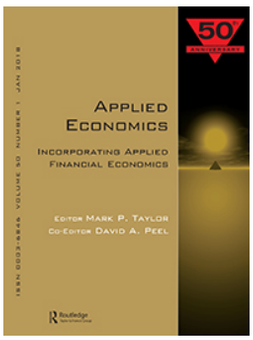

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Euro depreciation and trade asymmetries between Germany and Italy versus the US: industry-level estimates

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ABSTRACT

Since April 2014 to March 2015, the European Central Bank expansionary monetary policy instigates a huge depreciation of the euro in terms of dollar. According to the mainstream monetary theory, these dynamics should make the exports cheaper and at the same time make the imports more expensive. Has real depreciation of the euro helped in the improvement of European countries' trade balances? Following the main methodologies in the recent literature, our study analyses the effects of this depreciation both for Italy and Germany towards the US. We use industry-level data at monthly frequency. The results are different from each bilateral relationship. We find that 11 industries register a long-run improvement (8 for Italy and 3 for Germany). The J-curve effect is proven just in six cases, always for Italy. The inverted J-curve effect is proven in eight cases, four for Germany, and four for Italy. These results seem to be an indirect demonstration of the structural asymmetries between German and Italian economies: German economic system is more able to be competitive with a strong currency, than Italy.

KEYWORDS

Industry trade; bounds testing; J-curve; Germany; Italy; US

JEL CLASSIFICATION

F31; F32

I. Introduction

At the end of 2012 and at the beginning of 2013, the euro appreciated noticeably towards other currencies. Among others, the French President François Hollande (Breuer and Klose 2015, 1966)[1] stressed the necessity to discuss about potential interventions of the European Central Bank (ECB) in order to manage the exchange rate. Indeed, a persistent appreciation of the nominal exchange rate may determine lower exports and higher imports. While the European Monetary Union (EMU) precludes the traditional mechanism of individual exchange rate adjustment, euro fluctuations may be relevant for trade outside the region.

Since the ECB announcement of quantitative easing in mid-2014,[2] the euro has actually depreciated considerably against dollar, as shown in Figure 1. The exchange rate goes from €0.732/$ (in April 2014) to €0.933/$ (in March 2015), and then it becomes stable.

Contrary to Hollandes' thought, German business community worried especially after the ECB decision to sustain the euro depreciation through September 2015 by quantitative easing: for instance, Anton Börner (president of the Federation of German Wholesale) affirmed that one of the reasons Germany has become so competitive is that German companies have been forced to contend with a strong currency, by increasing their innovative investments (Böll et al. 2015).

Has real depreciation of the euro helped in the improvement of European countries' trade balances? The European Economic Forecast, published by European Commission in February 2016, affirms that in 2015 depreciation of exchange rate represents one of the main causes of the strong increase in the current account surplus of the euro-area (European Commission 2016, 5).

However, the euro-area is characterized by important structural asymmetries that are also reflected in European trade imbalances. As shown, among others, by Botta (2014, 10), 'German exports seem to concentrate even further in the medium/high-tech segment of manufacturing goods, while a process of increasing

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[1] About the possible advantages of the euro depreciation, see the report published by Natixis (Artus 2012).

[2] In mid-2014, Mario Draghi, president of the ECB, announced that the bank plans to engage in a form of quantitative easing through the purchase of private sector credit, including asset-backed securities and covered bonds, in addition to a cut of the benchmark refinancing rate from 0.15% to 0.05% and the deposit rate from -0.1% to -0.2%. On 9 March 2015, the Public Sector Purchase Programme actually started. The ECB decided to buy €60 billion worth of bonds a month as a way of injecting cash into European banks. This was supposed to stop in September 2016, but in December 2015, it has been extended by 6 months. The ECB has also said it will start buying regional and local government debt.

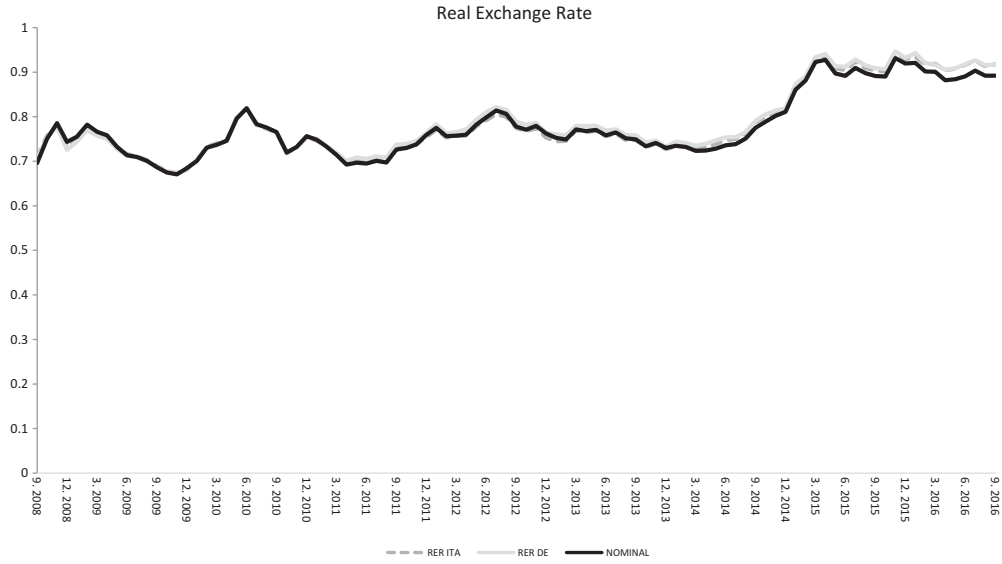

Figure 1. Nominal value of the euro in terms of the dollar, the US–Germany real exchange rate (RER) and the US–Italy RER (January 2010–February 2016).

despecialization is taking place in labour and resource-intensive or low-tech sectors'; France and other Southern European countries are characterized by an export despecialization in the medium-tech capital good sector, notwithstanding Italy confirms its specialization in the mechanical industry. Then, we should expect that the depreciation of the euro versus US dollar determined different consequences for trade balances, according to the aim of our study, for Germany and Italy. The US economy represents the first non-euro trade partner for German and Italian enterprises.

Verheyen (2013) investigates whether euro volatility against the US dollar has affected bilateral German exports to the US, one of its major export destinations. His empirical results indicate that, in the period prior to financial crisis, the export demand equation for the US is stable. These findings are in line with Langwasser (2009) who proves that German exports are less exchange rate–sensitive compared with other EMU countries. From a policy point of view, Verheyen (2013) suggests that German exporters can cope with strong euro, which cheapens commodity imports.

Breuer and Klose (2015) verifies that there are substantial regional differences in the export elasticities of the Euro-countries: particularly for Germany and Italy, the US competitors are of more importance, while for other countries, like France and Spain, Japanese or British competitors are more relevant. They also find that for Germany, Italy and Spain, the real effective exchange rate does not seem to have a significant impact on imports. They conclude that euro depreciation would on average increase the trade balance, since exchange rate elasticities on exports are found to be statistically meaningful with correct sign in most cases.

In order to analyse the effects of depreciation on the trade balance, several studies test the J-curve effect, first introduced by Magee (1973).[3] As known, such statistical evidence postulates that depreciation worsens the trade balance first, in the short run, and improves after the lags are realized, in the long run.

Bahmani-Oskooee, Harvey, and Hegerty (2013) examine the specific case of trade between Italy and the US at industry level using annual data from 1979 to 2010. They find that in only 19 cases (of 106) there is a long-run improvement after a depreciation, which are highly concentrated in miscellaneous manufactures.

In this study, we examine the specific cases of trade between Germany and the US on one hand, and Italy

[3]From the seminal contributions of Magee (1973), an intense debate about the J-curve phenomenon has been developed. The contributions can be divided into two groups: (1) the first group collects the scientific papers that use aggregate data in order to estimate the phenomenon and (2) the second group collects the scientific papers that use bilateral data. Clearly, this division is based on the progress of the econometric techniques. The most relevant contributions in the first group are Miles (1979) and Himarios (1985); they are the first authors who proposed a precise definition of short and long run in this field. Miles used several tests involving both the seemingly unrelated and pooled cross section and time-series regression techniques, while Himarios provides a critique of Miles' results. Among the first research studies in the second group, see Rose and Yellen (1989), that explained the reasons for the preferable use of bilateral data, and Bahmani-Oskooee and Brooks (1999).

and the US on the other hand. To the best of our knowledge, we are the first to estimate the J-curve on these countries using monthly data for the period 2010–2016.

The analysis begins in 2010, when severe stress was observed in some euro-area bond markets and when we observe the presence of the roots of the ECB's non-standard monetary policy measures that continue in the present: since May 2010, in order to preserve financial stability in Europe by providing financial assistance to eurozone states in economic difficulty, the European Financial Stabilisation Mechanism and the European Financial Stability Facility became operative. In the same period, the ECB initiated a revolutionary programme of monetary policy implementation, the so-called Securities Markets Programme. The programme consists of targeted purchases of eurozone public and private bonds in the secondary markets in order to ensure the proper transmission of monetary policy impulses in sectors of the bond markets that the ECB considered to be dysfunctional.[4] The analysis stops in February 2016, when the fluctuations of the exchange rate begin to decrease.

Following the main methodologies in the recent literature, we examine the bilateral trade balances for the most representative 68 individual industries, 34 for Germany and 34 for Italy, respectively. We find many significant results, which vary from industry to industry and from country to country. Differently by Bahmani-Oskooee, Harvey, and Hegerty (2013), the focus of this contribution is about the consequences of the euro depreciation which started in April 2014, by showing in the trade asymmetries characterizing German and Italian main industries; we find that the long-run improvement after the depreciation regards eight industries for Italy and just three for Germany. It is interested to stress that, according to Rose and Yellen's (1989) definition, a J-curve effect occurs just for six Italian industries.

This contribution is organized as follows: Section II outlines the methodology. The main results are presented and discussed in Section III, where robustness and diagnostic checks also validated. A specific robustness test involves the estimation for a longer time period (September 2009–September 2016). Section IV concludes. Our data set is explained in the Appendix.

II. The model and the method

Using a model, suggested among others by Bahmani-Oskooee and Wang (2008) who investigate the J-curve phenomenon between China and the US, we assume that the trade balance model for industry takes the following form:

$$\ln(TB)_t = \alpha + \beta_1 \ln Y_t^{US} + \beta_2 \ln Y_t^{fc} + \beta_3 \ln REX_t + \varepsilon_t \quad (1)$$

where TB is calculated as the ratio between exports and imports for industry i, Y is the national nominal GDP for the US and singularly for Italy and Germany and REX is the RER between the US and singularly Italy and Germany as well. We used Italy and Germany as home country to analyse their different behaviour towards the US.

