CAPTURING THE GAINS

economic and social upgrading
in global production networks

Capturing the *jobs* from globalization:

trade and employment in global value chains

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Abstract

With the steady growth of global value chains (GVCs), each country's trade now has a more complex relationship with the international division of labor. We decompose the employment effects of a country's trade into five components, specifically the labour content (1) in exports, (2) in imports, (3) in the import content of exports, (4) in the export content of imports and (5) in intermediates contained in imports. The last three components relate strictly to a country's participation in GVCs. With the availability of World Input-Output Database (WIOD), we are able to compute the amount of employment generated by each component for 39 countries over 1995-2009. On the aggregate level, final goods trade generated demand for about 538 million jobs in 2009, and GVC trade produced demand for about 88 million jobs. The countries with the greatest GVC-based labour demand are Germany, the US, China, the Netherlands and France. The only emerging developing economy that comes close to them in this respect is China. The countries with the largest positive *difference* between domestic and foreign labour demand are China, India, Indonesia and Brazil. On the other hand, the countries with greatest negative difference between domestic and foreign labour demand are the US, Germany and Japan. For the full sample in 2009, the import content of exports led to the demand for about 44 million jobs. Third-party intermediates contained in imports generated labour demand of about 39 million jobs. And the export content of imports created demand for about 5 million jobs. Using the data on 'hours worked by skill type' in the Social Economic Accounts, we find that, on a global scale, vertical specialization contained significantly more medium-skill and low-skill than high-skill labour content.

Keywords: Global value chains, employment, industrial upgrading, policies

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Abbreviations

CPRC	Chronic Poverty Research Centre
DFID	Department for International Development
ESRC	Economic and Social Research Council
GDP	Gross Domestic Product
GVC	Global Value Chain
H-O	Heckscher-Ohlin
ILO	International Labour Organization
OECD	Organisation for Economic Co-operation and Development
SCI	Sustainable Consumption Institute
UK	United Kingdom
UN	United Nations
UNCTAD	UN Conference on Trade and Development
US	United States
WIOD	World Input-Output Database
WTO	World Trade Organization

Introduction

International trade economists have recognized the importance of global value chains (GVCs) for trade theory and for the measurement of trade, but there has been little systematic research on the employment effects of trade in GVCs. Participation in GVCs is often characterized by countries specializing in some particular segment of a production process rather than in final products. Empirically, the phenomenon is documented by a rise in trade in intermediates, or 'vertical specialization' (when traded intermediates are used for further exporting).[1]

With the prevalence of trade in GVCs, the relationship between trade and employment becomes more complicated. The labour content associated with a country's foreign trade is no longer simply of two kinds – domestic labour contained in exports and foreign labour contained in imports. With the addition of GVC trade, there are five categories of employment to consider. In addition to the aforementioned two, we also must include (3) foreign labour contained in exports, (4) domestic labour contained in imports and (5) third-country labour contained in a country's imports. Recent publication of a World Input-Output Database (WIOD)[2] allows us to calculate all five categories of employment generated by trade over the period 1995-2009 for a panel of countries that cover 85 percent of world gross domestic product (GDP).[3] We find that, in 2009, the countries in our panel generated about 88 million jobs worldwide through their participation in GVC trade, which is about 14 percent of the total number of jobs generated by international trade that year. Countries that demanded the most labour as a result of GVC trade are the large developed economies with the exception of China. Regarding the import content of exports, we find that, in 2009, this led to the demand for about 44 million jobs within the 39 countries. Third-party intermediates contained in imports[4] generated labour demand of about 39 million jobs. And the export content of imports created demand for about 5 million jobs.

The purpose of this research is to address the question of employment in GVCs in a more systematic fashion. There is a tension in the GVC approach to industrial upgrading with respect to employment, since upgrading can bring employment declines, with the detrimental social consequences this can entail. This paper thus provides a simple methodology and some baseline magnitudes for understanding the employment implication of GVCs. Specifically, we first explain the five-part decomposition of the employment effects of trade. Second, we introduce the WIOD. Third, we report and analyse the results of our employment calculations. We conclude with a discussion of some policy implications of our findings.

