PANOECONOMICUS, 2023, Vol. 70, Issue 2, pp. 191-217
Received: 22 July 2019; Accepted: 07 October 2020.

UDC 339.5:303.446.3"1970/217"
https://doi.org/10.2298/PAN190722013A
Original scientific paper

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This work was supported by the by UPV/EHU under the Research Group "Institutions, Regulation and Economic Policy".

Is World Trade Slowing Down? New Evidence on Trade-Income Elasticity

Summary: This paper furthers and updates the research on the nature of the so-called global trade slowdown. Not only do we explain and discuss the determinants of this phenomenon, but we also offer an empirical description of the recent evolution of trade and trade elasticity. With the purpose of testing whether this is a structural phenomenon or not, we build an Error Correction Model for both world and regional data on trade and income using data from the World Bank for the period 1970-2017. World, OECD and Asian countries trade elasticity figures show a remarkable reduction after the hyperglobalization period (1986-2001), opposed to those of Latin America where trade volume has not stagnated so much. This slowdown might have major consequences for any country, but especially for those which have relied more intensively on trade as an engine for growth.

Keywords: Global trade, Trade-income elasticity, ECM.

JEL: C22, F15.

Global trade of goods and services had shown a relevant increase during approximately three decades prior to the global financial crisis in 2008, outperforming growth in global output. However, recent years have witnessed a deceleration in its real growth, in particular since the recovery after the Global Trade Collapse (GTC) of 2009.

One important question is whether the Global trade Slowdown is mostly a cyclical downturn, reflecting slow growth in GDP, or whether it is fundamentally reflecting a permanent change towards lower increases in world trade flows (in comparison with GDP). In the latter case, this would imply that the hyperglobalization period (Dani Rodrik 2011) has come to an end. Foreign direct investment flows (FDI) constitute another very relevant aspect of the globalization process and in fact as we mention later are closely linked to trade flows, but in this paper we only discuss trade flows.

Mainstream literature has insisted on the benefits of international trade as an engine of growth (Marc J. Melitz and Giancarlo I. Ottaviano 2008; Daria Taglioni 2016), whereas other authors have pointed out the negative side-effects of hyperglobalization (Rodrik 2011; Joseph E. Stiglitz 2017). In any case, if the slowdown in global trade becomes a long-run phenomenon it would mean a new regime for the global economy and evidently a relevant issue not only for academics but also, primarily, for institutions (Alessandro Borin et al. 2016) and policymakers in general.

The objective of this article is to test whether the global trade slowdown is essentially a structural phenomenon or not. To do so, we compute an Error Correction

Model (ECM) aimed at explaining the evolution of the relationship between trade and income over time.

This paper contributes to the literature on this phenomenon particularly updating the works of Patrice Ollivaud and Cyrille Schwellnus (2015) or Cristina Constantinescu, Aaditya Mattoo, and Michele Ruta (2016, 2018). We utilize a more comprehensive time span and obtain trade-income elasticity estimations for different geographical areas: the World, OECD, Asia, and Latin American countries.

The remainder of the paper is organized as follows. Section 1 presents the factors explaining trade slowdown and the empirical literature review, Section 2 presents the stylized facts about this phenomenon, Section 3 is about the econometric strategy and results, and finally, Section 4 concludes.

1. Factors Explaining the Global Trade Slowdown: Theoretical and Empirical Considerations

Before turning to the causes of the global trade slowdown, it is important to mention that the dating of this phenomenon should be taken with some measure of flexibility. However, there is an apparent consensus (Constantinescu, Mattoo, and Ruta 2018) that trade growth accelerated - in comparison to the 70s - from the mid-1980s to the beginning of the 2000s, reaching a trade elasticity of around 2, and slowing down afterwards, especially from 2008, (trade elasticity fell to approx. 1). Notwithstanding, regarding its causes, the global slowdown is a complex phenomenon, as shown by the long list of determinants put forward by the literature. Moreover, whether they are of a cyclical or structural (long-term) nature is not neatly defined, so we will try to do our best to mention the most cited studies and classify them as clearly as possible, admitting that they are neither contradictory nor exhaustive.

1.1 Structural and Cyclical Causes of Global Trade Slowdown

One of the main structural factors to be cited is evidently the recent halt in trade liberalization. The progressive opening of trade, as witnessed especially in the 1990s favoured by the creation of NAFTA, WTO, and the European Single Market together with transition economies joining the world market has apparently come to an end, as the impossibility of signing the WTO Doha Round or the failure of new commercial integration schemes such as the TTIP or the TAIP shows. In consequence, the trade-creation effect put forward by Jacob Viner (1950) is no longer promoting commerce flows. Going even further, we can talk about some signs of protectionist trade policy. Although there has not been a strong increase in tariffs, non-tariff barriers (such as rules of origin or sanitary and phytosanitary SPS measures) are increasingly being employed (Przemyslaw Wozniak and Malgorzata Galar 2018), and recent trade policy developments, such as the USA-China trade tension, suggest the possibility of a forthcoming trade war. However, import trade restrictions are only showing a slight rise, as revealed by the WTO trade restrictiveness indicators (World Trade Organization 2018).

A structural factor of major importance is the attenuation of commerce cost reduction. The previous spread of the utilization of ICT in transport and logistics, as well as containerization, which started in the 1960s, have almost been exhausted as crucial trade increasing factors, at least since the 2000s (David Hummels 2007).

Another long-term determinant deriving from predictions from the trade gravity model (James E. Anderson 2011) is that the higher the number of smaller countries there are, the greater the magnitude of international trade will be. In the 1990s there was an increase in the number of countries and a reduction in their average dimension, mainly due to the splitting up of the USSR and Yugoslavia (Hubert Escaith and Sébastien Miroudot 2015). Similar historical events are not likely to occur again and neither, therefore, can trade increases be provoked. Although some nationalist tensions do exist, for instance in Europe (Scotland, Catalonia, the Basque Country), nowadays there is little likelihood of there being a relevant increase in the number of countries. Another prediction arising from the same model is that trade is maximized when countries are of similar size; in this regard, income convergence of large developing countries along with the slower growth amongst mature industrialized ones have been a relevant engine of trade expansion in the past decades. As Escaith and Miroudot (2015) state, income convergence has slowed down since the 2000s.

According to classical Ricardian theory, a higher degree of product specialization amongst countries will boost trade flows. In this regard, a rise in Gross Domestic Product *per capita* (GDP pc) brings about an expansion in product specialization, but only up to a certain GDP pc threshold level ($25,000 Purchasing Power Parity PPP, Olivier Cadot, Céline Carrère, and Vanessa Strauss-Kahn 2011); had this threshold level been reached during the 2000s among some large emerging countries (BRICs), it could also have had a negative impact on trade.

Additionally, especially among emerging countries, structural change provoked by progressive economic development has caused an increase in the contribution of services to GDP and to demand. As a consequence, the global slowdown could be partially explained by the structural shift towards services since these are less tradable than goods; first, some services are not completely tradable (consumption and "production" takes place in the same location, e. g. education, health, public services…), and second, because services are usually subject to more trade frictions than goods. Therefore, we can talk about a compositional effect: when, following Engel's law, demand switches towards services, countries trade relatively less, consequently explaining the global slowdown. This is coherent with Douglas A. Irwin (2002), who states that the increase in trade-income elasticity for the long period 1950-2000 is due to the higher share of manufacturing goods of GDP.

