External Adjustment in Europe: Lessons from Input-Output Models

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The article investigates the current account adjustment experience in ten European countries – seven "deficit countries" and three "surplus countries" – from 2007 to 2016. It uses a multi-regional input-output model and data from the World Input-Output Database to quantify the extent to which changes in economic structure and changes in final demand have contributed to external adjustment. Value added trade flows are decomposed into structure effects and scale effects. The article calculates the level of final domestic demand that is consistent with balanced trade, holding economic structure fixed. The results show that adjustment is far from complete. The external deficits will resurface if and when growth in the European South picks up.

Keywords: euro area, European Union, external adjustment, current account, global value chains, input-output analysis, macroeconomic imbalances
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1. Introduction

Before the global financial crisis and the onset of the euro crisis, some European countries recorded large current account deficits and other European countries recorded large current account surpluses. In the meantime, the current account deficits have largely disappeared while the surpluses have survived. This article investigates the external adjustment experience in ten European countries – seven deficit countries and three surplus countries – from 2007 to 2016.[1]

Johnson's (1958) clear distinction between expenditure-switching policies and expenditure-reducing policies will serve as the guiding principle. Taking as given the level of the rest of the world's final demand, a national government can try to correct a current account deficit by influencing i) the level of domestic final demand by means of expenditure-reducing policies and/or ii) the composition of global final demand by means of expenditure-switching policies. Composition here refers to the shares of final demand that fall on home-produced goods and foreign-produced goods respectively. Faced with a current account surplus, it is unlikely that a national government will ever adopt expenditure-switching policies with the intent of steering demand away from home-produced goods in the direction of foreign-produced goods. This government might however try to influence the level of domestic final demand by means of expenditure-raising policies, either in pursuit of domestic policy objectives or in response to external political pressure. There are policies that attempt to influence the *scale* of final demand and there are policies that attempt to influence its *composition*.

Johnson's ideas are expressed in a two-country setting in the traditional Keynesian macroeconomic paradigm. In this theoretical framework exports are entirely produced at home and finally consumed abroad. Export production relies exclusively on domestic primary factors. Imports are entirely produced abroad and finally consumed at home. Import production relies exclusively on foreign primary factors. Today more than ever before, production chains do stretch across national borders and trade flows are composed of final goods and intermediate goods (including raw materials). The international fragmentation of production has increased (Hummels et al., 1998; Baldwin and Lopez-Gonzalez, 2014; Los et al., 2015).[2] For present purposes it is sufficient to recognize that both producers and final consumers can alter the composition of their expenditure in favor of home-produced goods. Domestic and foreign *producers* can switch their input expenditure from a foreign supplier of intermediate goods to a domestic supplier, provided a domestic substitute exists. Domestic and foreign *end-users* can switch their consumption expenditure from a foreign supplier of final goods to a domestic supplier, provided a domestic substitute exists. In both cases do domestic primary factors increase their contribution to production for global final demand, and they receive higher income in return. In both cases does the home economy's total income increase because *value added exports* rise and *value added imports* fall. This

[1] Aside from the usual suspects, the investigation includes two emerging economies outside the euro area. The ten countries are: Austria, the Czech Republic, France, Germany, Greece, Italy, the Netherlands, Poland, Portugal, and Spain.

[2] The phenomenon is not new, but today quantitatively more important than in the past. In recognition of the fact that production chains stretch across national borders and a lot of trade is in intermediate goods, Miyazawa (1960) introduced the input-output formulation of the traditional foreign trade multiplier in 1960.

kind of trade balance adjustment – via expenditure switching – is an objective of external adjustment policy.

To do justice to the international dimension of production chains, this article quantifies the actual extent of expenditure switching on the basis of a multi-regional input-output model that covers the whole world economy. Section 2 sets the stage and presents descriptive statistics on the adjustment experience from 2007 to 2016. Section 3 presents a decomposition of value added trade flows in order to quantify the role played by changes in economic structure and the scale of final demand. The decomposition is based on a multi-regional input-output model fed with data from the World Input-Output Database (Timmer et al., 2015). Section 4 uses the input-output model to derive the level of final domestic demand that would balance trade, taking as given the structure of the world economy – the *trade-balancing level of final demand*. Section 5 concludes that the external adjustment challenge remains. The deficits will return if and when growth returns.

2. Background

In 2007 Greece, Spain, and Portugal recorded current account deficits close to or in excess of 10 percent of GDP. France and Italy recorded merely small current account deficits, but had experienced a steady worsening of their trade balance from the mid-1990s to 2007. The Czech Republic (−4.7 percent) and Poland (−6.5 percent) recorded mid-sized current account deficits. The commonalities among this group of countries – five euro members and two Eastern European low-wage globalizers outside the euro area – may not extend far beyond the fact that all of them recorded current account deficits in 2007. Nevertheless, these seven countries will be called the "deficit countries". Germany and the Netherlands are the principal "surplus countries". Austria, which records small current account surpluses since 2002, is included among the surplus countries.

