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Article

ECB quantitative easing, euro depreciation and supply chains: Industry-level estimates for Germany, Italy and Greece. New prospects for a Minskyan big bank?

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Abstract:

We investigate how the 2014-2016 depreciation of the euro against the US dollar triggered a cascade effect on the European supply chains which reduced the current account imbalances among the EU member states. In particular, we analyze the specific case of Greece to verify whether the higher export demand towards the USA in the two main European exporting countries, Germany and Italy, increased the demand for Greek goods and services by the German and Italian economies. We employee a linear ARDL model which is able to track short- and long-term effects of the depreciation on the industries of Greece with respect to Germany, Italy and the USA for the period 2010-2016 using bilateral monthly data. The empirical findings show that the euro depreciation increased the integration between the German and Greek production structures in various industries representing more than 35% of the entire trade between the two countries.

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1. Introduction

Since the Second World War, the economies of the European Union have been characterized by a core-periphery dynamic determined by an inequitable distribution of technological resources (Musto, 1981; Gräbner et al., 2020), to which, from the early 1980s onwards, were added the negative effects of financial liberalizations that determined a debt-led growth model of development in southern Europe (Celi et al., 2018; Kapeller et al., 2019). Moreover, these two aspects have been recently reinforced by strong intra-European

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competition from the establishment of the euro area (Kapeller et al., 2019) and by the impossibility of devaluating nominal exchange rates.[1]

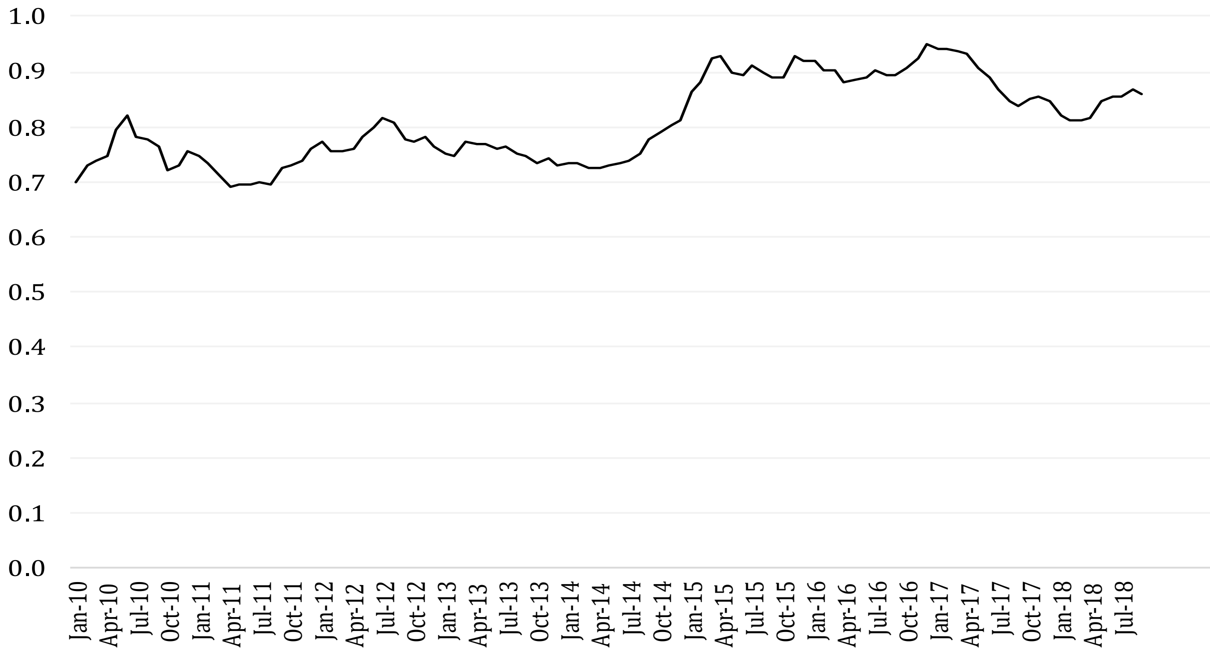
In particular, the literature shows that peripheral member countries have suffered from increasingly overvalued exchange rates since the early 2000s (Eichengreen, 2007; Coudert et al., 2012). The net international investment position (NIIP) data indicate the existence of two different areas since 2009 in particular: one in which external liabilities have not exceeded domestically owned foreign assets, and one in which precisely the opposite situation has obtained.

Indeed, since the introduction of the euro, financial investments by the northern European countries have enabled southern ones to achieve growth fueled by current spending and real estate bubbles. This has led to an explosion of current account deficits in peripheral countries which in the past triggered three waves of capital flight from the periphery to the core of Europe (August 2007-April 2010; May 2010-June 2011; July 2011-May 2012), jointly with a solvency crisis of PIIGS countries (European Commission, 2010; European Council, 2011; Amato and Fantacci, 2013; Moro, 2016; Terzi, 2016). This “flight to quality” dynamic of investments to Germany, France and the Netherlands forced the European Central Bank (ECB) to finance the banking systems of the peripheral economies by means of long-term refinancing operations (LTROs). Thereafter, the president of the ECB, Mario Draghi, announced that it would do “whatever it takes” to preserve the euro’s integrity and implemented the Outright Monetary Transactions (OMT) program that consistently stabilizes the sovereign spreads. Furthermore, in mid-2014 the ECB announced that it would undertake a quantitative easing (QE) plan similar to those already implemented by the US Federal Reserve System (the Fed), the Bank of England (BoE) and the Bank of Japan (BoJ). The stated objective of the expansionary measures implemented by the ECB was to support economic growth throughout the euro area. In no uncertain terms, the central banker repeatedly referred to the need to combine this monetary policy with an expansionary fiscal policy.[2] Without it, the traditional channels of monetary policy would not have worked. In particular, the reduction in interest rates would not have been able to engender a resumption of private sector investment in all Eurozone countries. However, the reduction in real asymmetries among the member states seems to have occurred, albeit partially: according to Dedola et al. (2018), QE had a significant effect in causing the euro’s depreciation against the dollar of about 12% between September 2014 and December 2016 (figure 1). Moreover, the effect on the exchange rate seemed to be a more effective channel in the monetary policy transmission than the impact on demand and inflation through the Phillips curve (Beck et al., 2019). Furthermore, the ECB underlines the positive effect of the euro’s depreciation on the current account for the period considered in the ECB annual reports of 2015 and 2016 and in Lane’s keynote speech (ECB, 2015; 2016; 2019). Indeed, according to Lane: “Turning to the empirical evidence, recent ECB staff analysis suggests that the net impact of a monetary policy expansion on the trade balance is positive” (ECB, 2019). In 2012, Fed chairman Ben Bernanke stated: “well, the problem with QE is it works in practice, but it doesn’t work in theory” (Brooking Institution, 2014). For the European case, it should be pointed out that the credit expansion channel did not work for the peripheral countries. As shown by Alvarez et al. (2017) and Baldo et al. (2017), excess liquidity created by QE accumulates in northern

[1] As is well known among economists, this neo-structuralist interpretative approach was first propounded by the Argentine economist Raul Prebisch, who laid the foundations of the theory of dependence (Prebisch, 1949).
[2] See, for instance, Draghi (2019).

economies, with about 80-90% of total excess liquidity being held. Therefore, under the pressure of austerity and the mild increase in credit supply, it could be claimed that the rebalancing of current accounts in southern European countries was mainly due to two economic dynamics: on the one hand, the positive effect of the devaluation of the euro on exports; on the other, the decrease in imports due to stagnation.

Figure 1 – *Nominal value of the euro in terms of the dollar* (*NEX*)



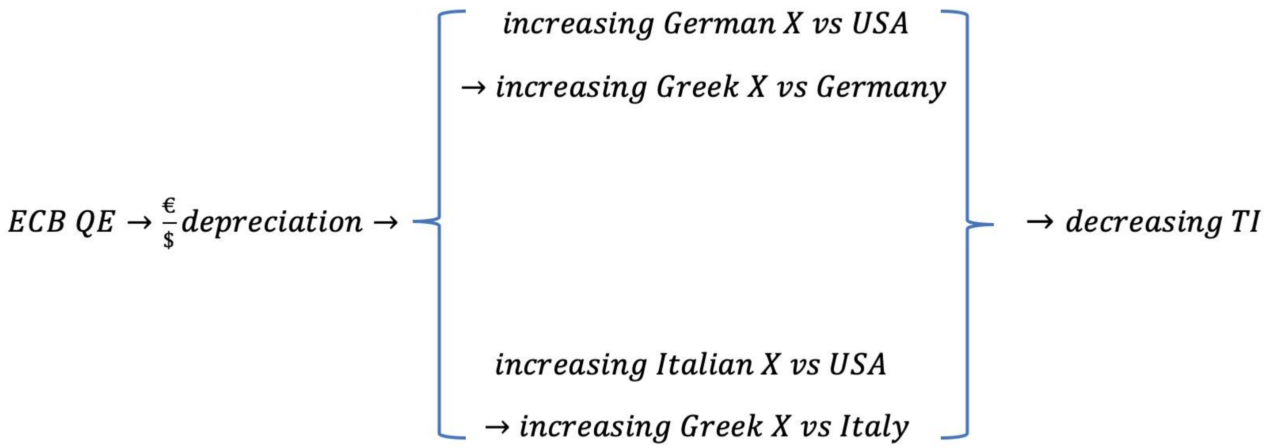
Source: Eurostat, ERT_BIL_EUR_M; January 2010-Septemper 2018; monthly average value, available at https://ec.europa.eu/eurostat/databrowser/view/ert_bil_eur_m/default/table?lang=en

The purpose of this paper is to demonstrate that the European monetary policy under the presidency of Mario Draghi was able to curb the tendency towards Eurozone disintegration. Indeed, the use of unconventional monetary policies to realize euro depreciation reduced the current account imbalances among the European countries. Mario Draghi's monetary policy compensated for the lack of expansionary fiscal policies by the most troubled European countries. Using Minskyan terminology, we could say that the ECB acted as a Big Bank in the absence of a Big Government (i.e., a quasi-Minskyan Big Bank). As recognized by all major media outlets, this approach prevented the collapse of the Eurozone (Ewing, 2019).

More precisely, we investigate how the 2014-2016 depreciation of the euro against the US dollar triggered a chain effect within the supply production in Europe. We analyze the specific case of Greece to verify whether the higher export demand towards the USA in the two major European exporting countries, Germany and Italy,[3] increased the demand for Greek goods and services from the German and Italian economies.

The analytical framework underlying the main hypothesis that will be tested can be represented as follows (figure 2).

