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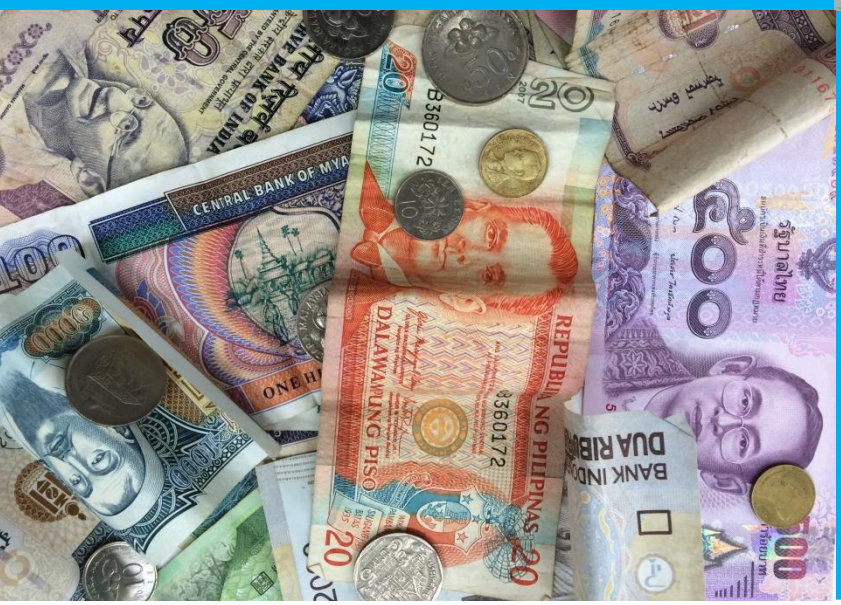
VALUE ADDED TRADE COSTS IN GOODS AND SERVICES

(UPDATED: OCT 2016)



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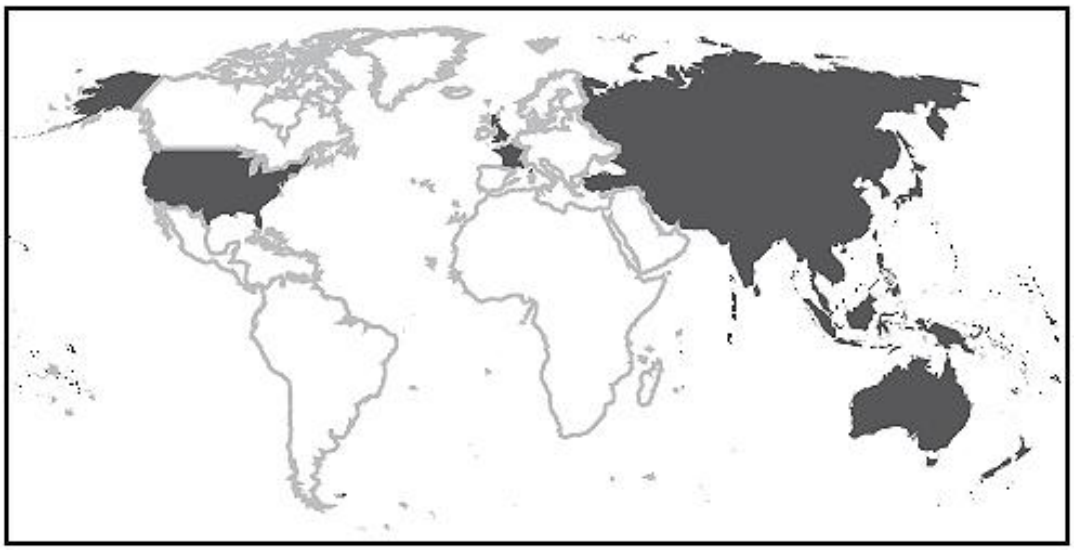

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VALUE ADDED TRADE COSTS IN GOODS AND SERVICES

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Abstract: This study introduces a new dataset of bilateral value added trade costs for the goods and services sectors, based on a measure derived from the micro-founded gravity model and using data from the OECD-WTO TiVA database. This is the first study to calculate value added trade costs for a set of developed and developing economies, both for the goods and services sectors. Overall, we find that, in the goods sector and in absolute term, international trade costs calculated using value added data are lower than those calculated using gross trade and output data. However, in relative term, bilateral trade costs remain broadly similar regardless of the trade data employed, with trade costs of Republic of Korea and Malaysia consistently outperforming all other developing countries – as well as most developed countries – included in the dataset. Value added trade costs are declining over time across most countries and regional groups and integration into global supply chains and production networks is found to be clearly associated with lower value added trade costs. The agricultural sector is characterised by substantially higher trade costs than in both manufacturing and services sectors. In turn, value added trade costs are found to be slightly higher in services than in manufacturing, although substantial cross-country heterogeneity is observed at the sub-sectoral level.

JEL Classification: F10; F13; F14; O24

Keywords: Trade Facilitation; Trade costs; Value added; Global Value Chains

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"The statistical bias created by attributing the full commercial value to the last country of origin can pervert the political debate on the origin of the imbalances and lead to misguided, and hence counter-productive, decisions." Pascal Lamy (2010) – Former Director-General of the World Trade Organization (WTO)

1. Introduction

International trade has experienced an unprecedented rate of growth over the last two decades, growing at a rate of 6.1% a year between 1994 and 2013.[1][2] This is substantially higher than world GDP growth, which averaged just 2.8% over the same period.[3] Although international trade is growing, and tariff costs are at historical lows (WTO, 2015a), the empirical evidence suggests that trade costs remain high. In fact, a seminal study by Anderson and Van Wincoop (2004) found that ad-valorem trade costs across developed economies amounted to 170% – only 8% of which are related to tariffs. Precisely measuring and quantifying trade costs related to non-tariff barriers remains a challenge, and this in turn increases the difficulty in targeting policies to reduce such costs.

There have been many attempts to develop trade cost measures. Much effort has focused on direct measurement of various trade cost components, such as international transport costs (using actual shipping costs of a container to various destinations, or more aggregate CIF/FOB trade data) or costs of moving good from the factory of the deck of a ship at the nearest sea port (including for example: costs of preparing trade documentation, customs clearance, goods transport and handling to the port). Other more recent studies have used micro-founded measures of trade costs – based on the inverse gravity model – inferring bilateral trade frictions from gross trade and output data (e.g., Novy, 2013; Arvis et al., 2013).

1 This calculation is based on United Nations Comtrade data accessed through WITS (accessed May 2015).
2 Although the longer-run rate of growth has been unprecedented, Constantinescu et al (2015) find that there has been a slowdown in recent years. They argue that this is due to a structural change in the trade-GDP relationship caused by international vertical specialisation.
3 This calculation is based on the World Bank Development Indicators database (accessed May 2015).

However, calculation of trade costs in these studies has been heavily constrained by the lack of data on national gross output. Indeed, the ESCAP-World Bank trade cost database, which aims at providing a global standardised set of bilateral trade cost data based on a micro-funded inverse gravity model formula, only features trade costs in goods for the manufacturing and agricultural sector. With the exception of Miroudot et al. (2013), computation of bilateral trade costs in services has also not been attempted given the severe data limitations – on both the gross trade data and gross output side. Calculating international trade costs on the basis of increasingly available trade in value-added data combined with commonly available national sectoral GDP data would allow for bilateral trade costs for both goods and services at a more disaggregated level, while also better reflecting the impact of global supply chains.

In fact, companies are increasingly dividing their operations around the world. From product design, component manufacture, to assembly and markets, this finer division of operations and labour has led to the development of complex international production chains. As the WTO (2015b) points out, products are increasingly being 'Made in the World' rather than made in a specific country. Xing and Detert (2010) for example find that the iPhone 4 produced by Apple Inc. costs $188 to produce, however only $23 of components were produced in the United States. The remaining components were produced by the Republic of Korea ($80), Taiwan Province of China ($21), and other countries ($64).[4] This suggests that what increasingly matters for growth and development is not the volume or gross value of goods being traded, but the value addition made as part of the trading process. Accordingly, trade costs calculated based on value added data rather than gross data may provide a more relevant indicator to develop trade and development strategies.

Accordingly, this paper presents a first analysis of bilateral trade costs in the goods and services sectors using value added data from the Organization for Economic Cooperation and Development (OECD)-WTO TiVA database over the period 1995-2011,

4 Note that these numbers do not take into account the profits earned from distribution and retail. Kraemer et al (2011) find that Apple keeps 58% of the sales price of the iPhone 4.

across twenty developed and developing economies, most of which are members of the UN Economic and Social Commission for Asia and the Pacific (ESCAP). In addition to being the first to provide a dataset of bilateral trade costs on a value-added basis, the study extends the analysis from merchandise trade costs to also include the services sector, including a disaggregated breakdown of trade costs in sub-sectors of merchandise and services trade. Finally, it analyses trade costs bilaterally between countries and regional groups over time to observe longer-run cross-country intra-interregional trends. The dataset for this study is available in the Data Appendix to this paper and the full value-added trade cost dataset for all 61 countries featured in TiVA is available for public use on the ESCAP website.[5]

Our results can be summarised as follows. Firstly, we find that the difference between value added trade costs in goods of developed and developing economies is, on average, much smaller than it is when considering trade costs in gross terms – keeping in mind, however, that the developing countries included in the analysis are, with the exception of Cambodia, large or Asian middle-income developing countries. The lowest value added trade costs are in fact typically observed in East Asia-3 countries. At the sectoral levels, value added trade costs in the agricultural sector are found to be substantially higher than in the manufacturing sector (see Section 3.1).

Secondly, we find that value added trade costs in goods are declining over time – and that this decline is much steeper than that of gross trade costs. The fall in trade costs is observed in both the manufacturing sector and agricultural sector; however the rate of decline is faster in the former and slower in the latter (Section 3.2).