The increase of China's share of total world manufacturing exports during the last decades (from 3% in 1990 up to 25% in 2016) suggests that any structural change in the Chinese economy may affect world trade in the long-run. In this sense, the apparent shift from an export-driven trade growth model to one based on internal demand is a structural factor, which could explain the global trade slowdown in the long-run (Gee Hee Hong et al. 2017). China's trade growth before the crisis reached an annual 20% (from 2002 to 2007), but recent data show a clear stagnation in trade growth: only 1.5% in 2015.

Finally, a frequently mentioned possible factor is the evolving nature of production within global value chains during the last 30 years. Some innovations in the production process, such as its international fragmentation have permitted delocalizing different stages of the value chain to less costly locations. This pattern of trade contrasts with the conventional (Heckscher-Ohlin) comparative advantage trade model used for final goods. Richard Baldwin (2011) goes even further, pointing out that there is international specialization in "tasks" and not products.

These global value chains are mostly driven and managed by multinational enterprises using vertical foreign direct investment strategies mainly to reduce labour costs (Baldwin 2011). This phenomenon has predominantly involved developing and emerging countries, especially China, and in consequence it has provoked a "genuine" trade-creation effect (Escaith, Nannette Lindenberg, and Miroudot 2010), due to the expansion of intermediate trade in inputs. In this sense United Nations Conference on Trade and Development (UNCTAD 2013) estimates that the share of foreign value added in total exports reaches 30% in East and South East Asian countries.

In addition to this trade-creation effect of GVCs, there is also a purely accounting side effect that inflates trade values mostly in the countries which are most involved in that trade, including many small industrialized countries. According to UNCTAD (2017) estimates, trade in intermediate inputs accounts for approximately 45% of total trade in goods and services.

However, there are signs of some recent reshoring strategies by firms as a reaction to an apparent overshooting of the international fragmentation of production. Marcel Peter Timmer et al. (2016), by developing a global import intensity measure for production, estimate that international fragmentation has stalled since 2010. In the EU, between 2011 and 2013, the intermediate-to-final goods ratio decreased from 1.93% to 1.85%. Moreover, in the USA during 2013, it was estimated that between 30,000 and 40,000 new manufacturing jobs were created in America due to reshoring (Vida Vanchan, Rachel Mulhall, and John Bryson 2018). Apparently, the highly complex fragmentation of some firms has not brought the expected benefits, so reshoring has been identified as an alternative. The literature (Matthieu Crozet, Charlotte Emlinger, and Sébastien Jean 2015; European Central Bank - ECB 2016) has mentioned some general underlying drivers for this reshoring: firstly, the increasing capabilities of developing countries to produce upstream products for domestic demand at home, as happened in China. Secondly, the increased automation of industrial processes is already causing a certain degree of reshoring. Additionally, there are managerial drivers to be considered, such as changes in the business context (Carmen Martínez-Mora and Fernando Merino 2014), managerial errors (Steffen Kinkel and Spomenka Maloca 2009), and the deep interconnections inside the value chain (Claus Steinle and Holger Schiele 2008). Finally, other drivers might be the changes in relative labour costs, or policy measures such as protectionist pressures (for instance, the "America First" Initiative or "China 2025"). However, a word of caution is needed, since empirical evidence of reshoring is still scarce and far from being conclusive. In fact, Baldwin (2016) states that it is unclear whether international fragmentation will restart again, especially in the case of services.

Turning lastly to cyclical factors related to the exacerbated effect of the business cycle on trade, recent studies have put emphasis on two channels through which trade slowdown can be interpreted: firstly, the so-called GVC composition effect, which states that as long as durable goods are more vertically integrated within GVCs, together with the fact that these types of goods show a higher income elasticity, when there is an income shock, it causes a higher impact on trade, thereby increasing trade-income elasticity (Rudolfs Bems, Robert C. Johnson, and Kei-Mu Yi 2010; Janet Ceglowski 2014). The second channel is called the supply chain effect or Bullwhip effect. This states that firms involved in offshoring strategies tend to accumulate more buffer stocks of inventories to safeguard from mistakes in sales forecasts. In consequence, when there is a downturn in sales, firms employ inventories, and disproportionately suspend new purchases of inputs. This strong fall in input purchases can exacerbate the sensibility of trade to external income shocks in comparison with regular trade (George Alessandria, Joseph P. Kaboski, and Virgiliu Midrigan 2011; Carlo Altomonte et al. 2012).

Another cyclical composition effect is the higher import propensity of investment in comparison with other components of aggregate demand, such as public spending or even consumption. The relative stagnation of investment with respect to public spending, due to its higher procyclicality, might explain the fall in total trade-income elasticity during the recent financial crisis (Matthieu Bussière et al. 2013). Public expenditure acquires more non-tradable goods and services and additionally has a higher home bias, which explains its lower import intensity (ECB 2016).

From the supply side, the literature has highlighted the relatively sluggish GDP growth amongst some relevant import-intensive countries (especially Eurozone ones), which has also reduced trade volumes (Michael Francis and Louis Morel 2015; Ulf Slopek 2015). The current contribution of intra-European trade to world trade expansion is about half of the amount it represented in the 1990s.

Financial constraints have also logically played a role during the global trade collapse because most international trade transactions incur costs, such as those related to finding export opportunities or creating foreign distribution networks. Moreover, exporters rely heavily on financial advances because production costs are borne long before revenues are obtained, and additionally, to hedge for financial risks associated with export operations (ECB 2016).

Lastly, as mentioned by the International Monetary Fund (2016) and Wozniak and Galar (2018), the commodity prices cycle may also have caused a reduction in trade in 2014 and 2015. Commodity prices sank during those years, and the reduction in export revenue amongst commodity exporters provoked an increase in capital outflows, currency depreciations, fiscal problems, as well as political unrest. These factors favoured a reduction in the imports of investment goods, thus pushing down imports even further.

Once having listed all these drivers affecting trade, we can arrive at the following consideration: structural factors are causing a permanent reduction in trade elasticity, whereas cyclical factors, per se will depend on the global business cycle. Therefore, in Section 3 we want to test whether there has been a reduction in long-run elasticity and whether there is a higher pro-cyclicality of trade flows.

1.2 Review of the Empirical Literature

However, before moving to the econometric model and the results, a brief review of the empirical literature should be carried out. This paper follows two strands of the empirical literature about trade slowdown. The first has to do with the large body of research compiled about the specific causes that provoked the sudden and severe global trade collapse of 2008-2009 following the financial crisis. Although there are some discrepancies about the relative importance of each one, the bulk of the empirical research reveals that the main determinants were the big fall in aggregate demand (especially of its most trade intensive components) and also the credit crunch which affected trade financing (Bems, Johnson, and Yi 2010; Bussière et al. 2013). However, our work is linked more closely to the papers concentrating their focus on the changes in the long-run elasticity between trade and income. The most recent papers include the GTC years too, and therefore, their main interest, as in our case, is to analyse whether GTS are connected to changes in the long-run trade elasticity. Most of these studies use ECM techniques in order to detect the short- and long-run elasticity over different time periods. Only the paper of Caroline Freund (2009) does it for several areas but she uses an OLS technique.

In this sense, Irwin (2002) analyzes very long-run trends between world trade and income. The results he obtains show that from 1950 to 2000, trade grew slightly more rapidly than income (with a trade elasticity of 1.7) and that, apparently, there was a structural break between the mid-1980s and 2000 due, principally, to a new, much more liberal regime for trade under the auspices of GATT and the World Trade Organization (WTO). During this last period, trade became extremely responsive to changes in income, reaching an elasticity of 3.4. Freund (2009) examines the impact of past global downturns on trade flows and finds that by employing an OLS technique from 1960 to 2007, the elasticity of global trade volumes to world GDP increased gradually from approx. 2.0 in the 60s to 3.7 in the 2000s (2000-2007). Another result is that during severe downturns trade tends to be more responsive than during more tranquil times. Finally, the largest elasticity is for East Asian countries, for which the figure is approx. 4.5 from 1995 to 2007.