Figure 2 – *Interpretative framework*



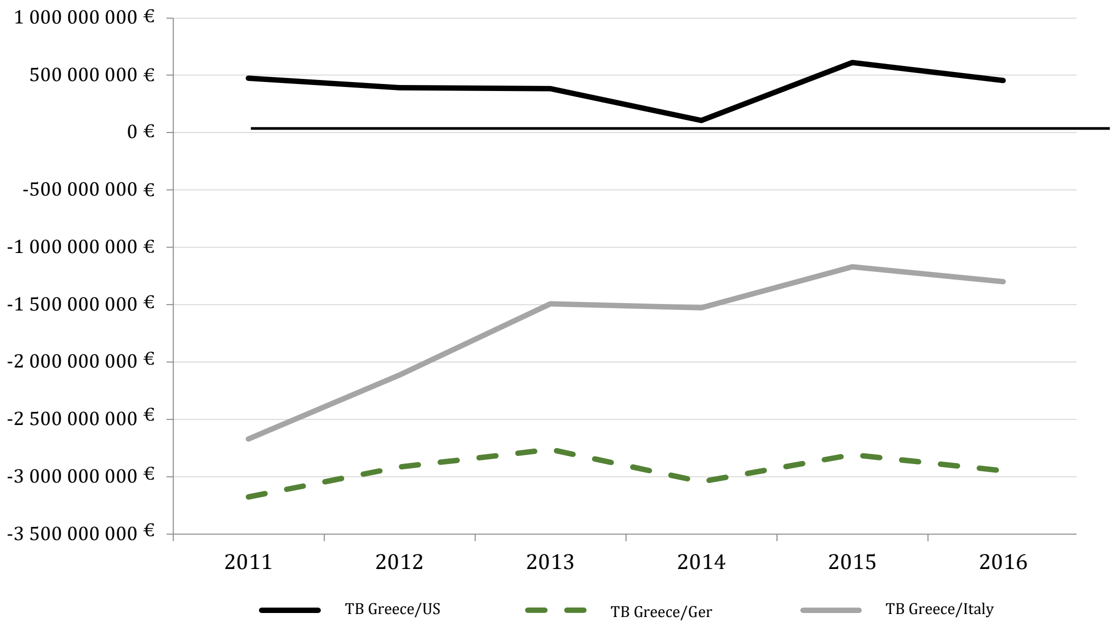
Notes: *ECB QE*: European Central Bank quantitative easing; *X*: exports; *TI*: trade imbalances between core and periphery (Germany and Greece in our case).

Firstly, it should be noted that Italy absorbed 10.7% of Greek exports in 2016, Germany 7.25%, and the USA 4.85%. As regards imports, Germany is in first place in 2016 with 10.8%, Italy in second place with 8.33%, and the USA in third place with 1.64%.[4]

A first inspection of the annual data referring to the Greek trade balance gives some interesting insights (figure 3): coinciding with the periods in which the euro depreciated against the dollar (in particular the periods 2011-2012 and 2014-2015), the Greek trade balance against the European partners considered here (Germany and Italy) always improved. On the other hand, there was an improvement in the trade balance between Greece and the USA only in the period 2014-2015, when the depreciation of the euro against the dollar was more marked.

[3] The analysis is focussed on Germany and Italy because these two countries were Greece's main trade partners in the period considered. See table A.1 and table A.2 in the appendix.
[4] Source: https://oec.world/

Figure 3 – *Greek trade balances with respect to the USA, Germany and Italy*



Source: Eurostat, EU trade since 1988 by HS2-HS4 [DS-0168894]; 2011-2016; values in euros; available at https://data.europa.eu/data/datasets/47ub7zhbtstzbweb01xhw?locale=en

However, in order to find a more meaningful confirmation of these relationships, the literature suggests using more specific empirical tools. Moreover, we cannot dwell only on aggregate data; it is also important to consider data referring to industrial sectors.[5] For our analyses, we employ a linear autoregressive distributive lag (ARDL) model able to track short- and long-term effects of the depreciation on the industries of Greece with respect to Germany, Italy, and the USA for the period 2010-2016 using bilateral monthly data. The notions of 'short run' and 'long run' that we use in this study are those typical of the econometric analysis of time series developed since the second half of the 1980s (Engle and Granger, 1987). Because economic series are typically evolutionary, the problem is how to deal with non-stationarity (i.e., the infinite 'memory' property of the time series) where random shocks have a permanent effect on the dynamics of the series rather than a temporary one, as the statistical properties of the econometric model instead require. As is well known, if the residuals are stationary, then the variables considered are cointegrated, i.e., there is a long-run or equilibrium relationship between them. The error correcting model, proposed for the first time by Engle and Granger, makes it possible to deal with non-stationary data series and separates the long from the short run.[6]

[5] Table A.4 in the appendix shows the industries that we selected for the empirical analysis.
[6] As described by the Royal Swedish Academy of Sciences when it declared the winners of the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel in 2003, "Clive Granger demonstrated that the statistical methods used for stationary time series could yield wholly misleading results when applied to the analysis of non-stationary data. His significant discovery was that specific combinations of non-stationary time series may exhibit stationarity, thereby allowing for correct statistical inference. Granger called this phenomenon cointegration. He developed methods that have become invaluable in systems where short-run dynamics are affected by large random disturbances and long-run dynamics are restricted by economic equilibrium relationships" (The Royal Swedish Academy of Sciences, 2003).

In the period 2010-2016 the euro recorded very substantial depreciation (from 1.48 to 1.04 dollars in euro terms), which makes this time interval particularly suitable for our analysis. Our study makes two contributions to the international trade literature. Firstly, it enriches the strand of literature that investigates the short- and long-term effects of currency depreciation and the presence of *J* or inverted *J* effects in various industries. Secondly, the paper contributes to the monetary policy literature by providing information on the international trade channel of QE.

The paper is divided into six sections. The second section conducts the literature review. Section 3 describes the model and the methodology. The fourth section sets out the empirical results for the period considered (2010-2016). Section 5 provides specific comments on the outcomes. Finally, section 6 states the conclusions and shows how the ECB can be considered a Big Bank in the Minskyan sense.

2. Literature review

In this section we present a literature review of the main topics investigated in the paper. Studies that deal with the short- and long-term effects in trade balances resulting from currency depreciation are numerous and varied in terms of the methodology applied and its outcomes. In regard to methodology, there are differences in the types of data considered (aggregated or bilateral) and in the models used for the estimates (VAR, Linear ARDL, Nonlinear ARDL). Here we limit ourselves to analyzing the main studies that employ bilateral data and linear ARDL models. The use of bilateral data for this type of analysis was widespread in the late 1980s and is still common today (e.g., Rose and Yellen, 1989; Bahmani-Oskooee and Brooks, 1999; Arora et al., 2003; Baek, 2007; Bahmani-Oskooee and Harvey, 2017; Lucarelli et al., 2018).[7]

Considering the effects of the depreciation of the euro against the dollar, Bahmani-Oskooee and Hajilee (2012) examine the specific case of trade between German and American industries by using annual data over the period 1962-2009. They find short-run effects of the depreciation for 91 industries; nevertheless, these short-run effects last into the long run in 59 industries. Furthermore, they detect a *J*-curve pattern in 31 cases.

Bahmani-Oskooee et al. (2013) investigate the trade relationship between Italy and the USA at the industry level using annual data from 1979 to 2010. They find that in only 19 cases (out of 106) is there a long-run improvement following depreciation. These cases are highly concentrated in miscellaneous manufactures. However, the situation seems to change when considering the consequences of the expansionary monetary policy after 2014. Indeed, using monthly data over the period 2010-2016, Lucarelli et al. (2018) analyze the impact of the depreciation induced by the ECB's QE for both Italy and Germany with respect to the USA. Relying on industry-level data, they find that 11 industries registered a long-run improvement (8 for Italy and 3 for Germany). The *J*-curve effect is proven in only six cases, always for Italian industries that tend to be competitive by lowering prices, while the inverted *J*-curve phenomena are typical of the German economy in industries that tend to be competitive without lowering prices.

Papanikos (2015) conducts an analysis of the Greek foreign exchange rate before and after Greece's adoption of the euro. In particular, he finds that the real effective exchange rate in the euro years was overvalued by 20%, implying a negative impact on Greek economic growth.

[7] For a literature review, we suggest Bahmani-Oskooee and Ratha (2004).

According to his estimates, a 10% undervaluation would have increased the rate of growth of per capita GDP by almost an additional 1.25% per annum, thereby mitigating the severity of Greece's downturn. Nevertheless, the analysis does not cover the period after the ECB QE plan.

To our knowledge, there are no studies which have analyzed the effects of variations in the euro/dollar exchange rate on trade within the Eurozone.

3. The model

In this section we present the ARDL model and the methodology that we employed in our analysis. We relied on monthly data on the US dollar per euro exchange rate. In particular, we extracted quarterly GDP data from the OECD-library database. Then, we transformed quarterly into monthly GDPs by weighting them according to the monthly Consumer Price Index (CPI) levels. The CPIs employed were obtained from the OECD-Stats database with index 2015=100. Moreover, we retrieved monthly averages of the nominal exchange rate (NEX) from the IMF database, while the real exchange rate (REX) was calculated by multiplying the NEX and the ratio between the CPIs of Greece and those respectively of the USA, Germany, and Italy. Finally, the international trade information was collected from the United Nations Comtrade database at industrial two digits level according to the Harmonized System standards.

Following Pesaran et al. (2001), we employed the ARDL model defined in equation (1), which is based on the error-correcting model proposed by Engle and Granger (1987).

This model makes it possible to determine the effects of a change in a policy variable, i.e., in our case, the effects of the variation in the exchange rate on the current account among Greece and respectively, the USA, Italy and Germany at the industry level.

$$\Delta \ln(TB_i)_t = \alpha + \sum_{k=1}^{n} y_{1,t-k}\, \Delta \ln(TB_i)_{t-k} + \sum_{k=0}^{n} y_{2,t-k}\, \Delta lnY_{t-k}^{fc} + \sum_{k=0}^{n} y_{3,t-k}\, \Delta lnY_{t-k}^{HEL} +$$
$$\sum_{k=0}^{n} y_{4,t-k}\, \Delta \ln\mathrm{REX}_{t-k} + \theta_1 \ln(TB)_{t-1} + \theta_2 lnY_{t-1}^{fc} + \theta_3 lnY_{t-1}^{HEL} + \theta_4 \ln\mathrm{REX}_{t-1} + \mu_t \qquad (1)$$

where TB indicates the ratio between exports and imports for industry i; Y^{fc} is the national nominal GDP for the foreign country (USA, Italy and Germany), and Y^{HEL} for Greece; and REX is the real exchange rate. Greece is considered as home country in order to analyze its trade balance behavior towards the USA, Italy and Germany (fc). Finally, μ_t is an error term.

The assumption of Pesaran et al. is that the variables are either $I(0)$ or $I(1)$. Therefore, the short-run effects are inferred from the coefficients bound to the first difference variables, while the long-run effects are inferred from the estimates of θ_2, θ_3 and θ_4 that are normalized on θ_1.

The current change in TB is the sum of two components: the first is proportional to the change in REX_{t-1}; the second is a partial correction for the extent to which TB_{t-1} deviates from the equilibrium value corresponding to REX_{t-k} (the equilibrium error).

The optimum number of lags is obtained by minimizing the Akaike Information Criterion (AIC) for each industry.

In accordance with Pesaran et al. (2001) and Narayan (2005), we examined the presence of cointegration between the variables. A standard F-statistic test was applied, accepting those models whenever the F-test values were higher than 3.898. If cointegration was ascertained, both short-run and long-run effects were correctly estimated. On the contrary, only the short-run coefficients could be properly estimated.

