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ABSTRACT

This paper documents the importance of trade in services for global value chain participation in the ASEAN region. Using newly created data on GVCs as well as a new database on the services trade restrictiveness index to connect international trade policies in services to participation in GVCs, we show that restrictions on trade in services are detrimental for backward participation in GVCs and that such restrictions are harmful to ASEAN members when compared to other countries in the data set. Also, we show that services trade restrictions are especially detrimental to ASEAN countries when such backward integration is connected to forward participation, hence, central positions in GVCs. Restrictions on trade in services slow down the upgrading of value chain positions, which calls for policy actions to follow up trade liberalization in industrial products with a new round of lower restrictions on services trade.

Introduction

According to the OECD (2020), seventy per cent of world trade involves a variety of transactions for intermediate goods and services organized in Global Value Chains (GVCs) that operate across countries. These activities take place before the creation of final products. The Asian economies have for some time been significant contributors to the extent of activity in GVCs: ESCAP (2015) estimated that in 2013 the Asia Pacific region accounted for about 45 percent of final goods associated with value chains and 43 percent of GVC related intermediate products. This central role for the Asia Pacific region was promoted by the admission of China to the WTO and the construction of Factory Asia (Subramaniam and Ng 2014): this involved 'the model of regional production networks connecting factories in different Asian economies; producing parts and components that are then assembled, with the final product shipped mainly to advanced economies' (p. 5), including those outside Asia.

The OECD assessment (2020, Figure 2) is that GVC activity reached a peak in 2008 as well as a plateau: the level of GVC activity now is only a little below that in 2005. These assessments refer to goods products. However, the nature of GVCs in manufactured products is changing. Services inputs have become essential elements of good production processes (one-third of total value added in manufactured exports (OECD, 2020, Figure 4). Furthermore, services provide necessary facilitation for the operation of GVCs through communications, logistics, financial services etc. Poor performance in services may be linked to policies restricting trade in services and more competitive services markets, thus impeding GVC performance. They are the 'key to competitiveness' (OECD, 2020, p. 4). Conversely, services liberalization can contribute to better performance in goods GVCs and the acceleration of GVC activities in services themselves.

GVCs are defined as the series of stages in producing a good or a service that is sold to a final consumer: each stage adds value, and at least two stages are in different countries (Antras 2020 and World Bank 2020). Participation in GVCs can be defined at the firm level and the country level. A firm involved in at least one stage is a participant. A country's participation is the aggregation of that of its firms. In this paper, we concentrate on the assessment and measurement of participation at the country level. The development consequences of country-level participation in GVCs are considerable. Antras (2020) identifies the growth in income from a finer international division of labour and the gains from trade. He also observes that by lowering input costs and expanding scale, GVC participation tends to raise productivity at the firm level. GVCs also facilitate the transfer of technology and usually involve foreign direct investment flows, adding to the participating economies' capital stock. By breaking up the production process, it can be easier to industrialize through entry via GVCs, creating employment opportunities offering higher labour productivity and higher wages. However, there are qualifications. Those winning these jobs might also be the higher-skilled, leading to greater wage inequality within host economies (see, e.g. Lee and Yi 2018). Another consideration is whether the GVCs become more intense 'shock transmitters' between economies (see, e.g. Lee 2019).

Our interest in this paper is the drivers of participation in GVCs because it links to growth and development. The literature has identified several factors that shape participation, including the size of markets (related to past economic growth), technological change and reductions in the cost of organizing and managing transactions within GVCs. As noted above, however, services are the key to an economy's competitiveness in GVCs. Our interest, therefore, is the role of service activities that support GVCs and how policies affecting the production of and trade in services in various countries affect their participation. The discussion of the role of services in GVCs has a long history in the economics literature, but it is timely to revisit the topic, prompted by the release of new data sets relevant to the characterization of both GVCs and services trade policy.

Restrictions on services imports may squeeze certain activities of manufacturing firms that participate in GVCs. Foreign service partners may play a crucial role in the productivity of domestic firms. New data sets have been created which measure the degree of restrictiveness of policies on these various forms of international commerce

in services. We expect to see consequences of restrictions on international trade in services in terms of GVC participation, which we measure in a couple of ways. We hypothesize that 'backward linkages' (which involve imports in the export sector) to be affected most by restrictions on services trade. 'Forward linkages' (domestic producers who create value-added in exports used in exports by other countries) may also be affected by restrictions in services trade, but probably indirectly. For example, domestic value-adding activities may be less efficient because of the lack of connections to foreign service providers. These measurements have also been facilitated by work on new data sets related to the movement of goods across international borders within GVCs.

To empirically analyze the relationship between trade in services, restrictions on those trade flows, and participation in GVCs, we combine several newly created sets of data on GVC's and STRIs. To start, we use the dataset provided by the World Bank accompanying the World Development Report in 2020 that focused exclusively on the importance of GVCs for development. This dataset differentiates GVCs in backward participation and forward participation; in the data method section, we provide more details on how these are used. We combined the data on GVCs with a new dataset on trade restrictions on services beyond the more traditional indicators for developed countries and included, therefore, many observations for the Asia-Pacific region.

Hence, we concentrate here on the experience of the ASEAN economies. After reviewing the emerging literature in this field, we use these data to document the growing importance of value chain participation for countries in the Asia region and connect those to trade restrictions in services. We show that ASEAN economies have focused so far on liberalizing trade in goods (reducing tariffs and non-tariff barriers) but have fallen behind in liberalizing trade in services. However, looking at individual countries, there are significant differences in services trade liberalization, which are connected to the level of development and the importance of services in the economy in general and specifically in the exporting sector. Applying data from a global panel, we show that restrictions on trade in services have a substantial adverse effect on participation in GVCs, especially in backward participation. We also show that restrictions on trade in services hamper forward participation in value chains, and therefore constrain upgrading in value chains.

