EUROPEAN CENTRAL BANK

EUROSYSTEM

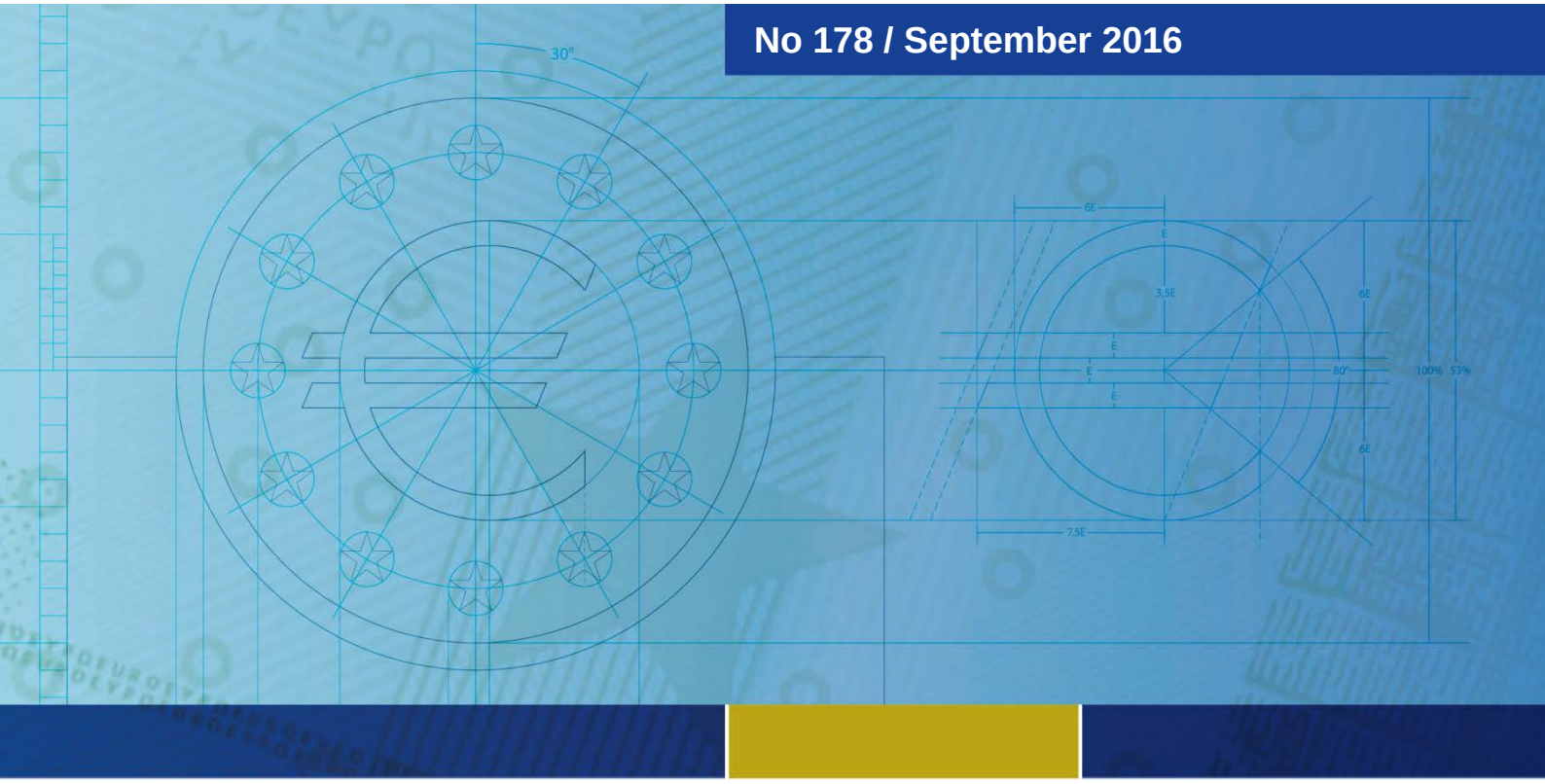
Occasional Paper Series

IRC Trade Task Force

Understanding the weakness in global trade

What is the new normal?

No 178 / September 2016



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Abstract

Global trade has been exceptionally weak over the past four years. While global trade grew at approximately twice the rate of GDP prior to the Great Recession, the ratio of global trade to GDP growth has declined to about unity since 2012. This paper assesses to what extent the change in the relationship between global trade and global economic activity is a temporary phenomenon or constitutes a lasting change. It finds that global trade growth has been primarily dampened by two factors. First, compositional factors, including geographical shifts in economic activity and changes in the composition of aggregate demand, have weighed on the sensitivity of trade to economic activity. Second, structural developments, such as waning growth in global value chains, a rise in non-tariff protectionist measures and a declining marginal impact of financial deepening, are dampening the support from factors that boosted global trade in the past. Notwithstanding the particularly pronounced weakness in 2015 that is assessed to be mostly a temporary phenomenon owing to a number of country-specific adverse shocks, the upside potential for trade over the medium term appears to be limited. The “new normal” for global trade can therefore be expected to look broadly similar to the weakness observed over recent years on average. In this sense, buoyant trade dynamics in the 1990s and early 2000s may have been what was exceptional, rather than the slowdown over recent years.

Keywords: global trade slowdown, trade elasticity, global value chains, frictions in global trade, protectionism.

JEL codes: F10, F13, F14, F15.

Non-technical summary

In recent years, global trade has been exceptionally weak. Annual import growth since 2012 has been half of what it was between 1980 and the Great Recession, and is currently recording the longest period of below-trend growth in almost half a century. Notably, the same weakness has not been reflected in economic activity, which, while subdued, has not decelerated to the same extent. As a result, the ratio of average imports to GDP growth – or the income elasticity of trade – has declined markedly relative to pre-crisis levels, such that the relationship of global trade and activity appears to have changed.

The long period of sub-par trade growth has raised the question of whether this is a temporary deviation from trend or a longer-lasting phenomenon, reflecting fundamental structural change. The question has been a prominent area of recent research and is highly relevant for central banks seeking to understand the role of external demand and international linkages in shaping the outlook for domestic activity, potential output and inflation. This paper aims to identify the main determinants of the decline in the income elasticity of trade with a view to identifying a possible “new normal” for trade growth.

The change in the global income elasticity of trade between the pre-crisis period and more recent years is found to be mainly driven by two developments (see **Table 1** below). One source of change arises from compositional effects, such as the shift of growth in trade and economic activity towards economies with lower trade intensity, and changes in the composition of aggregate demand factors towards less trade-intensive components. These shifts are not necessarily structural and could reverse in part over the medium term. The other source of change relates to structural factors that are altering the fundamental relationship between trade and economic activity, such as the degree of trade liberalisation and the reliance on global value chains (GVCs). These tend to be slow-moving changes reflecting fundamental shifts in the economy. The main difference between these two sources is that the latter fundamentally changes the relationship between trade and economic activity at the level of individual countries or demand components, while the former changes the global income elasticity of trade by shifting the weight of activity among countries or demand components which differ in their underlying sensitivity of trade to economic activity.

Compositional effects explain about half of the decline in the global income elasticity of trade. The largest effect originates from the geographical composition of activity, especially the growing weight in the world economy of emerging market countries, which typically have a lower trade intensity than advanced economies. This implies a weaker relationship between trade and economic activity at the global level. To a lesser extent, demand composition effects have also contributed to the global trade slowdown: with import-intensive GDP components such as investment no longer growing more strongly than overall GDP, import growth has moderated. The demand composition effects have been generally limited; however, as the global economy

recovers, some strengthening of investment and thus the global trade elasticity might be expected.

Table 1

Assessment of factors driving the recent weakness in global trade

Factors behind change	Quantitative impact* (1995-2007 vs. 2012-15)	Outlook: are these factors temporary or longer lasting?
Compositional factors	**0.4-0.6**	
Changing composition of global activity and trade – shifting from AEs (high trade elasticity) to EMEs (low elasticity)	Large	Longer-lasting. EMEs are expected to continue making a large contribution to global demand, but risks to outlook mean a rapid shift in the composition of global growth cannot be excluded.
Shift in global demand away from trade-intensive components (e.g. investment)	Small/medium	Temporary. A recovery in global investment would increase the trade intensity of demand. However, investment growth is not expected to return to the rapid growth of early 2000s.
Shift in global trade from manufacturing to services	Small	Ongoing. Shift towards services remains very gradual amid possible measurement biases.
Structural developments	**0.3-0.4**	
Dwindling global value chain participation	Medium	Longer-lasting, but dependent on pace of technological progress and trade liberalisation.
Waning reductions in transportation costs	Small	Largely permanent. Dependent on technological progress, but limited room for further large reductions in trade costs.
Waning trade liberalisation, increased non-tariff protection measures	Small	Trade liberalisation mainly permanent, but swift progress with further trade liberalisation not expected in immediate future.
Waning financial deepening provides less support for trade expansion	Small/medium	Largely permanent. Rapid financial deepening in past suggests limited scope for further support from financial deepending to enchance trade.

* The table above provides a summary assessment of the relative importance of the various factors affecting the trade elasticity, comparing recent experience (2012-15) with the pre-crisis period (1995-2007). 'Longer-lasting' denotes developments that are not necessarily permanent but are likely to persist over the medium-term. The distinction between composition and structural factors is mainly based on the decomposition exercise in Chapter 2. The relative magnitudes among structural factors is based on empirical analyses in Chapters 3 and 4. However, as some of the structural factors are inevitably interrelated, some judgment has been applied to appropriately align their marginal contributions. The empirical evidence underlying these results is discussed in the paper.

Although qualitatively less important, the second source of change in the global trade elasticity reflects structural developments, the influence of which materialises via three channels. The first reflects waning support from factors that had previously contributed to global trade outpacing global output growth, including lower transportation costs, the removal of trade barriers through lower tariffs and the growing adherence to global trade agreements through the increase in WTO membership. The second, related, channel reflects the moderation in the expansion of GVCs. Over recent decades the rapid integration of emerging market economies into the world economy had boosted the expansion of GVCs, but the process of fragmenting production across borders was already slowing even before the Great Recession. The contraction in GVCs also reflects in part rising labour costs in key emerging markets, a better appreciation of supply risk considerations in the wake of some natural disasters and an increasing move towards onshoring of production to export markets, which is partially motivated by a rise in protectionist policies. The third channel reflects diminishing marginal support from financial deepening to facilitate export capacity. As some of these explanatory factors are interconnected, an assessment of the marginal contributions to the trade weakness necessarily requires a degree of judgment. Moreover, the future evolution of both the structural drivers and compositional developments remains uncertain, and the identified explanatory factors may not capture the decline in the trade elasticity in its entirety.

This paper concludes that the recent weakness in the global trade-income relationship constitutes a "new normal" for the medium-term global trade-income

elasticity, and hence trade growth. Some of the structural factors that supported rapid trade expansion in the past, such as reduced transportation costs, declines in tariffs, and support from financial deepening seem to have largely run their course. The expansion of GVCs has stalled, and anecdotal evidence implies that, against the background of rising protectionist measures such as local content requirements, strong renewed expansion is unlikely to materialise in the medium term. Other factors are more uncertain and may contribute to some cyclical upswing. For instance, the dampening effect of low investment may gradually wane as the impact of negative shocks in emerging markets and oil-exporting countries unwinds or output gaps in advanced economies gradually close. New trade agreements and closer integration of countries in the southern hemisphere into the world economy could give a fresh impetus to global trade. Yet, while the trade elasticity of emerging market economies may over time converge with that of advanced economies, the underlying shift in the geographical composition of global economic activity from advanced towards emerging market economies is likely to persist. As such, the upside potential for trade over the medium term appears to be limited, and the new normal for global trade can be expected to look broadly similar to the “weakness” observed over recent years on average.

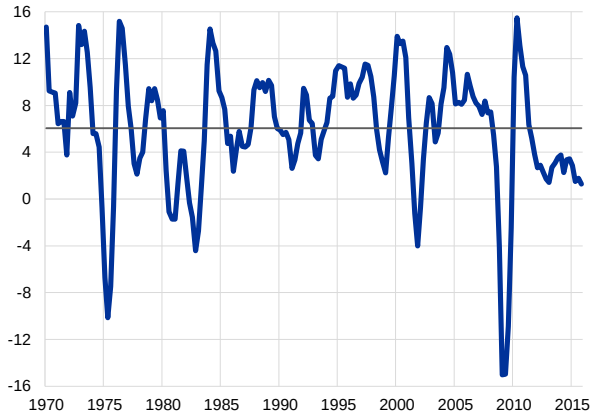
1 Review of stylised facts and literature

1.1 Introduction and motivation

Global trade has been exceptionally weak over the past five years. Annual world import growth has been below its long-run average since mid-2011, the longest period of below-trend growth for a half century (**Chart 1**). While global activity has also been subdued, the weakness in trade has been exceptional. Prior to the Great Recession, the ratio of global imports to GDP was rising steeply, whereas since 2011, this ratio has flattened considerably (**Chart 2**). That is, the relationship between global trade and activity appears to have changed.

Chart 1
World import growth

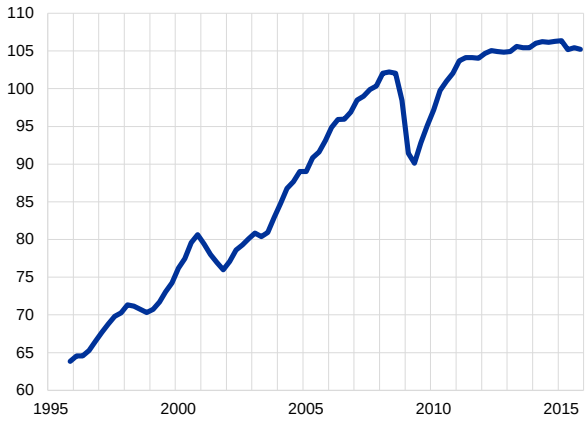
(annual percentage changes; quarterly data)



Source: OECD and national sources.
Notes: Imports of goods and services. The dashed line shows the average over the period 1970Q1-2015Q4. The last observation refers to 2015Q4.

Chart 2
Ratio of global imports to GDP

(ratio of levels)



Source: National sources.
Notes: Global GDP is aggregated with market exchange rates. Last observation is 2015Q4.

The long period of sub-par trade growth raises the question of whether this is a temporary deviation from trend or a longer-lasting phenomenon, reflecting fundamental structural change. This question is highly relevant for central banks. External demand for domestic goods plays an important role in the outlook for domestic activity and inflation. Understanding international trade linkages is essential in the assessment of the transmission of external shocks to the domestic economy. International trade is also a driver of total factor productivity and hence of potential growth. Against this background, this paper identifies the main determinants of the decline in the gross income elasticity of trade, defined as the average growth rate of world trade divided by the average growth rate of world GDP.[1] A major focus is the extent to which these drivers are temporary or longer-lasting – in short, what is the

[1] See, for example, US International Trade Commission (1997).

"new normal" rate of trade growth, and more specifically, of the trade-income elasticity?

The paper is structured as follows. The first chapter reviews stylised facts and the existing literature, introducing a theoretical framework for understanding the determinants of trade. The second chapter provides empirical evidence for the impact of changes in the geographical, sectoral and demand composition. The third chapter focuses on the role of global value chains, while the fourth assesses the impact of trade frictions. The paper closes with a summary assessment.

1.2 Stylised facts: recent developments in global trade

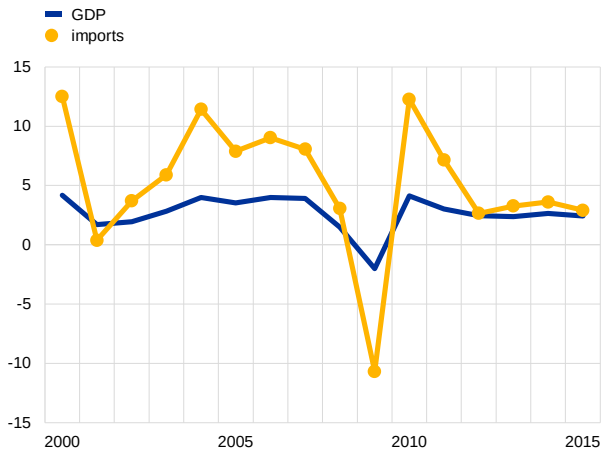
Until the Great Recession, global trade typically expanded faster than global GDP. The income elasticity of trade was above unity on average prior to the Great Recession. Indeed, from the 1980s until 2007, global trade expanded on average about twice as fast as global GDP.

The financial crisis brought large swings in global trade. The crisis and subsequent rebound between 2009 and 2011 were marked by strong changes in trade relative to GDP (**Chart 3**). During the Great Recession, the decline in trade was much more pronounced than the decline in global output. Subsequently, trade recovered and grew at over 12% in 2010, well above global GDP growth.