As regards the empirical results, the t-value of each variable was observed in order to establish statistical significance. A positive effect was detected for t-values higher than 1.64, while a negative effect was recognized in the case of t-values lower than –1.64. Drawing on Rose and Yellen's (1989) methodology, we assessed the presence of a J-curve whenever there was evidence of long-run positive effects together with short-run negative effects. In the opposite case, we scored an inverted J-curve.

A robustness check of the linearity hypothesis consisted of the Ramsey Regression Equation Specification Error Test (RESET). This test is distributed as a χ^2 with one degree of freedom, and in this case the critical value was 3.84. Finally, we applied the cumulative sum (CUSUM) and cumulative sum of square (CUSUMQ) tests to the model residuals in order to verify that both cointegration and stability held in the short and long run.

4. Empirical analysis

In this section we present the results of the empirical analysis. We first show the analysis between Greece and the USA and then those between Greece and, respectively, Germany and Italy.

The F-tests evidence that the cointegration between the variables is proven for all the bilateral relationships tested (see the second column in tables 2, 4, and 6).

As regards Greece and the USA, we analyzed the impact of the depreciation of the euro against the dollar on the trade balance of 36 production sectors for the period January 2010-December 2016. These sectors represent 87% of the total value of trade between the two countries. Table 1 shows our estimate for each productive sector.

We detected a positive long-run effect of the euro's depreciation on the trade balance of seven industries (HS 20, HS 25, HS 27, HS 48, HS 71, HS 74, and HS 87) representing in aggregate 42.18% of the trade share. Three industries are characterized by a J-curve effect: they are heterogeneous in the weight of the trade share, ranging from sector HS 27, which alone accounts for 26%, to sectors HS 48 and 74, which together score 1.42%. In particular, sector HS 27, "mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes", represents only 26.61% of the total, leaving sectors HS 48, "paper and paperboard; articles of paper pulp, of paper or paperboard", and HS 74, "copper and articles thereof", to account together for only 1.42%.

On the other hand, four industries show long-run negative dynamics (HS 62, HS 72, HS 76, and HS 88). These production sectors represent together 10.35% of the Greek trade balance. An inverted J-curve effect is ascertained in industries HS 62, 72, and 76.

Table 2 shows the results of the diagnostic tests for each industry. On considering the industries displaying significances in the long run, the RESET test for functional form misspecification is always lower than the critical value (in this case 3.84), confirming correctly specified optimum models. We examined the stability of the long-run coefficients together with the short-run dynamics following Pesaran and Pesaran (1997) by applying the CUSUM and CUSUMQ tests to the model residuals. Only sector HS 87, "vehicles other than railway or tramway rolling-stock, and parts and accessories thereof," displayed parameter instability to both CUSUM and CUSUMSQ tests.

Table 1 – *Short-run and long-run estimates. Results for period 1 (Jan 2010-Dec 2016). Trade balance between Greece and the USA*

Industry code	Rank	Trade share	Short-run coefficient estimates				Long-run coefficient estimates			
			∂ln REX t	∂lnREX t-1	∂lnREX t-2	∂lnREX Lt-3	constant	ln*YGR*	ln*YUS*	ln REX
HS 03	17	1.14%	−4.127 (−0.817)	−5.272 (−0.93)	2.854 (0.526)	−7.936 (−1.069)	−662.045 (−1.472)	5.447 (1.163)	18.357 (1.541)	3.45 (1.596)
HS 08	11	2.00%	−0.327 (−0.099)	2.56429 (0.5770)	3.114 (0.865)	−5.442 (−1.357)	−13.744 (−0.0796)	−3.564 (−1.866)	3.302 (0.710)	0.943 (0.602)
HS 15	13	1.69%	23.972 (1.151)	46.978 (2.505)	−2.896 (−0.156)	34.892 (1.974)	294.89 (0.33)	−20.798 (−2.141)	7.009 (0.288)	0.142 (0.016)
HS 19	19	0.91%	−25.338 (−1.406)	5.095 (0.368)	−10.9 (−0.967)	−4.096 (−0.243)	2107.81 (2.88)	−41.744 (−5.086)	−38.286 (−1.953)	5.13 (0.704)
HS 20	2	10.17%	−1.35 (−0.246)	−4.508 (−1.051)	−6.61 (−1.583)	−15.393 (−1.276)	1281.95 (2.347)	−12.711 (−2.319)	−33.349 (−2.329)	8.659 (2.088)
HS 22	20	0.89%	1.228 (0.249)	−2.075 (−0.638)	−2.103 (−0.363)	1.0712 (0.290)	124.195 (0.531)	−0.604 (−0.224)	−3.704 (−0.599)	2.901 (1.392)
HS 24	15	1.60%	−2.794 (−0.084)	14.202 (0.544)	−15.353 (−0.485)	−17.699 (−0.592)	−520.323 (−0.243)	−9.912 (−0.439)	25.579 (0.455)	−0.986 (−0.06)
HS 25	5	4.12%	2.483 (0.572)	−3.313 (−0.943)	2.316 (0.593)	−4.346 (−1.313)	114.421 (0.589)	−7.761 (−3.029)	2.543 (0.467)	5.601 (3.622)
HS 27	1	26.61%	−17.348 (−0.63)	−19.996 (−1.459)	−18.659 (−1.421)	−27.067 (−2.227)	1068.53 (1.297)	1.622 (0.2)	−37.613 (−1.636)	15.136 (1.704)
HS 29	28	0.20%	5.422 (0.411)	−3.648 (−0.37)	−12.423 (−1.139)	−16.652 (−1.978)	904.834 (1.789)	−4.264 (−0.739)	−27.446 (−2.054)	6.269 (1.268)
HS 33	22	0.78%	−1.032 (−0.314)	1.819 (0.533)	−0.435 (−0.14)	3.339 (0.735)	219.114 (1.219)	−1.687 (−0.867)	−6.14 (−1.224)	2.156 (1.097)
HS 38	24	0.48%	21.167 (1.18)	7.546 (0.387)	−4.061 (−0.219)	46.681 (2.547)	−1147.89 (−1.394)	25.571 (2.352)	18.433 (0.86)	−4.51 (−0.491)
HS 39	10	2.54%	−0.0546 (−0.028)	−3.326 (−1.398)	n.a.	n.a.	−142.9 (−1.187)	0.947 (0.755)	4.138 (1.262)	1.008 (0.978)
HS 40	29	0.17%	−6.507 (−1.259)	n.a.	n.a.	n.a.	790.074 (2.708)	−7.708 (−2.531)	−20.786 (−2.575)	2.54 (0.857)
HS 42	36	0.04%	−2.299 (−0.568)	7.776 (1.531)	−0.587 (−0.169)	5.561 (1.1)	−183.82 (−0.767)	0.541 (0.176)	5.834 (0.972)	−1.593 (−0.924)
HS 48	23	0.53%	−0.514 (−0.121)	−5.713 (−1.621)	−1.843 (−0.411)	−9.1 (−3.527)	87.734 (0.572)	−5.806 (−2.377)	1.592 (0.445)	3.924 (2.447)
HS 62	30	0.14%	−16.642 (−3.024)	15.977 (3.348)	6.769 (0.165)	n.a.	−1454.16 (−5.19)	7.878 (2.557)	43.25 (5.761)	−6.6 (−2.525)
HS 64	34	0.08%	15.802 (1.411)	−21.529 (−2.040)	23.687 (1.095)	26.636 (2.420)	−1002.81 (−1.690)	−11.299 (−1.311)	43.254 (2.773)	−5.294 (−1.273)

HS 68	18	1.03%	−1.835	−3.479	1.052	−4.47	88.78	−5.964	1.871	1.016
			(−0.652)	(−1.21)	(0.325)	(−1.099)	(0.435)	(−2.826)	(0.343)	(0.789)
HS 69	35	0.04%	−3.022	17.565	−13.768	10.502	417.111	−8.159	−7.678	1.63
			(−0.418)	(2.345)	(−2.061)	(1.648)	(1.411)	(−2.097)	(−1.013)	(0.625)
HS 70	31	0.12%	−2.604	−2.472	−3.993	−7.341	−106.549	2.672	1.468	4.387
			(−0.377)	(−0.448)	(−0.551)	(−1.29)	(−0.311)	(0.807)	(0.156)	(1.254)
HS 71	25	0.38%	3.633	1.423	−3.053	−2.845	417.889	−5.995	−9.355	4.297
			(1.193)	(0.317)	(−0.771)	(−0.625)	(1.743)	(−2.504)	(−1.418)	(1.742)
HS 72	4	4.69%	−16.757	32.898	76.372	10.02	−3796.42	8.533	122.347	−48.993
			(−0.904)	(1.295)	(3.238)	(0.319)	(−2.624)	(0.646)	(2.995)	(−3.809)
HS 73	3	7.11%	−12.144	6.415	−0.974	10.47	385.976	−7.325	−7.234	4.039
			(−0.930)	(0.584)	(−0.098)	(1.215)	(0.565)	(−0.929)	(−0.408)	(0.754)
HS 74	21	0.88%	−3.383	−4.602	−7.336	1.15	−139.817	0.33	4.543	4.353
			(−0.640)	(−0.977)	(−1.822)	(0.235)	(−0.585)	(0.129)	(0.704)	(2.072)
HS 76	6	3.99%	−0.859	14.445	8.53	n.a.	−384.334	−0.195	13.35	−6.148
			(−0.157)	(3.41)	(1.961)		(−1.616)	(−0.069)	(2.173)	(−3.266)
HS 82	33	0.09%	12.237	4.455	−12.63	1.901	357.955	−1.113	−11.412	7.645
			(0.935)	(0.346)	(−1.23)	(0.146)	(0.854)	(−0.232)	(−0.985)	(1.429)
HS 84	7	3.89%	0.537	0.906	1.769	−2.956	−326.274	−0.752	11.659	−1.19
			(0.172)	(0.249)	(0.492)	(−1.038)	(−1.876)	(−0.38)	(2.54)	(−0.691)
HS 85	9	2.91%	−5.891	3.091	−1.029	−5.948	−16.951	−3.05	3.035	−0.786
			(−1.58)	(0.723)	(−0.299)	(−1.605)	(−0.11)	(−1.825)	(0.711)	(−0.453)
HS 87	32	0.11%	−8.712	9.782	7.449	−17.307	484.485	−16.251	−3.557	9.619
			(−0.677)	(0.885)	(0.705)	(−1.458)	(0.959)	(−2.123)	(−0.257)	(1.675)
HS 88	16	1.53%	−9.9	6.64	−5.109	7.681	57.133	−3.501	0.812	−5.621
			(−1.58)	(0.99)	(−0.726)	(0.848)	(0.165)	(−0.741)	(0.095)	(−2.005)
HS 89	12	1.79%	−35.639	−3.085	18.643	−26.822	4079.94	−49.284	−99.605	19.108
			(−1.578)	(−0.15)	(0.942)	(−1.402)	(3.448)	(−3.697)	(−3.024)	(1.295)
HS 90	14	1.67%	−4.756	4.517	0.758	−0.826	−286.357	2.973	7.299	0.664
			(−1.155)	(1.211)	(0.258)	(−0.341)	(−1.925)	(1.759)	(1.849)	(0.3978)
HS 93	27	0.33%	−5.029	40.636	−54.178	−39.704	−2276.16	40.315	45.205	−0.073
			(−0.235)	(1.675)	(−3.006)	(−2.125)	(−1.812)	(2.770)	(1.404)	(−0.008)
HS 94	26	0.35%	−7.724	14.405	−12.027	10.670	−410.334	−2.862	16.269	−2.320
			(−1.648)	(3.068)	(−2.032)	(2.445)	(−1.557)	(−1.027)	(2.272)	(−0.898)
HS 99	8	3.72%	4.643	−17.997	1.007	−12.653	396.973	−7.242	−7.657	3.476
			(0.639)	(−2.365)	(0.141)	(−1.693)	(0.751)	(−1.452)	(−0.528)	(0.689)

Notes: *t*-values within parentheses; statistical significance at 95% is denoted by absolute values larger than 1.64.