The analysis makes several contributions to the literature. We find that not only is trade in services hampered by restrictions on those services, but also there is a spill-over effect on participation in GVCs. Using the connection between backward and forward participation, we find a complex interaction between restrictions on trade in services, services imports, foreign firms' participation in the domestic service economy, and the ability to capture value in global business. The policy contribution is the observation that, for the next round of regional trade liberalisation, policymakers will benefit from a sharper focus on lowering the barrier to trade in services, to complement their efforts to consolidate the benefits of low trade restrictions in manufacturing.

The following section reviews the options for measuring GVC participation and discusses the role of services in GVCs. In this section, we also revisit some earlier

discussion of the drivers of GVC participation. The next section introduces the new measures of services trade policy and those of GVC participation and provides some summary statistics of both and their relationship. An econometric analysis of the relationship then follows. Conclusions are reported at the end.

Conceptual and contextual background

The organisation of this section is as follows. As in the empirical part of the paper, we will evaluate how restrictions on trade in services affect participation in GVCs. We will start in this section by discussing what we know about participation in GVCs. After that, we provide information on trade restrictions in services and new areas of analysis in this field. Lastly, we offer a link to the empirical part of the paper by discussing what we already know about the connection between restrictions on trade in services and how this affects participation in GVCs.

How to measure GVC participation

GVC participation can be measured in various ways, reviewed by Pomfret and Sourdin (2018). One is via studies of particular products, and examples quoted often relate to Apple's GVC in producing the iPhone (see, e.g. Grimes and Sun 2016). The second approach to measurement is to use trade data. Pomfret and Sourdin (2018) apply two measures - the share of parts and components in trade and the extent to which countries' trade flows are in sectors commonly associated with GVCs. The World Bank (2020, Figure 1.10) points out that industries with high and rising GVC participation include metals, chemicals, electrical equipment and transport equipment. Clothing and textiles show a high participation rate that has changed little since the 1980s, while food and agriculture shows a low rate. Based on these measures, for goods, Pomfret and Sourdin (2018) conclude for Asia that GVC participation is concentrated in China, as well as Hong Kong, Taiwan, South Korea, Thailand and Malaysia as well as Japan. Viet Nam participation (in their data which goes to 2012) was increasing in their assessment. They found limited participation in Indonesia and the Philippines and minor participation in other ASEAN Members. Athukorala (2019) presents data-based trade indicators of involvement in GVCs (which he refers to as global production networks (GPN)).

A third method to assess GVC participation is to link input-output tables to identify the origins of the value-added, which is accumulated in a product. In the context of value chains, the value of gross exports is the summation of all value-added components embodied in all goods and services. We can then divide this value-added split between value-added provided by domestic firms (including foreign investors) and value-added supplied by foreign firms. The latter is often referred to as backward linkages when those foreign inputs are used to export goods and services. These backward linkages, which are imported goods and services from abroad used in the country's exported goods and services, are essential to GVCs.

Another component of output related to GVCs is value-added produced by domestic producers embodied in goods and services exported to other countries and are in

those countries used as inputs for exported goods and services. These are defined as forward linkages in most of the literature. It is already relatively straightforward to infer from this definition that forward links refer to activities that are potentially higher up in the value chain. It includes domestic production used in the export of other countries, potentially adding extra steps in the value chain compared to backward participation. However, there is no 'black and white' division because value-added in backward participation is also used in the exports of other countries (Antràs et al. 2012). There is, therefore, an ongoing discussion whether forward participation is linked more to upstream activities, which create a higher value-added and are therefore more 'desirable' from a policy perspective. The case may be made for firms in technology-intensive sectors. There is a connection between technology frontier countries like the United States and its positioning in upstream value chains. However, in a cross-country setting, such statements may be misleading because natural resource producers and agricultural sectors can be considered upstream in several value chains. Such segments are often not regarded as desirable from a value-added perspective.

Hence, the total value chain trade (production that takes two or more country locations so that trade involves at least three countries) is the summation of backward linkages (value-added supplied by foreign producers and embodied in exports) and forward linkages (value-added produced by domestic suppliers that are embodied in goods and services that are later used in other countries for exports in goods and services) (WTO n.d.). Our focus in this paper is upon these measures of participation.

Services and GVCs

Services play a direct role in facilitating the operation of GVCs. The nature of their provision thereby affects the costs of undertaking the chain activities. The role of services in breaking up what otherwise would be a vertically integrated production process was examined, in a series of papers from the 1990s, by Jones and Kierzkowksi (for more recent summaries of their work, see Jones and Kierzkowski (2005a and 2005b)). They explain that production involves a series of blocks that can be located in different countries. The incentive to do so is related to the factor intensities engaged in each block's production activity and the relative factor prices in each location. But then extra costs are incurred (transport, finance, communication, coordination). Fragmentation occurs when 'production cost per se drastically falls (by doing so), and the cost-of-service links for connecting production blocks is low enough' (Kimura 2006, pp. 335-6).

Jones and Kierzkowski (2005a and 2005b) considered the dynamic elements of the process of fragmentation. They discussed a case in which there were constant returns to scale in the production blocks but in which there were increasing returns to scale in the service links. They argued that the latter was plausible because of the nature of the service production process. In that case, as demand increased, the incentive to fragment also increased. So, the scale of demand was one driver of the process. Jones and Kierzkowski (2005a and 2005b) also noted that over time the costs of the service links had fallen as productivity In their provision increased. Technological change in

the service sector is, therefore, another driver. Jones, Kierzkowski, and Chen (2005) find empirical support for both the size of the market in a region (measured by its GDP) and the cost of services links (measured by business telephone charges) in explaining their indicator of fragmentation at the regional level, which is the extent of parts and components trade. Taguchi and Lar (2021) shows that logistics performance (an indicator of the quality-of-service links) affects the foreign value added in exports, focussing on the ASEAN economies.

