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A value-added trade perspective on recent patterns in world trade (CEPR)

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The discussion about structural changes in world trade since the Great Trade Collapse is mainly based on the development of gross trade per unit of GDP. This is partly historical, because the System of National Accounts is based on gross trade.¹ From an analytical perspective, however, an understanding of structural patterns in world trade requires that we go one step deeper. Gross trade concepts involve double-counting of trade flows, because imported intermediates used in the production of exports are counted again when the exporter sends his exports across a border (Koopman et al. 2014). Trade in value added avoids these double-counting issues and accounts only for the value added embedded in intermediate input, which allows a better understanding of how global value chains (GVCs) operate. Focusing on trade in value added may thus reveal the undercurrents of specialisation and competitiveness that shape the globalisation pattern.

Our contribution to the debate on the global trade slowdown is to use trade in value-added statistics to assess the recent trade dynamics. We focus on three claims in the recent literature on structural changes in world trade patterns:

- The trade slowdown is structural in nature and not caused by cyclical factors such as changes in the composition of GDP over the business cycle.

¹ The gross trade concept has its own merit. Gross trade is important for margin services like transport, trade and insurance that are often based on the volume and value of total trade.

- A structural fall in long-term trade elasticities is caused by a slowdown in foreign outsourcing (offshoring). This especially affects trade by the US and China.
- The fall in world trade elasticity is caused by a combination of regional shifts:
 - an increase of the total import share for regions with a low trade elasticity;
 - an increase in relative GDP growth of regions with a low trade elasticity; and
 - decreased import elasticities in some regions.

We use data from the World Input-Output Database (WIOD) project over the period 1995-2011 (Timmer 2012), which includes five years of the Global Crisis, if we allow for the fact that 2007 demarcated the start of the Crisis in some countries (Laeven and Valencia 2012). A limitation with value-added trade statistics is that they are based on input-output tables that only become available with a time lag. The most recent value-added trade statistics are available up to 2011. For the most recent period, we therefore use supplementary data from CPB's World Trade Monitor (WTM) database.

A look at the recent literature

After world trade bounced back from the Great Trade Collapse of 2008–2009, the growth of global trade was only 3% in 2012-2013, against an average of 6-7% in the preceding 35 years. Recently, various papers have discussed this slowdown, with the major point of discussion being whether it is cyclical or structural. Structural elements could include a decline in GVC trade, a surge in protectionism, changes in the trade composition (services versus goods) or a shift between demand components (consumption versus investment).

Constantinescu *et al.* (2014, 2015) claim that the decline of GVCs is an important explanation for the trade slowdown. They argue that the large trade-to-GDP elasticities in the 1990s were due to the increasing fragmentation of production driven primarily by the US and China. Since the mid-2000s, the importance of foreign inputs for production in China (particularly of US origin) has levelled off, suggesting that the growth of international fragmentation of production lines is stalling. While this is a structural

factor, the ratio of trade to GDP could still increase if GVC patterns evolve in other regions in the world. Ferrantino and Taglioni (2014) approximate GVC trade essentially by ‘imported intermediate goods’. They show that a fall in GVC trade may have driven the Great Trade Collapse; GVC trade has decreased more than total trade has. However, in the last few years the share of GVC in gross world trade has returned to the levels that prevailed before the Great Trade Collapse. Boz *et al.* (2014) conclude that GVC trade cannot be an important driver of the recent slowdown in trade and that regional demand factors explain at least half of the slowdown. This is cautiously supported by a paper from the European Commission (2015). All papers suggest that increased protectionism could also have contributed (albeit marginally) to the slowdown, but because of the intrinsic difficulties of measuring protectionism and the lack of recent data, to date no paper has been able to draw definitive conclusions on its role.