Table 2 – *Diagnostic statistics for period 1. Trade balance between Greece and the USA*

Industry code	*F*-test	Adj-*R2*	AIC	RESET	LM	CUSUM 95%	CUSUMSQ 95%
	higher than 3.898	*maximized*	*minimized*	*lower than 3.84*	*TR^2*	*s/us*	*s/us*
HS 03	58.288	0.437	333.485	0.041	5.143	stable	unstable
HS 08	8.140	0.286	213.838	1.336	9.667	stable	unstable
HS 15	33.627	0.598	483.901	3.561	15.049	stable	stable
HS 19	36.830	0.550	445.353	0.018	6.227	stable	unstable
HS 20	72.776	0.473	308.075	0.704	7.959	stable	unstable
HS 22	36.921	0.522	233.147	0.073	9.596	stable	unstable
HS 24	10.372	0.503	581.587	0.002	14.893	stable	stable
HS 25	31.110	0.564	206.203	0.681	21.102	stable	unstable
HS 27	56.083	0.526	442.330	0.001	14.129	stable	unstable
HS 29	26.215	0.515	379.223	0.197	17.789	stable	stable
HS 33	24.007	0.476	186.433	0.010	11.227	stable	stable
HS 38	28.179	0.547	497.184	0.027	15.515	stable	stable
HS 39	23.301	0.479	122.757	0.259	14.077	stable	stable
HS 40	22.269	0.561	299.349	0.956	14.479	stable	stable
HS 42	13.556	0.511	247.263	0.763	11.035	stable	stable
HS 48	15.267	0.456	185.093	1.327	18.362	stable	stable
HS 62	17.541	0.443	255.624	0.006	8.118	stable	stable
HS 64	24.848	0.532	401.706	0.579	9.183	stable	unstable
HS 68	14.335	0.435	220.336	1.032	27.037	stable	stable
HS 69	29.561	0.551	303.423	0.625	17.681	stable	stable
HS 70	12.663	0.427	291.026	0.798	5.110	stable	stable
HS 71	14.319	0.427	216.924	0.461	13.786	stable	stable
HS 72	13.514	0.480	514.653	0.101	14.194	stable	stable
HS 73	15.442	0.468	374.275	0.083	8.595	stable	stable
HS 74	7.985	0.286	253.104	2.533	10.560	stable	stable
HS 76	13.673	0.482	243.375	1.231	19.052	stable	stable
HS 82	29.335	0.560	415.938	1.637	5.978	unstable	stable
HS 84	18.928	0.501	183.939	0.017	14.069	stable	stable
HS 85	10.452	0.493	201.319	0.102	3.611	stable	stable
HS 87	7.574	0.406	389.928	2.211	33.286	unstable	unstable
HS 88	10.894	0.473	315.107	0.291	10.590	stable	unstable
HS 89	37.867	0.469	509.064	0.234	16.699	unstable	stable
HS 90	20.472	0.492	192.009	2.132	9.783	stable	stable
HS 93	22.493	0.492	518.197	1.737	9.420	stable	stable
HS 94	7.012	0.434	273.513	11.401	17.709	stable	unstable
HS 99	13.628	0.420	337.919	0.567	6.559	stable	unstable

As regards the analysis between Greece and Germany, we considered 36 industrial sectors that in aggregate represent around 92% of the trade balance between the two countries. Our estimates are presented in table 3. The long-term investigation reveals the positive effects of the depreciation of the euro against the US dollar on the trade balance between Greece and Germany for 10 sectors (HS 04, HS 16, HS 18, HS 27, HS 29, HS 33, HS 76, HS 84, HS 87, HS 90), for an aggregate percentage value on the trade balance equal to 36.75%. Of these 10 sectors, 3 show the presence of *J* curves (HS 16, HS 29, HS 84) for an aggregate percentage value on the trade balance equal to 14.3%.

At the same time, four sectors (HS 20, HS 32, HS 34, and HS 74) show significant and negative long-run effects for 5.62% of the total trade share. Furthermore, in three out of four industries, negative long-run effects are identified as inverted *J*-curve phenomena. Those are industries HS 20, "preparations of vegetables, fruit, nuts or other parts of plants", HS 32, "tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks", and HS 34, "soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, 'dental waxes' and dental preparations with a basis of plaster", which account for 4.73% of the trade share.

Among the industries displaying significances in the long-run, only two sectors showed problems during the diagnostic check. Sector HS 04 (trade share: 5.64%) suffered from model misspecification since it failed the RESET test, while HS 18 (trade share: 0.78%) displayed instability for both the CUSUM and CUSUMSQ tests. Table 4 shows the outcomes of the diagnostic tests.

Table 3 – *Short-run and long-run estimates. Results for period 1 (Jan 2010- Dec 2016). Trade balance between Greece and Germany*

Industry code	Rank	Trade share	Short-run coefficient estimates				Long-run coefficient estimates			
			∂ln REX t	∂lnREX t-1	∂lnREX t-2	∂lnREX Lt-3	constant	ln*YEL*	ln*YDE*	ln NEX
HS 02	12	2.28%	−3.354 (−0.671)	0.0153 (0.004)	1.092 (0.35)	5.659 (1.053)	−98.856 (−0.852)	−1.114 (−0.728)	4.575 (1.347)	−2.045 (−1.273)
HS 03	32	0.62%	−1.445 (−0.938)	1.3 (0.666)	−3.223 (−1.719)	n.a.	67.872 (1.654)	−0.565 (−1.148)	−2.067 (−1.689)	0.939 (1.367)
HS 04	5	5.64%	−0.031 (−0.027)	n.a.	n.a.	n.a.	85.625 (3.516)	−2.405 (−6.402)	−1.135 (−1.654)	1.148 (3.336)
HS 07	23	1.04%	1.63 (0.623)	−1.427 (−0.609)	−0.686 (−0.268)	−5.505 (−2.474)	308.695 (3.647)	−5.574 (−4.438)	−6.753 (−3.097)	0.398 (0.524)
HS 08	9	2.81%	−1.073 (−0.353)	5.178 (1.312)	n.a.	n.a.	−171.561 (−2.23)	1.629 (1.575)	5.132 (2.401)	−1.275 (−1.348)
HS 15	26	0.86%	1.654 (0.810)	9.582 (3.241)	−2.051 (−1.001)	4.098 (2.018)	−7.083 (−0.129)	−2.399 (−3.502)	2.432 (1.476)	−1.814 (−1.764)
HS 16	34	0.52%	−0.402 (−0.185)	−0.786 (−0.308)	−5.218 (−2.435)	−0.054 (−0.020)	24.126 (0.345)	−0.507 (−0.591)	−0.48 (−0.243)	1.237 (1.678)
HS 17	31	0.68%	−0.84 (−0.24)	−5.307 (−1.254)	0.462 (0.143)	−6.147 (−2.098)	238.176 (2.464)	−3.124 (−2.617)	−6.297 (−2.292)	1.866 (1.384)
HS 18	27	0.78%	−4.513 (−1.072)	−5.609 (−1.208)	1.07 (0.257)	−4.429 (−1.164)	−143.472 (−1.571)	0.531 (0.52)	4.766 (1.767)	3.561 (2.077)
HS 19	19	1.43%	0.181 (0.223)	n.a.	n.a.	n.a.	−57.552 (−2.464)	0.941 (2.84)	1.351 (2.090)	0.368 (1.276)
HS 20	8	2.93%	−1.4 (−1.347)	2.432 (1.848)	−1.851 (−1.822)	n.a.	15.048 (0.497)	−0.566 (−1.343)	−0.033 (−0.04)	−0.967 (−2.309)
HS 21	22	1.13%	−2.026 (−1.998)	2.429 (2.185)	−0.758 (−0.681)	−0.219 (−0.157)	−109.267 (−3.546)	−0.753 (−1.785)	4.808 (4.886)	0.427 (1.095)
HS 22	20	1.35%	1.541 (0.986)	n.a.	n.a.	n.a.	−150.935 (−3.626)	1.328 (2.303)	4.587 (3.886)	−0.366 (−0.625)
HS 24	30	0.68%	−8.014 (−1.189)	4.049 (0.414)	3.554 (0.371)	9.339 (1.038)	371.407 (0.921)	−3.541 (−1.058)	−11.064 (−0.869)	9.339 (1.038)
HS 27	29	0.72%	−8.479 (−0.834)	n.a.	n.a.	n.a.	−204.760 (−0.696)	−0.050 (−0.015)	7.922 (0.888)	15.647 (3.235)
HS 29	11	2.37%	3.373 (1.244)	1.831 (0.427)	−9.292 (−2.881)	4.030 (1.033)	42.742 (0.708)	−0.823 (−1.013)	−1.03 (−0.512)	5.307 (3.609)
HS 30	1	13.97%	0.457 (0.388)	n.a.	n.a.	n.a.	−57.431 (−1.684)	1.347 (2.198)	0.952 (1.164)	−0.232 (−0.641)
HS 31	33	0.53%	−29.066 (−1.32)	−12.294 (−0.522)	−8.852 (−0.371)	−15.053 (−0.561)	79.919 (0.119)	4.439 (0.54)	−7.369 (−0.376)	2.64 (0.252)