The five components of labour demand in a country's trade

In a world where GVCs are absent, countries engaging in trade would be exporting and importing final goods and services only. In this world, a country's foreign trade only contains two components – final exports and imports. Moreover, since exports generate domestic income, and imports

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[1] Miroudot et al. (2009) report that trade in intermediates accounted for almost 60 percent of world trade in goods in 2007, up from just over 50 percent in 1999. On vertical specialization, see Jiang and Milberg (2012).
[2] See Timmer (2012) for details on the WIOD.
[3] This is an area of ongoing work by various international organizations, including the Organisation for Economic Co-operation and Development (OECD) (Measuring Trade in Value-Added initiative, 2011), the International Labour Organization (ILO) (Jiang 2013), the World Trade Organization (WTO) (Made in the World initiative, 2012), the World Bank (Erumban et al. 2011) and the UN Conference on Trade and Development (UNCTAD) (UNCTAD 2013). The UNCTAD World Investment Report, coming out in August 2013, will focus on this.
[4] Later, we refer to this as 'third-party intermediates trade'.

generate foreign income, and income in turn creates jobs, then exports and imports are the only sources of employment creation from international trade.

Let us now consider a more realistic case – a world with GVCs. In this world, countries are trading with each other not just in final goods and services for the purpose of consumption, but also in intermediate goods and services for the purpose of further production. In this world – alternatively called fragmentation, vertical specialization and trade in tasks – exports and imports are intertwined. A country's exports might contain foreign imports as intermediates, and its imports from foreign countries might also contain its own exports to these countries as intermediates. In sum, we can decompose a country's trade into five components. The first two are exports and imports of final goods, and the three additional ones are the result of a country's participation in global production networks. We describe the three additional components in more detail below.

Import content of exports
A country's exports might contain imports from other countries as intermediates. For example, a country is an exporter of cheese, but to produce the cheese for exporting this country might import milk from abroad as an intermediate input. The milk imported from foreign countries for the purpose of making cheese as exports is the 'import content of exports' for this sector/country. Another (well-documented) example is Nicaragua's importation of Chinese textiles used in the production of Nicaraguan apparel that is exported to the Brazil (see Bair and Gereffi 2001). In the international trade literature, this component is called 'vertical specialization' (Hummels et al. 2001; Jiang and Milberg 2012). As a result of the import content of exports, a country's exports generate jobs and incomes in foreign countries.

Export content of imports
The same logic can be applied in the reverse case. If a country imports cheese from foreign countries, those foreign cheese exporters might import milk from this country as an input. In other words, a country's imports from foreign countries might contain its own exports to those foreign countries as intermediate inputs. A well-documented example is the US export of semiconductors to China, which are used in the Apple iPod that the US imports from China for sale in the US (see Xing and Detert 2010). In this case, a country's imports generate jobs domestically.

Third-party intermediates trade
If a country imports cheese from a foreign country, but this foreign country imports milk from a different foreign country as an intermediate input, such trade generates additional trade when the cheese maker imports milk from abroad. We call this component the 'third-party intermediates trade' because it is two countries' trade that generates income in the third country. The income generated in the third country in turn creates jobs in that country.

To summarize, in a world with internationalized production processes, there are five distinct channels through which a country's trade can affect employment globally. Two are the standard impact of final goods and services exports and imports. The last three are uniquely the result of countries' participation in global supply chains. Each channel produces income and labour demand, domestically or internationally. Exports and the export content of imports generate demand for domestic labour. Imports, the import content of exports and third-party intermediates trade generate demand for foreign labour.

The empirical method and the WIOD

The newly published WIOD – which captures all the goods and services inputs required in each industry to generate national output in a country – makes it possible to actually calculate labour demand according to our five-part decomposition for many countries for the years 1995-2009. The WIOD represents a huge advance in internationally comparable data, providing not only bilateral final goods and services trade data by sector, but also data on trade in intermediate goods and services by sector. In order to know how much employment is generated from trade, we first have to know how much income is generated from trade using input-output analysis. Calculating the import content of exports (vertical specialization) also requires the input-output framework.[5] The WIOD also contains employment data consistent with the input-output sectoral specifications.