Escaith, Lindenberg, and Miroudot (2010) also find an increase of long-run elasticity during the 1980s and 1990s before noting its fall in the 2000s. However, their figures are considerably lower (probably because they restricted the sample to 24 OECD countries). More importantly, for their last period (2000-2009), the elasticity falls from 2.8 in the 1990s to 1.9. Another study (Jaime Martinez-Martin 2016) using an ECM panel technique finds, like the one of Irwin (2002), that trade response to income change in the long-run for the period of 1960 to 2000 is approx. 1.4, which later increased slightly from 2001 to 2009 and fell to 1.2 from 2010 to 2015. For him, the apparent main cause of this small slowdown is a levelling off of the GVC.

Constantinescu, Mattoo, and Ruta (2016) obtain a decreasing long-run elasticity from 2.2 (1986-2000) to 1.3 (2001-2013), quite similar to that found by Ollivaud and Schwellnus (2015), but a little lower than that for Escaith, Lindenberg, and Miroudot (2010) who calculated it at 1.9. Jouchi Nakajima et al. (2016), using quarterly data, obtain a long-run estimation of this parameter of 1.0 for the period 2009-2015 that is slightly lower than for the previous period (1995-2008: 1.5). Their results are very close to those of Martinez-Martin (2016: 1.2): they attributed this lower elasticity to the expansion of in-house production in China and the already-mentioned deceleration of GVC expansion. Finally, the recent paper of Constantinescu, Mattoo, and Ruta

(2018), also using annual and quarterly data, shows that elasticity in the long-run has declined from 2.5 (2001-2007) to 1.0 (2008-2015) due, mainly, to the slowing pace of international vertical specialization.

2. Stylized Facts

In order to make a preliminary assessment of the relative relevance of structural and cyclical components on trade elasticity at the world level and the other regions analyzed, we have applied the Hodrick-Prescott filter for the annual data of imports (goods and services) and of trade-income elasticity. Trade-income elasticity has been calculated in the usual way as the ratio between the annual change in imports of goods and services and the change in GDP, both of them measured in constant 2010 US dollars.

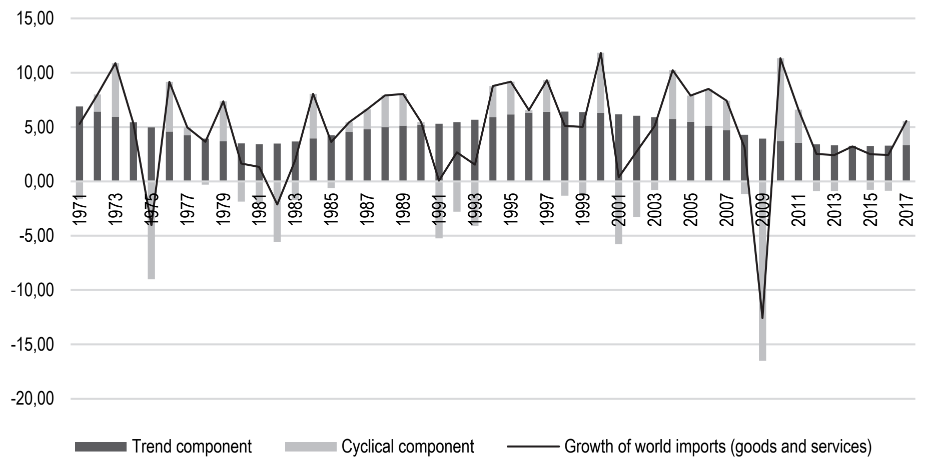
The data used in this study are annual observations of GDP and imports of goods and services and the analyzed period is 1970-2017. The data have been sourced from the World Development Indicators of the World Bank (2019)[1]. The units of the data are in constant 2010 US dollars. Logarithmic transformations have been used for all the variables.

We perform our analysis using time series data for four geographical world regions separately: (i) the world as a whole; (ii) OECD countries; (iii) Asian countries; and (iv) Latin America (see Appendix for concrete countries in each group).

In Figure 1 it can be seen that after the overshooting of 2010 following the GTC, import trade growth declines considerably until 2017. The average growth for this period (2011-2017) is 3.6% below the previous average for between 1985 and 2007 (6.1%) and more in line with the 1971-1984 period (4.39%). It can be also deduced that the cyclical component of world imports is negative during those years in which world GDP growth is below trend, something that will be discussed in more detail below in Figure 3.

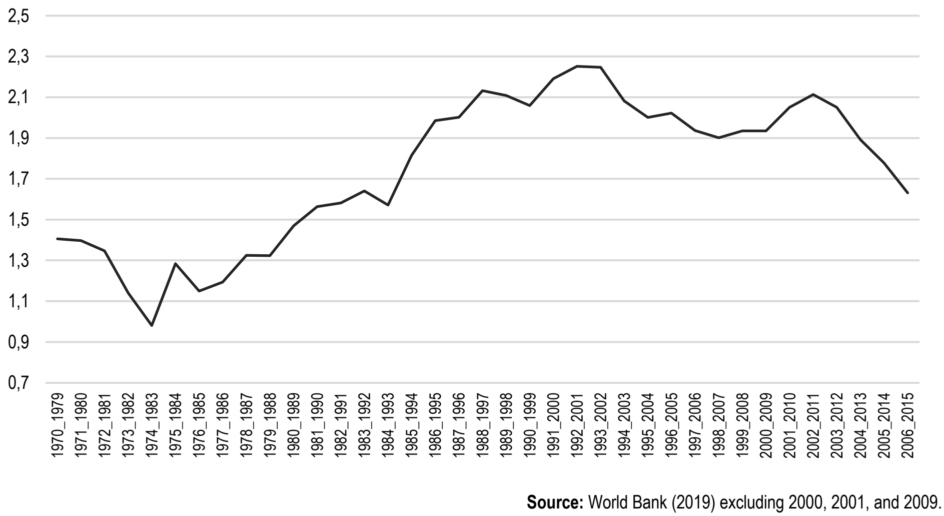
Additionally, it is worth mentioning that throughout this period of more than 30 years, there have been only three years with a negative growth rate coinciding with global downturns: namely 1975, 1982, and the much deeper GTC of 2009, the only year with a negative world GDP growth. In fact, the section capturing the cyclical effects is larger during periods of crises, such as the three we mentioned. Additionally, this cyclical part also seems to be larger when the global economy rebounds, as for example in 1976 and more clearly in 2010. Another characteristic is that the trend (structural) component of global trade increased from the period of the mid-1980s until the GTC, being quite a bit larger than the cyclical component, thereby explaining the bulk of trade increase. The graph also shows the decomposition of trade growth between the trend and the cycle. Coinciding with GDP downturns, the cyclical component (in absolute values) is higher than the structural one in 1975, 1982, 1984, 2009, and 2010.

[1] **World Bank.** 2019. World Development Indicators. https://databank.worldbank.org/source/world-development-indicators (accessed March 20, 2019).



Source: World Bank (2019) and own elaboration.