Thirdly, we find that intra-East Asia-3 value added trade costs are lowest across all regional groups considered, and even lower than intra-EU-3 trade costs from 2005 onwards. Furthermore, intra-ASEAN-4 value added trade costs are higher than those between ASEAN-4 and both East Asia-3 and the USA. The highest inter and intra-regional value added trade costs are found in developed Pacific economies (Australia and New Zealand), in

5 We make the data freely downloadable on ESCAP's Asia-Pacific Research and Training Network on Trade (ARTNeT) website: http://artnet.unescap.org/databases.html#first. We kindly request citation of this paper upon use of the dataset in research.

contrast to earlier studies using gross data (see Duval and Utoktham, 2011). Overall, intra and inter-regional value added trade costs have both mostly declined between 1995 and 2010 then stay still or slightly increase in 2011 (Section 3.3).

Fourthly, we find that as participation in global value chains – measured in terms of intermediate goods exports relative to total exports – increases, value added trade costs decline, across most economies. This negative association suggests that a country that manages to reduce its value added trade costs will trade more in value added intermediate goods (Section 3.3).

Finally, we find that on average, across both developed and developing economies, value added trade costs are higher in the services sector compared to the goods sector. High trade costs in services tend to be associated with high trade costs in goods, and vice versa. In contrast to sub-sector industries for goods trade (e.g., agriculture vs. manufacturing), differences in value added trade costs across services sub-sectors (e.g., transport and telecoms vs. finance and insurance) also tend to be more limited. In line with the goods sector, lower trade costs in the services sector are observed in East Asia-3 economies. Both intra-regional and inter-regional trade costs are similar to those in the good sector and appear to be declining over time across most regional groupings (Section 3.5).

2. Data and Methodology

This section outlines the main sources and technique used to construct the trade cost database, using value added data. After calculating the trade cost database between countries and regional groups, our dataset covers 20 developed and developing countries for the years: 1995, 2000, 2005, and from 2008 to 2011. In the goods sector, we cover total trade, agriculture and manufacturing. In the services sector we cover total trade, transport and telecoms, and finance and insurance.

2.1 Calculating trade costs

In line with Novy (2013), we calculate the geometric average bilateral trade cost (φ_{ijkt}) between country i and country j in sector k at time t, as the product of country i's intra-national trade (x_{ii}) and country j's intra-national trade (x_{jj}) divided by the product of country i's trade flows to country j, (x_{ij}), and country j's trade flows to country i, (x_{ji}), scaled by a sector specific elasticity of substitution between sectors.[6] Following this approach, the ad-valorem trade cost measure can be interpreted as follows: trade costs are inferred as higher when countries trade more domestically than they do internationally, and lower when they trade more internationally than they do domestically. This is because if trade costs vis-à-vis another country falls, then some of the production which was consumed domestically will be shipped overseas.

$$\varphi_{ijkt} = \left(\frac{x_{iikt}x_{jjkt}}{x_{ijkt}x_{jikt}}\right)^{\frac{1}{2(\sigma_k-1)}} - 1 \qquad (1)$$

6 Anderson and Van Wincoop (2004) assume that each country is specialised in one good. The elasticity of substitution can therefore be considered to be the elasticity of substitution between foreign and domestic goods, as the setting is aimed to measure average trade friction. Novy (2009) studies trade costs at a disaggregated sectoral level. (σ_k)becomes the elasticity of substitution between varieties within sector k. For comparative purposes, the elasticity of substitution is set to 8, in line with Arvis, et al (2013), Miroudot, et al (2013) and Novy (2013).

This approach to measuring bilateral trade costs has several advantages over alternative methods. Firstly, it is comprehensive in that it encompasses all costs involved with trading internationally with another partner (i.e. beyond the national border), relative to those involved with trading intra-nationally (i.e. domestically). This is because the 'top-down' model captures both observed and unobserved trade costs. It has the added advantage of not requiring an explicit list of trade cost factors for use in econometric estimation – typically required by 'bottom-up' models – which means the measure does not suffer from omitted variable bias. In addition, the trade cost measure is fully grounded in theory – based on a rearrangement of the Anderson and Van Wincoop (2004) gravity model of trade.[7]

More importantly, this approach to measuring trade costs can be applied to the goods sector and the services sector. In the goods sector, some trade costs – such as tariffs and transport costs – can be readily measured however other trade costs are more difficult to quantify – such as exchange rate costs, language barriers, information costs and security costs. This problem is even more apparent in the services sector, where factors such as regulatory barriers, heterogeneous business and investment conditions, access to financing, and behind the border measures are also difficult to measure and quantify. The Novy (2013) measure has the advantage of calculating a 'top-down' trade cost measure which overcomes these obstacles.

2.2 Value added data

To account for the role of GVCs in the production chain, all trade flows (i.e. exports) and intra-national trade data in this study are in a value added basis. The data source for both intra-national and international trade is the OECD-WTO Trade in Value Added (TiVA) database. This data deconstructs trade data into the value added of each country in the

7 The theoretical foundations of the Novy (2012) approach implemented in this paper are primarily based upon the goods sector of trade, but Miroudot and Sauvage (2013) show that this approach can be extended to both the goods and services sectors. The work by Noguera (2013), who decomposes trade flows in to intermediate and final goods to derive a theoretical micro-founded graved model for value added trade, also suggests that that the Novy approach remains theoretically consistent in the value-added trade context, although more work to confirm this would be useful.

production of goods and services. It is constructed using input-output tables, thereby providing information on intermediate imports embodied in exports.[8]

The specific data series used for the calculation of trade costs is "Value-added in gross exports by source country and source industry" (EXGR_VA_BSCI: Value added embodied in gross exports by source country and source industry).[9]Value-added export of a country *i* to a country *j* in a particular industry (sector) is calculated by summing up all the value-added export of that source industry (sector) from source country *i* across all the destination industries (sectors) in the destination country *j*.[10]

There are several advantages to using value added data instead of gross shipment and output data in this study. Firstly, it offers an alternative approach to measuring trade costs and is therefore a robustness check for existing studies. Secondly, data is available for both the goods sector and services sector. Thirdly, the data is gradated, and available for manufacturing and agricultural sectors in goods trade, and for the transport and telecoms, and finance and insurance in services trade. This allows us to analyse sub-sectoral trade costs. Fourthly, as Arvis et al. (2013) point out, the most challenging part of calculating trade costs is obtaining gross output data, however this is not an issue with value added data as we can use domestic value-added component for each country to be a representation of intra-national trade. Nevertheless, use of value added data to calculate trade costs has its own limitations, including the fact that the TiVA database so far features value added trade data for only 7 years (1995, 2000, 2005, from 2008 to 2011) and covers only 25 developing countries. In contrast, the data featured in the ESCAP World Bank Trade Cost database and calculated using gross shipment and output data covers over 150 countries over 17 years.

8 The foreign component of value added trade includes both direct and indirect exports, the domestic and re-imported value added (when goods travel back and forth), and this may influence the interpretation of the value added trade costs as calculated in this study.

9 The following is the link to the dataset: https://stats.oecd.org/index.aspx?queryid=47807.

10 In the TiVA dataset, values are labelled by source industry and (destination) industry as well as source and destination countries. For example, value-added export of agriculture sector (source sector: agriculture, hunting, forestry, and fishing) from source country Thailand, to food product sector (food product, beverages, and tobacco) in Germany is USD 10 million. To calculate trade costs between Thailand and Germany in agricultural sector, we use the sum of all value added export Thailand in the agricultural sector (source sector) to all the destinations sector (including the food product sector) in Germany.

2.3 Countries and regional groups

The 20 countries covered in this analysis include United Nations ESCAP member nations (United Nations, 2015) for which data is available and BRICS (Brazil, Russian Federation, India, China, South Africa) nations.[11] The entrepôt nations of Hong Kong, China and Singapore are excluded from the analysis because re-exports account for a high proportion of their total exports. The regional and sub-regional breakdowns of these countries are presented in Table 1. The dataset for this study is available in the Data Appendix and the full dataset for all 61 countries is available for public use in on the ARTNeT Website.[12]

Table 1: List of countries, sub-regions and other groupings

List of countries, sub-regions and other groupings

	UNESCAP	Asia-Pacific	BRICS	Developed Economies	Developing Economies	ASEAN-4	Developed Pacific	East Asia-3	EU3
Australia	x	x		x			x		
Brazil			x		x				
Brunei Darussalam	x	x			x				
Cambodia	x	x			x				
China	x	x	x		x			x	
France	x			x					x
Germany				x					x
India	x	x	x		x				
Indonesia	x	x			x	x			
Japan	x	x		x				x	
Malaysia	x	x			x	x			
New Zealand	x	x		x			x		
Philippines	x	x			x	x			
Republic of Korea	x	x			x			x	
Russian Federation	x	x	x		x				
South Africa			x		x				
Thailand	x	x			x	x			
United Kingdom	x			x					x
United States	x			x					
Viet Nam	x	x			x				

Notes: Table 1 lists 22 United Nations ESCAP member states and BRICS nations by region and sub-groups.

11 We exclude entrepôt nations of Hong Kong, China and Singapore from the analysis.

12 We make the data freely downloadable on the ARTNeT Website: http://artnet.unescap.org/databases.html#first and in doing so we hope that this will be a useful and valuable resource to the research community. We kindly request citation of this paper upon use of the dataset in research.

3. Results and Discussion

This section compares bilateral trade costs, both between countries and regional groups and over time. The value added trade costs are calculated using the technique of Novy (2013) with data from the OECD-WTO TiVA database. These trade costs are compared to those from the ESCAP World Bank Trade Cost database, which uses gross shipment and gross output data instead of value added data. We begin by comparing trade costs cross-sectionally – in 2011 – bilaterally between countries in the goods sector (section 3.1) before investigating how these trade costs have evolved over time (section 3.2) and across regional groups (section 3.3). We subsequently analyse the relationship between increasing involvement in global value chains and value added trade costs (section 3.4) and finally extend the analysis to the services sector (section 3.5).