Chart 3

Global imports and GDP growth

(annual percentage changes)

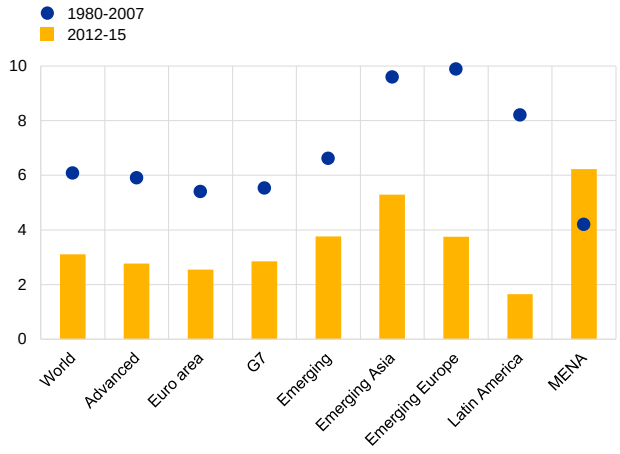


Source: IMF (WEO).
Notes: Imports of goods and services. Global GDP is aggregated with market exchange rates. Last observation is 2015.

Chart 4

Average import growth across countries

(annual growth rates)



Source: IMF (WEO).
Notes: Imports of goods and services. MENA refers to Middle East and Northern Africa.

From 2012 onwards, however, world trade weakened substantially again. Global import growth decelerated to around 3%, about half of the pre-crisis average and close to the GDP growth rate. The decline has affected both advanced and emerging economy aggregates; import weakness has also been broad-based across regions (**Chart 4**). The ongoing weakness in global trade, especially relative to GDP growth, was unexpected and reflected in repeated downward adjustments to trade

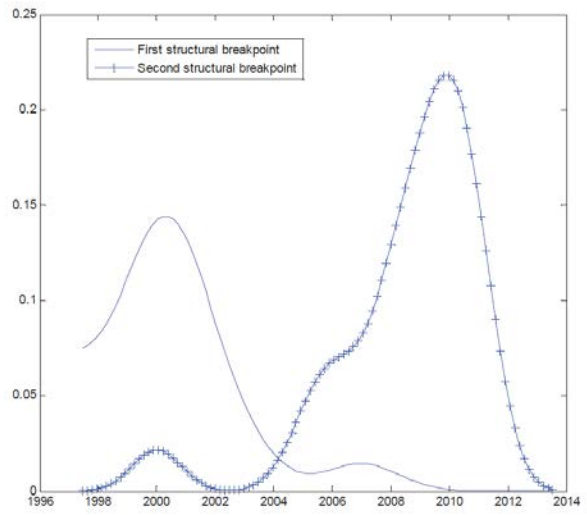
projections in recent years by the Eurosystem, international organisations and private forecasters.

Empirical analysis suggests there has been a structural break in the trade-income relationship. Formal panel structural break tests suggest two structural breakpoints, resulting in three different regimes (**Chart 5**).[2] The estimated break dates are placed around 2000, i.e. in the run-up to China's accession to the WTO accession (and its integration to the global economy), and at the end of 2009, reflecting the impact of the Global Trade Collapse (GTC). Tests at country level confirm considerable differences in the link between trade and income[3] across the three regimes (**Chart 6**), in particular a considerable decline in the trade elasticity in the third regime after 2009.

Chart 5

Structural breaks in the trade-income link

(frequencies of estimated heterogeneous break dates)

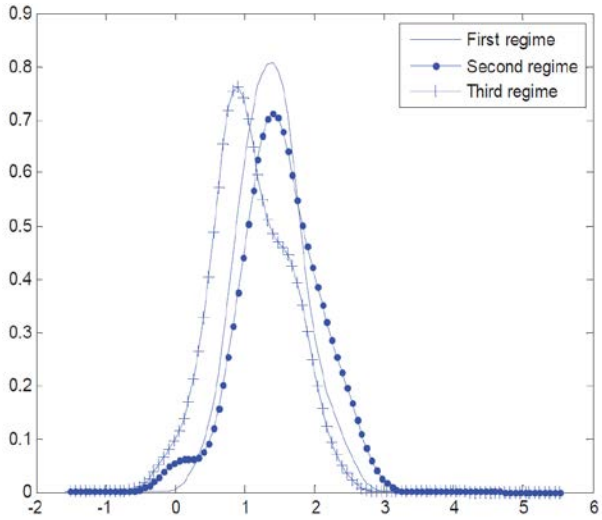


Source: Martinez-Martin (2016).

Chart 6

Coefficient of the (log of) import-adjusted demand (IAD)

(coefficients in different regimes)



Source: Martinez-Martin (2016).
Notes: Estimated break dates for countries for which the null hypothesis of no cointegration is rejected at the 5% level of significance in the unit-by-unit analysis.

2 Following Martinez-Martin (2016), using a cointegrating framework based on 21 (mostly advanced) countries. **Chart 5** shows the frequency of estimated heterogeneous break dates.

3 Rather than GDP, the tests use Import-Adjusted Demand (IAD), which weighs expenditure components according to their import shares (see Section 2.4).

Table 2

Pre- and post-crisis growth rates of trade and GDP

(annual growth rates; ratios)

Period	GDP weights*	GDP growth	Import growth	Ratio
1980-2007	MEX	3.0	6.1	2.0
1995-2007	MEX	3.2	7.4	2.3
2012-15	MEX	2.5	3.1	1.3
1980-2007	PPP	3.5	6.1	1.7
1995-2007	PPP	4.1	7.4	1.8
2012-15	PPP	3.3	3.1	0.9

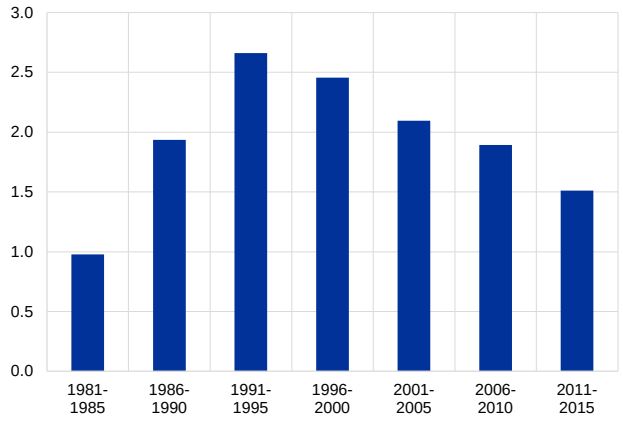
Source: IMF (WEO).
Notes: Imports of goods and services. Global weights refer either to market exchange rate (MEX)-based weights or purchasing power parity (PPP) weights.

The decline in the global trade-income elasticity is robust to different aggregation methods. Trade and activity can be compiled at a global level using different methods. Using annual data, **Table 2** compares the decline in the global elasticity ranges using different measures of global GDP (aggregated either with purchasing power parity (PPP) or market exchange rate (MEX)-based weights) and alternative reference periods (starting in 1980 or 1995). The decline in the global trade elasticity ranges between 0.7-1.0. For consistency of the analysis, this paper will focus on one measure: the market exchange rate-based measure of global activity, which suggests the global trade-income elasticity has fallen by 1.0 from its 1995-2007 average of 2.3.[4] The overall result is clear, however: on each measure and aggregation method, global trade has been substantially weaker since 2012 than in pre-crisis periods.

Chart 7

Ratios of global import growth to global GDP growth

(ratios of growth rates; annual data)



Source: IMF (WEO).
Notes: Imports of goods and services. Global GDP is aggregated at market exchange rates. The last observation refers to 2015.

Yet, while global trade has been particularly weak since 2012, the declines appear to be part of a longer-term trend. Simple comparisons of recent experience with pre-crisis averages can miss important slow-moving trends. Even before the financial crisis, the global trade-income elasticity had fluctuated substantially. It peaked in the early 1990s and has been on a declining trend ever since (**Chart 7**). Rather than looking for exceptional developments since 2012, it might be important to see recent experience as part of broader shifts in global trade trends. Indeed, there are a number of indications that the pre-crisis experience was exceptional – a period in which factors such as global integration, declining trade costs and advances in technology provided a one-off, albeit persistent, boost to trade growth. In other words, to assess the "new normal" for trade growth, one may need to ask whether previous experience constituted a sustainable benchmark.

[4] Global trade flows are aggregated by calculating nominal country shares in a common currency (USD) at market exchange rates (MEX), which is the same approach as taken, for example, in the IMF World Economic Outlook (WEO). To be consistent, global GDP should therefore also be aggregated using MEX. Furthermore, while GDP in PPP terms is important for comparing real incomes (per capita) across countries, it is less applicable for global trade, where the relevant purchasing power is mainly concerned with global prices; in other words, PPP weights would overstate the purchasing power of emerging economies in international markets for tradable goods and services.

1.3 A brief review of related literature

A number of studies argue that post-war trade was boosted by significant advances in technology, communication and transportation that are now gradually waning. In explaining rising trade growth, Irwin (2002) points to a shift from trade in primary goods to manufactured goods. Containerisation and other logistical innovations created efficiency gains in the transportation sector that helped support trade (Hummels 2007). Perhaps most importantly, emerging markets opened to international trade, as evidenced by sharply falling tariff rates (see Chapter 4). At the same time, technological and economic advances allowed the manufacturing process to become fragmented internationally through the use of global supply chains (Amador and di Mauro 2015). This outsourcing of intermediate production processes led to a rise in the trade of intermediate goods, such that gross trade increased even if the consumption of final traded goods did not change (Gangnes et al. 2015). All of these factors helped to raise the income elasticity of trade above unity in the pre-crisis period. But many of these supporting drivers have also faded as tariff rates have stabilised at lower levels, logistical innovations have matured and global value chain expansion has slowed owing, for instance, to increasing labour costs in key emerging markets. As Chapter 3 discusses, waning support from these factors could, at least partly, explain the long-running decline in trade elasticity, even before the Great Recession.

The literature has tended to interpret the trade collapse and subsequent strong rebound over 2009-2011 as a crisis-related, temporary deviation from longer-term trends. Freund (2009) finds that the relationship between trade and GDP changes during recessions, with trade declining more strongly than historical non-recessionary co-movements with output suggest, partly owing to drawdowns of inventories and a preference for sourcing from home country suppliers during downturns. Global value chains can further amplify the volatility through bullwhip effects, whereby changes in final demand can lead to larger adjustments in inventories along the production chains (Altomonte et al. 2012). Bussière et al. (2013) attribute the collapse in trade during the Great Recession in particular to a sharp decline in investment, which has a higher import content than other GDP components.

However, other papers have pointed to long-lasting crisis effects arising from protectionism and financial constraints. A number of empirical studies show that protectionist non-tariff measures (NTMs) have increased recently (Evenett and Fritz 2015) and that countries pursue more trade-restrictive policies when they experience recessions and/or when their competitiveness deteriorates through an appreciation of real exchange rates (Georgiadis and Gräb 2013). Empirical studies also suggest that liquidity contractions and tighter financial conditions have a restrictive effect on trade-intensive sectors, especially those that are most credit-dependent (Chor and Manova 2013). These developments were especially visible during the global financial crisis. However, Iacovone and Zavacka (2009) find evidence that the consequences are longer-lasting – as much as three years after a banking crisis, a country's exports continue to grow more slowly in sectors that are more dependent on external assets and with limited tangible assets to pledge as collateral.

1.4 Conceptual framework and basic model

Before turning to the empirical analysis, a simple theoretical model may help provide an understanding of how different factors affect trade growth and the trade elasticity. A benchmark model in studies of international trade assumes that all goods are tradable (Bems et al. 2013, Levchenko et al. 2010). **Box 1** provides a detailed discussion of the model and the implications for trade elasticities.

A key insight from the conceptual framework is that the long-run equilibrium income elasticity of trade is unity. For individual countries, deviations from this equilibrium value occur only to the extent that changes in trade costs or other frictions add a positive wedge to the income elasticity. The diffusion of global value chains can raise the elasticity above one, as it induces trade flows to grow at different rates from final demand. However, in each case the effect is temporary: once trade costs stop declining, progress on trade liberalisation comes to a halt or global value chains stop expanding, the trade-income elasticity will revert to unity. Finally, two-sector extension of the model shows that changes in the composition of aggregate demand can induce deviations from the unitary elasticity.

At the global level, however, the aggregate income elasticity can also differ from one owing to aggregation or compositional effects. Changes in country shares in aggregate income or demand can affect the global trade elasticity. For instance, if trade is growing faster (slower, in the euro area countries, which have a higher share in world trade than in world GDP, then the ratio of growth rates will be higher (lower) than unity.

Box 1
A stylised model of global trade

To start, we follow Armington (1969) and assume that the volume of goods imported from source country i by destination country j at time t, $x_{ij,t}$, takes the CES form:

$$x_{ij,t} = \left(\frac{\tau_{ij,t} \cdot p_{i,t}}{P_{j,t}}\right)^{-\sigma} D_{j,t} \qquad (1)$$

where $\tau_{ij,t} \geq 1$ is the iceberg cost[5] of delivering one unit of good from country i to country j at time t, $p_{i,t}$ is the factory gate price of the goods produced in country i at time t, $P_{j,t}$ is the aggregate price level of country j, $D_{j,t}$ is the real aggregate expenditure of country j, and $\sigma > 0$ is the elasticity of substitution between different goods. We assume that trade balances are zero and demand shocks are symmetric across countries, with the result that there are no transfers between countries and that income and expenditure coincide. By taking log variations, equation (1) becomes:

$$\hat{x}_{ij,t} = -\sigma \cdot \hat{\tau}_{ij,t} - \sigma \cdot \left(\hat{p}_{i,t} - \hat{P}_{j,t}\right) + \hat{D}_{j,t} \qquad (2)$$

[5] Iceberg costs are a simplifying assumption in the model, i.e. transporting a good uses only a fraction of the good itself, without using any other resources.

The income elasticity of country j at time t, $\eta_{j,t}$, is defined as the ratio between the percentage change of its imports and the percentage change of its aggregate income (both in volumes). Using a log approximation, we can write:

$$\eta_{j,t} \equiv \frac{\hat{x}_{ij,t}}{\hat{D}_{j,t}} = 1 - \sigma \frac{\hat{\tau}_{ij,t}}{\hat{D}_{j,t}} - \sigma \frac{(\hat{p}_{i,t} - \hat{P}_{j,t})}{\hat{D}_{j,t}}, for\ \hat{D}_{j,t} \neq 0, \quad (3)$$

where the condition $\hat{D}_{j,t} \neq 0$ grants that the elasticity exists and is finite.

The trade liberalisation effect

Equation (3) provides two interesting insights about the income elasticity. First, it shows that, in a steady state in which trade barriers and relative prices are constant, the income elasticity is equal to 1. In other words, changes in aggregate income translate into proportional changes in imports. Second, although the level of trade barriers does not affect the trade elasticity (at least in this simple framework), changes in trade barriers do. Thus, by ignoring all the short-run fluctuations in relative prices (i.e. $\hat{p}_{i,t} = \hat{P}$) and by assuming a positive trend for aggregate income ($\hat{D}_{j,t} > 0$), equation (3) shows that trade liberalisation and/or a decline in transportation costs ($\hat{\tau}_{ij,t} < 0$) add a positive wedge to the income elasticity ($-\sigma\hat{\tau}_{ij,t} / \hat{D}_{j,t} > 0$). Clearly, this effect fades out when the liberalisation process stalls, and it turns negative in the event of a resurgence in trade protectionism.