The WIOD has several unique features. First, it provides input-output tables and bilateral trade data for 40 countries, which comprises 85 percent of world GDP. Second, all the data are harmonized into 35 input-output sectors, making cross-country comparisons possible. Third, the bilateral trade data are split into intermediate and final goods traded, and traded intermediates are reported as intermediate trade in the basic flow matrix for each country. Fourth, a separate account called the Social Economic Accounts contains employment data in terms of number of persons engaged, total hours worked and total hours worked by skill types for every country and each of the 35 sectors. With these accounts, we can calculate labour coefficients, which allow us to extract labour content embodied in incomes generated by trade. Last but not least, all of the data from this database are provided annually for the 15-year period, 1995-2009. The final calculation thus includes 39 countries and 33 sectors.[6]

Calculations of employment demand from trade

Employment demand in the full decomposition

Table 1 presents the total employment generated in each of the five components of trade for the most recent year – 2009 – for each of the 39 countries. Sector-level information has been aggregated to a single employment figure for each country. We can view the total *domestic labour demand* for each country as the sum of labour demand by domestic exports and domestic content of imports. The sum of the rest is counted as the total *foreign labour demand* resulting from each country's trade position in 2009. If we sort the list by the difference between total domestic and foreign labour demand, we can see that, in 2009, most of the countries demanded more foreign labour than domestic labour through exports. The countries with the largest positive difference between domestic and foreign labour demand are China, India, Indonesia and Brazil, the four large emerging developing economies in our panel of 39 countries. On the other hand, the countries with greatest negative difference between domestic and foreign labour demand are the US, Germany and Japan, the three largest developed economies. It is perhaps worth pointing out here that these rankings do not necessarily correlate with the ranking of trade balances for these countries. The amount of jobs generated by the trade flow in a particular country's particular sector would depend on multiple factors such as the labour intensity of that sector and how integrated this sector is with

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[5] See Escaith et al. (2010), Hummels et al. (2001), Koopman et al. (2010), Meng et al. (2011) and WTO (2011).
[6] The method to make the calculations is a combination of regional input-output analysis (Miller and Blair 2009), factor-content analysis (Kucera and Milberg 2000, 2003; Sachs and Shatz 1994) and the computation of vertical specialization (Hummels et al. 2001; Jiang and Milberg 2012; Koopman et al. 2010). Some parts of the algorithm, such as the construction of the trade vector from the perspective of the home country, follow Stehrer et al. (2012). For a full description of the algorithm, see Jiang (2013).

the rest of the economy of that country. To further demonstrate this point, we calculated the Spearman and Kendall rank correlation coefficients for the list of net domestic jobs demanded and the list of net exports, and the results end up being negative and insignificant (-0.078 for Spearman and -0.084 for Kendall). These results show that the ranking of countries' net domestic job demands do not correlate with the ranking of countries' trade balances.

Table 1: Jobs generated by five components of foreign trade 2009 (thousands)