3.1 Bilateral trade costs (goods)

To calculate and compare bilateral trade costs between countries, we select China as the in-region reference country because it is the both the region's and the world's largest exporting economy (Monaghan, 2014).[13] We also present calculations in the Appendix using the United States as another reference county, both as a robustness check of our findings and to provide an out-of-region benchmark with which to compare trade costs.[14]

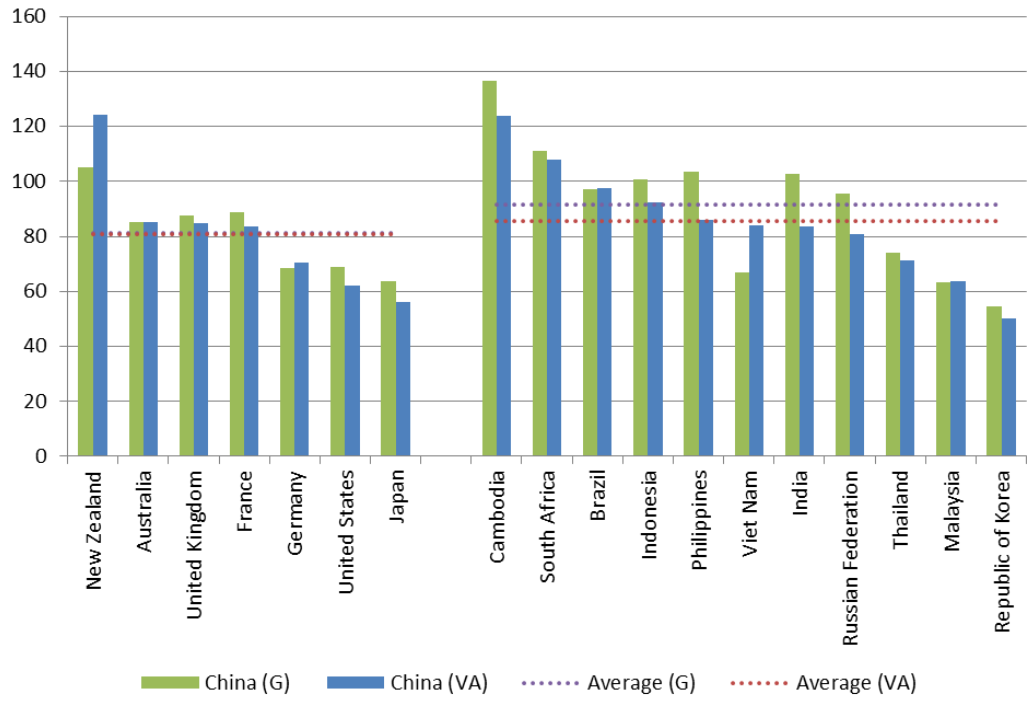
In Figure 1, we present trade costs in the goods sectors, separated by developed and developing economy groups – as defined by the United Nations – and ranked from highest to lowest in each group using value added trade costs. An important stylised fact which emerges is that the difference between value added trade costs in goods of developed and developing economies is, on average, much smaller than it is when considering trade costs in gross terms.

13 Another option would have been to present average of bilateral trade costs of a reference group of countries, as done in Arvis et al. (2013). All bilateral trade cost aggregation methods have their own limitations, however. We therefore use only one reference country at a time in this first analysis of value added trade cost.

14 The full dataset in the Data Appendix presents bilateral trade costs between each country, using each other country as the benchmark.

China's lowest trade cost partners – measured using either gross shipment or value added – include Japan and the United States across developed economies, and the Republic of Korea and Malaysia across developing economies. The highest trade costs are typically observed in BRICS countries whilst the lowest trade costs are typically observed in East Asia-3 countries – both excluding China. This is a finding consistent with Duval and Utoktham (2011) who find that China, Japan and the Republic of Korea (East Asia-3) have the lowest intra-trade group costs of any free trade areas in Asia, even though they do not have formal trade agreements with one another. Similar observations are made when using the United States as a reference country (Appendix A1).

Figure 1: Trade costs with China in the goods sector, 2011

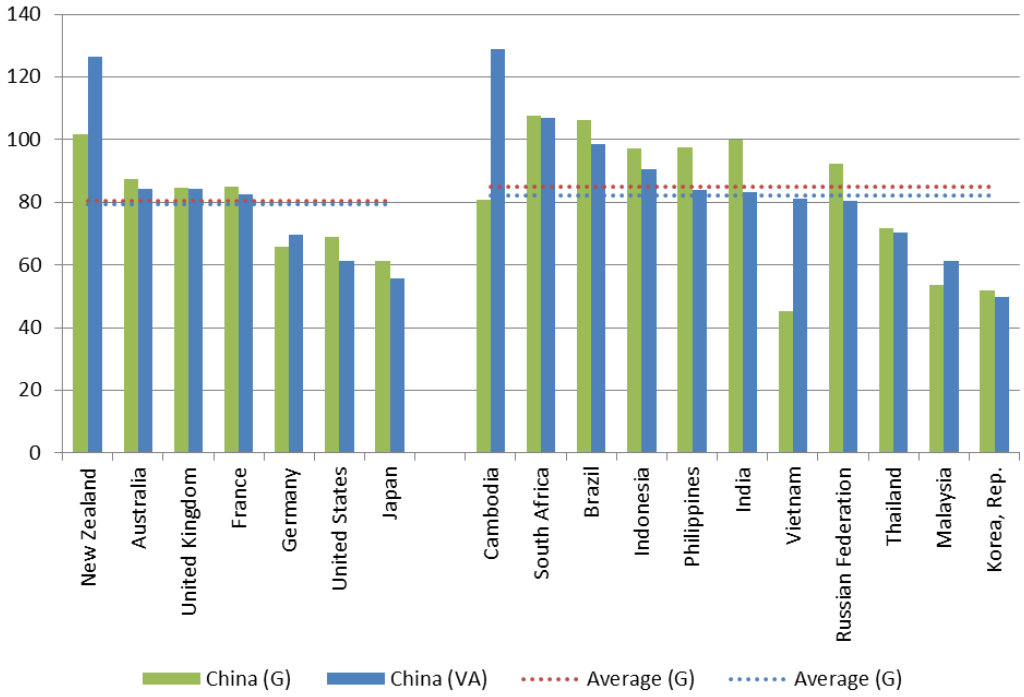


Notes: Figure 1 shows trade costs between each country and China measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

We continue the investigation by disaggregating goods data into constituent components of the manufacturing and agricultural sectors, to explore sub-sectoral variations in trade costs. In Figure 2, we find that trade costs in the manufacturing sector are strikingly

similar to those observed for total goods trade as a whole in Figure 1. Trade costs across all countries are similar regardless of trade data employed (e.g. value added vs. gross). It is however important to note that with the exception of Cambodia, and Viet Nam, developing economies included in this investigation are large or middle-income developing economies.

Figure 2: Trade costs with China in the manufacturing sector, 2011



Notes: Figure 2 shows trade costs between each country and China measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

Japan and the United States have the lowest trade costs across developed economies. Republic of Korea and Malaysia have the lowest trade costs across developing economies. BRICS countries tend to have higher trade costs, while East Asia-3 economies tend to have lower trade costs. These findings are consistent with using the United States as a reference country (Appendix A2).

In Figure 3, we find that value added trade costs in the agricultural sector are higher than the manufacturing sector.[15] Across both developed and developing economies, the average value added trade cost is higher in agriculture compared to manufacturing. This pattern is also present when using gross shipment trade costs. It is also robust towards using the United States as a reference country.[16] Interestingly, Japan has relatively lower value added trade costs, which suggests they have a large international trade in high value added agricultural products relative to intra-national trade of those products. This may be because Japan has a large trade in high value added foodstuffs and animal products such as non-frozen filleted fish, flavoured waters, rolled tobacco and prepared meats.[17] In the case of Cambodia, substantially lower value added trade is more difficult to explain. It may be due to substantial exports of high value foodstuffs and animal products as well as high imports of high value vegetable products, or substantial imports of high value added goods. In line with the manufacturing sector, we find that value added agricultural trade costs are lowest in East Asia-3 economies. These findings are consistent with using the United States as a reference country (Appendix A3). Across all economies, value added trade costs are relatively lower than those calculated in gross terms, which suggests that each country has a substantial amount of value added international trade.

Higher trade costs in the agricultural sector are driven by a range of factors including the perishability of agricultural goods across larger distances and protectionist tariffs imposed by different countries. In addition, the common agricultural policy – a system of agricultural subsidies in the European Union – has created significant long-term distortions in the global agricultural market. Indeed, Arvis et al (2013) point out – in a study measuring

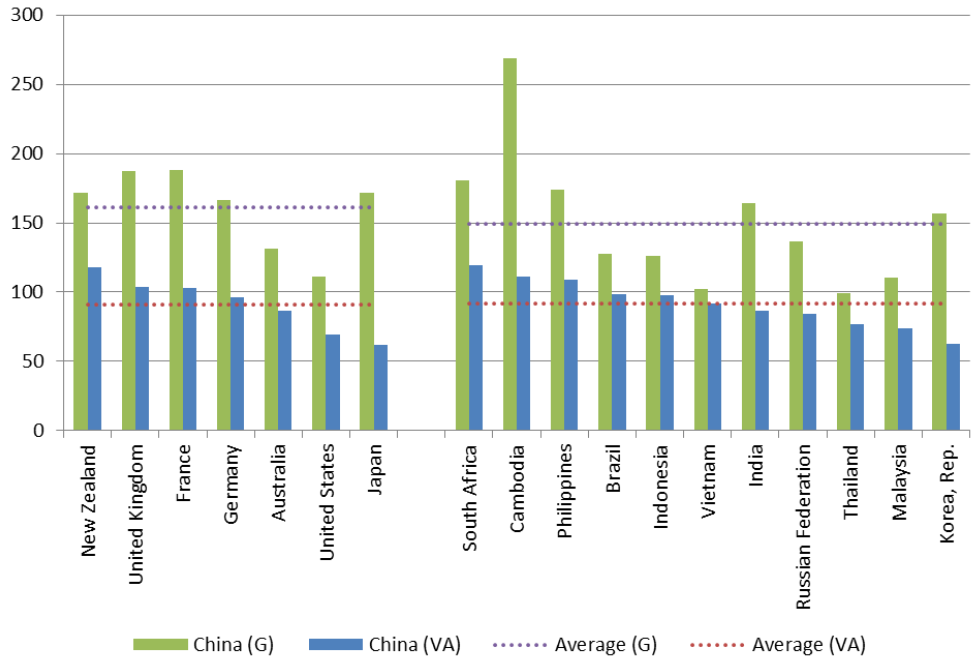
15 The finding of markedly higher trade costs in the agricultural sector, compared to the manufacturing sector is consistent with a previous study by Arvis, et al (2013).