HS 32	24	0.91%	0.424 (0.405)	1.251 (0.845)	−1.54 (−1.126)	4.282 (2.611)	25.887 (0.913)	−1.585 (−3.631)	0.368 (0.389)	−1.128 (−2.185)
HS 33	21	1.32%	2.738 (1.457)	−0.463 (−0.251)	−0.669 (−0.493)	−2.404 (−1.342)	56.626 (1.189)	−0.66 (−1.285)	−1.617 (−1.083)	1.589 (2.098)
HS 34	25	0.88%	−3.854 (−1.844)	4.239 (1.825)	0.138 (0.066)	−5.049 (−2.533)	−11.167 (−0.266)	−0.736 (−1.449)	0.972 (0.799)	−1.735 (−2.657)
HS 38	15	1.76%	−2.609 (−0.603)	1.302 (0.596)	−2.759 (−0.998)	6.929 (2.44)	−330.666 (−3.934)	3.675 (3.472)	9.227 (3.891)	−1.106 (−0.977)
HS 39	6	3.77%	0.988 (1.139)	n.a.	n.a.	n.a.	−44.317 (−1.745)	−0.294 (−0.755)	1.916 (2.794)	−0.059 (−0.156)
HS 40	18	1.46%	−2.326 (−0.639)	4.803 (0.982)	−14.620 (−2.942)	2.434 (0.674)	108.956 (0.883)	−0.215 (−0.147)	−4.014 (−1.094)	−1.399 (−0.655)
HS 48	14	1.80%	2.103 (0.887)	3.968 (1.527)	−2.174 (−0.881)	1.98 (0.767)	−28.797 (−0.577)	−0.177 (−0.207)	1.223 (0.75)	0.591 (0.745)
HS 61	13	1.95%	2.693 (1.783)	n.a.	n.a.	n.a.	55.634 (0.829)	−0.545 (−0.562)	−1.609 (−0.924)	−0.415 (−0.856)
HS 72	17	1.58%	0.692 (0.181)	−6.267 (−1.501)	−8.691 (−2.465)	2.231 (0.557)	138.581 (1.752)	1.634 (1.348)	−6.788 (−2.853)	1.585 (0.97)
HS 73	16	1.69%	−0.727 (−0.375)	n.a.	n.a.	n.a.	128.315 (3.056)	−1.49 (−2.46)	−3.575 (−3.135)	0.386 (0.663)
HS 74	35	0.52%	−1.599 (−1.169)	−3.823 (−2.158)	n.a.	n.a.	−32.502 (−0.798)	0.029 (0.05)	1.257 (1.085)	−1.480 (−1.872)
HS 76	10	2.40%	1.174 (0.755)	n.a.	n.a.	n.a.	−47.445 (−1.580)	0.391 (1.065)	1.524 (1.679)	1.509 (3.496)
HS 84	2	11.45%	−0.264 (−0.19)	−1.397 (−1.009)	−5.602 (−2.486)	n.a.	118.693 (1.805)	−0.176 (−0.225)	−4.422 (−2.387)	2.975 (4.853)
HS 85	4	7.27%	−1.064 (−0.666)	n.a.	n.a.	n.a.	−26.011 (−0.678)	−0.597 (−1.354)	1.501 (1.311)	0.264 (0.61)
HS 87	3	8.09%	1.471 (0.93)	3.507 (1.651)	−0.219 (−0.0995)	−0.007 (−0.004)	101.052 (1.800)	0.241 (0.32)	−4.085 (−2.69)	2.111 (3.442)
HS 90	7	3.45%	1.132 (0.921)	n.a.	n.a.	n.a.	−13.673 (−0.293)	1.431 (1.942)	−0.82 (−0.665)	2.125 (3.456)
HS 94	28	0.74%	1.123 (0.702)	−2.226 (−1.44)	−4.156 (−2.01)	n.a.	−45.726 (−0.829)	−1.523 (−1.764)	3.086 (2.126)	1.119 (1.361)
HS 95	36	0.51%	1.586 (0.648)	−1.514 (−0.6793)	0.364 (0.171)	2.264 (1.148)	2.927 (0.039)	−2.722 (−4.299)	2.241 (0.896)	−0.11 (−0.124)

Notes: *t*-values within parentheses; statistical significance at 95% is denoted by absolute values larger than 1.64. *EL* stands for Greece, *DE* for Germany.

Table 4 – *Diagnostic statistics for period 1. Trade balance between Greece and Germany*

Industry code	*F*-test	Adj.-*R*2	AIC	RESET	LM	CUSUM 95%	CUSUMSQ 95%
	higher than 3.898	*maximized*	*minimized*	*lower than 3.84*	*TR^2*	*s/us*	*s/us*
HS 02	8.643	0.475	204.788	3.281	17.509	stable	unstable
HS 03	13.807	0.397	49.100	0.002	22.615	stable	stable
HS 04	28.204	0.572	–13.497	6.142	12.920	stable	stable
HS 07	28.204	0.601	109.757	0.602	23.963	stable	stable
HS 08	12.479	0.379	173.557	2.022	16.342	stable	stable
HS 15	25.686	0.520	122.416	0.991	24.330	stable	stable
HS 16	8.615	0.470	108.031	3.815	36.559	unstable	stable
HS 17	8.643	0.358	171.536	1.064	33.608	stable	stable
HS 18	33.977	0.618	211.782	1.900	18.749	unstable	unstable
HS 19	20.144	0.520	–13.021	0.698	28.605	stable	stable
HS 20	11.839	0.410	8.131	1.340	17.093	stable	stable
HS 21	20.090	0.583	9.782	1.310	28.212	stable	stable
HS 22	7.717	0.456	46.673	1.283	14.468	stable	stable
HS 24	15.743	0.450	360.525	3.646	11.374	stable	unstable
HS 27	12.066	0.528	388.583	0.197	11.223	stable	unstable
HS 29	32.126	0.573	177.903	0.004	12.687	stable	stable
HS 30	5.860	0.387	1.295	8.161	11.651	stable	unstable
HS 31	12.868	0.462	477.520	1.197	17.542	stable	stable
HS 32	22.259	0.544	51.857	0.938	18.136	stable	stable
HS 33	31.660	0.578	85.264	0.640	16.192	stable	stable
HS 34	25.908	0.521	96.034	0.097	8.146	stable	stable
HS 38	22.024	0.638	159.671	0.186	20.052	stable	stable
HS 39	21.242	0.379	–30.411	1.259	10.650	stable	stable
HS 40	9.578	0.393	225.494	0.020	25.084	stable	unstable
HS 48	17.007	0.476	126.097	0.205	37.716	stable	unstable
HS 61	19.856	0.509	66.858	4.617	25.552	stable	stable
HS 72	8.953	0.447	204.654	1.218	15.912	stable	stable
HS 73	13.581	0.391	79.861	0.017	22.354	stable	unstable
HS 74	11.152	0.463	79.800	0.252	7.002	stable	unstable
HS 76	24.273	0.420	19.130	0.041	8.585	stable	stable
HS 84	10.267	0.414	61.483	0.206	14.404	stable	stable
HS 85	11.355	0.249	43.599	0.062	9.559	stable	stable
HS 87	13.223	0.398	99.309	0.138	30.135	unstable	stable
HS 90	15.975	0.530	72.197	1.326	21.953	stable	stable
HS 94	23.078	0.607	89.559	0.074	12.419	stable	stable
HS 95	11.131	0.520	109.669	2.953	28.355	stable	stable

As regards the trade relationship between Greece and Italy, we analyzed 41 industries for a total trade share of 90.36% of the total: table 5 shows our estimates. Significant positive long-run effects are apparent in eleven cases (HS 04, HS 08, HS 15, HS 16, HS 26, HS 31, HS 34, HS 62, HS 64, HS 85 and HS 90) covering 18.50% of the trade share. For two sectors, HS 42 and HS 87, amounting to 3.95% of the trade share, we find possible anticipated *J*-curve effects.

Once again, following the definition by Rose and Yellen (1989), four *J*-curves are recognized as accounting for 12.05% of the trade share distributed among the industries HS 15, "animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes", HS 34, "soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, 'dental waxes' and dental preparations with a basis of plaster", HS 62, "articles of apparel and clothing accessories not knitted", and HS 85, "electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles".

Among the five sectors with established long-run negative effects (HS 21, HS 38, HS 48, HS 73 and HS 76), accounting in total for 12.38% of the trade share, only industry HS 73, "articles of iron or steel", presented also significant positive short-run evidence. We classify this case as an inverted *J*-curve phenomenon representing 1.40% of the trade share.

The results of the diagnostic tests are presented in table 6. In particular, four sectors (HS 08, HS 15, HS 21, and HS 31) display misspecification problems since they fail the RESET test, while all the other industries pass the main tests. Once again, although the CUSUM and CUSUMSQ tests show parameter stability in both cases for most of the industries, several industry-specific discordances are apparent.

Table 5 – *Short-run and long-run estimates. Results for period 1 (Jan 2010-Dec 2016). Trade balance between Greece and Italy*

Industry code	Rank	Trade share	Short-run coefficient estimates				Long-run coefficient estimates			
			∂ln NEX t	∂ln NEX t-1	∂ln NEX t-2	∂ln NEX Lt-3	constant	ln*YEL*	ln*YIT*	ln NEX
HS 02	11	3.00%	7.414 (1.232)	−1.298 (−0.204)	−9.564 (−1.623)	n.a.	171.411 (2.166)	−9.353 (−4.588)	−12.305 (−1.330)	0.452 (0.268)
HS 03	5	5.17%	1.37 (0.948)	n.a.	n.a.	n.a.	−12.904 (−1.538)	−0.029 (−0.079)	2.235 (2.4)	0.74 (1.342)
HS 04	16	1.66%	2.93 (1.992)	−0.825 (−0.724)	2.343 (1.212)	n.a.	12.317 (0.906)	−1.201 (−3.009)	−0.052 (−0.032)	0.919 (2.436)
HS 07	37	0.66%	−1.5 (−0.647)	n.a.	n.a.	n.a.	−52.196 (−1.886)	−0.075 (−0.108)	7.627 (2.188)	0.322 (0.405)
HS 08	24	0.91%	7.272 (2.03)	n.a.	n.a.	n.a.	21.727 (0.802)	−0.792 (−1.247)	−1.946 (−0.559)	2.421 (2.233)
HS 09	10	3.14%	−24.268 (−1.225)	6.732 (0.302)	−23.716 (−1.133)	19.129 (0.929)	25.977 (0.199)	−8.389 (−2.357)	6.937 (0.434)	4.331 (0.963)
HS 10	33	0.70%	−1.524 (−0.146)	−10.043 (−0.722)	6.23 (0.651)	−5.574 (−0.849)	−433.618 (−3.007)	10.393 (3.539)	48.211 (2.781)	0.606 (0.258)
HS 15	4	5.64%	2.159 (0.909)	4.049 (1.458)	−6.165 (−2.355)	−2.203 (−1.01)	0.965 (0.072)	0.364 (0.826)	−0.486 (−0.287)	2.403 (3.202)
HS 16	39	0.64%	6.711 (2.271)	−2.794 (−0.953)	3.154 (0.988)	−4.005 (−1.287)	77.584 (2.006)	1.596 (1.776)	−13.551 (−2.843)	3.734 (4.081)
HS 19	22	1.02%	1.965 (0.905)	−0.315 (−0.172)	−1.65 (−0.915)	−2.325 (−1.86)	12.28 (1.458)	−1.145 (−3.02)	−0.274 (−0.265)	−0.706 (−1.583)
HS 20	30	0.75%	0.69 (0.54)	−2.173 (−1.796)	n.a.	n.a.	7.521 (1.072)	−0.2 (−0.772)	−0.754 (−0.953)	0.135 (0.439)
HS 21	35	0.68%	−2.349 (−1.534)	n.a.	n.a.	n.a.	−2.896 (−0.367)	0.064 (0.172)	0.519 (0.525)	−1.061 (−2.071)
HS 22	38	0.65%	−0.344 (−0.201)	3.219 (1.909)	n.a.	n.a.	−8.304 (−0.732)	−0.573 (−2.167)	2.073 (1.381)	−0.538 (−1.221)
HS 23	21	1.13%	1.072 (0.216)	7.462 (0.908)	−9.777 (−1.899)	1.552 (0.292)	−47.355 (−0.911)	3.540 (2.214)	2.255 (0.372)	−1.535 (−1.001)
HS 26	41	0.56%	−7.198 (−0.575)	−18.944 (−1.382)	−1.52 (−0.151)	−7.775 (−0.584)	−5.463 (−0.063)	11.985 (5.292)	−15.655 (−1.385)	7.73 (2.139)
HS 27	1	10.91%	−5.378 (−0.983)	13.723 (1.763)	−8.152 (−1.091)	2.033 (0.353)	−171.430 (−3.317)	7.465 (4.821)	14.194 (2.312)	−0.521 (−0.288)
HS 28	32	0.71%	−6.816 (−1.591)	7.053 (1.093)	−6.755 (−1.615)	4.076 (0.968)	−140.948 (−2.933)	4.446 (4.446)	13.951 (2.332)	0.445 (0.396)
HS 30	8	3.33%	−2.124 (−0.834)	3.814 (1.288)	n.a.	n.a.	10.088 (0.652)	1.532 (2.968)	−3.443 (−1.55)	0.745 (1.237)
HS 31	40	0.64%	30.859 (0.981)	2.871 (0.166)	−30.71 (−0.956)	−35.799 (−1.208)	576.811 (3.315)	−11.605 (−2.119)	−65.396 (−2.931)	16.374 (1.983)
HS 32	31	0.74%	0.092 (0.059)	n.a.	n.a.	n.a.	77.127 (3.637)	−0.958 (−2.037)	−9.542 (−3.675)	0.498 (1.08)
HS 33	25	0.85%	−3.777 (−2.067)	4.56 (2.511)	n.a.	n.a.	0.536 (0.043)	−0.388 (−1.035)	0.553 (0.381)	−0.938 (−1.587)
HS 34	27	0.82%	1.173 (0.974)	−1.52 (−1.329)	1.821 (1.133)	−1.853 (−1.732)	−10.898 (−1.391)	0.588 (2.053)	1.014 (1.017)	3.248 (4.008)