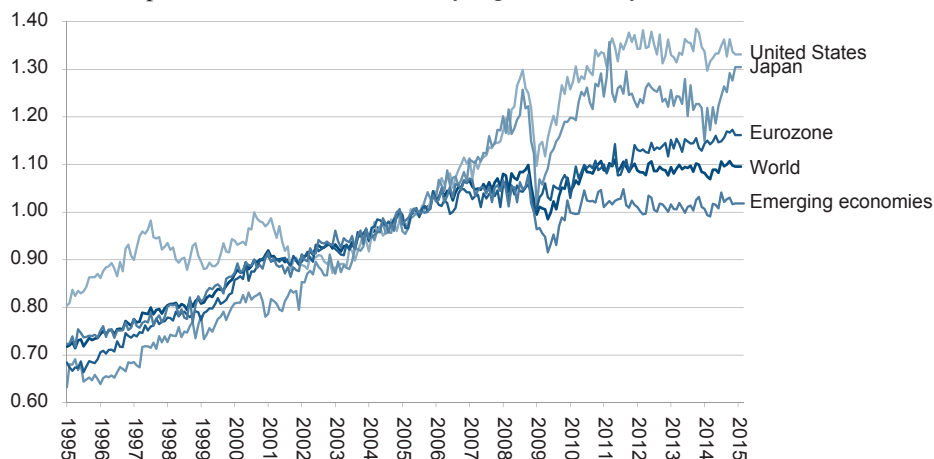
Gross and value-added trade

Remarkably, all papers address the slowdown in global trade using the traditional statistical data on trade. The literature on trade in value added shows that traditional gross trade statistics can present a misleading picture of international trade relations, in particular for countries that are highly integrated in global supply chains (Johnson and Noguera 2012, Koopman *et al.* 2014, Lejour *et al.* 2014). The internationalisation of the supply chain into global value chains has led to complex, integrated trade networks, which do not show up in traditional trade statistics. The value added composition of final exports no longer reflects domestic value added. An important share of value added comes from third countries via intermediate inputs. Thus, traditional gross trade statistics usually overstate real trade flows and are less suitable to analyse GVC trade. When intermediate inputs cross borders more than once (and sometimes they do so several times), there is a double-counting issue. Value added previously embedded in the intermediate input is counted every time there is a cross-border movement. Francois *et al.* (2013), using GTAP data, show that this type of trade overstatement is larger for manufacturing than for commercial services.

Global trade slowdown since 2008?

For an up-to-date snapshot of relative trade growth, we use the ratio of the export volume over the industrial production volume. Trade intensity measured in this way is a gross trade indicator, but it has the advantage that we can use monthly data from CPB's WTM database, which is available up to the first quarter of 2015.² Figure 1 depicts this indicator for the world total and four regions.

Figure 1 Trade intensity: Merchandise export volume over volume of industrial production, 1995-2015Q1, by region, monthly indices (2005=100)



Note: Emerging economies includes Central and Eastern Europe, Asia except Japan, Latin America, Africa and the Middle East (see CPB 2013).

Source: Own calculations using the WTM database.

All regions experienced a set-back in their trade intensity ratio in 2008-2009, but by 2011 the world average had regained its 2008 level and has stabilised since then. This implies that world trade intensity has stagnated in recent years. In emerging

² Industrial production volume is weighted, seasonally and working-day adjusted, with reference 2005=100; it does not include construction activities. World export volumes are seasonally adjusted, also with reference 2005=100 (cf. documentation for the CPB World Trade Monitor (CPB 2015)). The relative trade ratio does not account for services trade and it does not inform about changes in the composition of merchandise trade.

countries, trade intensity has structurally dropped by around 5%, but here again we see a stabilisation since 2012. The three other large trade blocs experienced increasing trade intensity after 2008. The Eurozone had a small dip in trade intensity, but during the last five years its trade intensity consistently rose to a level that is now about 9% higher than in 2010.³ The US experienced a 20% fall in trade intensity after the third quarter of 2008, but a very quick recovery and further growth up to 2012. Since then, the US trade intensity has been falling mildly.

For a more comprehensive picture, we analyse the trade intensity relative to the gross domestic product. We calculate the trade intensity in terms of gross trade and in terms of value added trade, using WIOD data.⁴ These data also include services, which has a significantly lower elasticity to trade than manufacturing (Ariu 2014). Since 2008, the ratio of world exports growth to global GDP growth has declined compared to the levels that prevailed just before the Great Trade Collapse. For ease of comparison, the trade intensity indicator of Figure 1 is plotted in each of the four panels. It may approximate for the missing GVC indicators for the period 2012-2014.⁵