Unsustainable domestic demand booms and apparently emerging competitiveness problems have limited explanatory power with respect to the current account imbalances observed at the eve of the global financial crisis. To understand the origin of the large current account deficits in 2007, attention has to be paid to the non-trade components of the current account as well (Holinski et al., 2012; Kang and Shambaugh, 2013, 2016). The external deficits did not suddenly emerge after the euro was launched. Some deficit countries were running persistent trade deficits at least since the 1980s, and transfer payments limited the extent to which these trade deficits necessitated the incurrence of liabilities vis-a-vis the rest of the world or liquidation of claims on the rest of the world. For instance, in 1995 the transfer payments received by Greece and Portugal amounted to six percent of GDP. By 2007 this figure had fallen to 0.6-0.7 percent. The loss of incoming transfer payments had to be met either by the adoption of external adjustment policies of some kind or else by a willingness to accept a deterioration in the net international investment position. External adjustment policies were not adopted, and the current account deficits grew. In addition, many deficit countries recorded negative international investment positions at the time the euro was launched, and the persistent external deficits after launch implied a further deterioration in the investment income balance, which also increased the current account deficits (Kang and Shambaugh, 2013, 2016).

The deficit countries are running more or less balanced current accounts today. Table 1

Table 1: Current account adjustment from 2007 to 2016

	AUT	BEL	CZE	DEU	ESP	FIN	FRA	GRC	ITA	NLD	POL	PRT
(1) Current account												
2007	3.8	1.5	-4.7	6.8	-9.7	3.9	-0.3	-14.0	-1.4	6.0	-6.4	-9.8
2016	1.7	-0.4	1.1	8.3	1.9	-1.1	-0.9	-0.6	2.6	8.5	-0.2	0.8
(2) Goods												
2007	1.4	0.5	0.2	8.0	-8.6	4.7	-1.7	-17.8	0.1	9.6	-5.3	-11.4
2016	0.0	1.4	5.3	8.7	-1.6	0.3	-1.2	-9.4	3.6	12.0	0.5	-4.9
(3) Services												
2007	3.5	0.9	1.9	-1.4	2.7	0.3	1.0	7.1	-0.5	-1.1	1.7	4.1
2016	2.9	0.8	2.1	-0.7	4.6	-1.2	0.0	8.8	-0.2	-0.9	3.2	7.1
(4) Investment income												
2007	-0.6	0.2	-6.5	1.4	-2.9	-0.4	1.2	-3.9	-0.1	0.7	-5.0	-3.8
2016	-0.3	-2.0	-7.1	1.7	-0.4	0.6	1.2	-1.0	-0.3	-0.4	-4.6	-3.1
(5) Compensation of employees												
2007	0.2	1.3	-0.2	0.0	0.1	0.1	0.6	0.0	0.1	-0.8	1.2	0.1
2016	-0.2	1.4	0.7	0.0	0.2	0.1	0.9	-0.1	0.3	-0.7	0.0	0.1
(6) Other income												
2007	0.3	NA	0.4	0.1	0.4	0.2	0.3	NA	0.2	-0.2	0.7	0.7
2016	0.2	-0.2	0.5	-0.1	0.3	0.1	0.2	1.5	0.2	-0.3	0.9	0.8
(7) Secondary income												
2007	-1.0	-1.3	-0.6	-1.3	-1.2	-0.9	-1.7	0.7	-1.1	-2.3	0.2	0.6
2016	-1.0	-1.7	-0.6	-1.3	-1.1	-0.9	-2.0	-0.3	-1.0	-1.1	-0.2	0.8

Sources: BOPS and WEO. All values represent net figures, that is, credits minus debits, in percent of GDP. The trade balance is $TB = (2) + (3)$. The primary income balance is $PI = (4) + (5) + (6)$. The secondary income balance is $SI = (7)$. The current account balance is $CA = TB + PI + SI$.

summarizes the main current account categories in 2007 and 2016. In each of the large-deficit countries, the overall current account balance improved by more than 10 percentage points (from −9.7 to 1.9 percent in Spain, from −14 to −0.6 percent in Greece, and from −9.8 to 0.8 percent in Portugal). The external adjustment occurred mainly between 2007 and 2013, and the current account balance remained relatively constant thereafter. In Poland and the Czech Republic, the current account balance improved by more than five percentage points (from −6.4 to −0.2 percent in Poland, and from −4.7 to 1.1 percent in the Czech Republic). The current account improved by about three percentage points in Italy, and it deteriorated slightly in France.

Although the size of Austria's current account surplus declined from 2007 to 2016, it is fair to say that the surplus countries did not adjust. The German and the Dutch external surpluses were growing even after the global financial crisis, reaching more than eight percent of GDP in 2016. Effective economic or political adjustment mechanisms, which would force surplus countries to share the burden of adjustment, do not presently operate.

The non-trade components of the current account balance have hardly moved since 2007. The current account adjustment in the period 2007-2016 is the result of changes in the trade balance. The trade balance improved by 5.3 percentage points in the Czech Republic, by 8.9 percentage points in Spain, by 10.1 percentage points in Greece, by 3.2 percentage points in Italy, by 7.3 percentage points in Poland, and by 9.5 percentage points in Portugal. France's current account balance deteriorated slightly, and so did its trade balance.