HS 38	19	1.40%	−3.373 (−2.108)	n.a.	n.a.	n.a.	−23.56 (−1.223)	2.284 (4.172)	0.322 (0.134)	−2.033 (−3.841)
HS 39	6	4.68%	1.759 (1.556)	n.a.	n.a.	n.a.	−19.892 (−2.546)	0.623 (2.52)	2.058 (2.14)	0.164 (0.525)
HS 42	36	0.68%	6.014 (1.709)	−4.001 (−0.951)	−0.707 (−0.218)	4.042 (1.19)	59.486 (2.708)	−2.2 (−2.647)	−5.706 (−1.85)	−0.118 (−0.109)
HS 48	12	2.03%	−1.27 (−1.26)	n.a.	n.a.	n.a.	−20.983 (−1.657)	0.282 (0.874)	2.334 (1.589)	−1.45 (−3.881)
HS 61	15	1.71%	0.431 (0.163)	0.383 (0.137)	−1.566 (−0.6)	n.a.	87.456 (2.721)	−2.256 (−3.052)	−9.651 (−2.479)	−0.894 (−1.188)
HS 62	13	1.87%	1.001 (0.495)	−0.811 (−0.39)	−6.87 (−2.863)	n.a.	33.545 (1.651)	−1.08 (−2.499)	−3.674 (−1.469)	1.309 (2.289)
HS 64	29	0.76%	3.546 (1.05)	−4.107 (−0.909)	0.917 (0.274)	−3.449 (−0.77)	100.314 (2.85)	−3.151 (−3.919)	−10.412 (−2.458)	2.728 (2.588)
HS 69	34	0.69%	1.186 (0.385)	−8.041 (−2.974)	n.a.	n.a.	−12.442 (−0.363)	−3.046 (−3.94)	5.594 (1.324)	0.431 (0.703)
HS 70	42	0.50%	−4.13 (−2.127)	2.791 (1.058)	−1.121 (−0.409)	2.46 (0.959)	−84.11 (−5.145)	0.875 (2.267)	10.823 (5.245)	0.106 (0.233)
HS 72	14	1.77%	−1.325 (−0.34)	1.163 (0.248)	1.181 (0.283)	−8.601 (−1.769)	−63.292 (−2.069)	3.56 (3.586)	4.034 (1.067)	0.615 (0.584)
HS 73	18	1.40%	−0.723 (−0.226)	1.6 (0.486)	7.457 (2.406)	5.391 (1.638)	−128.05 (−2.532)	0.359 (0.458)	17.643 (2.751)	−2.419 (−2.433)
HS 74	28	0.76%	−5.044 (−2.039)	2.316 (1.017)	−3.84 (−2.088)	n.a.	52.226 (3.269)	−0.9 (−1.907)	−6.214 (−3.149)	−0.723 (−1.011)
HS 76	3	6.87%	−2.709 (−0.92)	2.807 (1.411)	1.446 (0.607)	3.034 (1.173)	2.558 (0.1567)	−1.038 (−2.434)	1.349 (0.624)	−1.66 (−2.286)
HS 83	26	0.84%	−1.954 (−0.573)	2.356 (0.626)	0.449 (0.128)	4.438 (1.654)	−59.228 (−2.063)	0.911 (1.248)	7.139 (1.957)	0.831 (0.958)
HS 84	2	10.25%	8.754 (2.584)	n.a.	n.a.	n.a.	20.765 (0.847)	−0.89 (−0.854)	−1.804 (−0.676)	2.136 (1.513)
HS 85	7	3.72%	4.284 (2.809)	−1.872 (−0.87)	1.828 (1.149)	−5.933 (−2.374)	45.197 (3.304)	0.062 (0.155)	−6.677 (−4.089)	2.006 (2.387)
HS 87	9	3.27%	12.578 (3.092)	1.247 (0.382)	−10.341 (−2.565)	2.216 (0.539)	0.197 (0.008)	0.582 (1.098)	−1.033 (−0.306)	0.342 (0.329)
HS 90	20	1.30%	3.873 (1.61)	−2.181 (−0.829)	0.53 (0.191)	−3.489 (−1.234)	−19.832 (−1.668)	2.18 (3.301)	−0.396 (−0.283)	1.735 (2.065)
HS 94	17	1.54%	−2.593 (−0.714)	−0.981 (−0.274)	−3.523 (−0.975)	−2.743 (−0.784)	23.699 (0.962)	−3.434 (−4.176)	0.813 (0.254)	0.36 (0.36)

Notes: *t*-values within parentheses; statistical significance at 95% is denoted by absolute values larger than 1.64. *EL* stands for Greece, *IT* for Italy.

Table 6 – *Diagnostic statistics for period 1. Trade balance between Greece and Italy*

Industry code	F-test	Adj.-R^2	AIC	RESET	LM	CUSUM 95%	CUSUMSQ 95%
	higher than 3.898	*maximized*	*minimized*	*lower than 3.84*		*s/us*	*s/us*
HS 02	21.942	0.773	244.125	0.038	21.656	stable	stable
HS 03	16.907	0.488	83.646	1.613	3.433	stable	unstable
HS 04	5.563	0.400	23.677	0.212	19.585	stable	stable
HS 07	13.292	0.397	126.039	2.482	15.443	stable	stable
HS 08	10.988	0.429	176.420	7.795	36.600	stable	stable
HS 09	12.251	0.415	469.945	0.071	15.642	stable	stable
HS 10	9.337	0.459	349.052	12.038	32.144	stable	unstable
HS 15	6.670	0.202	128.841	4.099	19.962	stable	stable
HS 16	10.004	0.255	148.430	0.205	16.215	stable	stable
HS 19	10.551	0.357	52.006	4.457	12.083	stable	stable
HS 20	21.712	0.391	33.793	3.765	12.726	stable	stable
HS 21	25.340	0.496	59.874	3.924	9.419	stable	stable
HS 22	14.070	0.469	65.104	0.250	16.931	stable	stable
HS 23	33.110	0.538	235.048	1.077	15.249	stable	unstable
HS 26	24.390	0.571	372.209	1.960	19.693	stable	stable
HS 27	16.382	0.397	264.137	0.318	12.740	stable	stable
HS 28	27.003	0.613	216.282	4.700	19.816	stable	stable
HS 30	26.010	0.549	102.159	0.098	14.217	stable	stable
HS 31	12.137	0.483	517.452	6.131	13.785	stable	stable
HS 32	13.963	0.471	73.155	4.466	23.290	stable	stable
HS 33	10.242	0.407	75.991	0.000	10.804	unstable	stable
HS 34	14.167	0.343	−1.709555	2.274	25.689	stable	stable
HS 38	12.338	0.361	105.331	2.136	11.928	stable	stable
HS 39	6.922	0.449	−24.50783	0.198	20.933	unstable	stable
HS 42	8.649	0.432	177.344	0.744	28.336	unstable	stable
HS 48	19.905	0.510	−7.790286	2.558	20.813	stable	stable
HS 61	6.021	0.449	112.496	0.021	34.356	unstable	stable
HS 62	29.375	0.609	91.217	0.023	24.644	stable	stable
HS 64	13.396	0.521	162.570	2.160	28.313	stable	stable
HS 69	11.015	0.400	152.050	0.012	11.570	stable	unstable
HS 70	8.122	0.384	89.306	0.488	33.657	stable	stable
HS 72	7.114	0.372	210.696	0.344	18.300	stable	unstable
HS 73	11.234	0.362	151.127	0.002	20.414	stable	stable
HS 74	13.531	0.530	93.966	2.589	23.069	stable	stable
HS 76	15.329	0.516	117.361	3.059	23.988	stable	unstable
HS 83	8.652	0.323	144.003	0.780	22.206	unstable	stable
HS 84	14.215	0.541	203.399	0.183	16.154	unstable	stable
HS 85	14.506	0.431	114.009	0.290	21.993	stable	stable
HS 87	11.953	0.406	180.646	0.790	10.372	unstable	stable
HS 90	20.291	0.449	148.101	1.010	11.960	stable	stable
HS 94	6.710	0.443	154.232	5.568	13.075	stable	unstable

5. Discussion of the results

The outcomes of the estimations are compared with the results in Lucarelli et al. (2018) in order to provide further comments on the existence of an intra-European supply chain triggered by the euro/dollar depreciation.

In the case of Greece versus Germany, the analysis has proven an overall positive effect of the euro depreciation on the Greek balance of payments. This finding is supported by the evidence of 3 *J*-curves totaling 14.35% of the trade relationship. Generalizing, positive long-run effects account in total for 36.75% of the commercial relationship. This outcome, together with the low trade share of industries with significant and negative long-run evidence (5.62%), makes possible the strong assumption that the depreciation policy promoted by the ECB worked positively for the Greek economy when trading with its German partner.[8]

On comparing the results with the findings of Lucarelli et al. (2018), a clear pattern emerges: in the presence of inverted *J*-curve phenomena for Germany against the USA (sectors 29, 39, 74, 84), Greece displays positive long-run significances, often characterized by a *J*-curve, versus Germany.

