A FAIR SOLUTION OR PURE THEORY: PRICE ADJUSTMENT IN THE EMU

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ABSTRACT

The expected results of price adjustment have been lying at the core of recent internal devaluation policies in Europe's Economic and Monetary Union (EMU), and stretch back to the questions of common monetary policy. Price changes have been presented in the literature as an important channel of adjustment of asymmetric developments, making common monetary policy more sustainable. However, price flexibility and its effects cannot be taken for granted in reality. Thus, this paper aims to empirically investigate the size of price changes and their effects on intra-area trade in the EMU after 2010. Notably, we examine two questions. The first is to what extent export prices and domestic prices have adjusted in member states. The second question is whether the observed price changes have sparked recovery via increased market shares of exports and import substitution in the crisis countries. This is investigated by applying decomposition equations to separate these "true" trade outcomes as a starting point. According to our findings, mild effects are partly in connection with the necessity of relying on slowly adjusting prices in the common currency framework. It is therefore advisable to place even greater emphasis on other risk mitigation mechanisms that underpin the viability of the euro.

INTRODUCTION

The relationship between prices and the trade balance is of particular relevance in monetary unions as it affects the magnitude of risks inherent in common currencies. The euro crisis has been traced back, at least in part, to uniform monetary conditions by many authors (see most prominently Stiglitz 2016). In a situation where the drawbacks of having a single currency can be deemed plausible, empirical research is needed to uncover the performance of possible mitigating mechanisms. Price changes are among those naturally coming to mind as a channel of adjustment, i.e. getting members' actual output patterns more aligned. This paper aims to examine this channel in the post-crisis EMU by addressing two questions. First, we investigate to what extent intra-area export prices and domestic prices have changed at all. Second, the trade impacts of the observed price movements are estimated.

This twofold analysis is structured as follows. The next two chapters present the key problem: the basic challenge of common currencies and the potential role of prices in solving that issue. The chapter thereafter introduces our approach (decomposition equations) to measure trade performance in this specific context. The second half of the paper includes the empirical application. After a brief description of the scope, data and the applied logic, we analyse the price changes in question. Then panel econometrics is utilized to uncover the relationship of prices and trade performance. The paper ends with drawing conclusions.

THE THREAT OF COMMON CURRENCIES

Single currencies have been attracting much attention particularly since the beginning of monetary unification in Europe. The starting point of this literature is the inherent risk of common currencies (Mundell 1961; McKinnon 1963; Kenen 1969; De Grauwe 2012). Joining a currency area involves the loss of the own nominal exchange rate, and more broadly, much less space for monetary policy customization. This can have its consequences, likely even in the case of small, open economies which are often thought of as having little room for individual monetary action anyway (Boros 2017). In a monetary union, any short-term adjusting effect of nominal exchange rate movements is by definition impossible (in relation to co-members). Furthermore, the central bank responsible for setting a single monetary policy may face a dilemma – which is in itself inescapable.

If members are at the same time affected by asymmetric shocks or are in opposite phases of the business cycle, no optimal interest rate decision can be made. An interest rate hike is supposed to tackle inflation in booming economies, but worsens unemployment in recessive ones, exerting deflationary pressure. Conversely, an interest rate cut, while suitable to avoid the latter outcome, would inflict more inflation on economies already experiencing price increases. The stalemate is less obvious, but still exists if actual economic developments are symmetric throughout the area, but magnitudes differ.

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The impacts of this bad feedback are even more striking when considering macro-financial links. A rate too low for parts of the area threatens with over-indebtedness and asset price bubbles in those economies. A connected problem intrinsic in monetary unions is that credit tends to be extended by co-members, substituting for external financing (Hale and Obstfeld 2014). This is primarily due to lower transaction costs of intra-area financing and the absence of nominal exchange rate risk. As a result, credit risk is mostly run by partners, triggering a zone-level crisis if the endogenous incentive to pile up debt results in defaults eventually. (Note also that debtors without a background of monetary independence are often seen to be more prone to debt crises. This is because they seem not to be able to create money completely on their own [De Grauwe 2013].)

RISK MITIGATION BY PRICE ADJUSTMENT?

According to the literature of currency areas referenced so far, flexible price adjustment can be one of the "tools" to avoid the trap. This view has also gained ground in the European Commission's proposals for "structural reforms" after the crisis (EC 2015). In theory, price changes compensate for the loss of the nominal exchange rate as they analogously influence exports and imports and so, output (at least in the short run). Price decreases, as part of the so-called internal devaluation, are expected to create relative price advantage for the subset of members in recession. This helps to restore symmetry, freeing the central bank from its dilemma. To be precise, more exports and less imports may also be achieved merely through "more moderate price dynamics" in economies in need of recovery. That is, price decreases are not necessary if other economies performing relatively better see their price levels increase.