Following the previous literature, Y_t^{US} is expected to carry a positive coefficient, while Y_t^{fc} is expected to carry a negative one.[5] REX is defined as $NEX \times (P_{US}/P_{fc})$ and NEX is defined as the number of American dollars per euro. Finally ε is an error term.

Using Equation (1) leads to two main problems. First, this kind of equation does not reveal any information about the short-run dynamics and the J-curve adjustment; second, we need a method able to estimate at the same time variables characterized by stationary, $I(0)$, and not stationary, $I(1)$. Pesaran, Shin, and Smith (2001) prove that is possible to define cointegration between variables ruling out pre-unit-root test. Consequently, we will estimate the following equation:

$$\begin{aligned}\Delta\ln(TB_i)_t = {} & \alpha + \sum_{k=1}^{n} \gamma_{1,t-k}\, \Delta\ln(TB)_{t-k} \\ & + \sum_{k=0}^{n} \gamma_{2,t-k}\, \Delta\ln Y_{t-k}^{US} \\ & + \sum_{k=0}^{n} \gamma_{3,t-k}\, \Delta\ln Y_{t-k}^{fc} \\ & + \sum_{k=0}^{n} \gamma_{4,t-k}\, \Delta\ln REX_{t-k} \\ & + \theta_1 \ln(TB)_{t-1} + \theta_2 \ln Y_{t-1}^{US} \\ & + \theta_3 \ln Y_{t-1}^{fc} + \theta_4 \ln REX_{t-1} + \mu_t \end{aligned} \quad (2)$$

[4]The year 2010 represented a real turning point for the European economic policy, as shown by another important event: the Greek government accepted the bailout deal with IMF and ECB. See among others Goodhart (2013).

[5]See also Halicioglu (2007) about Turkey versus its main trade partners, Bahmani-Oskooee and Zhang (2013) about China and the UK and Bahmani-Oskooee, Harvey, and Hegerty (2013) about Italy and the US.

Pesaran's assumption is that the variables are either $I(0)$ or $I(1)$. In this set-up, the short-run effects are inferred by the coefficients attached to first difference variables and the long-run effects are inferred by the estimates of θ_2, θ_3andθ_4 that are normalized on θ_1.

Equation (2) is an ARDL methodology, based on the ECM, proposed by Engle and Granger (1987). This approach has become the standard for similar analysis, because it gives both short-run and long-run results simultaneously and it is robust with small samples.

After selecting the optimum number of lags n (out of three maximum)[6] by minimizing the AIC, we estimate Equation (2) using OLS for each industry. Given the ARDL 'bounds testing' approach, there should be a (cointegrating) relationship among the variables only if the lagged level variables are jointly significant in the estimation of Equation (2). The test is based on standard F-statistic, which specifies critical values for its F-test, calculated by Pesaran, Shin, and Smith (2001) and Narayan (2005) for large and small samples, respectively. If the F-test lies above the 'upper bound', we can say that the variables are cointegrated; if F-test lies between the upper and the lower bound, the result is not conclusive; if it lies below the lower bound, there is no cointegration. In our case, according to Narayan (2005), the critical value for the F-test is 3.898. In case the F-statistic is smaller than the critical value, following Bahmani-Oskooee and Hegerty (2011), we perform an additional test. According to Banerjee, Dolado, and Mestre (1998) and Bahmani-Oskooee, Harvey, and Hegerty (2013), we rerun the Equation (2) replacing the lagged level variables by ECM_{t-1}[7] and test if the coefficient of ECM_{t-1} is negative and significant, the t-statistic value must exceed 2.94. The cointegration relationship is confirmed in the long-run analysis. We will proceed to calculate both the short- and long-run coefficients, just for the industries where cointegration is verified. Otherwise, we only estimate the short-run coefficients. We will observe which industries benefit from a real currency depreciation in the long run, while looking for possible J-curve effects as well.

III. Empirical results

In this section, we try to estimate the ECM (Equation (2)), for a significant sample of the industries that trade between the US and Germany on one side, and the US and Italy on the other. We will use monthly data over the period January 2010–February 2016.[8] Eurostat database provides data for 99 industries, but there are not enough available data for some of them. We will analyse the industries that represent, at least, the 0.5% of the bilateral trade for at least a bilateral relationship. Therefore, the estimation is limited to 34 industries for each bilateral relationship; consequently, we studied 68 bilateral industry-level analyses. According to Pesaran, Shin, and Smith (2001) and Narayan (2005), we investigate the presence of cointegration between the variables. Table 1 provides the results for the F-test. Of our 68 relationships, 66 have statistics that exceed this critical value (3.898). In order to test the presence of cointegration in the two relevant industries, we use the ECM test. In both the cases, the ECM assumes a negative and significant value. Table 1 shows that the cointegration between the variables is proven for all the 68 bilateral relationships tested. It means that it is possible to investigate the J-curve phenomenon also in the long run.

Table 2 provides the short- and long-run coefficients; in this table, we have estimated the Pesaran model (Equation 2) for the 34 industries and the 68 bilateral relationships. We impose the maximum of three lags and minimizing the AIC we select the optimal number of lags. The theory suggests that an increasing path of the GDP should be positively correlated with an increasing amount of the imports: coeteris paribus the trade balance account will worsen.[9] Consequently, the US GDP should be positively correlated with the bilateral trade balance (both for Germany and Italy), while the German and the Italian GDP should be negatively correlated with the dependent variable. The data evidence shows that the German GDP is negative and significant in only three industries (41, 64 and 87) and it is positive for three industries as well (8, 33 and 62). As regards the Italian GDP, we obtain that it is negative

[6]Bahmani-Oskooee and Zhang (2013) used a maximum of four lags, but the fourth lagged level variable is never significant.
[7]More precisely, ε_{t-1}substitutes $\theta_2 Y^{US}_{t-1} + \theta_3 Y^{fc}_{t-1} + \theta_4 REX_{t-1}$ in Equation (2).
[8]See the Appendix for the complete explanation about the data set.
[9]This proposition is coherent with the so-called multiplier approach as theorized by Meade (1948, 1949) and described in many international economics handbooks (see, for instance, Gandolfo (2002), chap. 8).

Table 1. Cointegration test statistics.

Industry description	Industry code	*F*-test	ECM_{t-1}	Cointegrated?
Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included	TB De/US 4	5.72		Yes
	TB It/US 4	18.16		Yes
Edible fruit and nuts; peel of citrus fruits or melons	TB De/US 8	4.67		Yes
	TB It/US 8	9.24		Yes
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants, straw and fodder	TB De/US 12	3.49	−1.02 (−4.94)	Yes
	TB It/US 12	7.57		Yes
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	TB De/US 15	21.00		Yes
	TB It/US 15	5.94		Yes
Preparations of cereals, flour, starch or milk; pastrycook's products	TB De/US 19	3.76	−0.62 (−5.64)	Yes
	TB It/US 19	27.03		Yes
Beverages, spirits and vinegar	TB De/US 22	16.41		Yes
	TB It/US 22	23.08		Yes
Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	TB De/US 27	19.90		Yes
	TB It/US 27	39.24		Yes
Organic chemicals	TB De/US 29	27.27		Yes
	TB It/US 29	39.13		Yes
Pharmaceutical products	TB De/US 30	19.84		Yes
	TB It/US 30	19.88		Yes
Essential oils and resinous; perfumery, cosmetic or toilet preparations	TB De/US 33	18.84		Yes
	TB It/US33	37.88		Yes
Miscellaneous chemical products	TB De/US 38	10.17		Yes
	TB It/US 38	15.85		Yes
Plastics and articles thereof	TB De/US 39	21.47		Yes
	TB It/US 39	23.10		Yes
Rubber and articles thereof	TB De/US 40	11.73		Yes
	TB It/US 40	22.81		Yes
Raw hides and skins (other than fur skins) and leather	TB De/US 41	26.16		Yes
	TB It/US 41	35.32		Yes
Articles of leather; saddlery and harness; travel goods, handbags and similar containers, articles of animal gut (other than silkworm gut)	TB De/US 42	23.21		Yes
	TB It/US 42	22.79		Yes
Paper and paperboard; articles of paper pulp, of paper or paperboard	TB De/US 48	16.79		Yes
	TB It/US 48	47.99		Yes
Articles of apparel and clothing accessories, knitted or crocheted	TB De/US 61	21.87		Yes
	TB It/US 61	13.11		Yes
Articles of apparel and clothing accessories, not knitted	TB De/US 62	16.48		Yes
	TB It/US 62	15.87		Yes
Footwear, gaiters and the like; parts of such articles	TB De/US 64	23.38		Yes
	TB It/US 64	9.35		Yes
Articles of stone, plaster, cement, asbestos, mica or similar materials	TB De/US 68	11.23		Yes
	TB It/US 68	38.34		Yes
Glass and glassware	TB De/US 70	15.05		Yes
	TB It/US 70	21.28		Yes
Natural or cultured pearls, precious or semi-precious stones, precious metal, metal clad with precious metal, and articles thereof, imitation jewellery coin	TB De/US 71	36.07		Yes
	TB It/US 71	15.37		Yes
Iron and steel	TB De/US 72	21.31		Yes
	TB It/US 72	24.50		Yes
Articles of iron or steel	TB De/US 73	10.47		Yes
	TB It/US 73	43.86		Yes
Aluminium and articles thereof	TB De/US 76	9.55		Yes
	TB It/US 76	5.08		Yes

(*Continued*)

Table 1. (Continued).

Industry description	Industry code	ECM_{t-1}	*F*-test	Cointegrated?
Tools, implements, cutlery, spoons and forks, of base metal, parts thereof base metal	TB De/US 82		16.94	Yes
	TB It/US 82		31.51	Yes
Nuclear reactors, boilers, machinery and mechanical appliance, parts thereof	TB De/US 84		13.07	Yes
	TB It/US 84		18.10	Yes
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	TB De/US 85		15.11	Yes
	TB It/US 85		12.91	Yes
Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	TB De/US 87		8.55	Yes
	TB It/US 87		17.31	Yes
Aircraft, spacecraft, and parts thereof	TB De/US 88		13.34	Yes
	TB It/US 88		54.29	Yes
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	TB De/US 90		10.81	Yes
	TB It/US 90		32.16	Yes
Arms and ammunition; parts and accessories thereof	TB De/US 93		15.88	Yes
	TB It/US 93		6.44	Yes
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings, lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plants and the like; prefabricated buildings	TB De/US 94		11.61	Yes
	TB It/US 94		19.13	Yes
Other products	TB De/US 99		28.78	Yes
	TB It/US 99		8.50	Yes

The upper bound critical value of the *F*-test for cointegration is 3.898 at the 10% level of significance. Numbers inside parentheses are the *t*-ratios.

and significant for eight industries (30, 38, 39, 41, 71, 73, 87 and 90) and positive for four (4, 33, 64 and 76). Finally, the US GDP is characterized by a positive significance, in both cases, for five industries (29, 64, 82, 84 and 94) and by a negative significance for the industry number 40. The US GDP is also positive towards Germany for other three industries (61, 87 and 88) and towards Italy for other nine industries (4, 33, 38, 41, 42, 62, 72, 76 and 90); it is negative and significant towards Germany for other four industries (8, 22, 33 and 41), and towards Italy for other six (12, 27, 30, 68, 73 and 87).

