-food (2010)	16	42	23	24
Apparel (2010)	17	49	51	47
Automotive (2010)	14	39	41	34
Electronics (2010)	15	25	18	19
Total Intermediates (2010)	**14 (↑4)**	**39 (↓3)**	**41 (↓6)**	**34 (--)**
Total Intermediates (2000)	**18**	**36**	**35**	**34**

Data Source: UN Comtrade.

Table 6: Centrality Measures for South Africa and Peer Countries, World Ranking 2010, Total Intermediates

	Local Centrality		Global Centrality	
	Node Degree Index	**Node Strength Index**	**Out-Closeness Index**	**Eigenvector Centrality Index**
SACU	**14 (3rd of 20 peers)**	**39 (9th of 20 peers)**	**41 (8th of 20 peers)**	**34 (6th of 20 peers)**
Brazil	17	28	38	35
Russia	25	23	40	36
India	5	22	14	14
China	5	1	1	1
Kenya	40	79	75	73
Mauritius	54	112	91	80
Rwanda	83	156	185	142
Tanzania	46	101	87	83

[12] Table 5 and Table 6 report rankings rather than absolute values of centrality measures in order to simplify comparability across different indexes.

	Local Centrality		Global Centrality	
	Node Degree Index	Node Strength Index	Out-Closeness Index	Eigenvector Centrality Index
Zambia	61	115	132	115
Cambodia	82	117	97	134
Malaysia	11	8	11	11
Thailand	12	12	13	17
Vietnam	44	34	33	45
Argentina	35	43	67	54
Bolivia	64	104	106	113
Chile	49	47	61	59
Colombia	40	51	64	61
Peru	50	58	78	74
Turkey	16	31	21	24

Data Source: UN Comtrade.

Finally, network representations help visualize the complexity and heterogeneity of actors and trade links in GVCs. Figure 4 and Figure 5, visualize the network reporting the strongest flow for each node. The most connected countries – the central nodes, as they are the main trade partner for several countries – are the "roots" of the tree, distinguished from the peripheral countries – the "leaves." The size of the node reflects a country's strength or centrality in the network. The thickness of links reflects the weight of the value added relation. Larger bilateral trade flows are portrayed by closer distances between nodes. Ideally, we would like to present the network using trade in value added data. However, such data are not available yet for a sufficient number of countries. Instead, we present the network for trade in consumption[13] goods (Figure 4) and intermediates (Figure 5).

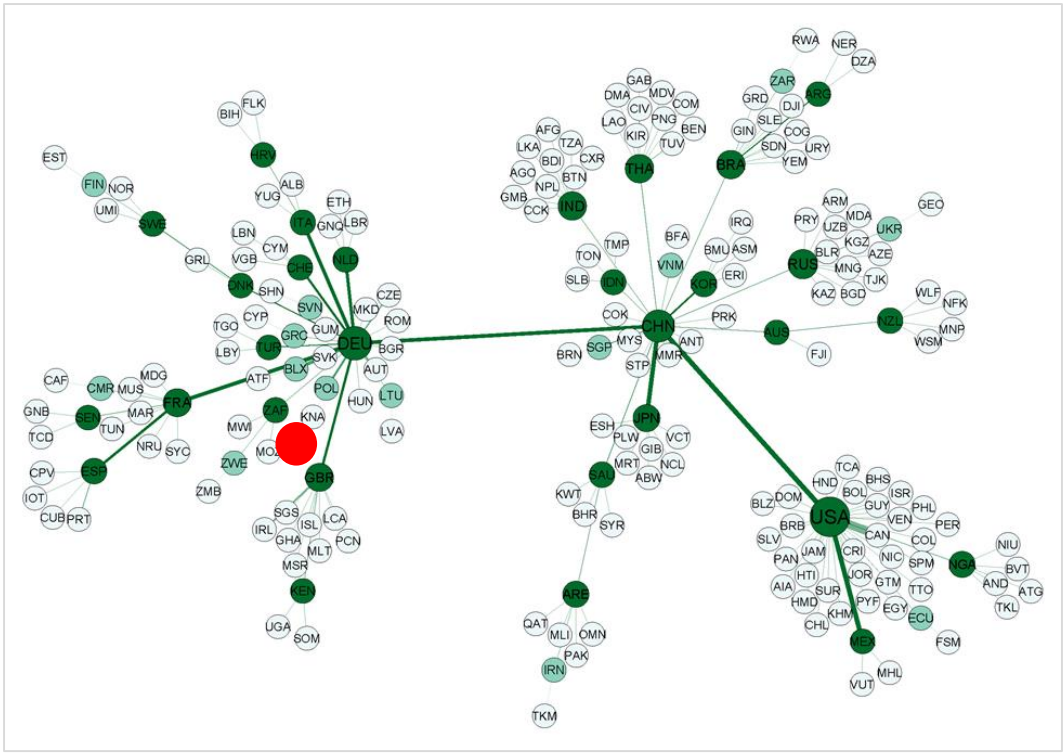
In the case of SACU[14], trade in consumption goods provides a sense of where the region sells its end products and where it is most linked into GVCs in terms of its backward integration (i.e. where it sources from). Here, we see the strongest links are with the EU trade network based around Germany. Figure 4 shows that SACU (mainly South Africa) is an important node linking some other regional economies into the European trade network. It also shows that while SACU is a significant player in the European regional trade network, it is has less direct links into Germany than trade partners like Eastern Europe and Turkey (as illustrated by its positioning further from Germany) and its level of trade is lower (as illustrated by thinner connecting lines).

The story is a bit different for intermediates (Figure 5), where China is demonstrably more central to trade for more countries than in consumer products. Here, SACU is primarily linked into the Chinese production network. Although the region is notably distant from the core of the Chinese network, it appears to play an even stronger role in intermediates as a regional node for Southern Africa.

Figure 4: Minimal spanning tree: trade in consumption goods (2010), SACU in red

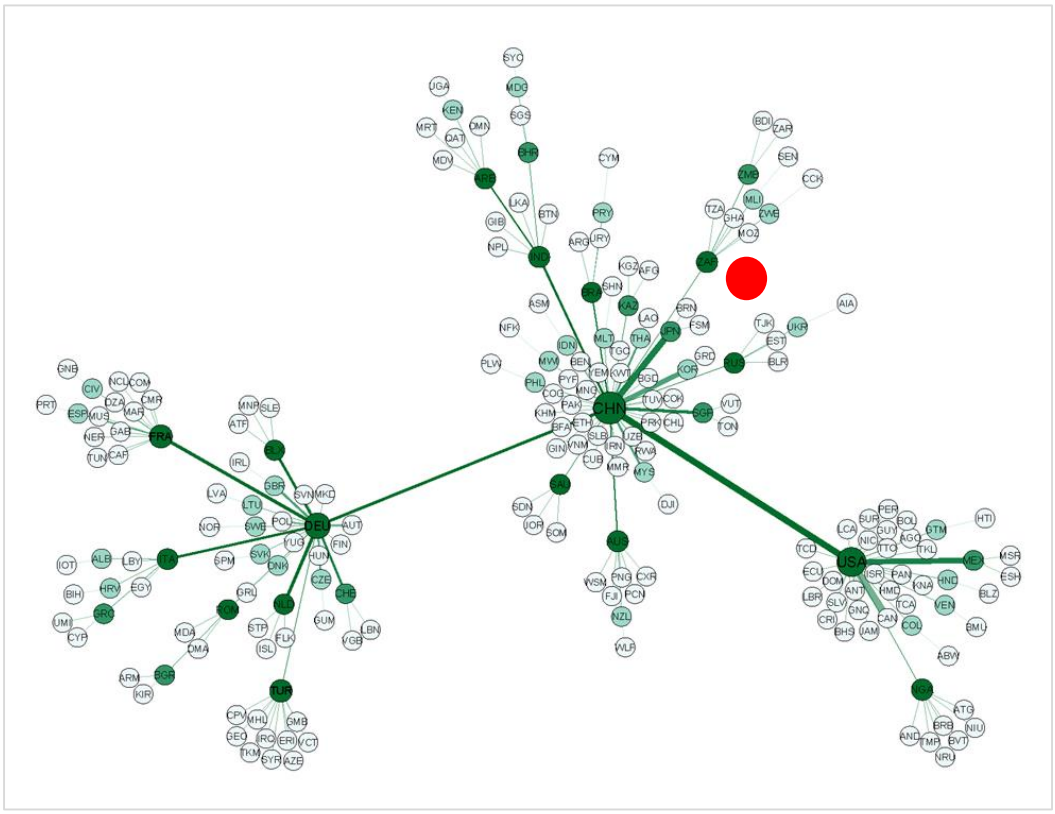
[13] The selection of consumption and intermediate goods is based on the UN Broad Economic Categories (BEC) classification which assigns goods to their final use, namely capital goods, consumption goods, and intermediate goods.

[14] The dataset of trade networks includes SACU as a single data point; no individual country data is available



Source: Santoni and Taglioni (2014). Data: CEPII, BACI Dataset.

Figure 5: Minimal spanning tree: trade in intermediate goods (2010), SACU in red



Source: Santoni and Taglioni (2014). Data: CEPII, BACI Dataset.

4. STEPPING INTO GVCs: MEASURING EXPORT VALUE-ADDED IN SACU

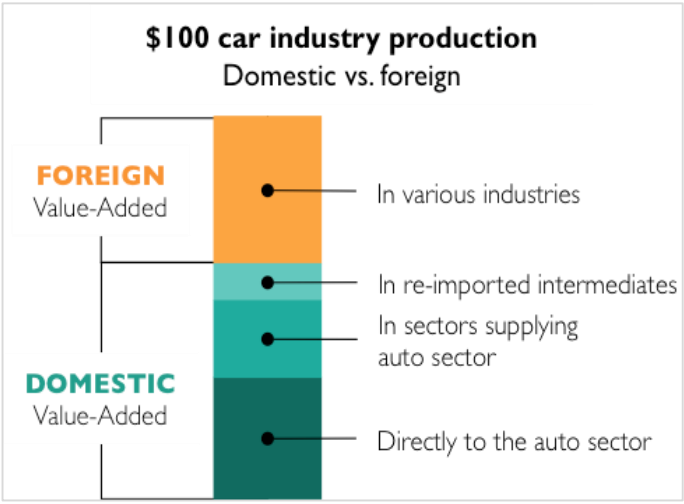
Section 3 of this note provided an initial overview of the scale and nature of integration of SACU countries in global trade networks. The analysis of trade in intermediate goods provided an initial view on SACU countries' trade in the types of products that generally typify GVC trade. Up until this point, however, we have been considering only data on "gross trade" – i.e. we have not considered the "value added trade" that is at the heart of analysis of global value chains. In this section, the analysis hones in more on GVC trade by isolating value-added trade from our traditional (gross) trade figures; it is followed in the remaining sections by further analysis of the nature of GVC trade.

4.1. Why understanding (domestic) value added is important in studying GVCs

One of the major implications of the growth of trade in fragmented global production networks is the inflation of aggregate export figures. This results from the double and triple counting of intermediates as they cross over national borders in the process of coming together to form an end product. For example, a Korean semiconductor that is incorporated into an ipod will be counted as a Korean export when it is shipped to Thailand to be assembled into an internal drive, and then again in Thailand's exports as the drive is shipped to China for final assembly, and then again from China as it is exported as a finished ipod. As a result, understanding a country's gross exports as well as exports of domestic value-added is important for understanding trade performance and GVC participation. It provides an insight into the critical issue of how trade performance contributes to the domestic economy in terms of output, industry linkages, and employment.

Indeed, what matters most for a country is not gross exports (which may include a significant share of foreign value added via imported inputs) but the domestic value added (DVA) embodied in gross exports. Figure 6 exemplifies the decomposition of gross exports for the auto industry. Domestic value added consists of value added created in the auto industry, value added created in other sectors supplying the auto industry, and of re-imported intermediates (which have been previously exported).

Figure 6: From gross exports to domestic value added: decomposition of gross exports in the auto industry



Source: Taglioni and Winkler (2014), based on Baldwin and Lopez-Gonzales (2013).

A country's ability to benefit from GVCs is best shown by the evolution of its DVA embodied in gross exports over time (see Box 2). At the industry level, DVA consists of value added created in a specific

industry itself, value added created in other domestic sectors supplying this industry, as well as previously exported intermediates re-imported from abroad for use in a given industry. In simple terms, an increase in DVA embodied in gross exports over time signifies greater value addition within the country itself. As a function of productivity, it is associated with a country's breadth, variety and sophistication of tasks and activities (Taglioni and Winkler 2014a). Beyond the likely welfare and employment implications, this also has a broader significance for trade policy.[15]

Box 2: Domestic and foreign value added: substitutes or complements?

Operating in GVCs is fundamentally about global trade integration – this means not only exporting within production chains but also making use of imported parts and components. Thus, while nominal domestic value added (DVA) is ultimately the measure of aggregate success for any country, the level of foreign value added (FVA) embodied in a country's exports is an important measure of GVC integration.

Mathematically, in percentage terms, DVA and FVA are substitutes – if a country increases its FVA from 40% to 50% of exports that necessarily means that DVA has declined from 60% to 50%. But that does not mean that maximizing DVA *share* should be the primary goal, particularly if it achieved through an import substitution strategy that results in producers having to accept lower quality or higher priced inputs (or simply inputs that are incompatible with those required by GVC-oriented buyers). In this case, maximizing DVA share comes at the expense of total volumes, as domestic producers may experience declining competitiveness in global markets and may be unable to participate in GVCs.

From a dynamic perspective, therefore, DVA and FVA can be seen as complements. Access to quality and cost effective imported inputs raises firm competitiveness, resulting in higher exports and therefore higher *nominal* DVA. Over time, technology spillovers from imported inputs may also result in some goods and services becoming competitively produced in domestic markets, leading to a productive substitution of imports for domestic supply, and potentially even higher DVA share.

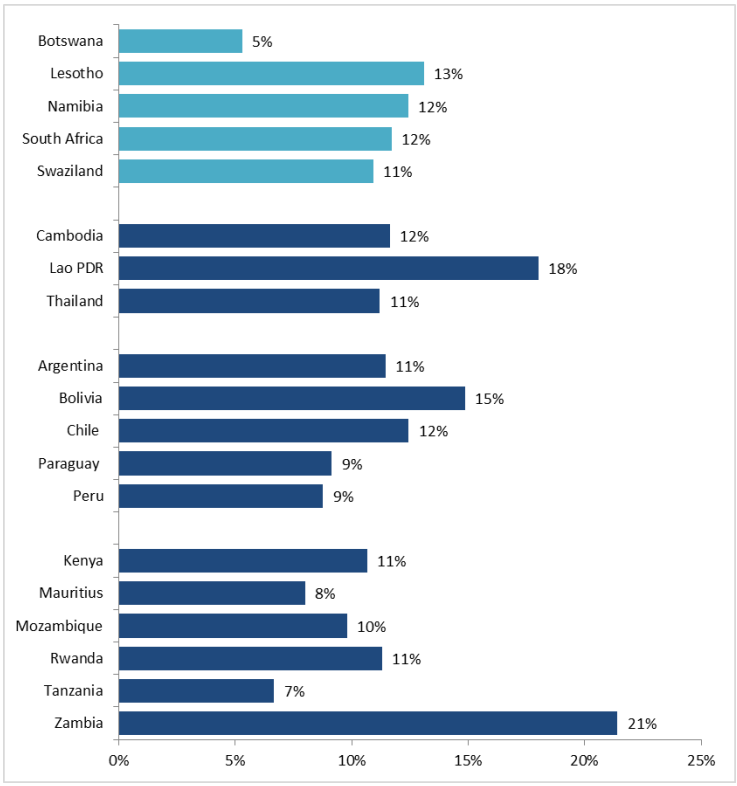
4.2. Is domestic value added increasing in SACU countries?

All five SACU countries have been able to grow their DVA in gross exports, albeit at different rates. Figure 7 examines compound annual growth rates of DVA embodied in gross exports[16] in the five SACU countries as well as their comparators both from 2000 to 2011. Among the five SACU countries, Lesotho has recorded the largest annual increase at 13% followed by South Africa and Namibia (12%) and Swaziland (11%). Lesotho also performs well in relation to its comparators. Only Bolivia, Lao PDR, and Zambia have seen a larger increase in DVA over the eleven-year period. The performance of the four leading SACU countries is comparable to that of Argentina, Paraguay, and Rwanda. By contrast, Botswana lags behind significantly at just 5% CAGR – in fact, Botswana's growth in DVA is the lowest among all 19 countries.

[15] For example, this information could be valuable in determining the effect of a country's currency appreciation on exports or in predicting the impact of exogenous shocks on welfare or employment.

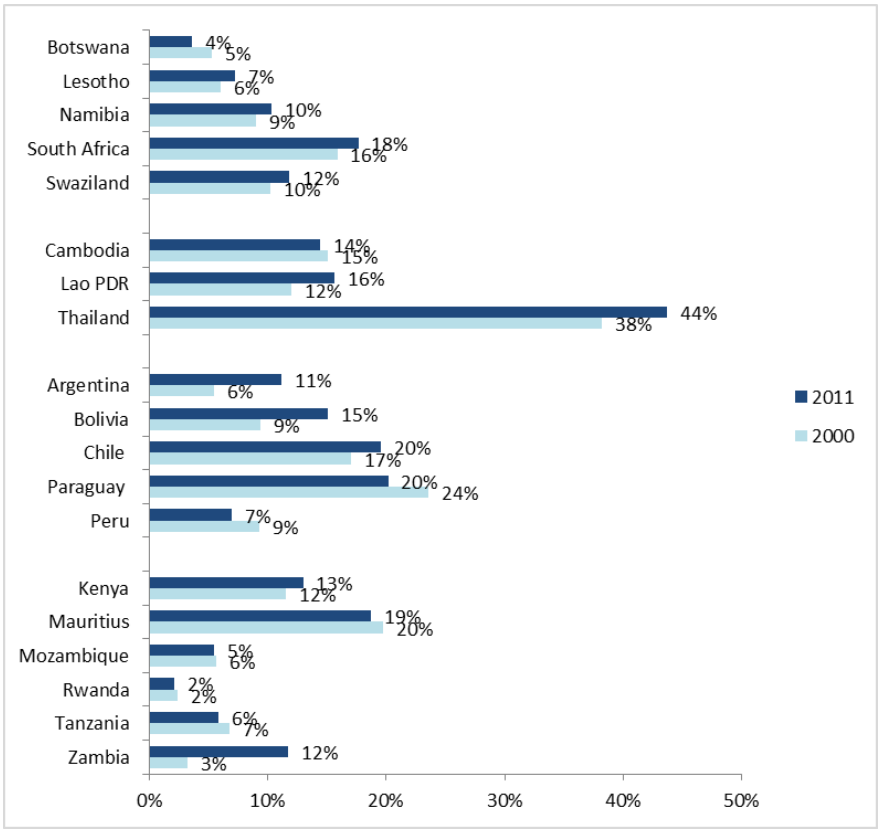
[16] Exports are measured in nominal US$

Figure 7: Compound annual growth rate of domestic value added embodied in gross exports, 2000-2011



Source: Own computations using Eora database

Figure 8: DVA embodied in gross exports as a share of GDP, 2000 and 2011

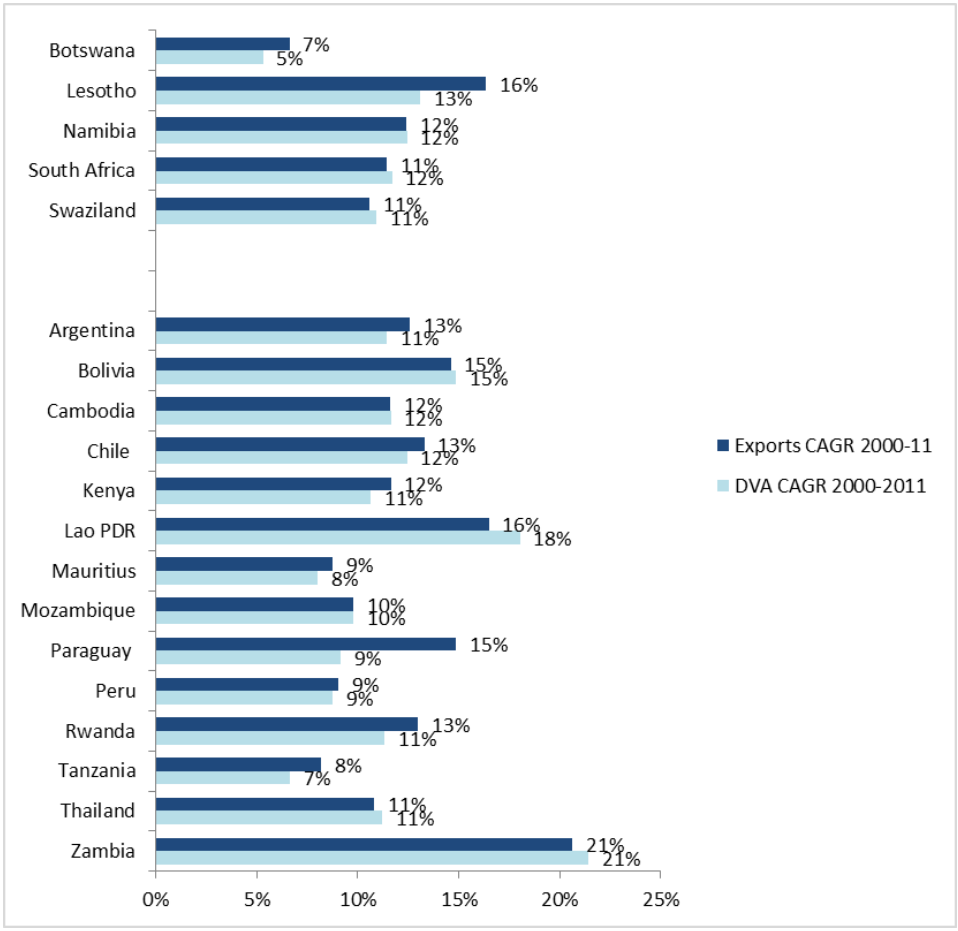


Source: DVA data own computations from Eora database, GDP data from World Bank World Development Indicators

Perhaps not surprisingly, some of the fastest rates of DVA growth, such as Lesotho and Rwanda, occurred in those economies that started exports from a very low base and which also have a low share of DVA embodied in gross exports as a share of GDP (Figure 8). Here, SACU countries still show relatively weak performance relative to peers. Only South Africa (increase from 16% to 18%) is among the leading countries in the group of comparators, though it is far eclipsed by Thailand (where exported DVA as share of GDP grew from 38% to 44%). Botswana saw a decline in its DVA as a share of GDP to 4%, with only Rwanda having a lower rate. Lesotho, Namibia and Swaziland saw marginal increases from a low base suggesting that their largest export sectors (which experience strong DVA growth) may have relatively low rates of domestic value addition. Interestingly, the largest increases between 2000 and 2011 were registered in Zambia, Thailand, Argentina, and Bolivia – all of which are relatively large producers of metals and/or commercial agriculture.