Aggregating at world level: the geographical composition effect

When computing the income elasticity at world level we also have to consider the issue of aggregation of bilateral trade flows and demand across countries. Under the assumption of a constant common elasticity of substitution, we can sum the bilateral trade flows in equation (2) over all markets (excluding the domestic one) by weighting the flows by the share of i's output sold in each market. The weight ω_{ij}^{x} is defined as the share of export revenues of country i that come from sales in destination j. As a result, total exports of country i are a linear function of the changes in the trade wedge, foreign demand ($\hat{F}_{i,t} = \sum_{j \neq i} \omega_{ij}^{x} \hat{D}_{j,t}$) and the real effective exchange rate (REER), $\hat{r}_{i,t}$, which captures relative price changes across countries.

$$\hat{x}_{i,t} = \hat{F}_{i,t} - \sum_{j \neq i} \omega_{ij}^{x} \hat{\tau}_{ij,t} - \sigma\hat{r}_{i,t} \quad (4)$$

Next, we aggregate over all exporting countries i in order to compute the world trade elasticity. We sum the expression in (4) across all countries by using the share of export revenues of country i with respect to world exports Ψ_i as the respective weights. The elasticity can then be obtained as the ratio between the growth in exports and the growth in aggregate foreign demand, as follows:

$$\eta_t = \frac{\hat{x}_t}{\hat{F}_t} = 1 - \sigma \frac{\sum_{i=1}^{K} \Psi_i \hat{r}_{i,t}}{\hat{F}_t} - \sigma \frac{\sum_{i=1}^{K} \sum_{j \neq i} \Psi_i \omega_{ij}^{x} \hat{\tau}_{ij,t}}{\hat{F}_t} \quad (5)$$

Equation (5) shows that the results for individual countries hold also at the world level. In practice, however, the relationship between the change in world trade and the change in world GDP is computed weighting GDP variations by shares in world income, instead of export shares. Then, the income-trade elasticity becomes

$$\tilde{\eta} = \eta_t \left(\frac{\hat{\Sigma}_{i=1\, i=t}^{K} \Psi_i \Sigma_{j \neq i} \omega_{ij}^{x} \hat{D}_{j,t}}{\Sigma_{i=1}^{K} \varphi_i \hat{Y}_{i,t}^{t}} \right) \quad (6)$$

where η_t is the elasticity as defined in equation (5) and φ_i is the share of GDP of country i with respect to world GDP. The second term in parentheses relates to the issue of geographical decomposition of world trade elasticity. For instance, if trade is growing faster (slower) in the euro area countries, which have a higher share in world trade than in world GDP, then the ratio of the second term will be higher (lower) than 1. Chapter 2 will highlight the importance of this compositional effect in shaping trends in the global income-trade elasticity.

Two-sector model – the demand composition effect

In the absence of changes in trade costs and relative prices, the one-sector model returns a unitary income elasticity, because changes in aggregate demand translate one-to-one into changes in imports. Key to this result is the fact that the composition of income does not matter. In reality, the composition of income matters because it differs from the composition of imports.

In order to assess how the different composition of trade flows and GDP affects the income elasticity, the benchmark two-country model is then extended to also incorporate the non-tradable goods sector, with preferences across goods taking a nested CES form. As in Bems et al. (2013), for each sector $s \in \{1,2\}$ of country j, the demand for domestic and foreign goods, $d_{jj,t}(s)$ and $d_{ij,t}(s)$, is aggregated to form a composite sector-level good, denoted by $d_{j,t}(s)$. These sector-level goods $d_{j,t}(1)$ and $d_{j,t}(2)$ can in turn be further aggregated into a composite final good, denoted by $D_{j,t}$. We assume that the goods of sector 1 are non-tradable and those of sector 2 are tradable and, for the sake of simplicity, we refer to the former as services and to the latter as manufacturing goods. We focus only on the effects of the different demand composition by making two additional simplifying assumptions: (i) within each sector, changes in demand across domestic and foreign varieties are symmetric (i.e. $\hat{d}_{jj,t}(s) = \hat{d}_{ij,t}(s)$); and (ii) trade costs and relative prices are constant.

In this framework, the income elasticity of country j becomes

$$\eta_{j,t} \equiv \frac{\hat{d}_{j,t}(2)}{\hat{D}_{j,t}} = \frac{\hat{d}_{j,t}(2)}{\omega_{j,t}(1).\hat{d}_{j,t}(1) + \omega_{j,t}(2).\hat{d}_{j,t}(2)}, for\ \hat{D}_{j,t} \neq 0 \quad (7)$$

where $\hat{d}_{j,t}(s)$ is the log change in the demand for the goods of sector s for country j at time t and $\omega_{j,t}(s) \leq 1$ is the weight of sector s on the total expenditure of country j at time t (where $\omega_{j,t}(1) = 1 - \omega_{j,t}(2)$). Equation (7) shows that, in general, the income elasticity is no longer equal to 1, unless manufacturing goods and services show exactly the same changes at any time t.[6]

International production linkages: the GVC effect

Trade in intermediate goods creates an additional linkage across countries, which affects the income elasticity. Referring again to Bems et al. (2013), we introduce a vertical production linkage in the two-country model by assuming that manufacturing products of country i are also used as intermediate inputs in the production of final goods in country j. The production technology is assumed to be Leontief, and the technical coefficient $a_{ij,t}(2,2)$ indicates the fraction of foreign

[6] Borin et al. (2016) show that, in the absence of a long-run trend in income and trade, the higher volatility of imports with respect to income and their procyclicality would push the elasticity persistently above 1. However, if trade flows and income have a long-run trend – and irrespective of whether this trend is common or not (i.e. irrespective of any trend in the trade-to-income ratio – the income elasticity turns out also to be procyclical, meaning that when GDP growth is high, one should expect a high elasticity and vice versa.

intermediates per unit of manufacturing output in j, $q_{j,t}(2)$. To keep the model as simple as possible while still giving a realistic representation of GVCs, we make the following assumptions: (i) we suppose that country j exports only final products ($a_{ji,t}(2,2) = 0$); (ii) country i exports only intermediates ($d_{ij,t}(2) = 0$); (iii) services keep being non-traded in both countries ($d_{ij,t}(1) = d_{ji,t}(1) = 0$); and (iv) demand changes are symmetric within countries ($\hat{d}_k(s) = \hat{D}_k$ $(k \,\epsilon\, \{i, j\})$). Again neglecting relative prices and trade costs, the change in aggregate imports by country j is determined by the variation of manufacturing gross output and by the change in the foreign input requirement:

$$\hat{x}_{ij,t} = \hat{q}_{j,t}(2) + \hat{a}_{ij,t}(2,2) \qquad (8)$$

Equation (8) shows that intermediate goods create an additional linkage between countries: if demand in country j grows, then this growth also affects demand in country i, which needs to increase the supply of the intermediate goods which are necessary for country j to raise its production of final goods. The production of final goods, $\hat{q}_{j,t}(2)$ in turn can be expressed as a weighted average of the changes in domestic and foreign demand, where the weights are the fractions of manufacturing production in j destined for the corresponding market:

$$\hat{q}_{j,t}(2) = \omega_{jj}^{q}(2)\hat{D}_{j,t} + \omega_{ji}^{q}(2)\hat{D}_{i,t}$$

where $\omega_{ji}^{q}(2) = d_{ji}(2) \,/\, q_j(2)$. Thus the income elasticity becomes:

$$\eta_{j,t} \equiv \frac{\hat{x}_{ij,t}}{\hat{D}_{j,t}} = \omega_{jj}^{q}(2) + \frac{\omega_{ji}^{q}(2)\hat{D}_{i,t}}{\hat{D}_{j,t}} + \frac{\hat{a}_{ij,t}(2,2)}{\hat{D}_{j,t}}, for\ \hat{D}_{j,t} \neq 0 \qquad (9)$$

The first key insight provided by equation (9) is that the trade elasticity now also depends on the variation in foreign demand, as foreign intermediate inputs are used to produce domestic final output. In particular, the elasticity diverges from 1 whenever changes in expenditure differ across countries. The last term of equation (9) is a proxy for the evolution of vertical integration: as countries become more integrated, $\hat{a}_{ij,t}(2,2)$ is positive, raising the elasticity. As for the case of trade liberalisation, the diffusion of GVCs pushes the elasticity above 1, because it makes trade flows grow faster than final demand. This wedge, however, vanishes when GVC intensity stabilises.

2 The role of shifts in the geographical, sectoral and demand composition of global activity

This chapter studies how geographical, sectoral and demand-side changes may have affected the trade-income relationship. A key insight from these analyses is that the composition of activity across the world can affect the aggregate global trade-income elasticity – either because demand or output switches away from trade-intensive expenditure components or sectors, or because global growth shifts geographically and is increasingly driven by countries with lower trade intensities. Importantly, some of these shifts may be cyclical – for example weak investment (which is trade-intensive) may be a temporary phenomenon. Other effects, however, such as the shift in global activity from advanced to emerging economies, are likely to be longer-lasting. With regard to the global trade slowdown, the geographical effect – i.e. the relative demand shift from advanced (AEs) to emerging economies (EMEs) – is found to account for about half of the decline in the global trade-income elasticity.

2.1 Geographical perspective

The decline in trade-income elasticities has been a common but uneven phenomenon across countries. Chapter 1 showed that most regions have seen a decline in trade elasticities in recent years compared to pre-crisis experience. The decline was, however, much more pronounced among EMEs than in AEs (see **Table 3**), with the elasticity for China falling particularly strongly (see also **Box 2**).

Table 3
Trade-income elasticities

(ratios of import-to-GDP growth)

	1980-2007	2012-15
World**	**2.0**	**1.3**
Advanced economies*	**2.1**	**1.8**
United States	2.2	1.4
United Kingdom	2.1	1.7
Emerging economies*	**1.5**	**0.8**
China	1.8	0.8
India	1.5	0.6

Source: IMF (WEO). Notes: *based on PPP aggregation; **based on MEX aggregation.

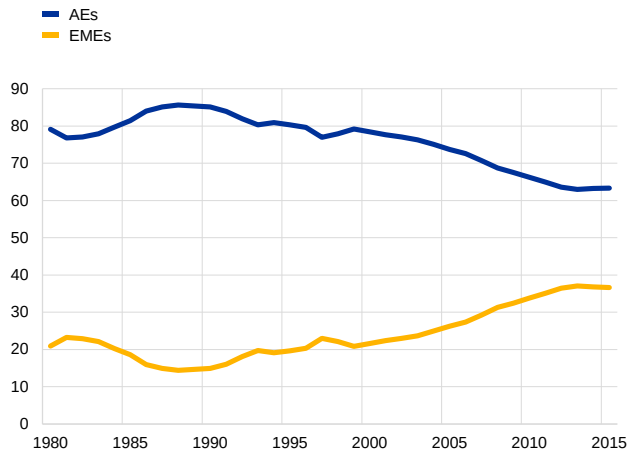
However, shifts in the global trade elasticity can reflect changes in both individual country trade-income elasticities and the relative weights of each country within the global aggregate. The global trade elasticity represents a weighted sum of national elasticities (Constantinescu et al. 2015), with the weights determined by a country's import share and GDP growth relative to global economic growth. Thus, in addition to fluctuations in elasticities at the national level, changes in the global elasticity will also reflect shifts in import shares or relative growth across countries. Indeed, the global elasticity could change even without changes to elasticities for individual countries.

The past decade has seen significant changes in the relative contributions of advanced and emerging economies to global growth and trade.[7] Relative to advanced economies, the contribution of EMEs to global GDP growth has increased significantly; advanced economies have also lost shares of global trade (**Chart 8** and **Chart 9**). Since advanced economies typically have a higher trade elasticity than their EME counterparts (see **Table 3**), the decreasing importance of advanced economies in the global economy – in terms of trade and activity – has implications for the global trade elasticity.

Chart 8

Shares of global imports

(percentages of world total)

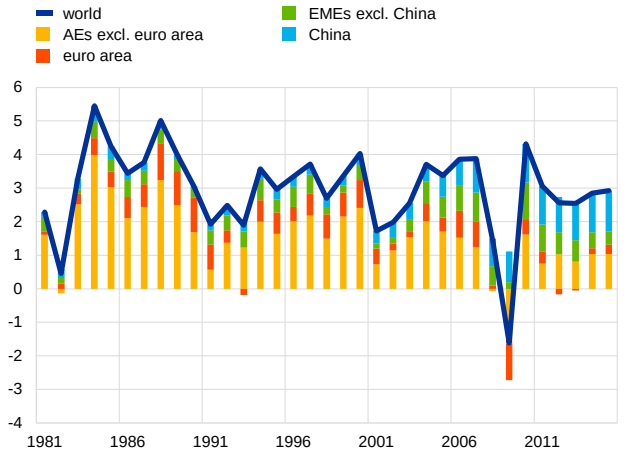


Source: IMF (WEO), authors' calculations.

Chart 9

Global GDP growth contributions

(annual percentage changes; percentage points)



Source: World Bank (WDI), IMF (WEO), Haver Analytics and authors' calculations. Aggregation based on market exchange rates.

An accounting exercise helps to quantify the impact on the global trade-income elasticity of these shifts in relative demand between countries and regions. Following Slopek (2015), the individual country contributions to the change in the global trade-income elasticity can be decomposed into three terms: the change in the national trade-income elasticity; the change in a country's share in world imports; and the change in national real GDP growth relative to the global aggregate.[8]

$$\Delta e_w \approx \sum_{i=1}^{c}(\Delta e_i)\overline{m}_i\,\overline{y}_i + \sum_{i=1}^{c}(\Delta m_i)\overline{e}_i\,\overline{y}_i + \sum_{i=1}^{c}(\Delta y_i)\overline{e}_i\,\overline{m}_i$$

$$\underbrace{\qquad}_{elasticity\ contribution} \quad \underbrace{\qquad}_{import\ share\ contribution} \quad \underbrace{\qquad}_{relative\ growth\ contribution}$$

[7] The following analysis is based on a sample of 24 AEs and 18 EMEs from the World Bank (WDI) and IMF (WEO April 2016) databases.

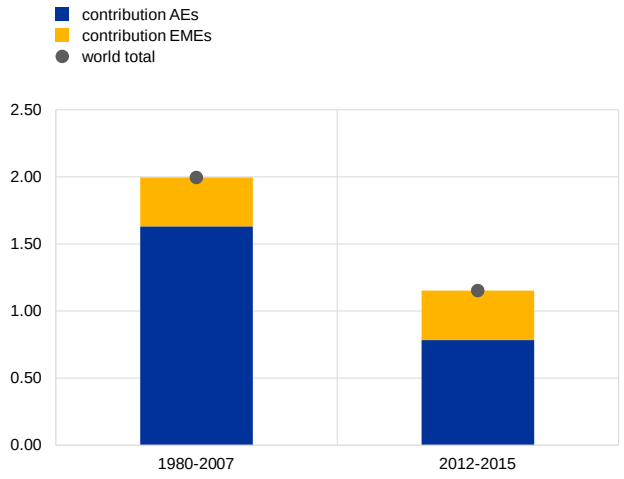
[8] This is a close approximation of the Shapley decomposition, see for example Ang et al. (2003).

where the change in the global trade elasticity (Δe_w) approximately equals the sum of the changes in each component (Δe_i refers to the change in the elasticity, Δm_i is the change of the import share of total world imports, and Δy_i is the change in growth relative to real world GDP growth, in each case in country i) weighted by the averages of the other two components over the two periods under comparison. We define the sum of the weighted changes in one component as the contribution to the change in the global elasticity from this component. Adding up the contributions from each component for country i provides the contribution from this country.

Chart 10

Contributions of regions to global trade elasticity

(trade-income elasticity and contributions)

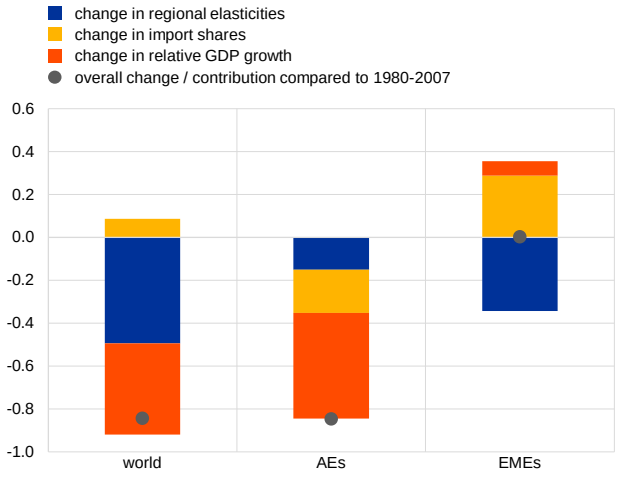


Source: Authors' calculations.
Notes: Analysis based on an approximate total differential for aggregates of 24 advanced economies (AEs) and 18 emerging market economies (EMEs).

Chart 11

Contributions to changes in global trade elasticities

(changes in trade-income elasticity and contributions)



Source: Authors' calculations.
Notes: Analysis based on an approximate total differential for aggregates of 24 advanced economies (AEs) and 18 emerging market economies (EMEs).