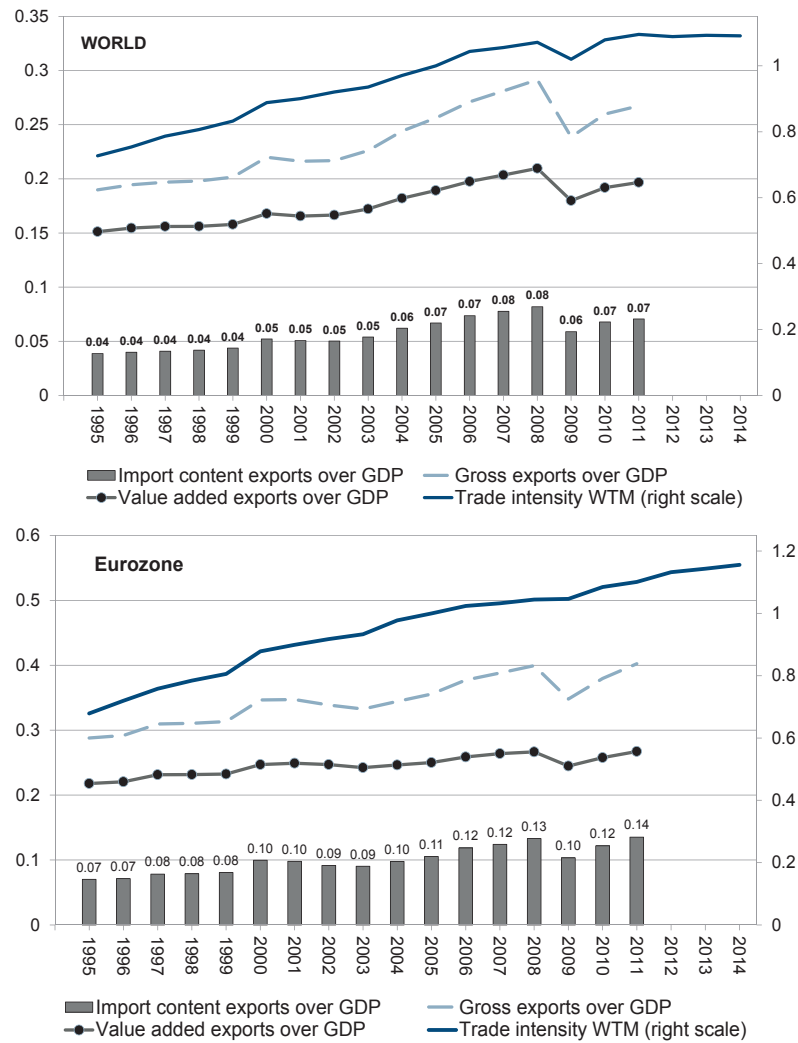
For the world total, the two GDP-related indicators show that trade intensity in 2011 had not yet returned to the pre-2008 levels. The slowdown is most pronounced and persistent for the emerging economies; this holds for all three trade-intensity indicators. Note also that in this region the decline had already started before 2008. Both for the Eurozone and for the US, the GDP-related indicators display a forceful recovery of trade intensity up to 2011. The WTM trade intensity indicator for the Eurozone suggests a further growth in the later years, while for the US a stabilisation occurs.

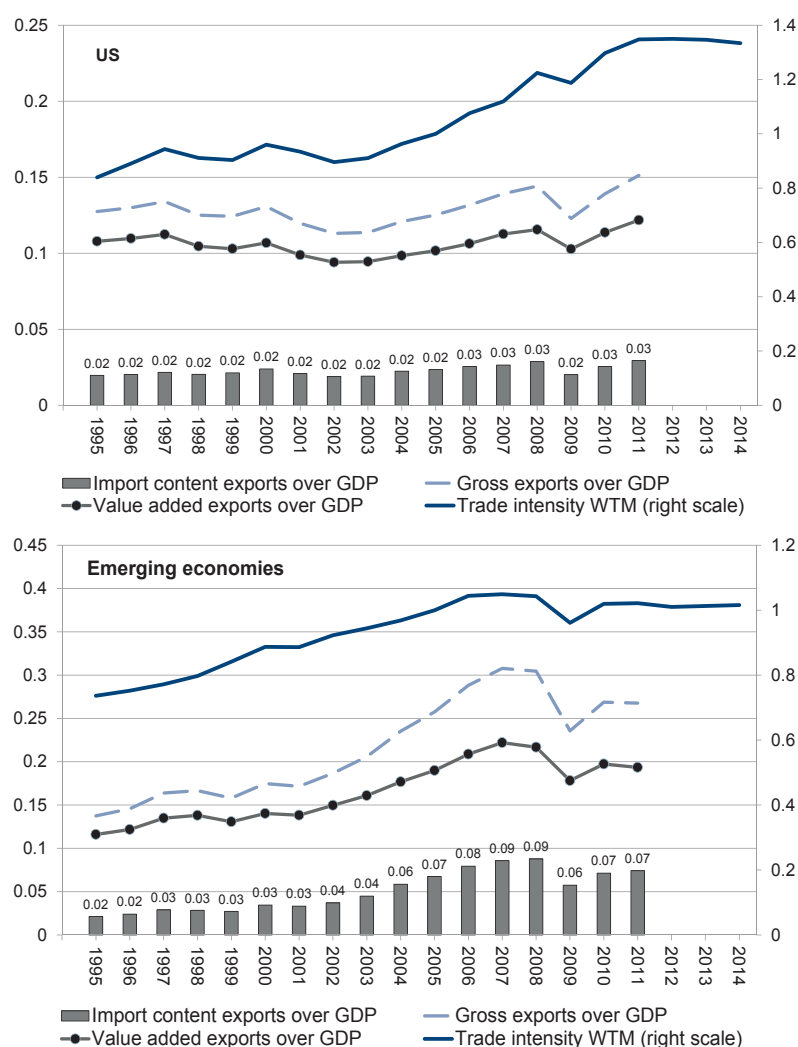
3 The small 2008-2009 dip in trade intensity is due to the fact that the large dip in exports went along with a similar dip in industrial production. This again relates to the open character of the EU economy.