3. Decomposition of Trade in Value Added

3.1. Concepts, Method, and Data

The concept *value added exports*, introduced by Johnson and Noguera (2012), refers to the income generated in a country as a result of foreign final demand. It represents the remuneration of domestic primary factors for their contribution to the production of goods and services that ultimately satisfy foreign final demand. The ratio of value added exports to conventional gross exports is termed the VAX ratio and often interpreted as a measure of vertical specialization. *Value added imports*, naturally, refer to the income generated in the rest of the world as a result of domestic final demand. This concept represents the remuneration of foreign primary factors for their contribution to the production of goods and services that ultimately satisfy domestic final demand. On the country level, the trade balance in value added terms is equal to the trade balance in gross terms. When the trade balance is dis-aggregated by trade partner or product/industry, this equality no longer holds (Stehrer, 2013).

The complement to value added exports is *domestic demand-activated income*. Domestic demand-activated income refers to the income generated in a country as a result of domestic final demand. It represents the remuneration of domestic primary factors for their contribution to the production of goods and services that ultimately satisfy domestic final demand. Value added exports and domestic demand-activated income together make up GDP, that is, $v = VAX + DDI$. Here the terms GDP, income, and value added are used interchangeably. The VAX share and the DDI share add up to one, that is,

$$1 = \frac{VAX}{v} + \frac{DDI}{v}. \tag{1}$$

Value added exports and domestic demand-activated income are calculated on the basis of a multi-regional input-output model. Following the exposition of Stehrer (2012), with minor changes in notation, country r's value added exports are computed as

$$VAX^r = t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{f}^{-r}. \tag{2}$$

Let m be the number of countries included the multi-regional input-output model and n be the number of industries per country. $\boldsymbol{vc}^r$ is an nm-vector of value added coefficients (value added divided by gross output). Only the n elements in $\boldsymbol{vc}^r$ that correspond to country r are non-negative and all other elements are zero. $\boldsymbol{vc}^r$ and all following vectors are column vectors, and $t(\cdot)$ denotes the transposition operator. $\boldsymbol{L}$ is the Leontief inverse, which is of dimension $nm \times nm$. $\boldsymbol{f}^{-r}$ is the rest of the world's final demand vector, which is of order nm. $\boldsymbol{f}$ is the world's final demand vector and $\boldsymbol{f}^r$ is country r's final demand vector, thus $\boldsymbol{f}^{-r} = \boldsymbol{f} - \boldsymbol{f}^r$.

Country r's value added imports are computed as

$$VAM^r = t(\boldsymbol{vc}^{-r})\ \boldsymbol{L}\ \boldsymbol{f}^r. \tag{3}$$

$\boldsymbol{vc}^{-r}$ is an nm-vector of value added coefficients. The elements in $\boldsymbol{vc}^{-r}$ that correspond to the rest of the world are non-negative and the n elements that correspond to country r are zero. The other right-hand-side variables were defined above.

Country r's domestic demand-activated income is computed as

$$DDI^r = t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{f}^r. \tag{4}$$

The right-hand-side variables were defined above.

The rest of the world's final demand vector decomposes into *scale* s^{-r} and *composition* $\boldsymbol{c}^{-r}$. Scale, $s^{-r} = t(\boldsymbol{i})\ \boldsymbol{f}^{-r}$, is the total value of the rest of the world's final demand, a scalar. $\boldsymbol{i}$ always denotes a summation vector of suitable order. $\boldsymbol{c}^{-r} = \boldsymbol{f}^{-r}/s^{-r}$ is the rest of the world's final demand composition; the elements of $\boldsymbol{c}^{-r}$ represent the share of s^{-r} which falls on the output of a particular industry in a particular country. $\boldsymbol{c}^{-r}$ is of the same order as $\boldsymbol{f}^{-r}$ and its column sum is one.

Country r's value added exports decompose as

$$VAX^r = t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{c}^{-r}\ s^{-r}. \tag{5}$$

The first two terms, $t(\boldsymbol{vc}^r)\ \boldsymbol{L}$, jointly summarize the world economy's production technology. A change in value added exports from t to $t+1$ could be decomposed into a technology effect, a final demand composition effect, and a scale effect.

Country r's final demand vector decomposes in the same manner into scale and composition ($s^r = t(\boldsymbol{i})\ \boldsymbol{f}^r$ and $\boldsymbol{c}^r = \boldsymbol{f}^r/s^r$). Country r's value added imports decompose as

$$VAM^r = t(\boldsymbol{vc}^{-r})\ \boldsymbol{L}\ \boldsymbol{c}^r\ s^r. \tag{6}$$

A change in value added imports from t to $t+1$ could be decomposed into a technology effect, a final demand composition effect, and a scale effect.

Country r's domestic demand-activated income decomposes as

$$DDI^r = t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{c}^r\ s^r. \tag{7}$$

A change in domestic demand-activated income from t to $t+1$ could be decomposed into a technology effect, a final demand composition effect, and a scale effect.

Here we decompose changes in value added exports into *structure effects* and *scale effects*. The first three terms, $t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{c}^{-r}$, jointly summarize the world economy's structure. For a given level of the rest of the world's final demand, the world economy's production technology and the rest of the world's final demand composition jointly determine the remuneration of producers in country r. Given the world economy's production technology and the rest of the world's final demand composition, the level of the rest of world's final demand determines the remuneration of producers in country r.