To start understanding what may be behind the DVA performance in a country, it can be useful to compare trends in DVA with trends in the development of gross exports (the latter reflects the standard measure of exports). This is show in Figure 9. Here, we see that growth in DVA has largely tracked gross export growth for the five SACU economies, as well as for most comparators. However, for both Botswana and Lesotho gross export growth has been faster than DVA growth (by 2% and 3%, respectively), suggesting that exports from sectors with lower rates of domestic value addition have been growing more rapidly. This may be indicative of increasing GVC participation, but it may also simply reflect changing composition in the export basket (see Box 3).

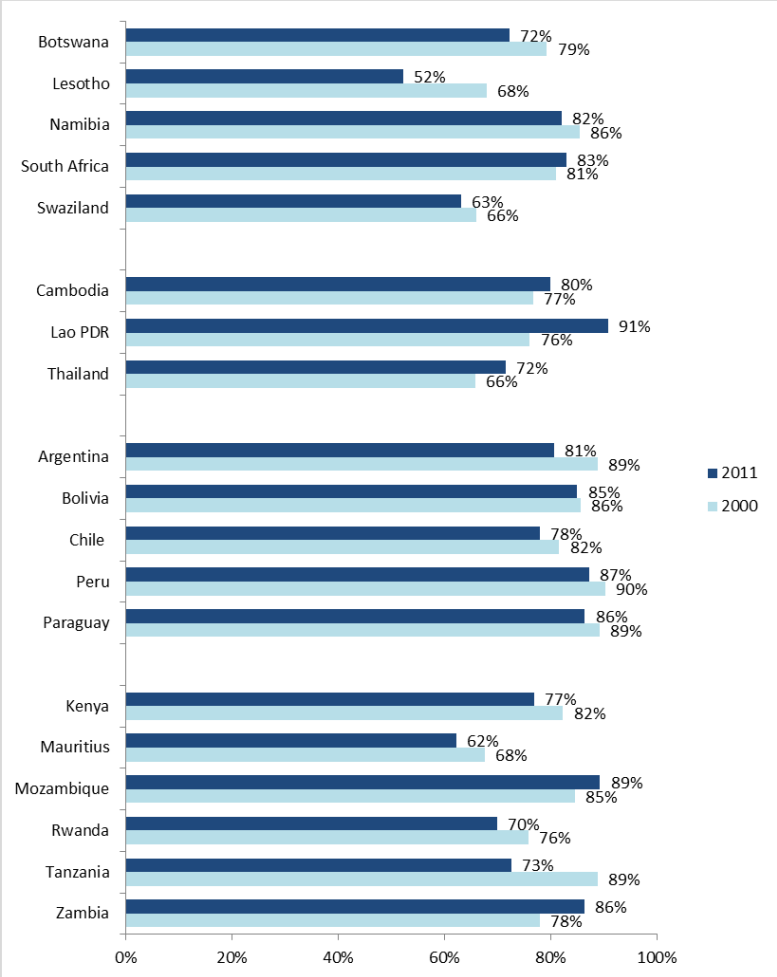
Figure 9: Compound annual growth rate of domestic value added embodied in gross exports, and of gross exports, 2000-2011



Source: Own computations using Eora database

Looking at the share of DVA in gross exports (in addition to their relative growth) is also critical to understanding the nature of exports and of GVC integration. Figure 10 highlights significant differences among SACU countries in this regard, as well as significant changes over time in some countries. While Lesotho (52%) has the lowest share of DVA among the entire set of peers and Swaziland is among the lowest (63%), the rest of the region has DVA shares of exports between 70% and 85%, generally in line with the peer countries, although somewhat on the lower end. All BLNS countries had declining DVA as share of exports – in Lesotho's case a striking 16 percentage point decrease, and 7 percentage points for Botswana. The 11-year time period 2000 to 2011 largely covers Lesotho's integration into the textile and apparel GVC (facilitated in part by AGOA and its third-country fabric provision), most likely explaining the scale of the change over the time period. Among comparators, Argentina and Tanzania, and to a lesser degree Kenya also saw substantial decline in DVA as share of exports, while Lao PDR, Cambodia, Thailand, and Zambia saw significant increases.

Figure 10: DVA embodied in gross exports as share of gross exports, 2000 and 2011



Source: Own computations using Eora database

Box 3: The challenge of interpreting DVA results

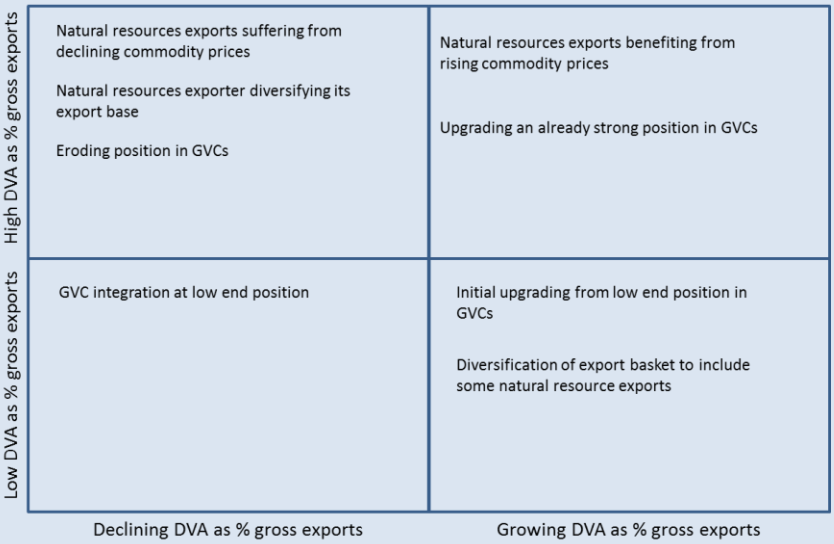
As noted earlier, what matters ultimately for a country is growing DVA (in nominal terms) over time, regardless of the relative share of DVA. But from the perspective of understanding GVC participation and performance, the interpretation of high or low levels of DVA growth is not always that obvious. While we want to see increasing DVA, rapid integration into global production chains is likely to result in lower DVA as a share of gross exports. In fact, evidence of decreasing DVA a share of gross exports can be indicative of participation in longer and more

sophisticated value chains in which more imported value added is in turn being re-exported (Taglioni and Winkler 2014b). While increasing DVA may reflect growth in the services economy, which tends to have short value chains and high values of exported DVA as a share of exports.

Moreover, DVA growth is affected by important factors that are not linked directly to GVCs (at least not the variety of GVCs associated with vertically fragmented production). Most notably for SACU and other developing countries with large agriculture and natural resource exports, growth in commodity exports and changing global commodity prices will shape DVA measures significantly (for example, extractives exports may have high DVA, despite weak links to domestic labor markets and supply chains). Increasing DVA can also signify increasing quality of exports (higher unit prices) regardless of whether these exports are within GVCs. And so changing sectoral composition of the export basket will have a significant impact on the DVA measure.

The figure below provides a basic overview of the some of the different situations that may explain various DVA outcomes, based around: i) the level of DVA to gross exports; and ii) the growth of DVA to gross exports. This underscores the importance of going beyond the aggregate analysis to understand better the factors shaping DVA performance, and the degree to which they are shaped by GVC participation and position. At minimum, it highlights the need to look at data at the sectoral level. Beyond this, assessing sectoral structure and performance at a qualitative level is likely to be important in order to interpret the results effectively.

Note that in the case of the analysis presented in this note, minerals exports have been excluded, so at least some of the effect of natural resources exports on the DVA figures is controlled for in the results presented here.



4.3. Where is DVA growth coming from? – sectoral assessment

Performance at the sectoral level has been highly heterogeneous and can reveal a bit more about the particular sources of DVA growth. Table 7 summarizes for each of the five SACU countries the five non-mining sectors contributing the most to overall DVA for the year 2011, including the sectoral compound annual growth as well as the DVA in exports as a share of total exports. In terms of their overall DVA in exports, it is striking – if not entirely surprising – how much more DVA as share of total exports is contributed by services sectors. Examining individual countries, this disaggregation suggests that Botswana's overall stagnation is in part attributable to slower growth in manufacturing sectors. Similarly, the pace of Lesotho's DVA growth is greatest in services sectors, although these are starting from a very low base. In Namibia, the leading sources of DVA growth are predominantly in food processing and manufacturing. South Africa, on the other hand, has a relatively balanced level of growth across its leading sectors. This sectoral disaggregation by country is expanded in Appendix 5.

Table 7: DVA in exports for 2011, compound annual DVA growth, and DVA in exports as share of exports for 5 largest sectors by DVA, 2000-2011

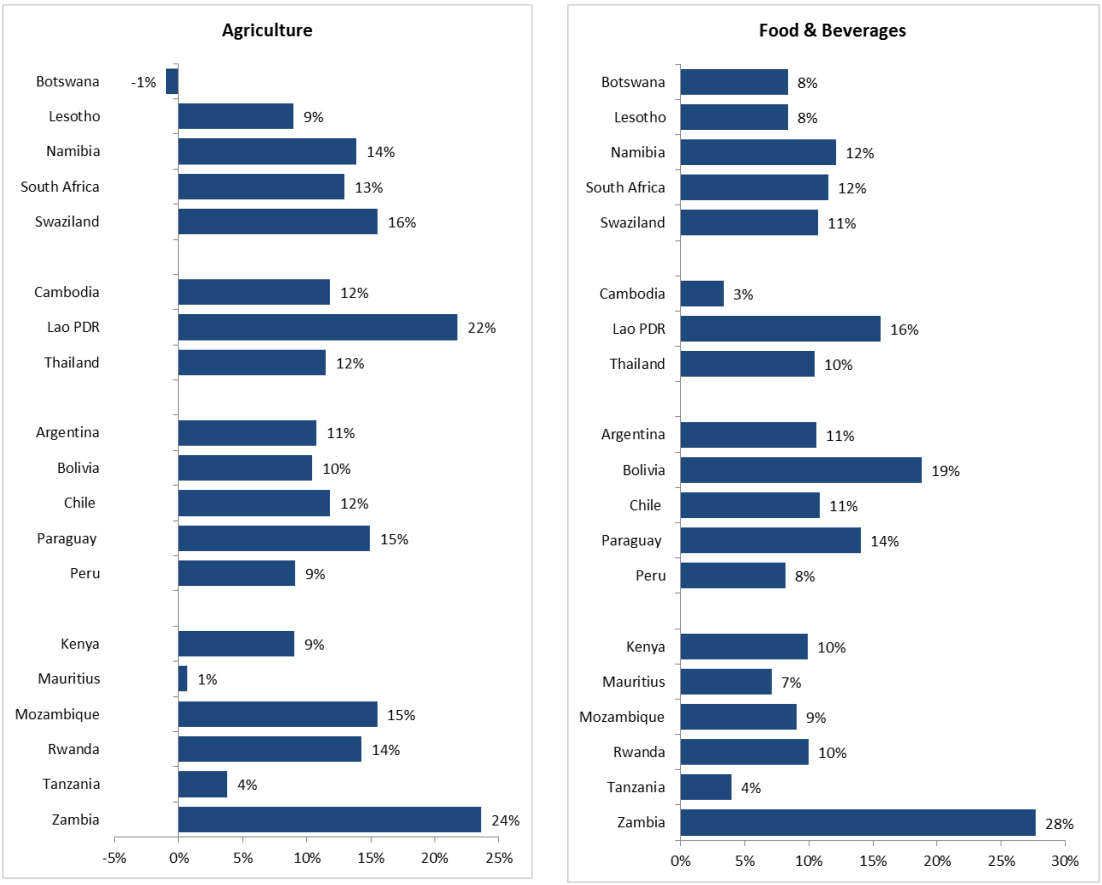
Bots-wana	**Largest sector (left to right)**	**Hotels & Restaurants**	**Transport**	**Other manuf.**	**Education & Health**	**Food & Beverages**	**Total**
	Total DVA in exports (in $1,000) and CAGR (2000-11)	**114,227 (11%)**	**101,622 (9%)**	**53,883 (6%)**	**49,804 (11%)**	**40,461 (8%)**	**543,139 (5%)**
	DVA in exports as % of sectoral exports (2011)	**79.7%**	**74.3%**	**63.9%**	**88.7%**	**60.1%**	**72.3%**
Lesotho	**Largest sector (left to right)**	**Textiles & Apparel**	**Transport**	**Education & Health**	**Post & Telecomm.**	**Financial Intermed.**	**Total**
	Total DVA in exports (in $1,000) and CAGR (2000-11)	**45,755 (10%)**	**17,971 (12%)**	**13,150 (22%)**	**10,673 (18%)**	**7,324 (14%)**	**179,161 (13%)**
	DVA in exports as % of sectoral exports (2011)	**53.5%**	**43.4%**	**77.5%**	**63.6%**	**84.1%**	**52.3%**
Namibia	**Largest sector (left to right)**	**Food & Beverages**	**Petroleum & Chemicals**	**Electrical & Machinery**	**Agriculture**	**Textiles & Wearing Apparel**	**Total**
	Total DVA in exports (in $1,000) and CAGR (2000-11)	**489,912 (12%)**	**133,363 (9%)**	**71,785 (15%)**	**65,986 (14%)**	**57,525 (15%)**	**1,283,849 (12%)**
	DVA in exports as % of sectoral exports (2011)	**73.3%**	**68.6%**	**61.1%**	**87.9%**	**66.6%**	**71.9%**
South Africa	**Largest sector (left to right)**	**Metal products**	**Financial Intermed.**	**Petroleum & Chemicals**	**Transport**	**Electrical & Machinery**	**Total**
	Total DVA in exports (in $1,000) and CAGR (2000-11)	**12,724,103 (13%)**	**10,513,070 (13%)**	**10,086,014 (10%)**	**7,566,665 (14%)**	**6,669,546 (13%)**	**71,327,567 (12%)**
	DVA in exports as % of sectoral exports (2011)	**83.7%**	**93.9%**	**79.4%**	**87.9%**	**77.6%**	**82.9%**
Swazi-land	**Largest sector (left to right)**	**Food & Beverages**	**Electrical & Machinery**	**Transport**	**Agriculture**	**Hotels & Restaurants**	**Total**
	Total DVA in exports (in $1,000) and CAGR (2000-11)	**98,087 (11%)**	**78,682 (13%)**	**41,032 (15.0%)**	**35,711 (16%)**	**30,488 (17%)**	**489,622 (11%)**
	DVA in exports as % of sectoral exports (2011)	**61.3%**	**49.5%**	**54.1%**	**86.5%**	**61.4%**	**58.3%**

Source: Own computations using Eora database

Figure 11 compares DVA growth rates for two sectors that are important in most SACU countries – **Agriculture** and **Food & Beverages** – with those of peers. For the first of these – Agriculture – the SACU countries are, with the exception of Botswana, towards the middle, with DVA growth ranging from 9% (Lesotho) to 16% (Swaziland). Looking over the most recent five years (2006-2011, not shown in the figure below), Lesotho's growth of 30% far exceeds all other countries. The highest performers in agriculture tended to be the least developed comparator countries, Zambia (24%) and Lao PDR (22%), with the middle-income countries in the sample generally achieving growth rates between 5% and 15%. For the Food and Beverages sector, the SACU countries again perform in the middle, with Namibia and South Africa having the highest overall performance (12%). While Lesotho and Botswana lag at 8% annual

growth. Lesotho's growth in the 2006-2011 period (not shown) was again substantial (26% CAGR). Again the highest performers are the less developed comparators Zambia (28%), Bolivia (19%), and Lao PDR (16%); but low income countries also showed the lowest growth, including Cambodia (3%) and Tanzania (4%).

Figure 11: Compound annual growth rate of sectoral domestic value added embodied in gross exports for the Agriculture and Food & Beverages sectors, 2000-11

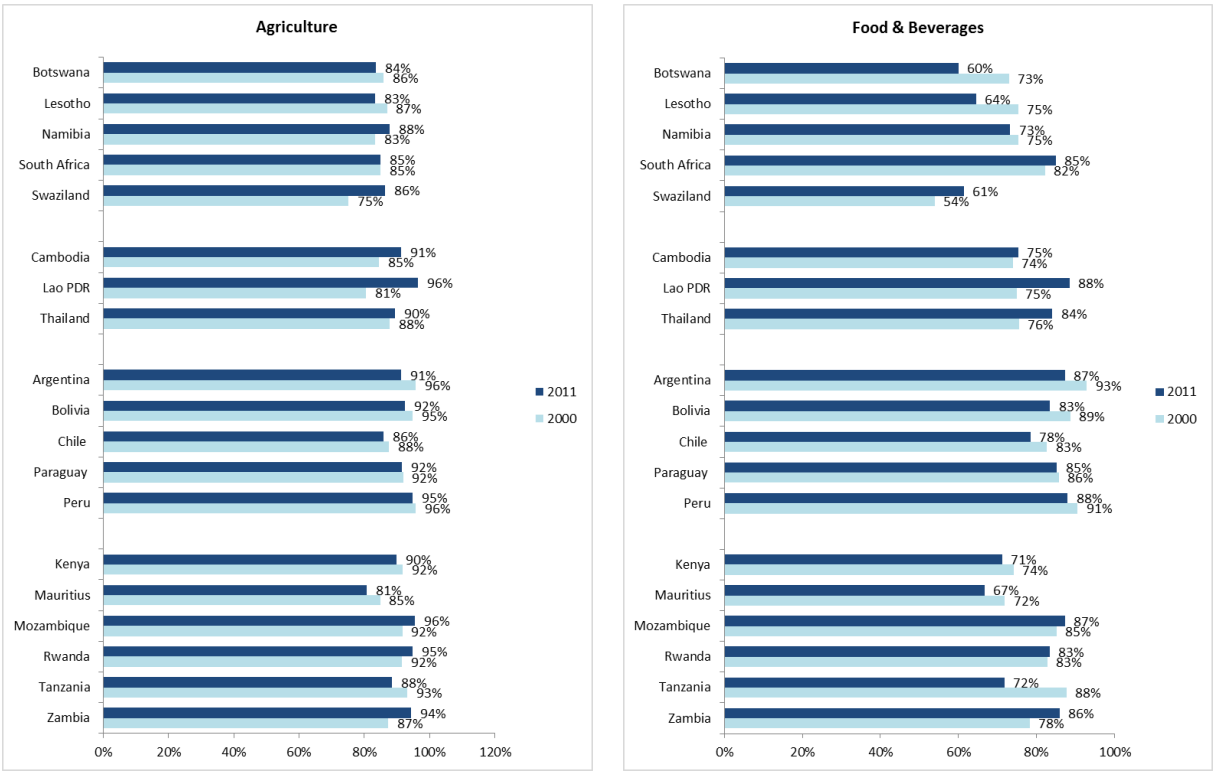


Source: Own computations using Eora database

Complementing the sectoral DVA growth with data on DVA share of total exports over time in these sectors can provide further insights into GVC developments. Figure 12 shows these results for the Agriculture and Food & Beverages sectors. In Agriculture, Swaziland saw a large increase in DVA share of gross exports, from 75% to 86%. This was the second largest change in any country and, if the data is correct, it would most likely reflect changing composition of agricultural exports. Lao PDR experienced the largest growth in DVA share (15 percentage points), while Zambia and Cambodia also showed large growth in its DVA share. The SACU countries all tended to be in the lower half of the comparator group in terms of DVA share, indicating that their agricultural exports make greater use of imported inputs.