Shifts in relative demand from AEs towards EMEs have indeed played a significant role in the recent trade slowdown. Comparing the periods 1980-2007 to 2012-15, the global trade elasticity fell from 2.0 to 1.2. While the contribution of EMEs has been stable, the contribution of advanced economies has shrunk (**Chart 10**).[9] The lower contribution from advanced economies is almost entirely a function of their lower weight in the global aggregate: the trade-income elasticity in advanced economies has decreased only slightly during that period (from 2.1 to 1.9), but a lower share in global imports and, crucially, a fall in GDP growth relative to the global average have lowered the weight of advanced economies in the global aggregate. By contrast, the contribution from EMEs is broadly unchanged: the trade elasticity of EMEs has actually fallen sharply (1.6 to 0.7) but this was offset by a higher weight in the global aggregate trade-income elasticity. Overall, roughly half of the decline in the global

[9] The analysis was conducted using data on 42 countries. To provide a clear exposition, this discussion focuses on the aggregate contributions of advanced and emerging market blocs. See Slopek (2015) for more details.

trade elasticity can be attributed to the relative demand shift from AEs to EMEs (**Chart 11**).[10]

Looking ahead, global projections see the shift in relative demand from AEs towards EMEs persisting. Import shares are very persistent and therefore change only slowly. Relative growth differentials between advanced and emerging economies could in principle revert faster. Yet the latest global projections from international organisations (e.g. the IMF) suggest that EMEs will continue to outperform their advanced economy counterparts, making a larger contribution to global output growth. This would suggest that the geographical compositional shifts – towards economies with less trade-intensive growth – that have weighed on the global trade-income elasticity in recent years are not expected to reverse rapidly.[11] At the same time, public and private sector forecasters have also highlighted downside risks to activity growth, particularly for EMEs. A rapid shift in relative demand with compositional effects on the global trade-income elasticity cannot be entirely excluded. Furthermore, in the longer run, the catch-up process could also lead to an increase in trade elasticities of EMEs.

Box 2
The special role of China in the recent trade slowdown

The recent decline in China's income elasticity of imports has been striking and has made a marked contribution to the fall in the world trade elasticity. China's trade elasticity dropped from 1.8 in 1980-2007 to 0.8 in 2012-15. The fall in imports in 2015 was particularly stark, with imports expanding by just 2%, despite robust economic activity (see **Chart A**). This box discusses the supply and demand factors behind the slowdown in China's trade flows.

As a major supplier and consumer of traded goods, China's fast development has increased both the supply and demand for traded goods. In the late 1990s and early 2000s, the increasing openness of the Chinese economy acted as a global supply shock, contributing to a decline in the relative price of tradables and boosting global trade. At the same time, as a fast-growing economy, particularly focused on rapid capital accumulation, it has been a major source of overseas demand for many other trading nations (see, for example, Bussière and Mehl 2008). More recently, however, these factors have weakened: the ongoing rebalancing of the Chinese economy, with diminishing emphasis on investment and export-driven growth, has gradually dampened China's import growth.

China's increasing integration into the global economy has greatly enhanced the supply capacity for traded goods in the past two decades. Prior to the Great Recession, China expanded its export capacity significantly by specialising in labour-intensive industries for which it had a comparative advantage in production (see Gaulier et al. 2015). The export-oriented growth strategy resulted in a

[10] Other analyses confirm the role of the geographical shift in global growth in driving changes in the global trade income elasticity. Deutsche Bundesbank (2016) compares a "top-down" regression-based estimate of the aggregate global-trade income elasticity with a bottom-up assessment based on similar regressions for 42 countries, finding that the geographic composition can account for a considerable portion of the observed weakness in world trade. Stratford (2015) performs a similar comparison – based on mean-variance adjustment of the two series – and also attributes an important part of the slowdown to geographic compositional effects.

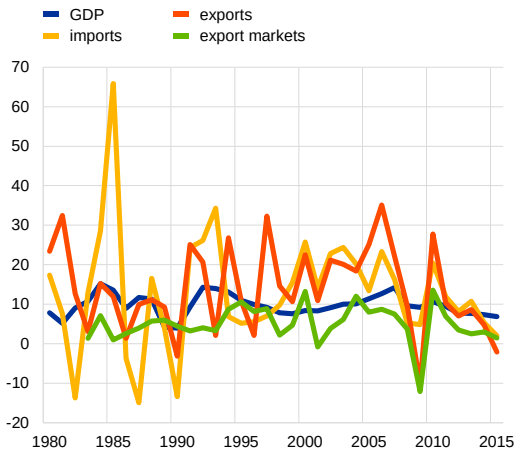
[11] See IMF World Economic Outlook, April 2016.

rapid expansion of the manufacturing base in China, supporting global trade growth both by providing relatively cheaper goods and by boosting demand for intermediate traded inputs through increasing integration into global supply chains (see Chapter 3). However, growth in Chinese exports has slowed in recent years. China's market share gains have gradually moderated: in 2001-07, China's exports rose faster by about 15 percentage points than import demand in its main markets; by 2008-13, this differential had fallen to 6 percentage points (see **Chart A**). Waning competitiveness over that period may have played a role: China's real effective exchange rate (based on relative producer prices) has appreciated by about one-quarter since 2005. At the same time, China's exports had to slow eventually – they cannot outstrip the expansion of export markets in the long term. In that regard, China's export sector – comprising 10% of global exports – may simply be maturing as it has reached a critical size (see Deutsche Bundesbank, 2016), with the ratio of exports to GDP declining considerably since 2010 (see **Chart B**).

Chart A

Chinese trade flows and demand determinants

(annual percentage changes)

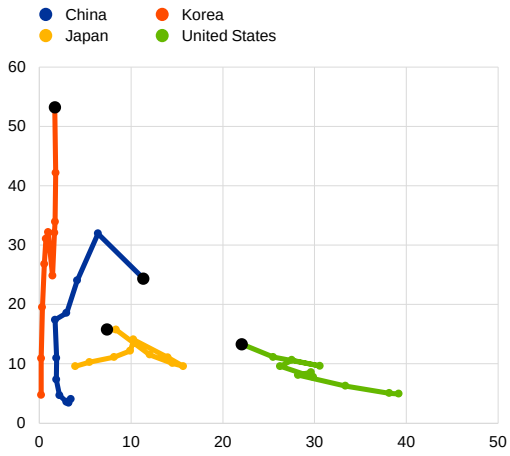


Sources: World Bank (WDI), IMF (WEO), OECD (EO), Haver Analytics and authors' calculations.
Notes: Real growth rates, trade flows refer to trade in goods and services.

Chart B

Relative size and trade openness, 1960-2014

(x-axis: GDP as a percentage of global GDP; y-axis: exports-to-GDP ratio; 5-year averages, 1960-2014)



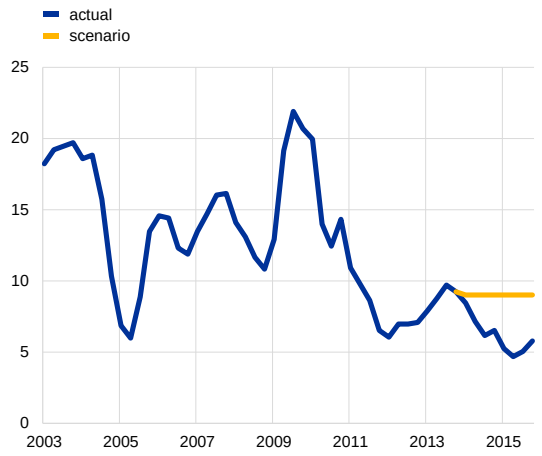
Source: Deutsche Bundesbank (2016).
Notes: Exports of goods and services. Aggregation (nominal GDP) based on market exchange rates. Last period (2010-14) is indicated by black indicators.

More recently, the gradual rebalancing of China's demand away from trade-intensive investment has contributed to slowing import demand. In recent years, China's demand has shifted, driven more by consumption and less by trade-intensive exports and investment. In the first decade of the century, China's investment surged, with the investment share of GDP rising from 34% in 2000 to 48% in 2010. However, investment growth has moderated sharply since. By 2015 investment was expanding at a slower pace than aggregate GDP. A Bayesian vector autoregression analysis suggests that the recent weakness in China's imports is partly driven by the investment slowdown. Conditional forecasts for imports since 2014 – one based on observed investment developments and a second assuming constant investment growth of 9% – suggest that imports would have been significantly higher had investment remained more resilient (**Chart C** and **D**). Indeed, the investment slowdown accounts for a significant proportion of the drop in import growth over the 2014-15 period.

Chart C

Constant investment growth scenario

(year-on-year percentage changes)

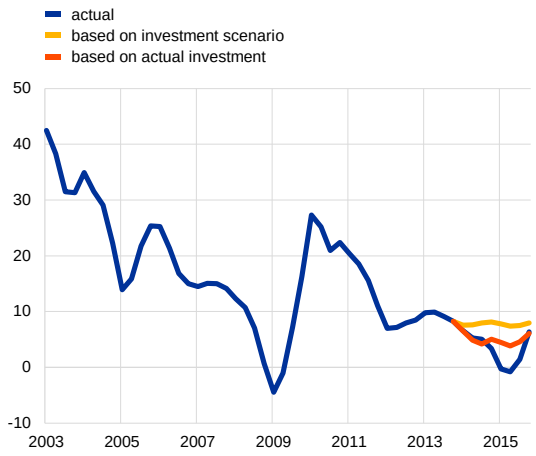


Source: ECB calculations.

Chart D

Import growth under investment scenario

(year-on-year percentage changes)



Source: ECB calculations.
Notes: Investment scenario refers to the yellow line in **Chart C**.

Overall, China's slowing import demand reflects its changing role as both a supplier and consumer of traded goods. China's integration into the global economy contributed to a significant decline in the relative price of tradables prior to the financial crisis. China greatly increased its role as a major global exporter. However, the effects were likely to diminish over time – China could not continue to make rapid market share gains indefinitely. Gradually waning competitiveness has also played a role in moderating export growth. At the same time, China's demand has changed: after a period of rapid capital expansion, China is rebalancing away from investment – as it does, the trade intensity of demand growth is falling. Given its size and the strong structural changes that China has experienced, it has played an important role in the global trade slowdown.

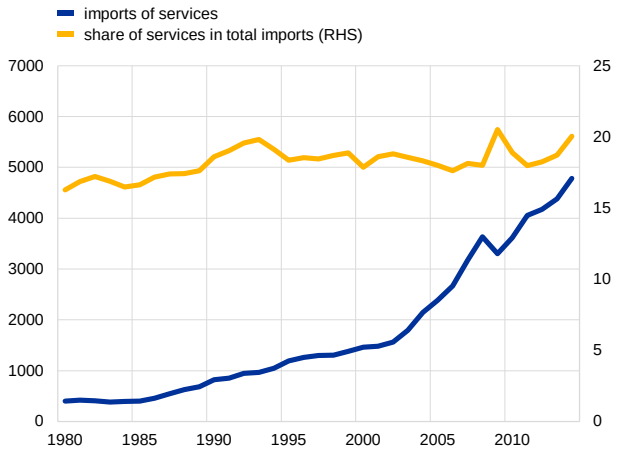
2.2 Sectoral perspective: the role of the services sector

While geographical shifts have played an important part in the recent decline of the global trade elasticity, the role of sectoral shifts in the trade slowdown is less certain. While the share of non-tradables is higher than in goods, data show that world services imports have increased steadily over the past 30 years and the share of services imports (within total imports) has also risen (**Chart 12**). Trade in services has different characteristics to trade in goods; in particular it is less volatile and shows less co-movement with economic cycles (Borchert and Mattoo 2009). At the same time, the income elasticity of services import is larger in magnitude than goods trade elasticities (**Chart 13**). However, measurement of trade in services is increasingly challenging as, for example, data, storage and technical services are provided in an increasingly diffuse manner through online services. These in turn are more difficult to locate precisely and capture accurately in trade statistics (see Box 3). Overall, the impact from the global sectoral shift from goods to services appears to be difficult to assess, but current evidence does not point to a major role for services in explaining the recent weakness in global trade.

Chart 12

Imports of commercial services and their share in total imports

(billions of current USD; shares in percentages)

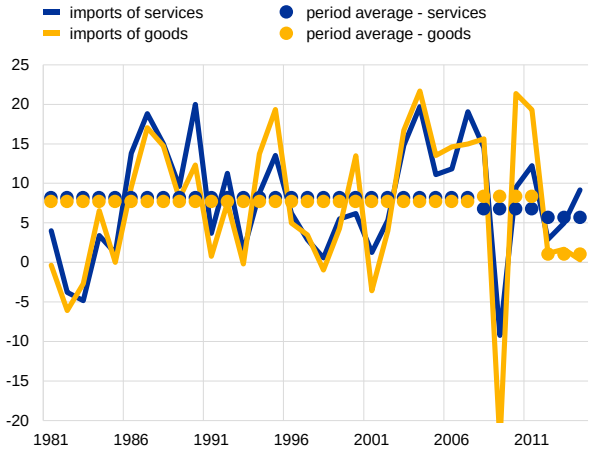


Source: WTO.
Notes: Government services are excluded from commercial services. Total imports refers to the sum of commercial services and merchandise imports.

Chart 13

Change in global imports of goods and services

(annual percentage changes)



Source: WTO
Notes: Government services are excluded from commercial services. Periods are defined as pre-crisis (1981-2007), crisis and rebound (2008-11) and post-crisis (2012-14).

2.3 Demand composition

The changing composition of demand can also play an important role in driving trade fluctuations, since the import-intensity of GDP components differs considerably. Components of demand tend to have different trade intensities (Bussière et al. 2013, Boz et al. 2014). Business investment, for instance, is a more trade-intensive category of expenditure than government spending, which falls more on non-tradables and perhaps also has a larger home bias; private consumption lies between these two extremes (see **Chart 14**).[12] In addition, the components of GDP typically exhibit different degrees of procyclicality. Investment is highly procyclical, whereas public spending is acyclical or even countercyclical. As a result, recessions induce a very different relation between imports and GDP than exists at normal times. During a recession, investment can fall very sharply, which weighs heavily on imports. By contrast, GDP is supported by public spending but, given the low import-intensity of public spending, this provides limited stimulus to imports.

For advanced economies, the shift in the composition of demand – particularly the weakness of investment – appears to have been a key factor behind weak trade since the Great Recession. Bussière et al. (2013) quantify the impact of demand factors by using an import-intensity-adjusted (IAD) measure of demand, based on OECD input-output tables, to model import developments in a panel regression for

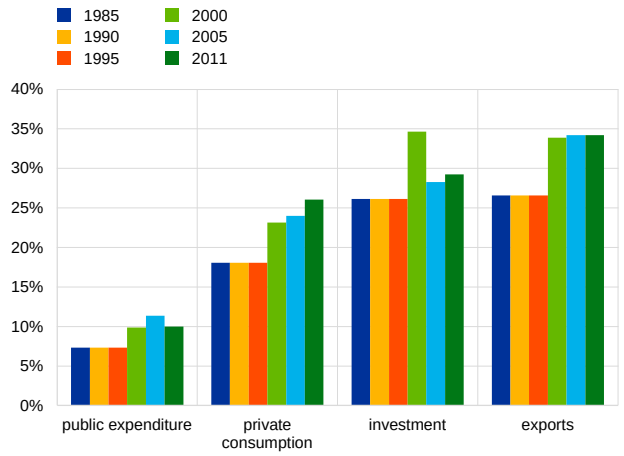
[12] Another import component is inventories, which is also very import-intensive and procyclical. Bussière et al. (2013) show that a model for the G7 countries that includes inventories improves the fit of the model noticeably.

18 advanced economies.[13] The results support the view that the composition of demand matters for explaining trade developments: using the IAD measure instead of GDP improves the fit of the model considerably.[14]

Chart 14

Import content of GDP components

(percentages)

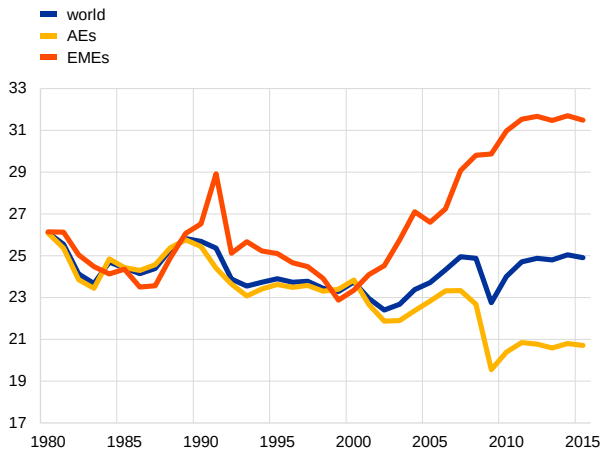


Source: Martinez-Martin (2016).
Notes: Calculations based on input-output tables in G7 countries.

Chart 15

Investment-to-GDP ratios

(shares in percentages)



Sources: IMF (WEO), authors' calculations.