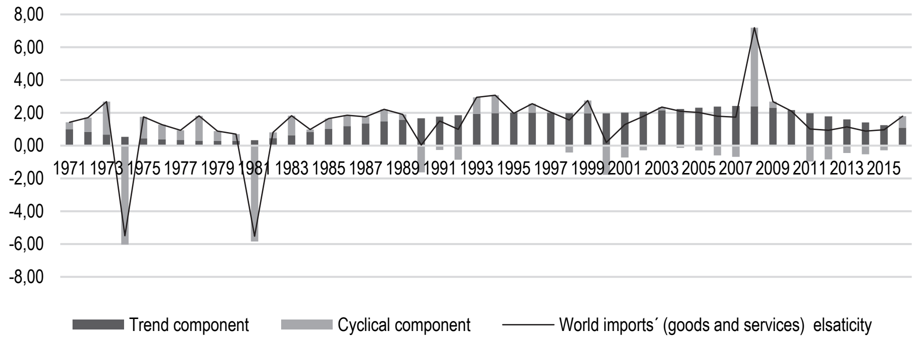
Figure 1 Decomposition of Trend and Cycle of Global Imports of Goods and Services



Source: World Bank (2019) excluding 2000, 2001, and 2009.

Figure 2 Ten-Year Moving Average of Imports of Goods and Services Income Elasticity

Regarding trade-income elasticity evolution, we use a ten-year moving average (Constantinescu, Mattoo, and Ruta 2018) in order to obtain a better and smoother picture of its long-run dynamics. In Figure 2, elasticity reaches its trough in the decade of 1974-1983 and peaks in the 10-year window corresponding to 1992-2001; thereafter, there is initially a slight decrease until the window of 2002-2011, from which a stronger downturn is clearly observed until the end of the period in 2017.

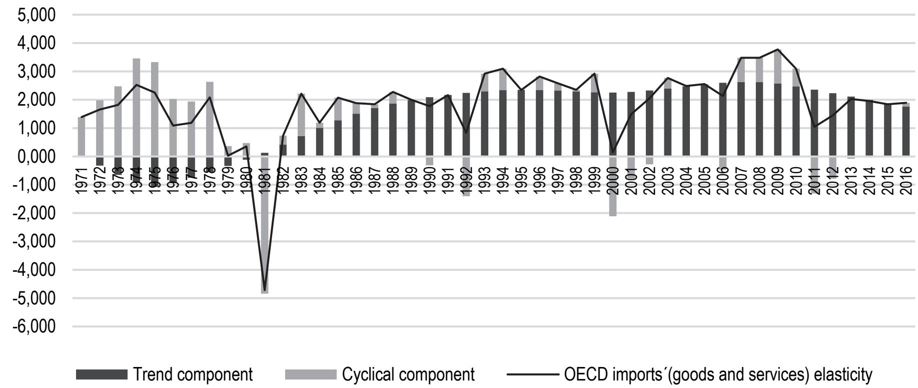


Source: World Bank (2019) and own elaboration.

Figure 3 Decomposition of Trend and Cycle of World Imports (Goods and Services) Elasticity

In order to gain a more detailed view of the elasticity and its components, Figure 3 shows three important features: first, elasticity increases on average from the beginning of the 1980s until the beginning of the 2000s and thereafter stagnates at a relatively high level. Second, from the early 1980s until the GTC in 2009, the trend component shows a continuous increase and additionally appears to be significantly larger than the cyclical one. Finally, not only elasticity, but also its trend component, slowly decreases from 2010 until 2017 (the elasticity outliers of 1975, 1982, and 2009 are due to the large decrease of imports in those years; in 2009 elasticity is positive since GDP also decreases). As commented regarding Figure 1, the cyclical component is negative, coinciding with a world GDP growth below its long-term trend.

Moving now to the OECD, Figure 4 shows the evolution of trade elasticity and its components for the same time period.

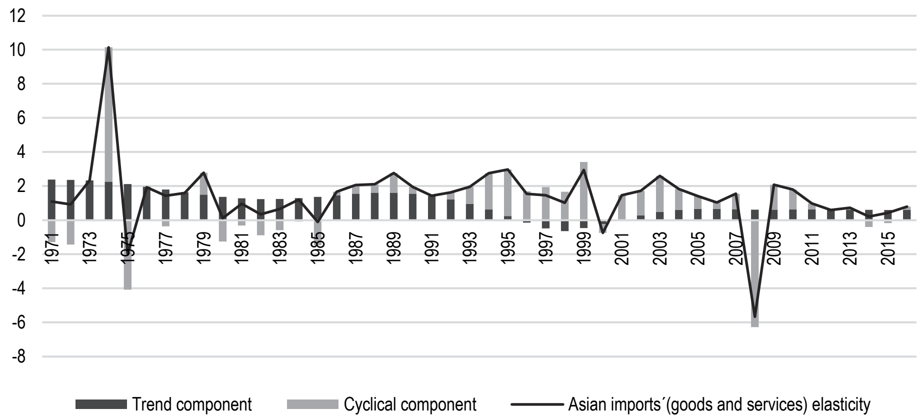


Notes: 1975 data has been removed because the elasticity figure reaches -20% due to the impact of the oil crisis, making the graph less legible.

Source: World Bank (2019) and own elaboration.

Figure 4 Decomposition of Trend and Cycle of OECD Imports (Goods and Services) Elasticity

Figure 4 shows, that the pattern of the elasticity for OECD imports is similar to that of the world's, i.e. with an upward tendency from the 1980s to the 2000s, a relative stagnation thereafter until the GTC in 2009, and a pronounced decline since 2010. On average, trade elasticity increases from approximately 1% until the mid-80s to 2.4% during the 90s until 2009, but thereafter elasticity undergoes a small fall to 2.1%. Even more pronounced than in the world's case, the changes in the structural component more than explain the evolution in trade elasticity, which is especially true after the GTC. Therefore, apparently the slowdown has little to do with the business cycle but with more structural or fundamental factors. All in all, the case of the OECD countries shows a similar evolution.

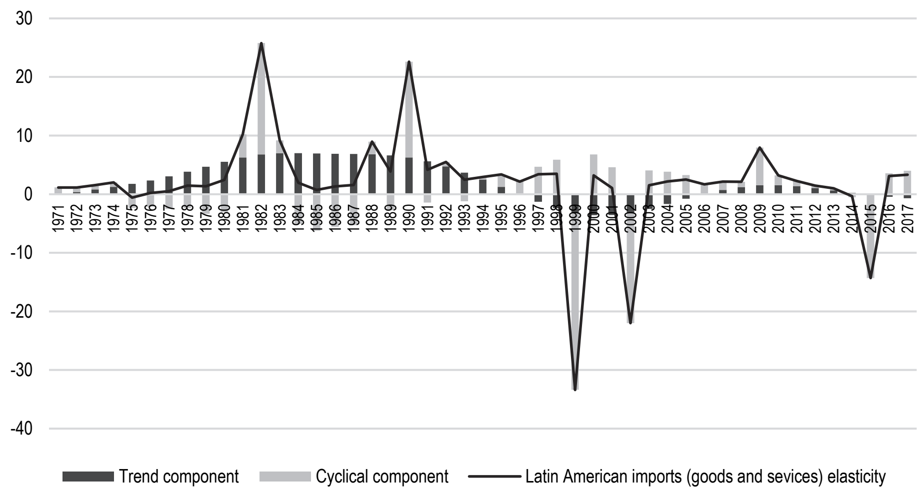


Notes: 1998 has been removed because the elasticity figure reaches approx. -20% due to the balance of payments crisis of Asian countries, making again the graph less legible.

Source: World Bank (2019) and own elaboration.