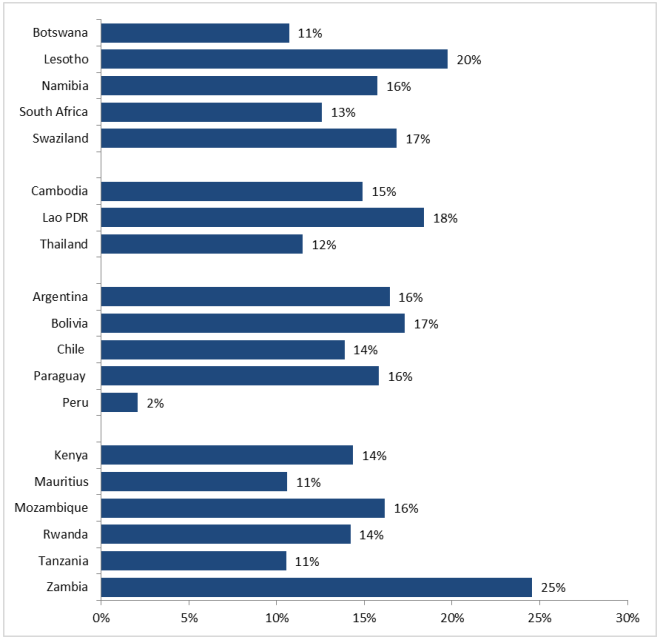
For the Food & Beverages sector, South Africa has by far the highest share of DVA among the SACU countries (at 85% in 2011), while the rest of the region showed relatively low levels of DVA. Both Botswana and Lesotho experienced large declines in DVA share over the decade and Swaziland, while experiencing growth, showed the second lowest DVA share among all peers (at 61%, just after Botswana at 60%). The findings suggest that domestic processing in BLNS increasingly relies on imported inputs, most likely (in the case of this sector) from intra-regional sources.

Figure 12: DVA embodied in gross exports as share of gross exports for the agriculture and food & beverages sectors, 2000 and 2011



Source: Own computations using Eora database

Figure 13: Compound annual growth rate of sectoral domestic value added embodied in gross exports for the Hotels & Restaurants sector, 2000-2011

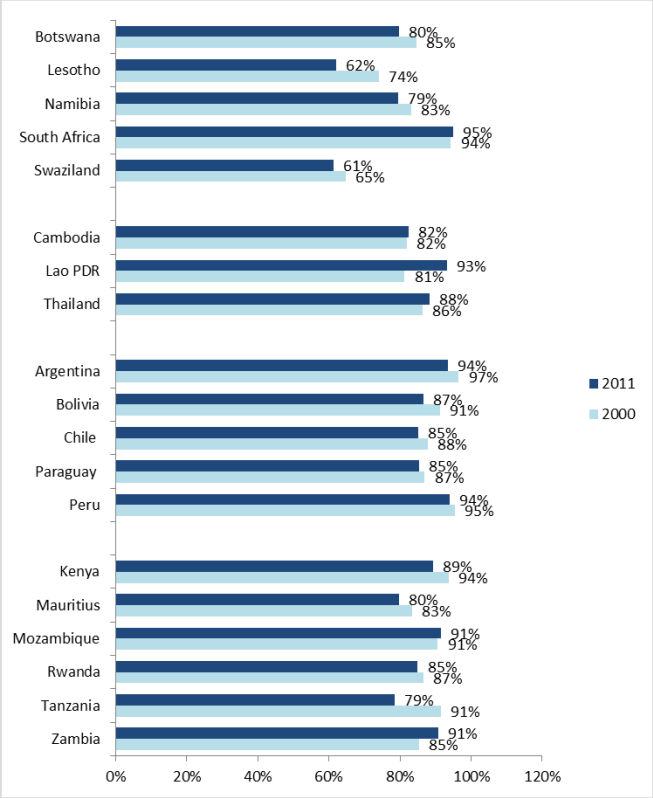


Source: Own computations using Eora database

For tourism, proxied through the Eora "hotels and restaurants" sector (see Figure 13), Lesotho, Swaziland, and Namibia have all seen rapid growth (16%-20%), while South Africa and Botswana (13% and 11%, respectively) experienced relatively strong growth but still trailed most peers. In terms of DVA share of gross exports (

Figure 14), however, there are stark differences in the region. South Africa shows the highest DVA among all peers (near 95%) while the rest of the region trails most peers. Swaziland (61%) and Lesotho (62%) have particularly low levels of domestic value added in tourism.

Figure 14: DVA embodied in gross exports as share of gross exports for hotels & restaurant sector, 2000 and 2011



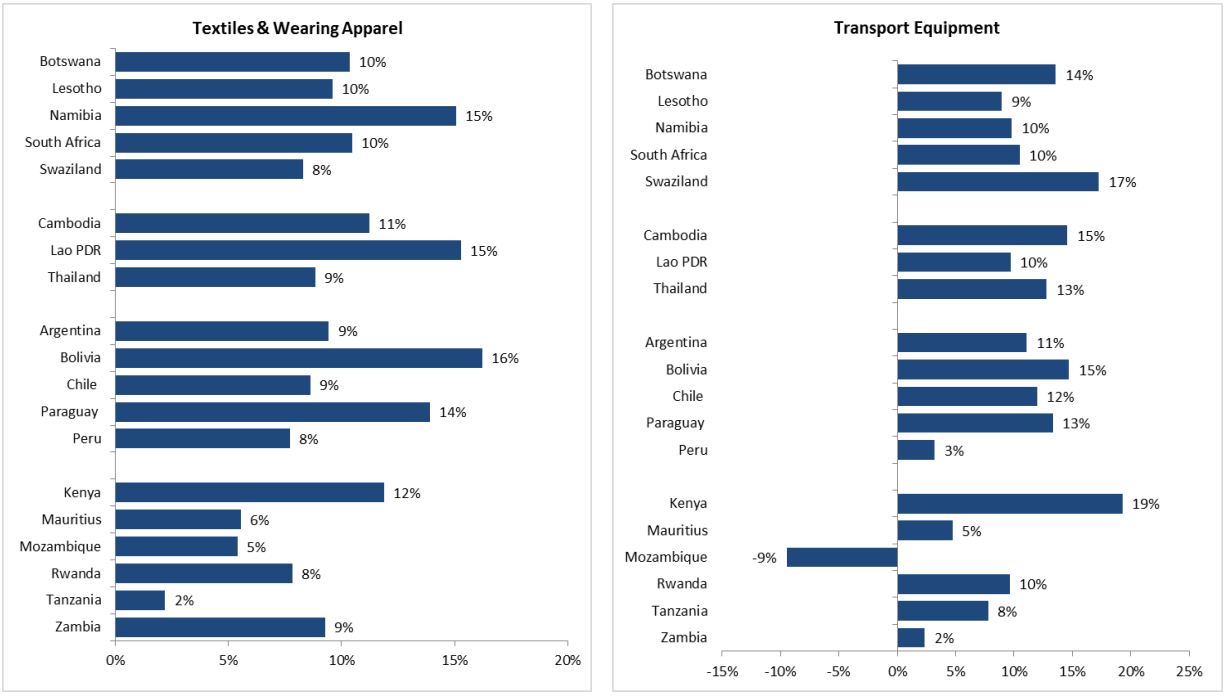
Source: Own computations using Eora database

The textiles & apparel and transport equipment sectors (see
Figure 15) provide a useful comparative overview of the manufacturing sectors that tend to be most GVC-oriented on a global basis. For textiles & apparel, the five SACU countries look broadly similar to East Asian and South American comparators and ahead of most African peers, with all five achieving annual compound DVA growth at or near 10% (Swaziland lags at 8% and Namibia leads at 15%, but from a small base). For the **transport equipment** sector, Swaziland (17% growth) has been the fastest growing country among all comparators, other than Kenya. Again, however, this comes from a very small base; Botswana has also experienced strong growth (14%) in DVA. The other three SACU countries all rank towards the middle of the table, with growth in DVA between 9% and 10%.

In terms of DVA share of exports (
Figure 16), Botswana, Lesotho, and Namibia have seen their exported DVA as a share of total sectoral exports decline in both manufacturing sectors – in some cases quite substantially. For example, Lesotho's DVA embodied in gross exports as a share of gross exports in textiles fell from 66% to 53% and Botswana's from 71% to 60%, while Lesotho's fell in transport equipment from 68% to 49% and Botswana's from 64% to 54%. This suggests these value chains may have grown in length and complexity, with less value added in country, and/or that Lesotho and Botswana's tasks have become lower value-added. South Africa and Swaziland in both sectors have remained reasonably consistent over the decade, although South Africa's DVA share is substantially above that of Swaziland in both sectors. It is worth noting that relatively low DVA shares in these sectors may indicate greater GVC participation. For example, South Africa's DVA

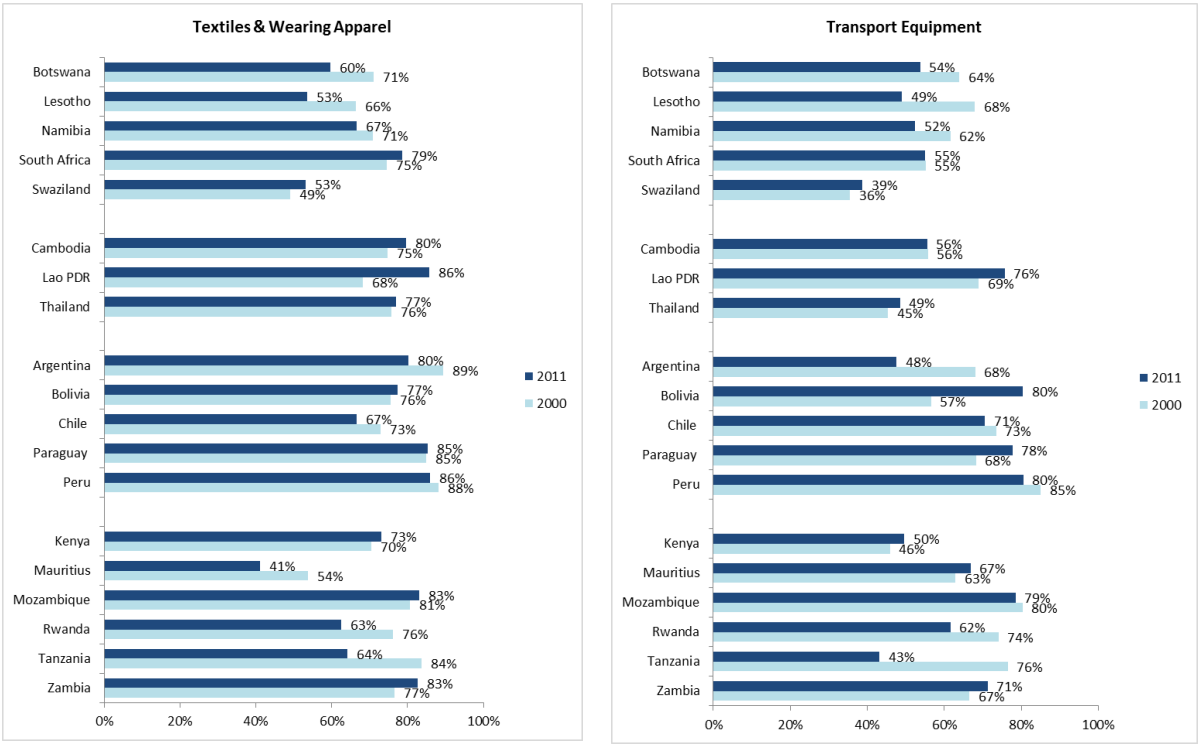
share in automotive (55%) is similar to that of countries like Thailand and Argentina, both of which have significant automotive sectors, while other countries with limited automotive sectors show higher DVA shares.

Figure 15: Compound annual growth rate of sectoral domestic value added embodied in gross exports for the textiles & wearing apparel and transport equipment sectors, 2000-2011



Source: Own computations using Eora database

Figure 16: DVA embodied in gross exports as share of gross exports for the textiles & wearing apparel and transport equipment sectors, 2000 and 2011



Source: Own computations using Eora database

5. GLOBAL VALUE CHAIN PARTICIPATION AND POSITIONING

The analysis of trends in value-added trade give some insight into how SACU countries are integrating into GVCs, but the analysis still remains a step removed from actual GVC trade. In this section, we use the Eora database to calculate recently developed indicators on GVC participation and positioning.

5.1. GVC participation – introduction and overall index

A country's level of participation in GVCs can in part be assessed based on both its forward and backward integration:

- *Forward integration, or indirect value added (IVA*) –refers to a country's share of value added embodied in other countries' exports – i.e. producing intermediates that you export to other countries, who will then add further value and export them as finished products or further stage intermediates.
- *Backward integration, or foreign value added (FVA*) – is the share of foreign value added in embodied in a country's exports – i.e. intermediate inputs imported from other countries that you then add value to and export as finished products or further stage intermediates.

Both forward and backward integration matter, but neither should be inherently maximized. As discussed in Box 3, the products involved and the qualitative nature of the integration determine the benefits that accrue from it. Backward integration provides access to quality inputs, which contributes to downstream competitiveness; it also has significant potential to deliver productivity spillovers through access to global frontier technologies. As such, backward integration tends to be particularly important for developing countries as it links to a number of measures of structural transformation. But taken to the extreme, backward integration may crowd out local production and limit domestic value addition. Similarly, forward integration is an indicator of integration into value chains and also provides opportunities to benefit from technology spillovers. But the desirability of forward integration depends a lot on what is being exported and where you sit on the value added chain. High levels of forward integration in developing countries can often be associated with higher resource dependency and is negatively linked to measures of diversification and structural change (AfDB 2014).[17] On the other hand, countries like the US and Japan have high forward integration by selling leading edge technologies (with high value added) into the early stage of global production processes.

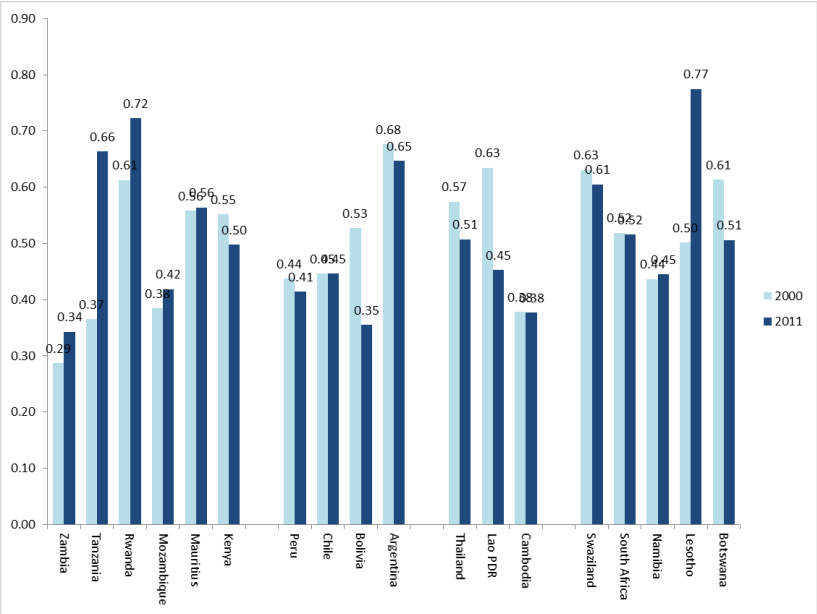
Figure 17 reports the *GVC participation index* for SACU countries and peers in 2000 and 2011, based on data from the Eora database. The GVC participation index combines the measures of forward and backward integration[18], each of which will be elaborated on in more detail in the next section. The index is intended to indicate the extent to which a country participates in vertically integrated production (Koopman et al. 2010). The higher the foreign value added in gross exports and the higher the value of inputs exported to third countries and used in their exports, the higher the participation value. This tends to favor small, open economies, so it is perhaps unsurprising that Lesotho stands out as the most GVC-integrated of all peers, particularly given what we know about the development of its apparel sector in the 2000s. Lesotho's GVC participation measure increased by more than 50% over the decade. Other countries that show significantly growing GVC participation include Tanzania, Rwanda, and Zambia. The

[17] Domestic value added and foreign value added by definition should equal to the total sum of exports and thus - as the corollary of DVA - a declining share of domestic value added in total gross exports will by definition result in increased foreign value added as a share of exports. Due to the balancing considerations outlined earlier, this does not hold completely for the Eora dataset.

[18] The index combines FVA and IVA, both as a share of gross exports

South American and (surprisingly) East Asian peers also experienced declining GVC participation. What is notable from the review of peer countries is that while those countries which are dependent on commodity exports fare well in terms of DVA, they perform less well when measuring GVC participation.