Studying the J-curve phenomenon according to Rose and Yellen (1989), we can observe that a significant negative value (for the RER) in the short run is followed by a positive and significant value in the long run just in six cases, always between the US and Italy (27, 30, 41, 61, 68 and 87).

An inverted J-curve effect is present in eight cases, four for Germany (29, 39, 73 and 84) and four for Italy (33, 39, 42 and 62). As known, Bahmani-Oskooee, Bolhassani, and Hegerty (2011) followed a different definition for the J-curve: only short-run results are used in order to describe the J-curve as a negative and significant RER coefficient. According with this definition, we can find the presence of J-curve in other 13 cases, 7 for Germany (30, 33, 61, 68, 72, 82 and 90) and 6 for Italy (38, 70, 72, 85, 88 and 90). The evidence shows that just two industries are interested by the J-curve phenomenon both for Italy and Germany: 'Iron and steel' (72) and 'Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus, parts and accessories thereof' (90).

Robustness and diagnostic checks

In order to validate the robustness of the estimated ECMs throughout the sample period, we examine the stability of the long-run coefficients together with the short-run dynamics following Pesaran and Pesaran (1997) by applying the Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMQ) tests on the model residuals. As known, CUSUM and CUSUMQ are due to Brown, Durbin, and Evans (1975). Table 3 shows that the hypothesis of parameters' stability cannot be rejected at the 5% significance level for the great majority of the cases: only in three situations both CUSUM and

Table 2. Short-run and long-run coefficient estimates.

		Short-run coefficient estimate				Long-run coefficient estimates				
Industry description	Industry code	$\Delta \ln REX_t$	$\Delta \ln REX_{t-1}$	$\Delta \ln REX_{t-2}$	$\Delta \ln REX_{t-3}$	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln *REX*
Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included	TB De/US 4	1.53 (0.47)	−0.52 (−0.19)	−3.13 (−1.28)	0.85 (0.24)	−27.36 (−0.68)	3.22 (0.33)		1.24 (0.14)	−0.04 (−0.02)
	TB It/US 4	−5.47 (−1.41)	−1.46 (−0.4)	−1.94 (−0.64)	5.43 (1.14)	−314.8 (−2.6)		27.11 (2.68)	21.77 (2.5)	−3.92 (−1.95)
Edible fruit and nuts; peel of citrus fruits or melons	TB De/US 8	4.99 (2.55)	n.a	n.a	n.a	50.65 (1.49)	13.29 (1.87)		−14.44 (−2.18)	1.51 (0.98)
	TB It/US 8	−3.81 (−1.13)	4.52 (1.16)	−2.35 (−1.03)	−4.25 (−1.17)	78.24 (1.05)		−10.02 (−1.42)	−3.55 (−0.71)	1.29 (0.9)
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants, straw and fodder	TB De/US 12	−6.2 (−0.9)	5.55 (0.78)	2.33 (0.34)	−5.53 (−0.76)	49.66 (0.84)	12.68 (0.54)		−14.05 (−0.83)	−0.09 (−0.03)
	TB It/US 12	0.38 (0.12)	−2.47 (−0.88)	−4,08 (−1,39)	−2.6 (−0.73)	168.02 (2.66)		−4.87 (−0.88)	−16.98 (−3.56)	0.38 (0.12)
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	TB De/US 15	2.11 (0.45)	4.83 (0.81)	−2.71 (−0.59)	3.91 (0.89)	46.57 (1.4)	9.92 (0.53)		−11.67 (−0.86)	2.07 (1.17)
	TB It/US 15	6.03 (1.31)	n.a	n.a	n.a	35.94 (0.36)		−7.61 (−0.81)	0.81 (0.11)	3.46 (1.67)
Preparations of cereals, flour, starch or milk; pastrycook's products	TB De/US 19	0.59 (0.22)	2.4 (0.89)	0.45 (0.18)	−3.6 (−1.35)	28.81 (1.35)	−14.19 (−1.64)		5.83 (0.93)	−0.04 (−0.04)
	TB It/US 19	3.53 (0.7)	−3.88 (−1.11)	−7.8 (−1.38)	−4.02 (−1.31)	−0.28 (−0.002)		−5.14 (−0.39)	3.63 (0.38)	0.22 (0.09)
Beverages, spirits and vinegar	TB De/US 22	1.27 (0.90)	−0.10 (−0.08)	−2.05 (−1.17)	0.92 (0.72)	48,51 (3.25)	8.84 (1.79)		−11.20 (−3.10)	1.62 (2.47)
	TB It/US 22	2.17 (1.07)	n.a	n.a	n.a	0.84 (0.02)		−2.39 (−0.66)	1.65 (0.63)	0.69 (0.96)
Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	TB De/US 27	−0.26 (−0.07)	−1.62 (−0.36)	−2.93 (−0.60)	1.09 (0.32)	−38.63 (−1.25)	−11.53 (−0.73)		11.64 (1.00)	0.02 (0.01)
	TB It/US 27	7.44 (1.27)	−12.89 (−2.20)	−13.75 (−1.81)	−12−76 (−1.81)	594.81 (2.73)		−31.76 (−1.85)	−51.14 (−3.04)	16.36 (3.18)
Organic chemicals	TB De/US 29	−2.32 (−1.55)	3.92 (3.37)	1.32 (1.10)	4.02 (2.70)	−28.38 (−2.06)	−8.40 (−1.66)		8.69 (1.98)	−2.26 (−3.03)
	TB It/US 29	−1.61 (−0.78)	4.09 (2.39)	1.64 (0.88)	4.69 (2.39)	−50.99 (−1.48)		1.81 (0.63)	5.04 (1.93)	0.76 (0.83)
Pharmaceutical products	TB De/US 30	−1.56 (−2.07)	n.a	n.a	n.a	−56.02 (−6.09)	3.85 (1.33)		4.21 (1.82)	−0.54 (−1.53)
	TB It/US 30	−2.76 (−1.29)	1.36 (0.806)	−4.76 (−2.15)	−1.09 (−0.57)	113.65 (1.86)		−9.51 (−2.705)	−7.87 (−2.55)	2.12 (1.89)
Essential oils and resinous; perfumery, cosmetic or toilet preparations	TB De/US 33	0.12 (0.19)	0.40 (0.57)	−1.10 (−1.86)	−0.69 (−0.78)	15.14 (2.83)	6.93 (4.05)		−6.15 (−4.54)	−0.48 (−1.23)
	TB It/US33	0.07 (0.05)	4.14 (2.79)	−0.23 (−0.17)	3.86 (2.11)	−141.41 (−4.49)		13.46 (4.76)	9.04 (3.88)	−1.96 (−2.71)
Miscellaneous chemical products	TB De/US 38	0.53 (0.87)	n.a	n.a	n.a	1.53 (0.30)	0.27 (0.12)		−0.35 (−0.24)	−0.19 (−0.77)
	TB It/US 38	0.54 (0.66)	0.09 (0.11)	−1.92 (−2.22)	n.a	2.96 (0.19)		−5.49 (−4.30)	2.76 (2.10)	0.43 (0.22)
Plastics and articles thereof	TB De/US 39	−0.04 (−0.11)	−0.18 (−0.44)	−0.34 (−1.52)	1.44 (5.13)	−6,87 (−2.54)	0.63 (0.70)		0.41 (0.57)	−0.35 (−2.94)
	TB It/US 39	−0.03 (−0.05)	1.64 (2.00)	0.15 (0.19)	1.68 (2.46)	23.09 (1.16)		−6.34 (−2.74)	0.96 (0.86)	−0.80 (−2.79)
Rubber and articles thereof	TB De/US 40	0.25 (0.51)	n.a	n.a	n.a	−25.69 (−3.47)	−0.96 (−0.57)		3.67 (2.13)	−0.47 (−2.23)
	TB It/US 40	−0.69 (−0.79)	n.a	n.a	n.a	−64.34 (−2.61)		−0.07 (−0.04)	7.82 (3.93)	1.32 (3.02)
Raw hides and skins (other than fur skins) and leather	TB De/US 41	−2.51 (−0.98)	n.a	n.a	n.a	−11.04 (−0.51)	−23.18 (−2.69)		16.00 (2.56)	2.58 (1.90)
	TB It/US 41	−2.23 (−1.38)	−3.56 (−1.40)	−4.83 (−3.54)	−3.62 (−1.87)	266,04 (6.72)		−27.67 (−7.04)	−15.23 (−5.88)	5.81 (7.50)
Articles of leather; saddlery and harness; travel goods, handbags and similar containers, articles of animal gut (other than silkworm gut)	TB De/US 42	−0.90 (−0.72)	2.10 (2.36)	n.a	n.a	−1.97 (−0.18)	1.82 (0.71)		−0.82 (−0.34)	−0.70 (−1.20)
	TB It/US 42	2.98 (1.93)	2.50 (1.88)	n.a	n.a	−51.17 (−1.76)		−1.82 (−0.75)	7.57 (3.17)	−1.92 (−2.54)

(*Continued*)

Table 2. (Continued).