4 For comparability reasons we use the US dollar values from the original database.

5 Note that the WTM trade intensity indicator of Figure 1 compares merchandise exports with industrial production, which is much smaller than the GDP denominator in Figure 2, so that the WTM trade intensity has a higher value. In the panel for emerging economies, China has the largest weight.

Figure 2 Three indicators for trade intensity by region: Gross exports over GDP, value-added exports over GDP, and WTM trade intensity (merchandise exports volume over industrial production volume)





Note: Emerging economies include Central and Eastern Europe, Asia except Japan, Latin America, Africa and the Middle East (see CPB 2013).

Source: Own calculations using the WIOD database and the WTM database.

The bars in the four panels of Figure 2 shows the import content of exports, an indicator of trade via global value chains. For the US, we only see a recovery of this indicator to its 2008 level, whereas in the Eurozone it has grown above this level. In the emerging economies and in the world total, the import content of trade appears to have dropped to 2005 levels.

A fall in long-term trade elasticities?

Using an error-correction model, Constantinescu et al. (2014) find that a fall in the long-term trade elasticity explains the global trade slowdown. We have investigated whether this holds when looking at value added trade. As a first measure we use a three-year moving average of the annual elasticities.⁶

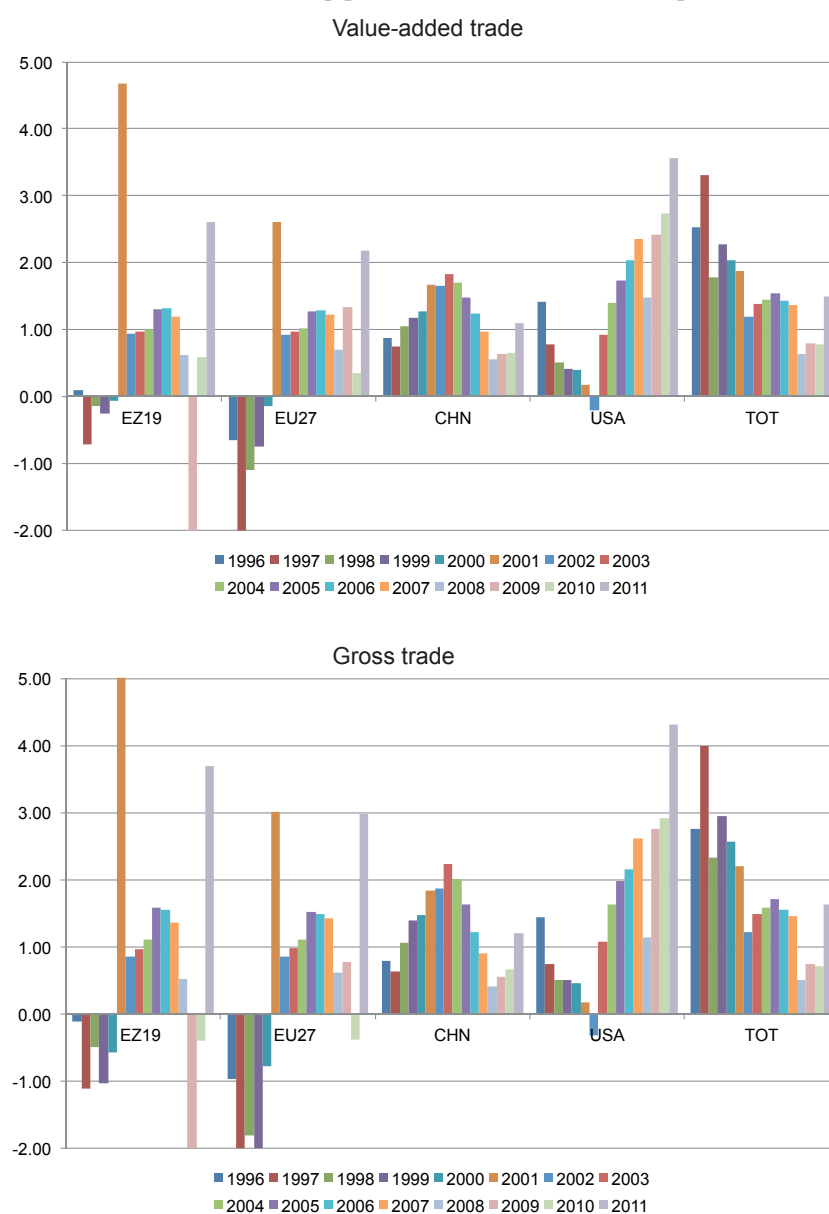
Figure 3 shows that the gross and value added trade elasticities have the same time patterns, although as expected, the gross trade values are generally higher and more volatile.⁷ Global (TOT) elasticities did indeed decrease in the period 1995-2011, with a rebound in the final year. This trend, however, disguises very heterogeneous regional trends. China has a bump-shape pattern. The US trade elasticity fell until 2002, after which a steep increase occurred. In Europe, the trends have been quite volatile around the 1997 and 2008 crises.