	Domestic labour		Foreign labour			Difference (domestic - foreign)
	Exports	Export content of imports	Imports	Import content of exports	Third-party imports in imports	
China	140,249.1	3,270.9	17,462.8	4,221.9	2,238.0	119,597.4
India	34,914.8	89.6	8,064.4	1,291.5	496.6	25,151.9
Indonesia	10,236.6	24.0	3,891.8	448.4	289.0	5,631.4
Brazil	7,143.3	21.9	3,210.6	168.8	486.7	3,299.0
Bulgaria	882.3	1.4	465.3	97.9	98.2	222.4
Romania	1,597.0	6.0	1,097.3	186.6	293.7	25.4
Latvia	162.2	0.7	161.0	23.1	51.4	(72.5)
Estonia	160.1	0.3	155.0	50.5	39.2	(84.3)
Malta	45.1	0.0	119.0	33.9	23.8	(131.5)
Cyprus	34.8	0.0	143.4	14.1	35.4	(158.1)
Lithuania	250.5	1.0	383.8	102.7	68.5	(303.5)
Slovenia	223.8	0.4	345.2	113.5	106.5	(340.9)
Mexico	6,054.1	46.7	4,317.6	1,590.4	848.1	(655.2)
Portugal	797.8	4.2	1,122.8	218.7	353.3	(892.8)
Slovak	738.4	4.9	977.2	458.0	264.7	(956.6)
Poland	3,592.6	26.9	3,149.1	911.0	747.0	(1,187.6)
Hungary	1,129.2	5.8	1,349.1	713.2	417.8	(1,345.1)
Finland	433.5	2.0	1,644.0	449.7	323.2	(1,981.4)
Czech	1,674.7	15.9	2,176.4	993.2	544.1	(2,023.2)
Turkey	2,056.6	6.2	3,146.6	456.5	506.2	(2,046.5)
Greece	204.9	0.8	1,807.2	83.4	386.6	(2,071.5)
Demark	529.4	3.4	1,974.9	463.1	542.5	(2,447.7)
Taiwan	3,119.7	23.2	3,807.2	1,681.9	517.2	(2,863.4)
Russia	6,532.3	47.3	8,398.5	225.3	897.5	(2,941.7)
Ireland	578.8	2.4	2,278.2	897.9	440.0	(3,034.9)
Sweden	828.5	6.7	2,520.9	697.5	694.6	(3,077.8)
Austria	942.3	8.9	2,575.1	734.4	739.2	(3,097.4)
Belgium	1,325.9	17.3	4,281.9	1,793.5	1,326.9	(6,059.2)
Australia	1,081.5	5.4	7,268.1	470.9	563.1	(7,215.2)
Spain	2,300.8	30.6	7,774.1	1,050.5	1,385.3	(7,878.4)
Italy	3,427.0	45.6	9,109.3	1,437.0	1,891.9	(8,965.6)
Canada	2,718.2	34.0	10,140.8	1,489.8	1,421.4	(10,299.8)
Korea	3,812.6	35.9	11,020.0	2,521.8	841.1	(10,534.4)
France	3,114.5	70.5	11,471.2	1,898.5	2,674.1	(12,858.8)
Netherlands	2,397.5	31.2	10,891.6	3,845.3	1,189.4	(13,497.7)
England	3,897.1	80.0	15,583.6	1,746.0	2,499.5	(15,852.0)
Japan	3,871.4	65.6	20,451.8	1,483.2	1,495.4	(19,493.2)
Germany	8,473.3	366.8	22,449.3	5,591.3	4,619.4	(23,819.8)
US	6,851.7	510.9	61,198.0	3,101.0	6,484.2	(63,420.6)
Total	**268,383.9**	**4,915.2**	**268,383.9**	**43,755.9**	**38,840.7**	**(77,681.4)**

Source: Authors' own calculations, based on the WIOD.

The results in Table 1 can be broken out into labour demand from final goods trade and labour demand from trade in intermediates, that is, the results of GVC participation. The first category is the sum of the final imports and exports columns in Table 1, and the sum of the other three columns is the second category. The results are shown in Table 2 below, sorted by labour demanded through GVC trade in descending order.

On the aggregate level, final goods trade generated demand for about 538 million jobs in 2009, and GVC trade produced demand for about 88 million jobs for our panel of 39 countries.

At the level of individual countries, the countries that demanded the highest amounts of labour from GVC trade are Germany, US, China, the Netherlands and France. That is, large and developed countries tend to be most responsible for GVC-based labour demand, and the only emerging developing economy that comes close to them in this respect is China. This distinguishes China from other emerging developing economies such as India, Brazil, Indonesia and Mexico. We can conclude that, while it has expanded its foreign trade, China is as engaged in GVCs at the same level in terms of employment as are the major industrialized economies.