At the global level, the shift away from trade-intensive components of demand has also played a role in the recent trade weakness. Investment in EMEs has been more resilient in the immediate aftermath of the financial crisis than in advanced economies, increasing strongly until 2012 and then remaining stable at high levels (**Chart 15**). Overall, the global investment-to-GDP ratio has plateaued in the past two to three years. That may reflect the gradual rebalancing in China away from investment-led growth and the sharp slowdown in investment amongst commodity exporters as commodity prices have slumped. Overall, the trade-intensity of global demand is no longer increasing: since 2012, a "global" measure of IAD has increased at almost the same pace as GDP, having outstripped GDP on average prior to the financial crisis (**Chart 16**).[15] Projections for global import growth conditional on the IAD measure and pre-crisis elasticities are closer to the observed import values than an equivalent projection using GDP growth (**Chart 17**). The difference is modest but, particularly in 2014 and 2015, the conditional projections

[13] Specifically, the regression that is considered is as follows,
$\Delta \ln(M_{c,t}) = \delta_c + \beta_D \Delta \ln(D_{c,t}) + \beta_P \Delta \ln(RMP_{c,t}) + \varepsilon_{c,t}$,
where all variables are in log changes, and M stands for imports, D for demand and RMP for relative import prices, all for country c at time (quarter) t. All things being equal, higher demand is expected to be associated with more imports, and higher relative prices with lower imports.

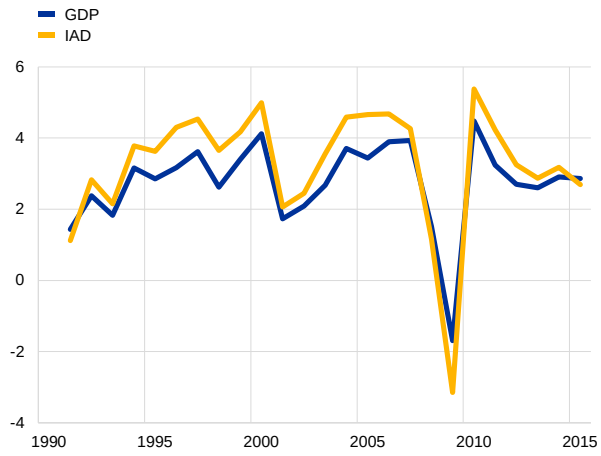
[14] The results are broadly confirmed by Martinez-Martin (2016), who also takes into account structural factors in his panel estimation (e.g. protectionism, foreign direct investment, vertical integration through GVC participation, etc.).

[15] Data limitations restrict the analysis to a set of 18 advanced and emerging countries. The sample covers roughly 78% of world GDP in 2015 and includes 9 AEs (Australia, Canada, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States) and 9 EMEs (Brazil, China, India, Indonesia, Korea, Mexico, Poland, Russia and Turkey).

suggest that the shift in global demand away from the more trade-intensive components of growth has contributed to global trade weakness.

Chart 16
Global GDP and IAD

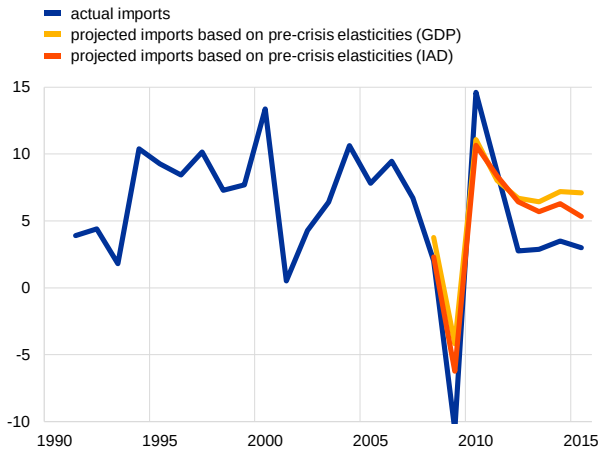
(annual percentage changes)



Source: IMF (WEO), authors' calculations. Country sample includes 9 AEs (Australia, Canada, France, Germany, Italy, Japan, Spain, the United Kingdom and the United States) and 9 EMEs (Brazil, China, India, Indonesia, Korea, Mexico, Poland, Russia and Turkey).

Chart 17
Projected import growth, conditional on IAD/GDP

(annual percentage changes)



Source: Authors' calculations.
Notes: Sample includes 18 countries (9 AEs and 9 EMEs) covering 78% of global GDP. Projections based on pre-crisis elasticities (1995-2007).

Box 3
Measurement issues in trade statistics

A considerable amount of uncertainty regarding trade measures arises from measurement issues in trade statistics. The sources of measurement problems are pervasive in trade, including particular challenges concerning deflators and connected with accurately measuring the rising share of trade in services.

Measures of trade prices suffer from strong selection and attrition biases. Exporters tend to be large firms using a disproportionate share of foreign inputs, which disconnect trade price (generally gross prices, not value added prices) and domestic prices, even within narrowly defined sectors. Firms can charge different prices at home and abroad, as they can set price-cost margins optimally in response to market condition changes (owing to exchange rate changes, for instance). Furthermore, a large share of world trade takes place in the form of international transactions within multinational companies, which need to be treated as if they had taken place between independent firms. However, transfer pricing, owing in particular to tax avoidance strategies, creates an additional wedge between the prices of goods and services that are sold abroad and those that are sold domestically (Vicard, 2015).

Statistics on trade in services suffer from greater measurement problems than statistics on trade in goods. Historically, owing to tariff revenues, flows of goods have been recorded at borders with high accuracy, but service flows are much more abstract and harder to capture, leading to weaker compilation practices. For instance, technical infrastructure, software and cloud storage are increasingly detached from hardware infrastructure, located physically on company premises, and are traded globally as services rather than goods (OECD, 2001). Also, as services are intangible, non-storable and often require face-to-face interaction between the seller and buyer, in order to

reach consumers firms open up offices in the foreign destination markets and the services provided are no longer considered to be exports (Pindyuk and Wörz 2008; McKinsey Global Institute 2014). Furthermore, the expansion of global value chains has been widely supported by the internationalisation of business services (e.g. legal, accounting and data processing). However, the increased use of intangible inputs in production raises further concerns, as their location of production is ambiguous, making it extremely difficult to account for these based on service trade definitions (Lipsey, 2009). To the extent that services are gaining importance in trade and their value is systematically underreported, the observed stagnation in world trade could be partly explained by the above-mentioned measurement issues. In this context, the role of statistical authorities in reducing ambiguities in measuring service trade flows should be stressed.

3 The role of global value chains

Global value chains (GVCs) have also played an important role in the evolution of the income elasticity of global trade. GVCs describe the international fragmentation of production processes, in which intermediate goods are shipped across borders multiple times, with each exporting country providing some value added, until the good is imported for final consumption by a given economy. Statistics that measure trade flows in gross terms are affected by such global integrated production networks. Each time goods or services cross international borders they are registered as gross trade flows, meaning that in extended supply chains intermediate inputs can be counted multiple times. The rise in global value chains in the 1990s and early 2000s is therefore one possible explanation for why trade grew at a higher rate than GDP. It follows that a deceleration in or outright reversal of the outsourcing of intermediate production could also explain why trade has weakened relative to GDP more recently.

This chapter will assess the role of GVCs in the recent weakness of global trade. It will examine to what extent GVCs rose prior to the Great Recession and how the pace of cross-border outsourcing of intermediate production processes has changed over recent years. It will then consider empirical evidence for the change in the contribution of GVCs to global trade growth. Finally, micro evidence is used to understand the underlying drivers of the change in global value chains.

3.1 Measuring global value chains

There are different ways of assessing the integration of a country or region into international production networks, but recent literature has focused on measures using global input-output tables.[16] Global input-output tables help to track value added flows across industries and countries.[17] Such data are then used to construct GVC participation indices, which take account of two dimensions of value chain participation. One is the upstream or backward perspective, meaning a country's use of imported goods and services in producing its own exports. The other is the downstream or forward perspective, which captures a country's exports of intermediate goods and services that are subsequently processed by a trading partner. We focus on an index of GVC participation that measures GVC-related trade flows as those that entail at least two cross-border flows of goods (based on Borin and Mancini 2015, Koopman et al. 2014).[18]

16 See, for example, the discussion in Amador and Cabral (2014).

17 Examples here include Hummels, Ishii and Yi (2001), Koopman, Wang and Wei (2014), Johnson and Noguera (2012) and Los, Timmer and de Vries (2014).

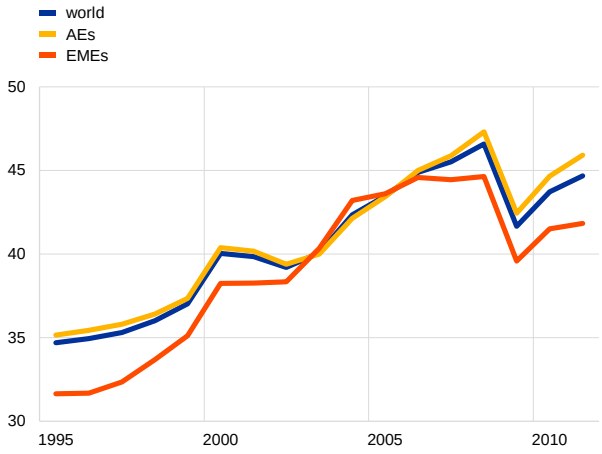
18 The measure is estimated using bilateral trade data based on the World Input-Output Database (WIOD). It excludes the fraction of domestic value added that is exported only once and directly absorbed by the destination country. The remaining part of exports is considered part of global value chains processes and is divided by total trade of a country or region to obtain the GVC participation index. The index is adjusted for commodity price effects by setting to zero valued added in energy sectors.

At global level, GVC participation rose steadily from 1996 until the Great Recession. Emerging markets in particular joined global production processes, with GVC participation rising faster than in advanced economies (**Chart 18**). However, EME participation began to level off prior to the Great Recession.

Chart 18

GVC participation

(share of GVC-related exports in total exports)



Source: Authors' calculations.
Note: Computations based on Borin and Mancini (2015).

Table 4

Contributions to the global income elasticity of trade

(trade-income elasticity and contributions)

	Long-term	GVC	Other	Elasticity
1996-2000	1.0	0.45	0.61	2.06
2001-07	1.0	0.29	0.19	1.47
2008-11	1.0	-0.09	-0.11	0.80

Source: Authors' calculations.
Note: Computations based on Borin and Mancini (2015).

Changes in global value chain participation have played a role in the fluctuations in the global trade-income elasticity. One can derive the quantitative impact of the expansion of global value chains on the global trade elasticity using the decomposition of Borin and Mancini (2015). Expressing total imports Mt as the sum of non-GVC-related ("Ricardian") trade, R_t, and GVC-related trade G_t, global imports can be written as:

$$M_t = \frac{M_t}{R_t}\frac{R_t}{Y_t}Y_t,$$

where Y_t denotes the level of global GDP and the ratio $M_t/R_t \equiv \text{GVCM}_t^*$ is a measure of international fragmentation of production strictly related to global value chains. The second ratio $R_t/Y_t \equiv \text{DMFD}_t^*$ measures the direct (non-GVC related) import content of final demand. Taking log differences, dividing through by the log difference of GDP and averaging growth rates over a given sample period {s}, we can decompose the global trade elasticity into three components: the long-run unit elasticity, the income elasticity of the international fragmentation intensity ($\eta_{t,s}^{gvcm}$), and a residual factor relating to the income elasticity of the non-GVC related import content of final demand ($\eta_{t,s}^{dmfd}$):

$$\eta_{t,s}^{m} = 1 + \eta_{t,s}^{gvcm} + \eta_{t,s}^{dmfd}.$$

Note that when global value chains neither expand nor contract, the contribution from the GVC-related component is zero.

Based on this decomposition, it appears that the expansion of global value chains boosted the trade elasticity before the Great Recession, but the contribution has since waned. In the period 1996-2000, GVC expansion raised the income-trade elasticity by almost 0.5. During the early 2000s, the contribution declined to 0.3 (**Table 4**). During the recession and subsequent rebound, the average contribution dropped to about zero; however, the crisis-related volatility in the data makes interpreting the decomposition over the years 2008-11 difficult.

A panel model incorporating a measure of GVC participation confirms the quantitative impact of global value chains on the global income elasticity of trade. Using a similar GVC participation index, based on global input-output tables, the contribution of global value chain expansion to the trade elasticity is assessed using the following empirical model:

$$m_{i,t} = \alpha_i + \nu_i t + \beta_i m_{i,t-1} + \gamma_i d_{i,t} + \emptyset_i gvc_{i,t} d_{i,t} + \delta_i \frac{p^{imp}{}_{i,t}}{p^{prod}{}_{i,t}} + \varepsilon_{i,t},$$

where α_i and t denote country-specific effects and a time trend respectively, $m_{i,t}$ is the level of imports, $d_{i,t}$ is aggregate domestic demand, $p^{imp}{}_{i,t}/p^{prod}{}_{i,t}$ denotes relative prices and $gvc_{i,t}$ is the GVC participation index, which is interacted with the demand variable. For aggregate demand, either GDP or import-adjusted demand (IAD) is used, as discussed in Chapter 2. The equation is estimated separately for a set of advanced and a set of emerging market economies over the period 1995-2011.[19] The GVC participation was interacted with aggregate demand in order to assess the extent to which GVCs raise the income elasticity of trade. Overall, the panel results suggest that the expanding GVC participation contributed about 0.4 to the global trade-income elasticity between 1995 and 2011, thereby confirming the results of the decomposition exercise above (**Table 5**).[20]

Table 5

Panel regressions using GVC participation

Model	(1)	(2)	(3)	(4)
Region	Advanced	Advanced	Emerging	Emerging
Dependent variable	Imports	Imports	Imports	Imports
Aggregate demand variable	GDP	IAD	GDP	IAD
Relative prices	0.0018	-0.012	0.093	-0.0019
Aggregate demand	1.28***	0.79***	1.41***	1.12***
GVC*aggregate demand	0.097***	0.10***	0.097***	0.087***
Elasticity	1.72	1.24	1.85	1.48
GVC contribution	0.40	0.45	0.44	0.36
Observations	112	112	96	96

Notes: * p<0.10, ** p<0.05, *** p<0.01. The GVC participation measure is based on WIOD. For additional information regarding the regressions, see Al-Haschimi, Skudelny, Vaccarino and Wörz (2015).

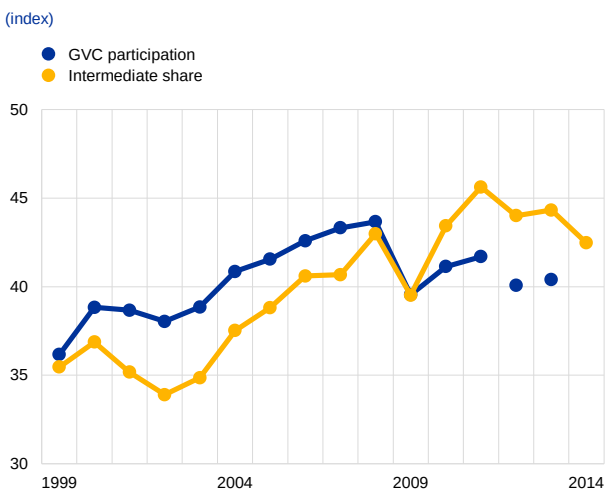
Global input-output data are available only with a long lag, but more timely insights into GVC participation can be approximated by the share of intermediate goods in total goods imports. As the WIOD data underlying the computations currently end in 2011, the share of intermediate goods in total imports offers one alternative for more timely assessment for the evolution of GVCs. The measure is imperfect, as some of the intermediate inputs may not be used in global value chain-related activities. However, it has correlated reasonably well in the past with GVC participation measures from global input-output tables (**Chart 19**).

19 The advanced countries included are the United States, the United Kingdom, Japan, Germany, France and Italy; for the emerging economies, the sample consists of China, India, Russia, Turkey, Poland and Brazil.

20 The contribution of global value chains is given by $\emptyset_i \overline{gvc_{i,t}}$, where $\overline{gvc_{i,t}}$ is the sample average of the GVC participation measure.

Chart 19

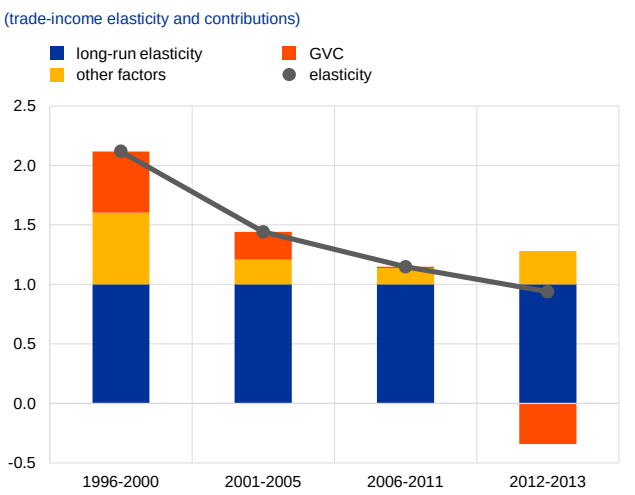
GVC participation versus share of intermediate goods in total goods imports



Sources: OECD and WIOD.
Notes: Both measures exclude energy-related trade. The intermediate share is mean-variance adjusted to that of GVC participation measure. The GVC measure is based on Borin and Mancini (2015) and extended for 2012-13 with changes in the share of intermediate goods indicator.