Specific circumstances also matter as a driver of the growth of fragmentation, and thereby the organisation of production in GVCs. For example, Pomfret and Sourdin (2018) observe that until the late 1980s, value chain trade did not account for a large proportion of global trade. Factors that helped change strategy in the mid-1980s were the yen's appreciation, leading Japanese firms to find new sources of competitiveness by offshoring labour intensive steps. Integration in Europe and NAFTA also led to finer degrees of international specialisation.

Among drivers of reductions in service links costs, Jones and Kierzkowski (2005b) also mention 'deregulation of service activities both nationally and between countries' (p. 4). This is the driver on which we focus in this paper, particularly policy change that affects trade in services between countries; we further discuss these policy changes in the next section. The World Bank (2020) discusses the significance of service links in the context of whether economies that are not central in geographic terms can offset their disadvantage and participate in GVCs. The Bank stresses the importance of all the elements of connectivity costs, including transport, other logistics services and the fees of passing through official processes at national borders, including the time involved and the degree of uncertainty involved. Connectivity also includes communication, the costs related to the provision of infrastructure and the processes of competition in the markets for services. Internet coverage is an essential component of communications in the GVC context.

Services are linked to GVCs in another way, not just via service links. Services are an important component of value-added which is embodied in goods. The embodiment of services in goods production, and exported in that form, is one example of a broader set of linkages between manufacturing and services, referred to as servicification (Miroudot 2019). Manufacturing firms also sell bundles of goods and services in domestic and foreign markets, referred to as services being 'embedded' with goods (Lodefalk 2017). Hybrid offerings of manufacturing products and services strengthen firms' competitiveness by diversification (Lodefalk 2014).[1]

Patterns of trade in GVCs in goods and services

GVCs operate in a number of different patterns or shapes. The traditional treatment of value chains in goods and their measurement in terms of forward and backward linkages implies the value chain is a linear process, with value-adding at each step. Other shapes are possible (see Baldwin and Venables (2013) and Miroudot and Cadestin (2017)). For example, parts come together to form a final product, which is often combined with contributions from linear processes. Baldwin and Venables (2013) stress the coordination challenges involved in this design compared to the linear model.

There are GVCs in services as well as goods. The use of back-office services by other services firms and goods producers is an example (Simangunson, Anas and Findlay (2019) discuss the drivers and outcomes of offshoring of accounting services). The framework to explain this process in services is the same as that applied to goods, a combination of the benefits of the costs of breaking up production into blocks compared to the cost of the service links between them. The services provided in the links between goods production blocks may be the consequence of GVCs in services.

As in the case of goods, the shape of value chains in services may differ (Miroudot 2019). One option is that value is created by linking customers, e.g., in insurance and banking, or when a group of airlines or large machinery managers share spare parts, even as competitors in other markets. This is referred to as a value network. A value shop is created where consumer problems are solved, for example, in the application of medical services, consultancy (specialists in different locations), or engineering services. Value shops involve higher degrees of tailoring and personalisation. Relevant knowledge may also be scattered and brought together to solve problems, as occurs in large consulting firms. Value shops may be rising in importance (Miroudot and Cadestin 2017). All these formats may also exist together, for example, in motor vehicle production, which involves chains in vehicle production, shops in vehicle design and networks in distribution and finance.

What else drives participation of countries in GVCs?

In this part, we add further comments on which economies might be active participants in GVCs. The discussion so far indicates that drivers of advantage are the costs of links to and from an economy, and its relative factor prices, and thereby its complementarity with trading partners. However, there is in the more recent literature an argument about another layer of drivers of participation.

The development of GVCs involves more than just the finer international division of labour (Antras 2020). This is because the transactions involved in GVCs are not like the arms-length, or 'one shot', transactions observed in other trades. Instead, they include products that are highly different and specific to the transaction. Also, the transaction is often repeated. There will be contracts associated with these transactions, but the contracts are often not complete because of the complexity of the transaction. Firms will have made highly specific investments, often in partnership with foreign investors. The parties are tied together in this way. These features are important for both goods and services value chains.

These features have important implications for participation in GVCs. Antras (2020) stresses the contribution of institutional quality and political stability to success in admission to a GVC. This is because, as noted above, GVCs involve investments that are specific to a relationship (as processes are customised to suit the preceding and subsequent stages), and involve flows of data and technology, including intellectual property, the ownership of which has to be secured. Sometimes but not always, contracts can be written to resolve these issues. Still, otherwise, the transaction relies on the development of trust because of and reinforced by a series of repeated transactions. Vertical integration, created by foreign direct investment, is

another part of the solution to these challenges. Trade agreements, which are sufficiently deep to deal with regulatory issues that operate 'behind the border', can also contribute. The World Bank (2020, chapter 2) finds a relationship in the data between indicators of institutional quality and participation in GVCs. Indeed, the drivers of participation in GVCs are, in the framework applied here, similar to those that drive the growth of services in an economy, given the specificity of the transactions which are associated with services production.

Conditions that lower the costs of connectivity, which facilitates the movement of goods into and out of the country, also matter, as does proximity to component suppliers in China, Korea and Japan; we discuss the contribution of connectivity to participation in GVCs in more detail in the next section. There are other drivers of GVC participation, in addition to institutional quality and connectivity. These are reviewed by Fernandes, Kee, and Winkler (2020) and include factor endowments, geography, policy on trade and foreign direct investment, industrial capacity, and macroeconomic factors. We consider these variables again in the discussion of our empirical strategy. Our focus here, however, is on the role of services in GVCs.

Trade in services and trade restrictions

In recent years there has been much progress in documenting the restrictiveness of policies regarding the international delivery of services. Broadly, these policies can be divided into those which affect entry into an international market and those which affect its operations there. Various policies are relevant for different types of services (for example, licensing systems or quotas on foreign providers which affect entry, or mandated forms of business structure that affect operations). Methodologies have been developed to list and measure the character of the range of policies relevant to a specific sector in terms of their restrictiveness (see, for example, Dee (2013)) across various delivery modes. These are based on a form of qualitative research, in which barriers to trade in services are assessed and scored accordingly and then combined into an index for each economy. They refer to policies that affect the conditions of entry of foreign suppliers into markets for services and to the requirements of operations once established.