Figure 17: GVC Participation Index 2000 and 2011



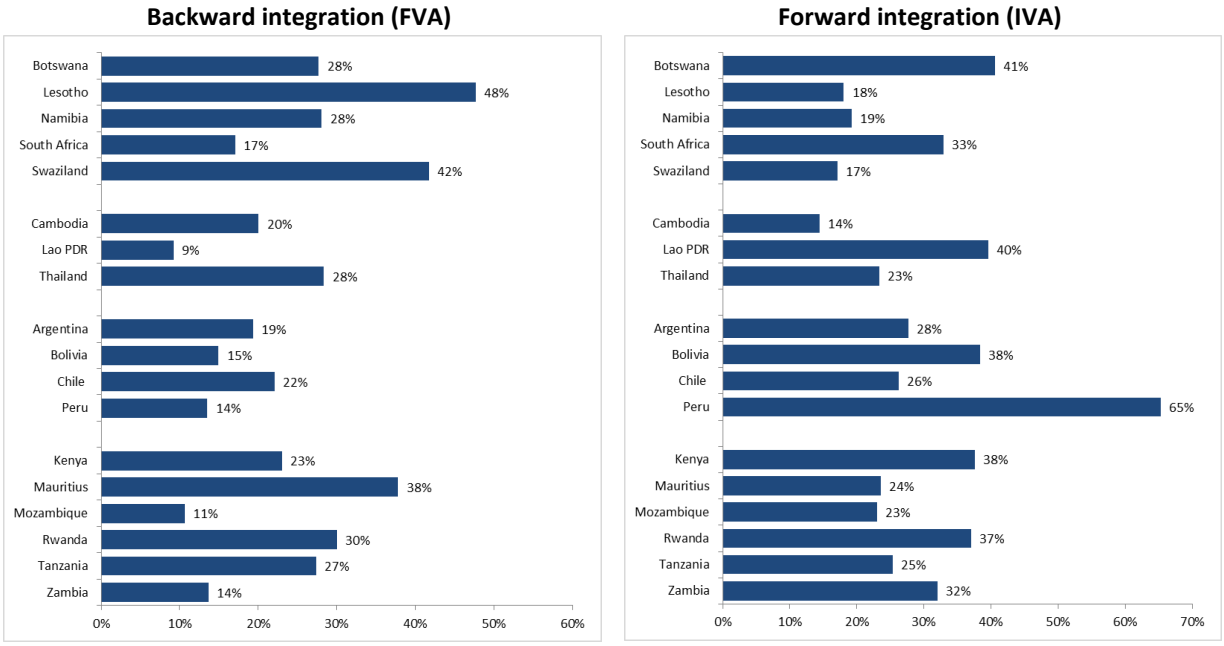
Source: Own computations using Eora database

5.2. What is driving GVC participation? – forward versus backward integration

But while the GVC Participation is a useful initial indicator, what matters much more are the components that make up this index. Figure 18 reports backward and forward integration as a share of gross exports for SACU and peer countries in 2011, and gives a perspective on what is driving the broad measure of GVC participation. This is followed in Figure 19 with an illustration of growth in forward and backward integration over the decade. It shows that, overall, SACU countries tend to be slightly less forward integrated than peers and slightly more backward integrated; but with the exception of Lesotho, growth in both forward and backward integration is trailing many peers. Reviewing each country briefly:

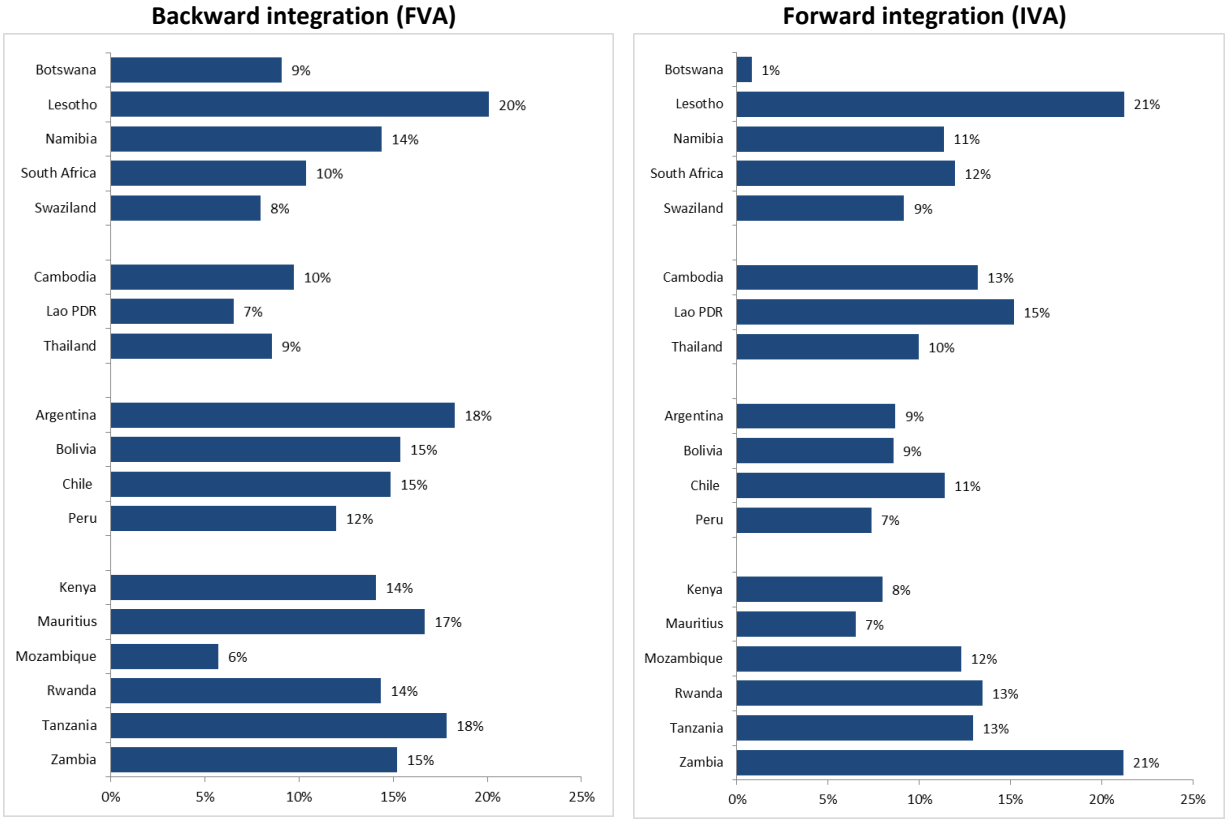
- *Botswana*: More forward integrated (41%) than backward (28%), although forward integration is likely to be distorted by diamonds, as is suggested by the very low growth over the past decade (1%). Backward integration is relatively high, but growing slowly.
- *Lesotho*: Highest level of backward integration (48%) and highest growth (20%) among all peers; forward integration much lower (18%) and trailing most peers (although growing rapidly), reflecting focus on assembly stage of apparel manufacturing.
- *Namibia*: Slightly above average level (28%) and growth (14%) of backward integration, while forward integration remains limited (19%).
- *South Africa*: Below average backward integration (17%), which is common for larger countries (although Thailand's backward integration is 28%); forward integration moderately high 33%. Growth is moderate in both FVA and IVA.
- *Swaziland*: High level of backward integration (42%) but among lowest forward integration among peers (17%); growth in both FVA and IVA among the lowest of peers.

Figure 18: Foreign value added (left) and indirect value added (right) embodied in gross exports as share of gross exports, 2000 and 2011



Source: Own computations using Eora database

Figure 19: Compound annual growth rate of foreign and indirect value added embodied in gross exports, 2000-2011



Source: Own computations using Eora database

5.3. Sectoral drivers of GVC participation

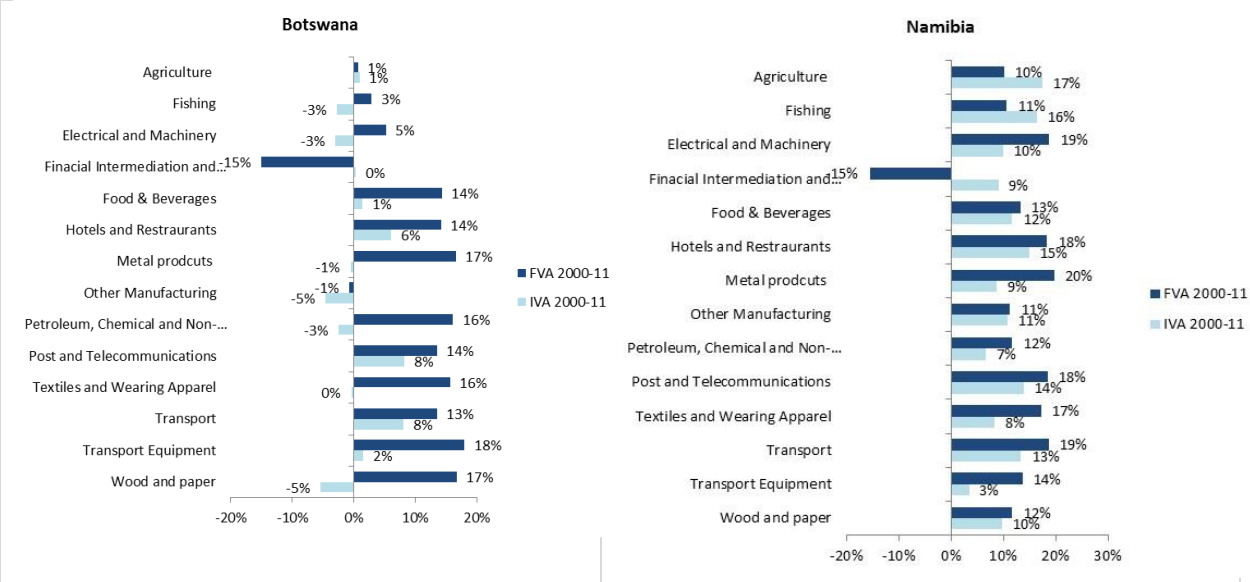
At the sectoral level, there is considerable heterogeneity among these countries' growth rates in foreign and and indirect value added (see

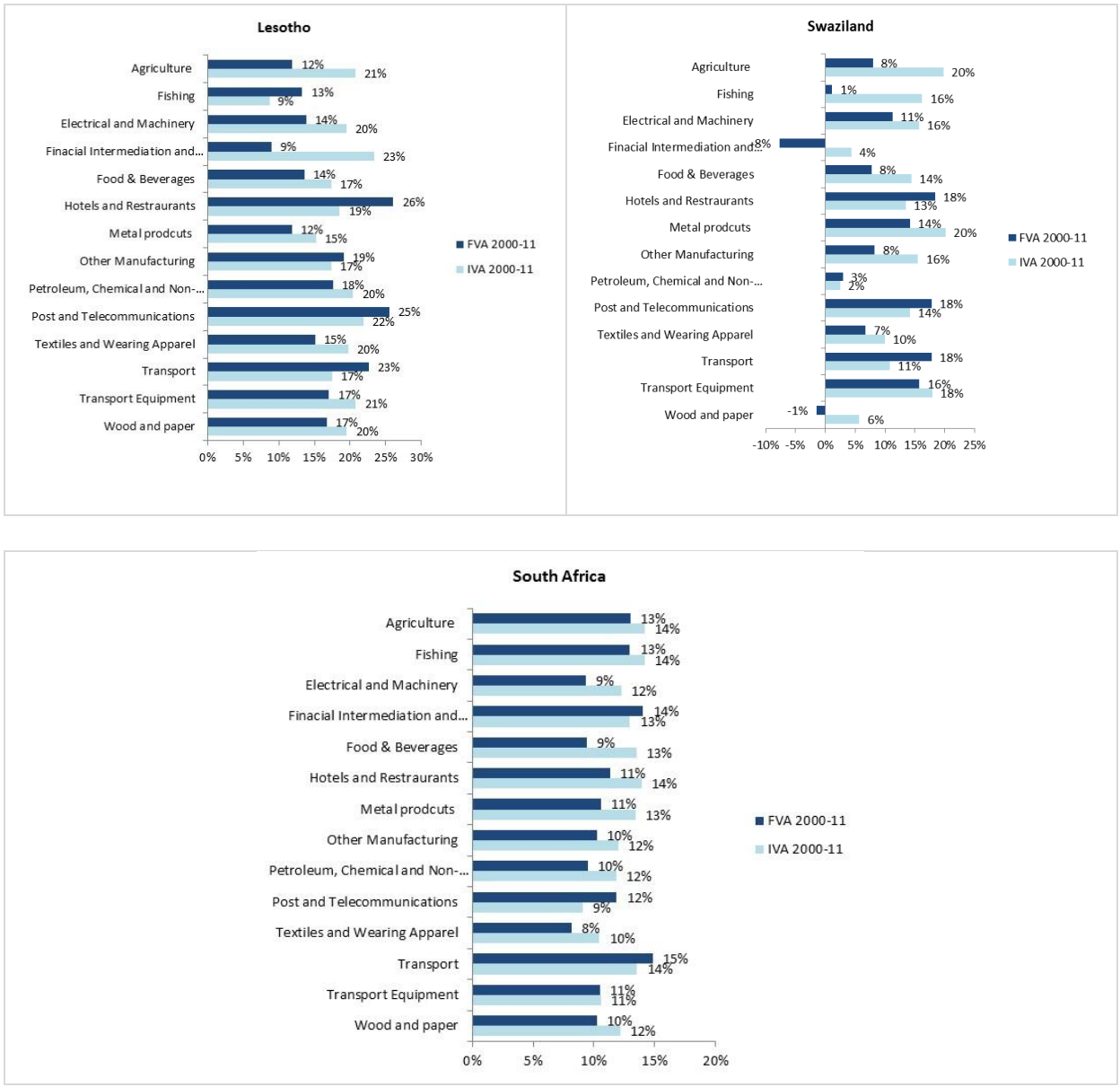
Figure 20). For Botswana, foreign value added increased the most in transport equipment (18%), along with metal products and wood and paper (17% each). As was the case for DVA, FVA in financial intermediation declined substantially (-15%) while other manufacturing and agriculture were stagnant. In Namibia, the largest growth in foreign content was in the metal products (20%) and electrical machinery and transport sectors (19% each); financial intermediation also showed a sharp decline in FVA. For Lesotho, growth in foreign content was highest in services sectors (especially hotels and restaurants, post and telecommunications, and transport). Swaziland showed a similar pattern of strong growth in services FVA (with the exception of decline in financial intermediation), but showed much weaker growth in other areas. For South Africa, FVA increases were largest in agriculture and services sectors, while manufacturing FVA growth was modest.

Financial intermediation and agriculture consistently shows the lowest FVA as a share of gross exports while transport equipment shows the highest foreign content (see Appendix 6). Other manufacturing sectors, including electrical and machinery and food and beverages also show relatively high foreign content across the region.

Growth in value added exports embodied in third countries' exports (indirect value added) came across a broad range of sectors, with agriculture (except Botswana) and services particularly strong. In Botswana, the most rapid growth in IVA came in transport and communications, followed by tourism, while most other sectors were stagnant or in decline. In Namibia, Swaziland, and Lesotho growth in IVA was relatively strong across the board, although the rates of growth were substantially higher in Lesotho. A similar story of broad sectoral IVA growth can be seen in South Africa.

Figure 20: Compound annual growth of foreign value added and indirect value added by SACU country, by sector, 2000-2011



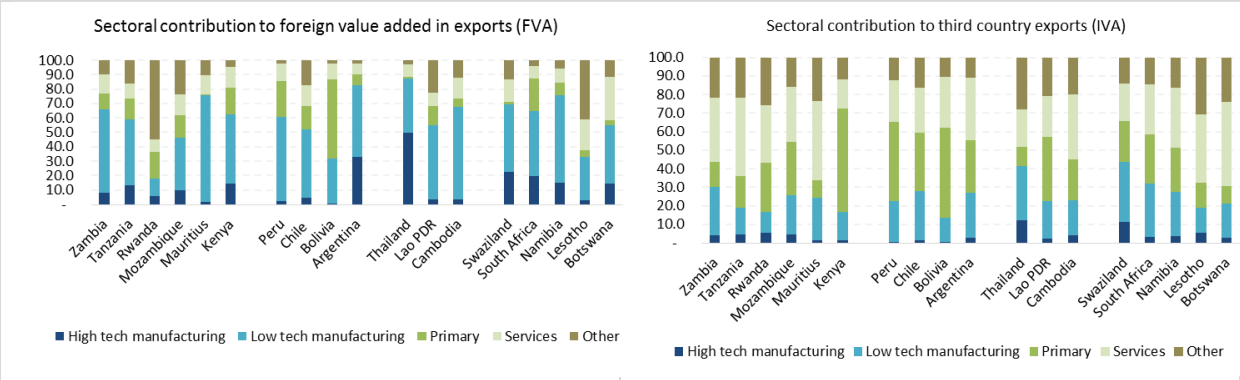


Source: Own computations using Eora database

Looking at performance in individual sectors is useful but runs the risk of obscuring the bigger picture, particularly as sectors vary substantially in their contributions to GVC participation across the countries. Figure 21 aggregates sectors according to the OECD's classification of technology content in sectors. This aggregation gives a better sense of where foreign content embodied in GVCs is coming from across the SACU countries and the type of sectors where its GVC exports are feeding into. This is critical for understanding the potential of generating spillovers from GVC participation. The data on foreign value added shows that Swaziland and South Africa (and to a lesser degree Namibia) gain most of their foreign value added embodied in exports from manufacturing sectors, with a substantial amount coming from high technology sectors. Indeed, these countries compare very favorably to peers, although trail substantially behind Thailand (driven by large FVA in the electrical and machinery sector) and Argentina (FVA in transport equipment). In the case of Swaziland, the high technology FVA is coming mainly from exports embodying foreign content in the electrical and machinery sector, while in South Africa it comes from both electrical and machinery and the transport equipment sectors. From the perspective of facilitating technology spillovers, Lesotho's imported content is among the least favorable across all peer countries.

In terms of IVA, the story is similar, although the differences are less stark across countries. What is notable for SACU and just about all peers is that the profile of their forward contribution to GVCs is much less technology intense than their backward integration. This allows for some tentative conclusions about relative positioning in GVCs (see Section 5.5). That said, contribution to services exports of other countries appears to be significant, which may represent interesting opportunities for learning and upgrading.

Figure 21: Sectoral contribution to FVA and IVA (2011)



Source: Own computations using Eora database; OECD

5.4. Geographical drivers of GVC participation

Understanding the direction of forward integration (the selling side of GVCs) is important for identifying potential sources of shocks a country may face (see Appendix 7) [19][20]. For South Africa, the most important destination is Germany, followed by the UK and Netherlands. This underscores the continuing reliance on European demand in GVC-oriented sectors. The BLNS does not register as a significant source of IVA for South Africa. For Botswana, Israel – presumably as a destination for diamonds and other minerals – makes up over 30% of Botswana's IVA, followed by the UK, Germany and Norway (all of which grew their share from 1996 to 2011 at the expense of regional neighbors). For Lesotho, the largest share of IVA is in the "rest of world" sector, followed by Belgium and Germany. Namibia also shows a strong link to the European market, with IVA highest in Germany, France, the Netherlands and Belgium.

Similarly, understanding the source of foreign value added (the buying side of GVCs) is important, in this case for identifying the source of technology transfer and the type of GVCs a country is likely to join. This ultimately affects the growth of domestic value added since it affects the nature of the intra-firm and arm's length transfer of know-how and the country's ability to absorb tacit knowledge (i.e. business models and all other types of knowledge that cannot be codified) and/or the knowledge embedded in the imported inputs. Data on FVA sources for SACU countries is also available in Appendix 7. For South Africa, FVA sources are spread across the three main global poles, with Germany as the largest contributor, followed by the US and China. The questions for South Africa (which requires further assessment) are: i) whether integration with more technologically advanced nations produces a premium in terms of growth of the domestic value added embedded in exports; and, ii) whether distance matters for the rate of growth. The latter is important since tacit knowledge is likely to flow more easily over shorter distances and – assuming that the latter produces more spillovers – distance and trade costs,

[19] These figures are similar but not identical to those derived from the I2E index (Baldwin and Gonzalez-Lopez 2013).

[20] Here, (as for sectoral disaggregation), results should be treated with caution: in some cases statistical discrepancies (i.e. the RoW sector) is among these countries' largest destination for intermediates. In SACU, this is the case with Lesotho. Further, trade flows within the SACU region are very poorly tracked (including by Comtrade).

particularly those affecting the services sector, may matter for the ability of countries to boost domestic value added via GVCs.

For the BLNS, the distance issue is less relevant – here, South Africa dominates as a source of intermediates. Where South Africa's trade flows are measured in Eora, it is by far the largest exporter of FVA, making up 60% of FVA imported into Botswana, Swaziland, and Namibia (it is not included for Lesotho). For Botswana, the other main sources of FVA have traditionally been the Netherlands, US, and Germany, with China emerging as a leading FVA source in 2011. Re-exported intermediates from South Africa to Lesotho are not reported and as a result China and Chile, followed by India and Taiwan are the main sources of backward linkages. Namibia also sources over 70% of foreign value added from South Africa, followed by Germany and the US. As is the case for Botswana, China has become increasingly important as a provider of inputs while inter-regional sourcing (besides South Africa) remains minimal. Swaziland also depends on South Africa for the bulk of its FVA, followed by Germany and the US, though their share has been declining as China's has increased.

5.5. Assessing GVC positioning

As discussed earlier, what is ultimately more important than participating in GVCs is capturing value that facilitates sustainable growth and higher-quality employment. This depends, in part, on a country's positioning within a GVC. It can be upstream (production of inputs at the beginning of the value chain) or downstream (production of goods and services towards the end of the value chain) depending on its specialization. Countries specialized in upstream activities produce the raw material or the intangibles involved at the beginning of the production process (e.g., research and design). Countries concentrated in downstream tasks specialize in the assembly of the final products or in customer services. Finally, countries involved in activities at the center of the value chain focus on the standardized labor-intensive manufacturing jobs. Again, it is not always obvious where a country would ideally want to be positioned – it depends very much on the value chain in question. For some value chains, most of the value is captured upstream, for others downstream; and in some cases both. Generally, speaking, mid-stream activities ("at the center of the value chain", as described above) are least likely to be in a position to capture significant value.