One can argue that it is uncertain to what extent prices adapt and influence trade balance. This is exactly what this paper seeks to examine. It is essential to have empirical insight into this as internal devaluation policies also have their severe drawbacks. Although we do not focus on wages here, it must be kept in mind that price developments considerably rely on wage changes. Therefore, "standard internal devaluation", both as a market process and a policy, can be hardly exempt from nominal wage cuts (or freezing nominal wages at best).

The consequences of relying on the moderation of wages and prices are manifold. First, adjustment tends to take time, due to the short-term rigidity of prices discussed in macroeconomics (De Grauwe 2012). The time factor gets even clearer when compared with the speed of exchange rate changes of floating currencies. Second, downward adjustment is "painful" what in fact partly explains its slow pace (beyond standard reasoning like costs of repricing and long-term contracts). Krugman (2011) and Stiglitz (2016) point out that even though possibly desirable at the macro level, wage and price cuts have immediate adverse impacts at the micro level, namely on firms' revenues, business continuity and survival. This is largely connected to financing. Given the procyclicality of financial intermediation, stable revenues are crucial for firms not to lose day-to-day financing. However, price reductions typically decrease revenues until sales rise sufficiently (provided that this happens as foreseen by theory). Moreover, less revenues make debt servicing more burdensome as nominal debts are unchanged. (And bad loans could further aggravate the credit crunch.) Customers may be discouraged to order from firms struggling to survive even if they could shop at favourable prices (Stiglitz 2016). Third, this depressive process is not constrained to the tradable sector. By contrast, exchange rate adjustment, in itself and directly, does not change the income of the non-tradable sector, neither does it affect the servicing of debts denominated in domestic currency.

These immediate recessionary effects and vicious circles have prompted research to evaluate the outcome of the recent internal devaluation efforts of some eurozone members. Examples include Malliaropulos and Anastasatos 2011, 2013; Uxó et al. 2014; Kersan-Škabić 2016; Villanueva et al. 2018). Most of them are understandably concerned with austerity measures forced by EU-IMF creditors as a no-other-way policy. However, it must be highlighted here explicitly that downward wage and price adjustment is not only a matter of policy. It is also an automatic market process: recession, in its most forms, is expected to involve falling/stagnating prices as a matter of course. This can prove to be an "automatic stabilizer" in a currency union *if* it is both quick *and* highly effective to create competitive advantage. If so, no hard and socially unjustifiable policy action would be put on the agenda in most recessive episodes and immediate bad consequences would be provisional. Thus, the question is in large part about flexibility and elasticities.

DETECTING "TRUE" TRADE PERFORMANCE

What makes it difficult to measure these characteristics is first of all the correct determination of trade performance in this special regard. Price changes aim for substitution in favour of goods and services of particular economies. Nonetheless, "headline" export and import figures also reflect impacts other than this. Changes of demand, both aggregate and for certain product groups, are key determinants of trade data, but reveal no information on choices among competing offers of different suppliers (i.e. economies in this case). To assess the results of internal devaluation, only this latter is of interest.

Not all studies pay attention to this distinction. Among those that do so, Malliaropulos and Anastasatos (2013) focus on overall market shares of exports. While this approach truly helps to filter out the change of aggregate demand, it does not allow to get rid of changes of demand for particular product groups. This is because the overall

market share of a particular exporter can still increase even if there is no change in its shares in any submarkets, *but* its exports are concentrated on products selling better than the growth of total demand. Uxó et al. (2014) and Villanueva et al. (2018) separate the impacts of demand and price-induced substitution by controlling for both in model equations.

This paper is even more straightforward on the separation of demand and substitution effects by directly quantifying the contribution of aggregate demand, composition and relative competitiveness to trade performance. In case of exports, this decomposition relies on Equation (1) (see Oblath 2010):

$$\Delta X = X^0 \frac{\Delta M}{M^0} + \sum_{j=1}^{J}\left[x_j^0\left(\frac{\Delta m_j}{m_j^0} - \frac{\Delta M}{M^0}\right)\right] + \sum_{j=1}^{J}\left[x_j^0\left(\frac{\Delta x_j}{x_j^0} - \frac{\Delta m_j}{m_j^0}\right)\right] \qquad (1)$$

In general terms, X refers to the total real exports of an exporting country, sold in a specific target market. M refers to the total real imports of that target market (i.e. a chosen set of importing countries). As such, M represents the overall demand of the target market. As usual, Δ denotes the change between two consecutive periods of time, with 0 marking the earlier period. Product groups are indexed by j = 1, …, J. So, x_j means the export volume of product group *j*, sold by the exporting country in the target market ($\sum x_j = X$), and m_j refers to the import volume of product group *j*, purchased by the target market (regardless of the source, $\sum m_j = M$). For product groups, any classification can apply that covers the whole spectrum of traded goods and services. (See the next chapter on the classification used in this paper.)