Figure 4 compares three- and five-year averages for the long-term trade elasticities. How we calculate the long-term trade elasticity appears to matter for the Eurozone (EZ19) and the EU (EU27). With respect to the three-year averages we see that the European trade elasticity is declining, while using five-year averages we observe a slight increase in the trade elasticity in Europe.

⁶ The annual trade elasticities display high volatility due to large swings during or after international crises (e.g. 1997 and 2008-2010). Most papers therefore use multi-year averages to smooth the series, but the selection and length of the estimation period also affects the pattern.

⁷ In what follows we only present the value added values, but both measures show very similar patterns.

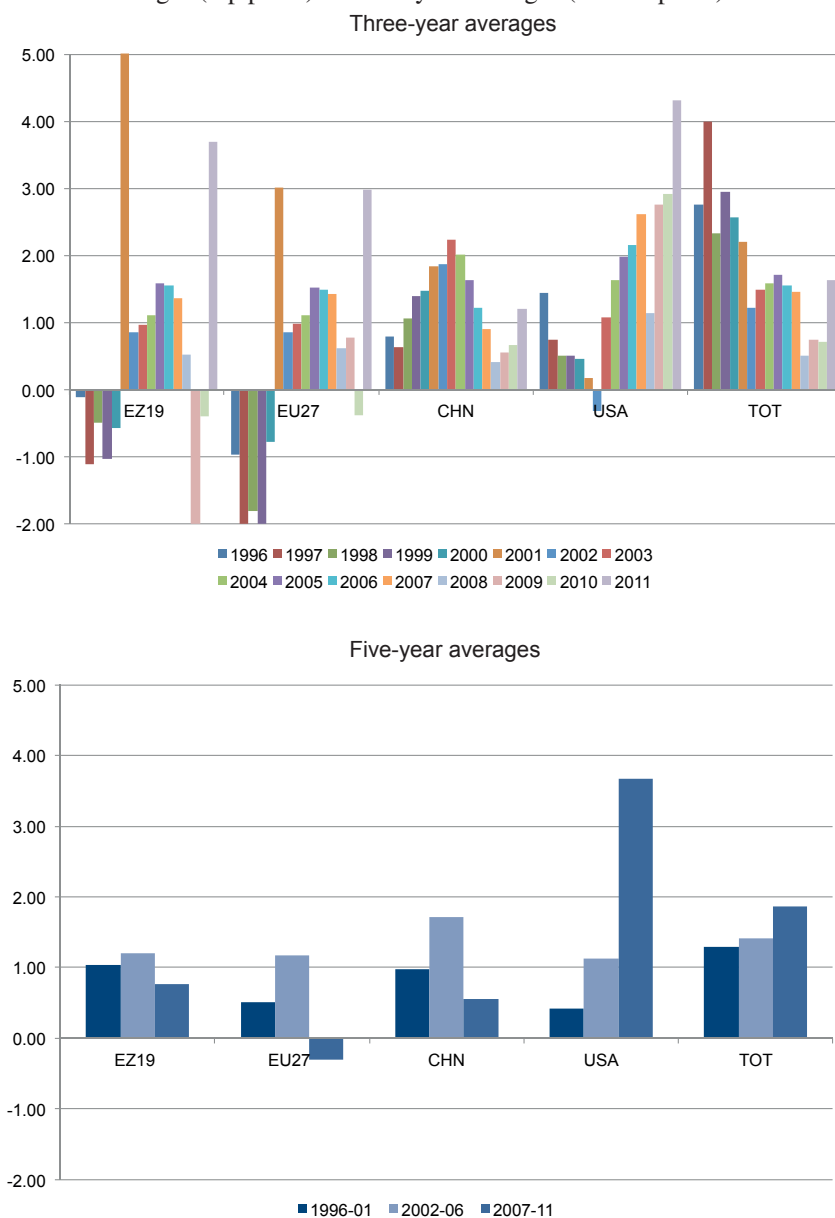
Figure 3 Annual trade elasticities with respect to GDP, three-year moving averages, value added trade (top panel) and gross trade (bottom panel), 1995-2011



Notes: EZ19 are the Eurozone members and TOT is the world. Some values for the EZ and EU exceed the lower and higher boundaries in the graph.