Industry description	Industry code	Short-run coefficient estimate				Long-run coefficient estimates				
		$\Delta \ln REX_t$	$\Delta \ln REX_{t-1}$	$\Delta \ln REX_{t-2}$	$\Delta \ln REX_{t-3}$	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln *REX*
Paper and paperboard; articles of paper pulp, of paper or paperboard	TB De/US 48	1.22 (2.00)	−0.27 (−0.33)	0.33 (0.54)	1.81 (3.00)	−0.97 (−0.15)	0.61 (0.29)		−0.20 (−0.11)	0.13 (0.31)
	TB It/US 48	−1.08 (−1.14)	0.95 (0.97)	n.a	n.a	−5.41 (−0.24)		0.31 (0.15)	0.42 (0.26)	1.74 (3.65)
Articles of apparel and clothing accessories, knitted or crocheted	TB De/US 61	0.23 (0.27)	−3.12 (−3.42)	1.57 (1.60)	−2.31 (−1.88)	−68.71 (−5.81)	5.68 (1.83)		4.43 (2.04)	−0.08 (−0.23)
	TB It/US 61	−0.31 (−0.13)	0.32 (0.17)	−1.85 (−1.03)	−4.64 (−2.99)	30.60 (0.72)		−5.51 (−1.42)	−0.05 (−0.02)	2.35 (2.91)
Articles of apparel and clothing accessories, not knitted	TB De/US 62	0.93 (0.70)	−0.12 (−0.07)	3.09 (2.62)	n.a	−37.97 (−3.41)	10.54 (2.40)		−2.15 (−0.63)	−0.20 (−0.51)
	TB It/US 62	−0.15 (−0.13)	2.04 (1.93)	n.a	n.a	−33.48 (−1.43)		−2.54 (−1.17)	5.84 (3.41)	−1.49 (−3.13)
Footwear, gaiters and the like; parts of such articles	TB De/US 64	0.71 (0.48)	−0.36 (−0.30)	2.23 (1.26)	n.a	−58.46 (−4.56)	−12.69 (−2.28)		15.18 (3.64)	−1.77 (−3.04)
	TB It/US 64	−0.28 (−0.13)	n.a	n.a	n.a	−149.95 (−2.97)		12.62 (2.72)	11.28 (3.10)	−1.71 (−1.77)
Articles of stone, plaster, cement, asbestos, mica or similar materials	TB De/US 68	−0.71 (−1.00)	0.18 (27)	−1.67 (−1.86)	n.a	11.34 (2.11)	1.68 (0.64)		−2.39 (−1.20)	−0.10 (−0.22)
	TB It/US 68	−3.48 (−2.87)	1.84 (1.95)	−4.01 (−2.39)	n.a	42.93 (1.23)		−0.63 (−0.20)	−5.50 (−1.88)	1.16 (2.36)
Glass and glassware	TB De/US 70	−0.89 (−1.51)	0.90 (1.30)	n.a	n.a	4.77 (−0.83)	1.36 (0.75)		−0.30 (0.18)	−0.28 (−0.18)
	TB It/US 70	−2.36 (−1.95)	n.a	n.a	n.a	0.69 (0.03)		0.04 (0.02)	0.01 (0.00)	0.54 (1.14)
Natural or cultured pearls, precious or semi-precious stones, precious metal, metal clad with precious metal, and articles thereof, imitation jewellery coin	TB De/US 71	−0.52 (−0.26)	0.03 (0.04)	−2.94 (−1.82)	n.a	26.03 (2.44)	−1.21 (−0.22)		−2.27 (−0.54)	0.46 (0.92)
	TB It/US 71	−0.95 (−0.61)	n.a	n.a	n.a	21.47 (0.73)		−7.76 (−2.62)	1.95 (0.92)	0.74 (1.26)
Iron and steel	TB De/US 72	2.62 (3.81)	1.50 (1.36)	−1.96 (−3.00)	0.82 (1.18)	−25.37 (−3.75)	3.58 (1.63)		0.92 (0.47)	0.70 (2.08)
	TB It/US 72	−2.21 (−0.80)	1.65 (0.53)	−4.91 (−1.97)	2.71 (1.28)	−138.65 (−2.72)		5.20 (1.26)	13.42 (3.23)	1.17 (0.84)
Articles of iron or steel	TB De/US 73	−0.29 (−0.58)	0.72 (1.21)	−0.37 (−0.80)	1.78 (2.67)	−3.35 (−0.79)	2.27 (1.23)		−1.04 (−0.74)	−0.53 (−2.18)
	TB It/US 73	0.70 (0.63)	3.70 (3.66)	0.77 (0.57)	3.35 (3.07)	111.18 (4.71)		−15.27 (−6.47)	−3.98 (−2.40)	−0.19 (−0.41)
Aluminium and articles thereof	TB De/US 76	0.20 (0.15)	n.a	n.a	n.a	5.35 (0.59)	−3.63 (−1.45)		1.71 (0.83)	−1.59 (−2.65)
	TB It/US 76	0.38 (0.33)	1.46 (1.29)	−1.36 (−1.75)	2.59 (2.25)	−62.4 (−2.802)		5.65 (2.38)	4.09 (2.49)	−0.27 (−0.51)
Tools, implements, cutlery, spoons and forks, of base metal, parts thereof base metal	TB De/US 82	−1.44 (−2.73)	n.a	n.a	n.a	−14.50 (−2.18)	−1.49 (−0.81)		2.73 (1.91)	−0.44 (−1.48)
	TB It/US 82	−0.36 (−0.36)	n.a	n.a	n.a	−60.56 (−1.81)		2.04 (0.708)	6.11 (2.51)	0.76 (1.44)
Nuclear reactors, boilers, machinery and mechanical appliance, parts thereof	TB De/US 84	−0.03 (−0.07)	0.38 (0.88)	0.12 (0.37)	0.93 (1.90)	−23.41 (−5.75)	−1.46 (−1.60)		3.72 (5.35)	−0.76 (−5.34)
	TB It/US 84	−0.72 (−0.96)	1.71 (0.09)	n.a	n.a	−83.19 (−3.97)		1.03 (0.74)	9.28 (5.01)	−2.08 (−4.39)
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	TB De/US 85	0.02 (0.08)	−0.04 (−0.16)	0.12 (0.38)	0.72 (2.34)	−12.95 (−3.33)	1.70 (1.69)		0.47 (0.86)	−0.39 (−3.40)
	TB It/US 85	−1.66 (−1.79)	2.64 (2.89)	−2.79 (−2.66)	−2.42 (−2.18)	−33.93 (−1.28)		2.203 (0.95)	2.75 (1.48)	0.05 (0.11)
Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	TB De/US 87	1.35 (1.18)	1.89 (1.38)	n.a	n.a	−11.83 (−1.24)	−7.69 (−3.31)		6.34 (2.88)	−0.77 (−1.55)
	TB It/US 87	1.55 (1.61)	−3.604 (−2.16)	n.a	n.a	107.91 (2.92)		−12.74 (−3.34)	−5.13 (−2.27)	2.07 (3.98)
Aircraft, spacecraft, and parts thereof	TB De/US 88	−4.81 (−0.85)	n.a	n.a	n.a	−182.81 (−4.79)	−0.70 (−0.05)		27.77 (2.00)	−1.44 (−0.79)
	TB It/US 88	0.37 (0.13)	−3.61 (−1.38)	−7.38 (−2.42)	n.a	160.502 (1.81)		−15.91 (−1.82)	−9.59 (−1.82)	1.75 (1.31)

(*Continued*)

Table 2. (Continued).

Industry description	Industry code	Short-run coefficient estimate				Long-run coefficient estimates				
		$\Delta\ln REX_t$	$\Delta\ln REX_{t-1}$	$\Delta\ln REX_{t-2}$	$\Delta\ln REX_{t-3}$	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln *REX*
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	TB De/US 90	0.03 (0.05)	−0.22 (−0.41)	−1.47 (−2.69)	−0.37 (−0.76)	1.83 (0.48)	1.16 (0.77)		−0.94 (−0.81)	0.23 (1.08)
	TB It/US 90	−0.42 (−0.81)	0.19 (0.42)	−1.201 (−1.99)	n.a	−28.57 (−1.63)		−2.59 (−1.92)	4.84 (3.106)	−0.24 (−0.96)
Arms and ammunition; parts and accessories thereof	TB De/US 93	1.28 (0.56)	−4.25 (−1.17)	n.a	n.a	1.16 (0.05)	8.86 (1.04)		−5.66 (−0.93)	−0.35 (−0.31)
	TB It/US 93	−5.53 (−1.41)	7.98 (2.307)	n.a	n.a	27.13 (0.24)		−2.04 (−0.17)	−2.03 (−0.30)	0.109 (0.07)
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings, lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plants and the like; prefabricated buildings	TB De/US 94	−0.43 (−0.60)	−0.89 (−1.01)	−1.56 (−1.63)	n.a	−15.88 (1.81)	−5,09 (−1.75)		5.15 (2.00)	−0.49 (−3.87)
	TB It/US 94	−1.603 (−1.04)	n.a	n.a	n.a	−10.38 (−0.33)		−5.59 (−1.78)	4.708 (1.97)	−0.94 (−5.55)
Other products	TB De/US 99	−1.66 (−0.77)	4.02 (2.07)	3.19 (2.27)	3.95 (2.42)	−26.06 (−1.39)	−2.30 (−0.39)		4.44 (0.89)	−1.52 (−1.34)
	TB It/US 99	3.92 (2.17)	−0.6 (−0.22)	−1.85 (−1.01)	5.15 (2.22)	36.92 (0.78)		−2.73 (−0.75)	−2.82 (−.76)	0.33 (0.39)

Numbers inside parentheses are the *t*-ratios.

CUSUMQ reveal parameters' instability (8, 15, 85 always in Italy).

Following the literature and the previous studies, we also report in Table 3 the main diagnostic statistics: the Lagrange Multiplier to test for autocorrelation and the Regression Equation Specification Error Test, for functional misspecification of optimum models; these are both distributed as a χ^2 with one degree of freedom, and in this case the critical value is 3.84. Table 3 shows coefficients that are lower than 3.84 in the majority of cases, implying autocorrelation-free residuals in most models as well as confirming correctly specified optimum models.

Finally, we add the adjusted $R2$ to provide the goodness of the estimations: the results are in line with previous contributions by Payne (2008) and Bahmani-Oskooee and Zhang (2013), among others.

We may conclude that estimated ECMs are correctly specified and the residuals are well behaved.

Another robustness test involves the estimation of the equations for the following longer time period: from September 2009 – when the first serious signals of the global crisis involved EMU countries – to September 2016, i.e. the last available data. Again we focus on the industries that represent at least 0.5% of the bilateral trade for at least a bilateral relationship. Our sample is now composed by 72 bilateral relationships (36 for Italy and 36 for Germany). Differently from the previous analysis (January 2010–February 2016), industries 12 and 61 are not part of the sample, while we now comprehend industries 28, 32, 69 and 74.

Tables 4 and 5 show that the results do not present any significant changes from those reported previously. The cointegration between the variables is proven for all the 72 bilateral relationships tested.

In the case of Germany, all the inverted J-curves that we found for the previous sample are confirmed for the new sample (29, 39, 74, 84), where we also obtained four new inverted J-curves (32, 40, 84 and 87). We also find a J-curve phenomenon (41).

In the case of Italy, the J-curves that we found are confirmed for four industries (27, 41, 68, 87), and are not confirmed in two industries (30 and 61). We also obtained four new J-curves (4, 48, 69 and 70). Italian industries in the new sample confirm the inverted J-curve phenomena in three cases (33, 39, 42). Only one case is not confirmed (62). We also

Table 3. Diagnostic statistics.