Equation (1) separates three channels of change in export volumes. The first term on the right-hand side captures how exports of the country in question would have changed due to aggregate demand exclusively (all other things being equal). The second term reflects the composition effect, i.e. how much of the change in exports has happened because the exporter had set up capacities to produce kinds of goods lately selling better than other kinds (ceteris paribus, i.e. with unchanged market shares). Note that similarly to the first, this component embodies demand effects. Notably, it accounts for changes in demand for certain product groups, which can differ from the aggregate. This difference favours the exporting country if it has been specializing in products with currently above-average demand growth. Hence, this effect does *not* come from more competitive offers relative to others of the same kind, but from "lucky" export composition. In contrast, competitive advantage is captured by the third term, the so-called "export competitiveness effect" (*XC*). It sums up the gains and losses in export volumes purely attributed to increased or decreased market shares in different product markets. XC is key to measuring the impact of internal devaluation because it can only become positive if exports manage to outperform demand growth for at least some product groups. In other words, to produce positive XCs, exports must expand to the detriment of competitors. And this is exactly what marks the success of internal devaluation.

Imports can be decomposed by analogy with Equation (1). Equation (2) is created for this purpose:

$$\Delta B = B^0 \frac{\Delta F}{F^0} + \sum_{k=1}^{K}\left[b_k^0\left(\frac{\Delta f_k}{f_k^0} - \frac{\Delta F}{F^0}\right)\right] + \sum_{k=1}^{K}\left[b_k^0\left(\frac{\Delta b_k}{b_k^0} - \frac{\Delta f_k}{f_k^0}\right)\right] \qquad (2)$$

In general, B denotes the total real imports of a country (hereinafter importer), and b_k refers to its import volume of product group *k*, accordingly ($\sum b_k = B$). Demand for imports is represented by the domestic use (F) of the importer (i.e. the sum of final consumption expenditure and gross capital formation). Imports of product groups are matched with corresponding categories of domestic use (f_k, $\sum f_k = F$, see the practical application later). The analogy with Equation (1) is clear. Here, the first term measures the extent to which change in imports is attributed to the overall rise or fall of domestic use. It is especially important to filter this effect out when evaluating internal devaluation episodes as those take place in recessionary times when demand indeed decreases. While this in itself may "help" to restrain imports and "control" the external position, it has nothing to do with relative price advantage. This fall in imports would occur anyway, independently from relative prices. Similarly, composition effects (the second term), in relation to the possible rearrangement of spending on different kinds of goods, are largely a matter of consumer needs and trends and current income constraints on the one hand, and inland production capacities on the other hand. This second term separates the impact which comes from different patterns of demand for product groups of different relevance within imports, while assuming that the imports/domestic sales ratio is unchanged. We are interested, however, in the change of this ratio, i.e. the growing purchase of domestic products instead of imported ones of the same kind. This "import substitution effect" (*MS*) is captured by the third term.

SCOPE AND METHOD OF ANALYSIS

The post-crisis EMU is a "great" field of research to investigate the relationship between prices and trade. This is not only because internal devaluation policies had to be applied by some members at the insistence of EU-IMF creditors. It is also because the differences in the drop of economic activity have created a (repeated) situation not perfectly ideal for single monetary policy. While there was a common need for monetary easing in the tense years, questions on its magnitude and duration have been indeed raised since then. Surely, the South has

been in need for any further boost, may it come from a truly effective price advantage.

So, the question arising here is twofold. First, the evolution of prices has to be examined to evaluate the size and speed of the adjustment after the eruption of the euro crisis. Second, the relationship between prices and trade performance shall be explored. For this purpose, we utilize XC and MS as dependent variables in the respective panel equations. In case of XC, the target market is the eurozone as intra-area adjustment is of our primary interest. (Besides, nominal exchange rate movements of the euro would otherwise blur the picture.) Similarly, MS relies on imports from the euro area. Product groups correspond to the Broad Economic Categories Classification (BEC) in all cases. Data on trade, including price indices, are derived from Eurostat's E-COMEXT database. Additional data on services are gathered from Eurostat's main statistical tables and in case of one time series, from IMF statistics.