Figure 5 Decomposition of Trend and Cycle of Asian Imports (Goods and Services) Elasticity

Regarding Asia, Figure 5 shows that a similar pattern is repeated, although with some peculiarities: elasticity grows on average from the mid-80s to 2001 in comparison to the previous period (1971 to 1984) from 1.5% to 1.8%. This is a small increase in comparison with that occurring in the world or OECD cases, which has to do with the substitution as strong world traders of first Japan by the SE Asian countries and finally by China during these decades; this is why the slowdown in trade could be considered to have started earlier (in the mid-90s) than in the other cases commented above. But then again, since 2001 elasticity drops on average below 1% (0.8%). As for 2009 GTC the large and negative effect on elasticity is due to a large drop in imports (11%), whereas GDP growth remains positive (2%) and since 2010 the slowdown in trade elasticity is quite clear. Also making a difference with the world and the OECD countries, the largest component of trade elasticity is of a structural nature until the beginning of the 90s, but then the cyclical component and its variations dominate the evolution of trade elasticity; however, and as in the previous cases, since 2010 the drop in trade elasticity appears to be explained principally by structural factors.



Source: World Bank (2019) and own elaboration.

Figure 6 Decomposition of Trend and Cycle of Latin American Imports (Goods and Services) Elasticity

This region (Figure 6) shows a quite different evolution. In fact, there are many extreme cases coinciding with repeated critical periods owing to the debt crisis in the beginning of the 80s, the currency crisis in the beginning of the 90s, and the one affecting mostly Argentina in 1999. Apart from GDP volatility, because the region has been hit several times by major crises, trade flows are also quite volatile because of large exchange rate fluctuations. However, the structural component grew until the end of the 90s, but thereafter it diminished quite considerably.

Summing up, trade-income elasticity, after its strong growth during the 1990s, seems to have been falling from the beginning of the 2000s. However, the most intense elasticity reduction has taken place after the global trade collapse. This is coincident with the evolution at the world level and for the other regions, except for Latin America. For the world and OECD countries, it is also clear that the trend component has played an important role firstly in the stagnation after 2000 and thereafter in the recent sharp decline of elasticity, revealing somehow the structural nature of the trade slowdown phenomenon. This is not so clear in the case of Asian countries or for Latin America.

3. Econometric Modelling and Results

3.1 Econometric Strategy and Results

Our econometric strategy consists of estimating the long-run equilibrium relationship (the trade elasticity, hereafter), the short-run adjustment dynamics between real income (GDP) and trade volumes (proxied by imports of goods and services), and the speed of adjustment to the long-term equilibrium. In order to do so, we follow the literature and use the Error Correction Model (ECM) representation of the first-order autoregressive distributed-lag model (ARDL) of M. Hashem Pesaran and Yongcheol Shin (1999) and Pesaran, Shin, and Richard J. Smith (2001).

The ARDL bounds test offers several advantages over more traditional cointegration approaches (for instance, Robert F. Engle and Clive W. J. Granger 1987 and Søren Johansen and Katarina Juselius 1990). The main advantage of the ARDL approach is that it avoids problems of serial correlation and of endogeneity. In addition, this method avoids pretesting of the order of integration, which is associated with other cointegration analyses (Emeka Nkoro and Aham Kelvin Uko 2016). We only have to ensure that the dependent variable is I(1) and that the regressors are not of an order of integration higher than I(1). This means that one does not have to make the difficult I(0)/I(1) decision (Soren Jordan and Andrew Q. Phillips 2018). Finally, this approach is more efficient and provides better results for small samples (Subrata Ghatak and Jalal U. Siddiki 2001) than other traditional cointegration techniques. We use the ARDL approach to cointegration that, in this study, entails estimating the following ECM:

$$\Delta \, ln\, m_t = \alpha + \beta \Delta ln y_t + \gamma \, ln m_{t-1} + \delta ln y_{t-1} + e_t, \tag{1}$$

where Δ denotes first differences; m_t is the import of goods and services (constant 2010US$), and y_t is the real GDP (constant 2010US$) at time t; α is a constant and e_t is the error term. The parameter δ portrays long-run effects normalized by γ $(-\delta/\gamma)$; the β parameter depicts short-run effects and $(-\gamma)$ is the speed of adjustment to the long-run equilibrium. In the ARDL model, the null hypothesis is stated as ($\delta = 0$). The optimal number of lags of the ECM is chosen using the Akaike Information Criterion. Based on this, we estimate the ARDL (1 1) bound testing approach which, according to the literature, is sufficient to ensure a white noise error term (Irwin 2002; Constantinescu, Mattoo, and Ruta 2018).

Following Pesaran, Shin, and Smith (2001), the testing procedure of a long-run relationship between the variables can be based on the F-test. The authors derived their asymptotic distributions under the null and proposed critical value bounds, which allows one to accept or reject the null hypothesis that the coefficients on the level variables lagged are jointly equal to zero. If the statistics fall outside of their respective critical upper bound, then we reject the null hypothesis and we have evidence of a long-run relationship (indicating cointegration). If the statistics are below their respective critical lower bound, then we cannot reject the null hypothesis of no cointegration. Finally, if the statistic falls between the upper and lower critical bounds, then the inference is inconclusive.

As noted, the ARDL model does not need to pre-test the order of integration, but it requires a confirmation for the non-presence of second-order stationarity I(2) in the model. The Augmented Dickey Fuller (David A. Dickey and Wayne A. Fuller 1979) and the Phillips-Perron stationarity tests were conducted for all the variables. The results are reported in Table 1. The results show that the real GDP and the volume of imports of goods and services for the different geographical regions are not stationary at the level (with constant term and with trend), but are stationary at the first difference (with constant term and with trend). As a consequence, the ARDL approach can be used to determine the existence of a cointegration relationship between our variables.

Table 1 Tests for Unit Root: Augmented Dickey Fuller and Phillips-Perron Tests

	Level		First difference	
	Constant	**Trend**	**Constant**	**Trend**
Augmented Dickey Fuller test (ADF)				
World (m_t)	-.578	-2.173	-5.306***	-5.250***
World (y_t)	-1.170	-4.563**	-5.574***	-5.631***
OECD (m_t)	-.745	-1.733	-5.143***	-5.104***
OECD (y_t)	-2.285	-1.431	-4.616***	-5.310***
Asia (m_t)	-1.064	-1.950	-5.003***	-5.096***
Asia (y_t)	-.362	-2.414	-5.330***	-5.250***
Latin America (m_t)	-.471	-2.261	-4.703***	-4.649***
Latin America (y_t)	-1.808	-3.722	-3.781***	-3.986**
Phillips-Perron test (z (t)) (PP)				
World (m_t)	-.617	-2.126	-6.487***	-6.428***
World (y_t)	-1.686	-3.618	-5.090***	-5.177***
OECD (m_t)	-.784	-1.685	-6.310***	-6.282***
OECD (y_t)	-3.138**	-1.152	-4.604***	-5.198***
Asia (m_t)	-.1.070	-1.753	-5.962***	-6.013***
Asia (y_t)	-.424	-2.176	-5.527***	-5.470***
Latin America (m_t)	-.468	-1.919	-4.919***	-4.857***
Latin America (y_t)	-2.514	-3.406	-4.160***	-4.447***

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively. y_t denotes GDP (constant 2010US$), m_t imports of goods and services (constant 2010US$). The lag length is based on the Schwarz Information Criterion.

Source: Authors' calculations.

Pesaran, Shin, and Smith (2001) detail different scenarios to carry out the bounds testing approach. In our case, we consider the *F*-statistic of the model with unrestricted intercept and no time. Table 2 shows the values of *F*-statistics and the critical bounds. The tests lie above the critical upper bound. Therefore, the null hypotheses of no-co integration is rejected, implying in all cases the existence of a long-run relationship between the variables.