It is convenient to introduce the notation $str^{-r} \equiv t(\boldsymbol{vc}^r)\ \boldsymbol{L}\ \boldsymbol{c}^{-r}$. The world economy's structure str^{-r} is a scalar (the Leontief inverse is pre-multiplied by the row vector $t(\boldsymbol{vc}^r)$ and post-multiplied by the column vector $\boldsymbol{c}^{-r}$). Value added exports is a product of two scalars, that is, $VAX^r = str^{-r} \cdot s^{-r}$. We will perform an additive decomposition using mid-point weights:

$$\Delta VAX^r = \underbrace{(\Delta str^{-r}) \cdot s^{-r}(1/2)}_{\text{Structure effect}} + \underbrace{str^{-r}(1/2) \cdot (\Delta s^{-r})}_{\text{Scale effect}} \tag{8}$$

The Δ denotes a change in the respective variable from t to $t+1$. The $(1/2)$ denotes the average of the respective variable at t and $t+1$. The structure effect and the scale effect fully account for the change in value added exports. The additive decomposition using mid-point weights is exact, because here there are only two determinants, and intuitively appealing, because the determinants have the same type of weights.[3]

How to interpret the two effects? It is important to recognize that cross-country variation in the scale effect stems largely from cross-country variation in economic structure. Although the level and the change of the rest of the world's final demand does vary across countries – the scale variable represents global final demand minus the respective country's final demand – the cross-country variation is small. After all, a single country's final demand is a small fraction of global final demand. Still, a homogeneous one-unit final demand change in the rest of the world will have a different effect from one country to the next, for the change in scale is multiplied by structure. The given structure determines the extent to which a country's producers are able to benefit from a global demand expansion.

The structure effect quantifies the extent to which a country's producers improve their position in value chains that ultimately satisfy foreign final demand. When the contribution of domestic primary factors increases, value added exports rise for a given level of foreign final demand. In an environment of generally increasing economic integration and stronger interdependence between countries, the structure effect can be expected to be positive in most countries. Some countries are better able to exploit the world market's opportunities than others. [[[applies strictly only to L but not to c^{-r}]]]

Value added imports are decomposed in analogous manner:

$$\Delta VAM^r = \underbrace{(\Delta str^r) \cdot s^r(1/2)}_{\text{Structure effect}} + \underbrace{str^r(1/2) \cdot (\Delta s^r)}_{\text{Scale effect}}, \tag{9}$$

where $str^r \equiv t(\boldsymbol{vc}^{-r})\ \boldsymbol{L}\ \boldsymbol{c}^r$.

[3] See for instance Dietzenbacher and Los (1998) for alternatives to the mid-point-weight-additive decomposition in the case of more than two determinants.

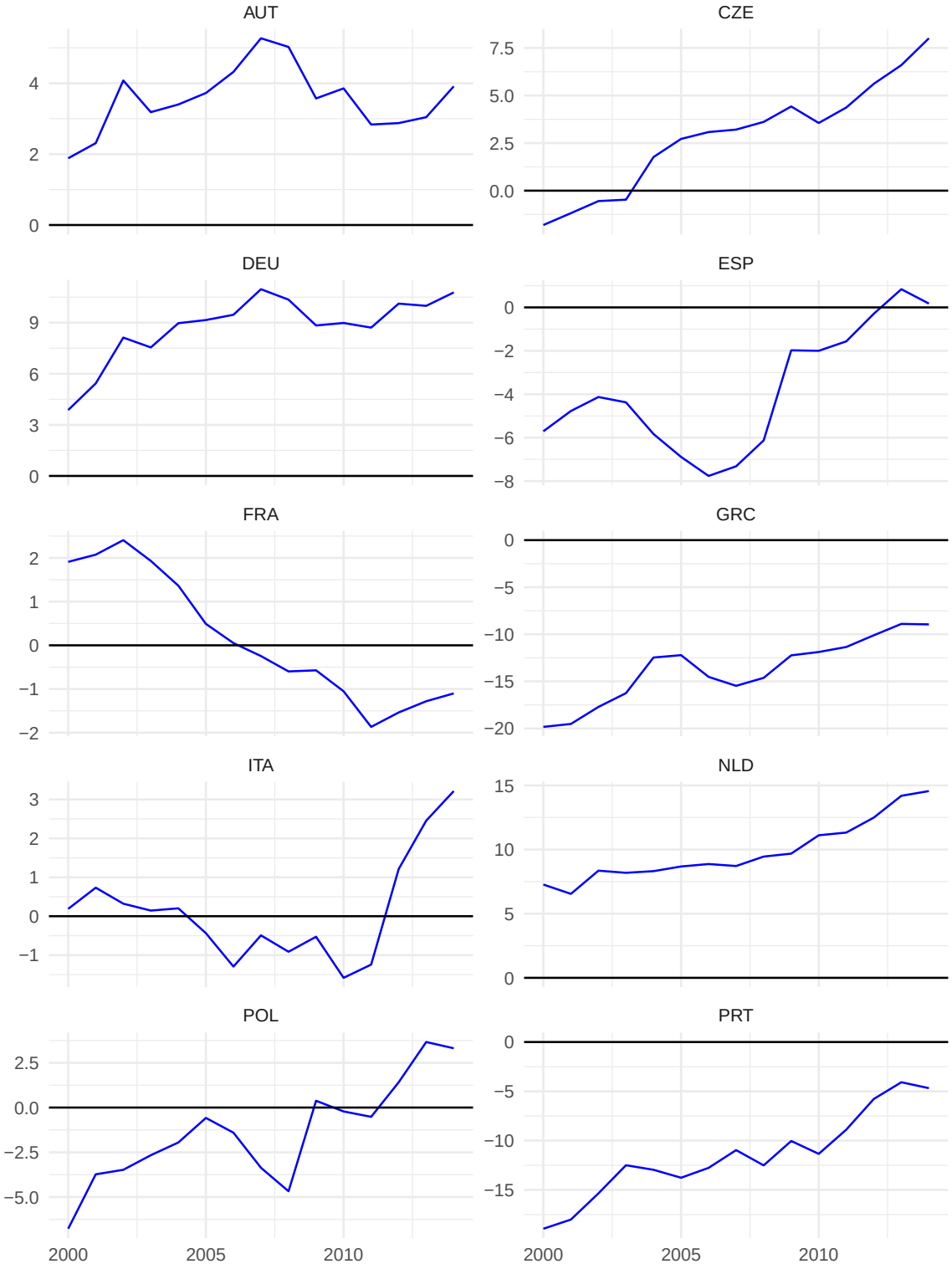
A global multi-regional input-output (MRIO) table is required to operationalize the multi-regional input-output model. Of all existing MRIO tables, the World Input-Output Database (WIOD) currently provides the most recent data (Timmer et al., 2015). The latest year included in the WIOD is 2014. The WIOD's 2016 release contains 43 countries plus a model for the rest of the world ($m = 44$), with 56 industries per country ($n = 56$), from 2000 to 2014. The MRIO table contains the relevant variables: the inter-industry flow matrix $\boldsymbol{Z}$, the gross output vector $\boldsymbol{x}$, the value added vector $\boldsymbol{v}$, and the final demand matrix $\boldsymbol{FD}$. The final demand matrix contains multiple demand categories (gross fixed capital formation, household consumption, etc.) which were aggregated by country to give the country final demand vectors $\boldsymbol{f}^r$. The inter-industry flow matrix and the gross output vector give the technical coefficients matrix, $\boldsymbol{A} = \boldsymbol{Z}\ \hat{\boldsymbol{x}}^{-1}$, and the technical coefficients matrix gives the Leontief inverse, $\boldsymbol{L} = (\boldsymbol{I} - \boldsymbol{A})^{-1}$, where $\boldsymbol{I}$ is the identity matrix. All entries in the MRIO table are measured in current US dollars and were converted to euros using market exchange rates.