Table 2: Jobs generated by final goods trade and global value chains 2009 (thousands)

	Final goods	GVC
Germany	30,922.7	10,577.5
US	68,049.7	10,096.1
China	157,711.9	9,730.8
Netherlands	13,289.1	5,066.0
France	14,585.7	4,643.1
England	19,480.7	4,325.5
Korea	14,832.6	3,398.8
Italy	12,536.3	3,374.5
Belgium	5,607.7	3,137.7
Japan	24,323.2	3,044.2
Canada	12,858.9	2,945.3
Mexico	10,371.7	2,485.3
Spain	10,074.9	2,466.3
Taiwan	6,926.9	2,222.4
India	42,979.2	1,877.8
Poland	6,741.7	1,685.0
Czech	3,851.2	1,553.2
Austria	3,517.4	1,482.5
Sweden	3,349.4	1,398.8
Ireland	2,857.0	1,340.3
Russia	14,930.7	1,170.0
Hungary	2,478.2	1,136.8
Australia	8,349.6	1,039.4
Demark	2,504.2	1,009.1
Turkey	5,203.3	968.8
Finland	2,077.4	774.9
Indonesia	14,128.4	761.3
Slovak	1,715.6	727.6
Brazil	10,353.9	677.4
Portugal	1,920.6	576.3
Romania	2,694.3	486.4
Greece	2,012.2	470.7
Slovenia	569.0	220.3
Bulgaria	1,347.6	197.6
Lithuania	634.2	172.1
Estonia	315.1	89.9
Latvia	323.3	75.1
Malta	164.1	57.6
Cyprus	178.2	49.6
Total	**536,767.8**	**87511.8**

Source: Authors' own calculations, based on the WIOD.

Jobs from vertical specialization by skill level
An important feature of this analysis is that it enables us to look in more detail into the employment effect of each country's participation in GVCs. Regarding the import content of exports, we find that, in 2009, it led to the demand for about 44 million jobs within the 38 countries. Third-party intermediates trade generated labour demand of about 39 million jobs. And the export content of imports created demand for about 5 million jobs.

Using the data on 'hours worked by skill type' in the Social Economic Accounts, we find that, on a global scale, vertical specialization contained significantly more medium-skill and low-skill than high-skill labour content. That is, of the jobs generated by vertical specialization in 2009, 13

percent were high-skill, 44 percent were medium-skill and 43 percent were low-skill. In 2009, the labour demand from vertical specialization in India, Indonesia, Cyprus, Australia and Japan was mostly for low-skill workers, whereas for Ireland, China, Finland and Sweden the import content of exports demanded more high-skill workers comparing with other countries. [7] In fact, the composition of skills embodied in each country's *import content of export* provides important insights about this country's *value-added* trade performance, a subject matter that is explored in details in Jiang (2013).

Changes in domestic and foreign labour demand
The WIOD has data over the period 1995-2009, so we can compute the employment *changes* generated by foreign trade over this period. Table 3 reports the change in employment generated by each of the five components of trade over the period 1995-2009. According to this table, most of the countries increased their labour demand for each of the five components. Note that a negative figure in Table 3 does not necessarily imply that a particular component of foreign trade for a particular country declined over the period 1995-2009. It is also possible that this particular component of trade has become less labour-intensive over the years. An extreme example is Japan, whose imports over time have led to reduced demand for foreign employment (by almost 40 percent between 1995 and 2009). This does not mean that Japan reduced its final goods imports by the same amount. Indeed, the Asian economic crisis in the late 1990s caused a significant imports decline for Japan, but in addition to this effect we might also speculate that Japan was importing final goods that were increasingly less labour-intensive from 1995 to 2009. Japan's participation in GVCs and the employment effects is another curious case that awaits further analysis.