16 Trade costs are markedly higher in the agricultural sector compared to the manufacturing sector when using the United States as a reference country (Figure A3).

17 Although we do not have product level data on value added trade, we can gauge some insight from raw trade data. Using data from the Observatory of Economic Complexity from MIT: flavoured water was the largest export in the foodstuff category, non-frozen fish fillet was the largest export in the animal products category, prepared meat and rolled tobacco were the largest imports in the foodstuff category, and pig meat and non-frozen fish fillet were the largest imports in the animal products category.

trade costs using gross trade and output –that higher trade costs in agricultural trade are largely attributable to these protectionist and distortionary policies.

Figure 3: Trade costs with China in the agricultural sector, 2011



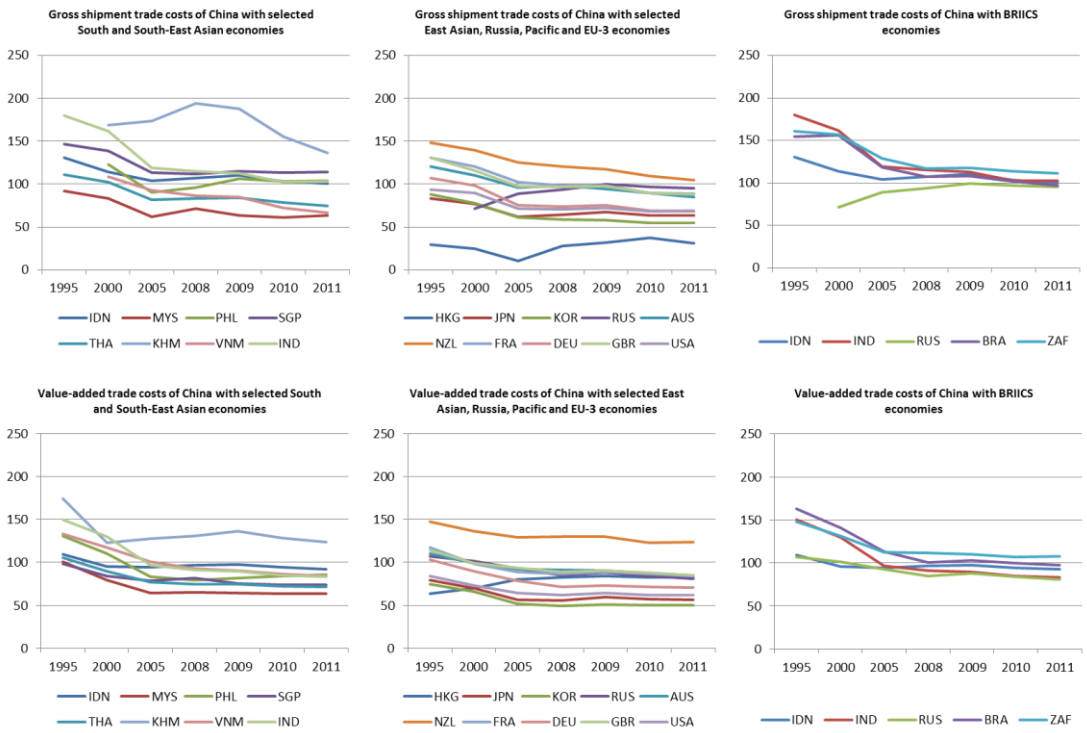
Notes: Figure 3 shows trade costs between each country and China measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

3.2 Evolution of trade costs (goods)

Thus so far, we have analysed bilateral trade costs with China – and the United States in the Appendix – cross-sectionally for a single year – 2011. In this section, we explore bilateral trade costs over time, specifically over the years for which data is available: 1995, 2000, 2005, and from 2008 to 2011. In Figure 4, an important stylised fact is immediately apparent: trade costs in the goods market as a whole are declining over time and the declining pace is similar in both datasets. This fall in trade costs is also observed across the manufacturing sector (Appendix A5) and agricultural sector (Appendix A6); however it is shown to be faster in the former and slower in the latter. A previous study (see Arvis et al, 2013) found that trade costs in the manufacturing sector were declining over

time, however had stagnated in the agricultural sector. We yield similar conclusions using gross shipment trade costs however when using value added trade costs, we find that trade costs overall are indeed declining over time, though at a slower rate than the manufacturing sector.[18]

Figure 4: Evolution of trade costs with China in the goods sector



Notes: Figure 4 shows trade costs between each country and China measured using gross output and gross shipment and gross output data and value added data. The former trade costs are from the ESCAP World Bank Trade Cost database and the latter trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005 and from 2008 to 2011.

3.3 Intra-regional and inter-intra-regional trade costs (goods)

Having identified significant cross-country heterogeneity in calculations of trade costs, we continue the investigation by comparing trade costs both within and between regional groups and countries. Our benchmark groups include: ASEAN-4 (Indonesia, Malaysia, Philippines, and Thailand), Developed Pacific (Australia and New Zealand), East Asia-3 (China, Japan, and Republic of Korea), EU-3 (France, Germany and United Kingdom), India and the United States. In Table 2 we present intra-regional and inter-regional trade costs calculated using both gross shipment data and value added data.

18 The faster decline in manufacturing trade costs may be explained by the fact that GVC activity is more intense in this sector.

Intra-regional East Asia-3 value added trade costs are the lowest across all regional groups, and even lower than intra-regional EU-3 trade costs from 2005 onwards.[19] This suggests that East Asia-3 economies have substantially higher levels of value added intra-regional trade than inter-regional trade. Interestingly, intra-regional ASEAN-4 value added trade costs are actually higher than inter-regional ASEAN-4 to East Asia-3 value added trade costs. This implies that ASEAN-4 economies trade more inter-regionally with East Asia-3 than they do with each other. The highest inter-regional value added trade costs for all regions are found to be with Developed Pacific economies – largely attributable to the distance from other countries – in contrast to previous studies (see Duval and Utoktham, 2011).[20] High value added trade costs are also observed with all regional groups with India. Nevertheless, value added trade costs have declined from 1995 to 2011 between many intra-regional and inter-regional groups.

There are important differences using gross shipment trade costs. Intra-regional EU-3 trade costs are lowest across all regional groups. Intra-regional ASEAN-4 trade costs are broadly similar to inter-regional ASEAN-4 to East Asia-3 trade costs. The highest inter-regional trade costs across all regions are also typically observed with India – not with Developed Pacific countries as seen with value added trade costs. This suggests that India is performing better in terms of value trade costs but comparatively worse in terms of gross trade costs. In contrast, Developed Pacific economies are performing better in gross trade cost terms, however worse in value added trade costs. This may be partly due to the fact that Australia trade is dominated by exports of metals and minerals, which are characterized by high domestic value added but lower indirect export value added.

3.4 Trade costs and integration in to global value chains (goods)

Value added trade costs in principle better reflect the impact of global supply chains, and our dataset provides us with a unique opportunity to explore the relationship between

19 This finding is consistent with Arvis et al (2013) and APTIR (2013) which find that East Asian economies are typically characterized by lower trade costs than other countries and regional groups.

20 Battersby and Ewing (2005) find that Australia and New Zealand are the most remote developed economies in the world.

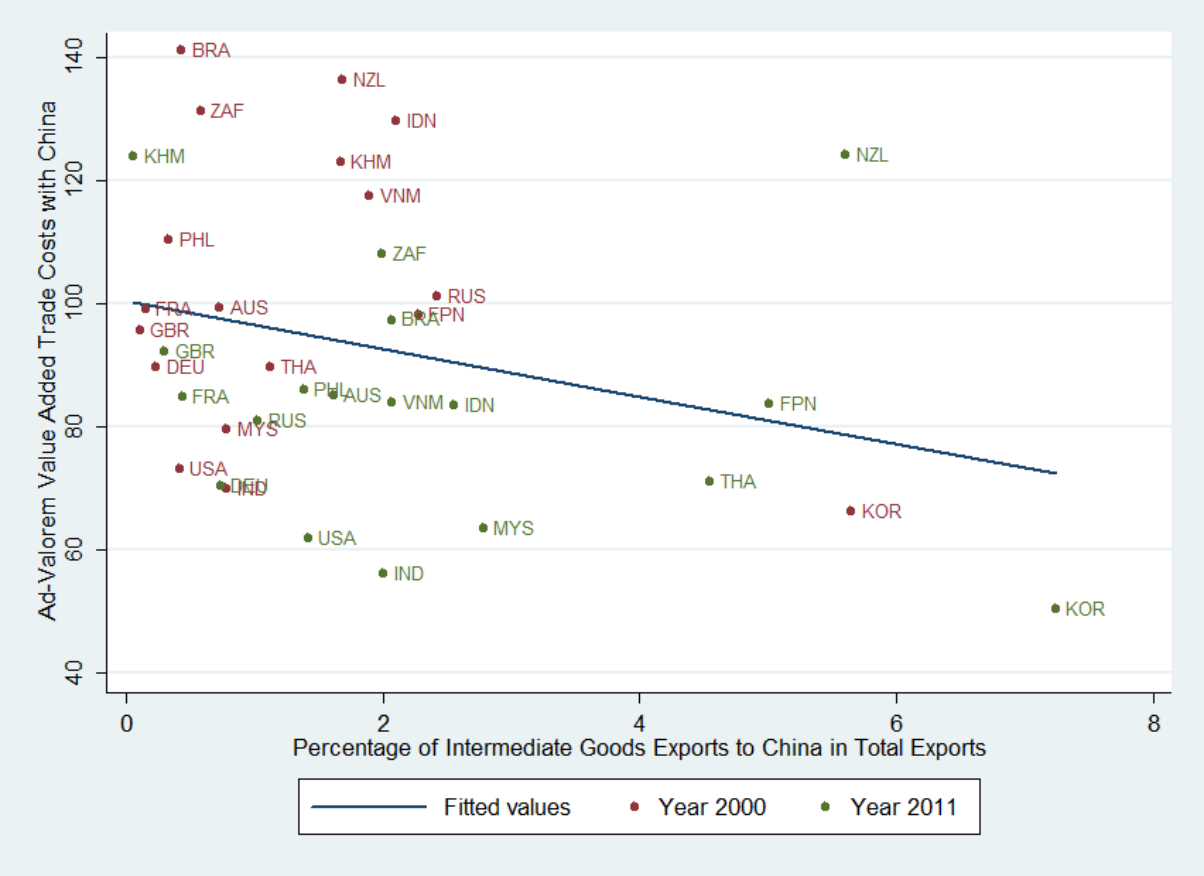
value added trade costs and integration in to global value chains. Figure 5 shows value added trade costs between each country and China in 2000 and 2011, plotted against intermediate goods exports to China as a share of total exports of each country – a proxy for integration in global value chains. We find that across most economies, as participation in global value chains increases, value added trade costs decline. For example, as the Republic of Korea's intermediate goods exports to China increased from 5.7% of total exports in 2000 to 7.5% in 2009, value added trade costs declined. This is a pattern reflected in almost every economy in the chart. It implies that lower value added trade costs is clearly associated with greater participation in global value chains – in terms of greater exports of intermediate goods.