PRICE ADJUSTMENT SINCE THE CRISIS

Export Prices

To evaluate overall export price developments, the weighted averages of yearly price changes of exported goods and services are calculated for all EMU members for each year between 2010 and 2017 (see Table 1 for regional averages). Weighted averages are calculated in the following way. For price changes of exported products, we use the unit value indices of intra-area exports given in the E-COMEXT database per country. To capture price changes of exported services, we are only able to use the Eurostat service producer price index (SPPI) covering many, but not all types of services (e.g. accommodation and food services are not included). (Databases provide chain-linked indices, 2010=100. Based on them, we calculate yearly indices both in the case of products and services.) Weights for producing the averages of these price changes correspond to the goods /services ratio in the respective member's intra-area real exports in the given year.

Table 1: Yearly Average Price Changes of Intra-EMU Exports, %

Reg	Years, 2010-2017							
	10	11	12	13	14	15	16	17
Med	3.3	4.1	1.4	-0.9	-0.5	-0.4	-1.0	3.4
Core	3.7	5.8	2.2	0.0	-0.4	0.3	-1.0	3.8
East	6.1	7.4	1.5	-0.5	-1.5	-1.2	-1.2	4.7

Med: CY, ES, GR, IT, PT + IE; Core: AU, BE+LU, DE, FR, NL; East: EE, FI, LT, LV, SK, SI.

The three EMU regions have been basically exhibiting the same pattern regarding the directions of change. Exporters in all regions were on average showing moderate price dynamics for intra-area sales between 2012 and 2016. Still, there were differences, even though slight, indicating the internal devaluation efforts of the Mediterranean countries and Ireland. While most of their price reductions were less pronounced than those of the East (partly also in crisis), moderation was noticeable relative to the Core (and somewhat more so without Ireland). Price decreases were the most apparent in Cyprus where average price cuts reached 3% p.a. every year between 2013 and 2016. Greece and Portugal recorded a decline of at least 1% in two years. Compared to Austria and Germany displaying stagnating or slightly increasing export prices in the same period, this can be deemed as more restrained price dynamics.

The same relative patterns are observed when excluding fuels and lubricants, i.e. the most obvious examples of commodities among the main BEC product groups used (Table 2). It is worth noting that non-fuel exporters have tended to get away with less price reductions in all regions, including the South plus Ireland. This points to price inflexibility/price smoothing behaviour which can be underpinned by market structure (see Encaoua and Geroski 1986) or more generally, supply-side factors such as participation in well-established supply chains, creating switching barriers or the prioritization of less price sensitive clients. In the Mediterranean, the abovementioned price cuts of Greece and Portugal virtually disappear when fuels are dropped. Although actual reductions remain only in Cyprus, core countries still retain slightly stronger price dynamics for the most part. In theory, this provides a chance for rearranging market positions which is examined in the next section.

Table 2: Yearly Average Price Changes of Intra-EMU Exports, Excluding Fuels and Lubricants, %

Reg	Years, 2010-2017							
	10	11	12	13	14	15	16	17
Med	2.6	3.4	1.1	-0.5	-0.2	0.8	-0.2	2.6
Core	3.1	4.5	1.7	0.4	0.4	1.7	0.1	3.3
East	4.2	5.7	1.1	0.1	-0.7	1.0	-0.3	4.1

For regional coverage, see Table 1.

To conclude, the moderation of the Mediterranean and the Irish export prices was slow and not meaningful in itself (except for Cyprus). It only started in 2012-2013 after the first waves of the euro crisis had already been causing severe slowdown, in continuation of 2008-2009. Small changes were spanning over years. Beyond market structure considerations, this underlines the possible role of firms striving to maintain prices in times of severe debt problems and bank loans drying up.

Import vs. Domestic Prices

This subsection examines the differences between average changes in import and domestic prices (Table 3). This is to uncover whether there has been an incentive to switch to domestic goods and services in countries facing internal devaluation. Intra-EMU import price indices are

calculated as weighted averages of price changes of goods and services imported from the eurozone, excluding fuels and lubricants. For products, unit value indices of intra-EMU imports from E-COMEXT are used. Developments in prices of imported services are again proxied by SPPI, or more precisely, SPPIs of EMU partners weighted by their share in service imports. Weights again correspond to the goods/services ratio in intra-EMU real imports. Domestic price indices cover producer prices in industry and the importer's own SPPI, weighted by shares in gross real value added. We choose producer prices instead of CPI because inland trade would distort the comparison with import prices. It can be reasonably assumed here that domestic distribution channels affect prices of goods and services of any origin in the same manner, so prices at source are of key importance. Besides, though relevant in many aspects, we do not account for the import content of domestic production here as internal devaluation requires inland players to "pick up the tab" anyway when it comes to encourage final import substitution.