After establishing the existence of cointegration in the model, short-run and long-run effects are computed and the results are presented in Tables 3-6 for the four different world regions, respectively. We run our estimations for four periods: the whole period under study (1970-2017) and three sub-periods: 1970-1985, 1986-2000 and 2001-2017. The selection of the sub-periods has been in line with the major waves of globalization.

We also conducted various diagnostic checks to assess the robustness of the above estimated results: To test if the residual terms are serially correlated we have use a Bresuch-Dodfrey Serial Correlation LM test and the alternative Durbin-Watson d-statistic. White's test has been used to test homoscedasticity.

Table 2 Critical Values and Bounds Test for Cointegration: *F*-statistics

World region	F-statistics	Critical values at significant level 0.05	
		I(0)	I(1)
World	5.950*	4.94	5.73
OECD	18.117*	4.94	5.73
Asia	5.740*	4.94	5.73
Latin America	12.010*	4.94	5.73

Notes: * indicates that the statistic lies above the upper level of the band. This model is based on the Akaike criterion. *F*-statistic represents the *F*-statistic of the model with unrestricted intercept and no time trend.

Source: Authors' calculations.

Table 3 World

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-.115*	-0.17	-.473***	-0.619
Long-run elasticity	1.836***	1.321***	2.155***	1.182*
Short-run elasticity	2.645***	1.835**	2.459***	3.469***
Constant	-3.269***	-2.05	-17.99***	-0.498
Durbin-Watson d-statistic	1.68	2.58	2.48	1.89
Breusch-Godfrey LM test for serial correlation	1.44	5.32	1.68	0.004
Homoscedasticity	7.04	12.5	9.25	13.23
R-squared	0.8219	0.8542	0.5904	0.9538
Observations	47	15	15	17

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively.

Source: Authors' calculations.

These results are broadly consistent with the literature we mentioned above. As far as the world is concerned, we detect an increase in the long-run elasticity in the period 1986-2000, compared to the previous period, and a decline thereafter (2001-2017). However, the short-run elasticity exhibits an increase in the 2001-2007 period, suggesting that the global slowdown is not just the result of the financial crisis, but a phenomenon that has more to do with fundamental factors. This also reveals that since 2001, trade flows respond more strongly to the business cycle. A last comment worth mentioning is that our findings reveal first that the global slowdown started some years before the GTC in 2009 and also that the biggest globalizing process has occurred since the mid-1980s. Finally, regarding the diagnosis tests of the models, the Durbin-Watson d-statistic and the Breuch-Godfrey LM test show that there is no serial correlation. White's test shows that the data is homoscedastic because the *p*-value is not significant.

For the OECD countries, Table 2 shows quite similar results as those for the whole world. Beyond representing this group of countries, which enjoy the majority share of world trade, elasticity change patterns are slightly smoother: long-run elasticity does not decrease as much as for the whole world, suggesting that they represent a more cohesive group of countries regarding international production and the corresponding global value chains. Additionally, we would like to highlight that the long-run elasticity for imports amongst OECD countries for the whole period (1970-2017) is somewhat higher than the world one. This means that structural factors, such as the ones promoting an increasingly globalized economy, have had a higher impact on trade growth in OECD countries. The results for the periods 1970-1985 and 2001-2017, however, should be taken with caution since the Durbin-Watson d-statistic and the Breuch-Godfrey LM tests are statistically significant.

Table 4 OECD

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-0.054	-0.431	-0.184	-0.438
Long-run elasticity	2.766***	1.313***	2.727***	2.237***
Short-run elasticity	2.729***	1.627*	2.386***	1.920***
Constant	-3.11***	5.092	-10.272	-17.664*
Durbin-Watson d-statistic	2.35	2.84	2.07	.910
Breusch-Godfrey LM test for serial correlation	1.97	9.92***	.43	7.87***
Homoscedasticity	16.30*	12.02	8.48	12.57
R-squared	0.8683	0.8497	0.8785	0.9103
Observations	47	15	15	17

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively. We have tested that residuals are stationary.

Source: Authors' calculations.

Table 5 Asia

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-0.022	-0.649	-0.263	-.233*
Long-run elasticity	1.088	1.196***	2.154***	.853***
Short-run elasticity	2.653***	-0.347	3.075***	3.777***
Constant	-0.153	-4.96	-9.569	0.611
Durbin-Watson d-statistic	1.98	1.55	1.96	2.62
Breusch-Godfrey LM test for serial correlation	.001	.803	.006	2.563*
Homoscedasticity	9.57	5.10	12.32	9.20
R-squared	0.4168	0.3808	0.8488	0.7816
Observations	47	15	15	17

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively. We have tested that residuals are stationary.

Source: Authors' calculations.

Regarding Asian results, the most remarkable feature is that in the last period (2001-2017), long-run elasticity has fallen more than in the other cases and we suggest this is coherent with the idea that reshoring strategies by firms have affected these countries more and that the export-led growth model of China might have started to be replaced by a model that does not depend so much on imported inputs and components. As for the rest of the results, the previous comments apply. The diagnosis tests reveal that there is no serial correlation (in the period 2001-2017 it is only statistically significant at the 5% level).

Turning lastly to Latin America, in line with the comments mentioned previously, this is the most divergent area. The lack of significance for the first sub-period (1970-1985) can be attributed to the extensive strategies for growth adopted by most Latin American countries, namely the so-called import substitution policies which decoupled GDP growth from imports. Additionally, during this period, the debt crisis that hit Latin America is also a factor to be considered. In the same vein, as the import substitution growth model was abandoned and the economies opened to world trade and GVCs, elasticity started to reach similar values to the rest of the world. In fact, as can be seen in Table 6, trade elasticity in the long-run even surpassed the world average for the period 1986-2000. Finally, as in the other cases, in the last period, the long-run relationship decreases. The Durbin-Watson d-statistic and the Breuch-Godfrey LM tests are not statistically significant at the 5% level which means that, at that level of significance, there is not serial correlation. White's test shows that the data is homoscedastic.

Table 6 Latin America

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-.135***	-0.02	-0,173	-.576***
Long-run elasticity	2.408***	9.764	3.337***	1.823***
Short-run elasticity	3.066***	3.802***	1.917*	1.883***
Constant	-5.852***	-5.245	-12.063	-14.85
Durbin-Watson d-statistic	1.24	2.37	1.28	2.22
Breusch-Godfrey LM test for serial correlation	7.169**	.721	2.960*	3.072*
Homoscedasticity	27.92**	12.74	9.63	12.06
R-squared	0.7007	0.8009	0.4236	0.9407
Observations	47	15	15	17

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively. We have tested that residuals are stationary.

Source: Authors' calculations.

Finally, we have checked the plots of the CUSUM and CUSUMSQ for each world region and these indicate the stability of both long and short-run coefficients since the residuals lie within the upper and lower bounds of the critical values. The plots of CUSUM and CUSUMSQ are not reported in this study, but they can be sent by request.

3.2 Robustness Checks

In order to check that our results are robust to the selected break years, we have first applied a test for structural breaks. Additionally, we have run the ECM, adding years one by one, and, moreover, we have run the ECM for exports as well in order to check whether there are differences compared to import flows.