Table 2: Intra-regional and inter-regional trade costs in the goods sector

Region	Year	Gross shipment						Value added					
		ASEAN-4	East Asia-3	IND	AUS-NZL	EU-3	USA	ASEAN-4	East Asia-3	IND	AUS-NZL	EU-3	USA
ASEAN-4	1995	87	93	133	114	107	85	118	105	160	139	129	97
	2000	78	88	136	109	111	80	99	92	149	136	125	91
	2005	73	82	126	111	116	86	97	88	133	139	131	97
	2008	84	86	120	110	124	92	98	86	123	134	131	99
	2009	84	86	121	112	122	95	100	89	122	141	134	104
	2010	82	83	117	110	118	94	95	86	118	134	134	103
	2011	82	82	115	107	118	95	98	88	118	134	134	105
East Asia-3	1995	93	82	155	115	114	79	105	78	148	125	113	78
	2000	88	75	151	110	106	76	92	70	142	124	103	72
	2005	82	64	128	106	98	73	88	59	115	123	99	72
	2008	86	64	117	105	98	73	86	57	103	119	95	71
	2009	86	64	117	102	99	74	89	61	106	122	100	76
	2010	83	61	111	99	93	71	86	59	101	118	98	73
	2011	82	60	110	96	91	71	88	58	101	119	96	73
IND	1995	133	155		169	127	122	160	148		180	144	130
	2000	136	151		165	127	119	149	142		180	141	127
	2005	126	128		154	116	110	133	115		160	124	112
	2008	120	117		147	109	99	123	103		154	113	99
	2009	121	117		140	112	105	122	106		150	117	99
	2010	117	111		141	109	103	118	101		143	114	96
	2011	115	110		140	105	100	118	101		148	113	94
AUS-NZL	1995	114	115	169	58	128	111	139	125	180	78	147	124
	2000	109	110	165	54	125	102	136	124	180	82	151	124
	2005	111	106	154	55	120	103	139	123	160	81	149	130
	2008	110	105	147	56	120	104	134	119	154	82	147	128
	2009	112	102	140	54	119	105	141	122	150	83	154	136
	2010	110	99	141	53	118	105	134	118	143	78	151	130
	2011	107	96	140	52	113	103	134	119	148	79	148	129
EU-3	1995	107	114	127	128	53	84	129	113	144	147	70	89
	2000	111	106	127	125	47	74	125	103	141	151	68	81
	2005	116	98	116	120	45	74	131	99	124	149	69	86
	2008	124	98	109	120	47	73	131	95	113	147	68	83
	2009	122	99	112	119	47	76	134	100	117	154	71	86
	2010	118	93	109	118	44	74	134	98	114	151	69	86
	2011	118	91	105	113	41	73	134	96	113	148	67	84
USA	1995	85	79	122	111	84		97	78	130	124	89	
	2000	80	76	119	102	74		91	72	127	124	81	
	2005	86	73	110	103	74		97	72	112	130	86	
	2008	92	73	99	104	73		99	71	99	128	83	
	2009	95	74	105	105	76		104	76	99	136	86	
	2010	94	71	103	105	74		103	73	96	130	86	
	2011	95	71	100	103	73		105	73	94	129	84	

Notes: table 2 shows trade costs between each regional group/country measured using gross output data and value added data. The result is calculated by using simple average trade cost. The gross shipment trade costs are from the ESCAP World Bank Trade Cost database and the Value-added are calculated using approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005 and from 2008 to 2011.

Figure 5: Trade costs and global value chains



Notes: Figure 5 shows a scatter plot of trade costs between each country and China measured using value added data and the percentage of intermediate goods exports to China as a percentage of total exports of each country. The trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 2000 and 2009. The classification of intermediate goods is based on Systems of National Accounts (SNS) by the United Nations Statistics Division (2011) and data is obtained from United Nations Comtrade data accessed through WITS (accessed August 2016).

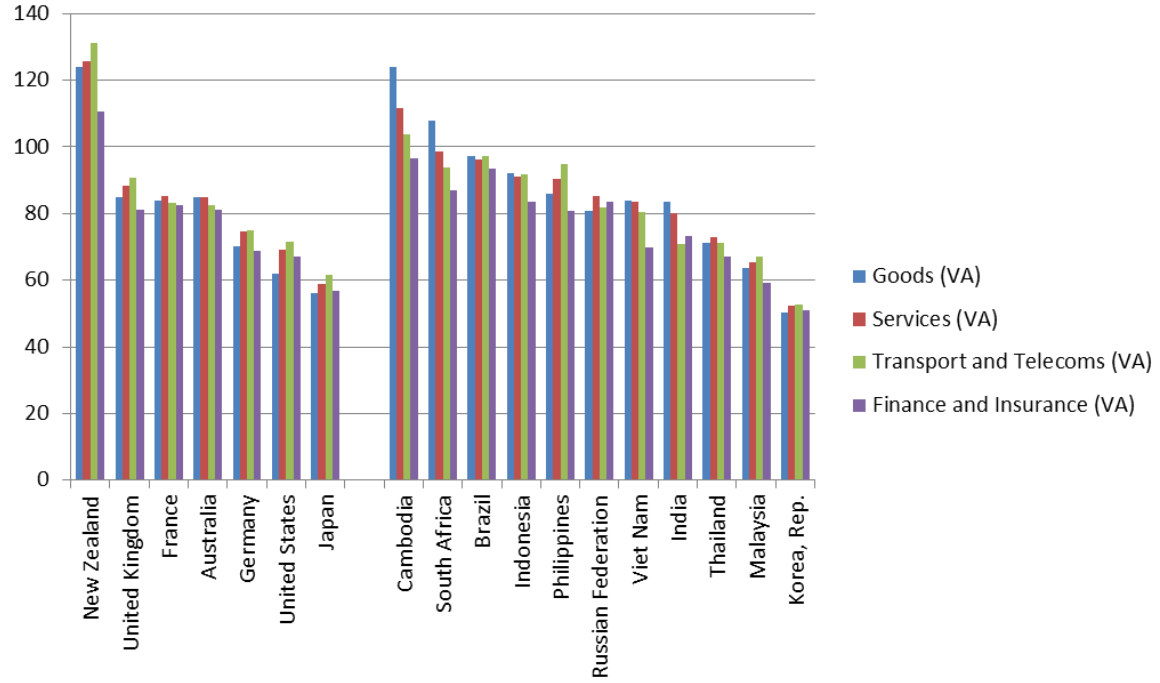
3.5 Trade costs in services

The analysis so far has focused on merchandise trade; however the services sector is also an important component of the global economy. In fact, UNCTAD (2014a, b) reports that global services exports account for around 20% of total goods and services trade, increasing by 5.5% in 2013 alone. This share is found to be even greater across developing economies, with the services sector accounting for around 51.4% of GDP in 2010. We continue the analysis by calculating trade costs in the services sector of trade. It is important to quantify trade costs in the services sector to assist policy makers in making evidence-based decisions about why trade costs vary across countries and sectors. This is necessary to understand the nature and tractability of trade costs, particularly if the international

division of labour continues over time, and global value chains become increasingly important in terms of trade.

The calculation of trade costs in the services sector has been heavily constrained by the lack of data on national gross output, but also by limitations in quality and availability of services trade data.[21] We build upon existing studies by calculating trade costs using bilateral services trade data from the OECD-WTO TiVA database and commonly available national sectoral GDP data.

Figure 6: Trade costs with China in the goods, services, transport and telecoms, and finance and insurance sectors, 2011



Notes: Figure 6 shows trade costs between each country and China measured using gross and value added data. The trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs – service sector. (VA) denotes value added data. Transport and Telecoms; Finance and Insurance; Total services are denoted as C60T64, C65T67 and C50T95 in TiVA database.

In Figure 6 we present value added trade costs in the goods and services sectors. We also show value added trade costs for sub-industry sectors within the services industry: transport and storage, post and telecoms, and finance, real estate and business services. An important stylised fact which emerges is that on average, across both developed and

21 Miroudot et al. (2013) use pure cross-border services trade data - which involve movement of the consumer through GATS Modes 1 and 2 – in their first evaluation of services trade costs.

developing economies, value added trade costs tend to be higher in the services sector compared to the goods sector.[22] In contrast to sub-sector industries for goods trade (e.g., agriculture vs. manufacturing), differences in value added trade costs across services sub-sectors (e.g., transport and telecoms vs. finance and insurance) also tend to be more limited.