Table 3: Change in employment in five components of foreign trade, 1995-2009 (thousands)

	Domestic labour		Foreign labour			Differences (domestic - foreign)
	Exports	Export content of imports	Imports	Import content of exports	Third-party imports in imports	
China	46,723.5	2,739.5	13,976.6	3,552.9	1,741.8	30,191.7
Japan	591.8	6.2	(14,022.8)	285.6	(481.5)	14,816.7
Netherlands	371.3	1.5	(2,440.7)	(837.1)	233.2	3,417.3
India	8,249.6	69.1	6,123.8	1,135.4	328.9	730.6
Taiwan	666.8	14.4	(155.9)	460.5	(32.8)	409.5
Brazil	2,402.4	12.0	1,845.7	109.8	186.1	272.8
Bulgaria	370.0	1.2	204.1	42.1	77.2	47.8
Cyprus	(0.5)	0.0	9.8	(4.7)	11.4	(16.9)
Malta	18.0	(0.0)	61.3	17.6	5.8	(66.7)
Latvia	4.2	0.6	80.9	12.5	38.9	(127.5)
Estonia	(24.4)	0.1	77.0	28.3	22.8	(152.3)
Slovenia	(0.9)	0.2	142.7	53.6	47.6	(244.6)
Demark	20.6	1.2	159.6	39.7	148.5	(326.0)
Portugal	34.4	2.2	263.4	21.0	129.2	(377.0)
Lithuania	(59.2)	0.8	235.6	69.0	52.5	(415.4)
Belgium	8.7	(2.9)	600.2	(111.0)	(39.0)	(444.4)
Finland	35.6	(0.0)	285.0	147.3	123.4	(520.1)
Romania	344.9	5.1	720.7	128.1	231.8	(730.5)
Italy	135.7	3.6	481.3	(95.8)	487.2	(733.4)
Indonesia	191.2	4.6	979.9	20.8	(20.7)	(784.3)
Slovak	157.6	(1.5)	511.6	311.2	202.1	(868.7)
Austria	331.5	3.9	587.7	374.9	265.0	(892.1)
Sweden	54.0	(0.3)	770.3	260.5	145.9	(1,123.0)
Greece	(25.9)	0.4	1,063.5	39.6	177.7	(1,306.3)
Hungary	338.0	4.6	794.2	586.5	313.3	(1,351.4)
Turkey	194.1	4.3	1,750.9	186.3	296.1	(2,034.9)
Ireland	147.8	1.4	1,442.7	507.5	245.7	(2,046.7)

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[7] In fact, this result might very well contradict the Heckscher-Ohlin (H-O) trade theory because the H-O theory would predict that developed countries would demand more low-skilled labour in their exports, whereas developing countries would demand more high-skilled labour in their exports. This contradiction will be an interesting point of departure for future research.

	Domestic labour		Foreign labour			Differences (domestic - foreign)
	Exports	Export content of imports	Imports	Import content of exports	Third-party imports in imports	
Czech	204.1	(3.1)	1,246.2	742.3	362.1	(2,149.6)
Poland	1,096.6	21.7	2,215.8	733.0	575.1	(2,405.6)
Korea	765.6	15.7	2,377.2	756.1	249.6	(2,601.6)
Mexico	1,805.6	20.2	2,953.6	1,157.7	498.5	(2,784.0)
Germany	2,985.6	107.9	2,242.3	2,666.7	985.9	(2,801.5)
Australia	278.4	3.2	2,840.4	193.1	215.4	(2,967.3)
Canada	(272.6)	(8.0)	3,227.1	85.4	515.0	(4,108.1)
Spain	818.0	17.2	4,280.5	560.9	626.0	(4,632.2)
France	13.8	(8.1)	3,410.0	556.3	683.5	(4,644.1)
England	(54.9)	(3.4)	5,565.5	257.4	550.7	(6,431.9)
Russia	(2,051.6)	(10.5)	4,994.4	80.9	544.7	(7,682.2)
US	(263.9)	(189.2)	14,703.9	827.8	2,378.7	(18,363.5)
Total	**66,605.7**	**2,835.9**	**66,605.7**	**15,959.5**	**13,123.6**	**(26,247.3)**

Source: Authors' own calculations, based on the WIOD.