Chart 20

Contributions to the global income elasticity of trade



Source: Authors' calculations.
Notes: The calculations follow Borin and Mancini (2015). Other factors refer to the income elasticity of the non-GVC related import content of final demand.

Data on the share of intermediate goods imply that the rapid rise of GVCs has stalled since 2011. Starting in 2012, the rise in the share of intermediate goods reversed and gradually declined in the period to 2014 back to the pre-crisis peak recorded in 2008. We use the changes in the intermediate goods series to extend the global GVC participation series. Applying this decomposition to the extended GVC data implies that the apparent reduction in global value chains made a negative contribution to the global trade elasticity (of -0.3) between 2012 and 2013 (**Chart 20**).[21] Some caution is warranted – the intermediate trade indicator is an imperfect proxy for GVC-related trade, and the latest falls may reflect compensation for earlier overshooting in 2010-11. Nonetheless, the evidence is indicative of a change in the evolution of GVCs, suggesting that the GVC expansion has at least levelled off since 2011, removing a strong supporting factor for global trade growth.[22]

3.2 What is changing global value chains?

The observed levelling off in the expansion of GVCs is a geographically widespread phenomenon. Using the share of intermediate goods data, it is apparent that the absence of GVC expansion over recent years can be observed across most countries and regions (**Chart 21** and **Chart 22**). For advanced economies, GVCs

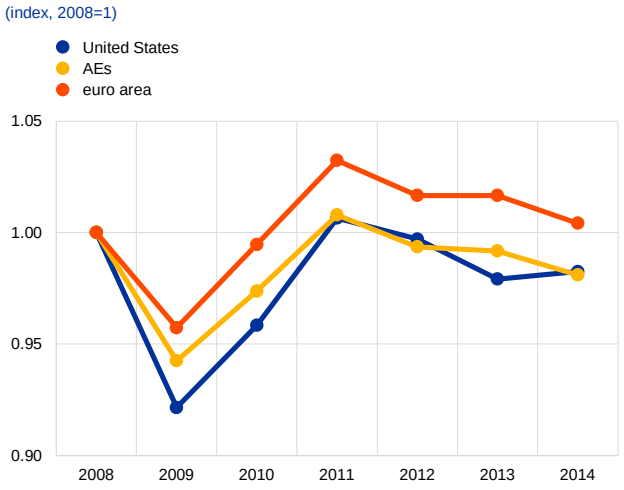
21 The GVC index was extended in the period to 2013 by mean-variance adjusting the intermediates goods indicator to that of the GVC participation index. The 2014 data point for intermediate goods was not taken on board, as doing so would have brought the GVC participation index down to a 12-year low, whereas the intermediate goods share only reverts back to levels near 2010 or 2008 (**Chart 19**).

22 Preliminary data for 2015 for a subset of the countries, together accounting for about one-quarter of total imports, suggest that the decline in the share of intermediate goods in total imports continued in 2015.

measured by the share of intermediate goods gradually declined from 2011 levels in the period to 2014. Similarly, emerging market economies also recorded a slight decline over this period, while China recorded a more protracted downturn in GVC-related activity. With the exception of China, then – which may be the counterpart of the downturn in AEs, at least to some extent – an explanation of the drivers behind the change in GVC participation is unlikely to relate to country or region-specific factors.

Chart 21

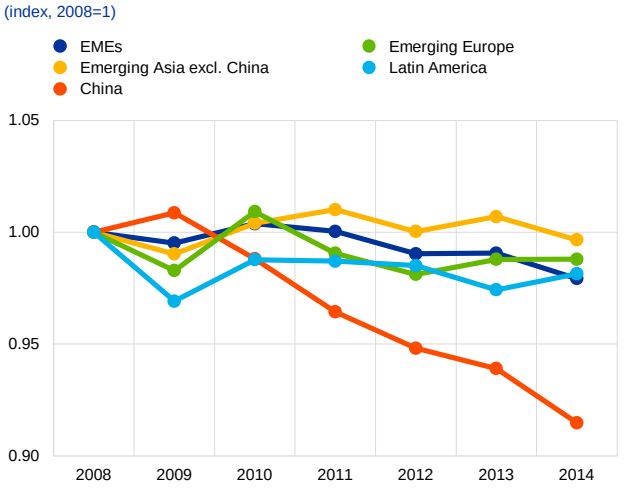
Share of intermediate goods in total goods imports in advanced economies



Source: OECD.
Notes: Both intermediate and total imports exclude energy-related trade.

Chart 22

Share of intermediate goods in total goods imports in emerging economies



Source: OECD.
Notes: Both intermediate and total imports exclude energy-related trade.

Global supply chains are increasingly organised based on factors other than cost minimisation. The 2011 earthquake and tsunami in Japan caused severe uncertainty and disruptions in the auto manufacturing sector, as a number of key suppliers of parts were located in the affected regions. In fact, a large number of companies did not know their suppliers' networks, as subcontractors in turn employed further subcontractors, with the result that supply chains lacked transparency. As a result, supply risk became difficult to manage. In response, some companies are reported to have reduced the length of their supply chains in order to better manage risk (OECD 2013), which in turn dampens GVC participation.

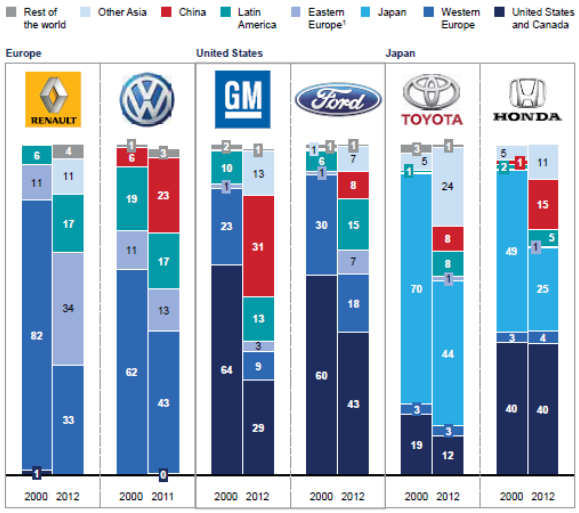
Local content requirements and other regulatory measures are also headwinds to GVC expansion.[23] These new barriers are often more subtle than previous tariff and non-tariff measures and aim to reduce imports by, for example, tailoring licence requirements to promote domestic purchases or provide tax incentives for local procurement (Bhatia, Evenett and Hufbauer 2016). These localisation measures

[23] See Jeffrey Immelt (2016), the CEO of General Electric (GE), who explained in a recent speech that protectionist barriers are rising and that GE is pursuing a "localisation strategy" to guard against protectionist policies; he notes that this shift is leading to lower exports for GE. For the impact of local content requirements on trade, see e.g. Hufbauer et al. (2013).

Chart 23

Auto production by region

(percentages of total production units)



Source: McKinsey (2014).

induce companies to onshore their manufacturing facilities to their export markets.[24] A similar shift can also be seen in the auto industry, which is characterised by long supply chains. McKinsey (2014) finds that between 2000 and 2012, auto companies moved production capacity towards their export markets on a significant scale (**Chart 23**). For instance, European manufacturer Volkswagen reduced its domestic production share from 62% to 43% over this period, shifting production instead towards export markets and notably China. The same dynamics can be seen across other major auto companies. While such moves initially lead to increases in trade in intermediate components, McKinsey argues that once global manufacturers reach sufficient scale in the new regions, major suppliers will move towards these regions, which, in addition to policies encouraging local sourcing, dampens trade growth.

Euro area companies also report localisation measures as being a driver for onshoring production to export markets. In a recent survey of large euro area firms conducted by the ECB, two-thirds of respondents indicated that local content requirements are one of the main reasons for relocating production outside of the European Economic Area (EEA).[25] As a result, sourcing and producing in local markets are substituting earlier trade flows.

[24] Furthermore, the global initiative by many countries to prevent profit shifting to low-tax countries (i.e. more severe restrictions on transfer pricing) could also be a headwind for the expansion of GVCs.

[25] Details regarding the ECB survey of large euro area companies on global production patterns are described in the 2016 ECB Economic Bulletin Issue 6, Box 4.

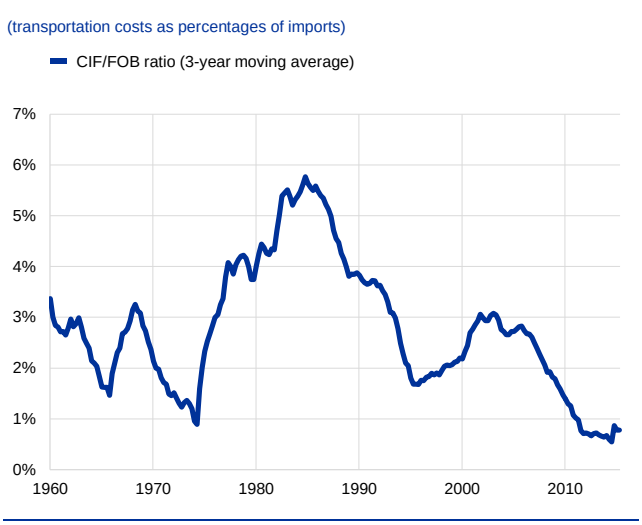
4 Frictions in global trade

The final chapter of this paper focuses on direct and indirect frictions in trade. Among other things, direct effects include factors such as transportation costs and trade protectionism, while indirect effects relate in particular to financial factors. The latter could affect trade either by constraining import demand or exporter capacity, i.e. by restricting credit availability or financing conditions. The role of foreign direct investment (FDI) flows and their significance for trade is also discussed in a subsection.

4.1 Transportation costs

Chart 24

Transport costs: World CIF/FOB ratio



Source: IMF International Financial Statistics database.
Notes: We deducted 1 from the ratio, so that the measure approximates transportation costs as a percentage of imports.

Recent sluggishness in global trade has coincided with a period of slowing reductions in transportation costs. Falling transportation costs were a major factor behind the rapid trade expansion of the past few decades. The costs of air transportation and international shipping, which represent 90% of global trade, have declined substantially since the mid-1980s (Hummels 2007), driven in the latter case by the benefits of containerisation.[26] The strong fall in transportation costs is illustrated by the evolution of the CIF/FOB ratio – a measure of the price of imports (including costs of insurance and freight, CIF) relative to the price of exports (declared as free on board, FOB)[27] – which declined from the mid-1980s to the mid-1990s and again in the first decade of this century (**Chart 24**). Since 2010, however, transportation costs have stopped falling.[28] The end of an era of falling trade costs may be one explanation for the sluggish trade dynamics in recent years.

[26] Hummels (2007) estimates that a distant exporter (14,000 km from the United States) would have paid air shipping prices that were 2.3 times that of a proximate exporter (2,000 km away) in 1974, but only 1.3 times as much in 2004. Hummels (2007) also estimates that doubling container usage has lowered shipping costs by 13.4%.

[27] Owing to limited data for transportation costs, researchers have tended to use indirect measures of trade costs, such as the CIF/FOB ratio. Hummels and Lugovskyy (2006) argue that the CIF/FOB ratio is not a good proxy for transportation costs, mainly because of mismeasurement or differences in the registration methods across countries. Nevertheless, the proxy in **Chart 24** (taking CIF/FOB ratios at the global level) shows an overall picture of global dynamics in transportation costs that is broadly confirmed by studies that rely on other, more sophisticated measures, namely a considerable decrease in transportation costs in the last few decades.

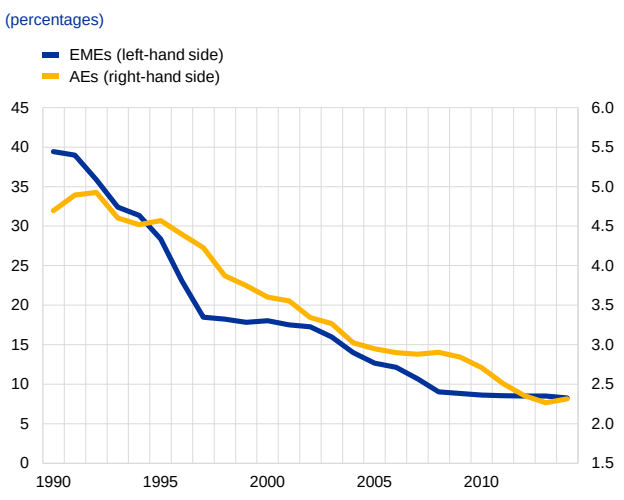
[28] Very recently, the strong decline in oil prices and overcapacity in maritime transport may have led to further declines in transportation costs (e.g. the Baltic Dry Index reached a historical low in 2015). Nevertheless, the long-run trend points to some levelling-off since 2010.

4.2 Protectionism: tariffs and non-tariff measures

Progress in reducing tariffs and liberalising trade policies also appears to have stalled. Strong trade growth in the 1990s and early 2000s was accompanied by widespread trade liberalisation policies and tariff reductions. GATT and WTO negotiations led to substantial tariff reductions in the post-World War II period. Since the beginning of the 1990s average tariff rates among EMEs fell by three-quarters to below 10% (**Chart 25**); tariffs among advanced economies halved to below 2.5%. Since the global financial crisis, however, tariff rates have remained broadly stable among EMEs, with rather modest further declines among AEs. This is confirmed by more sophisticated measures of tariffs that take into account import volumes by product category and the respective demand elasticities (**Chart 26**). Indeed, with global tariffs having fallen considerably in the last two to three decades and now at low levels, the future support from further trade liberalisations for global trade is likely to be considerably smaller.

Chart 25

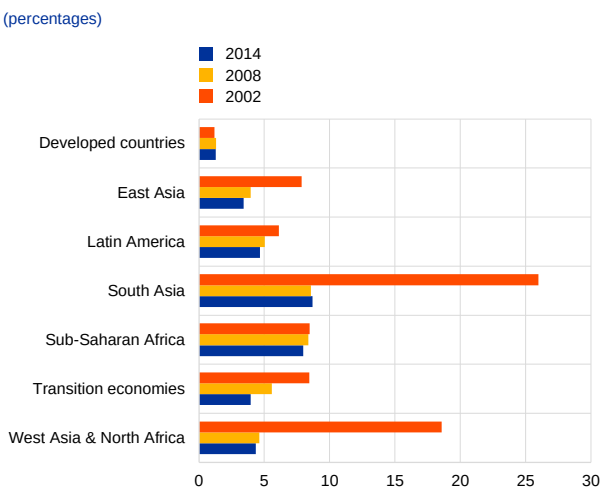
Average tariffs in advanced economies and emerging market economies



Source: World Bank (WDI).
Notes: Tariff rate, applied, simple mean, all products in percentages. Aggregates based on the 14 largest countries in the world (according to PPP GDP weights in 2010). AEs include the United States, Japan, Germany, France, United Kingdom, Italy and Spain. EMEs include China, India, Russia, Brazil, Indonesia, Mexico and Korea. Tariffs are three-year moving averages. Missing years have been extrapolated.

Chart 26

Average import restrictiveness



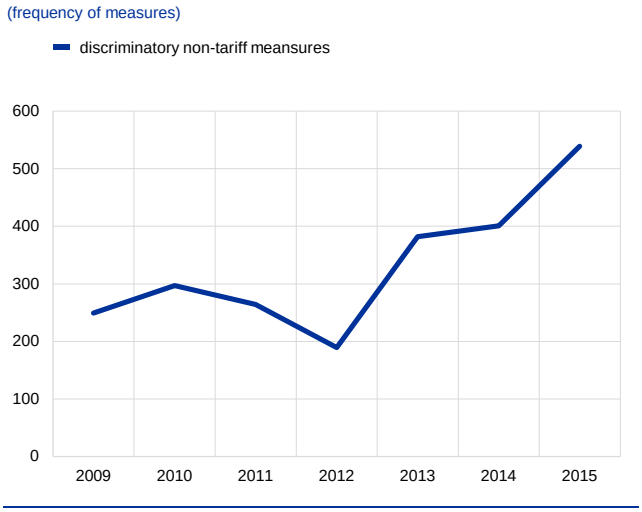
Source: UNCTAD (2015).
Notes: As tariffs differ greatly between individual goods, the trade restrictiveness index calculates the uniform tariff that would need to be applied to all imports of a country in order to keep overall imports at the current level.

While tariffs have stopped falling, non-tariff measures (NTMs) appear to be on the rise. Non-tariff frictions encompass measures that restrict or distort trade flows, such as export subsidies, domestic clauses in public procurement and restrictions on licensing, technology transfer or FDI.[29] Love and Lattimore (2009) argue that such indirect measures represent the main form of trade restriction at present – a form of "murky protectionism" according to Intscher (2014). The empirical literature finds some evidence that NTMs have increased since 2012. Aggarwal and Evenett (2012) argue that industrial policy responses to the global crisis have been selective and

[29] They also include legitimate policy measures, such as product, health and safety standards.