In 2008 the World Bank compiled an extensive services trade restrictiveness index (STRI) to measure the level of restrictiveness across countries. Since 2012, the OECD has created a services trade restrictiveness index (Geloso Grosso et al. 2015), and recently the World Bank and OECD work together with the WTO in creating an updated version of the 2008 World Bank index for the year 2016 (Borchert et al. 2019). Services trade restrictiveness index levels can be compared before the financial crisis in 2008 and about a decade later to see to what extent services have been liberalised. For this analysis, we use the World Bank restrictiveness index, although the results are robust for using the OECD index. In the next section, we report data on the index values for economies of interest and its correlation with GVC participation.

GVC Participation and STRIs. Here we make use of the two data sources: the recent release of the World Development Report 2020 (WDR), which as a companion

Table 1. Participation in GVCs and trade policy indicators for various country groups.

Group	GVC share exports	of which Forward	STRI	Tariff
ASEAN	53.2%	36.2%	52	2.9%
Asia (non-ASEAN)	41.6%	50.9%	48	6.1%
Latin America	34.2%	45.4%	42	5.3%
OECD	57.9%	36.6%	44	1.6%
Other	42.2%	61.0%	50	6.3%

Sources: World Development Report data companion, World Bank STRI dataset.
Note: the GVC share of exports are backward and forward participation in GVC as a share in total exports of trade. The column of which forward is the share of forward participation in GVCs in total participation in GVCs. STRI scores range from zero to 100, and higher scores indicate a higher degree of restrictiveness. Tariff refers to the trade-weighted most-favoured-nation tariffs.

dataset on participation in GVCs for a large number of countries and a substantial number of years; the new World Bank dataset on trade restrictions in services (STRI), that updates the 2008 database to include restrictions for 2016. Concerning the GVC dataset, we make use of the EORA-UNCTAD Global Supply Chain Database (EORA)[2] input in the WDR, which includes many more countries, including many emerging markets and developing countries, in contrast to the World Input-Output Database (WIOD), that focuses on OECD and large emerging markets. In EORA, countries in Latin America have moved towards liberalisation of trade in services quite substantially between 2000 and 2010, and therefore provide a natural comparison group regarding GVC participation to countries in Asia. Nearly all countries in Asia and Latin America are included in the updated version of the trade restrictions data of 2016. Starting with the WDR data from EORA and then complimenting it with the other datasets is the most logical empirical strategy.

Combining the WDR data on participation in GVCs and the dataset on services trade restrictions results in some stylised facts across countries and country groups presented in Table 1.

When we compare the ASEAN countries to other groups, Column 1 clarifies that the ASEAN members have relatively high participation levels in GVCs, only topped by OECD countries not belonging to other groups of emerging markets (a group including mainly European countries and the US and Canada). The importance of global value participation for ASEAN members is evident by comparing it to other countries in Asia (including China and India) and peer middle-income countries in Latin America. The residual group of 'Other' countries consists of countries in Africa and oil-producing countries, which participate in GVCs by exporting natural resources. In the second Column, we observe that forward participation (exporting goods used in exports of other countries) is relatively low in all groups (the residual of the forward participation percentage is the backward measure). It is interesting to observe that the degree of forward (and backward) participation of ASEAN members is very close to OECD members not included in other groups. In contrast, forward participation is substantially higher for other countries in Asia, of which Japan and Korea, large exporters of manufacturing intermediates to be used in exports of other countries dominates. The share of forward participation for natural resource exporters is much higher, which lifts that share for 'Other' countries.

To summarise, concerning the first two columns in Table 1, participation in GVCs is very important for ASEAN countries' trade and participation, mainly through

Table 2. The importance of services in the economy and foreign supply.

	Services/ DVA	Foreign	ASEAN	Asia	China
ASEAN	48.3%	33.0%	1.4%	3.5%	1.8%
Asia (non-ASEAN)	53.1%	21.8%	0.8%	1.9%	1.2%
Latin America	55.7%	16.9%	0.1%	0.6%	0.8%
OECD	59.6%	28.2%	0.3%	0.8%	0.6%
Other	52.2%	21.5%	0.2%	0.6%	0.8%

Source: WIOD 2018. Note: China is not here included in Asia (non-ASEAN). Foreign, ASEAN, Asia, and China in columns refer to the share of that region is contributing to services in domestic value-added.

including foreign inputs in exporting. Hence, restrictions on foreign inputs of services may be quite important for the efficiency of GVCs participation in the ASEAN region. The relatively low forward participation of ASEAN may signal concern about a failure to capture value in global trade, to which high restrictions on services inputs may contribute.

Columns 3 and 4 in Table 1 show trade restrictions on services and goods. When comparing ASEAN countries to peer countries in Latin America, it is striking that the position in trade restriction on goods and services is the opposite. Whereas ASEAN countries have relatively high levels of restrictions on services, compared to their peers, it has relatively low restrictions on trade in goods: only OECD countries not included in other groups have lower average tariffs. The contrast with Latin American countries is striking. Whereas it is often observed that countries in Asia have not moved much in terms of services trade restrictions, it is important to note that they have moved quite far in liberalising trade in goods, primarily through free trade agreements. Stated differently, whereas countries in the ASEAN region have progressed rapidly in liberalising trade in goods to streamline supply chains in manufactured products, they are behind in liberalising trade in services. When building up services becomes more important in supporting effective GVCs, liberalising trade in services may be the important next policy priority.