Despite the similarities across sub-sectors, notable observations can be made. We find that value added trade costs in transport and telecoms are higher than services as a whole across most economies – particularly in the New Zealand and the Philippines. Meanwhile another subsector of services sector – Finance and Insurance has the lowest value added trade costs in general. In line with the goods sector, we find overall that lower trade costs in the services sector are observed in East Asia-3 economies while higher trade costs are typically observed across BRICS economies. These findings are consistent with using the United States as a reference country (Appendix A7).

Table 3: Intra-regional and inter-regional value added trade costs in the services sector

Region	Year	ASEAN-4	East Asia-3	IND	AUS-NZL	EU-3	USA
ASEAN-4	1995	119	105	159	139	133	107
	2000	103	94	146	135	128	98
	2005	96	88	126	135	131	105
	2008	97	86	115	132	135	110
	2009	100	89	113	142	138	116
	2010	97	87	108	136	137	114
	2011	100	88	106	135	136	116
East Asia-3	1995	105	80	147	124	115	83
	2000	94	72	137	122	106	77
	2005	88	62	116	120	100	78
	2008	86	60	105	115	96	77
	2009	89	63	105	120	101	81
	2010	87	61	101	116	99	79
	2011	88	61	99	118	98	78
IND	1995	159	147		177	145	135
	2000	146	137		173	136	130
	2005	126	116		144	116	111
	2008	115	105		149	109	104
	2009	113	105		149	114	104
	2010	108	101		140	107	99
	2011	106	99		140	102	94
AUS-NZL	1995	139	124	177	79	144	128
	2000	135	122	173	77	145	123
	2005	135	120	144	82	145	134
	2008	132	115	149	79	145	129

22 The only other study to calculate trade costs in the services sector is by Miroudot et al (2010). Their study finds that trade costs in the services sector are 2-3 times that observed in the goods sector. The sharp difference with our results may be attributable to the data employed in each study. Our calculations present more muted differences in trade cost calculations for the services sector compared to the goods sector.

Region	Year	ASEAN-4	East Asia-3	IND	AUS-NZL	EU-3	USA
	2009	142	120	149	85	152	137
	2010	136	116	140	83	148	131
	2011	135	118	140	83	146	128
EU-3	1995	133	115	145	144	73	91
	2000	128	106	136	145	70	83
	2005	131	100	116	145	71	85
	2008	135	96	109	145	71	83
	2009	138	101	114	152	74	87
	2010	137	99	107	148	72	86
	2011	136	98	102	146	70	85
USA	1995	107	83	135	128	91	
	2000	98	77	130	123	83	
	2005	105	78	111	134	85	
	2008	110	77	104	129	83	
	2009	116	81	104	137	87	
	2010	114	79	99	131	86	
	2011	116	78	94	128	85	

Notes: Figure 3 shows trade costs between each regional group/country and China measured using gross output and gross shipment and gross output data and value added data. The former trade costs are from the ESCAP World Bank Trade Cost database and the latter trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005, from 2008 to 2011.

Table 3 presents intra-regional and inter-regional value added trade costs between countries and regions in the services sector. It shows that intra-regional East Asia-3 to East Asia-3 value added trade costs in the services sector are the lowest across all regional groups and countries, and even lower than EU-3 to EU-3 trade costs from 2005 onwards. In addition, intra-regional ASEAN-4 to ASEAN-4 value added trade costs are found to be higher than inter-regional ASEAN-4 to East Asia-3 and ASEAN-4 to USA trade costs. Inter-regional trade cost with India has highest value from 1995 to 2000 then Developed pacific economies get this position from 2005 onward. The most striking feature of this intra-inter-regional trade cost matrix is the similarity with the goods sector. The overarching conclusions yielded for the goods sector in Table 2 remain the same in the services sector.

4. Conclusions

A dataset of bilateral value added trade cost was developed using data from the OECD-WTO TiVA database, covering 34 OECD countries and 27 developing countries over seven years between 1995 and 2011. A subset of this bilateral trade cost data, covering 15 developing Asian countries and 5 out-of the region reference countries, was analysed in some details in this paper.[23]

This first analysis of value-added trade cost resulted in findings that were generally very consistent with those obtained from analysis of international trade costs calculated on the basis of gross shipment and output data, as in the ESCAP-World Bank Trade Cost Database. While year and country coverage remains too limited, in particular to conduct relevant analysis for less and least developed countries, the value-added trade costs dataset enabled analysis of trade costs for both goods and services at a more disaggregated level, while also better accounting for the importance of value addition and global supply chains.

Looking forward, while indeed recent work by Noguera (2013) and Miroudot and Shepherd (forthcoming) suggest that the the inverse gravity model trade cost formula used in this paper is applicable in the value added trade context, it would be useful to further strengthen the theoretical micro-foundation of the measure in that particular context. In addition, more work will be needed in interpreting and presenting the value-added trade cost data, as it may indeed be better understood and interpreted as a trade or global value chain (GVC) connectivity indicator rather than as trade cost in the traditional sense.[24]

From a regional perspective, it will be important to extend the dataset and analysis to cover South and Central Asian countries, in particular since previous studies using data in gross term found these two regions to be characterised by high trade costs. In the meantime, on the basis of existing data, more detailed analysis will be needed, including the

23 The dataset for this study is available in the Data Appendix and the full dataset for all 56 countries is available for public useat http://artnet.unescap.org/databases.html#first .

24 This comment is in fact applicable to all trade costs calculated using the Novy formula, given that they capture overall trade frictions between partner countries. However, it is even more relevant in the context of value added trade costs, as several cost components (e.g., transport) apply to the overall value and volume of goods rather than to its value-added.

development and estimation of an econometric model of value added trade costs will be important to identify specific sources and factors of costs and their relative importance.

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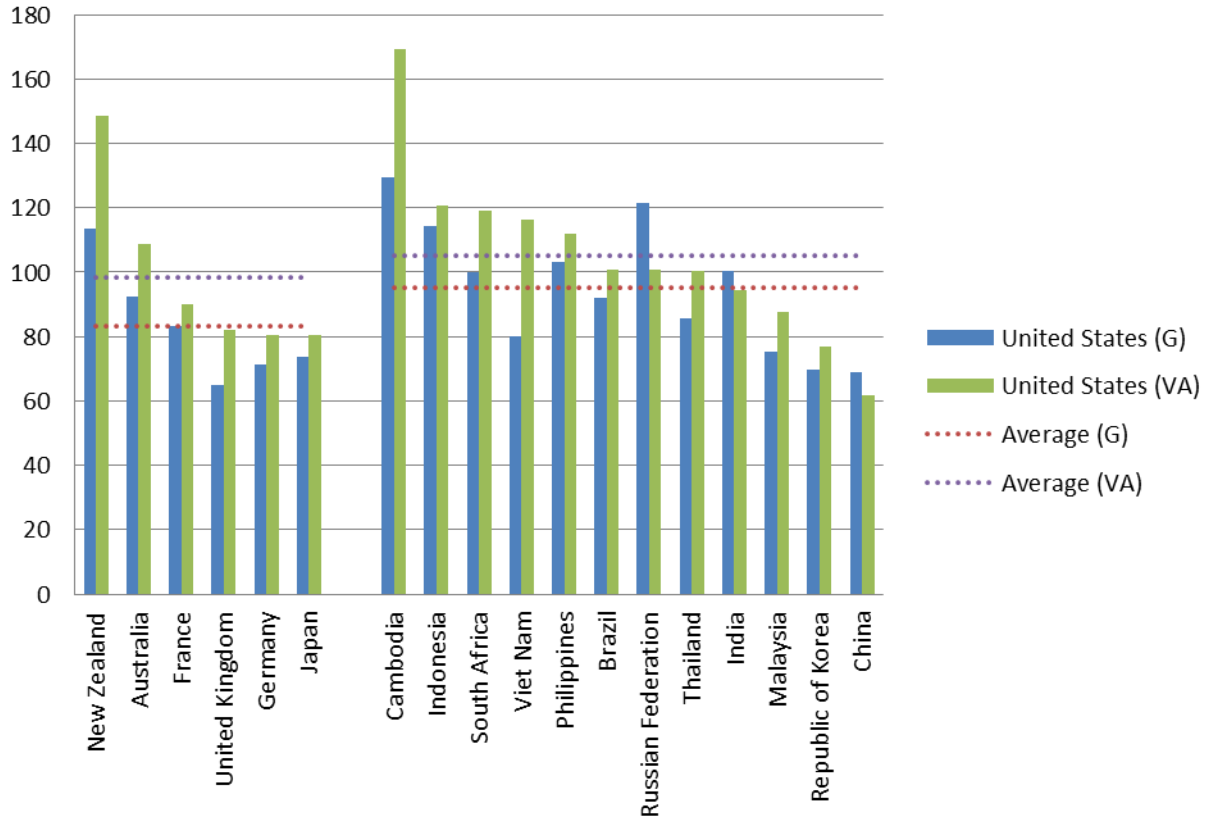
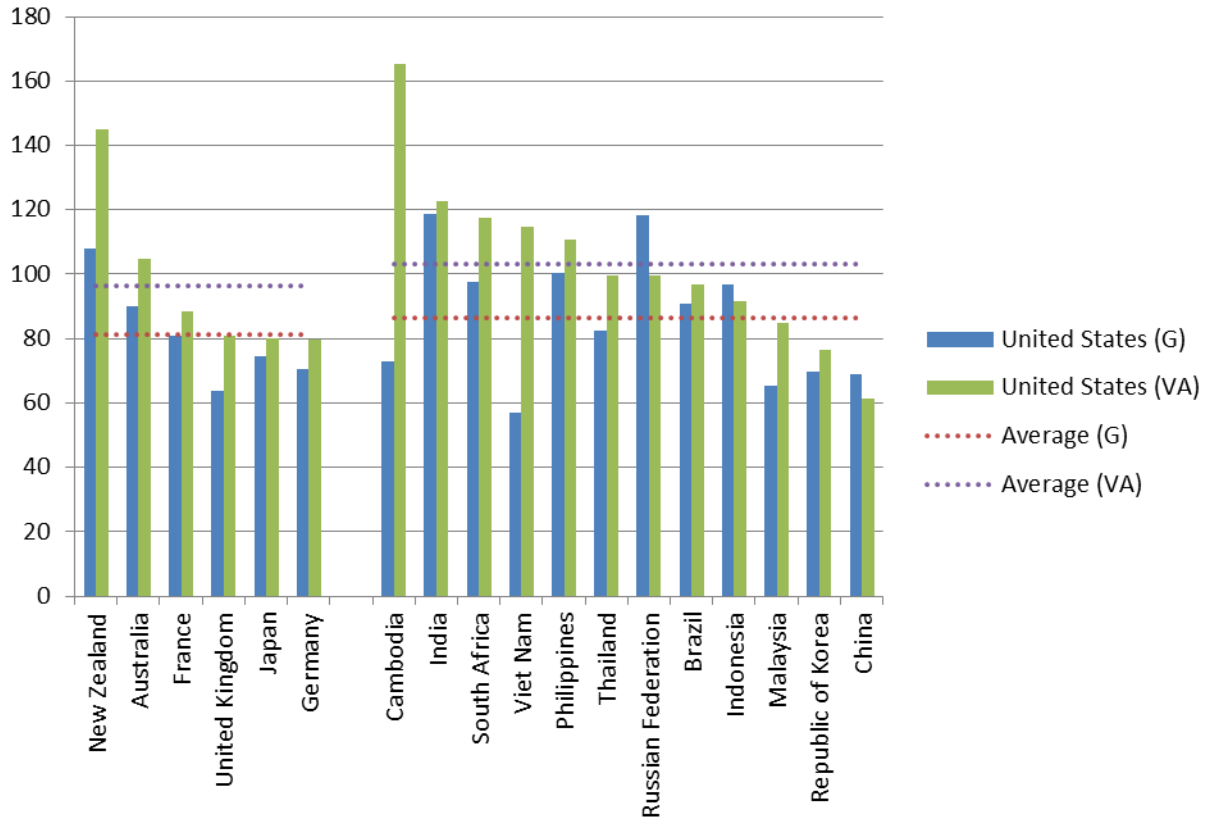
APPENDIX