Specifically, when the German-American commercial relationship shows inverted *J*-curve evidence for the industries HS 29 and HS 84, the Greek-German trade relationship displays *J*-curve evidence for a total trade share of 13.82%. Moreover, industry HS 76 (trade share: 2.40%), showing a negative long-run significance for Germany versus the USA, reveals a positive long-run significance for the case of Greece versus Germany. Furthermore, the empirical results reveal that Greece benefits in the long run from euro depreciation in four sectors (HS 29, HS 87, HS 84, and HS 90) that together represent more than 55% of the total German-American commercial balance. At the same time, the sectors that mostly damaged the Greek trade balance with Germany in the long-run individually account for less than 1.3% of the German-American trade balance.

Lucarelli et al. (2018) and Bahamani-Oskooee and Mohammadian (2019) affirm that the German balance of payments neither particularly benefited nor was damaged by any changes in the exchange rate in the period considered. The positive long-run effects on the German trade balance with respect to the USA did not empirically occur for two reasons. On the one hand, euro depreciation against the dollar increased the trade between Germany and its European partners. On the other hand, the relationship between Germany and China strengthened.

When our findings are matched with those of Lucarelli et al. (2018), the sectors that showed inverted *J* curves between Italy and the USA cannot be associated with *J* curves between Greece and Italy.

Consequently, we do not find exact confirmation of the hypotheses presented in our interpretative framework (see figure 2). As we hypothesized, there is a significant reduction in the trade imbalance between Greece and Germany following the depreciation of the euro vs. the dollar; however, this result is concentrated in industries where the trade balance of Germany vs. the USA only improves in the short term and then worsens in the long term.

[8] See table A.3 in the appendix to visualize the changes in exports and imports between Greece and Germany in those industries that are statistically significant. The data confirm that there is a reduction in trade imbalances between the two countries after 2014.

6. Conclusions: new perspectives for a Minskyan Big Bank?

In this study we have investigated the effect of the depreciation of the euro against the dollar that occurred between September 2014 and December 2016 on the trade balance of Greek industries with respect to the American, German and Italian ones. The results summarized in the previous section show that the QE plan activated by Mario Draghi had long-term effects on the Greek economic system through an increase in trade between Greece and Germany.

We could have expected a Prebischian dynamic given that Greece exports are mainly primary products and low-tech manufactured goods. This means that a depreciation of the exchange rate would engender a deterioration in the terms of trade with respect to the USA, making the country poorer. What we have seen instead is an improvement in the Greek trade balance vis-à-vis Germany in the sectors in which Germany recorded a trade improvement vis-à-vis the USA in the short term. Future research should check whether the increase in imports of Greek products by Germany is due to an increase in German exports to countries other than the USA, such as China.

Therefore, our analysis identified and stressed a variant of the transmission channel of QE with respect to a currency depreciation which is usually not considered: the integration between the German and Greek production structures has improved in various industries, representing more than 35% of the entire trade between the two countries; this occurred not only in production related to food and beverages, but also in organic chemicals, electrical machinery and furniture. On the other hand, we did not find significant results when considering the commercial relations between Greece and Italy.

In light of our empirical investigation, can the ECB be classified as a Big Bank in Minsky's sense after the use of QE and other unconventional monetary policy measures?

The term "Big Bank" is usually associated with three activities of a central bank: that of being a lender of last resort, that of setting interest rates, and that of regulating and supervising banks. The idea of a Minskyan Big Bank has recently attracted new attention in the post-Keynesian community thanks to the studies by Wray (2011) and Vasconcelos (2014). However, these are studies that limit themselves to proposing a reinterpretation of the Minskyan themes without verifying whether today the central banks have adopted monetary policy measures so that one can legitimately talk about Big Banks. Minsky (1984) considered the joint effect of a Big Bank and a Big Government to be essential for avoiding severe recessions. In particular, Minsky (2008) showed how the oil shock crisis of the 1970s was milder than the crisis of 1929 due to the lender-of-last-resort role played by major central banks (Big Banks), combined with countercyclical fiscal policies undertaken by western governments (Big Government).

The recent European crisis has been particularly severe and prolonged because of the austerity policies implemented by the governments of the Eurozone countries. In this way, in the absence of a Big Government, the action of the ECB alone has not been sufficient to counteract the recession in a short time. In the absence of a revision of the European treaties governing the fiscal policies of the Eurozone governments, a "Small Government" regime has persisted (at least before the so-called "coronavirus pandemic crisis", which is not considered in this paper). This implies the high vulnerability of European economies to possible future economic shocks. Nevertheless, the attempt to use QE to rebalance intra-Eurozone trade imbalances is undoubtedly an innovative way to move in the direction indicated by Minsky: i.e., limiting losses due to financial crises which follow the instability induced by innovation during the boom. Paraphrasing Minsky (1984, p. 176), even in the presence of rapid action by the central bank to stabilize financial markets, the absence of a rapid fiscal policy to increase community liquidity cannot minimize the repercussions of the crisis on consumption and investment expenditures, as happened in Greece. Yet the ECB has managed to avert a great depression by maintaining a last indirect channel of transmission of monetary policy to the real economy, one able to partially correct trade imbalances within the Eurozone. Accordingly, we may say that the ECB, during Draghi's mandate, worked as a Big Bank in the absence of a Big Government (what we propose to call a "quasi-Minskyan Big Bank"). As far as we know, the issue of the relationship between Big Banks and exchange rates is an uncharted research topic in the Minskyan literature. However as shown in this paper and in line with the study by Beyer et al. (2017), the exchange rate channel made a substantial contribution to the European economy's recovery from the sovereign debt crisis. During the pandemic shock, European policy makers also have moved towards an institutional structure characterized *de facto* by a Big Bank and Big Governments in the Minskyan sense.[9]

References

Amato M. and Fantacci L. (2013), *Saving the Market from Capitalism*, Cambridge: Polity Press.

Alvarez I., Casavecchia F., De Luca M., Duering A., Eser F., Helmus C., Hemous C., Herrala N., Jakovicka J., Lo Russo M., Pasqualone F., Rubens M., Soares R. and Zennaro F. (2017), "The Use of the Eurosystem's Monetary Policy Instruments and Operational Framework since 2012", *ECB Occasional Paper Series*, n. 188, Frankfurt a.M.: European Central Bank.

Arora S., Bahmani-Oskooee M. and Goswami G.G. (2003), "Bilateral J-curve between India and her Trading Partners", *Applied Economics*, 35 (9), pp. 1037-1041.

Bahmani-Oskooee M. and Brooks T. (1999), "Bilateral J-Curve between U.S. and her Trading Partners", *Review of World Economics*, 135 (1), pp. 156-165.

Bahmani-Oskooee M. and Harvey H. (2017), "The J-curve and Bilateral Trade Balances of Indonesia with its Major Partners: Are There Asymmetric Effects?", *New Zealand Economic Papers*. Available at: doi.org/10.1080/00779954.2017.1371207

Bahmani-Oskooee M., Harvey H. and Hegerty S.W. (2013), "Currency Depreciations and the U.S.-Italian Trade Balance: Industry-Level Estimates", *Research in Economics*, 67 (3), pp. 215-225.

Bahmani-Oskooee M., and Hajilee M. (2012), "German-US Commodity Trade: Is there a J-Curve Effect?", *Applied Economics Quarterly*, 58 (4), pp. 327-353.

Bahmani-Oskooee M. and Mohammadian A. (2019), "Who Benefits from Euro Depreciation in the Euro Zone?", *Empirica*, 46 (3), pp. 577-595.

Bahmani-Oskooee M. and Ratha A. (2004), "The J-Curve: A Literature Review", *Journal of Applied Economics*, 36 (13), pp. 1377-1398.

Baek J. (2007), "The J-curve Effect and the US-Canada Forest Products Trade", *Journal of Forest Economics*, 13 (4), pp. 245-258.

Baldo L., Hallinger B., Helmus C., Herrala N., Martins D., Mohing F., Petroulakis F., Resinek M., Vergote O., Usciati B. and Wang Y. (2017), "The Distribution of Excess Liquidity in the Euro Area", *ECB Occasional Paper Series,* n. 200, Frankfurt a.M.: European Central Bank.

Beck R., Duca I.A. and Stracca L. (2019), "Medium Term Treatment and Side Effects of Quantitative Easing: International Evidence", *ECB Working Paper Series,* n. 2229, Frankfurt a.M.: European Central Bank.

Beyer A., Nicoletti G., Papadopoulou N., Papsdorf P., Rünstler G., Schwarz C., Sousa J. and Vergote O. (2017), "The Transmission Channels of Monetary, Macro- and Microprudential Policies and Their Interrelations", *ECB Occasional Paper Series*, n. 191, Frankfurt a.M.: European Central Bank.

[9] Despite the presence of discordant opinions in the literature, the institutional structure of the ECB still appears weak because, especially during the pandemic, it is based on the suspension of the treaties in force. The ECB has assumed an increasingly active role, moving irreversibly away from its statutory mandate, or at least from the original interpretation of its statute. Nevertheless, the ECB's performance does not seem as effective as that of central banks in other advanced economies. Dedola et al. (2020) showed how the Fed's balance sheet increased by 16 percentage points more than that of the ECB between March and September 2020, determining an appreciation of the euro towards the dollar of 10%. Future research will have to investigate this phenomenon.

Brookings Institution (2014), "Central Banking After the Great Recession: Lessons Learned and Challenges Ahead: A Discussion with Federal Reserve Chairman Ben Bernanke on the Fed's 100th Anniversary." January 16. Available at http://www.brookings.edu/events/2014/01/16-central-banking-after-the-great-recession-bernanke.

Celi G., Ginzburg A., Guarascio D. and Simonazzi A. (2018), *Crisis in the European Monetary Union: A Core-Periphery Perspective*, London: Routledge.

Coudert V., Couharde C. and Mignon V. (2012), "On Currency Misalignments within the Euro Area", *Center d'etudes projectives et d'informations internationals*, n. 07.

Dedola L., Georgiadis G., Grab J. and Mehl A. (2018), "Does a Big Bazooka Matter? Central Bank Balance-sheet Policies and Exchange Rates", *ECB Working Paper Series*, n. 2197, Frankfurt a.M.: European Central Bank.

Dedola L., Georgiadis G., Grab J. and Mehl A. (2020), "Does a Big Bazooka Matter? Quantitative Easing Policies and Exchange Rates", *ECB Research Bulletin*, n. 76, 20 October.

Draghi M. (2019), Stabilisation Policies in a Monetary Union", Speech by Mario Draghi, President of the ECB, at the Academy of Athens, 1 October. Available at: https://www.bis.org/review/r191002d.pdf

ECB (2015), *Annual Report*. Available at: https://www.ecb.europa.eu/pub/pdf/annrep/ar2015en.pdf

ECB (2016), *Annual Report*. Available at: https://www.ecb.europa.eu/pub/pdf/annrep/ar2016en.pdf

ECB (2019), "The International Transmission of Monetary Policy", Keynote Speech by Philip R. Lane, Member of the Executive Board of the ECB, CEPR International Macroeconomics and Finance Programme Meeting, Frankfurt am Main, 14 November.