To consider the relation between services trade and participation in GVCs, Table 2 documents the importance of services in the economy for the various groups of countries, and it sheds some light on the relative importance of several country groupings in cross-group trade. As a global trend, the importance of services in domestic value-added has increased over time, and according to the data in Column 1, this is the case for many countries where the share of services is above 50%. The ASEAN countries are the only exception, where the share of services in the economy is lower, pointing to the fact that many of these countries are considered at the heart of the 'manufacturing factory of the world'. According to Column 2, many groups have a high share of foreign firms providing services as part of domestic value-added, especially the ASEAN economies.

Combining this finding with the results in Table 1 clarifies that the relatively strong focus on backward participation in the GVCs is not restricted to the imports of manufactured products in foreign countries but extends to the inclusion of foreign services in value chains. The use of foreign inputs in ASEAN countries compared to OECD countries not included in other groups illustrates this point. However, many European countries in that latter group benefit from an integrated internal market

Table 3. Services and GVC participation for individual countries.

	GVC	Services/DVA	Foreign share	STRI
China	38.2%	49.2%	12.6%	59.0
Hong Kong	74.5%	60.5%	35.0%	34.6
India	37.0%	48.5%	20.7%	63.8
Indonesia	40.5%	43.7%	19.2%	56.8
Japan	38.4%	54.1%	13.5%	34.1
Korea, Rep.	53.6%	53.3%	27.1%	43.1
Malaysia	58.3%	48.0%	36.6%	52.1
Philippines	52.0%	44.6%	23.2%	62.7
Singapore	70.1%	60.8%	41.3%	39.3
Thailand	44.5%	46.2%	33.3%	53.5
Viet Nam	53.7%	46.2%	44.5%	46.5

Source: World Bank 2020 data companion, World Bank STRI dataset. Foreign share refers to the share of foreign firms value-added in total services value-added.

and so we can expect a high level of foreign participation. When we consider the European Union as an individual country, the results will be substantially different, and the foreign share of services in ASEAN will stand out even more.

Despite the high share of foreign inputs in services for ASEAN countries, the intraregional inputs are very low (the last three columns of Table 2 show components of the second Column). Although Singapore in the ASEAN region is an important services hub, in general, ASEAN countries play a limited role both within their country grouping and in Asia as large in exporting services to other countries. The services input in the ASEAN region may not only be concentrated in sourcing from the United States and the EU but also extend to regional trading partners like Australia and, to a lesser extent New Zealand, which are included in the 'OECD' heading. Lastly, it is interesting to note that inputs from Chinese services are much higher in the ASEAN region than in most of the OECD countries. Given the low input levels of foreign service providers in the other Asia Pacific countries and the Latin America region, the market share of Chinese service providers is comparable to that share from ASEAN countries.

In summary, foreign inputs are important in ASEAN countries, possibly very much so in support of participation in GVCs, since foreign services also support backward participation in manufacturing value chains. High levels of services trade restriction in the ASEAN region do not stop foreign firms from supplying services in those countries. But an interesting question is how restrictions on trade in services affect foreign services participation in the domestic value-added and how they are connected to participation in GVCs.

Country patterns

To consider further the relationship between restrictions on services, the share of services as part of domestic value-added, and participation in GVCs, Table 3 introduces the results of these variables for various countries to show substantial within-group differences. We focus on the ASEAN countries. Those with high restrictions on trade in services (Indonesia, Thailand, and the Philippines) have lower value chain participation when compared to countries that have lower restrictions on trade in services (Singapore, Malaysia and to a lesser extent Viet Nam). These countries with

low restrictions on trade in services also have a substantially higher share of foreign participation in the service economy.

The position of Viet Nam is interesting to observe, as relatively low restrictions on services (which have come down substantially in the past ten years) together with a high share of foreign participation in the domestic service economy have had only limited effects on participation in GVCs. At least, Viet Nam may have the ambition given its low level of restrictions and high foreign participation to improve its positions in GVCs over the coming years.

Focusing briefly on the other countries in the region, the relation between restrictions on trade in services and GVCs participation seems to extend beyond the ASEAN region, where countries with high restrictions have on average lower levels of participation. Interestingly, the share of foreign services in China is very low, as is documented extensively. Given the size of its domestic economy, the importance of GVCs participation as a share of economic activity is also low. However, the direction of effect may be from the latter, so that the low participation of foreign firms in services in China may be connected to the relatively low participation in GVCs. However, this is a fuzzy area to reach conclusions, as many services may be provided by foreign firms operating in China, which are not linked to specific services imports through the balance of payments data and as documented in the foreign inputs' share.

This section provided some stylised facts about the relationship between trade policies in services and participation in GVCs as well as on the share of foreign services participation in the domestic economy. Participation in GVCs is crucial for countries in the ASEAN region. Although they have made substantial progress in lowering restrictions on goods, some steps are still to be made in lowering restrictions on services. However, we also observe substantial differences across countries, which points to the fact that lower restrictions on trade in services are connected to the ability to participate in GVCs. In the next section, we explore the relation between restrictions on trade in services and participation in GVCs, where we also exploit the differences across countries in the region.

Econometric analysis

In this part of the paper, we are interested how country-level participation in GVCs as a dependent variable is affected by restrictions on trade in services. As explained in section 2, participation in GVCs as a dependent variable has two faces: backward participation and forward participation. Backward participation is the input of foreign producers that is used to produce exports. Forward participation is the production of exports that are used in exports of other countries. As the primary explanatory variable, we use restrictions on trade in services which, is an index provided by the World Bank as a database.[3] This index is also reported at the country level, in which restrictions on services across industries are aggregated to an overall score.[4] We are particularly interested in how restrictions on trade in services playout for countries in the Asia-Pacific region.