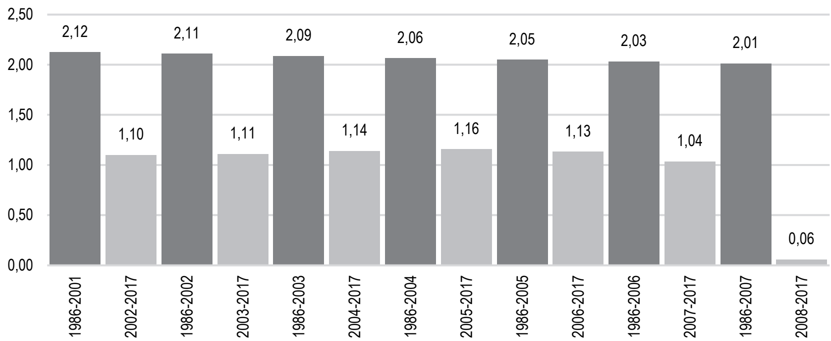
The test is conducted with the "sbknown" command using Stata 15.0, which performs a test of the null hypothesis that the coefficients do not vary over the subsamples defined by the specified known break dates. Table 7 shows the results of this test for each world region and reveal that the selected break years (1985 and 2000) are statistically significant at the 0.01 level in each geographical region meaning that we can reject the null hypothesis of no structural break for the specified dates.

By running the ECM for different periods (adding years, one by one, to the second period starting in 1986), we can see in Figure 7 for world trade, that the coefficients remain almost the same and are statistically significant. Thus, this is further evidence indicating that the second break year is 2001 as otherwise we would have observed a significant and major change in the long-run coefficient. As this is not the case, we can be more confident about choosing 2001 as the year when trade elasticity started to change. The fall of trade elasticity for the period 2008-2017 to a figure close to zero is not so apparently incomprehensible because it includes the 2009 GTC and the subsequent years of anaemic growth in world trade.

Table 7 Structural Break Test

Break dates: 1985-2000	t-statistics
World	245.2867***
OECD	535.8027***
Asia	170.2380***
Latin America	383.5965***

Source: Authors' calculations.



Notes: Dark grey bars refer to the long-run elasticity for the first period (1986-2000s) and the light grey ones to the second period (2000s-2017).

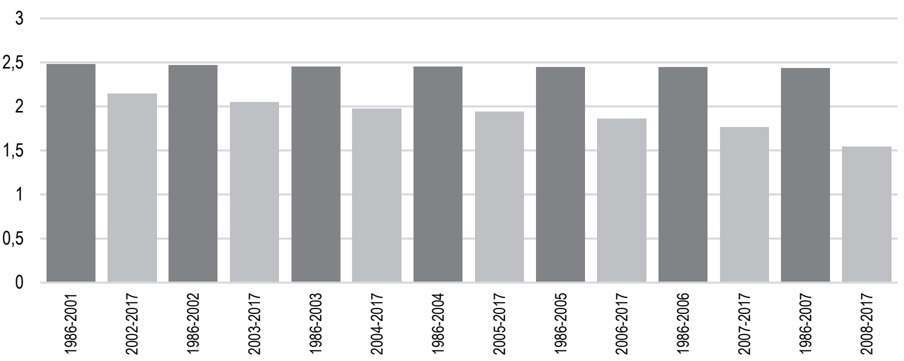
Source: World Bank (2019) and own elaboration.

Figure 7 Long-Run World Elasticities for Different Periods (1986-2017): World

Regarding the OECD, we have proceeded in the same way, checking the robustness of the break dates, and again the results do not change significantly (see Figure 8). The figures for the 1986-2000s periods (dark grey bars) are all closed to 2.5 and for the other period (light grey bars) they fall to figures around 2.0. Curiously, in the case of OECD countries, the period 2008-2017 does not show such a high decrease in elasticity compared to the World case, but this is coherent with the argument stated above, which mentions that GDP growth amongst OECD countries was also very low.

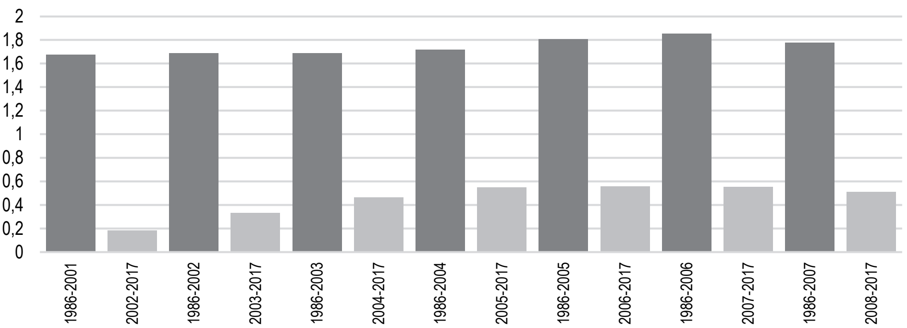
In reference to the results for Asian countries (Figure 9), we can assert again that ECM coefficients stay almost unchanged, showing the big fall in elasticity between the second (dark grey bars) and third period (light grey bars).

In line with the results in Table 6, Latin America's additional ECMs (Figure 10) do not show a steady pattern: results corresponding to subsequent ECMs from 1986-2001 are neither statistically significant (dark grey) nor do they show a similar result. In the Latin American case, we must be cautious about the existence of a point of time from which trade slowdown takes place. This robustness check has also been carried out for a year break of 1985, but results have not been included for the sake of simplicity, being available upon request.



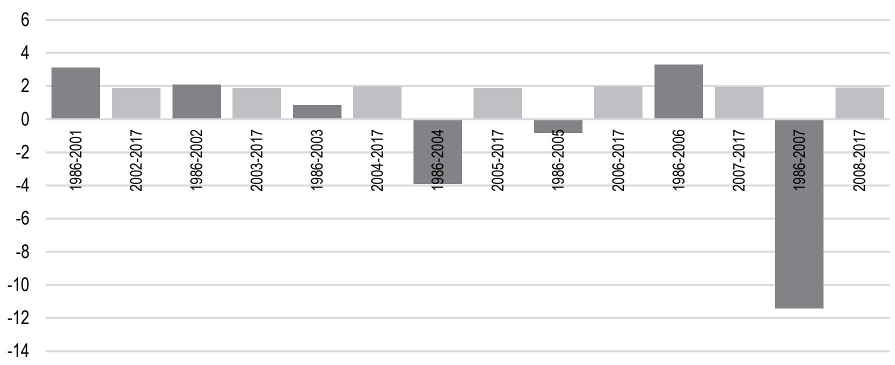
Source: World Bank (2019) and own elaboration.

Figure 8 Long-Run World Elasticities for Different Periods (1986-2017): OECD



Source: World Bank (2019) and own elaboration.

Figure 9 Long-Run World Elasticities for Different Periods (1986-2017): Asia



Source: World Bank (2019) and own elaboration.

Figure 10 Long-Run World Elasticities for Different Periods (1986-2017): Latin America

We have used import data when analyzing trade elasticity, but it is possible that regional data exports may show a different pattern Consequently, we have checked the robustness of the results so far obtained by running the ECM for export data and for the same periods: the export data's ECM results show a similar pattern, since export elasticity grows from 1986 to 2001 in comparison with the previous period 1970-1985 to fall thereafter (2001-2017) revealing a similar slowdown as in the case for imports (Appendix). The only exception is for Latin American countries, where long-run export elasticity does not show a relevant slowdown. Moreover, figures are significantly lower than in the case of imports, probably due to their high dependency on exporting commodities.

4. Conclusions

The aim of this paper is to assess whether the global trade slowdown is fundamentally a structural phenomenon or not. In order to carry this out, we compute an ECM for the World and different regional areas (World, OECD, Asia, and Latin American countries) and for several time periods (1970-1985; 1986-2000; 2001-2017), testing trade-income elasticity shifts over time.