Eichengreen B. (2007), "The Breakup of the Euro Area", *NBER Working Paper*, n. 13393, Cambridge (MA): National Bureau of Economic Research.

Engle R.F. and Granger C.W.J. (1987), "Co-Integration and Error Correction: Representation, Estimation, and Testing", *Econometrica*, 55 (2), pp. 251-276.

European Commission (2010), "European Economic Forecast - Autumn 2010", Publications office of the European Union. Available at: https://ec.europa.eu/economy_finance/publications/european_economy/2010/pdf/ee-2010-7_en.pdf

European Council (2011), "The European Council in 2010", January, Publications office of the European Union. Available at: https://www.consilium.europa.eu/media/21369/qc3010507enc.pdf

Ewing J. (2019), "Mario Draghi Saved the Euro. Will His Successor Be Equally Committed?", *The New York Times*, 16 June. Available at: https://www.nytimes.com/2019/06/16/business/mario-draghi-ecb-euro.html

Gräbner C., Heimberger P., Kapeller J. and Schütz B. (2020), "Structural Change in Times of Increasing Openness: Assessing Path Dependency in European Economic Integration", *Journal of Evolutionary Economics*, 30 (5), pp. 1467-1495.

Kapeller J., Gräbner C. and Heimberger P. (2019), "Economic Polarisation in Europe: Causes and Policy Options", *Research Report 440*, Vienna: The Vienna Institute for International Economic Studies.

Lucarelli S., Andrini F.U. and Bianchi A. (2018), "Euro Depreciation and Trade Asymmetries between Germany and Italy versus the US: Industry-level Estimates", *Applied Economics*, 50 (1), pp. 15-34.

Minsky H. (1984), *Can "It" Happen Again? Essays on Instability and Finance,* Armonk, New York: M.E. Sharpe.

Minsky H. (2008), *Stabilizing an unstable economy*, New York: McGraw-Hill.

Moro B. (2016), "The European Twin Sovereign Debt and Banking Crises", in Rossi S., Malavasi R. (eds.), *Financial Crisis, Bank Behaviour and Credit Crunch. Contributions to Economics* (pp. 19-35), Cham: Springer.

Musto S.A. (1981), "Die Süderweiterung der Europäischen Gemeinschaft", *Kyklos*, 34 (2), pp. 242-273.

Narayan, P.K. (2005) The saving and investment nexus for China: evidence from cointegration tests, *Applied Economics*, 37, 1979-1990.

Papanikos G.T. (2015), "The Real Exchange Rate of Euro and Greek Economic Growth", *The Journal of Economic Asymmetries*, 12 (2), pp. 100-109.

Pesaran M.H. and Pesaran B. (1997), *Working with Microfit 4.0: Interactive Econometric Analysis,* Oxford: Oxford University Press.

Pesaran M.H., Shin Y. and Smith R.J. (2001), "Bounds Testing Approaches to the Analysis of Level Relationship", *Journal of Applied Econometrics*, 16 (3), pp. 289-326.

Prebisch R. (1949), "The Economic Development of Latin America and its Principal Problems", E/CN.12/89/Rev.1, United Nations Publication, Sales No. 50 II.G, volume 2.

Rose A.K. and Yellen J.L. (1989), "Is There a J-Curve?", *Journal of Monetary Economics,* 24 (1), pp. 53-68.

The Royal Swedish Academy of Sciences (2003), "The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, 2003", 8 October. Available at: https://www.nobelprize.org/prizes/economic-sciences/2003/press-release/

Terzi A. (2016), "In the Absence of Fiscal Union, the Eurozone Needs a More Flexible Monetary Policy: A Comment", *PSL Quarterly Review*, 69 (278), pp. 279-285.

Vasconcelos D. (2014), "Minsky on 'Big Government'", *Brazilian Journal of Political Economy*, 34 (1), pp. 15-38.

Wray L.R. (2011), "Minsky Crisis", *Levy Economics Institute Working Paper*, n. 659, Annandale-on-Hudson (NY): Levy Economics Institute of Bard College.

Appendix

Table A1 – *Top 10 trade partners for Greece (exports) in 2016 and their evolution since 2010*

Trade partners	Exports (percentage)						
	2016	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**
Italy	10.7	10.4	9.04	9.05	8.44	9.44	9.08
Germany	7.41	7.09	6.7	6.76	6.75	8.08	9.21
Cyprus	5,43	5.22	4.67	4.28	4.9	5.89	6
Turkey	5.19	6.79	12.3	12.1	11.1	7.95	6.09
United States	4.85	5.34	3.49	3.6	3.88	4.99	4.18
Bulgaria	4.69	4.71	4.94	5.27	1.96	5.35	5.24
United Kingdom	4.22	4.25	3.77	3.81	3.36	4.05	4.56
Egypt	3.32	4.15	3.03	2.33	1.4	1.76	1.86
Romania	3	2.74	2.38	2.28	2.16	2.61	2.95
France	2.83	2.62	2.58	2.52	2.67	3.1	3.15

Source: https://oec.world/

Table A2 – *Top 10 trade partners for Greece* (*imports*) *in 2016 and their evolution since 2010*

Trade partners	Imports (percentage)						
	2016	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**
Germany	10.7	10.4	10.4	10.3	9.74	10.4	11
Italy	8.54	8.54	8.37	8.31	8.63	9.77	11
China	7.34	6.66	6.03	5.27	5.24	5.59	6.14
Russia	5.63	5.78	6.83	11.2	10.1	7.44	5.49
Netherlands	5.1	5.26	5.15	4.83	4.6	5.33	5.33
Iraq	4.85	6.44	7.93	7.4	3.32	1.55	1.28
South Korea	4.72	3.25	2.52	1.92	3.58	2.17	2.94
France	4.56	5	4.91	5.14	4.75	5.64	5.56
Spain	7.78	4.2	3.99	3.25	2.84	3.22	3.42
Belgium	3.61	3.43	2.96	3.05	2.82	3.44	3.56

Source: https://oec.world/

Table A3 – *Annual imports and annual exports between Greece and Germany*

		2010	2011	2012	2013	2014	2015	2016
HS 04	Exp	311,524,879	336,555,354	360,676,691	417,613,446	478,362,535	557,725,588	574,973,774
	Imp	787,280,894	808,725,751	761,716,780	828,524,960	828,376,319	739,309,724	731,451,380
HS 16	Exp	71,149,607	43,026,387	27,666,875	30,587,706	28,894,462	27,678,624	32,449,835
	Imp	166,967,560	155,950,299	142,478,559	146,876,065	143,553,050	133,031,879	129,180,196
HS 18	Exp	16,277,830	18,818,590	23,611,157	25,272,810	26,054,488	34,125,372	35,117,896
	Imp	190,743,340	163,461,384	148,793,710	151,220,916	170,989,234	165,993,652	180,743,776
HS 27	Exp	5,421,253,523	7,399,826,376	10,649,418,369	10,597,421,842	10,257,184,511	7,546,990,565	6,896,659,875
	Imp	12,278,532,465	14,814,316,874	18,280,569,644	17,232,726,157	16,300,493,089	11,344,814,555	9,729,400,231
HS 29	Exp	65,536,613	42,591,291	47,574,967	29,045,252	24,276,943	26,431,289	26,206,194
	Imp	873,083,566	893,750,831	777,346,303	739,054,444	767,538,040	755,125,258	709,428,393
HS 33	Exp	191,352,389	162,463,088	174,017,086	179,321,660	192,257,678	222,070,803	226,713,003
	Imp	549,707,716	503,745,086	464,434,458	484,965,886	511,331,346	508,483,667	552,794,003
HS 76	Exp	1,020,082,283	1,258,935,575	1,199,898,091	1,188,962,123	1,288,494,995	1,410,734,518	1,394,379,206
	Imp	634,825,485	715,591,930	629,483,973	636,781,298	693,381,967	748,458,996	751,930,921
HS 84	Exp	784,741,494	785,276,296	785,601,159	752,532,763	1,067,291,344	1,286,513,139	1,324,342,704
	Imp	3,242,740,848	2,534,013,023	2,211,905,896	2,245,113,778	2,742,468,487	2,946,985,537	3,170,334,649
HS 87	Exp	170,831,929	184,991,754	212,117,255	158,283,646	144,780,745	152,128,063	145,300,987
	Imp	2,263,398,250	1,625,370,844	1,090,693,582	1,222,573,294	1,601,804,816	1,623,448,629	1,880,139,931
HS 90	Exp	138,861,094	143,403,533	159,535,505	171,834,811	199,828,773	247,889,807	254,225,370
	Imp	1,079,370,067	775,416,649	663,345,961	710,121,537	749,594,324	773,306,786	867,768,987

Source: Eurostat. (EU trade since 1988 by HS 2,4,6 and CN8 [DS-645593]; 2010-2016; values in euros)

Table A4 – *Selected industries from Harmonized System 2002 sections*

	Harmonized System 2002 sections
HS 02	Meat and edible meat offal
HS 03	Fish and crustaceans, molluscs and other aquatic invertebrates
HS 04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included
HS 07	Edible vegetables and certain roots and tubers
HS 08	Edible fruit and nuts; peel of citrus fruit or melons
HS 15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes
HS 16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates
HS 17	Sugars and sugar confectionery
HS 18	Cocoa and cocoa preparations
HS 19	Preparations of cereals, flour, starch or milk; pastrycooks' products
HS 20	Preparations of vegetables, fruit, nuts or other parts of plants
HS 21	Miscellaneous edible preparations
HS 22	Beverages, spirits and vinegar
HS 24	Tobacco and manufactured tobacco substitutes
HS 25	Salt; sulphur; earths and stone; plastering materials, lime and cement
HS 27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes
HS 29	Organic chemicals
HS 30	Pharmaceutical products
HS 31	Fertilisers
HS 32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks
HS 33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations

HS 34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations with a basis of plaster
HS 38	Miscellaneous chemical products
HS 39	Plastics and articles thereof
HS 40	Rubber and articles thereof
HS 42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)
HS 48	Paper and paperboard; articles of paper pulp, of paper or of paperboard
HS 61	Articles of apparel and clothing accessories knitted or crocheted
HS 62	Articles of apparel and clothing accessories not knitted or crocheted
HS 64	Footwear, gaiters and the like; parts of such articles
HS 68	Articles of stone, plaster, cement, asbestos, mica or similar materials
HS 69	Ceramic products
HS 70	Glass and glassware
HS 71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation jewellery; coin
HS 72	Iron and steel
HS 73	Articles of iron or steel
HS 74	Copper and articles thereof
HS 76	Aluminium and articles thereof
HS 82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal
HS 84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof
HS 85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles
HS 87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof
HS 88	Aircraft, spacecraft, and parts thereof
HS 89	Ships, boats and floating structures
HS 90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof
HS 94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plates and the like; prefabricated buildings
HS 95	Toys, games and sports requisites; parts and accessories thereof
HS 99	Works of art, collectors' pieces and antiques