For this reason, we construct a dummy on the membership of ASEAN. For the inclusion of control variables, we use the strategy used in the World Development Report that has fleshed out the main factors explaining participation in GVCs (in the WDR, though, participation is the dependent variable in the regression). As we are using a simple OLS, in which the subscript i indicates country-level variables, the regression setup that shapes the analysis can be summarised as:

$$GVC_i^p = \alpha_0 + \beta_1 STRI_i + \beta_2 ASEAN + \beta_3 (STRI_i * ASEAN) + \beta_z Z_i + \epsilon_i$$

in which the sign and significance of the crucial interaction term is captured by β_3 and Z is the set of control variables. The index $p \in [b, f]$ can be referred to as backward participation b or forward participation f.

To quantify participation in GVCs (GVC), we make use of the World Development Report (WDR) of 2020 data companion. The data for the WDR report (not our paper) includes a large panel that ranges from the 1990s to today. Participation in GVCs is estimated using input-output tables at the country level connected across countries using the EORA-UNCTAD method. However, it should be kept in mind that input-output table-generated data have a substantial time lag because of limited updating of the table itself, and the last year present for the GVCs participation data (the dependent) is 2015. Hence, generating a variable for GVCs that is the average of 2011 to 2015 to smooth out incidental shocks in GVCs is a reasonable approach to connecting the STRIs to GVCs. Because the services trade restrictions do not have a yearly time dimension, we are also restricted by the limited number of countries for which restrictions on trade in services are reported, so we end up with a cross-sectional data set of 67 countries.

The World Bank Report provides a detailed analysis of the measuring of the variables to restrict to a more general overview of how GVCs participation is measured. Using this definition, participation in GVCs has two components: backwards and forward participation. At the industry level, backward participation is measured by the value-added provided by foreign firms (imports) in exports. Forward participation is the export of goods and services that are used in the exports of other countries. Using industry trade statistics and connect these to the Input-output table, participation can be measured in terms of output and in terms of employment (by connecting to Industry level employment data). Following most of the literature, we will use the output measure for GVCs participation. The overall participation in GVCs is the sum of backward and forward participation. However, because those are quite different concepts, we use them as dependent variables separately in this paper. We aggregate the industry score for GVC participation using the export shares for each industry.

For the restrictions on trade in services, we use the recent database provided by the World Bank. Creating overall restrictions on trading services is very time-consuming and, to some extent, a subjective activity. It transcribes regulatory measures in the area of services to an overall score. The scores are provided on the industry level and then aggregated to the national level using a method that also takes into account the interaction between these measures. The restrictions in Mode 1 (cross-border supply) and Mode 3 (foreign presence) are most important in practice. One may argue that restrictions on foreign presence do not explain backward

participation, as higher production of foreign-owned firms shows up in domestic value edit and not so much as foreign value-added. However, it is a well-established stylised fact that especially foreign establishments make extensive use of imports of goods and services. Hence, restrictions on foreign services as well as on establishing entities that use foreign services capture how such restrictions can limit the use of services in GVC participation. Concerning forward participation, it may be argued that limitations on foreign presence may hamper the competitiveness of domestic suppliers within GVCs. For example, foreign-owned banks may be important suppliers of trade finance that shape participation in GVCs. Overall, we expect a negative relation between the degree of restrictions on trading services and participation in GVCs.

For the control variables, we use the exploratory regressions of Chapter 2 of WDR2020 (see for more detail Fernandes, Kee, and Winkler (2020)). These variables mostly come from the World Development Indicators and include (with an indication of likely direction of effect) (i) average MFN tariffs on products in that industry (negative), with the assumption that higher tariffs increase the cost of imports and therefore restrict participation in GVCs, (ii) the inflow of foreign direct investment (positive), which is often seen as the most important variable explaining the presence of multinational companies that are also large importers and exporters and is shaping GVCs, (iii) an index of political stability (positive) because it is assumed that GVCs benefit a lot from contractual certainty which is highly connected to political stability (iv) the size of the capital stock (positive) because this shapes the manufacturing industry productivity, (v) land area relative to GDP (negative) because of difficulty in establishing within country logistics; (vi) the share of low skilled labor in the workforce (positive) as much of the comparative advantage relies on labor intensive production, (vii) (sum of the) distance to GVC hubs (negative) because this distance explains the relative cost position, (viii) and the size of the manufacturing sector (positive) in GDP. As we will see in the analysis below, the control variables create a model that explains more than 80% of the variance in GVC participation.

As a last component of the analysis, we include a dummy for countries that are a member of ASEAN. As the sample of 67 countries is already quite small for econometric analysis, splitting the sample is not a viable option. Using interaction with the dummy variable is more appropriate for analysing the differentiating effects for countries in the Asia-Pacific region. We will be interested mainly in interacting the ASEAN dummy with the services restrictions index that takes the value between zero and 100. When interpreting the sign and magnitude of the interaction components, it is wise to keep in mind that they have to be compared to the base of countries that are outside of the ASEAN region (the zero values for the dummy) and countries that have low restrictions on trade in services (low values for STRI). We will be mainly interested in the significance only of the interaction effects for two reasons. First, given the small sample size, paying too much attention to the size of the coefficient for all interaction components is not recommended because of the potentially high variance in these components caused by the interaction inclusion. Secondly, in the estimations, we use the beta coefficient to compare the various factors and focusing on the significance of elasticities. Hence, we are primarily interested in seeing where

Table 4. STRIs and GVCs Participation, baseline results.