Description	Industry code	RESET	LM	CUSUM	CUSUMq	Adj R^2
Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included	TB De/US 4	3.93	0.53	s	s	0.17
	TB It/US 4	3.61	9.11	s	s	0.42
Edible fruit and nuts; peel of citrus fruits or melons	TB De/US 8	0.82	4.35	s	us	0.17
	TB It/US 8	2.20	2.85	us	us	0.43
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants, straw and fodder	TB De/US 12	1.75	0.94	s	s	0.36
	TB It/US 12	0.48	0.58	s	s	0.40
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	TB De/US 15	0.09	10.50	s	s	0.60
	TB It/US 15	2.28	5.32	us	us	0.46
Preparations of cereals, flour, starch or milk; pastrycook's products	TB De/US 19	1.62	3.42	s	s	0.39
	TB It/US 19	11.46	12.80	s	s	0.40
Beverages, spirits and vinegar	TB De/US 22	0.86	3.28	s	s	0.49
	TB It/US 22	1.35	1.58	s	s	0.61
Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	TB De/US 27	0.02	0.16	s	s	0.37
	TB It/US 27	1.73	2.49	s	s	0.54
Organic chemicals	TB De/US 29	1.40	3.33	s	s	0.57
	TB It/US 29	0.40	2.74	s	s	0.68
Pharmaceutical products	TB De/US 30	0.92	4.41	s	s	0.49
	TB It/US 30	1.75	4.99	s	s	0.42
Essential oils and resinous; perfumery, cosmetic or toilet preparations	TB De/US 33	0.52	2.10	s	us	0.40
	TB It/US33	0.68	0.06	s	s	0.61
Miscellaneous chemical products	TB De/US 38	1.81	4.73	s	s	0.26
	TB It/US 38	0.52	9.41	s	s	0.42
Plastics and articles thereof	TB De/US 39	0.80	12.43	s	s	0.34
	TB It/US 39	0.89	4.41	s	s	0.55
Rubber and articles thereof	TB De/US 40	0.09	7.92	us	s	0.34
	TB It/US 40	0.86	2.80	s	s	0.68
Raw hides and skins (other than fur skins) and leather	TB De/US 41	0.64	3.16	s	s	0.58
	TB It/US 41	3.23	2.77	s	s	0.67
Articles of leather; saddlery and harness; travel goods, handbags and similar containers, articles of animal gut (other than silkworm gut)	TB De/US 42	0.84	4.34	s	s	0.42
	TB It/US 42	0.75	4.05	s	s	0.62
Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard	TB De/US 47	1.13	7.48	s	s	0.33
	TB It/US 47					
Paper and paperboard; articles of paper pulp, of paper or paperboard	TB De/US 48	1..88	12.88	s	s	0.52
	TB It/US 48	1.12	1.11	s	s	0.69
Articles of apparel and clothing accessories, knitted or crocheted	TB De/US 61	0.63	1.95	s	s	0.49
	TB It/US 61	0.13	21.88	s	s	0.39
Articles of apparel and clothing accessories, not knitted	TB De/US 62	0.82	5.63	s	s	0.47
	TB It/US 62	2.13	0.96	s	s	0.52
Footwear, gaiters and the like; parts of such articles	TB De/US 64	1.52	1.40	s	s	0.42
	TB It/US 64	0.03	2.28	s	s	0.59
Articles of stone, plaster, cement, asbestos, mica or similar materials	TB De/US 68	2.90	3.10	s	s	0.39
	TB It/US 68	1.68	1.14	s	s	0.59
Glass and glassware	TB De/US 70	0.66	9.70	s	s	0.41
	TB It/US 70	3.89	7.20	s	s	0.49

(*Continued*)

Table 3. (Continued).

Description	Industry code	RESET	LM	CUSUM	CUSUMq	Adj R^2
Natural or cultured pearls, precious or semi-precious stones, precious metal, metal clad with precious metal, and articles thereof, imitation jewellery coin	TB De/US 71	0.71	6.32	s	s	0.56
	TB It/US 71	0.99	7.98	s	s	0.39
Iron and steel	TB De/US 72	0.25	0.77	s	s	0.50
	TB It/US 72	0.31	0.67	s	s	0.58
Articles of iron or steel	TB De/US 73	3.59	2.99	s	s	0.47
	TB It/US 73	0.81	4.02	s	s	0.62
Aluminium and articles thereof	TB De/US 76	5.06	0.61	s	us	0.33
	TB It/US 76	1.59	4.01	s	s	0.48
Tools, implements, cutlery, spoons and forks, of base metal, parts thereof base metal	TB De/US 82	0.61	7.40	s	s	0.43
	TB It/US 82	0.41	1.64	s	s	0.48
Nuclear reactors, boilers, machinery and mechanical appliance, parts thereof	TB De/US 84	2.79	3.68	s	s	0.52
	TB It/US 84	1.39	1.67	s	s	0.68
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	TB De/US 85	0.13	10.23	s	s	0.49
	TB It/US 85	0.85	1.208	us	us	0.501
Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	TB De/US 87	0.30	3.26	s	s	0.40
	TB It/US 87	0.44	4.405	s	s	0.43
Aircraft, spacecraft, and parts thereof	TB De/US 88	0.48	4.77	s	s	0.42
	TB It/US 88	3.64	4.17	s	s	0.58
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	TB De/US 90	0.34	1.70	s	s	0.42
	TB It/US 90	0.13	2.65	s	s	0.55
Arms and ammunition; parts and accessories thereof	TB De/US 93	2.67	6.25	s	s	0.41
	TB It/US 93	2.27	1.38	s	us	0.36
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings, lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plants and the like; prefabricated buildings	TB De/US 94	0.55	3.24	s	s	0.37
	TB It/US 94	0.51	5.62	s	s	0.49
Other products	TB De/US 99	0.76	5.21	s	us	0.49
	TB It/US 99	3.69	0.89	s	S	0.27

Lagrange multiplier (LM) test of residual serial correlation; RESET, Ramsey's test for functional test. Both are distributed as a χ^2 with one degree of freedom. CUSUM: cumulative sum of residuals; CUSUMSQ: cumulative sum of squared residuals; RESET: Regression Equation Specification Error Test; s: stable, us: unstable.

Table 4. Cointegration test statistics (new sample).

Industry description	Industry code	*F*-test	ECM_{t-1}	Cointegrated?
Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included	TB De/US 4	2.122		Yes
	TB It/US 4	11.66		Yes
Edible fruit and nuts; peel of citrus fruits or melons	TB De/US 8	6.316		Yes
	TB It/US 8	14.87		Yes
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit, industrial or medicinal plants, straw and fodder	TB De/US 12			
	TB It/US 12			
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	TB De/US 15	32.03		Yes
	TB It/US 15	16.24		Yes
Preparations of cereals, flour, starch or milk; pastrycook's products	TB De/US 19	9.52		Yes
	TB It/US 19	29.89		Yes
Beverages, spirits and vinegar	TB De/US 22	10.73		Yes
	TB It/US 22	201.68		Yes
Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	TB De/US 27	10.25		Yes
	TB It/US 27	42.105		Yes
Inorganic chemicals, organic or inorganic compounds of precious metals, of rare earth metals, of radioactive elements of isotopes	TB De/US 28	20.157		Yes
	TB It/US 28	17.16		Yes
Organic chemicals	TB De/US 29	35.49		Yes
	TB It/US 29	21.07		Yes
Pharmaceutical products	TB De/US 30	17.62		Yes
	TB It/US 30	19.27		Yes
Tanning or dyeing extracts; tannins and their derivatives, dyes, pigments and other colouring matters, paints and varnishes, putty and other mastics, inks	TB De/US 32	14.39		Yes
	TB It/US 32	46.28		Yes
Essential oils and resinous; perfumery, cosmetic or toilet preparations	TB De/US 33	16.26		Yes
	TB It/US 33	43,601		Yes
Miscellaneous chemical products	TB De/US 38	7.61		Yes
	TB It/US 38	23.802		Yes
Plastics and articles thereof	TB De/US 39	17.57		Yes
	TB It/US 39	26.47		Yes
Rubber and articles thereof	TB De/US 40	25.40		Yes
	TB It/US 40	36.01		Yes
Raw hides and skins (other than fur skins) and leather	TB De/US 41	47.15		Yes
	TB It/US 41	15.52		Yes
Articles of leather; saddlery and harness; travel goods, handbags and similar containers, articles of animal gut (other than silkworm gut)	TB De/US 42	21.28		Yes
	TB It/US 42	24.97		Yes
Paper and paperboard; articles of paper pulp, of paper or paperboard	TB De/US 48	8.90		Yes
	TB It/US 48	18.11		Yes
Articles of apparel and clothing accessories, knitted or crocheted	TB De/US 61			
	TB It/US 61			
Articles of apparel and clothing accessories, not knitted	TB De/US 62	22.59		Yes
	TB It/US 62	30.77		Yes
Footwear, gaiters and the like; parts of such articles	TB De/US 64	18.03		Yes
	TB It/US 64			Yes

(*Continued*)

Table 4. (Continued).

Industry description	Industry code	*F*-test	ECM_{t-1}	Cointegrated?
Articles of stone, plaster, cement, asbestos, mica or similar materials	TB De/US 68	15.19		Yes
	TB It/US 68	36.84		Yes
Ceramic products	TB De/US 69	4.19		Yes
	TB It/US 69	6.25		Yes
Glass and glassware	TB De/US 70	12.99		Yes
	TB It/US 70			Yes
Natural or cultured pearls, precious or semi-precious stones, precious metal, metal clad with precious metal, and articles thereof, imitation jewellery coin	TB De/US 71	25.22		Yes
	TB It/US 71	9.45		Yes
Iron and steel	TB De/US 72	18.05		Yes
	TB It/US 72	31.42		Yes
Articles of iron or steel	TB De/US 73	10.68		Yes
	TB It/US 73	20.42		Yes
Copper and articles thereof	TB De/US 74	10.47		Yes
	TB It/US 74	18.66		Yes
Aluminium and articles thereof	TB De/US 76	10.75		Yes
	TB It/US 76	33.79		Yes
Tools, implements, cutlery, spoons and forks, of base metal, parts thereof base metal	TB De/US 82	15.99		Yes
	TB It/US 82	31.05		Yes
Nuclear reactors, boilers, machinery and mechanical appliance, parts thereof	TB De/US 84	14.25		Yes
	TB It/US 84	15.94		Yes
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	TB De/US 85	24.57		Yes
	TB It/US 85	29.74		Yes
Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	TB De/US 87	14.76		Yes
	TB It/US 87	17.46		Yes
Aircraft, spacecraft, and parts thereof	TB De/US 88	8.73		Yes
	TB It/US 88	22.05		Yes
Ships, boats and floating structures	TB De/US 89	34.72		Yes
	TB It/US 89	9.64		Yes
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	TB De/US 90	24.03		Yes
	TB It/US 90	28.5		Yes
Arms and ammunition; parts and accessories thereof	TB De/US 93	11.22		Yes
	TB It/US 93	17.55		Yes
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings, lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plants and the like; prefabricated buildings	TB De/US 94	28.05		Yes
	TB It/US 94	20.7		Yes
Other products	TB De/US 99			
	TB It/US 99			

The upper bound critical value of the *F*-test for cointegration is 3.898 at the 10% level of significance. Numbers inside parentheses are the *t*-ratios. The new industries are written in bold.