Chart 27

Number of non-tariff measures



Source: Evenett and Fritz (2015).
Notes: GTA = Global Trade Alert database.

often discriminatory. Georgiadis and Gräb (2013) find that countries have pursued more trade-restrictive policies during recessions or in periods when their competitiveness deteriorated. In this context, Evenett and Fritz (2015) find a clear indication of increasing use of measures hampering international trade, including more frequent recourse to protectionist measures (**Chart 27**). Of the 539 measures that had a discriminatory effect counted in 2015, 443 were imposed in the G20 countries. There is also some indication that those measures have affected world trade – within G20 countries, the product categories that have seen the largest trade declines have been those with proportionally more trade restrictions. Yet Ghodsi et al. (2015) found that although NTMs have increased, they had a relatively modest effect on the volume of world trade: as average estimated tariff equivalents of all measures are small, despite great variation across different types of measures, and NTMs comprise both trade-dampening and trade-enhancing measures.[30]

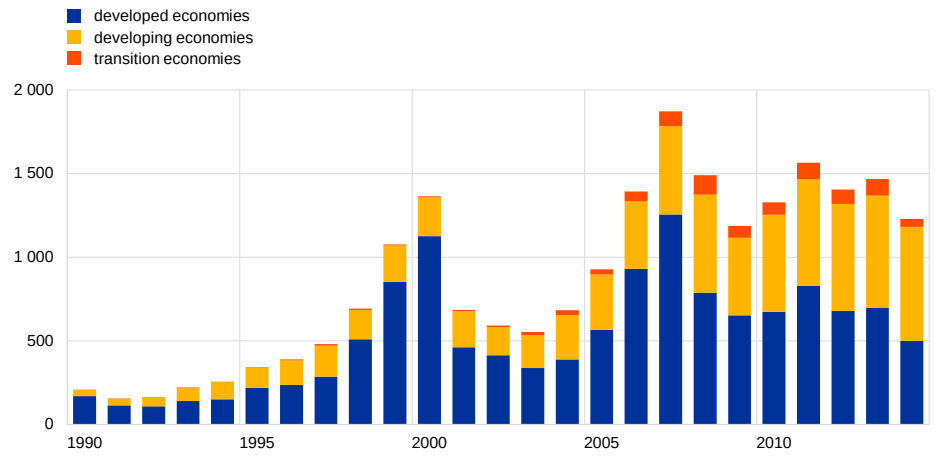
4.3 Foreign direct investment

A moderation in foreign direct investment (FDI) flows might also have played a role in explaining weak trade growth. The dynamic interaction between trade and foreign investment is at the core of globalisation, and FDI can either create or substitute trade. A negative relationship or trade-substituting relation would follow if existing trade moved abroad in response to FDI activity. Yet empirical evidence tends to suggest that FDI and trade have a complementary relationship (Lipsey and Weiss 1984; Grubert and Mutti 1991; Blomstrom and Kokko 1994, Brenton et al. 1999; Clausing 2000), as the proliferation of international production networks means that increased foreign production often requires more inputs from the home country. Following strong growth in the 1990s, global FDI inflows have decreased in recent years (**Chart 28**), which may also have been a factor in the period of modest global trade expansion.

[30] Current discussions about “mega-regional” trade agreements, such as the Transatlantic Trade and Investment Partnership (TTIP) and the Trans-Pacific Partnership (TPP) are among the most important developments in the global trade system. Besides the elimination of tariffs, those agreements aim at improving regulatory compatibility and providing a rules-based framework for cross-border transactions. While there are large uncertainties regarding the impact of those agreements, models suggest that TTIP could increase EU trade to the United States by between 16% and 28%, with the exact percentage mostly depending on the extent of liberalisation in NTMs (Francois et al. 2013). Gains in the level of GDP per capita are estimated at between 0.5% and 4% for the EU (Felbermayr 2016).

Chart 28

Global FDI inflows by region



Source: UNCTAD (FDI/TNC database).

4.4 The finance-trade nexus

Financial frictions may also play an important role in the context of the global trade slowdown. Compared with selling products domestically, exporting goods abroad involves substantial upfront costs, such as learning about profitable export opportunities and setting up foreign distribution networks. In addition, working capital needs are often higher owing to the considerable time lags associated with international transactions. International shipments take longer than domestic shipments, which implies that producers have to incur costs of production long before revenues are obtained (Hummels and Schaur 2013). Furthermore, the additional risks of selling products overseas, combined with exporters having limited capacity to evaluate such risks, often make them turn to banks for payment insurance and guarantees. Hence, finance performs two vital roles: providing working capital to support international trade transactions and providing the means to reduce payment risks.[31]

The finance-trade nexus involves both a cyclical and a structural effect. The former particularly focuses on the impact of variations in financing conditions and the availability of trade finance. Empirical studies suggest that tighter financial conditions can have a restrictive effect on trade-intensive sectors, especially those that are most credit-dependent (Iacovone and Zavacka 2009, Amiti and Weinstein 2011). There is some evidence that trade finance disruptions had a considerable effect in

[31] Globally active banks seem to play a special role in the finance-trade nexus. Claessens, Hassib and Van Horen (2015), studying a large number of EMEs, show that the local presence of foreign banks, especially when headquartered in the importing country, is associated with higher exports in industries that are dependent on external finance and more opaque. In a similar vein, Caballero, Candelaria and Hale (2016) show that the formation of international bank linkages increases exports.

the large trade slowdown following the 2008 financial crisis (CGFS 2014).[32] However, there is considerably less evidence of longer-lasting effects. Indeed, in subsequent periods, including the years during the euro area sovereign debt crisis, trade finance does not appear to have been a limiting or accelerating factor in global trade growth (CGFS 2014).[33]

The link between finance and trade is however not limited to the role of trade finance, but also involves an important structural factor. Financial sector development has been seen as an important factor in building up export capacities in many industrial sectors. In this context, substantial empirical evidence exists that financial development and better access to capital markets exercise a positive impact on trade (see Foley and Manova 2015 for an extensive literature review). Building on the theoretical work of Kletzer and Bardhan (1987), Beck (2002) uses aggregate cross-country data and shows that financial development positively affects exports in manufactured goods. Other papers exploit differences in financial vulnerability across sectors, finding a strong causal impact of financial sector development on exports in sectors dependent on external finance (Do and Levchenko 2007; Braun and Raddatz 2008; Beck 2003; Manova 2013), on export shares in industries with more intangible assets (Hur, Raj and Riyanto 2006) and on industrial specialisation (Svaleryd and Vlachos 2005).[34]

More recent empirical analysis suggests strong non-linearities in the structural finance-trade nexus.[35] Gächter and Gkrintzalis (2016) estimate an equation relating various measures of trade openness (i.e. imports, exports and trade as a percentage of GDP) to a measure of financial development (private sector credit as a percentage of GDP) and a set of control variables.[36] By including a squared term of the financial indicator, they capture non-linear effects of finance on trade.[37] They find a positive but non-linear effect of financial development on both exports and imports relative to GDP (see **Table 6**).[38] The "hump-shaped" relationship points to a threshold –

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32 The relationship is also complicated by endogeneity. Not only does weak trade finance weigh on trade growth, demand for trade finance can also be lower as trade activity and prospects fall. In order to narrow the scope of this section, we focus on the effect of finance on trade.

33 Nevertheless, lack of access to trade finance may be an issue for small low-income countries. Survey evidence suggests that structural difficulties of poor countries in accessing trade finance might have even worsened since the financial crisis, also owing to regulatory issues (Auboin 2015).

34 Manova (2013) provides some insights into the mechanisms through which credit constraints affect trade outcomes. Using a heterogeneous firm model, she documents that limited financial development not only restricts trade by lowering output, but also disrupts trade by precluding potentially profitable firms from exporting (extensive margin) and restricting exporters' sales abroad (intensive margin).

35 Recent contributions in the finance and growth nexus literature suggest that the link between finance and growth is non-linear (Cecchetti and Kharroubi 2012, Arcand, Berkes and Panizza 2015, Beck, Georgiadis and Straub 2014, Breitenlechner, Gächter and Sindermann 2015). However, previous literature on the finance-trade nexus had neglected non-linear effects.

36 The set of control variables includes total population, GDP per capita in PPP terms, a measure of schooling, the share of gross fixed capital formation in total GDP, the share of general government final consumption expenditure within total GDP, net inflows of FDI, inflation, population growth and a measure for tariffs.

37 Following previous literature (e.g. Beck 2002), the authors estimate a panel with 5-year averages of the corresponding variables from 1960 to 2011. To take into account possible simultaneity bias between financial development and the trade variables, they estimate – on top of the pooled OLS setting – a pooled IV model, in which the financial development indicator is instrumented with the initial value of each 5-year period, and a dynamic panel (system GMM) model, which takes into account the possibility that some explanatory variables might not be exogenous or predetermined (Blundell and Bond 1998).

38 The weaker link between finance and trade in earlier papers is not surprising to the extent that models that do not allow for non-monotonicity in the relationship between the two variables lead to a systematic downward bias in the estimated relationship under the assumption that the true link is non-monotonic (see Arcand et al. 2015).

estimated when private sector credit reaches around 100% of GDP – where further financial deepening is no longer associated with increasing trade relative to GDP.

Table 6

The non-linear link between financial development and trade

Model	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Imports	Imports	Imports	Exports	Exports	Exports
Estimation method	Pooled OLS	Pooled IV	System GMM	Pooled OLS	Pooled IV	System GMM
Finance	15.76**	15.73**	19.84*	20.96***	20.69**	15.04*
	(2.47)	(2.29)	(1.75)	(2.67)	(2.46)	(2.09)
$Finance^2$	-6.21**	-6.23*	-9.10*	-9.74***	-9.64**	-6.35**
	(-2.05)	(-1.91)	(-1.70)	(-2.67)	(-2.46)	(-2.10)
Full set of control variables	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	543	531	533	543	531	533
Adjusted R^2	0.542	0.544		0.372	0.374	
Hansen test (p-value)			0.113			0.209
Threshold	**126.9**	**126.3**	**109**	**107.6**	**107.3**	**118.5**

Notes: t-statistics in parenthesis; * p<0.10, ** p<0.05, *** p<0.01. The table shows some selected results from Gächter and Gkrintzalis (2016). The dependent variables are imports and exports as a ratio of GDP, respectively. All regressions include the full set of control variables and time-fixed effects.

The non-linearities in the finance-trade nexus may be one explanation for the slowdown in global trade growth. Many countries have experienced substantial financial sector development in the last three decades, which has been associated with higher trade.[39] However, as countries approached the estimated threshold, the support provided by financial deepening for further trade growth is likely to have waned. A counterfactual analysis provides a quantitative estimate of the effect of financial sector deepening on the global trade-income elasticity. Simulating the global imports-to-GDP ratio based on the assumption that the private credit-to-GDP ratio had remained constant at the level of 1995 suggests that financial deepening contributed approximately half of the overall increase in the global import-to-income ratio up to 2007, boosting the global trade-income elasticity by about 0.3 (**Chart 29** and **Chart 30**).[40] Since the global financial crisis, however, as more countries have approached the threshold at which financial deepening no longer supports trade growth to the same extent, the boost to global imports has been much smaller.

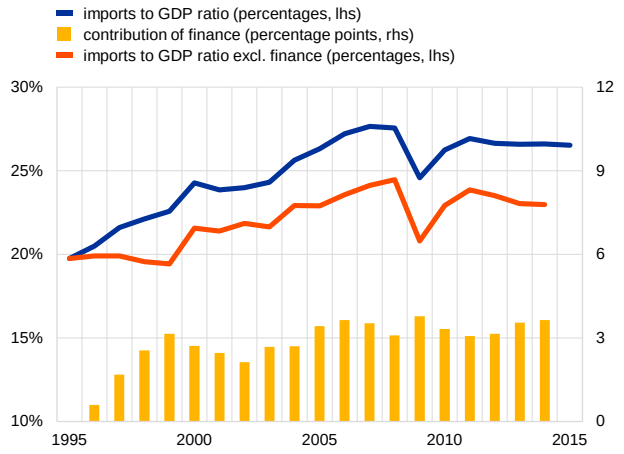
[39] While in 1980 only two (out of 94) countries exceeded a private credit-to-GDP threshold of 100%, 30 countries had already surpassed the same threshold in 2010. On top of this, many countries still below the threshold also experienced considerable financial sector development, implying that further financial deepening has a much weaker effect on trade openness than in previous years.

[40] To estimate the impact of financial deepening on (global) trade openness, Gächter and Gkrintzalis (2016) take the estimated coefficients of the financial indicator variable and its squared term from the dynamic panel model, and calculate the impact of the change in private credit (relative to 1995) on the imports-to-GDP ratio over time at country level.

Chart 29

Global imports to GDP ratio

(percentages; contributions in percentage points)

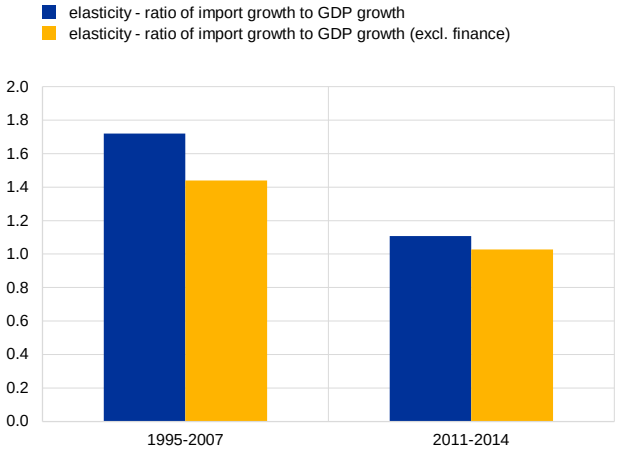


Source: Gächter and Gkrintzalis (2016).
Notes: The global imports to GDP ratio excl. the effect of finance (red line) is calculated by subtracting the effect of finance from the observed imports-to-GDP ratio at the individual country level based on model (3) in **Table 6**. The global ratio is an aggregate of the individual country level results. The yellow bars indicate the difference between the red and blue line, and thus represent the (cumulative) contribution of finance to the global imports-to-GDP ratio since 1995.

Chart 30

The impact of finance on the global trade-income elasticity

(ratios of import growth to GDP growth)



Source: Gächter and Gkrintzalis (2016).
Notes: Global trade elasticities are calculated on the basis of the counterfactual analysis shown in **Chart 29**. The elasticity excl. the effect of finance is calculated by using the estimation results from model (3) in **Table 6**.

Moreover, looking ahead, the future support from financial factors to global trade growth will be rather limited. Almost 60% of countries (weighted by nominal imports in 2014) have already reached or exceeded the estimated credit-to-GDP threshold in 2014, and many others are close to it, with further financial deepening contributing only marginally to trade growth. Assuming that all remaining countries still below the estimated threshold were to catch up (i.e. reach a private credit-GDP ratio of just above 100%), this would provide only a modest boost to the global import-GDP ratio, equivalent to about half the increase observed between 1995 and 2007. Overall, the results would thus suggest that the financial boost to the global trade-to-income elasticity will be very limited in the future.

5 Discussion and outlook: what is the "new normal"?

Prior to the global financial crisis, global trade grew approximately twice as fast as global GDP. However, in recent years the income elasticity of trade has declined to around unity. As highlighted in this paper, the underlying reasons are manifold and partly intertwined.

Chapter 1 noted that theory suggests that the long-run equilibrium global trade elasticity is unity. For individual countries, under the assumption of a constant share of tradables and non-tradables in goods and services, deviations occur only to the extent that changes in trade costs or other frictions change the level of trade openness, and thus the income elasticity of trade. These tend to be slow-moving changes that reflect fundamental shifts in the economy. At the global level, however, the aggregate income elasticity can also differ from unity owing to aggregation or compositional effects, reflecting shifts in country shares in global income or activity.

Chapter 2 presented empirical evidence that compositional effects have played an important role in the slowdown in global trade. The shift in economic activity from advanced towards emerging economies, which typically exhibit lower trade elasticities, has weighed on the global trade elasticity. Indeed, these geographical compositional factors have contributed roughly half of the decline in the global trade elasticity in recent years. However, the same decomposition also suggests that a considerable part of the decline is due to a decrease in trade elasticities at country level. In this context, lower national trade elasticities have also been linked to the weakness of import-intensive demand components, particularly investment. These demand composition effects have had a further dampening effect on global trade.