Table 3: Average Difference between Indices of Intra-EMU Import Prices and Domestic Prices, percentage points

Reg	Years, 2010-2017							
	10	11	12	13	14	15	16	17
Med	0.6	0.3	-0.5	1.6	1.4	2.6	3.0	0.7
Core	1.0	1.6	0.6	0.9	1.1	2.2	1.3	1.2
East	0.8	0.0	0.3	0.3	0.2	3.3	2.4	0.8

For regional coverage, see Table 1. Positive values indicate stronger average dynamics of import prices (i.e. higher increase or smaller decrease compared to domestic price changes).

Note that on average, import price indices surpassed domestic ones in all regions in the whole period, except for the Mediterranean and Irish average in 2012. In line with still increasing export prices at the same time (see Table 2), this may also point to the observed delay of price moderation in the wake of the crisis. From 2013 to 2016, however, domestic price levels in the South and Ireland were evolving much more moderately than import prices, compared to any other parts of the EMU (and this holds even more so when disregarding Ireland). With a one-time exception of Greece, the difference remained positive in the South throughout the period, often reaching as much as +2 percentage points. These results entailed actual *decreases* of inland producer prices (more than 1% on yearly average in all 5 countries). That is, falling unit revenues became reality for a substantial part of Mediterranean producers during that time. The biggest price advantage of domestic production can be recorded in Cyprus where the difference between price indices exceeded +4.5 percentage points (and the domestic price level decreased by at least 2.5%) in 3 out of the 4 years in question.

In sum, price developments of the South in terms of imports have turned out to be more notable than those of exports. The next section also studies whether this has proved to be enough to invoke import substitution gains.

THE RELATIONSHIP OF PRICES AND TRADE PERFORMANCE

Prices and the "Export Competitiveness Effect"

To check the basic "tenet" of internal devaluation, i.e. the relationship between prices and export performance, we first calculate the "export competitiveness effect" (*XC*) for intra-EMU exports for every single euro area member. This means that the decomposition in Equation (1) is separately carried out for each member as an exporting country, with the target market being the other member states. The values of XC are then put into a panel equation as the dependent variable, regressed on yearly export price changes (discussed in the previous chapter). (Note here that throughout this paper, we apply chain-linked indices to get trade volumes. Moreover, fuels and lubricants are excluded. To account for differences in size, components of "true" trade performance are expressed as a ratio to real GDP.)

XCs help to clarify the picture for sure. Total export data would automatically lead to the conclusion that internal devaluation has been successful as Cyprus, Greece, Italy, Portugal and Spain all increased their intra-area real exports in most years of relative price moderation (2013-2016). However, we record negative XCs for Greece, Italy and Portugal for 3 years in this period, meaning that their exports lost relative ground in EMU markets in aggregate terms. Still, we should be cautious to draw conclusions at this point since values need to be examined in the context of the complete data set. (For example, some other EMU members also fell behind at the same time: Austria, France and Germany display negative XCs in 3 years, too.) This is why we look at panel results.

Working estimates have indicated different behaviour on the part of the Mediterranean economies regarding the relationship in question. (The coefficient of the price variable has turned out to be positive for the whole data set, switching to negative when restricting data to the South.) Therefore, we introduce a dummy variable (*Med_dummy*), taking the value of 1 in case of Cyprus, Greece, Italy, Portugal and Spain, and 0 otherwise. This dummy is used to create an interaction (*Interact*) with the price index marking the yearly average change of export prices (*XP*, %). We start with a full model containing both contemporaneous and lagged (t-1) values of XP and their respective interactions. Keep in mind that for the sake of staying focused, we do not use any other non-price explanatory variables in this study which means that impacts identified here could be smaller indeed. After testing for conditions for fixed- and random-effects models and backward selection based on the Akaike Information Criterion (AIC), we adopt the model shown in Table 4.