At the aggregate level, for our panel of 39 countries final goods trade (total of exports and imports) generated demand for 67 million jobs in 2009, a 25 percent increase from the 1995 level. However, the increase in labour demand from GVC trade is much faster. The total import content of exports (vertical specialization) and total third-party intermediates trade generated an additional 16 million jobs (a 36 percent increase from its 1995 level) and 13 million jobs (a 34 percent increase from its 1995 level), respectively. Finally, the total export content of imports has added additional 3 million jobs, a 58 percent increase from its 1995 level.

The relatively large employment increase related to GVC trade is consistent with existing research that has identified vertical specialization as the main driver of trade expansion since the late 1990s (Yi 2003). The rapid increase in 'processing trade' (Ma and van Assche 2010) since the 1990s is also reflected in the large increase in labour demand generated by the export content of imports. From the home country's perspective, if its imports contains large amount of its own exports, it means this country is heavily involved in processing trade: the home country adds values through processing, and exports to other countries; other countries then make them into final products, and the home country imports them back (Stehrer et al. 2012)

For most countries in our sample, trade generated more additional foreign jobs than domestic jobs between 1995 and 2009. Among the countries that generated more additional domestic jobs than foreign jobs through trade, the top six are China, Japan, the Netherlands, India, Taiwan and Brazil. Three of these – Japan, the Netherlands and Taiwan – achieved this large difference by reducing foreign labour demand, whereas the other three countries – which also happen to be three large developing economies – achieved large difference by generating much more additional domestic employment than foreign employment as a result of their foreign trade. The countries at the bottom of the list in Table 3 are mostly developed countries except for Russia.

Did participation in GVCs unambiguously create jobs for participants? Did it do so on a global scale? We find that, in 2009, GVC trade demanded about 87.5 million jobs globally, which is additional 32 million jobs compared with the 1995 level. However, we do not know the counterfactual level of employment, that is, the level of employment had the countries *not* participated in GVCs. If we assume no other trade-based employment would have been created in the absence of participation in GVCs, then our calculations provide the answer to this question. In future research we will explore this issue of a counterfactual in more detail.

Conclusions and policy implications

Trade policy debates are too often focused simply on raising the volume of trade without paying careful attention to its employment effects. The relationship between trade and employment in a world with GVCs is no longer simple and straightforward as in the 'old world', which assumes no trade in intermediates. With the availability of the WIOD, we are able to calculate for the first time a comprehensive measure of the employment effects of international trade. This methodological and data breakthrough could be of great significance in informing trade policy discussions. Policy designed to reduce domestic unemployment via foreign trade should take into account the employment effect of the country's participation in GVCs. In principle, jobs can be created by policies reducing the import content of exports and/or expanding the export content of imports while final exports and imports remain unchanged. However, policies as such would have to focus on GVC analysis and industrial upgrading. Given the global scope of GVCs, it would of course be extremely valuable to extend this dataset and the employment calculation to the least developed countries in order to better inform trade and industrial policy debates. Moreover, more attention should be given to sectoral employment composition associated with trade. The results we have shown in Tables 1 and 2 are aggregate results, but our method also gives results that are disaggregated to the sector level. For some sectors in some countries, trade expansion might be absorbed mainly by foreign labour, whereas for some other sectors trade protection might create more unemployment than employment domestically. Trade policies should thus take into account the sectoral variation in GVC participation.

References

Blair, J. and Gereffi, G. (2001). 'Local clusters in global value chains: Yhe causes and consequences of export dynamism in Torreon's blue jeans industry'. *World Development* 29(11): 1885-1993.

Erumban, A., Gouma, R., Los, B., Stehrer, R., Temurshoev, U., Timmer, M. and de Vries, G. (2011). 'The World Input-Output Databas (WIOD): Construction, challenges and Applications'. World Bank Workshop on the Fragmentation of Global Production and Trade in Value Added, Washington, DC, 9 June.

Escaith, H., Lindenberg, N. and Miroudot, S. (2010). 'International supply chain and trade elasticity in times of global crisis'. Staff Working Paper, August. Geneva: WTO.