We have been able to detect that the highest trade elasticity was reached in the period 1986-2000, coinciding not accidentally with important structural changes that were positively affecting world trade (liberalization of trade policies, lower transport and logistics costs, and international fragmentation of production processes). In line with other papers, our findings support that the trade slowdown started before the global trade collapse in 2009, although since this year, the slowdown has been more evident.

When we look at different regions, this pattern is quite similar for import and export flows (except for Latin American countries). As for OECD countries, long-run elasticity does not decrease as much as for the whole world, suggesting that these countries represent a more cohesive group. Furthermore, the long-run elasticity for imports for the whole period (1970-2017) is somewhat higher than for the whole world. In Asia, results are consistent with the idea that reshoring strategies by firms have affected these countries more, since the coefficient for the slowdown period is lower. As for Latin American countries, apparently import substitution policies adopted during the 1970s explain the feeble relationship between trade and GDP. Thereafter, since the mid-eighties, elasticity started to be similar to values for the rest of the world, consistent with the radical change in trade policy. Finally, as in the other cases, in the last period, the long-run relationship decreases.

We think that these conclusions are quite relevant since they corroborate a major shift in the global economy towards less trade and less globalization in general, with potential significant effects in every world area. Provided this change is a persistent one, this will require a considerable structural adjustment in growth models, especially in those countries that are more dependent on trade openness, such as smaller countries, as well as emerging ones.

In our opinion the policy implications of such a big shift are far reaching. Policy makers in many countries, both developed and emerging alike, that have embraced export-led growth strategies as a first best option during recent decades by implementing neo-mercantilist policies may change their minds. Achieving strong international competitiveness and a persistent current account surplus through wage repression, currency devaluation and labour cost reducing FDI may become a less attractive option now. If the globalization process shows signs of exhaustion this may open more space to push for a new policy agenda based on strengthening domestic demand and on enlarging more local capabilities. In the end, less trade dependent economies may be more resilient to “exogenous” shocks, more environmentally friendly and even more in accordance with less income inequality.

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Appendix

List of Countries

OECD

Australia
Austria
Belgium
Canada
Chile
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Israel
Italy
Japan
Korea, Rep.
Latvia
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Slovenia
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

ASIA (EAST ASIA AND PACIFIC & SOUTH ASIA)

Afghanistan
American Samoa
Australia
Bangladesh
Bhutan
Brunei Darussalam
Cambodia
China
Fiji
French Polynesia
Guam
Hong Kong SAR, China
India
Indonesia
Japan
Kiribati
Korea, Rep.
Lao PDR
Macao SAR, China
Malaysia
Maldives
Marshall Islands
Micronesia, Fed. Sts.
Mongolia
Myanmar
Nauru
Nepal
New Caledonia
New Zealand
Northern Mariana Islands
Pakistan
Papua New Guinea
Philippines
Samoa
Singapore
Solomon Islands
Sri Lanka
Taiwan, China
Thailand
Timor-Leste
Tonga
Tuvalu
Vanuatu
Vietnam

LATIN AMERICA AND THE CARIBBEAN

Antigua and Barbuda
Argentina
Aruba
Bahamas, The
Barbados
Belize
Bolivia
Brazil
British Virgin Islands
Cayman Islands
Chile
Colombia
Costa Rica
Cuba
Curacao
Dominica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Puerto Rico
Sint Maarten (Dutch part)
St. Kitts and Nevis
St. Lucia
St. Martin (French part)
St. Vincent and the Grenadines
Suriname
Trinidad and Tobago
Turks and Caicos Islands
Uruguay
Venezuela, RB
Virgin Islands (U.S.)

ECM Estimations Using Exports of Goods and Services (2010 $ Constant)

Table A1 Unit Root Test: Augmented Dickey Fuller (ADF) Test

	Level		First difference	
	Constant	**Trend**	**Constant**	**Trend**
World (x_t)	-.897	-2.048	-5.569***	-5.562***
OECD (x_t)	-1.273	-1.618	-5.769***	-5.941***
Asia(x_t)	-1.866	-.809	-5.620***	-6.223***
Latin America (x_t)	-1.688	-2.479	-4.622***	-4.741***

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively.

Source: Authors' calculations.

Table A2 Unit Root Test: Phillips-Perron Test (z (t))

	Level		First difference	
	Constant	**Trend**	**Constant**	**Trend**
World (x_t)	-1.016	-2.154	-7.163***	-7.168***
OECD (x_t)	-1.482	-1.583	-6.982***	-7.152***
Asia(x_t)	-2.300	-1.146	-7.514***	-8.106***
Latin America (x_t)	-1.561	-2.557	-7.693***	-7.880***

Notes: *, **, *** denote the statistical significance at the level of 10%, 5%, and 1% respectively.

Source: Authors' calculations.

Testing Break Dates when Using Exports of Goods and Services (2010 $ Constant)

Table A3 Break Dates (2010 $ Constant)

Break dates: 1985-2000	**t-statistics**
World	159.1227 ***
OECD	325.9134 ***
Asia	56.4807***
Latin America	158.3463 ***

Source: Authors' calculations.

Estimations

Table A4 World: Exports of Goods and Services (2010 $ Constant)

	1970-2017	**1970-1985**	**1986-2000**	**2001-2017**
Speed of adjustment	-.125**	-.741**	-.481***	-.191
Long-run elasticity	1.768***	1.354***	2.222***	1.462***
Short-run elasticity	2.156***	.385	1.483***	2.795***
Constant	-3.256	-10.210*	-19.253***	-3.101
Durbin-Watson d-statistic	1.81	2.13	1.68	1.952
Breusch-Godfrey LM test for serial correlation	.535	1.461	.442	.008
Homoscedasticity	10.43	12.34	7.66	14.23
R-squared	.7016	.7619	.8022	.9584
Observations	47	15	15	17

Source: Authors' calculations based on data from the World Bank.

Table A5 OECD

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-.071	1.465***	-.338**	-.325
Long-run elasticity	2.345***	1.688***	2.592***	2.516***
Short-run elasticity	2.031***	-1.438**	1.211**	1.978***
Constant	-3.110*	-34.09***	-17.39***	-16.076
Durbin-Watson d-statistic	1.89	2.24	2.29	1.08
Breusch-Godfrey LM test for serial correlation	.141	.546	.024	5.934**
Homoscedasticity	15.72*	9.85	7.14	5.22
R-squared	.7272	.9247	.7381	.9008
Observations	47	15	15	17

Source: Authors' calculations.

Table A6 Asian Countries

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-.061	-.648*	-.322	-.244*
Long-run elasticity	1.347***	1.673***	2.031***	.914***
Short-run elasticity	1.446***	-.546	1.094***	4.081***
Constant	-.737	-14.040*	-10.457*	.191
Durbin-Watson d-statistic	2.27	1.90	2.10	2.73
Breusch-Godfrey LM test for serial correlation	1.461	.002	1.194	4.171*
Homoscedasticity	11.08	7.68	12.93	9.72
R-squared	.2760	.3407	.6008	.8419
Observations	47	15	15	16

Source: Authors' calculations.

Table A7 Latin American Countries

	1970-2017	1970-1985	1986-2000	2001-2017
Speed of adjustment	-.184*	-.637**	-.021	-.355*
Long-run elasticity	1.539***	1.071***	1.01	.967***
Short-run elasticity	1.101**	.816	.074	1.159***
Constant	-3.184	-2.595	.009	-.195
Durbin-Watson d-statistic	2.13	2.01	1.99	.743
Breusch-Godfrey LM test for serial correlation	.388	.226	.087	11.07***
Homoscedasticity	6.68	7.48	8.51	15.44*
R-squared	.1916	.3969	.011	.5934
Observations	47	15	15	17

Source: Authors' calculations.

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