It is salient at first glance that this model (with minimum AIC) does not include the contemporaneous variables. Put otherwise, it is prominently the preceding year's

Table 4: Fixed-Effects Model for Intra-Area Exports

Dependent variable: XC (as % of real GDP)			
Indep. var.	**Coefficient**	**Std. error**	**p-value**
Constant	-5.48	5.51	0.322
XP_lag1	0.13	0.06	0.040**
Interact_lag1	-0.24	0.13	0.064*
LSDV R-sq: 0.235; Within R-sq: 0.050; Betw. R-sq: 0.105			
No. of observations: 119; No. of groups: 17; No. of years: 7			

MT excluded due to data gaps. BE and LU considered together. Data coverage: 2010-2017. Without fuels and lubricants. Variables: *XC*: "Export Competitiveness Effect" based on Equation (1). XP: Price index marking the annual average change of export prices (%). XP_lag1: 1-year lag of XP. Interact_lag1: interaction of XP_lag1 and Med-dummy. Med-dummy = 1 in case of Cyprus, Greece, Italy, Portugal and Spain; 0 otherwise.

average price change which affects the current market position of exports. This underscores the relevance of time discussed earlier. It points to the probable difficulties of customers (especially businesses) in adapting to perceived price changes, e.g. getting information on new suppliers and products, integrating and testing new inputs, contracting etc. Nonetheless, *this* part of slowness would be possibly the same if nominal exchange rates existed. The problem lies more in the pace of price adjustment itself. In case of slow price changes, impacts estimated here are fragmented over years. This is of course even more disadvantageous if the effects are small and/or curtailed by counteracting intra-group characteristics.

Regarding the latter, our model suggests the existence of such impediments. In economies other than the Mediterranean ones, price *increases* are expectedly accompanied by an improvement in export competitiveness. This may be a hurdle in cases like the recent crisis when higher prices of one group ought to catalyse the sales of other exporters. Even though we obtain a negative coefficient for the interaction (meaning that the price index has indeed a negative sign in case of the South), this impact could be boosted were it not for the difference in question.

The positive sign of XP may be surprising from a demand perspective, though less so when considering the supply side. As suggested above, firms reasonably tend to expand in markets and segments where they can push through higher prices. If this effort goes along with good product quality and other perceived benefits for customers (such as recognisable brand names and distribution channels), companies can end up with selling at above-market growth rates in spite of their prices creeping up. Such characteristics are less typical for the South (see Malliaropulos and Anastasatos 2011). Product group level data shows that the growth of non-Mediterranean sales of capital goods, transport equipment and services was at least 2 percentage point higher than that of import demand for these items in most of the period. This coincided with stronger price dynamics of these very sales.

As for effect size, estimates reveal a 0.13 percentage points rise in XC in the Core and East, expected in case of a 1% average increase in their export prices. By contrast, a 1% rise of the price level of Mediterranean exports results in a drop of XC by 0.11 percentage points, or what is the same, a 1% price decrease should come with a boost of 0.11 percentage points. To evaluate the magnitude of these two coefficients, it is reasonable to compare them with the respective values of XC. In the Core and East, country averages range from -0.48% for Belgium and Luxembourg and 1.56% for Slovakia. Here, an addition of 0.13 percentage points is not really remarkable for the most part. In the South, we record country averages between -0.12% (Greece) and 0.35% (Cyprus), i.e. an additional 0.11 percentage point is not negligible in this sense. (This impact on exports might have been more impressive were it not for the unfavourable starting point in terms of price competitiveness as a result of pre-crisis developments.) The effect size is similar to what was found by Villanueva et al. (2018) in case of Spanish exports between 2010 and 2017 (+0.36% volume increase *in exports* for 1% decrease in export prices). However, when it comes to the key idea of macro level output smoothing, these magnitudes could produce meaningful results only in case of uncommonly vast price movements, coming preferably in one step.

Thus, our conclusion regarding exports is twofold. On the one hand, we have presented some findings which question the rationale for relying on prices, *but* would be possibly valid even if economies could resort to nominal exchange rates. These involve the reaction time of demand and the role of non-price factors (also indicated by the small explanatory value of our model). Though not specific to currency unions, these aspects are relevant as they may hinder the smooth functioning of the common monetary policy. On the other hand, we have uncovered problems which *are specific* to the single currency, namely the actual unavailability of the benefits of price changes that are though limited, but not excluded. This is because it would take an unrealistic degree of price flexibility to reap them. This forms the real basis of our conclusion, at least in terms of exports, that internal devaluation is not a solution to ground the euro's future on.