Source: Own calculations using the WIOD database.

Figure 4 Elasticities of value-added exports with respect to GDP, three-year averages (top panel) and five-year averages (bottom panel)



Notes: Some values for the EU exceed the lower boundary in the graph.

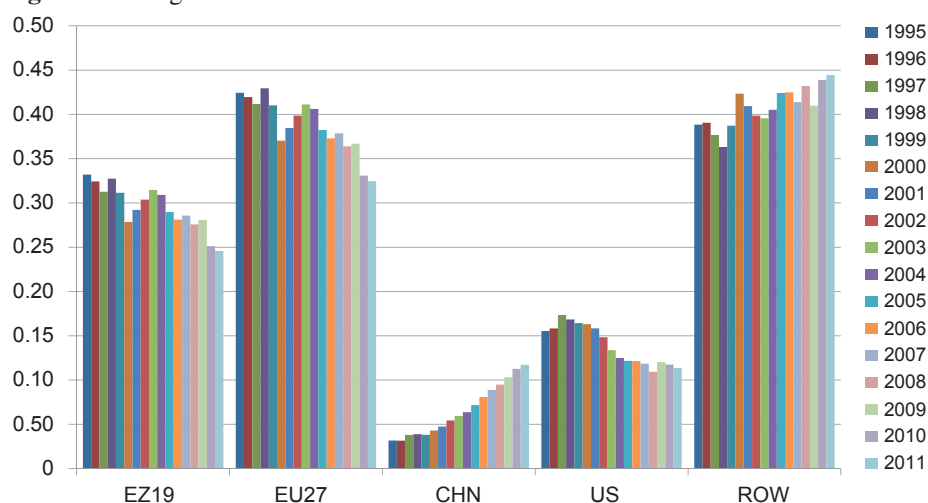
Source: Own calculations using the WIOD database.

In general, we obtain similar results for the world (TOT) as those in the studies by Constantinescu *et al.* (2014) and the European Commission (2015). However, in our results the US trade elasticity is clearly increasing, while the EC study identifies a falling pattern.⁸

Is the fall in world trade elasticity caused by a combination of regional changes?

Figure 5 shows that the shares in total value-added trade have been steadily decreasing for the Eurozone (EZ19), the EU (EU27) and the US, while they are increasing for China and the rest of the world (ROW). Since the latter two regions have lower trade elasticities (cf. Figure 4), the composition changes in world trade may have a negative impact on world trade elasticities.

Figure 5 Regional shares of total world value-added trade



Notes: Rest of the World (ROW) includes all regions except EU-27, China and USA.

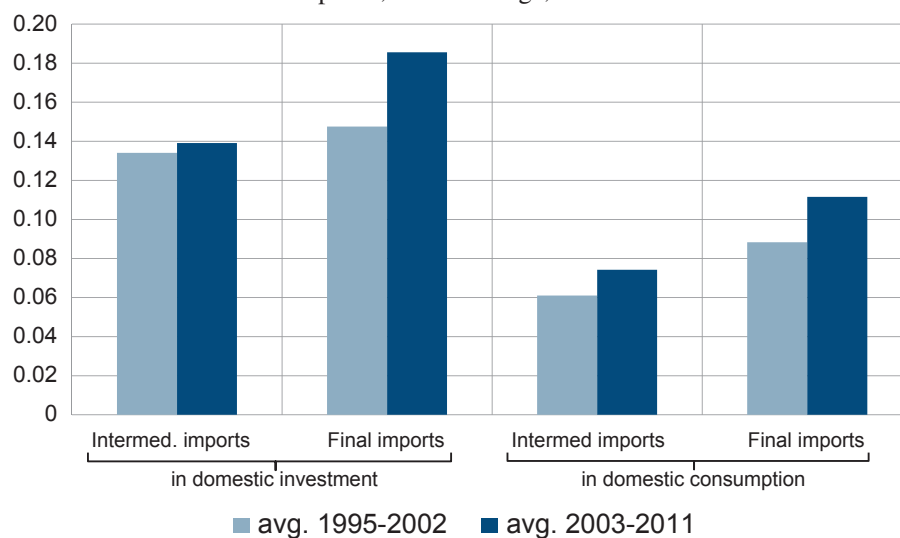
Source: Own calculations using the WIOD database.

⁸ The difference cannot be explained by the fact that the European Commission (2015) study uses WEO data for PPP-adjusted GDP. Our results were confirmed when we used the same WEO data or the World Trade Monitor data.

Is the trade slowdown structural or cyclical?