Table 5. Short-run and long-run coefficient estimates (new sample).

		Short-run coefficient estimates				Long-run coefficient estimates				
Industry description	Industry code	Δln *REXt*	Δln REX_{t-1}	Δln REX_{t-2}	Δln REX_{t-3}	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln*REX*
Dairy produce; birds' eggs; natural honey; edible products of animal origin not elsewhere specified or included	TB De/US 4	1.036 (0.33)	−1.73 (−0.65)	−3.90 (−1.70)	6.61 (1.42)	−328.53 (−3.42)	5.83 (0.95)		6.03 (0.88)	−1.70 (−1.35)
	TB It/US 4	−7.20 (−1.89)	−1.56 (−0.49)	−10.15 (−2.79)	8.08 (2.23)	−1017.96 (−5.13)		22.76 (4.62)	15.002 (4.83)	−1.76 (0.104)
Edible fruit and nuts; peel of citrus fruits or melons	TB De/US 8	3.71 (1.75)	−1.93 (−0.77)	n.a.	n.a.	129.11 (1.67)	11.93 (2.88)		−15.10 (−2.78)	2.19 (1.61)
	TB It/US 8	−5.01 (−1.44)	6.38 (2.098)	n.a.	n.a.	−35.64 (−0.16)		−2.87 (−0.507)	3.68 (1.16)	−1.44 (−1.16)
Animal or vegetable fats and oils and their cleavage products, prepared edible fats, animal or vegetable waxes	TB De/US 15	0.72 (0.22)	5.06 (1.31)	−3.35 (−1.04)	0.75 (0.21)	256.66 (2.78)	−12.23 (−1.16)		2.17 (0.25)	1.92 (1.24)
	TB It/US 15	1.89 (0.40)	6.49 (1.44)	6.63 (1.55)	6.06 (1.11)	−1069.39 (−3.04)		15.07 (1.74)	23.45 (4.04)	−4.49 (−2.20)
Preparations of cereals, flour, starch or milk; pastrycook's products	TB De/US 19	0.10 (0.04)	3.61 (1.89)	−1.87 (−1.01)	−5.52 (−3.29)	25.82 (0.57)	1.33 (0.41)		−2.01 (−0.64)	0.28 (0.34)
	TB It/US 19	−0.01 (−0.02)	−4.16 (−1.46)	−5.84 (−1.83)	−0.06 (−0.02)	346.57 (1.07)		−12.08 (−1.34)	−1.06 (−0.31)	0.53 (0.37)
Beverages, spirits and vinegar	TB De/US 22	0.01 (0.03)	n.a.	n.a.	n.a.	158.11 (3.74)	−6.87 (−2.33)		0.75 (0.28)	0.71 (1.44)
	TB It/US 22	1.34 (1.42)	n.a.	n.a.	n.a.	140.81 (1.62)		−0.2 (−0.08)	−4.73 (−4.56)	−0.39 (−0.77)
Mineral fuels, mineral oils and products of their distillation, bituminous substances, mineral waxes	TB De/US 27	−6.16 (−1.79)	n.a.	n.a.	n.a.	189.40 (2.11)	−23.03 (−2.19)		14.06 (1.48)	1.22 (0.77)
	TB It/US 27	5.09 (1.01)	−6.91 (−1.38)	−11.71 (−2.07)	−5.89 (−0.99)	1471.42 (3.51)		−18.101 (−1.94)	−34.37 (−3.86)	11.74 (0.01)
Inorganic chemicals, organic or inorganic compounds of precious metals, of rare earth metals, of radioactive elements of isotopes	TB De/US 28	−2.08 (−0.91)	−0.02 (−0.01)	−2.23 (−1.16)	−1.51 (−0.83)	−47.27 (−0.97)	2.96 (0.96)		−1.01 (−0.29)	0.54 (0.56)
	TB It/US 28	1.51 (1.11)	1.51 (1.21)	1.64 (0.96)	2.01 (1.28)	−139.05 (−1.47)		8.23 (3.29)	−2.46 (−1.76)	−1.09 (−1.62)
Organic chemicals	TB De/US 29	−2.05 (−1.55)	2.49 (2.04)	3.56 (2.10)	3.38 (2.29)	−60.90 (−1.47)	−7.36 (−2.49)		8.68 (2.18)	−1.94 (−2.65)
	TB It/US 29	−0.61 (−0.33)	2.72 (1.64)	−0.49 (−0.29)	3.93 (2.27)	91.14 (0.92)		−3.93 (2.27)	−3.33 (−1.40)	0.92 (1.40)
Pharmaceutical products	TB De/US 30	−1.123 (−1.18)	−0.29 (−0.32)	0.56 (0.55)	0.318 (0.42)	−135.44 (−4.66)	−2.78 (−1.42)		7.13 (3.19)	−1.06 (−2.49)
	TB It/US 30	−3.03 (−1.62)	2.00 (1.49)	−4.61 (−2.66)	n.a.	78.01 (0.77)		−2.02 (−0.71)	−0.94 (1.28)	0.94 (1.28)
Tanning or dyeing extracts; tannins and their derivative dyes pigments and other colouring matters, paints and varnishes, putty and other mastics, inks	TB De/US 32	−0.09 (−0.16)	−0.88 (−1.57)	−0.26 (−0.38)	1.25 (2.05)	−63.77 (−2.71)	1.13 (0.78)		1.17 (0.82)	−0.76 (−2.57)
	TB It/US 32	−3.25 (−2.70)	0.18 (0.18)	−0.78 (−0.53)	n.a.	59.73 (0.94)		−4.306 (−2.64)	1.74 (1.77)	0.12 (0.31)
Essential oils and resinous; perfumery, cosmetic or toilet preparations	TB De/US 33	0.56 (0.85)	0.84 (1.35)	−1.27 (−2.48)	−1.31 (−2.24)	7.00 (0.583)	5.11 (4.94)		−4.79 (−4.57)	−0.14 (−0.48)
	TB It/US33	0.88 (0.81)	3.06 (2.44)	−0.46 (−0.36)	2.96 (2.61)	−332.9 (−5.62)		8.65 (4.63)	3.86 (3.76)	−1.39 (−2.37)
Miscellaneous chemical products	TB De/US 38	0.54 (0.98)	0.53 (1.01)	−1.66 (−2.61)	n.a.	−22.59 (−1.41)	2.77 (2.53)		−1.70 (−1.63)	−0.17 (−0.62)
	TB It/US 38	−0.039 (−0.05)	n.a.	n.a.	n.a.	−2.54 (−0.05)		−4.18 (−3.18)	3.73 (4.72)	0.16 (0.61)
Plastics and articles thereof	TB De/US 39	−0.33 (−0.98)	−0.05 (−0.15)	−0.54 (−2.10)	1.15 (3.98)	−36.31 (−3.88)	−0.47 (−0.74)		1.67 (2.09)	−0.44 (−2.87)
	TB It/US 39	−0.43 (−0.75)	1.58 (2.21)	−0.31 (−0.48)	1.505 (2.81)	87.52 (1.97)		−5.41 (−4.53)	1.76 (2.55)	−0.68 (−2.57)
Rubber and articles thereof	TB De/US 40	−0.29 (−0.52)	0.79 (1.35)	0.51 (1.01)	0.688 (1.97)	−66.84 (−4.56)	−1.08 (−1.51)		3.25 (3.73)	−0.89 (−3.34)
	TB It/US 40	−0.51 (−0.72)	n.a.	n.a.	n.a.	−149.37 (−2.85)		−1.09 (−0.78)	6.13 (6.37)	1.41 (3.87)
Raw hides and skins (other than fur skins) and leather	TB De/US 41	−2.75 (−1.32)	1.15 (0.45)	−6.20 (−2.82)	n.a.	291.91 (4.68)	−40.05 (−8.23)		25.81 (5.08)	4.17 (3.42)
	TB It/US 41	−2.27 (−1.71)	−1.13 (−0.53)	−2.87 (−1.81)	−2.08 (−1.32)	549.05 (4.07)		−14.15 (−4.13)	−6.35 (−3.49)	3.408 (5.82)
Articles of leather; saddlery and harness; travel goods, handbags and similar containers, articles of animal gut (other than silkworm gut)	TB De/US 42	−0.48 (−0.41)	1.85 (2.17)	0.37 (0.31)	−0.50 (−0.51)	5.51 (0.18)	0.16 (0.10)		−0.29 (−0.14)	−0.57 (−1.04)
	TB It/US 42	1.05 (0.69)	2.47 (1.96)	1.89 (1.31)	n.a.	−427.71 (−4.93)		2.77 (1.53)	12.33 (5.94)	−3.23 (−4.01)

(*Continued*)

Table 5. (Continued).