3.2. Results

In principle the trade balance in value added terms equals the trade balance in gross terms. In practice there are differences. One difference is that the WIOD's input-output tables are expressed in basic prices while conventional national accounts are expressed in purchasers' prices. The trade balance shown in figure 1 therefore slightly differs from the trade balance in conventional national accounts. The figure shows the full time span covered by the WIOD, and the results that follow further below are based on this data. Note that in 2014 Greece and Portugal were still running trade deficits near or in excess of five percent of GDP. In contrast, France and Spain's trade accounts were approximately balanced in 2014 (the French deficit stood slightly above one percent). Italy recorded a healthy surplus of three percent. The Czech Republic is included among the deficit countries because it recorded a deficit on the current account in 2007, but the country is running surpluses on the trade account since 2004. The three surplus countries showed no signs of imminent reversal in 2014.

Table 2 presents the results of the decomposition. There is a high correlation between the growth rate of value added exports and the growth rate of gross exports. The stylized facts of gross trade flows in the period from 1999 to 2007, which are well known, therefore carry over to value added trade flows from 2000 to 2007. Between 2000 and 2007 Greece's value added exports grew by nearly as much as the Czech Republic and Poland's value added exports. Portugal and Spain's value added export growth was higher or close to Germany's value added export growth. In the light of this rather impressive export growth, it is difficult to sustain the argument that Greece, Portugal, and Spain's main problem in the euro period was rooted in a deterioration of international price competitiveness. This point had previously been made with reference to gross export performance (Gaulier and Vicard, 2012; Kang and Shambaugh, 2013, 2016; Schröder, 2016); it applies equally to the value added export performance. The disappointing value added export performance in France and Italy, on the other hand, could be interpreted as evidence of competitiveness problems.

The international fragmentation of supply chains increased from 2000 to 2007. It is therefore not surprising to find that the importance of domestic primary factors engaged in



Source: WIOD. The value added trade balance is calculated as value added exports minus value added imports divided by GDP, that is, $TB = (VAX - VAM)/v \cdot 100$.