Figure A 1: Trade Costs with the United States in the goods sector, 2011



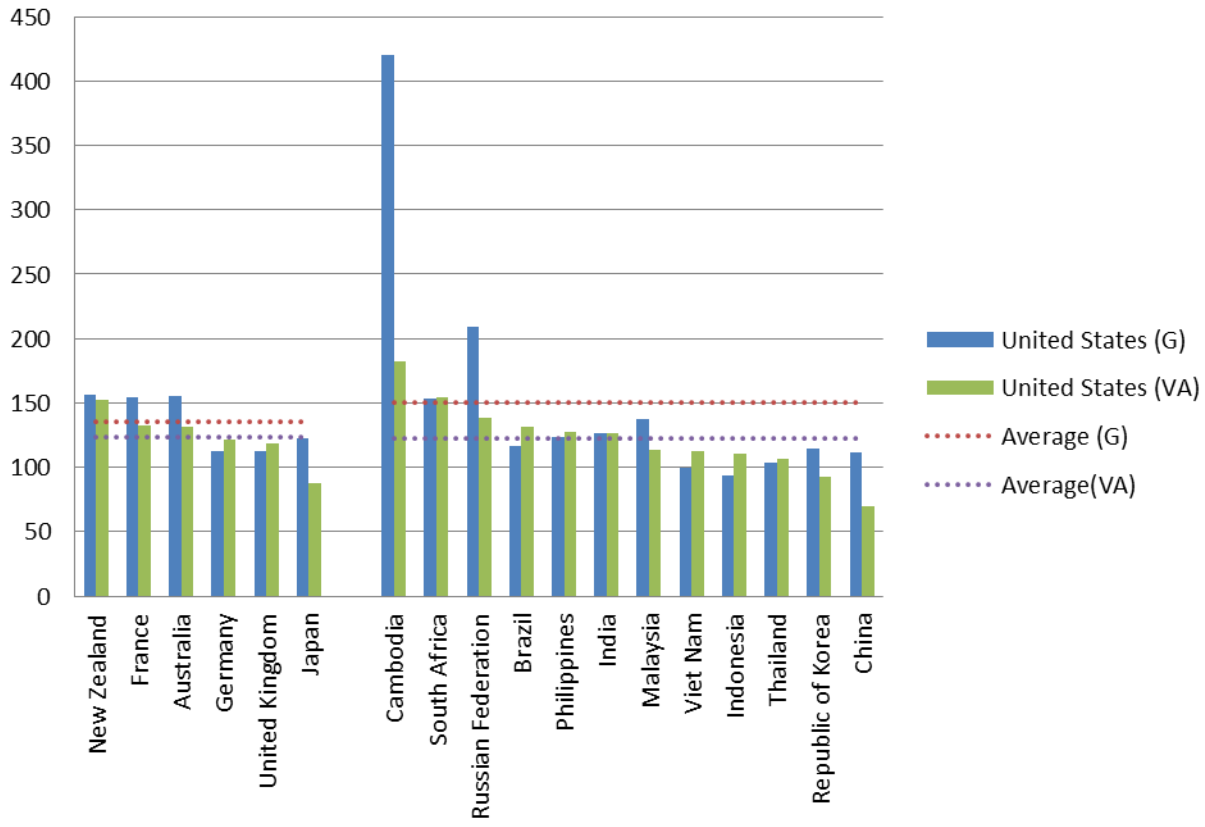
Notes: Figure A1 shows trade costs between each country and the United States measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

Figure A 2: Trade Costs with the United States in the manufacturing sector, 2011



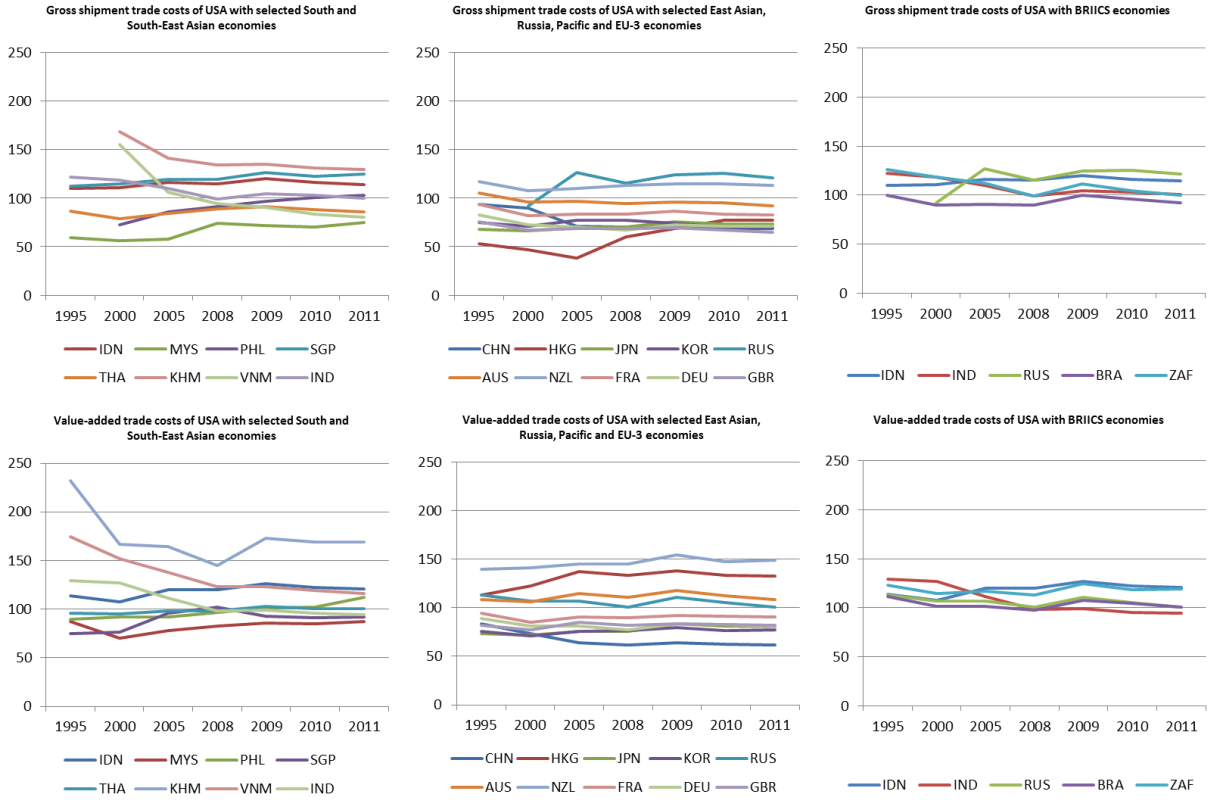
Notes: Figure A2 shows trade costs between each country and the United States measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