Gereffi, G. (1994). 'The organzation of buyer-driven global commodity chains'. In Gereffi, G. and Korzeniewicz, M. (eds). *Commodity Chains and Global Capitalism.* Westport, CT: Greenwood Press.

Gibson, B. (2011). 'Assessing the impact of trade on employment: Method of analysis'. In Marion, J., Ralf, P. and Salazar-Xirinachs, J. (eds). *Trade and Eemployment: From Myths to Facts*. Geneva: ILO.

Hummels, D., Ishii, D. and Yi, K. (2001). 'The nature and growth of vertical specialization in world trade'. *Journal of International Economics* 54(1): 75-96.

Humphrey, J. (2004). 'Upgrading in global value chains'. Policy Integration Department Working Paper 28. Geneva: ILO.

Jiang, X. (2013). 'Trade expansion and employment in a vertically specialized world'. Research Working Paper 5. Geneva: ILO (forthcoming).

Jiang, X. and Milberg, W. (2012). 'Vertical specialization and industrial upgrading: A preliminary note'. Capturing the Gains Working Paper 10.

Koopman, R., Powers, W., Wang, Z. and Wei, S. (2010). 'Give credit where credit is due: Tracing value added in global production chains'. Working Paper 16426. Cambridge, MA: NBER.

Kucera, D. and Milberg, W. (2000). 'Gender segregation and gender bias in manufacturing trade expansion: Revisiting the "Wood Asymmetry"'. *World Development* 28(7): 1191-1210.

Kucera, D. and Milberg, W. (2003). 'Trade expansion and employment in OECD: New factor content calculations for 1978-1995'. *Review of World Economics* 139(4): 601-624.

Ma, A. and van Assche, M. (2010). 'The role of trade cost in global production networks: Evidence from China's processing trade regime'. Policy Research Working Paper 5409. Washington, DC: World Bank.

Meng, B., Yamano, N. and Webb, C. (2011). 'Application of factor decomposition techniques to vertical specialization measurements'. IDE Discussion Paper 276. Toyko: IDE-JETRO.

Miller, R. and Blair, P. (2009). *Input-Output Analysis: Foundations and Extensions,* Cambridge: Cambridge University Press.

Miroudot, S., Rainer, L. and Ragoussis, A. (2009). 'Trade in intermediate goods and services'. Trade Policy Working Paper 93. Paris: OECD.

OECD (Organisation for Economic Co-operation and Development) (2011). 'Measuring trade in value added'. An OECD-WTO joint initiative. Available at http://www.oecd.org/industry/ind/measuringtradeinvalue-addedanoecd-wtojointinitiative.htm (accessed 20 March 2013).

Sachs, J. and Shatz, H. (1994). 'Trade and jobs in US manufacturing'. Papers on Economic Activity 1. Washington, DC: The Brookings Institute.

Stehrer, R., Foster, N. and de Vries, G. (2012). 'Value added and factors in trade: A comprehensive approach'. WIOD Working Paper 7.

Sturgeon, T. and Memedovic, O. (2010). 'Mapping global value chains: Intermediate goods trade and structural change in the world economy'. Working Paper 5. Vienna: UNIDO, Development Policy and Research Branch.

Timmer, M. (2012). 'The world input-output database (WIOD): contents, sources and methods'. WIOD Working Paper 10.

Xing, Y. and Detert, N. (2010). 'How the i-phone widens the U.S trade deficit with the PRC'. Working Paper 257. Manila: ADBI.

UNCTAD (UN Conference on Trade and Development) (2013). 'Global value chains and development: Investment and value added trade in the global economy'. Report. Geneva: UNCTAD.

Yi, K.-M. (2003). 'Can vertical specialization explain the growth of world trade?' *Journal of Political Economy* 111(1): 52-102.

WTO (World Trade Organization) (2012). '"Made in the World" initiative'. Available at http://www.wto.org/english/res_e/statis_e/miwi_e/miwi_e.htm (accessed 12 March 2013).

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