Prices and the "Import Substitution Effect"

To check whether internal devaluation has invoked import substitution, MS values are calculated for each member state as an importer. This is carried out by calculating Equation (2) for every member separately,

considering intra-area imports. To determine f_k values, we create pairs of BEC product groups (i.e. product groups of imports) and categories of domestic use. Demand (f_k) for food and beverages, consumption goods and services is represented by corresponding household consumption, while capital goods and transport equipment (considered together) are matched with gross capital formation and household purchases of vehicles. Since demand for industrial supplies (at this level of aggregation) can be proxied only by total inland use, we do not account for composition effects in this single case. The calculated MS data shows that it is Cyprus, Finland, Greece, Malta, the Netherlands and Spain who managed to have negative values for more than 2 years. That is, in 4 Mediterranean countries, domestic products gained certain ground to the detriment of imports.

In Table 5, we relate this to the import vs. domestic price difference (*MP*) specified in the previous chapter. Interactions are again created to detect any possible difference between the South and other members. According to AIC, this full model is retained, meaning that both contemporaneous and lag1 price differences inform substitution decisions. Although only MP turns out to be significant, it must be noted that what we have here is the whole population, not a sample, at least in cross-sections. It is thus not worth overlooking interactions that arrange for favourable impacts for the Mediterranean economies, leastwise regarding signs. Due to them, the final coefficients of the price difference reveal import substitution taking place in case of stronger import price dynamics. So, if Southern import prices evolve to surpass changes of domestic producer prices by 1 percentage point on average, MS is expected to decline by 0.18 percentage points (contemporaneous case) or 0.7 percentage points (lag1 case). Remember Equation (2) showing that a decrease in MS means more moderate import expansion or even a relative shrinkage of imports. Regarding the contemporaneous price difference, the inverse relationship holds for the whole EMU. Interestingly, import demand seems somewhat less elastic in the Mediterranean region in this case, while more so in terms of the preceding year's price developments. Based on the incidence of negative MS values at the product group level, Mediterranean customers switched to domestic products most consistently in case of food and beverages and consumer goods. This can indicate that these economies are better prepared to produce these items anyway and/or customers have traditionally more experience with domestic products of these sorts. At the same time, it was service imports that gained ground most clearly in Austria, Belgium and Luxembourg, France, Germany and the Netherlands. This could have supported Mediterranean exports, but not surprisingly in light of the above, this did not happen to a meaningful extent.

Table 5: Random-Effects Model for Intra-Area Imports

Dependent variable: MS (as % of real GDP)			
Indep. var.	**Coefficient**	**Std. error**	**p-value**
Constant	0.85	0.28	0.002***
MP	-0.30	0.14	0.033**
Interact	0.12	0.22	0.573
MP_lag1	0.06	0.14	0.669
Interact_lag1	-0.13	0.22	0.545
Within R-sq: 0.055; Betw. R-sq: 0.000; Overall R-sq: 0.045			
No. of observations: 126; No. of groups: 18; No. of years: 7			

BE and LU considered together. Data coverage: 2010-2017. Without fuels and lubricants. Variables: MS: "Import Substitution Effect" based on Equation (2). MP: Difference between the annual index of intra-EMU import prices and domestic producer prices (percentage points). Interact: interaction of MP and Med-dummy. MP_lag1: 1-year lag of MP. Interact_lag1: interaction of MP lag1 and Med-dummy. Med-dummy = 1 in case of Cyprus, Greece, Italy, Malta, Portugal and Spain; 0 otherwise.

Note that magnitudes are very similar here as in the case of exports. This result is again in line with Villanueva et al. (2018) who estimated that price elasticity of imports was 0.25% in Spain (for a unit change in domestic/import price ratio). Villanueva et al. (2018) therefore assert that the bulk of import reduction followed from collapsing aggregate demand, and not domestic substitution. The same finding is presented in Uxó et al (2014).

While the conclusion regarding the operability of internal devaluation is quite the same here as in the previous subsection, we should add an auxiliary remark. Even though export and import price effects do not differ in size, some more adjustment can be expected for imports. This is because we find that domestic producer prices of the South adjusted more firmly (in aggregate terms, from 2013) than their export prices. This can point to different pricing behaviour of export- and domestically oriented producers, subject to future research.

CONCLUSIONS

This paper has examined the size and effects of price adjustment in the post-crisis euro area. This topic is highly relevant not just because of the internal devaluation policies that had to be implemented in the crisis countries on creditors' demand, but also because the underlying theory seems to offer a solution to the problem key to currency areas. The essence of this remedy is the smoothing effect that prices could even automatically have on the actual output of members, helping to avoid the trap of common monetary policy. However, instead of adopting this as a standard assumption in a way of wishful thinking, empirical insight is needed.