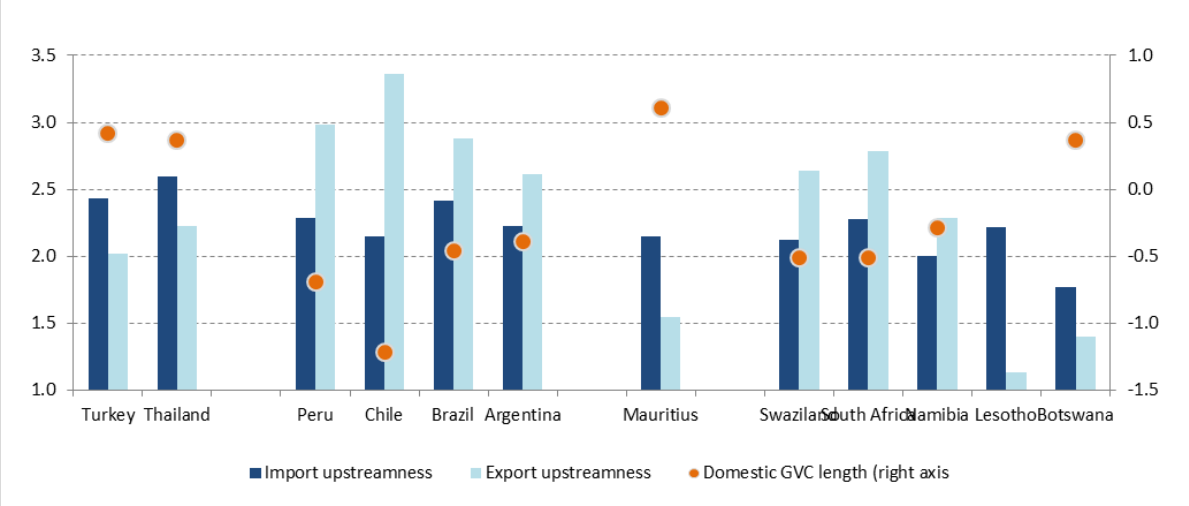
"Upstreamness" of a country's specialization can be measured by its "distance to final demand" (Antràs, Chor, Fally and Hillberry, 2012) – i.e. the distance in terms of number of production stages between the production of good i in country c and final demand[21]. Evidence suggests that only a few countries have managed to move downstream. Most countries have increased their upstreamness because the overall length of value chains has increased with the fragmentation of production. Moreover, the offshoring process that lengthens GVCs tends to affect more the early stages of production, although a new wave of services offshoring has been taking place in recent years (Taglioni and Winkler, forthcoming). A final useful metric is to combine import and export upstreamness to compute the domestic length of the value chain. A positive gap indicates that exports are relatively more downstream (or "closer to final demand") compared with imports. This is the case in economies where the manufacturing sector has been a key source of export-led growth, such as China, Japan, and Thailand. Conversely, a negative gap indicates that a country's export profile is more upstream than its import profile. This is the case in economies whose

[21] Measured as $GVC\_DIST_{ci} = 1 + \sum_{d,j} \varphi_{cdij} D_{dj}$, Ddj is the distance to final demand in terms of number of production stages in country d and industry j. These are summed up over all country-industry (d,j) combinations who use inputs from industry i and country c using ϕcdij as weights. ϕcdij is the fraction of production from industry i in country c that is purchased as an intermediate good by industry j in country d.

exports are concentrated in agriculture products and primary commodities, such as Australia, and New Zealand. Or it may be the case that the country is a home to a sophisticated consumer market and therefore an intensive importer of finished consumer goods, rather than being a reflection of its exports, such as the United States.

Figure 22 shows that most SACU countries export in upstream positions, relatively far from the final consumers, and show a "negative" domestic GVC length. The exceptions here are Botswana (distorted by the short value chain of diamonds) and Lesotho (final stage apparel assembly). Turkey, Thailand and Mauritius appear to show a pattern of importing relatively upstream and exporting at a more downstream stage, thus indicative of a positive domestic GVC length. By contrast, the South American peers export further upstream than SACU and all show negative domestic GVC length. Between 2000 and 2012, almost all peer countries' exports became more upstream (probably as a result of increasing fragmentation of global production), but South Africa, Swaziland, and Namibia moved further upstream than most.

Figure 22: Import and Export Upstreamness and Domestic GVC length



Source: Authors calculations based on data from UN Comtrade (via WITS)

The relative structure of value chains and country positioning obviously varies considerably by sector.

Table 8 shows export upstreamness in key sectors in 2012. SACU countries appear to export slightly more downstream than peers in agriculture and food and beverage sectors and significantly more so in transport equipment, while they are positioned around the peer average in the other manufacturing sectors. No SACU countries stand out as being appreciably more upstream or downstream across the sectors, although Swaziland is quite a bit more upstream than SACU peers in food and beverages. Analogously, the data on domestic length of GVCs (Table 9), suggests the SACU countries have longer domestic chains in agriculture and agriprocessing, as well as transport equipment. But their import patterns in other manufacturing sectors means that SACU countries generally show negative domestic length in these sectors, indicating substantially shorter domestic value chains in manufacturing than in most of the peer countries.

Table 8: Export upstreamness, selected sectors (2012)

	Agriculture	Food & Beverages	Apparel & Footwear	Machinery	Electronics	Transport Equipt
Turkey	1.85	1.47	1.10	1.71	2.20	1.27
Thailand	2.07	1.77	1.11	1.93	2.26	1.29
Peru	1.77	2.02	1.06	1.73	2.32	1.38
Chile	1.85	1.52	1.11	1.69	1.89	1.34
Brazil	3.10	2.22	1.12	1.87	2.20	1.36
Argentina	3.02	2.69	1.16	1.91	2.18	1.17
Mauritius	2.20	2.00	1.06	1.50	2.27	1.76
Non-SACU avg	*2.27*	*1.96*	*1.10*	*1.76*	*2.19*	*1.37*
Swaziland	1.91	2.15	1.06	1.60	2.55	1.28
South Africa	2.01	1.58	1.32	1.85	2.12	1.17
Namibia	2.15	1.37	1.29	1.79	1.89	1.18
Lesotho	2.26	1.29	1.05	2.06	2.17	1.00
Botswana	2.10	1.33	1.10	1.68	2.21	1.22

Source: Authors based on data from UN Comtrade (via WITS)

Table 9: Domestic GVC length, selected sectors (2012)

	Agriculture	Food & Beverages	Apparel & Footwear	Machinery	Electronics	Transport Equipt
Turkey	1.21	0.59	0.01	0.11	(0.08)	0.09
Thailand	0.52	0.41	0.18	(0.03)	0.14	0.30
Peru	1.10	0.35	0.05	(0.02)	(0.37)	(0.23)
Chile	0.44	0.60	(0.02)	(0.01)	(0.09)	(0.12)
Brazil	(0.66)	(0.27)	0.01	0.02	0.02	0.06
Argentina	(0.98)	(0.94)	0.07	(0.02)	(0.17)	0.19
Mauritius	0.08	(0.37)	0.05	0.32	(0.30)	(0.62)
Non-SACU avg	*0.08*	*(0.04)*	*0.06*	*0.04*	*(0.13)*	*(0.07)*
Swaziland	1.08	(0.30)	0.12	0.05	(0.69)	0.59
South Africa	0.53	0.30	(0.22)	(0.10)	(0.25)	0.08
Namibia	0.10	0.26	(0.15)	(0.06)	0.09	0.02
Lesotho	0.05	(0.01)	0.21	(0.47)	(0.29)	0.14
Botswana	0.25	0.27	0.02	0.00	(0.09)	0.01

Source: Authors based on data from UN Comtrade (via WITS)

6. SUMMARY CONCLUSIONS

The increasing fragmentation of global production has the potential to offer substantial opportunities for the five SACU countries: Botswana, Lesotho, Namibia, South Africa, and Swaziland. Particularly for the four smaller SACU economies (the BLNS), proximity to and regional trade agreements with the "headquarter economy" South Africa both augment these opportunities and create risks of "crowding out", with South Africa reaping the gains of any investments in the region.

Overall the analysis in this note, which draws extensively on the Eora multi-region input-output database over an eleven-year time period and including fourteen comparator countries, suggests that the SACU region is moderately integrated into GVCs. But the scale and nature of this integration varies enormously by country and sector.

Considering overall trade integration first, the region fares well – less integrated than East Asia but more so than might be expected given its peripheral location (and more so than South American peers). However, the nature of integration tends to be biased toward imports, with exports largely commodity dependent (with notable exceptions of South Africa, Lesotho, and Namibia).

Taking the analysis a step further and looking at trade in intermediates, the picture for the region looks less optimistic. Here, SACU as whole has a lower share of intermediates in both exports and imports as compared to peer countries. Moreover, intermediates are declining as a share of exports and imports (with the exception of exports in Namibia and imports in South Africa). This highlights that the region's apparent trade integration remains biased toward commodity exports and consumption imports, with potentially rather limited GVC participation.

The analysis of network integration highlights that South Africa, at least, remains a moderately important player in global trade networks and a key regional hub both in consumption goods (where it is linked to the European market) and intermediates (where it is increasingly linked to China). This data, however, is based only on gross trade and not value-added trade and so South Africa's global position in intermediates is likely to be biased strongly by commodity exports, obscuring its real participation in GVCs.

Lesotho appears to have made the most strides in the region in terms of GVC participation, as evidenced by rapidly growing gross exports and DVA, and a declining ratio of DVA to gross exports. By contrast, Botswana fares poorly in measures of DVA growth and GVC integration, showing stagnant DVA and declining DVA share of gross exports. Swaziland also shows relative stagnation in its performance. South Africa and Namibia meanwhile show moderate performance, with South Africa in particular showing fairly strong levels of GVC participation and moderate growth in DVA and DVA share. From a sectoral perspective performance varies significantly, but what is most notable is that services sectors – and particularly transport and hotels and restaurants – have in general been growing more rapidly than manufactured goods.

These results are also mirrored in the GVC participation index, for which Lesotho saw the largest increase between 2000 and 2011 (from 48% to 70%). Among SACU economies only Namibia improved in this time period (from 37% to 39%). However, all five countries are – broadly speaking – in the middle range compared to the list of peer countries.

The region also shows big differences across countries in terms of the nature of this integration. Overall, South Africa is the only country in the region showing relatively strong forward integration in GVCs; Botswana also shows relatively high forward integration, but excluding diamonds, forward integration is limited. Lesotho and Swaziland, by contrast, show the lowest forward integration among all peers, and Namibia is also among the least forward integrated countries in the comparison. Lesotho, South Africa, and to a lesser degree Namibia are well integrated backward into GVCs. Botswana and Swaziland perform less well here, and both of these countries show stagnant performance over time across both forward and backward integration.

The direction of forward and backward integration shows the overwhelming dominance of South Africa as a source country of foreign content for the other four SACU economies, which suggests that they are more integrated into regional value chains than to global ones (see Keane, 2015). This may also have implications for access to global frontier technology, and therefore to productivity growth potential. China has grown substantially in significance, particularly as a source of foreign content. All countries, however, remain highly dependent on European markets for their forward participation in GVCs.

Finally, the region appears to be positioned relatively upstream in GVCs, in particular South Africa, Swaziland, and Namibia (while Lesotho is downstream positioned in the apparel GVC). While the region appears to be better positioned than the South American peers, a clear gap is apparent with countries like Thailand, Turkey, and Mauritius, which import relatively upstream in GVCs and then export further downstream. By contrast, most SACU countries import further downstream than they export.

In interpreting these results it is important to bear in mind the importance of the recent commodity super-cycle on the relative export value of goods and services for commodity-dependent exporters (including some of the SACU countries). This is likely to explain some of the trends observed, particularly in relation to growth in forward and indirect value added. These results – particularly in conjunction with existing sectoral studies on the export growth and diversification efforts of these economies – provide compelling evidence of the varied pace of GVC integration in recent years in the region, as well as the heterogeneity across sectors and source and destination countries.

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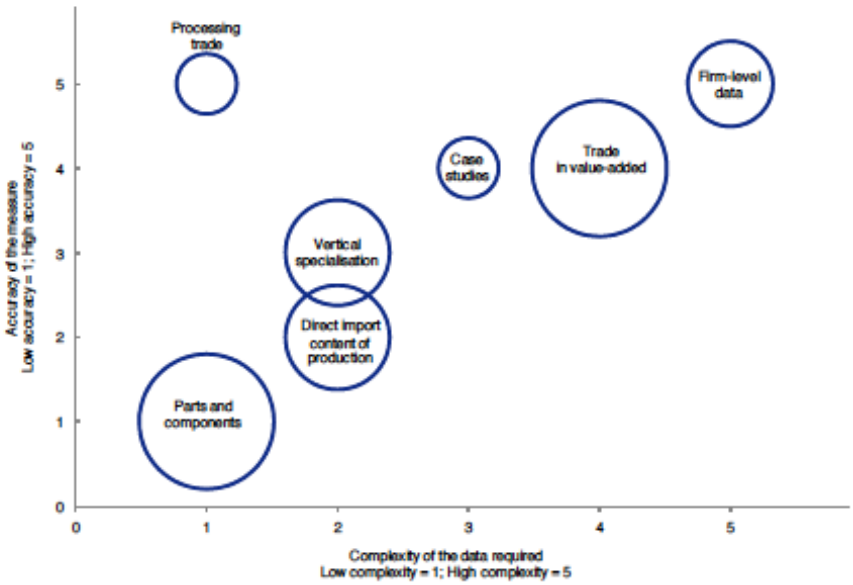
Appendices

Appendix 1: Overview of Eora and other MRIOs

A growing number of international and MRIO tables are allowing us to analyse sources and destinations of value that flows through GVCs, identifying the role of countries and industries in supply chains. Pioneered by Wassily Leontief in the 1940s, these were initially mostly applied to the analysis of national accounts for individual countries and were later on used primarily for environmental and ecological analysis (e.g. measuring responsibility for emissions) as well as in regional science (see Miller and Blair 2009 for an overview).

In recent years, national account data has been integrated with bilateral trade data and information about sourcing of inputs at the industry-level to derive information on use of domestic and imported inputs, and in turn, where value is added along supply chains provided a new, easily accessible approach to measuring trade in GVCs (see Figure 23 for an overview).

Figure 23: Main strands of empirical research on GVCs



Note: The size of the circles represents the coverage of each measure relatively to the real size of the GVCs phenomenon in the world economy. Larger circles stand for higher coverage.

Source: Amador and Cabral, p. 17

Of late, triggered by greater interest in understanding processes of international fragmentation and global supply chains, numerous empirical papers have been published using existing input-output databases (especially the forerunner of many recent MRIOs, the Global Trade Analysis Project, GTAP). Measuring trade in value added via MRIOs has a number of clear benefits (see Ahmad 2013). Firstly, it provides a crucial tool to understand a country's actual industrial structure and the national and international inter-linkages of sectors for developing growth and development strategies, as well as trade and industrial policies. Secondly, it makes clear how particularly non-tariff barriers (including regulatory measures) can impact competitiveness and upstream producers. Thirdly, it can help policymakers better anticipate *ex ante* the potential impact of macroeconomic shocks. Fourthly, it can allow for calculations of the 'job content' of trade. Finally, environmentally extended MRIOs allow for an assessment of the impact of trade as it affects ecosystem services.

MRIO tables are usually constructed through harmonised national supply-use tables (SUTs) and/or input-output tables (IOTs). These show truncations between domestic industries supplemented by tables breaking down imports by users, and have increasingly become indispensible for relevant macroeconomic and trade policy analyses (for an overview see Ahmad 2013, Jones et al. 2013, Dietzenbacher et al. 2013, Amadou and Cabral 2014).[22] MRIO tables allow for analysis of value contribution along supply chains, enabling the analysis of sources and destinations of value that flow through GVCs (for recent examples see Johnson and Noguera, Lenzen et al. 2013, UNCTAD 2013). There are now a number of global input-output databases that vary significantly in terms of country, sectoral coverage, time span and approach (see Table 10 below).

Table 10: Overview of main MRIO databases

Name	Countries	Type	Detail (I x p)[a]	Time	Extensions	Approach
Eora	World (over 180)	MR SUT/IOT	Variable (20-500	1970-2010	Various, especially environmental	Create initial estimate, gather all data in original formats, formulate constraints; detect and judge inconsistencies; set routine; calculate global MR SUT/IOT
EXIOPOL/ CREEA	World (43 countries + RoW)	MR SUT	129 x 129	2000 and 2007	30 emissions, 60 IEA, energy carriers, water, land, 80 resources	Create SUT; split use into domestic and imported use; detail and harmonise SUTs; use trade shares to estimate implicit exports; confront with exports in SUT; RAS out differences; add extensions
WIOD	World (40 countries + RoW)	MR SUT	35 x 59	1995-2009, annually	Detailed socio-economic and environmental satellite accounts	Harmonise SUTs; create bilateral trade database for goods and services; adopt import shares to split use into domestic and imported use; trade information for RoW is used to reconcile bilateral trade shares; add extensions
GTAP-MRIO	World (129 countries)	MR IOT	57 x 57	1990, 1992, 1995, 1997, 2001, 2004, 2007	5 (GWP), land use, energy volumes, migration	Harmonise trade; use IOTs to link trade sets; IOT balanced with trade and macroeconomic data
GRAM	World (40 countries	MR IOT	48 x 48	2000, 2004	Various	Use harmonised OECD IOTs; neglect differences like *i* x *i* and *p* x *p*; use OECD bilateral trade database to link trade

[22] For examples of early work on decomposing trade into the value-added shares see Hummels et al. (2001), Daudin et al. (2006), Johnson and Noguera (2010) and Koopman et al. (2012).

IDE-JETRO	Asia-Pacific (8: 1975; 10: 1985-2005)	MR IOT	56 x 56 (1975); 78 x 78 (1985-1995); 76 x 76 (2000, 2005)	1975 – 2005		Employment matrices (2000, 2005)	Harmonise IOTs based on cross-country survey information; link via trade; manual balancing to reduce discrepancies within certain bounds

[a] *i – number of industries, p - number of products; SUT… supply-use tables, IOT… Input-Output tables*

Source: Tukker and Dietzenbacher (2013)

The spate of recent MRIO tables greatly improves our understanding of how GVCs function in practice. They are, however, subject to a degree of uncertainty – as is common with any applications using accounts data and trade flow data – which is augmented when examining developing counties, where statistical capacities tend to be substantially worse. Moreover, MRIO tables also suffer from a deficiency faced in many other empirical approaches to trade flow analysis, namely they are not able to accurately assess the impact of services. They furthermore are subject to two assumptions that contribute to their uncertainty, the former of which particularly is relevant for analysing trade flows from developing countries (OECD 2012). Firstly they assume that all products (for export and domestic use) have the same import content (proportionality assumption – see Winkler and Milberg 2012) and secondly they assume a uniform use of inputs among all firms in a sector (homogeneity assumption).

The Eora MRIO dataset, has recently been used for GVC-related analyses in a number of international reports (UNCTAD 2013, AfDB/OECD/UNDP 2014). It has several advantages to other databases (see Lenzen et al. 2012). These include:

1. It is disaggregated into 187 countries (including all SACU members), providing important advantages for assessing impacts of consumption and production on relatively poor countries;
2. It has a historical time series spanning 1990-2011 (soon to be extended to 1970-2011 and updated with an approximate two year delay) based on an iterative process using an initial year estimate for 2000, overlaying estimates for 1999 and 2001 respectively with new data and then re-balancing;
3. It includes tables of basic prices, as well as two margins (taxes on products and subsidies on products) with constant prices to be added soon;
4. To clarify levels of uncertainty, standard deviation estimates have been calculated for all MRIO events;
5. It is publically available at www.worldmrio.com

In its construction, it was based on the principle of changing to the structure of the original data sources as little possible for the sake of transparency. Its matrices are based on the use of the following types of raw data (in order of assumed accuracy):

- input–output (I–O) tables and main aggregates data from national statistical offices where these are available;
- I–O compendia from Eurostat, IDE-JETRO, and OECD,
- the UN National Accounts Main Aggregates Database ,
- the UN National Accounts Official Data,
- the UN Comtrade international trade database, and
- the UN Servicetrade international trade database.

This makes it well suited for dynamic analysis of smaller developing countries not included in other datasets,[23] however should be complemented by more nuanced sectoral analysis drawing on alternative methodologies.