Chapters 3 and 4 then presented evidence that the structural drivers that had boosted trade in the decades before the financial crisis are now waning. Over recent decades, the rapid integration of emerging markets into the world economy boosted the expansion of global value chains (GVCs). That process of fragmenting production across borders appears to be maturing, as labour costs in key emerging markets have increased, and firms have reconsidered the risks associated with long supply chains and increasingly moved towards onshoring of production to export markets. The lack of further expansion of GVCs removes a factor that had pushed the trade elasticity significantly above unity prior to the Great Recession. At the same time, other factors that had facilitated global trade in the last couple of decades – declining transportation costs and the removal of trade barriers through lower tariffs – had already levelled off prior to the Great Recession. Diminishing marginal support from financial deepening to facilitate export capacity has also weighed on global trade. Some of these explanatory factors are interconnected – for example, reduced transportation costs and tariffs, and financial deepening have partly enabled firms to expand their global value chains. An assessment of the marginal contributions of each factor to the trade weakness therefore requires a degree of judgment.

Nonetheless, it appears that these structural trends have accounted for about half of the decline in the income elasticity of global trade in recent years.

Overall, the evidence suggests that the recent weakness in trade may constitute a "new normal" for medium-term global trade growth. Some of the structural factors that supported rapid trade expansion in the past, such as expanding global value chains, reduced transport costs, declines in tariffs and support from financial deepening, seem to have largely run their course. In this sense, buoyant trade dynamics in the 1990s and early 2000s may have been what was exceptional, rather than the slowdown over recent years.

Nonetheless, the outlook for trade is subject to some uncertainty. The dampening effect of low investment may gradually wane as the impact of negative shocks in emerging markets and oil-exporting countries unwinds, providing some support for trade in the future. New trade agreements and closer integration of countries in the southern hemisphere into the world economy could also give a fresh impetus to global trade. However, the shift in the geographical composition of global economic activity from advanced towards emerging economies, which has been weighing on the global trade-income elasticity, is likely to persist. Anecdotal evidence also implies that, against the background of rising protectionist measures such as local content requirements, renewed expansion in global value chains is unlikely to materialise in the current environment. Notwithstanding the particularly pronounced weakness in 2015 that is assessed to be mostly a temporary phenomenon owing to a number of country-specific adverse shocks, the upside potential for trade over the medium term appears to be limited. Hence, the new normal for global trade can be expected to look broadly similar to the weakness observed over recent years.

References

Aggarwal, V. and Evenett, S.J. (2012), "Industrial policy choice during the crisis era", *Oxford Review of Economic Policy*, Vol. 28, No 2, pp. 261-283.

Al-Haschimi, A., Skudelny, F., Vaccarino, E. and Wörz, J. (2015), "The trade and demand nexus: do global value chains matter?", in Amador, J., and di Mauro, F. (eds.), *The Age of Global Value Chains: Maps and Policy Issues*, VoxEU eBook, CEPR Press, 9 July.

Altomonte, C., Di Mauro, F., Ottaviano, G., Rungi, A. and Vicard, V. (2012), "Global Value Chains During the Great Trade Collapse: A Bullwhip Effect?", *ECB Working Paper*, No 1412, January.

Amador, J. and di Mauro, F. (2015), *The Age of Global Value Chains: Maps and Policy Issues*, VoxEU eBook, CEPR Press, 9 July.

Amador, J. and Cabral, S. (2014), "Global value chains: surveying drivers and measures", *ECB Working Paper*, No 1739, October.

Amiti, M., and Weinstein, D. (2011), "Exports and Financial Shocks", *The Quarterly Journal of Economics,* Vol. 126, No 4, pp. 1841-1877.

Ang, B.W., Liu, F.L. and Chew, E.P. (2003), "Perfect decomposition techniques in energy and environmental analysis", *Energy Policy*, Vol. 31, pp. 1561-1566.

Arcand, J., Berkes, E. and Panizza, U. (2015), "Too much finance?", *Journal of Economic Growth*, Vol. 20, No 2, pp. 105-148.

Armington, P. (1969), "A Theory of Demand for Products Distinguished by Place of Production", *IMF Staff Papers*, Vol. 16, No 1, pp. 159-178.

Auboin, M. (2015), "Improving the availability of trade finance in low-income countries: an assessment of remaining gaps", *Oxford Review of Economic Policy*, Vol. 31, No 3-4, pp. 379-395.

Bhatia, K., Evenett, S. and Hufbauer, G. (2016), "Why General Electric is localising production", VoxEU, 21 June.

Beck, R., Georgiadis, G. and Straub, R. (2014), "The finance and growth nexus revisited", *Economics Letters*, Vol. 124, No 3, pp. 382-385.

Beck, T. (2002), "Financial development and international trade: Is there a link?," *Journal of International Economics*, Vol. 57, No 1, pp. 107-131.

Beck, T. (2003), "Financial Dependence and International Trade", *Review of International Economics*, Vol. 11, No. 2, pp. 296-316.

Bems R., Johnson, R.C. and Yi, K.-M. (2013), "The Great Trade Collapse", *Annual Review of Economics*, Vol. 5, pp. 375-400.

Blomstrom, M. and Kokko, A. (1994), "Home Country Effects of Foreign Direct Investment: Evidence from Sweden", *NBER Working Paper*, No 4639.

Blundell, R., and Bond, S. (1998), "Initial conditions and moment restrictions in dynamic panel data models", *Journal of Econometrics*, Vol. 87, pp. 115-143.

Borchert I. and Mattoo, A. (2009), "The Crisis-Resilience of Services Trade", *World Bank Policy Research Working Paper*, No 4917.

Borin, A. and Mancini, M. (2015), "Follow the value added: bilateral gross export accounting", *Banca d'Italia Economic Working Paper*, No 1026.

Borin, M., Di Nino, V., Mancini, M. and Sbracia, M. (2016), "*The Cyclicality of the Income Elasticity of Trade*", mimeo, Banca d'Italia.

Boz E., Bussière, M. and Marsili, C. (2014), "Recent slowdown in global trade: Cyclical or structural", VoxEU, 12 November.

Braun, M. and Raddatz, C. (2008), "The Politics of Financial Development: Evidence from Trade Liberalization", *Journal of Finance*, Vol. 63, No 3, pp. 1469-1508.

Breitenlechner, M., Gächter, M. and Sindermann, F. (2015), "The finance–growth nexus in crisis", *Economics Letters*, Vol. 132, pp. 31-33.

Brenton, P., Di Mauro, F. and Lucke, M. (1999), "Economic Integration and FDI: An Empirical Analysis of Foreign Investment in the EU and Central and Eastern Europe", *Empirica*, Vol. 26, No 2, pp. 95-121.

Bussière, M. and Mehl, A. (2008), "China's and India's roles in Global Trade and Finance: Twin Titans for the New Millennium?", *ECB Occasional Paper*, No 80, January.

Bussière, M., Callegari, G., Ghironi, F., Sestieri, G. and Yamano, N. (2013), "Estimating trade elasticities: Demand elasticities and the trade collapse of 2008-09", *American Economic Journal: Macroeconomics*, Vol. 5, No 3, pp. 118-151.

Caballero, J., Candelaria, C. and Hale, G. (2016), "*Bank Linkages and International Trade*", mimeo, Federal Reserve Bank of San Francisco.

Cecchetti, S. and Kharroubi, E. (2012), "Reassessing the impact of finance on growth", *BIS Working Paper*, No 381.

CGFS (2014), "Trade finance: developments and issues", Report of the Study Group established by the Committee on the Global Financial System, *CGFS Paper*, No 50.

Chor, D. and Manova, K. (2013), "Off the Cliff and Back: Credit Conditions and International Trade during the Global Financial Crisis", *Journal of International Economics*, Vol. 87, pp. 117-133.

Claessens, S., Hassib, O. and Van Horen, N. (2015), "The role of foreign banks in trade", mimeo, De Nederlandsche Bank.

Clausing, K. (2000), "Does Multinational Activity Displace Trade?", *Economic Enquiry*, Vol. 38, No 2, pp. 190-205.

Constantinescu, C., Mattoo, A. and Ruta, M. (2015), "The Global Trade Slowdown: Cyclical or Structural?", *World Bank Policy Research Working Paper*, No 7158.

Deutsche Bundesbank (2016), "On the weakness of global trade", *Monthly Report*, March, pp. 13-35.

Dietzenbacher, E., Los, B., Stehrer, R., Timmer, M.P. and de Vries, G.J. (2013). "An illustrated user guide to the world input–output database: the case of global automotive production", *Review of International Economics*, Vol. 23, No 3, pp. 575-605.

Do, Q. and Levchenko, A. (2007), "Comparative advantage, demand for external finance, and financial development", *Journal of Financial Economics*, Vol. 86, No 3, pp. 796-834.

Escaith, H. and Miroudot, S. (2015), "World trade and income remain exposed to gravity", in Hoekman, B. (ed.), *The Global Trade Slowdown: A New Normal?,* VoxEU eBook, London: CEPR Press and EUI.

Evenett, S.J. and Fritz, J. (2015) "The Tide Turns? Trade, Protectionism, and Slowing Global Growth – The 18th Global Trade Alert Report", CEPR Press.

Felbermayr, G. (2016), "Economic Analysis of TTIP", in: Gnan, E. and Kronberger, R. (eds.): *Schwerpunkt Aussenwirtschaft 2015/2016. Transatlantische Handels- und Investitionspartnerschaft (TTIP)*, Vienna: Facultas, pp. 153-172.

Foley, C.F. and Manova, K. (2015), "International Trade, Multinational Activity, and Corporate Finance", *Annual Review of Economics*, Vol. 7, No 1, pp. 119-146.

Francois, J. et al. (2013). "Reducing Transatlantic Barriers to Trade and Investment. An Economic Assessment", Final Project Report, Centre for Economic Policy Research.

Freund, C. (2009), "The Trade Response to Global Downturns. Historical Evidence", *The World Bank Policy Research Working Paper*, No 5015.

Gächter, M. and Gkrintzalis, I. (2016): "The finance–trade nexus revisited: Is the global trade slowdown also a financial story?", mimeo, European Central Bank.

Gangnes, B., Ma, A.C. and Van Assche, A. (2015). "Global value chains and the trade-income relationship: Implications for the recent trade slowdown", in Hoekman, B. (ed.): *The Global Trade Slowdown: A New Normal?,* VoxEU eBook, London: CEPR Press and EUI.

Gaulier G., Santoni, G., Taglioni, D. and Zignago, S. (2015), "The power of the few in determining trade accelerations and slowdowns", in Hoekman, B. (ed.): *The Global Trade Slowdown: A New Normal?*, VoxEU eBook, London: CEPR Press and EUI.

Gaulier G., Steingress, W. and Zignago, S. (2016), "The role of China in the trade slowdown", mimeo, Banque de France.

Georgiadis, G. and Gräb, J. (2013). "Growth, Real Exchange Rates and Trade Protectionism since the Financial Crisis", *ECB Working Paper*, No 1618, November.

Ghodsi, M., Jokubauskaite, S. and Stehrer, R. (2015), "Non-Tariff Measures and the quality of imported products", mimeo, Vienna Institute for International Economic Studies.

Grubert, H. and Mutti, J. (1991), "Taxes, Tariffs and Transfer Pricing in Multinational Corporations", *Review of Economics and Statistics*, Vol. 73, pp. 285-293.

Hoekman, B. (2015), "*The Global Trade Slowdown. A New Normal?"*, VoxEU ebook, London: CEPR Press and EUI.

Hufbauer, G., Schott, J. , Cimino, C., Vieiro M. and Wada, E. (2013), "Local Content Requirements: A Global Problem", Peterson Institute for International Economics, *Policy Analyses in International Economics*, No 102, September.

Hummels, D. (2007), "Have International Transportation Costs Declined?", *Journal of Economic Perspectives*, Vol. 21, No 3, pp. 131-154.

Hummels, D. and Lugovskyy, V. (2006), "Are Matched Partner Trade Statistics a Usable Measure of Transportation Costs?", *Review of International Economics*, Vol. 14, No 1, pp. 69-86.

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

Hummels, D.L. and Schaur, G. (2013), "Time as a trade barrier", *American Economic Review*, Vol. 103, No 7, pp. 2935-2959.

Hur, J., Raj, M. and Riyanto, Y.E. (2006), "Finance and trade: A cross-country empirical analysis on the impact of financial development and asset tangibility on international trade", *World Development*, Vol. 34, No 10, pp. 1728-1741.

Iacovone, L. and Zavacka, V. (2009), "Banking Crises and Exports: Lessons from the Past", *World Bank Research Working Paper*, No 5016, August.

Immelt, J. (2016), "The World I See: Jeff Immelt's Advice to Win in Time of Anger About Globalization", 20 May 2016.

Intscher, N. (2014), "The Rise of 'Murky Protectionism': Changing Patterns of Trade-Related Industrial Policies in Developing Countries: A Case Study of Indonesia", London School of Economics, *Department of International Development Working Paper*, No 14-157.

Irwin, D. (2002), “Long-Run Trends in World Trade and Income”, *World Trade Review*, Vol. 1, No 1, pp. 89-100.

Johnson, R. and Noguera, G. (2012), “Accounting for intermediates: production sharing and trade in value added”, *Journal in International Economics*, Vol. 86, No 2, pp. 224-236.

Kletzer, K. and Bardhan, P. (1987), “Credit markets and patterns of international trade”, *Journal of Development Economics*, Vol. 27, No 1-2, pp. 57-70.

Koopman, R, Wang, Z. and Wei, S. (2014), “Tracing value-added and double counting in gross exports”, *American Economic Review*, Vol. 104, No 2, pp. 459-494.

Levchenko A., Lewis, L. and Tesar, L. (2010), “The collapse of international trade during the 2008-2009 crisis: in search of the smoking gun”, *IMF Economic Review*, Vol. 58, No 2, pp. 214–253.

Lipsey R. (2009), “Measuring International Trade in Services”, in Reinsdorf, M. and Slaughter, M. (eds.): *International Trade in Services and Intangibles in the Era of Globalization*, Chicago: University of Chicago Press.

Lipsey, R. and Weiss, M. (1984), “Foreign Production and Exports in Manufacturing Industries”, *Review of Economics and Statistics*, Vol. 63, No 4, pp. 488-494.

Los, B., Timmer, M. and de Vries, G.J. (2014), “How global are global value chains? A new approach to measure international fragmentation”, *Journal of Regional Science*, Vol. 55, No 1, pp. 66-92.

Love, P. and Lattimore, R. (2009), “Protectionism? Tariffs and Other Barriers to Trade”, in *International Trade: Free, Fair and Open?*, Paris: OECD Publishing.

Manova, K. (2013), “Credit Constraints, Heterogeneous Firms and International Trade”, *Review of Economic Studies*, Vol. 80, pp. 711-744

Martinez-Martin, J. (2016), “Breaking down world trade elasticities: A panel ECM approach”, *Banco de España Working Paper*, No 1614.

McKinsey (2014), “*Global flows in a digital age: How trade, finance, people, and data connect the world economy*”, McKinsey Global Institute, April.

OECD (2001), “Trade in Goods and Services: Statistical Trends and Measurement Challenges”, *Statistics Brief*, No 1, October.

OECD (2013), “Global value chains: managing the risks”, in *Interconnected Economies: Benefiting from Global Value Chains*, Paris: OECD Publishing.

Ollivaud, P. and Schwellnus, C. (2015), “Does the Post-Crisis Weakness of Global Trade Solely Reflect Weak Demand?”, *OECD Economics Department Working Paper*, No 1216, Paris: OECD Publishing.

Pei, J., Yang, C. and Yao, S. (2015), “Trade impact of China’s transition to the ‘new normal’”, in Hoekman, B. (ed.), *The Global Trade Slowdown: A New Normal?,* VoxEU eBook, London: CEPR Press and EUI.

Pindyuk, O. and Wörz, J. (2008), “Trade in Services: Note on the Measurement and Quality of Data Sources”, *FIW Research Report*, No 001, June.

Slopek, U. (2015), “Why has the income elasticity of global trade declined?”, mimeo, Deutsche Bundesbank.

Stratford, K. (2015), “Why has *w*orld *t*rade been so *w*eak in *r*ecent *y*ears?”, mimeo, Bank of England.

Subramanian, A. and Kessler, M. (2013), “The Hyperglobalization of Trade and Its Future”, *Peterson Institute for International Economics Working Paper*, No 6.

Svaleryd, H. and J. Vlachos (2005), “Financial markets, the pattern of industrial specialization and comparative advantage: Evidence from OECD countries”, *European Economic Review*, Vol. 49, No 1, pp. 113-144.

UNCTAD (2015), “*Key Statistics and Trends in Trade Policy 2014*”, Geneva.

U.S. International Trade Commission (1997), “*The Dynamic Effects of Trade Liberalization: An Empirical Analysis*”, Washington DC, October.

Vicard, V. (2015). “Profit shifting through transfer pricing: evidence from French firm level trade data”, *Banque de France Working Paper*, No 555.