Industry description	Industry code	Short-run coefficient estimates				Long-run coefficient estimates				
		Δln *REXt*	Δln REX_{t-1}	Δln REX_{t-2}	Δln REX_{t-3}	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln*REX*
Paper and paperboard; articles of paper pulp, of paper or paperboard	TB De/US 48	0.21 (0.32)	n.a.	n.a.	n.a.	1.52 (0.08)	−1.62 (−1.16)		1.42 (0.97)	0.07 (0.23)
	TB It/US 48	−1.49 (−1.52)	0.52 (0.55)	−2.507 (−2.81)	1.83 (2.22)	90.94 (1.33)		−1.81 (−1.02)	−1.52 (−1.56)	1.68 (4.36)
Articles of apparel and clothing accessories, not knitted	TB De/US 62	1.26 (0.94)	−0.30 (−0.18)	2.40 (1.97)	n.a.	−62.57 (−1.60)	3.20 (1.16)		−0.70 (−0.26)	0.24 (0.52)
	TB It/US 62	−0.55 (−0.64)	n.a.	n.a.	n.a.	−20.7 (−0.31)		−4.107 (−2.43)	4.42 (4.44)	−1.56 (−4.05)
Footwear, gaiters and the like; parts of such articles	TB De/US 64	−0.43 (−0.32)	1.96 (1.91)	3.18 (2.78)	−199.47 (−4.84)	1.64 (0.47)	1.64 (0.47)		5.42 (1.81)	−1.31 (−2.64)
	TB It/US 64	−0.45 (−0.21)	2.46 (1.27)	0.99 (0.78)	−2.45 (−1.23)	−640.64 (−4.95)		12.26 (4.04)	11.38 (5.42)	−2.68 (−3.41)
Articles of stone, plaster, cement, asbestos, mica or similar materials	TB De/US 68	−0.40 (−0.72)	−0.40 (−0.84)	−1.32 (−1.94)	n.a.	23.36 (1.67)	0.84 (0.72)		−1.55 (−1.24)	−0.20 (−0.61)
	TB It/US 68	−3.37 (−2.76)	0.75 (0.67)	−3.08 (−2.12)	−2.08 (−1.99)	223.55 (2.91)		−2.38 (−1.18)	−5.502 (−5.09)	1.84 (3.68)
Ceramic products	TB De/US 69	0.28 (0.30)	n.a.	n.a.	n.a.	75.24 (2.72)	0.77(0.56)		−3.25 (−2.14)	0.32 (0.99)
	TB It/US 69	−0.97 (−0.62)	1.48 (0.87)	−2.69 (−1.99)	n.a.	71.85 (0.66)		−1.95 (−0.805)	−0.62 (−0.34)	1.17 (2.06)
Glass and glassware	TB De/US 70	−0.22 (−0.41)	n.a.	n.a.	n.a.	−25.03 (−1.99)	−3.91 (−2.01)		4.34 (2.21)	−0.93 (−2.99)
	TB It/US 70	−2.91 (−2.46)	−1.63 (−1.22)	n.a.	n.a.	64.62 (0.72)		−1.16 (−0.52)	−1.15 (−0.88)	0.75 (1.68)
Natural or cultured pearls, precious or semi-precious stones, precious metal, metal clad with precious metal, and articles thereof, imitation jewellery coin	TB De/US 71	−0.50 (−0.24)	−0.96 (−1.09)	−2.43 (−1.39)	−2.98 (−3.44)	54.51 (2.09)	0.89 (0.32)		−2.65 (−0.97)	0.67 (1.52)
	TB It/US 71	0.12 (0.07)	0.66 (0.38)	0.26 (0.21)	−0.29 (−0.19)	78.23(1.11)		−6.42 (−3.3)	2.95 (2.02)	0.54 (0.78)
Iron and steel	TB De/US 72	3.46 (4.28)	1.49842 (1.431)	−1.88 (−2.63)	0.99 (1.39)	−59.82 (−3.06)	−1.01 (−0.63)		3.01 (1.78)	0.65 (1.65)
	TB It/US 72	−3.9 (−1.71)	n.a.	n.a.	n.a.	−218.104 (−1.79)		0.54 (0.17)	7.01 (2.82)	1.02 (0.91)
Articles of iron or steel	TB De/US 73	−0.34 (−0.80)	0.81 (1.31)	−0.39 (−0.83)	2.08 (3.51)	−30.81 (−2.53)	3.01 (2.68)		−1.62 (−1.44)	−0.52 (−2.29)
	TB It/US 73	0.98 (1.01)	3.902 (3.84)	1.73 (1.24)	3.21 (3.42)	161.92 (1.47)		−7.45 (−2.61)	1.04 (0.72)	−1.24 (−2.53)
Copper and articles thereof	TB De/US 74	0.01 (0.01)	n.a.	n.a.	n.a.	60.99 (2.78)	−4.56 (−2.36)		2.01 (1.21)	0.64 (1.95)
	TB It/US 74	1.004 (0.37)	−1.37 (−0.65)	−4.58 (−1.902)	5.609 (3.01)	312.41 (1.97)		−12.4 (−3.02)	0.22 (0.09)	1.89 (2.06)
Aluminium and articles thereof	TB De/US 76	−0.78 (−0.77)	1.37 (1.41)	1.99 (1.39)	n.a.	13.13 (0.48)	1.91 (0.85)		−2.14 (−0.84)	−1.73 (−2.90)
	TB It/US 76	0.4 (0.41)	0.57 (0.63)	−1.76 (−2.21)	n.a.	−31.12 (−0.56)		1.32 (0.79)	−0.08 (−0.12)	0.46 (1.05)
Tools, implements, cutlery, spoons and forks, of base metal, parts thereof base metal	TB De/US 82	−0.26 (−0.41)	−0.39 (−0.58)	−0.50 (−0.75)	n.a.	−46.83 (−2.88)	−0.28 (−0.24)		1.87 (1.57)	−0.35 (−1.26)
	TB It/US 82	−0.45 (−0.46)	n.a.	n.a.	n.a.	−45.74 (−0.61)		−1.073 (−0.54)	2.54 (2.27)	0.58 (0.204)
Nuclear reactors, boilers, machinery and mechanical appliance, parts thereof	TB De/US 84	−0.56 (−1.59)	0.41 (1.02)	−0.66 (−1.67)	0.64 (1.67)	−70.33 (−5.92)	−1.07 (−1.30)		3.37 (3.88)	−0.76 (−4.85)
	TB It/US 84	−1.52 (−2.41)	−0.303 (−0.34)	−0.74 (−1.12)	1.57 (2.77)	−237.41 (−4.30)		1.02 (0.90)	7.24 (6.43)	−1.52 (−4.27)
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	TB De/US 85	0.06 (0.22)	−0.29 (−0.94)	−0.10 (−0.30)	0.58 (1.58)	−47.46 (−2.85)	2.09 (2.49)		−0.24 (−0.39)	−0.26 (−1.78)
	TB It/US 85	−2.22 (−2.16)	2.36 (2.53)	−1.37 (−1.42)	−3.13 (−3.12)	−144.29 (−2.08)		2.108 (1.26)	3.08 (2.71)	−0.509 (0.22)
Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof	TB De/US 87	1.59 (1.50)	2.07 (1.66)	n.a.	n.a.	−45.30 (−1.78)	−1.69 (−1.08)		3.07 (1.73)	−0.84 (−1.98)
	TB It/US 87	2.72 (2.51)	−2.08 (−1.67)	−0.87 (−0.82)	−0.29 (−0.28)	270.64 (3.43)		−7.76 (−3.39)	−2.39 (−2.26)	2.27 (4.18)
Aircraft, spacecraft, and parts thereof	TB De/US 88	−5.47 (−1.07)	−7.21 (−1.36)	3.69 (0.83)	1.08 (0.31)	−315.21 (−3.09)	−22.37 (−2.50)		30.74 (3.16)	−0.44 (−0.24)
	TB It/US 88	−2.82 (−1.11)	−2.10 (−0.88)	−2.70 (−0.99)	4.35 (2.12)	77.13 (0.43)		−3.69 (−0.75)	0.59 (0.27)	−0.56 (−0.59)
Ships, boats and floating structures	TB De/US 89	12.57 (1.29)	−8.43 (−0.76)	12.009 (1.36)	−4.13 (−0.62)	−470.30 (−1.71)	31.82 (1.64)		−12.36 (−0.61)	−9.17 (−1.85)
	TB It/US 89	7.05 (0.85)	−2.71 (−0.35)	−3.96 (−0.55)	−15.49 (−2.35)	−600.27 (−1.53)		−4.65 (−0.45)	24.68 (3.201)	−1.12 (−0.31)

(*Continued*)

Table 5. (Continued).

Industry description	Industry code	Short-run coefficient estimates				Long-run coefficient estimates				
		Δln *REXt*	Δln REX_{t-1}	Δln REX_{t-2}	Δln REX_{t-3}	Constant	ln*YDE*	ln*YIT*	ln*YUS*	ln*REX*
Optical, photographic,	TB De/US 90	0.38 (1.43)	−0.33 (−0.77)	n.a.	n.a.	−18.70 (−1.88)	−0.06 (−0.09)		0.70 (0.90)	−0.31 (−1.50)
cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	TB It/US 90	−0.42 (−0.89)	n.a.	n.a.	n.a.	−144.35 (−3.54)		−2.16 (−2.31)	6.82 (8.41)	−0.606 (−3.62)
Arms and ammunition; parts and	TB De/US 93	0.41 (0.20)	−3.66 (−1.14)	n.a.	n.a.	10.02 (0.17)	2.95 (0.76)		−2.93 (−0.65)	−0.74 (−0.75)
accessories thereof	TB It/US 93	−2.64 (−0.80)	1.01 (0.29)	−1.406 (−0.52)	−0.83 (−0.32)	463.401 (2.18)		−15.38 (−2.67)	−2.3 (−0.81)	0.56 (0.43)
Furniture; bedding, mattresses,	TB De/US 94	−1.10 (−1.53)	−0.54 (−0.67)	−2.02 (−2.44)	n.a.	−13.58 (−0.69)	−6.05 (−3.69)		5.89 (3.32)	0.12 (0.35)
mattress supports, cushions and similar stuffed furnishings, lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated name-plants and the like; prefabricated buildings	TB It/US 94	−2.45 (−1.81)	−0.97 (−0.71)	−0.8 (−0.502)	−1.47 (−1.24)	29.23 (0.48)		−6.36 (−3.15)	4.65 (3.28)	−0.91 (−1.47)

Numbers inside parentheses are the *t*-ratios. The new industries are written in bold.

obtained two new cases of inverted J-curves (73 and 74).

Summing up, the new estimations also show that the J-curve phenomena are concentrated in the Italian case (eight cases) for industries that tend to be competitive by lowering prices, while the inverted J-curve phenomena are typical of the German economy (eight cases) in industries that tend to be competitive without lowering prices. Hence, the trade asymmetries for the two national economic systems are confirmed, as we will stress in the following subsections.

The longer time series also shows that the total amount of inverted-J curves after the euro depreciation tend to increase, both in Germany (from four to eight) and Italy (from four to five).

Relationship between J-curves, inverted J-curve phenomena and industries

Examining Table 6, which summarizes the first 10 largest internationalized industries, both in Germany and Italy,[10] we found a meaningful improvement in trade balance only in two cases: 'Pharmaceutical products' (30) for Germany, and 'Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof' (87) for Italy. Our results are in line with Bahmani-Oskooee, Harvey, and Hegerty (2013), indeed the largest industries (in terms of trade share), with just two exceptions, do not respond positively to currency fluctuation, probably because they are better able to edge against them. More precisely, the long-run RER is positive and significant in 11 cases, 3 for Germany (22, 41 and 72) and 8 for Italy (27, 30, 40, 41, 48, 61, 68 and 87). As regards Germany, the trade share of these industries varies from 0.032% to 0.636%, i.e. they are not in the top 10. In the Italian case, only two industries (30 and 87) are part of the largest ones collected in Table 4, while the other six industries present a trade share from 0.634% to 1.612%. We cannot exclude a negative correlation between industry size and sensitivity of its trade balance to currency fluctuations.

Table 6. Top 10 industries for trade share in Germany and Italy.