Figure 1: Value added trade balance in percent of GDP, 2000-2014

Table 2: Decomposition of trade in value added

	AUT	CZE	DEU	ESP	FRA	GRC	ITA	NLD	POL	PRT
2000-2007:										
Exports	54.0	140.1	57.9	52.5	23.3	103.3	34.4	38.8	112.9	83.2
Structure	34.7	114.8	37.9	34.3	6.8	80.6	16.9	20.8	89.6	61.7
Scale	19.3	25.3	20.0	18.2	16.5	22.7	17.5	18.1	23.3	21.4
Imports	38.5	107.3	23.6	66.8	37.8	53.8	39.1	32.5	80.5	22.7
Structure	8.6	8.0	12.5	-2.6	3.2	-1.6	6.8	-2.8	14.7	-3.3
Scale	29.9	99.2	11.1	69.4	34.7	55.3	32.3	35.4	65.8	26.0
2007-2014:										
Exports	16.4	29.9	17.6	15.6	14.7	-7.2	7.4	30.0	69.6	24.6
Structure	-19.7	-8.0	-19.5	-21.4	-22.1	-40.1	-28.6	-8.3	26.0	-12.6
Scale	36.0	37.9	37.1	37.0	36.8	32.9	36.0	38.3	43.5	37.3
Imports	22.1	15.7	19.5	-20.1	19.4	-32.4	-11.1	13.6	35.5	-5.6
Structure	4.1	10.0	3.6	-8.9	8.6	-4.7	-5.8	14.7	12.6	1.8
Scale	18.0	5.6	15.9	-11.3	10.9	-27.7	-5.3	-1.1	22.9	-7.3

Source: WIOD. The rows "Exports" and "Imports" report the percentage growth of value added exports and value added imports, measured in current euros, from t to $t+1$. The rows "Structure" and "Scale" report the results of an additive decomposition using mid-point weights, expressed in percent of the respective trade flow at t. The structure effect and the scale effect together fully account for the growth of the respective trade flow.

the production of goods and services that ultimately satisfy foreign final demand increases. The structure effect is positive in each of the ten countries considered. The effect's size varies: the two Eastern European member states record the largest structure effect, and Greece is not far behind.

The Czech Republic and Poland show the best value added export performance in the adjustment period as well. The French and Italian export performance remained weak. Greece's exports collapsed along with its economy. Again, this pattern correlates with gross export growth. Note that the scale effect is positive in each of the ten countries considered – although some countries in Europe and outside experienced stagnation, the rest of the world's final demand was still growing. [[[discuss relative size of structure effects in euro period and in adjustment period]]]]

4. Trade-Balancing Level of Domestic Demand

Here we analyze the level of domestic final demand that is consistent with balanced trade. Recall that the trade balance in value added terms is equal to the trade balance in gross terms, that is, $TB = VAX - VAM$. To proceed, first substitute the variables that make up value added imports, then assume that trade is balanced,

$$0 = VAX(t) - t(\boldsymbol{vc}^{-r}(t))\ \boldsymbol{L}(t)\ \boldsymbol{c}^{r}(t)\ s^{r}(*)\,, \tag{10}$$

and solve for $s^r(*)$, which is the level of domestic final demand that balances trade. Beware that the t outside a bracket denotes the transposition operator and the t inside a bracket denotes the time index. When all time-indexed variables take on their actual values, $s^r(*)$ is uniquely determined. $s^r(*)$ may rise or fall over time because value added exports change, the value added coefficient vector changes, the Leontief inverse changes, or country r's final demand composition changes.

Global final demand in 2014 was greater than in 2008. The higher the rest of the world's final demand, the higher will be the level domestic demand that balances trade, all else being equal. Maintaining balanced trade becomes easier when the rest of the world's final demand rises. To isolate changes in economic structure from changes in the scale of final demand, decompose value added exports into the constituent variables and hold fixed the scale of the rest of the world's final demand:

$$0 = t(\boldsymbol{vc}^r(t))\ \boldsymbol{L}(t)\ \boldsymbol{c}^{-r}(t)\ s^{-r}(t=2008) - t(\boldsymbol{vc}^{-r}(t))\ \boldsymbol{L}(t)\ \boldsymbol{c}^r(t)\ s^r(**)\,. \tag{11}$$