	Backward	Backward	Forward	Forward
STRI		−0.11*		−0.01
		[-1.78]		[-0.18]
Asean		−0.03		0.04
		[-0.50]		[0.64]
Average Tariff	−0.03	−0.04	−0.09	−0.07
	[-0.37]	[-0.47]	[-1.39]	[-0.98]
FDI Inflows	0.36***	0.36***	0.15**	0.15**
	[4.41]	[4.60]	[2.29]	[2.24]
Political Stability	0.12	0.09	0.01	0.01
	[1.32]	[0.95]	[0.15]	[0.16]
Capital	0.30***	0.30***	0.15**	0.14**
	[3.87]	[3.86]	[2.37]	[2.07]
Low Skilled	−0.37***	−0.33***	−0.28***	−0.29***
	[-3.17]	[-2.89]	[-3.01]	[-3.02]
Distance to GVC hubs	−0.10	−0.11	−0.08	−0.09
	[-1.47]	[-1.49]	[-1.53]	[-1.61]
Manufacturing	0.53***	0.54***	0.73***	0.72***
	[6.95]	[7.13]	[11.85]	[11.45]
Land	−0.09	−0.09	0.03	0.03
	[-1.36]	[-1.47]	[0.54]	[0.61]
Observations	67	67	67	67
Adjusted R-squared	0.824	0.834	0.887	0.884

Note: t-statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

this electricity difference for countries in the ASEAN region. Table 4 presents this analysis in which we assess the effects of STRI's for the full sample of 67 countries. In Column 1, we run the baseline regression.

We observe that most of the control variables are significant, except for the average tariff rate and political stability. It is interesting to note that tariffs do not play an essential role in explaining participation in GVCs. A potential explanation may be that most of the countries with substantial forward and backward linkages already have low applied tariffs because of the abundance of entries into free trade initiatives and tariff rebate schemes. When we include STRIs and the ASEAN dummy in Column 2, we see a marginal improvement in the model fit. So it is unlikely, given the good model fits in the baseline regression, that STRIs capture something different than restrictions in services trade. The important thing to note in Column 2 is the significant negative effect of STRI's on backward participation in GVCs. Hence, we can conclude that countries with high restrictions on importing services have lower backward participation in value chains. This may come as no surprise, as the services are often important to facilitate the participation of foreign parties into domestic value-added in exporting sectors.

Turning to forward linkages in Columns 3 and 4, we do not observe that STRI's for the full sample influence forward linkages. For the moment, the ASEAN dummy has no effect, as there are quite a few countries, also in middle America and central Europe, that are just as keen on participating in GVCs as countries in the ASEAN region. The more important reason is that forward participation depends on trade restrictions in countries where exports are ending up so that restrictions on services that mainly affect the input side are less important for forward participation compared to backward participation. As an overall conclusion, restrictions on trading

services seem to harm backward participation in GVCs and a limited correlation with forward participation. In addition, and in line with the descriptive statistics, on average, there is no evidence that participation in GVCs is higher for ASEAN countries.

Our next goal is to focus on services trade restrictions in the ASEAN region when it comes to participation in GVCs. Given our conceptual framework, we have argued that services are important for manufacturing GVC in which the ASEAN region excels. Hence, although there is no effect of the dummy for the participation in GVCs, it may be that the restrictions on services are more important given the importance of GVCs for the region. The most obvious route is to analyse the interaction effects between STRIs and ASEAN membership because that would split the ASEAN countries into those with high STRIs and those with low STRIs. When adding an interaction term, it is essential to establish the control group to which the marginal effects apply. If we introduce the dummy for ASEAN in the STRI variable, then the baseline group is non-ASEAN countries, which tend to have lower levels of STRIs. Although it is dangerous to interpret individual components that are interacted, the coefficient for STRIs says something about countries outside the ASEAN region that have high STRI's. In contrast, the ASEAN coefficient says something about ASEAN countries that have low STRI's.

Table 5 introduces the interaction terms in the regression output. In Column 1, we present for backward linkages the interaction effect between STRIs and ASEAN countries and see that the interaction term itself is significantly negative and of a substantial size. This implies that, compared to the baseline regression in Table 4, where the dummy for ASEAN membership had an insignificant effect, the interaction effect in Table 5 shows us that countries in the ASEAN region with higher STRI's have substantially lower participation in backward GVCs. Also, we see a substantial positive effect of ASEAN countries that have lower levels of STRI's. Compared to the full sample of countries, ASEAN countries with low levels of service trade restrictions are active participants in backward GVCs.

In sharp contrast in Column 2 of Table 5, which refers to forward linkages, we observe that the interaction effect is not significant at the conventional levels. In the previous sections, we argued that services trade restrictions may have an indirect effect on forward participation in GVCs via this connection. To test this effect, we include backward linkages as an explanatory variable in the forward linkages regression. In Column 3 of Table 5, we observe that these backward linkages add substantial value in explaining participation in forward linkages.

We then also create a second interaction effect between the three terms of STRIs, ASEAN, and backward linkages, which in Column 4 is negative. Effectively, using this term, we have split out ASEAN countries into those for which backward participation is important and those for which backward participation is not that important in explaining the variance in forward linkages. In Column 4 of Table 5, we observe that the interaction term between STRI and ASEAN countries is positive, capturing the effect of restrictiveness for countries for which backward linkages are not that important. By contrast, in countries for which backward linkages are important, STRIs harm their forward participation.

We may conclude that countries with high levels of STRIs and low participation in backward linkages have a protected domestic industry by which the local firms have

Table 5. STRIs and GVCs Participation with interaction terms.

	Backward	Forward	Forward	Forward
STRI	−0.04	−0.04	0.03	−0.01
	[-0.64]	[-0.76]	[0.64]	[-0.19]
Asean	0.92***	−0.40	0.05	−0.54*
	[2.92]	[-1.45]	[0.94]	[-1.93]
STRI*Asean	−1.01***	0.46		1.06***
	[-3.10]	[1.61]		[4.23]
STRI*Asean*Backward				−0.43**
				[-2.21]
GVC Backward			0.37***	0.70***
			[3.61]	[5.47]
Average Tariff	−0.10	−0.04	−0.05	0.01
	[-1.27]	[-0.55]	[-0.85]	[0.24]
FDI Inflows	0.29***	0.18**	0.01	−0.04
	[3.84]	[2.64]	[0.21]	[-0.53]
Political Stability	0.05	0.03	−0.02	−0.04
	[0.60]	[0.37]	[-0.28]	[-0.59]
Capital	0.26***	0.15**	0.03	0.02
	[3.60]	[2.33]	[0.38]	[0.30]
Low Skilled	−0.29***	−0.31***	−0.17*	−0.16*
	[-2.70]	[-3.24]	[-1.80]	[-2.00]
Distance to Hubs	−0.10	−0.10*	−0.06	0.00
	[-1.50]	[-1.68]	[-1.03]	[0.02]
Manufacturing	0.57***	0.71***	0.53***	0.33***
	[8.02]	[11.27]	[6.65]	[3.96]
Land	−0.07	0.02	0.07	0.08*
	[-1.28]	[0.47]	[1.35]	[1.78]
Observations	67	67	67	67
Adjusted R-squared	0.856	0.887	0.904	0.928