	Germany		Italy		Sign. Pos. In *REX*?	
Position	Sector	Share	Sector	Share	Germany	Italy
1	87	24,003	84	19,992	No	No
2	84	21,088	30	11,619	No	No
3	30	10,706	87	9,685	Yes	Yes
4	85	8,668	90	5,057	No	No
5	90	8,543	85	4,680	No	No
6	39	2,628	22	3,801	No	No
7	88	2,622	88	3,319	No	No
8	29	2,224	29	3,064	No	No
9	38	1,656	71	3,007	No	No
10	73	1,312	73	2,205	No	No

By analysing the industries that are interested to an inverted J-curve effect we found, both for Germany and Italy, those sectors that are traditionally characterized by a significant market power which allows them to be competitive without lowering prices: specifically, 'Organic chemicals' (29) and 'Nuclear reactors, boilers, machinery and mechanical appliance; parts thereof' (84) for Germany; and 'Essential oils and resinous, perfumery, cosmetic or toilet preparations' (33), 'Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silkworm gut)' (42) and 'Articles of apparel and clothing accessories, not knitted' (62) for Italy.

Among the industries that are particularly prone to a J-curve effect, we found the automobile (27 and 87) just in the case of Italy. Such result may be explained by considering that, as is well known, German automobile industry is characterized by low price-elasticity of demand. We are left with another interesting result from this study: among the industries that are most responsive to currency depreciation, there are not only manufactures, as knitted clothing or iron and steel, as found in Bahmani-Oskooee, Harvey, and Hegerty (2013), but also 'Pharmaceutical products' for Italy (30) and 'Beverages, spirits and vinegar' for Germany (22).

IV. Conclusions

The study of the effects of a currency depreciation on two important European countries' trade flows represents an original way to verify the structural differences inside the euro-area. Due to adjustment lags, countries' trade balances are not always able to improve after a currency depreciation. The bounds testing approach by Pesaran, Shin, and Smith (2001) offers the opportunity to differentiate short-run pattern from the long-run response of the trade balance to depreciation. In our study, we focus both on Germany and Italy's

[10]We considered the sum between import and export in order to weigh the international trade share.

relationship with the US, which is the major importer that does not have a currency that is fixed to euro. We apply cointegration analysis on a monthly sample that runs from January 2010 to February 2016. We examine 68 industries, finding effects that a higher level of aggregation may hide. Our empirical results revealed that all the industries are characterized by cointegration. Contrary to Bahmani-Oskooee, Harvey, and Hegerty (2013), we do not find that the 'fundamentals' (namely GDP) have a rather weak influence on industries' trade balances: particularly, the data evidence shows that the German GDP is significantly negative in three industries and it is significantly positive for three industries as well, while the Italian GDP is significantly negative for eight industries and significantly positive for four. As regards the US GDP, it is characterized by a positive significance in 17 cases, and a negative significance for 11 industries. A first difference between German and Italian trade is that the former is less sensitive to its GDP dynamics.

A total of 11 industries have positive long-run pattern (8 for Italy and 3 for Germany) after the euro depreciation. However, the J-Curve effect, according to Rose and Yellen's (1989) definition, is observed only for six Italian industries. Measured by their trade shares, these industries represent the 25.92% of the bilateral trade. The inverted J-curve effect characterizes the 27.25% of the German bilateral trade and the 6.24% of the Italian bilateral trade. The results seem statistically robust also considering new estimations on longer time series (September 2008–September 2016): the J-curve phenomena are concentrated in the Italian case (eight cases) for industries that tend to be competitive by lowering their prices, while the inverted J-curve phenomena are typical of the German economy (eight cases) in industries that tend to be competitive without lowering their prices.

These results seem to be an indirect demonstration that German economic system is able to be more competitive with a strong currency, than a weak one. In other words, Italian exporters' ability to be competitive in international markets is more based on prices dynamics. Also, Italian automotive industry seems to be particularly sensitive to price fluctuations. Finally, our results suggest that a euro depreciation rather weakly will have an impact on largest industries. Our results are in line with those of Artus (2016) that illustrate that the sharp euro depreciation in reality has done little to boost the eurozone economy.

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No potential conflict of interest was reported by the authors.

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References

Artus, P. 2012. "Dévaluer en cas de besoin avait beaucoup d'avantages." *Flash-économie*, Natixis, 365, May 29.

Artus, P. 2016. "The Euro Appears to Have Depreciated Sharply, but in Reality This Has Done Little to Boost the Euro-Zone Economy." *Flash-économie*, Natixis, 100, February 5.

Bahmani-Oskooee, M., M. Bolhassani, and S. W. Hegerty. 2011. "Industry Trade between Canada and Mexico: Will a Weakening Peso Help Mexico Manufacturing in the Long Run?" *North American Journal of Economics and Finance* 22: 89–101. doi:10.1016/j.najef.2010.09.002.

Bahmani-Oskooee, M., and T. J. Brooks. 1999. "Bilateral J-Curve between U.S. and Her Trading Partners." *Weòtwirtschaftiliches Archiv* 135: 156–165. doi:10.1007/BF02708163.

Bahmani-Oskooee, M., H. Harvey, and S. W. Hegerty. 2013. "Currency Depreciations and the U.S.-Italian Trade Balance: Industry-Level Estimates." *Research in Economics* 67: 215–225. doi:10.1016/j.rie.2013.04.001.

Bahmani-Oskooee, M., and S. W. Hegerty. 2011. "The J-Curve and NAFTA: Evidence from Commodity Trade between the U.S. and Mexico." *Applied Economics* 43: 1579–1593. doi:10.1080/00036840802360328.

Bahmani-Oskooee, M., and Y. Wang. 2008. "The J-Curve: Evidence from Commodity Trade between U.S. and China." *Applied Economics* 40: 2735–2747. doi:10.1080/00036840600970328.

Bahmani-Oskooee, M., and R. Zhang. 2013. "The J-Curve: Evidence from Commodity Trade between U.K. and China." *Applied Economics* 45: 4369–4378. doi:10.1080/00036846.2013.783680.

Banerjee, A., J. Dolado, and R. Mestre. 1998. "Error-Correction Mechanism Tests in a Single Equation

Framework." *Journal of Time Series Analysis* 19: 267–285. doi:10.1111/1467-9892.00091.

Böll, S., M. Hesse, A. Jung, A. Mahler, and C. Reiermann. 2015. "Draghi's Dangerous Bet: The Perils of a Weak Euro." *Der Spiegel*, January 28, http://www.spiegel.de/international/business/ecb-decision-to-weaken-euro-comes-with-pluses-and-minuses-a-1015322.html.

Botta, A. 2014. "Structural Asymmetries at the Roots of the Eurozone Crisis: What's New for Industrial Policy in the EU?." The Levy Economics Institute Working Paper Collection, 794, March. New York: Levy Economic Institute of Bard College

Breuer, S., and J. Klose. 2015. "Who Gains from Nominal Devaluation? An Empirical Assessment of Euro-Area Export and Imports." *The World Economy* 38: 1966–1989. doi:10.1111/twec.12241.

Brown, R. L., J. Durbin, and J. M. Evans. 1975. "Techniques for Testing the Constancy of Regression Relationships over Time." *Journal of the Royal Statistical Society, Series B* 37: 149–192.

Engle, R. F., and C. W. J. Granger. 1987. "Co-Integration and Error Correction: Representation, Estimation, and Testing." *Econometrica* 55: 251–276. doi:10.2307/1913236.

European Commission. 2016. "European Economic Forecast." European Economy Institutional Papers, 20. http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip020_en.pdf.

Gandolfo, G. 2002. *International Finance and Open-Economy Macroeconomics*. Berlin-Heidelberg: Springer.

Goodhart, C. A. E. 2013. "Lessons for Monetary Policy from Euro-Area Crisis." Bank of Greece Special Conference Paper. http://www.bankofgreece.gr/BogEkdoseis/SCP201317.pdf.

Halicioglu, F. 2007. "The J-Curve Dynamics of Turkish Bilateral Trade: A Cointegration Approach." *Journal of Economic Studies* 34: 103–119. doi:10.1108/01443580710745362.

Himarios, D. 1985. "The Effects of Devaluation on the Trade Balance: A Critical View and Re-Examination of Miles's 'New Results'." *Journal of International Money and Finance* 4: 553–563. doi:10.1016/0261-5606(85)90029-4.

Langwasser, K. 2009. "Global Current Account Adjustment: Trade Implications for the Euro Countries." *International Economics and Economic Policy* 6: 115–133. doi:10.1007/s10368-009-0135-2.

Magee, S. P. 1973. "Currency Contracts, Pass through and Devaluation." *Brooking Papers on Economic Activity* 1: 303–325. doi:10.2307/2534091.

Meade, J. E. 1948. "National Income, National Expenditure and the Balance of Payments. Part 1." *The Economic Journal* 58: 483–505. doi:10.2307/2226174.

Meade, J. E. 1949. "National Income, National Expenditure and the Balance of Payments. Part 1." *The Economic Journal* 59: 17–39. doi:10.2307/2225843.

Miles, M. A. 1979. "The Effects of Devaluation on the Trade Balance and the Balance of Payments: Some New Results." *Journal of Political Economy* 87: 600–620. doi:10.1086/260780.

Narayan, P. K. 2005. "The Saving and Investment Nexus for China: Evidence from Cointegration Tests." *Applied Economics* 37: 1979–1990. doi:10.1080/00036840500278103.

Payne, J. E. 2008. "Inflation and Inflation Uncertainty: Evidence from the Caribbean Region." *Journal of Economic Studies* 35: 501–511. doi:10.1108/01443580810916523.

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

Pesaran, M. H., Y. Shin, and R. J. Smith. 2001. "Bounds Testing Approaches to the Analysis of Level Relationship." *Journal of Applied Econometrics* 16: 289–326. doi:10.1002/jae.616.

Rose, A. K., and J. L. Yellen. 1989. "Is There a J-Curve?" *Journal of Monetary Economics* 24 (1): 53–68. doi:10.1016/0304-3932(89)90016-0.

Verheyen, F. 2013. "The Stability of German Export Demand Equation – Have German Exports Suffered from the Strength of the Euro?" *International Economics and Economic Policy* 11: 529–548. doi:10.1007/s10368-013-0260-9.

Appendix. Data Definition and Sources

In our work, we used monthly data over the period January 2010–February 2016 and September 2008–September 2016 in the robustness checks. These data come from Eurostat. The variables used are the following:

$TB_{i,t}$ is the ratio between exports (X) and imports (M) for each industry (i) at time t. $Y_{i,t}$ is used as income measure for the country i at time t and it is proxied by the real GDP. The GDP is given quarterly; we used a specific filter based on relation to disaggregate the data in monthly observation. We weighted the disaggregation using the price index–level dynamics and the industrial production that are given monthly.

RER is the real exchange rate that is defined as $NEX \times (P_{US}/P_{fc})$, where NEX is defined as the number of American dollars per euro and P_x is the price-level index.

Although Eurostat database provides data for 99 industries, we analyse just the industries that represent at least the 0.5% of the bilateral trade share (the trade share is calculated by the ratio between the sum of the imports and exports in a particular industry in the last month of our sample, and the total of the bilateral trade) for at least a bilateral relationship; this selection gives us 68 bilateral relationships (72 in the robustness checks).