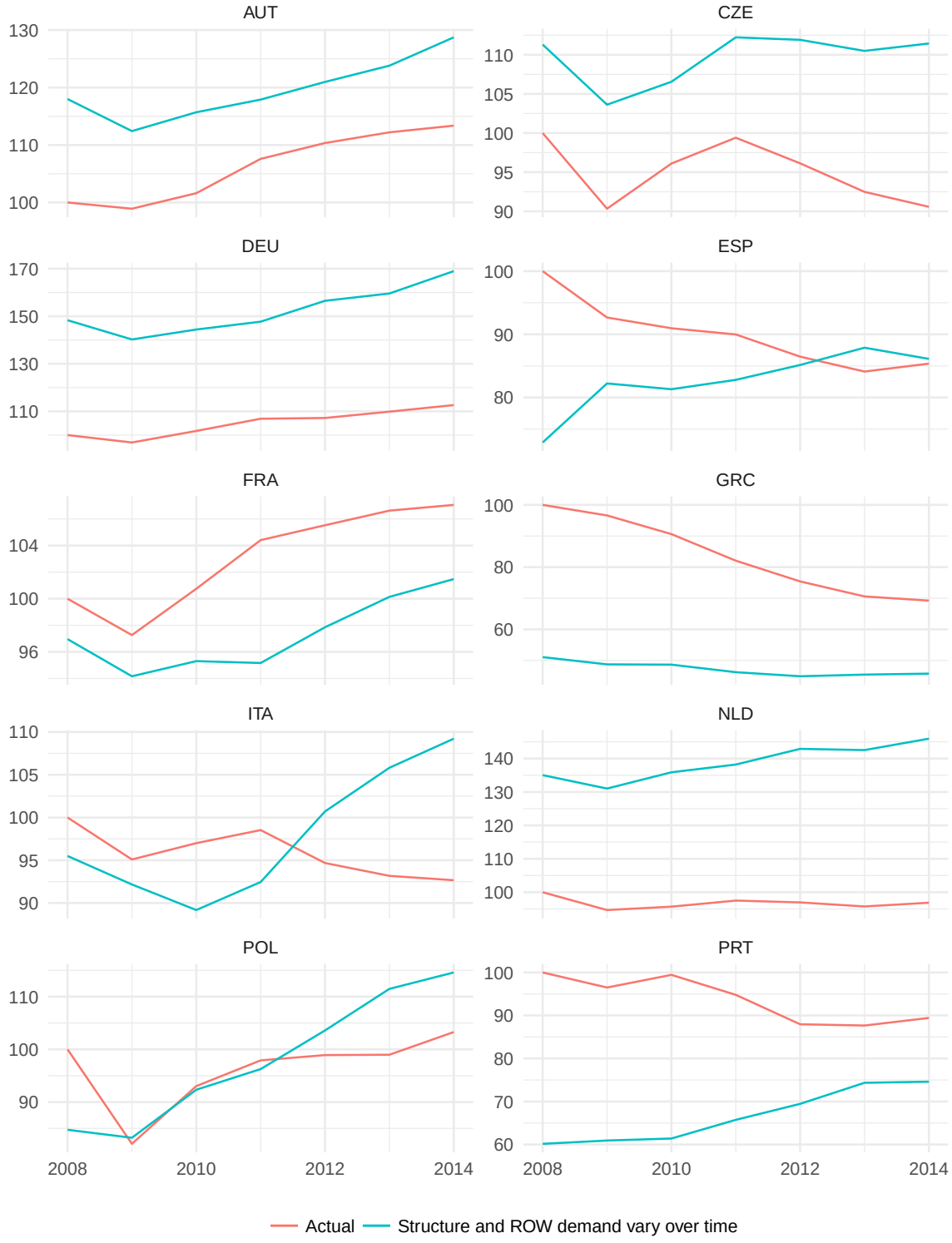
This equation can be solved for $s^r(**)$, the level of country r's final demand that would balance trade at the 2008 scale of the rest of the world's final demand.

When domestic and foreign producers switch their input expenditure from a foreign supplier of intermediate goods to a domestic supplier, this will be reflected in a change in the world's production technology ($\boldsymbol{vc}\ \boldsymbol{L}$). Value exports will rise and value added imports will fall – $s^r(*)$ and $s^r(**)$ increase as a result of expenditure-switching effects. When domestic and foreign end-users switch their consumption expenditure from a foreign supplier of final goods to a domestic supplier, this will be reflected in a change in the final demand composition vectors ($\boldsymbol{c}^r$ and $\boldsymbol{c}^{-r}$). Again, value exports will rise and value added imports will fall – $s^r(*)$ and $s^r(**)$ increase as a result of expenditure-switching effects. Changes in the world's production technology and the final demand composition vectors are structural changes, which here are distinguished from mere changes in scale. An increase in the scale of the rest of the world's final demand will increase $s^r(*)$ but not $s^r(**)$. Excluding changes in scale, $s^r(**)$ captures structural changes, that is, it captures expenditure-switching effects.

Figure 2 presents the trade-balancing level of final domestic demand from 2008 to 2014. The red line represents actual final domestic demand in current euros, normalized to 100 in 2008. The blue line represents $s^r(*)$, expressed in percent of actual final demand in 2008. With the exception of Greece, the trade-balancing level of final demand (the blue line) was rising everywhere. While this rise is undoubtedly good news, it might simply reflect the fact that the world market was still growing, in spite of the global trade collapse in 2009 and the following global trade slowdown. The world market was larger in 2014 than in 2008.

When there is a trade surplus, the blue line is above the red line; when there is a trade deficit, the blue line is below the red line. In Italy and Spain, the blue line is below the red line at the beginning of the adjustment period and above at the end. After all, the two countries managed to turn a trade deficit into a trade surplus. Yet the movement toward external balance did come at the expense of internal balance. In 2014 the unemployment rate stood at 13 percent in Italy and 24 percent in Spain.

Germany's blue line is far above its red line; in 2008 for instance, Germany's trade-balancing level of final demand was approximately 50 percent higher than actual final demand. To be clear, this result does not support the counterfactual claim that 50-percent higher domestic demand would have balanced the German trade account in 2008. In the case



Source: WIOD. The red line represents actual final domestic demand in current euros, normalized to 100 in 2008. The blue line represents the level of final demand that would balance trade under the assumption that the rest of the world's final demand and the world economy's economic structure take on their actual time-varying values ($s^r(*)$ defined in equation 10), in percent of actual final demand in 2008.

Figure 2: Trade-balancing level of final domestic demand, 2008-2014

of a massive demand boom, the ceteris paribus assumption would be violated. Economic structure would change. Relative wage and price inflation as well as hard production bottlenecks, for instance, would bring about expenditure switching away from German products. The 50-percent difference between actual and trade-balancing demand does suggest that the German trade surplus would easily survive a robust domestic expansion, if not by 50 percent, then arguably by 15 or 20 percent.