Appendix 2: Methodology for value-added analysis

The calculation below of the different value added measures comes directly from Koopman et al. (2010) who provide a full decomposition of value-added exports in a single framework encompassing previous measures by Hummels et al. (2001) and Johnson and Noguera (2012), among others.

They start with a standard input-output model where each country produces goods in N tradable sectors (Leontief 1970, Miller and Blair 2009):

$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{Y} = \mathbf{LY}$,...
... ***X*** is the $2N \times 1$ gross output vector for both countries
... ***A*** is the $2N \times 2N$ coefficient matrix giving intermediate use of each country's sector of goods produced in *r*.
... ***I*** is a $2N \times 2N$ identity matrix
... ***Y*** is the $2N \times 1$ final demand vector for both countries
... ***L*** is the $2N \times 2N$ Leontief inverse matrix.

Assuming the case of a 2-region, 1 sector example (i.e. N=1) consisting of Botswana (indexed B) and the rest of the world (indexed R), the two-country system can be written in block matrix notation as:

$$\begin{bmatrix} X_B \\ X_R \end{bmatrix} = \begin{bmatrix} L_{BB} & L_{BR} \\ L_{RB} & L_{RR} \end{bmatrix} \begin{bmatrix} Y_B \\ Y_R \end{bmatrix}$$

Value added trade is calculated using ***V*** as a $1 \times 2N$ row vector with each element representing the value added per unit industry output and each element in ***V*** gives the share of direct domestic value added in total output.

One can then calculate the value-added share (VAS) matrix as:

$$VAS \equiv VL = \begin{bmatrix} V_B & 0 \\ 0 & V_R \end{bmatrix} \begin{bmatrix} L_{BB} & L_{BR} \\ L_{RB} & L_{RR} \end{bmatrix} = \begin{bmatrix} V_B L_{BB} & V_B L_{BR} \\ V_R L_{RB} & V_R L_{RR} \end{bmatrix}$$

The columns in $V_B L_{BB}$ denote Botswana's domestic value-added share of domestically produced products in a particular sector at home. The columns of $V_R L_{RB}$ denote the share of the Rest of the World's value-added in these goods produced in Botswana. The second set of N columns present value-added shares for production in the RoW for Botswana's goods ($V_B L_{BR}$) and RoW value added for goods produced in the RoW.

The sum along each column must equal unity:

$V_B L_{BB} + V_R L_{RB} = V_B L_{BR} + V_R L_{RR} = \mathrm{u}$

[23] In comparative analysis (UNCTAD 2013) with the WIOD dataset, Eora was found to provide broadly similar results when calculating foreign and domestic value added, albeit with a slight upward bias (which is to be expected as the greater number of highly heterogeneous developing countries, many of which have been subsumed in WIOD's rest of world matrix).

In order to then determine domestic and imported content shares of each country's production and trade at the sector level, use gross exports as weight, letting $E_{B*} = \sum_B E_{BR} = \sum_R (A_{BR}X_R + Y_{BR})$

$E = \begin{bmatrix} E_{B*} & 0 \\ 0 & E_{R*} \end{bmatrix}$, and

$\widehat{\mathrm{E}} = \begin{bmatrix} diag(E_{B*}) & 0 \\ 0 & diag(E_{R*}) \end{bmatrix}$

Where:
… E is a $2N \times N$ matrix
… $\hat{E}$ is a $2N \times 2N$ diagonal matrix

The value-added share by source country for each sector can then be calculated as:

$$VAS\_\widehat{\mathrm{E}} \equiv VL\widehat{\mathrm{E}} = \begin{bmatrix} V_B L_{BB} E_B & V_B L_{BR} E_R \\ V_R L_{RB} E_B & V_R L_{RR} E_R \end{bmatrix}$$

Each element is the total upstream direct and indirect value added by source country and sector in gross exports for each sector (thus also including the specific sector itself).

Looking at aggregates and 2 countries (i.e. in the example above) there is no need to define sectoral shares, so one can just use

$E = \begin{bmatrix} E_{B*} & 0 \\ 0 & E_{R*} \end{bmatrix}$

and in turn for value-added by source in gross exports:

VAS_E= VLE = $\begin{bmatrix} V_B L_{BB} E_{B*} & V_B L_{BR} E_{R*} \\ V_R L_{RB} E_{B*} & V_R L_{RR} E_{R*} \end{bmatrix}$

The diagonal elements represent the domestic value-added of each country's exports; off-diagonal elements give the foreign value-added embodied in each country's exports[24]:

DV= $\begin{bmatrix} V_B L_{BB} E_{B*} \\ V_R L_{RR} E_{R*} \end{bmatrix}$

FV = $\begin{bmatrix} V_R L_{RB} E_{B*} \\ V_B L_{BR} E_{R*} \end{bmatrix}$

Assuming 3 countries (Botswana, Swaziland [indexed S] and RoW) and N sectors, production, value-added share and sources of value-added in gross exports are as follows:

$X = (I - A)^{-1}Y = LY$,…
VAS = VL
VAS_E = VLE

[24] Generalization of Hummels, Ishii and Yi (2001) vertical specialization measure as the this only caputres foreign value added in gross exports when only one country's intermediate goods are used abroad.

X and *Y* are $3N \times 1$ vectors; *A* and *L* are $3N \times 3N$; *V* and *VAS* are $3 \times 3N$ matrices; *E* is a $3N \times 3$ and *VAS_E* is 3×3.

For aggregate measures, all results continue to hold – can be expressed just by replacing relevant weighting matrix. Complexity arises from intermediate inputs that cross multiple borders (derivation via application of expression for inverse of a partitioned matrix).

As before, value-added shares can be applied to gross exports to produce VAS_E (3×3).

$$\text{VAS\_E} = \begin{bmatrix} V_B L_{BB} E_{B*} & V_B L_{BS} E_{S*} & V_B L_{BR} E_{R*} \\ V_S L_{SB} E_{B*} & V_S L_{SS} E_{S*} & V_S L_{SR} E_{R*} \\ V_R L_{RB} E_{B*} & V_R L_{SB} E_{S*} & V_R L_{RR} E_{R*} \end{bmatrix}$$

Here the sum of off-diagonal elements along a column is the measure of foreign value-added embodied in a country's gross exports, i.e.:
$FV_B = \sum_{B \neq T} V_T L_{TB} E_B$, or for this 3-coutnry case:

$$FV_B = V_S L_{SB} E_B + V_R L_{RB} E_B$$

The sum of off-diagonal elements along a row provides information on a country's value-added embodied as intermediate inputs in third countries' gross exports (i.e. indirect value added):

$$IV_B = \sum_{S \neq R} V_B L_{BS} E_{SR},$$

Domestic value in gross exports is, as above:

$$DV_B = V_B L_{BB} E_B$$

Sum of all DV and FV should add up to gross exports

To capture country's position (upstream/downstream) it makes sense to compare its exports of intermediates used by other countries, with that country's use of imported intermediates in the same sectors. If it lies upstream in the global value-chain, it participates in producing inputs for others – then its IV share of gross exports will exceed its FV share:

$$GVC\_Participation_{BR} = \frac{IV_{BR}}{E_{BR}} + \frac{FV_{BR}}{E_{BR}}$$

Appendix 3: Correspondence between Eora sectors and ISIC Rev.3

Eora sector	ISIC Rev.3 correspondence
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, chemical 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 telecommunications	64
Financial intermediation and business activities	65, 66, 67, 70, 71, 72, 73, 74
Public administration	75
Education, health and other services	80, 85, 90, 91, 92, 93
Private households	95
Other	99

Appendix 4: Exports and imports for SACU countries - Comparing Eora and Comtrade

This section provides an overview of changes in each of the five country's aggregate and sectoral exports between 2001 and 2011 drawing on the Eora database, as this is the source of the value-added analysis.

For **Botswana**, the Eora data (Table 11) shows a particularly strong increase in the significance of service exports in the economy. While the *Other Manufacturing* sector (which is likely to include diamonds) was the largest in 2001, the two largest export sectors in 2011 were *Transport* and *Hotels and Restaurants*. Eora data suggests a strong increase in both exports and imports in the given time period, with the former growing at almost 11% annually and the latter at over 30%. Besides the *Other Manufacturing* sector, the most important non-services sector is *Food and Beverages*, which has seen considerable growth (20.8% p.a.). In terms of imports, the largest sector is the *Petroleum, Chemical and Non-Metallic Mineral Products* sector, which has also experienced substantial growth since 2001, followed by *Electrical and Machinery*. *Financial Intermediation and Business Services* is the largest services import sector.

What is most striking when one compares Eora trade data to Comtrade's data for Botswana (Table 12) is the fact that *Other Mining and Quarrying*, which is by far the largest export sector in Comtrade (more than US$8 billion in exports and 15 times as many exports as any other sector) is completely underrepresented in Eora, both in terms of trade value and relative significance (it is 6th with approximately 45 million in exports). This discrepancy inevitably skews Botswana's results for any kind of value-added trade analysis. In terms of imports, the overlap is more significant with the EORA *Petroleum* sector aggregated from ISIC sectors 23-27 on Comtrade. Likewise, while Comtrade does not have information on the four services sectors featured as top ten imports in Eora (*Financial Intermediation and Business Services*, *Public Administration*, *Education, Health and Other Services* and *Construction*), there is an approximate correspondence between some of the other top-ten import sectors if one aggregates ISIC sectors to the 26-sector Eora format.

Table 11: Top 10 import and export sources (Eora) for Botswana, 2011

Exports			Imports		
Sector	Value (in $1000)	Annual growth since 2001 (%)	**Sector**	Value (in $1000)	Annual growth since 2001 (%)
Transport	174,082	19.5	**Petroleum, Chemical and Non-Metallic Mineral Products**	690,397	19.5
Hotels and Restaurants	168,985	22.0	**Electrical and Machinery**	546,937	22.0
Other Manufacturing	100,843	0.2	**Financial Intermediation and Business Activities**	334,514	0.2
Food & Beverages	79,724	20.8	**Transport Equipment**	268,340	20.8
Education, Health and Other Services	60,420	13.7%	**Public Administration**	267,401	13.7%
Electrical and Machinery	45,284	0.28	**Education, Health and Other Services**	217,366	0.28
Mining and Quarrying	42,807	2.00	**Construction**	207,161	2.00
Transport Equipment	42,651	3.36	**Food & Beverages**	193,044	3.36

Textiles and Wearing Apparel	39,598	2.38	**Metal Products**	180,521	2.38
Post and Telecommunications	35,272	1.99	**Transport**	156,526	1.99

Source: Own computations using Eora database

Table 12: Top 10 import and export sectors (Comtrade) for Botswana, 2011

Exports		Imports	
Sector	Value (in $1000)	**Sector**	Value (in $1000)
Other Mining and Quarrying	8,266,573	**Manufacture of Machinery and Equipment**	201,976
Manufacture of furniture	553,748	**Manufacture of Fabricated Metal Products**	169,873
Manufacture of Basic Metals	456,757	**Other Mining and Quarrying**	166,646
Mining of Metal Ores	53,225	**Manufacture of Electrical Machinery**	156,209
Manufacture of Motor Vehicles	45,465	**Manufacture of Radio and Television**	88,072
Manufacture of Food Products and Beverages	32,947	**Manufacture of Chemicals**	72,558
Manufacture of Chemicals	15,777	**Manufacture of Motor Vehicles**	71,880
Manufacture of Machinery and Equipment	12,743	**Manufacture of Wearing Apparel**	57,139
Manufacture of Coke, Refined Petroleum	12,115	**Manufacture of furniture**	52,994
Manufacture of Textiles	11,395	**Manufacture of Basic Metals**	52,359

Source: Comtrade

Lesotho's top export sector – *Textiles and Wearing Apparel* – far exceeds flows from any other goods sector according to Eora data (Table 6)(Table 13) with the subsequent sectors predominantly consisting of services (most prominently *Transport*, *Public Administration* and *Hotels and Restaurants*). These sectors have also grown significantly faster than the textiles and apparel sector. However, the largest export sector according to Comtrade, *Other Mining and Quarrying*, is again far less significant on Eora (Table 13) in Eora its approximate equivalent sector, *Mining and Quarrying* (which also includes four other ISIC sectors) has an export volume of approximately US$ 14 million on Eora compared to US$716 million for Comtrade.

Eora reports the largest import sectors to be predominantly services (*Public Administration*, *Financial Intermediation*, and *Transport*) – in all likelihood a product of its dependence on South African imports. Leading goods imports are listed as *Wholesale Trade* (which is not more clearly specified), *Electrical and Machinery* and *Petroleum, Chemical and Non-Metallic Mineral Products*. Again, the discrepancy to Comtrade is rather striking– here textiles are by far the largest import product, followed – more consistently with results from the Eora database- by "*Manufacture of Chemicals*" and "*Manufacture of Radio and Television*."

Table 13: Top 10 import and export sectors (Eora) for Lesotho, 2011

Exports			Imports		
Sector	Value (in $1000)	Annual growth since 2001 (%)	**Sector**	Value (in $1000)	Annual Growth since 2001
Textiles and Wearing Apparel	97,848	20.6	**Public Administration**	121,309	32.5
Transport	47,040	34.5	**Financial Intermediation and Business Activities**	109,822	19.4
Public Administration	19,718	97.3	**Transport**	100,507	66.3
Hotels and Restaurants	18,618	62.5	**Wholesale Trade**	100,335	49.6
Education, Health and Other Services	18,523	66.7	**Electrical and Machinery**	70,980	42.5
Wholesale Trade	18,314	67.9	**Education, Health and Other Services**	70,781	20.4
Post and Telecommunications	17,936	53.3	**Petroleum, Chemical and Non-Metallic Mineral Products**	52,624	41.2
Construction	17,287	74.1	**Post and Telecommunications**	49,698	68.0
Re-export & Re-import	16,254	71.7	**Transport Equipment**	46,955	54.8
Retail trade	15,826	7.07	**Construction**	45,716	25.5

Source: Own computations using Eora database

Table 14: Top 10 import and export sectors (Comtrade) for Lesotho, 2011

Exports		Imports	
Sector	Value (in $1000)	**Sector**	Value (in $1000)
Other Mining and Quarrying	716,373	**Manufacture of Textiles**	111,462
Manufacture of Wearing Apparel	274,034	**Manufacture of Chemicals**	25,968
Manufacture of Textiles	81,575	**Manufacture of Radio and Television**	22,577
Manufacture of furniture	34,138	**Agriculture, Hunting and Related Sectors**	13,273
Manufacture of Electrical Machinery	11,498	**Manufacture of Machinery and Equipment**	12,790
Manufacture of Food Products and Beverages	2,224	**Manufacture of Medical**	12,168
Manufacture of Other Transport Equipment	763	**Manufacture of Electrical Machinery**	6,984
Manufacture of Rubber and Plastics	323	**Publishing, Printing…**	5,646
Manufacture of Paper and Paper Products	265	**Manufacture of Food Products and Beverages**	5,466
Manufacture of Chemicals	172	**Manufacture of Rubber and Plastics**	4,995

Source: Comtrade

For **Namibia**, the largest three export sectors according to Eora are *Food and Beverages*, *Petroleum, Chemical and Non-Metallic Mineral Products*, *Mining and Quarrying* and *Transport* (Table 15). Here particularly mining and transport have seen remarkable growth over the past years (46% p.a. and 39% p.a., respectively, since 2001). Subsequent sectors are primarily manufacturing, including *Electrical and Machinery*, *Transport Equipment* and *Textiles and Wearing Apparel*. Comtrade data again has *Other Mining and Quarrying* as the top export sector (Table 9), which broadly reflects the importance of *Mining and Quarrying* in the Eora rankings. The subsequent sectors on Comtrade are *Manufacture of Basic Metals*, *Manufacture of Food Products* and *Manufacture of Coke and Refined Petroleum*.

In terms of Namibia's imports, the leading imports according to Eora are *Electrical and Machinery*, *Petroleum, Chemical and Non-Metallic Mineral Products* and *Financial Intermediation*. Again there is a substantial discrepancy to Comtrade, where the leading import is again related to mining (*Mining of Metal Ores*) followed by *Manufacture of Machinery* and *Manufacture of Food Products* (which is ranked 6th according to Eora).

Table 15: Top 10 import and export sectors (Eora) for Namibia, 2011

Exports			Imports		
Sector	Value (in $1000)	Annual growth since 2001 (%)	**Sector**	Value (in $1000)	Annual Growth since 2001
Food & Beverages	738,877	25.2	**Electrical and Machinery**	439,343	34.5
Petroleum, Chemical and Non-Metallic Mineral Products	255,705	25.7	**Petroleum, Chemical and Non-Metallic Mineral Products**	390,857	22.7
Mining and Quarrying	233,262	46.7	**Financial Intermediation and Business Activities**	307,464	25.9
Transport	174,492	38.8	**Public Administration**	259,543	35.5
Electrical and Machinery	130,698	55.2	**Transport Equipment**	219,818	34.4
Transport Equipment	97,785	20.3	**Education, Health and Other Services**	204,362	29.0
Textiles and Wearing Apparel	94,898	35.8	**Food & Beverages**	196,442	33.3
Agriculture	86,970	27.8	**Construction**	166,123	31.3
Metal Products	74,061	42.1	**Transport**	141,606	33.5
Hotels and Restaurants	70,476	41.3	**Metal Products**	138,940	32.8
Total	2,266,669	31.0	**Total**	3,202,782	30.4

Source: Own computations using Eora database

Table 16: Top 10 import and export sectors (Comtrade) for Namibia, 2011

Exports		Imports	
Sector	Value (in $1000)	**Sector**	Value (in $1000)
Other Mining and Quarrying	1,622,257	**Mining of Metal Ores**	639,250

Manufacture of Basic Metals	1,419,880	**Manufacture of Machinery and Equipment**	271,041
Manufacture of Food Products and Beverages	942,701	**Manufacture of Food Products and Beverages**	159,416
Manufacture of Coke, Refined Petroleum	713,334	**Manufacture of Motor Vehicles**	153,705
Mining of Uranium and Thorium Ores	194,633	**Manufacture of Chemicals**	129,420
Manufacture of furniture	177,684	**Manufacture of Textiles**	80,778
Agriculture, Hunting and Related Sectors	123,012	**Manufacture of Radio and Television**	68,904
Manufacture of Basic Metals	80,510	**Manufacture of Coke, Refined Petroleum**	68,679
Fishing	52,698	**Manufacture of Basic Metals**	59,134
Manufacture of Fabricated Metal Products	52,660	**Manufacture of Electrical Machinery**	50,365

Source: Comtrade

For **South Africa**, the largest export sectors according to Eora for 2011 were – broadly speaking – in mining and minerals, including the 'Other mining products' and 'Iron and steel products', followed by 'Coal and lignite and non-ferrous metals' (Table 17). The largest non-mineral-related sector was '*Transport services*' followed by '*Other business services*'.[25] This mirrors the results in Comtrade (Table 18), where the largest sectors were '*Manufacture of basic metals*' and 'M*ining of metal ores*', followed by '*Manufacture of motor vehicles*', which likely captures '*Transport services*' and the 9th ranked sector, '*Motor vehicle parts'*. The other top export sectors are either extractives, such as 'Basic chemical products' (6th), 'Petroleum products' (8th) as well as agricultural products (7th). These are all represented in Comtrade as leading sectors.

Among the leading imports, Eora's top sectors are '*Motor vehicles'*, followed by the two services sectors '*General government*' and '*Communications*', and then '*Other mining*' and 'Transport services'. In Comtrade the leading import sector is 'Extraction of crude petroleum' and 'Manufacture of machinery and equipment' followed by 'Manufacture of chemicals and chemical products' and 'Manufacture of motor vehicles'. While the ranking differs, both Eora and Comtrade demonstrate the centrality of the extractive and transport sectors both as inputs into further production and into final demand.

Table 17: Top 10 import and export sectors (Eora) for South Africa, 2011

Exports			Imports		
Sector	Value (in $1000)	Annual growth since 2001 (%)	**Sector**	Value (in $1000)	Annual Growth since 2001
Other mining products	15,651,790	29.2	**Motor vehicles**	6,873,574	25.7
Iron and steel products	11,870,540	27.1	**General Government**	4,451,320	27.7
Coal and lignite products	4,057,202	15.0	**Communications**	2,078,012	24.8

[25] As Eora could draw on South Africa's own input-output table, there are more sectors available than for the other SACU countries. However, the analysis in the subsequent sections draws on the summarized 26-sector summary (25, excluding mining and quarrying).