Note: t-statistics in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

higher shares in forward linkages value-added. It is possible to have important backward linkages along with high STRIs. That is, higher degrees of restrictiveness do not always add to the protection of local value-added. But at the same time, high STRIs impact forward linkages because they reduce the efficiency of the provision of that value-added by local companies (via restrictions on entry and competition). Those companies, including those which could have been set up via FDI, would otherwise have provided value-added that would be used downstream. Thus, high levels of STRI in this context reduce participation in forward GVCs.

Conclusion

In this paper, we have documented the relationship between participation in GVCs, especially in Asian countries, to restrictions on trade in services. The reason for doing so is that, as widely acknowledged, services play an important role in connecting

stages of value chains and facilitating participation. From our empirical strategy, we draw three main results. The first is that STRIs are important in explaining participation in backward linkages but add little to explaining participation in forward linkages. The second conclusion is that among the ASEAN countries, we can observe that countries with low levels of STRI's have higher levels of participation in backward linkages. The third conclusion is that high STRIs in ASEAN countries (particularly in the context of increased backward linkages, which would otherwise be a positive factor) are associated with lesser participation in forward linkages, which occurs we expect via effects on entry and competition into domestic services markets. These results are significant as the international trade of ASEAN members is dominated by their participation in global supply chains. Thus, the results show that participation by ASEAN countries is hampered by high levels of restrictions on international trade in services. Opening to foreign competition in services may reduce the overall share of domestic service providers in value chains. However, countries that do open find more substantial value chain positions. The results also show that more robust backward integration improves forward opportunities by supporting goods higher up in the value chain.

The paper makes several more general contributions to the theoretical literature on GVCs and the substantial literature on the effects of restrictions on trade in services on world trade. As we have argued, the current literature on GVCs and participation in those chains Includes analyses of many spatial components and policy interventions that support participation but has not considered trade policies in the area of services. This paper shows that restrictions on services also have a critical effect on participation. Then there is also the literature on the impact of restrictions, including services on bilateral trade in services using gravity models; however, this literature has not connected to participation in GVCs, as is done here. As a further contribution, the interaction of backward and forward participation in the context of STRI values sheds new light on the dynamic effects of trade restrictions in services and the importance of trade policy for centrality in GVCs.

The empirical analysis using data on GVCs participation has limitations. Well-documented are the challenges of input-output tables, especially the assumptions underlying the fixed relations between sectors and the approximation of input-output tables over countries. Ideally, one would back up the industry-based input-output tables with firm-level data to see the details of input relations to capture the large variance of input-output relations within industries. Also, the input-output tables are dated some years ago, so that there is a gap between the current policy discussions on the increased importance of GVCs and aspects which the data allow us to analyse.

Another issue in the empirical analysis is that the information on policy and regulation of trade in services is qualitative and must be transformed into quantitative data to capture their degrees of restrictiveness in a subjective process and require judgment by researchers. STRI measures are often hotly debated, so there is scope for adopting different methods of measuring them for the various approaches have substantially different outcomes across countries.

The primary policy conclusion in this paper is that services trade liberalisation plays an essential role in the future of value chain positions of ASEAN members. The analysis in this paper shows that liberalisation of services increases the participation in

GVCs and increases the scope for forward integration, which contributes to the upgrading of that participation. Furthermore, the path to competitiveness of newcomer participants includes attention to services policies, and success in that respect increases the scope for trading partners to diversify their GVCs pathways in order to add to their resilience and robustness. These matters have attracted attention in the aftermath of the COVID-19 pandemic and to manage other risks in GVCs operations.

Concerning the process of policy change, most ASEAN members have made substantial progress in liberalising trade, especially in the field of manufacturing goods directly important for participation in GVCs. In the next stage of trade liberalisation, ASEAN countries may focus on liberalising trade in services, which requires a lot of work to increase the transparency of regulations that affect the ease of doing business in the service sector. As countries in ASEAN are active participants in many regional trade initiatives, the paper highlights the value of coordinating trade liberalisation in the field of services and combining and sharing knowledge in this field.

Notes

1. Other classifications of these activities have been developed. Product-oriented cases occur when the services support the operation or a product, a motor vehicle for instance. A use-oriented contract is applied when the producer retains the ownership of an asset (a jet engine, for instance) and a user (an airline in this example) pays a fee to have access to that asset. A result-oriented contract does not specify how the outcome is to be created, but the recipient pays when that occurs. 'Factory less goods producers' (Miroudot 2019) is another form of the relationship of services and manufacturing. These firms are not involved in manufacturing themselves but provide the related services to deliver goods to customers. They might provide inputs for others to transform or they might ask the firm responsible for manufacturing to also organise procurement.
2. See https://worldmrio.com/ (visited on 30 September 2020) for details. Data are available up to 2015.
3. https://www.worldbank.org/en/research/brief/services-trade-restrictions-database
4. It is very difficult to aggregate restrictions after they are measured, as the interaction between various measures creates non-linear effects on overall levels of restrictions. For the index we use these consult the methodology paper available in Borchert et al. (2019).

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No potential conflict of interest was reported by the author(s).

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