Did the deficit countries manage to effect structural changes in their favor, or did they merely benefit from the expansion of global final demand? The red line in figure 3 shows $s^r(**)$, normalized to 100 in 2008. $s^r(**)$ declined everywhere except in Poland, where it was falling from 2008 to 2012 and then rising again from 2012 to 2014 to the level observed in 2008. The figure does not show it, but it is important to note that the Czech Republic and Poland did experience a sharp increase in $s^r(**)$ from 2000 to 2008; the year 2008 represents a structural break in these countries. Further, there are fast-growing low-wage economies – China is the prime example – that experienced an even sharper increase in $s^r(**)$ throughout the whole period from 2000 to 2014. In contrast, in this sample of European countries, if global final demand was constant, domestic demand would have to shrink in order to maintain balanced trade. The European economies can maintain balanced trade only when final demand expands faster in the rest of the world than in Europe. Where slow domestic demand growth is a necessary condition for balanced trade, the growth prospects over the medium- and long-run are dim.

Relative wages and prices did adjust over 2008-2014: the deficit countries tended to experience relatively low wage and price inflation and the surplus countries relatively high wage and price inflation (not shown). Balance-of-payments theory predicts that the relative price adjustment observed over 2008-2014 should have induced a switching of expenditure away from surplus countries toward deficit countries. There is no clear pattern in the cross-country distribution of structural change. For instance, in Germany and Spain, two countries with opposite unit labor cost developments, the change of $s^r(**)$ from 2008 to 2014 is broadly the same.

5. Conclusion

The evidence presented suggests that the European economies benefited from the growth of global final demand from 2008 to 2014. There is little evidence to indicate that the deficit countries managed to bring about structural change in their favor, that is, they could not induce a switching of expenditure away from surplus countries toward deficit countries. The trade balance adjustment from 2008 to 2014 is largely due to Europe's slow final demand growth relative to the rest of the world. The trade deficits at the onset of the crisis were shrinking over the adjustment period because final demand growth was slower in the European deficit countries than in the surplus countries.

The euro area imbalances took a long time to build up, and they will take a long time to unwind, even now, ten years after the global financial crisis. The economic policy straitjacket which the euro member states have knitted themselves certainly does not speed up the re-balancing process. Currency devaluation, trade subsidies, tariffs, and quantitative restrictions on imports – none of these expenditure-switching policies is available. The only expenditure-switching policy that remains at the disposal of national governments in the

Source: WIOD. The red line represents the level of final demand that would balance trade under the assumption that the rest of the world's final demand stays at the level of 2008 and the world economy's structure takes on actual time-varying values ($s^r(**)$ defined in equation 11), normalized to 100 in 2008.

Figure 3: Trade-balancing level of final domestic demand with ROW final demand held fixed, 2008-2014

euro area is internal devaluation. The relative price adjustment that can be accomplished via the route of fiscal devaluation is quantitatively limited to a few percent. The relative price adjustment that can be accomplished via the route of wage moderation can matter in quantitative terms, but is painfully slow. Higher wage growth in Germany and the Netherlands would help, but the share of these countries in the total trade of deficit countries is moderate. Wage inflation in the North will thus be of limited help.

If the ECB feels compelled to tighten the monetary stance in order to fend off emerging inflationary pressure, wage inflation in the North will quite possibly hinder adjustment. The low policy rate translates into low effective borrowing rates for indebted firms and households. Countries with large negative net international investment positions – Greece, Portugal, and Spain – benefit from the reduced debt service burden. A tighter monetary policy stance, when it arrives, will increase the private sector's debt service burden and reduce the post-interest income potentially available for investment and the upgrading of productive capacity, making re-balancing more difficult.

In a few labor-intensive and price-sensitive industries, wage moderation might support international competitiveness. But there is really no reason to expect that wage moderation encourages the development of new, innovative industries producing high-value goods and services, or vastly increases the sales of such industries where they already exist. Wage moderation is best thought of as a policy of *real income moderation* that affects the *scale* of final demand, and its first-order effect with respect to trade balance adjustment consists in the compression of imports for consumption purposes. The prime example is Germany, where the wage moderation started in 1995, and the emergence of the trade surplus can be largely attributed to the weakness of domestic demand before the crisis (e.g. IMF, 2015).

The deficit countries do need to align real incomes with productive capacity, at least roughly, and wage moderation is one way to get there. A more desirable way of re-balancing, of course, would be an increase in the productive capacity. Easier said than done. A good starting point might be the exemption of all public investment expenditure, or certain categories of public investment expenditure, from the tight rules of the Fiscal Compact (Truger, 2015; Feigl and Truger, 2015; Aiginger, 2016). Yet the structural transformation of the European deficit countries in socially desirable directions, in particular the development of green technologies, will require greater ambition in economic policy making. Efforts to formulate a modern industrial policy for Europe should be strengthened (Aghion et al., 2011; Rodrik, 2014; Mazzucato et al., 2015; Altenburg and Rodrik, 2017).

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A. Data Sources

AMECO Annual Macro-Economic Database of the European Commission's Directorate General for Economic and Financial Affairs. http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

WEO World Economic Outlook, April 2017, International Monetary Fund. http://www.imf.org/external/pubs/ft/weo/2017/01/weodata/index.aspx

BOPS Balance of Payments Statistics, International Monetary Fund. http://data.imf.org

WIOD World Input-Output Database, 2016 Release (Timmer et al., 2015). http://www.wiod.org/release16