Non-ferrous metals	9,317,438	27.1	**Other mining**	3,828,292	27.6
Transport services	7,911,638	31.1	**Trade**	3,747,478	26.9
Other business services	7,841,567	28.4	**Transport services**	3,159,089	25.0
Basic chemical products	7,369,986	25.0	**Agriculture**	2,472,700	24.0
Agricultural products	5,407,014	27.1	**Iron and steel**	2,130,715	18.5
Petroleum products	2,518,601	7.2	**Buildings**	1,921,877	29.3
Other manufacturing	2,445,980	30	**Petroleum**	1,756,022	20
Motor vehicles parts	2,233,046	20	**Insurance**	1,739,630	20

Source: Own computations using Eora database

Table 18: Top 10 import and export sectors (Comtrade) for South Africa, 2011

Exports		Imports	
Sector	Value (in $1000)	**Sector**	Value (in $1000)
Manufacture of basic metals	32,237,822	**Extraction of crude petroleum**	14,300,212
Mining of metal ores	14,164,483	**Manufacture of machinery and equipment**	12,711,015
Manufacture of motor vehicles, trains, …	9,020,687	**Manufacture of chemicals and chemical products**	10,645,394
Mining of coal and lignite	7,525,758	**Manufacture of motor vehicles, trains, …**	8,920,932
Manufacture of machinery and equipment	6,896,916	**Manufacture of coke, refined petroleum**	6,4613,79
Manufacture of chemicals and chemical products	6,886,717	**Manufacture of food products and beverages**	5,530,841
Manufacture of food products and beverages	5,083,184	**Manufacture of radio, television,…**	5,307,494
Agriculture, hunting and related sectors	4,165,987	**Manufacture of basic metals**	3,554,794
Manufacture of coke, refined petroleum	3,439,863	**Manufacture of electrical machinery**	3,092,348
Manufacture of fabricated metal products	1,900,436	**Manufacture of office, accounting…**	2,717,723

Source: Comtrade

Swaziland's largest export sectors are Food and Beverages, followed by Electrical and Machinery and Transport, Petroleum, Chemical and Non-Metallic Mineral Products and Hotels and Restaurants (Table 19). Together with Education and Health, both Transport and Hotels and Restaurants have been among the fastest growing sectors (up to 50% p.a.), indicative of the increasing importance of the services economy. This is broadly consistent with Comtrade data, where Manufacture of Food Products and Beverages is the largest sector, ahead of Manufacture of Chemicals and Manufacture of Machinery and Equipment. The other goods in Swaziland's list of ten most significant exports on Eora – Agriculture, Metal Products, Textiles and Wearing Apparel and Wood and Paper – are all represented in the top 10 according to Comtrade data.

The largest sources of imports according to Eora are Petroleum, Chemical and Non-Metallic Mineral Products, Electrical and Machinery and Financial Intermediation. This is followed by two other services sectors: Public Administration and Education and Health. When comparing Eora import data for Swaziland to Comtrade (Table 20), this does create numerous discrepancies. Comtrade data has Manufacture of Motor Vehicles, Manufacture of Chemicals, Manufacture of Textiles and Manufacture of Machinery and Equipment as the top goods sectors. As Manufacture of Chemicals is one of four sectors subsumed in Eora's Petroleum, Chemical and Non-Metallic Mineral Products sector and Transport Equipment ranks sixth in the Eora ranking (and third among goods sectors) there is a certain degree of overlap, though as before the omission of certain sectors of particular importance in the Comtrade rankings (e.g. textiles) is conspicuous.

Table 19: Top 10 import and export sectors (Eora) for Swaziland, 2011

Exports			Imports		
Sector	Value (in $1000)	Annual growth since 2001 (%)	**Sector**	Value (in $1000)	Annual Growth since 2001
Food & Beverages	211,043	15.5	**Petroleum, Chemical and Non-Metallic Mineral Products**	260,906	12.3
Electrical and Machinery	194,634	27.3	**Electrical and Machinery**	230,333	20.0
Transport	183,346	47.1	**Financial Intermediation and Business Activities**	163,488	17.2
Petroleum, Chemical and Non-Metallic Mineral Products	88,480	2.1	**Public Administration**	118,285	18.4
Hotels and Restaurants	87,129	50.9	**Education, Health and Other Services**	102,794	18.7
Agriculture	56,498	21.7	**Transport Equipment**	102,745	18.7
Metal Products	56,463	37.7	**Food & Beverages**	97,073	21.1
Education, Health and Other Services	49,298	45.2	**Construction**	92,147	18.1
Textiles and Wearing Apparel	47,988	13.8	**Metal Products**	79,513	18.8
Wood and Paper	47,966	1.9	**Transport**	76,134	20.5
Total	1,228,800	20.7	**Total**	1,761,590	17.5

Source: Own computations using Eora database

Table 20: Top 10 import and export sectors (Comtrade) for Swaziland, 2011

Exports		Imports	
Sector	Value (in $1000)	**Sector**	Value (in $1000)
Manufacture of Food Products and Beverages	456,054	**Manufacture of Motor Vehicles**	61,422
Manufacture of Chemicals	235,535	**Manufacture of Chemicals**	50,189
Manufacture of Machinery and Equipment	79,342	**Manufacture of Textiles**	32,355

Agriculture, Hunting and Related Sectors	73,965	**Manufacture of Machinery and Equipment**	21,693
Manufacture of Wearing Apparel	62,402	**Manufacture of Other Transport Equipment**	21,617
Manufacture of Basic Metals	45,162	**Agriculture, Hunting and Related Sectors**	18,007
Manufacture of Coke, Refined Petroleum	25,899	**Manufacture of Food Products and Beverages**	17,968
Manufacture of Radio and Television	25,384	**Manufacture of furniture**	16,387
Manufacture of Textiles	22,490	**Manufacture of Radio and Television**	14,595
Manufacture of Medical	12,711	**Manufacture of Basic Metals**	14,582

Source: Comtrade

As the above analysis shows, there exist substantial discrepancies between Eora and Comtrade, even when going beyond sectoral trade volumes and examining just the relative significance of different sectors in terms of total imports/exports. Trade data for SACU countries is notoriously flawed so there is little guarantee that either source provides an accurate estimate of 'true' trade volumes (and initial cursory analysis of trade data on the SACU statistical portal provides a further set of contradictions). However, the processes required to create the contiguous Eora database have likely come at the expense of precision for less globally significant economies, including SACU countries.

In this context, Table 22 through Table 25 provides a helpful overview not only of total non-exported output across time for each of the 15 tradable sectors (23 for South Africa as it has a more sophisticated IO table), calculated by adding output produced by a sector for use in any domestic sector as an intermediate and for domestic final consumption (but not for export), as well as the standard deviation. This provides some indication of the reliability of estimates. As can be seen, standard deviations vary across sectors, countries, and time[26]. For example, standard deviations tend to be significantly lower for services sectors than for mining and quarrying, while the level of uncertainty for Swaziland (over 60% for 2000 values and 30% for 2011) is far in excess of those of the other four SACU countries, where in aggregate the standard deviation tends to be range from a fraction of 1% (South Africa) to 5% of the result (Namibia and Lesotho). For each country adherence reports are available describing in greater detail which data sources have been respected most and least in the final outcome.

Table 21: Non-exported output and standard deviation of 15 key sectors for Botswana, 2000 and 2011

2011			2000	
Sector	Value (in $1000)	Standard deviation (in $1000)	Value (in $1000)	Standard deviation (in $1000)
Agriculture	383,261	3,516	121,917	87
Electrical and Machinery	1,500,841	4,936	556,254	2

[26] According to the Eora website, standard deviations are calculated where different data sources exist and assigning quality scores to these. Then, "*conflicting data points along with quality scores are run through optimization software which produces a quality-weighted result*." If two conflicting estimates exist, the researchers first ascertaine – either from written documentation, or from data source provider interviews – the reliability of the data source, and then assign standard deviations to the two or more values, with the optimiser then producing a quality-weighted final result.

Financial Intermediation and Business Activities	5,554,148	2,023	1,895,242	0
Fishing	26,225	43	6,610	91
Food & Beverages	628,833	1,714	234,667	5
Hotels and Restaurants	777,537	7,247	211,257	141
Metal Products	476,045	2,663	200,577	22
Mining and Quarrying	1,016,865	99,065	169,162	458
Other Manufacturing	205,582	105	47,222	63
Petroleum, Chemical and Non-Metallic Mineral Products	1,363,878	5,119	532,774	4
Post and Telecommunications	836,964	741	306,151	7
Textiles and Wearing Apparel	131,175	704	54,872	135
Transport	731,332	665	266,167	52
Transport Equipment	699,045	2,180	272,529	12
Wood and Paper	426,097	1,770	176,108	19
Total (all sectors)	**26,532,650**	**179,446**	**8,759,349**	**14,862**

Source: Own computations using Eora database

Table 22: Non-exported output and standard deviation of 15 key sectors for Lesotho, 2000 and 2011

2011			**2000**	
Sector	Value (in $1000)	Standard deviation (in $1000)	Value (in $1000)	Standard deviation (in $1000)
Agriculture	170,660	2,851	35,617	191
Electrical and Machinery	328,269	6,915	102,207	344
Financial Intermediation and Business Activities	1,053,422	592	444,168	22
Fishing	17,352	211	2,180	531
Food & Beverages	211,462	2,449	62,134	206
Hotels and Restaurants	179,279	322	63,539	63
Metal Products	130,875	3,643	36,935	559
Mining and Quarrying	111,166	5,988	12,394	3,756
Other Manufacturing	57,897	263	16,017	286
Petroleum, Chemical and Non-Metallic Mineral Products	294,126	7,025	88,163	683
Post and Telecommunications	157,451	208	58,118	0
Textiles and Wearing Apparel	26,076	772	8,333	391
Transport	173,330	284	58,689	0
Transport Equipment	152,713	3,122	45,366	182
Wood and Paper	131,753	2,443	35,614	580
Total (all sectors)	**5,532,083**	**54,329**	**1,876,050**	**16,929**

Source: Own computations using Eora database

Table 23: Non-exported output and standard deviation of 15 key sectors for Namibia, 2000 and 2011

	2011		2000	
Sector	Value (in $1000)	Standard deviation (in $1000)	Value (in $1000)	Standard deviation (in $1000)
Agriculture	782,552	100,970	187,154	78
Electrical and Machinery	1,058,158	10,669	345,435	11
Financial Intermediation and Business Activities	4,698,246	7,761	1,548,393	2
Fishing	23,578	471	5,453	161
Food & Beverages	458,088	3,700	156,539	0
Hotels and Restaurants	753,301	17,679	214,359	3
Metal Products	342,036	5,558	122,712	18
Mining and Quarrying	743,865	175,197	120,141	76
Other Manufacturing	163,039	297	48,532	127
Petroleum, Chemical and Non-Metallic Mineral Products	836,127	10,796	287,976	2
Post and Telecommunications	835,131	40,803	242,667	0
Textiles and Wearing Apparel	89,628	1,297	34,701	160
Transport	779,543	30,113	238,494	1
Transport Equipment	467,252	4,768	150,500	81
Wood and Paper	380,157	3,667	121,817	65
Total (all sectors)	**21,838,240**	**578,107**	**6,484,898**	**12,582**

Source: Own computations using Eora database

Table 24: Non-exported output and standard deviation of 23 key sectors for South Africa, 2000 and 2011

	2011		2000	
Sector	Value (in $1000)	Standard deviation (in $1000)	Value (in $1000)	Standard deviation (in $1000)
Agricultural products	21,650,518	328	7,437,639	1,037
Beverages and tobacco products	12,445,538	27	4,262,259	484
Dairy products	2,961,020	20	1,018,344	698
Fruit and vegetables products	1,918,177	12	667,194	830
FSIM	11,598,011	624	3,728,123	2,445
Furniture	2,733,789	4	939,597	2,001
Gold and uranium ore products	2,820,449	40	935,523	2,239
Iron and steel products	7,838,554	210	2,751,794	1,346
Leather products	465,829	71	129,146	732
Meat products	8,053,766	68	2,757,444	634

Motor vehicles	19,069,797	82	6,099,955	745
Motor vehicles parts	4,960,422	71	1,686,151	926
Non-ferrous metals	3,435,876	136	1,273,067	1,342
Other business services	17,902,473	242	5,945,001	2,497
Other mining products	10,170,479	259	3,812,418	1,095
Paper products	3,422,100	116	1,138,586	872
Petroleum products	10,198,927	144	2,920,779	1,434
Plastic products	4,424,651	252	1,479,190	1,794
Radio and television products	3,189,169	28	1,079,260	523
Textile products	2,040,989	131	635,060	868
Transport services	34,676,479	144	11,483,357	1,280
Wearing apparel	3,673,105	2	1,261,429	1,957
Wood products	3,015,569	112	976,779	767
Total (all sectors)	**659,938,975**	**7,683**	**214,167,952**	**119,236**

Source: Own computations using Eora database

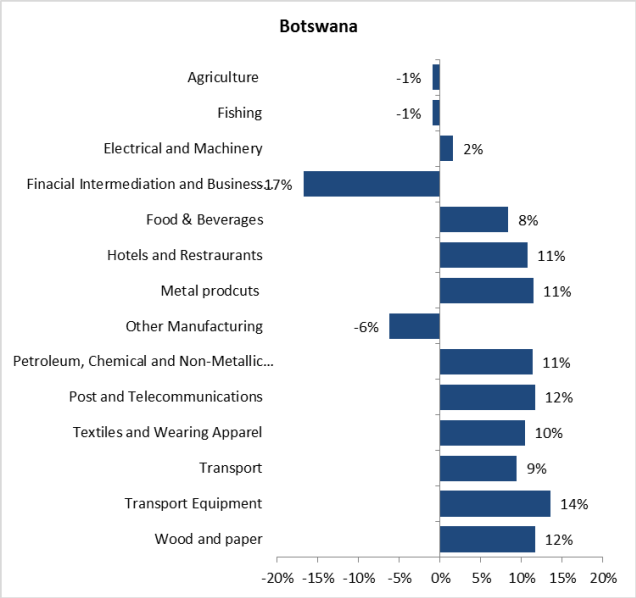
Table 25: Non-exported output and standard deviation of 15 key sectors for Swaziland, 2000 and 2011

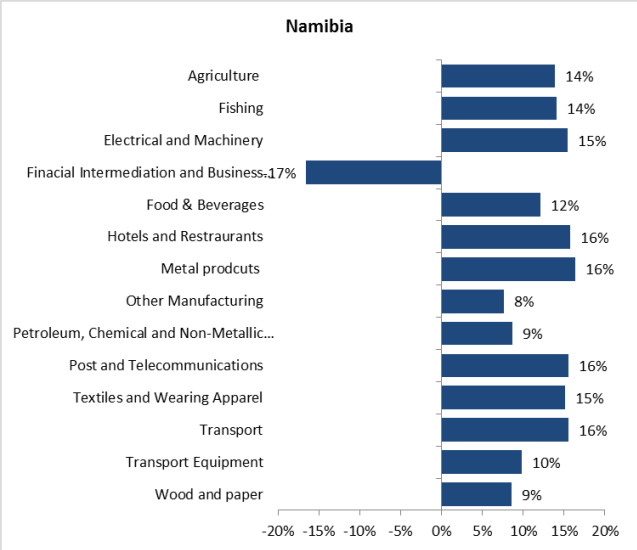
	2011		**2000**	
Sector	Value (in $1000)	Standard deviation (in $1000)	Value (in	Standard deviation (in $1000)
Agriculture	192,194	53,592	51,421	41,878
Electrical and Machinery	392,319	228,382	147,627	173,158
Financial Intermediation and Business Activities	1,874,520	1,007,495	759,029	738,247
Fishing	13,651	1,486	2,734	1,468
Food & Beverages	242,711	85,074	80,651	65,776
Hotels and Restaurants	267,420	6,870	100,527	5,717
Metal Products	155,291	120,112	61,008	92,320
Mining and Quarrying	106,815	7,335	31,937	6,139
Other Manufacturing	65,290	5,654	22,159	4,823
Petroleum, Chemical and Non-Metallic Mineral Products	472,864	229,321	161,275	173,757
Post and Telecommunications	267,443	90,012	103,364	69,520
Textiles and Wearing Apparel	43,261	29,318	14,830	23,373
Transport	322,730	67,656	126,048	52,527
Transport Equipment	217,904	106,899	79,748	82,321
Wood and Paper	157,423	79,804	37,817	61,909
Total (all sectors)	**7,539,815**	**2,288,715**	**2,865,782**	**1,727,781**

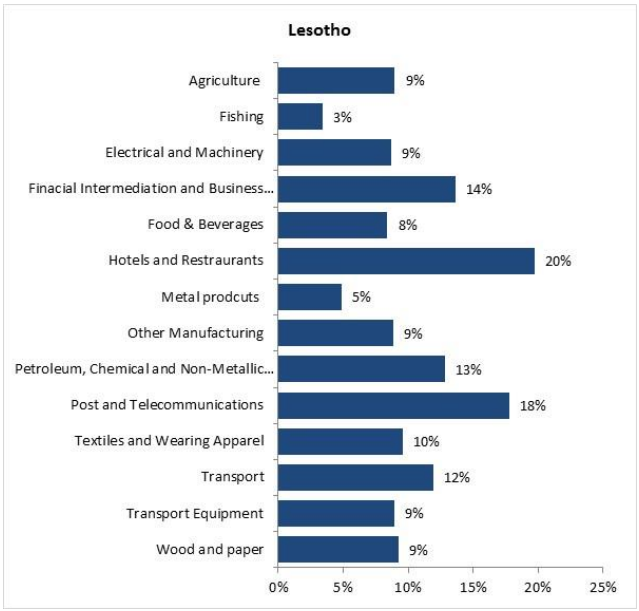
Source: Own computations using Eora database

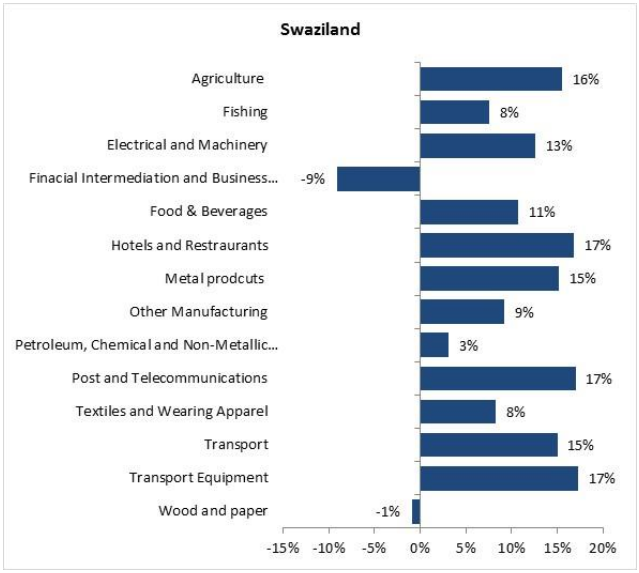
Appendix 5: Growth of DVA embodied in gross exports, by sector

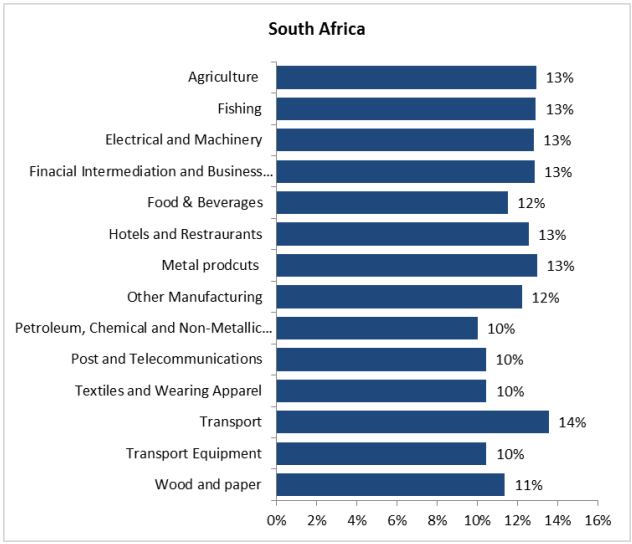
Figure 24: Compound annual growth rate of DVA embodied in gross exports by sector, 2000-2011