This paper has aimed to provide such an insight by addressing two questions. First, we have analysed the extent to which intra-area export prices and domestic prices changed in the EMU between 2010 and 2017.

What we have found is rather limited price adjustment, pointing to the possible role of "side-effects" of price cuts. Our second effort has been to measure the impact of the observed relative price changes on export expansion and import substitution. These are of interest as they have been supposed to help members more severely hit by the 2010-2012 crisis to bounce back, creating more sync within the EMU as a whole.

To examine the second problem, it is challenging to find the suitable methodology, especially in terms of measuring trade performance. It is only the market expansion and substitution effects that can be considered as true results of relative price developments. We have separated these effects using decomposition equations. Thereafter, the relationship between the outcome and price changes have been analysed.

Our results show that it is questionable to build far-reaching policies or expectations on price adjustment. This is not only because the effects on trade look to be mild, but mostly because of the observed sluggishness of price adjustment itself. With slow and limited price changes, any effects are fragmented over years. This is less useful for aligning output patterns for more obvious monetary policy decisions. Instead of automatically drawing the conclusion, however, that prices need to be put under even more pressure and/or be made more flexible in general, we should further improve our understanding of whether more price flexibility would invoke any changes to current findings, possibly in interaction with other risk mitigation mechanisms of currency unions. It also follows from this that even more emphasis should be placed on other channels of adjustment, both market and institutional, that underscore the viability of the euro. These include investments in real competitiveness and the early prevention of excessive endogenous risk taking in the financial sector (in relation to the banking union).

REFERENCES

Boros, E. 2017. "Endogenous Imbalances in a Single Currency Area." *Financial and Economic Review*, Vol. 16, Issue 2 (June), 86-116.

De Grauwe, P. 2012. "*Economics of Monetary Union.*" Oxford University Press, Oxford, Ninth edition.

De Grauwe, P. 2013. "Design Failures in the Eurozone – Can They Be Fixed?" *European Economy, Economic Papers* 491 (Apr). European Commission, Brussels.

Encaoua, D. and Geroski, P. 1986. "Price Dynamics and Competition in Five OECD Countries." *OECD Economic Studies*, No. 6, 47-76.

European Commission. 2015. "Quarterly Report on the Euro Area." *European Economy*, Vol. 14, No 4, Institutional Paper 016. DG for Economic and Financial Affairs, Brussels.

Hale, G. and Obstfeld, M. 2014. "The Euro and the Geography of International Debt Flows." *Federal Reserve Bank of San Francisco Working Paper Series*, 2014-10 (Dec).

Kenen, P. B. 1969. "The Theory of Optimum Currency Areas: An Eclectic View." In *Monetary Problems of the International Economy*, R. Mundell and A. Swoboda (Eds.). University Press of Chicago, Chicago, 41-60.

Kersan-Škabić, I. 2016. "Is Internal Devaluation Policy in the EU Effective?" *Economic Annals*, Vol. 61, No. 211, 29-46.

Krugman, P. 2011. "Can Europe Be Saved?" *New York Times Magazine*. 16 January 2011, 26.

Malliaropulos, D. and Anastasatos, T. 2011. "Competitiveness, External Deficit and External Debt of the Greek Economy." *Eurobank Research Economy & Markets*, Vol. 6, Issue 7

Malliaropulos, D. and Anastasatos, T. 2013. "The Improvement in the Competitive Position of the Greek Economy and Prospects for an Export-Led Growth Model." *Eurobank Research Economy & Markets*, Vol. 8, Issue 1

McKinnon, R. I. 1963. "Optimum Currency Areas." *The American Economic Review*, Vol. 53, No. 4, 717-725.

Mundell, R. A. 1961. "A Theory of Optimum Currency Areas." *The American Economic Review*, Vol. 51, No. 4, 657-665.

Oblath, G. 2010. "Hungary's Competitiveness in Global Trade." (In Hungarian) In *Social Report 2010*, T. Kolosi and I. Gy. Tóth (Eds.). TÁRKI Institute, Budapest, 192-212.

Stiglitz, J. E. 2016. "*The Euro. How a Common Currency Threatens the Future of Europe.*" W. W. Norton & Company, New York.

Uxó, J.; Paúl, J.; and Febrero, E. 2014. "Internal Devaluation in the European Periphery: The Story of a Failure." *UCLM Working Paper*, DT 2014/2.

Villanueva, P.; Cárdenas, L.; Uxó, J.; and Álvarez, I. 2018. "The Role of Internal Devaluation on the Correction of the Spanish External Deficit." *Instituto Complutense de Estudios Internacionales Working Papers*, WP05/2018.

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