Figure A 3: Trade Costs with the United States in the agricultural sector, 2011



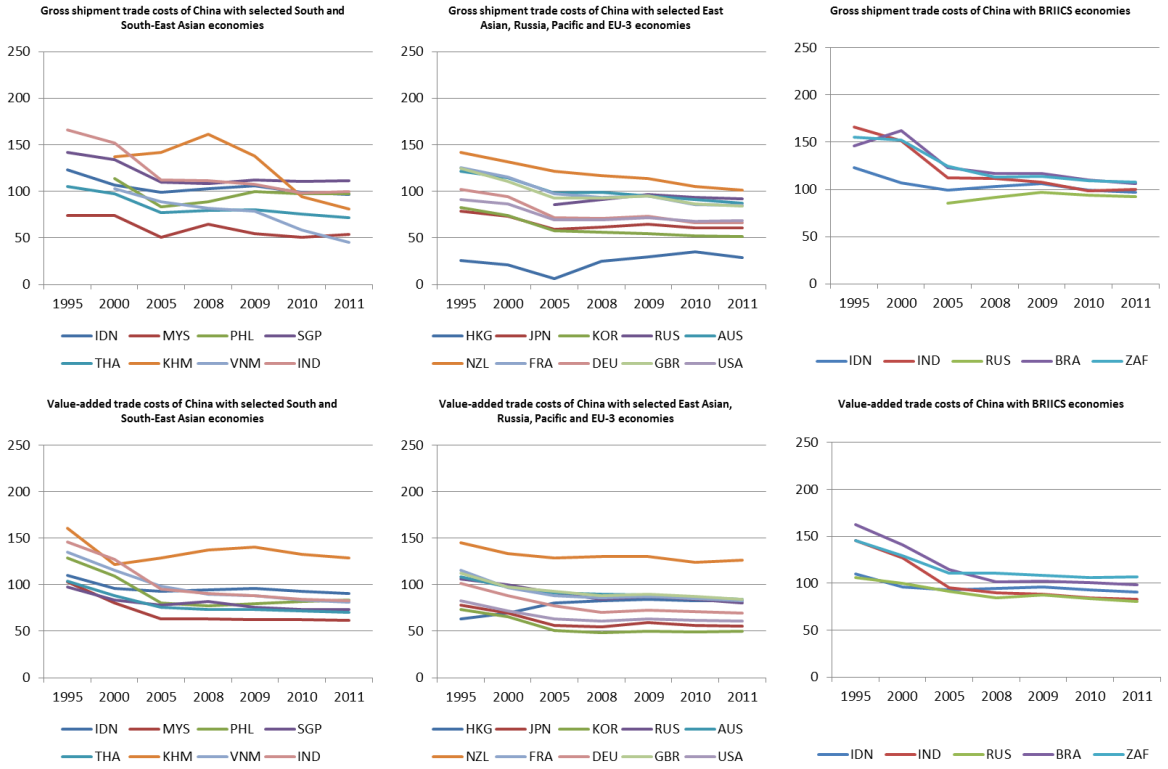
Notes: Figure A3 shows trade costs between each country and the United States measured using gross output and gross shipment and gross output data (blue bar) and value added data (green bar). The former trade costs (blue bar) are from the ESCAP World Bank Trade Cost database and the latter trade costs (green bar) are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs. (G) denotes gross shipment data and (VA) denotes value added data.

Figure A 4: Evolution of Trade Costs with the United States in the goods sector



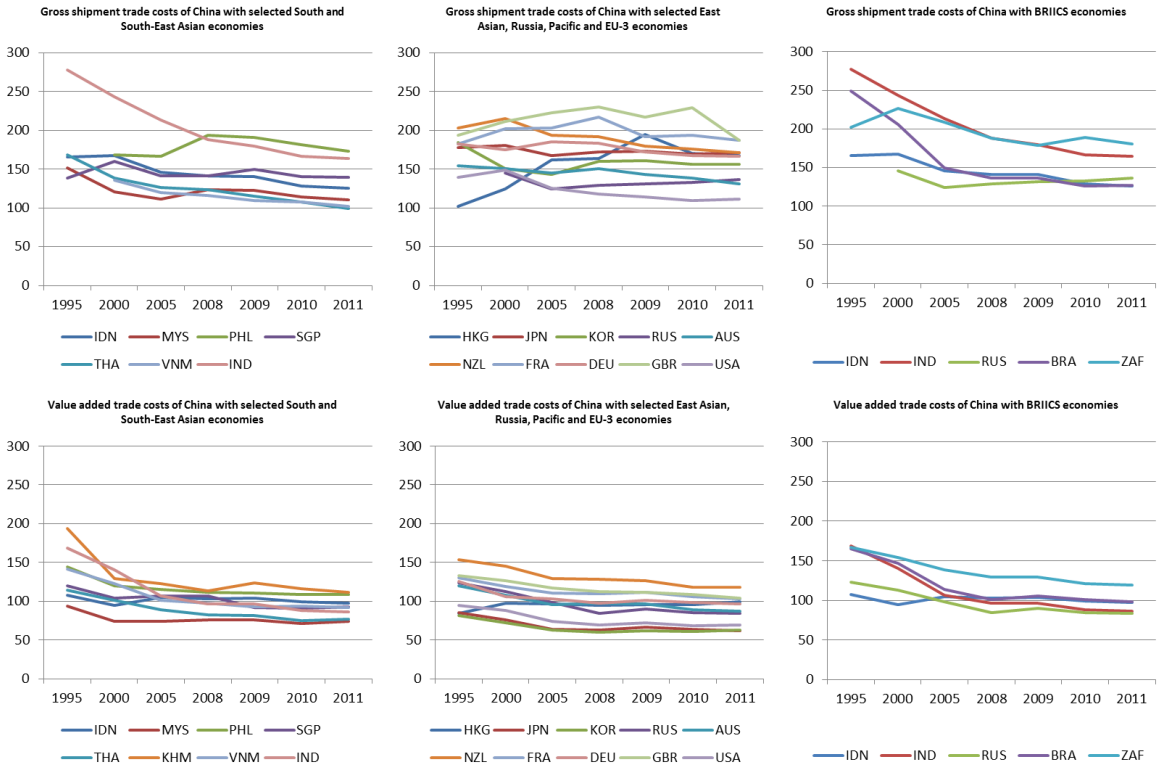
Notes: Figure A4 shows trade costs between each country and the United States measured using gross output and gross shipment and gross output data and value added data. The former trade costs are from the ESCAP World Bank Trade Cost database and the latter trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005 and from 2008 to 2011.

Figure A 5: Evolution of Trade Costs with the China in the manufacturing sector



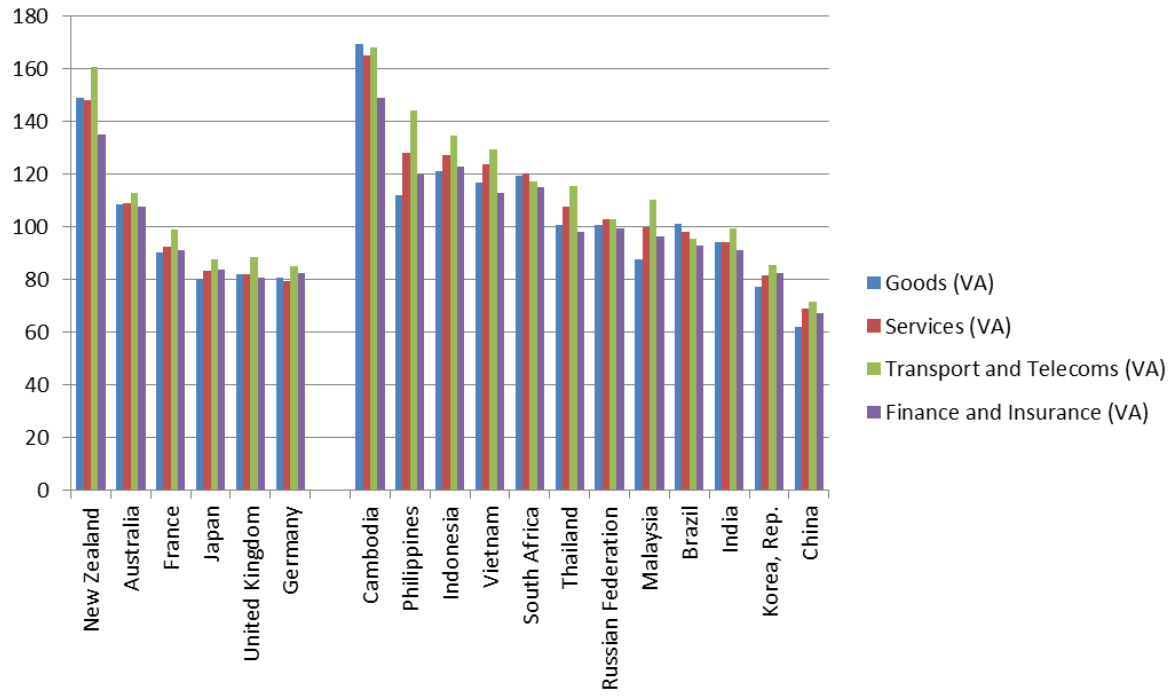
Notes: Figure A4 shows trade costs between each country and China measured using gross output and gross shipment and gross output data and value added data. The former trade costs are from the ESCAP World Bank Trade Cost database and the latter trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005 and from 2008 to 2011.

Figure A 6: Evolution of Trade Costs with China in the agricultural sector



Notes: Figure A6 shows trade costs between each country and China measured using gross output and gross shipment and gross output data and value added data. The former trade costs are from the ESCAP World Bank Trade Cost database and the latter trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database over the years: 1995, 2000, 2005 and from 2008 to 2011.

Figure A 7: Trade Costs with the United States in the services, transport and telecoms, and finance and insurance sectors, 2011



Notes: Figure A7 shows trade costs between each country and the United States measured using gross and value added data. The trade costs are calculated using the approach of Novy (2013) with data from the OECD-WTO TiVA database. The countries are separated by developed and developing economies, as defined by the United Nations, and ranked from highest to lowest in terms of value added trade costs – service sector. (VA) denotes value added data. Transport and Telecoms; Finance and Insurance; Total services are denoted as C60T64, C65T67 and C50T95 in TiVA database.

DATA APPENDIX

The data appendix contains bilateral, intra-national, and inter-regional Trade Costs, computed using gross shipment data as well as value added trade data. Trade costs in gross terms are taken directly from the ESCAP-World Bank Trade Costs database, while value added trade costs are calculated using data from the OECD-WTO Value added (TiVA) database. The data appendix for the original (May 2015) version of the paper is available for download at:

http://www.unescap.org/sites/default/files/Appendix_Working_Paper_0115.pdf

Kindly note that we also make available the full datasets of value-added trade costs for all 61 countries available in TiVA on the ARTNeT website at: http://artnet.unescap.org/databases.html#first . We make this data free for public and private use. However, we kindly request that you cite the related ESCAP TID Staff Working Paper upon use.

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