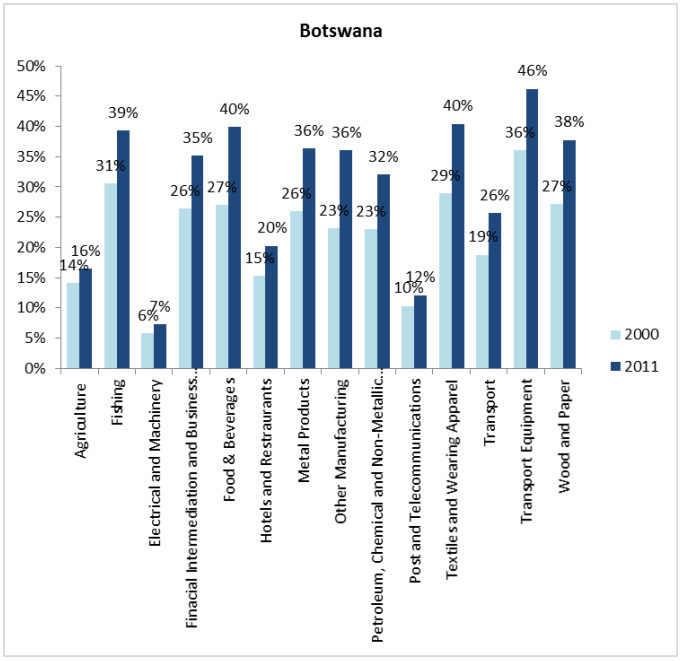


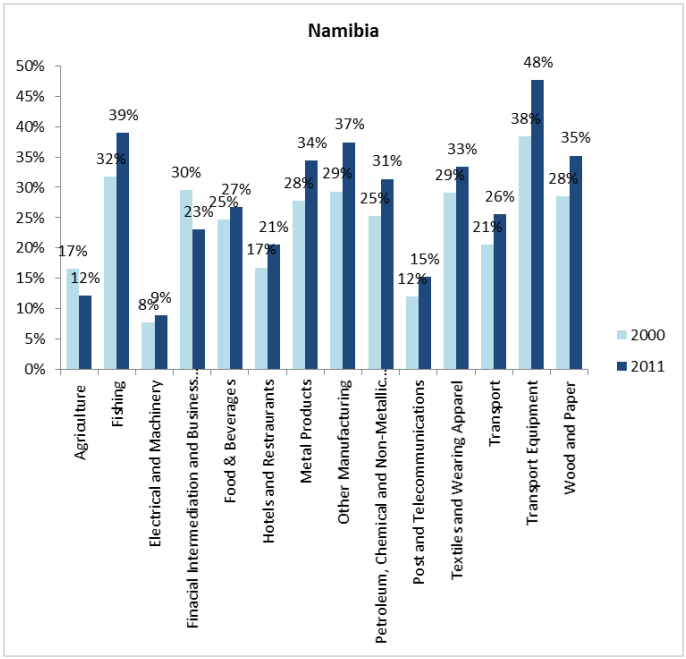


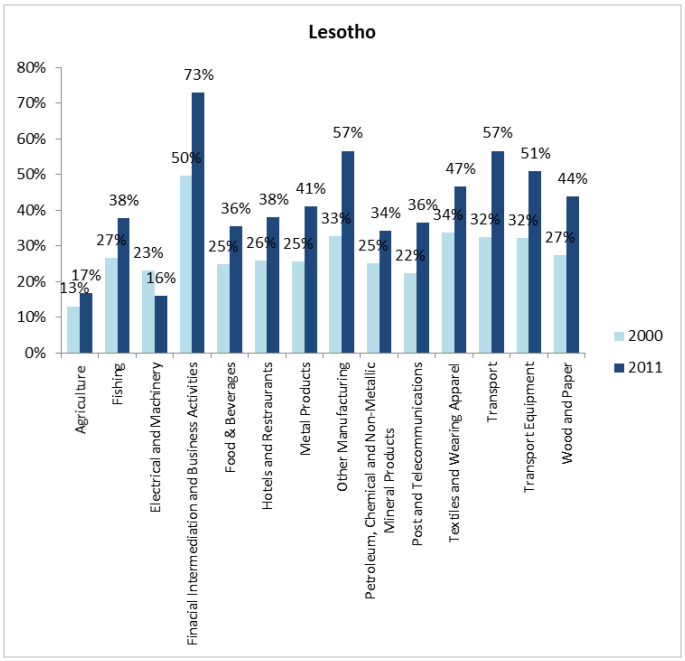
Source: Own computations using Eora database

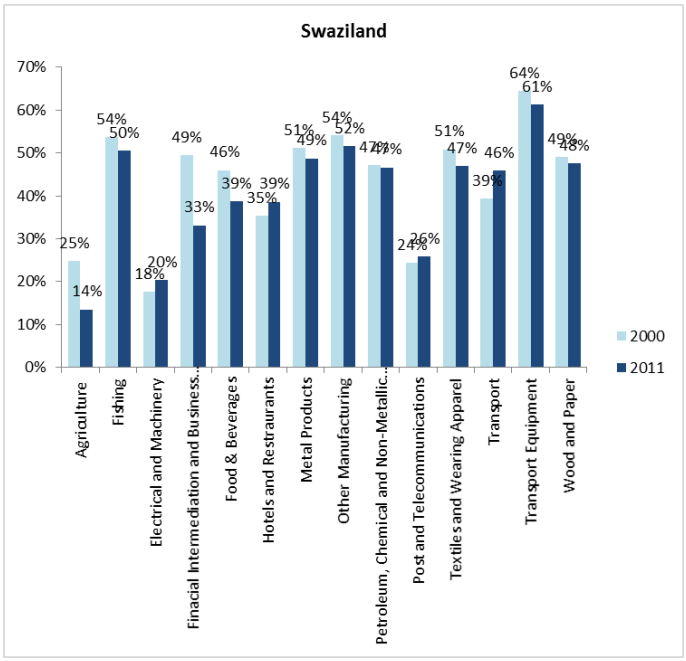
Appendix 6: FVA in exports as a share of gross exports, by sector

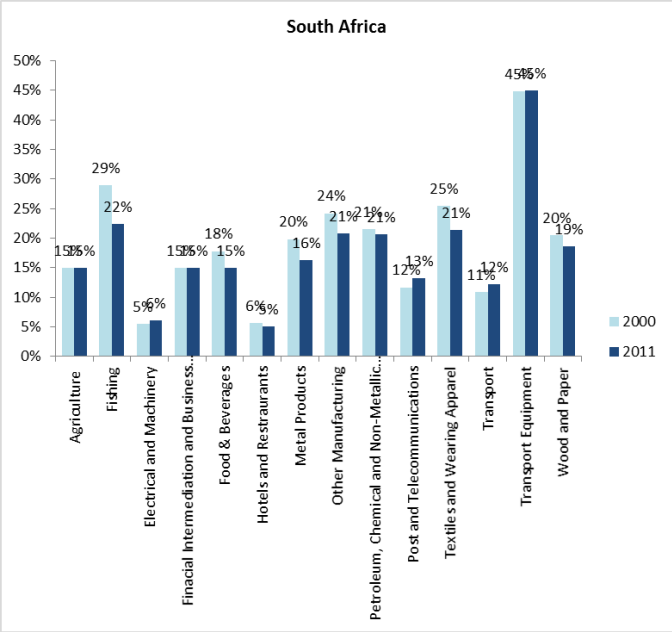
Figure 25: Foreign value added in exports by sector, 2000 and 2011






Lesotho
80%
70%
60%
50%
40%
30%
20%
10%
0%
13%
17%
27%
38%
23%
16%
50%
73%
25%
36%
26%
38%
25%
41%
33%
57%
25%
34%
22%
36%
34%
47%
32%
57%
32%
51%
27%
44%
Agriculture
Fishing
Electrical and Machinery
Finacial Intermediation and Business Activities
Food & Beverages
Hotels and Restraurants
Metal Products
Other Manufacturing
Petroleum, Chemical and Non-Metallic Mineral Products
Post and Telecommunications
Textiles and Wearing Apparel
Transport
Transport Equipment
Wood and Paper
2000
2011

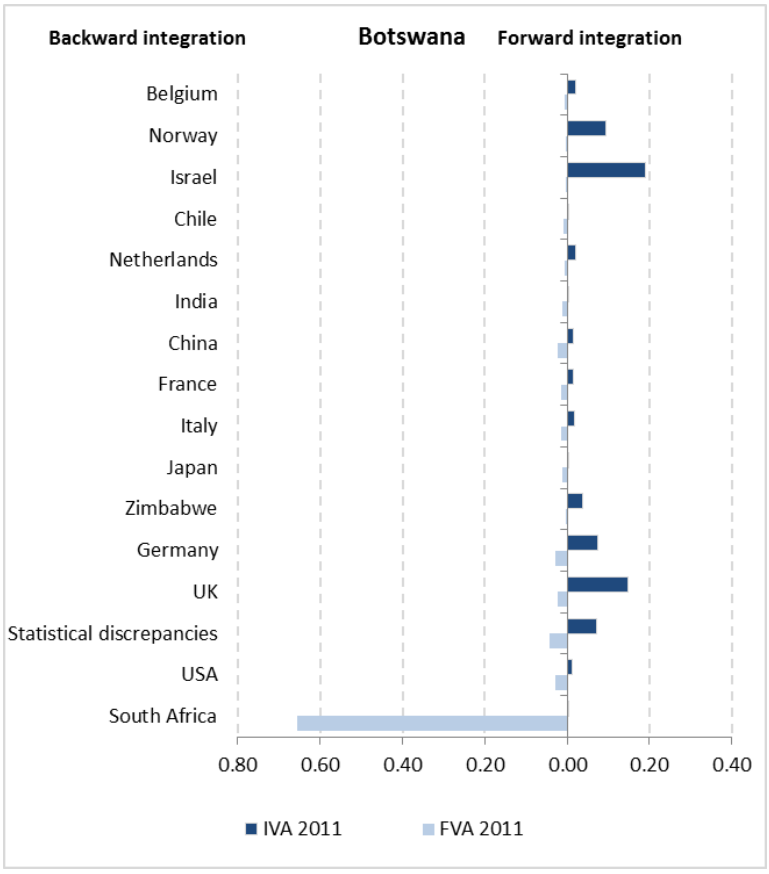

Swaziland
70%
60%
50%
40%
30%
20%
10%
0%
25%
14%
54%
50%
18%
20%
49%
33%
46%
39%
35%
39%
51%
49%
54%
52%
47%
47%
24%
26%
51%
47%
39%
46%
64%
61%
49%
48%
Agriculture
Fishing
Electrical and Machinery
Finacial Intermediation and Business...
Food & Beverages
Hotels and Restraurants
Metal Products
Other Manufacturing
Petroleum, Chemical and Non-Metallic...
Post and Telecommunications
Textiles and Wearing Apparel
Transport
Transport Equipment
Wood and Paper
2000
2011

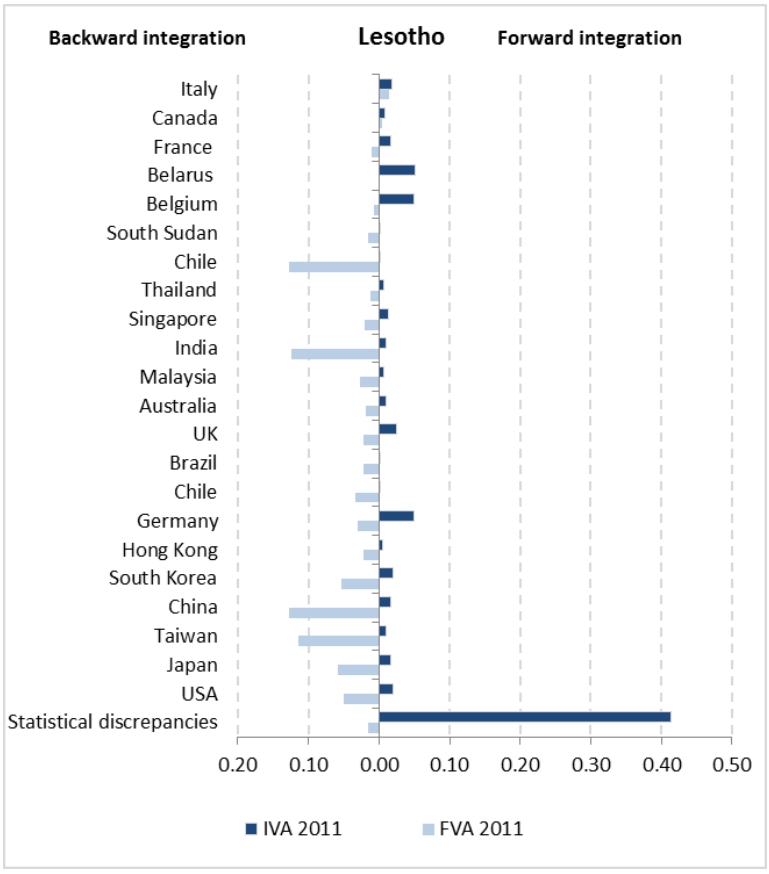


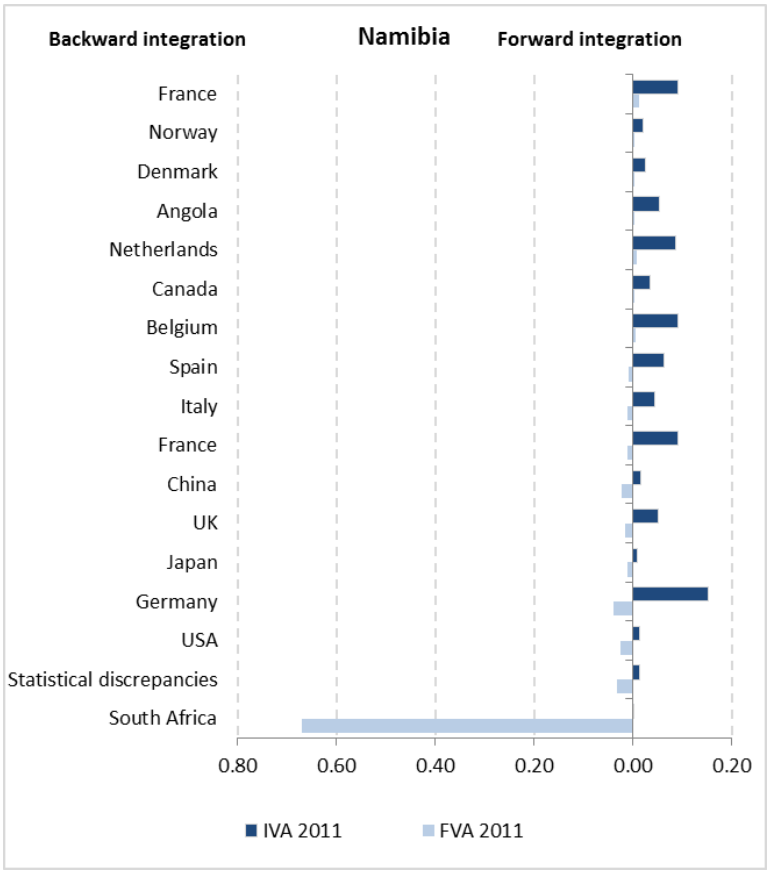
Source: Own computations using Eora database

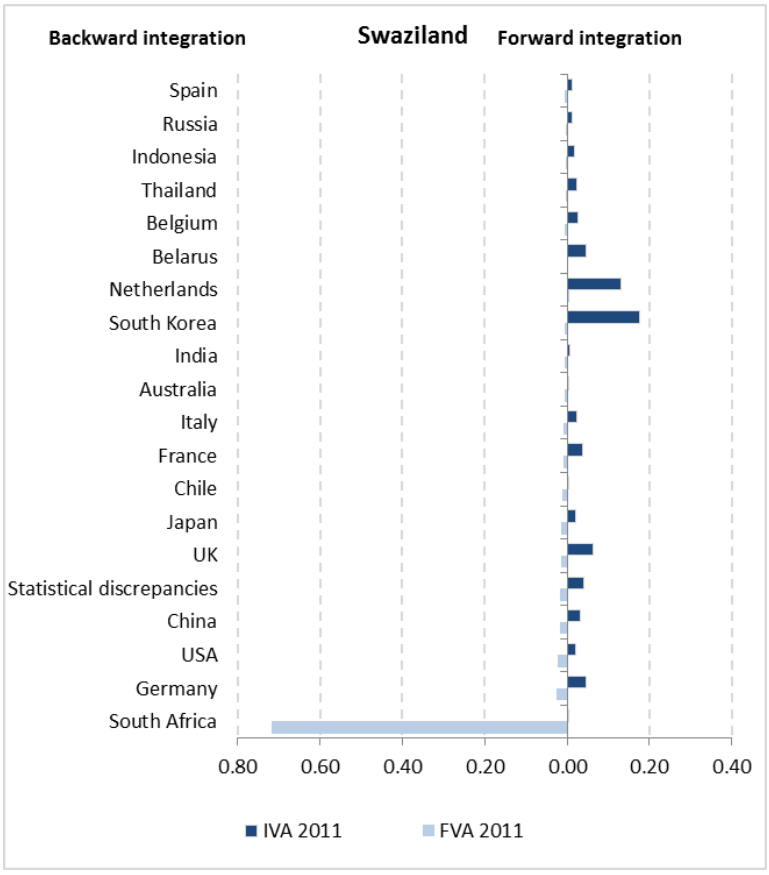
Appendix 7: Forward and backward integration by partner country

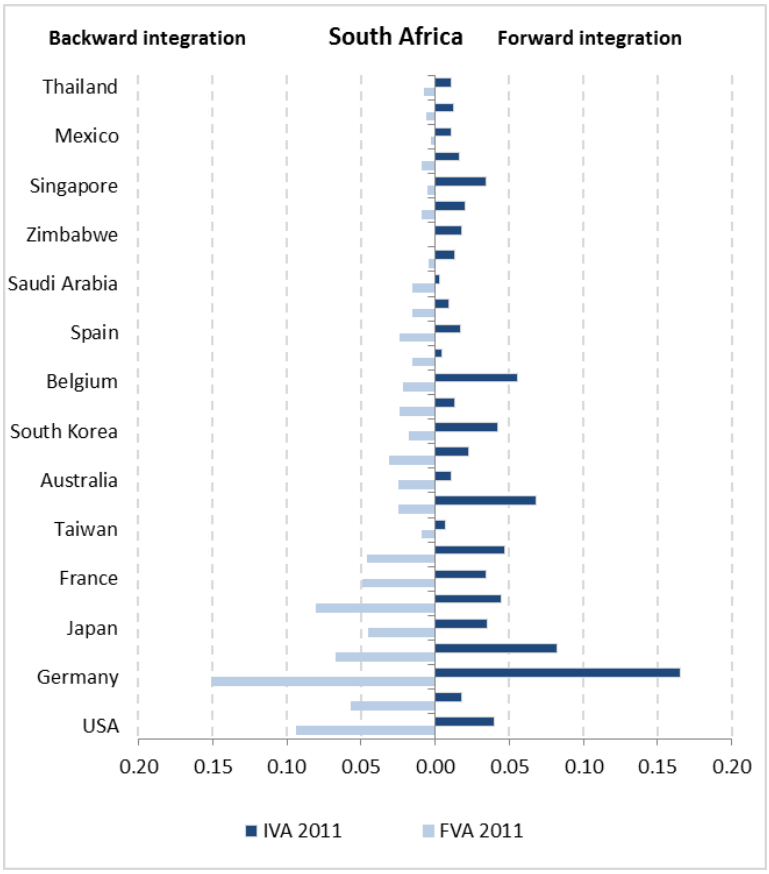
Figure 26: Foreign and indirect value added in exports by source and destination, 2011






Backward integration
Namibia
Forward integration
France
Norway
Denmark
Angola
Netherlands
Canada
Belgium
Spain
Italy
France
China
UK
Japan
Germany
USA
Statistical discrepancies
South Africa
0.80
0.60
0.40
0.20
0.00
0.20
IVA 2011
FVA 2011


Backward integration
Swaziland
Forward integration
Spain
Russia
Indonesia
Thailand
Belgium
Belarus
Netherlands
South Korea
India
Australia
Italy
France
Chile
Japan
UK
Statistical discrepancies
China
USA
Germany
South Africa
0.80
0.60
0.40
0.20
0.00
0.20
0.40
IVA 2011
FVA 2011



Source: Own computations using Eora database