Constantinescu *et al.* (2014, p. 25) argue that the decreasing long-term trade elasticity is due to structural rather than cyclical factors. However, we find evidence that cyclical changes in the composition of final demand are responsible for at least a substantial part of the trade slowdown. This has to do with the varying composition of GDP over the business cycle – in the downswing the share of consumption is higher than in the upswing. This has consequences for international trade because –as shown in Figure 6 – consumption generates considerably less final and intermediate imports than investment.⁹

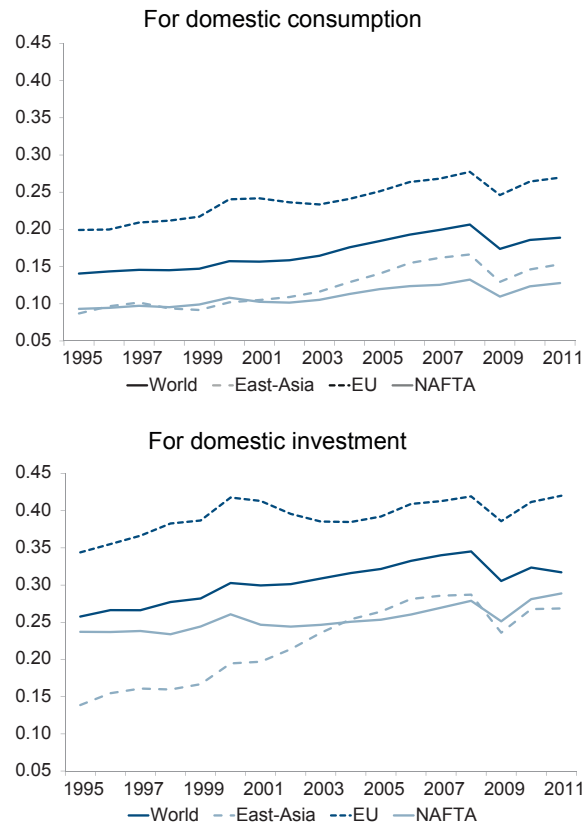
Figure 6 Share of final and intermediary imports in domestic investment and in domestic consumption , world average, 1995-2011



Source: Own calculations using the WIOD database.

⁹ Per unit, domestic investments require more trade than domestic consumption. Imports for domestic investment tend to be more in the form of final imports (such as ships, trains, machines and airplanes). Note that these lumpy final imports in their turn are product bundles based on often complex global value chains before they reach their final destination.

Figure 7 Imports for domestic consumption (top panel) and imports for domestic investments (bottom panel), 1995-2011



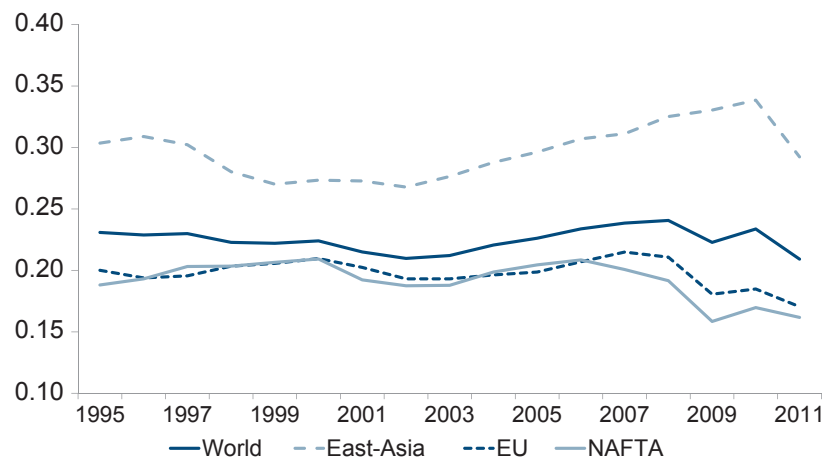
Note: East-Asia consists of China, Japan, Korea and Taiwan. NAFTA is Canada, Mexico and the US.
 Source: Own calculations using WIOD database.

Using WIOD data on trade in value-added, we have also calculated these indicators for three major trade regions over the period 1995-2011. The results are depicted in Figure 7. In all three trade areas, the cumulative import requirements per unit of domestic investment are consistently larger than those for consumption.¹⁰ Figure 8 further shows that the ratio of domestic investment over GDP indeed went down during the last

¹⁰ Figure 7 shows that the import requirements per unit of domestic investment in East Asia almost doubled during the observation period (1995-2011).

crisis in all regions, starting with the NAFTA region in 2006, the EU in 2008 and East Asia in 2011. All other things being equal, the falling investment shares during the recession years after 2008 must in itself be responsible for a substantial part of the trade slowdown.¹¹

Figure 8 Ratio of domestic investment over GDP, 1995-2011



Note: East-Asia includes China, Japan, Korea and Taiwan. NAFTA is Canada, Mexico and the US.

Source: Own calculations using WIOD database.

So, contrary to Constantinescu *et al.* (2014) but in line with Boz *et al.* (2014), we conclude that the trade slowdown is at least partly of a cyclical nature. Once the investment share in GDP increases again, the trade elasticity will presumably go up as well.¹²

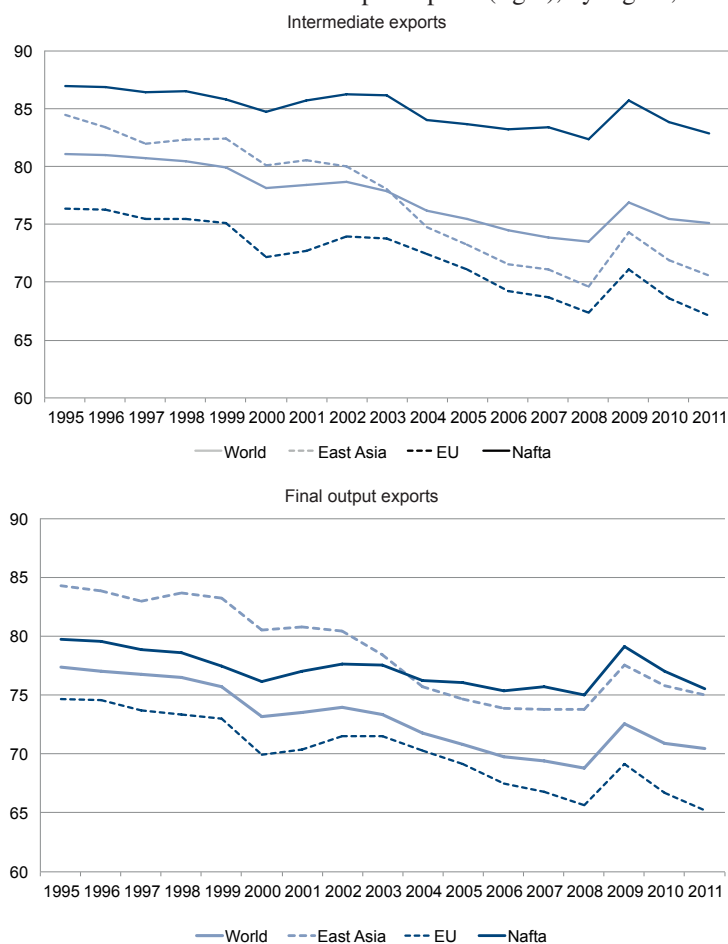
The cyclical analysis requires that we also consider the import contents of domestic exports. The globalisation process of the past 15 years has led to falling domestic value-added shares in both intermediate exports and final output exports. This has occurred in

¹¹ This conclusion assumes that nothing happens with other domestic final demand categories (i.e. government demand and exports). We deal with the trade intensity of exports later on.

¹² As a sideline we note that Figure 6 shows that the share of intermediate imports per unit of domestic consumption has risen more over the past 15 years than for domestic investment. This would imply that the cyclical impact of GDP composition on trade elasticities has become smaller over time.

all regions, as Figure 9 shows. The Great Trade Collapse of 2008-2009 was a hiccup in the secular trend towards more foreign content in exports. However, the figure shows that at least in Europe and East Asia, the trend towards falling domestic contents is continuing. The steepness of the curves suggest that it is only a matter of time before new heights in foreign value-added shares could be reached. This would be a sign of further developments in GVC trade.

Figure 9 Domestic value-added share of intermediate exports (left) and domestic value-added share in final output exports (right), by region, 1995-2011



Note: East-Asia includes China, Japan, Korea and Taiwan. NAFTA is Canada, Mexico and the US.

Source: Authors' calculations based on WIOD database.

From the value added trade data, we can conclude that vertical specialisation has largely recovered from the Great Recession, particularly in Europe. For the NAFTA region, for final exports in East Asia and for the rest of the world, restoration of the previous trend seems to be more hesitant. Future data will reveal whether the slowdown of the global vertical specialisation process in these regions is structural rather than cyclical. The more recent data (Figure 1) hint towards a cyclical interpretation, at least for the NAFTA region.

Conclusions

We have focused on three claims in the recent literature on structural changes in world trade patterns.

- We conclude that world trade elasticity has fallen due to a combination of regional and cyclical changes during the Global Crisis. One cyclical factor is the lower cumulative trade intensity of consumer goods compared to investment goods.
- Using value added trade data, we find no evidence for a structural trade slowdown. In contrast, foreign value added shares in final exports in Europe and East Asia are trending towards new peaks.
- The regional changes are caused by an increase of the total import share for regions with a low trade elasticity and decreased import elasticities in some regions.

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