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THE ENDOGENOUS FEEDBACK OF COMMON MONETARY POLICY AND PRICE ADJUSTMENT IN THE EURO AREA

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EXCERPT OF PHD THESIS

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1 Introduction

The prolonged crisis of the European Economic and Monetary Union (EMU) is one of the most striking economic problems of the past decade. The extraordinary turbulence has occurred in the frame of a financial system which, on the one hand, has been considered as definitely beneficial by the public, but on the other hand, called into question by a significant fraction of economists. Although it is obvious that the euro crisis is linked to the 2007-2008 global financial crisis, the causes of the European developments are rooted deeper. Before the euro crisis, some EMU members (conventionally referred to as 'periphery') piled up huge debts. In some cases, like that of Spain and Ireland, this involved the rising indebtedness of the private sector while in other cases, especially in Greece, it was the state which took out excessive amounts of loans. After the breakout of the crisis, the debts of the two sectors became interconnected and accumulated further together, bringing about a vicious circle. One of the most salient characteristics of the pre-crisis period was that credits were mostly extended by the so-called 'core economies' and first of all, German and French banks. The question naturally arises **whether the existence of the monetary union has contributed to all of these developments.**

Common monetary conditions for a heterogeneous area threaten with the risk that the central bank cannot address the needs of all participating economies at the same time. This is the starting point of the theory of optimum currency areas (OCA) which was largely evoked by the idea of European monetary unification in the last decades of the 20th century. The OCA theory pointed to real economic similarity and particular channels of market adjustment as conditions for avoiding the dilemma of the common monetary policy. However, the euro crisis has revealed that this framework needs to be extended with regard to financial intermediation, credit flows and even the role and meaning of money itself. My dissertation adopts such a wide framework for thinking which is even more important in view of **the conventional crisis management policies prevailing in the EMU after 2010.**

Measures taken by EU and IMF creditors in the 'program countries' (such as cutting pensions, social benefits, wages in the public sector) did not only focus on re-balancing state budgets, but also on 'restoring competitiveness.' Thus, these policies ultimately aimed to decrease wages and prices in order to boost output (through enhancing cost- and price-competitiveness). This is the so-called **'internal devaluation'** which indeed represents one form of **'expansionary contraction'**. Witnessing the slow recovery of several EMU members, one can raise the

question how effective price changes are in smoothing outputs on the macro level.[1] The answer is important not only to evaluate the recent crisis management, but much more because price adjustment can be seen as an automatic market process as well. As such, it may ensure stability for a currency area even without any policy intervention. The OCA theory showed that price changes can help avoid or eliminate endogenous monetary policy feedback by affecting external financing positions (and consequently, output). Therefore**, empirical research is needed to clarify to what extent the EMU can rely on price movements to correct for different economic developments between members.** The answer can help to decide whether internal devaluation (in terms of prices) should be regarded as a key adjustment channel and as such, a basis for intra-EMU macro-economic policy.

I realized the importance of this topic as early as starting my university studies back in 2010. This coincided in time with the eruption of the Greek crisis. Although news about economic crisis was not surprising at all in that time just after the global breakdown of 2008, it could somehow be felt that the European events are not simply spill-overs of the big international bust. So, I first decided to study the topic in my bachelor (BA) thesis which focused on the basic problem of monetary policy feedback and the answers of the OCA theory. During my master's (MA) studies, I gained deeper insight into the phenomenon of global imbalances (sustained or rising one-sided external financing positions of systematically important economies). This helped to enrich my framework for thinking regarding the internal dynamics of monetary unions. In the meantime, EU and IMF creditors forced different austerity measures in the bailed-out countries which focused my attention on the role of relative price changes. I asked myself the above questions about the real-life effects as **political and social tension was surmounting in Europe in the wake of the 'reform packages.'** My thinking has been largely inspired by the works of Stiglitz (2016) and Varoufakis (2017). The dissertation aims to uncover the operability and effectiveness of price changes as an adjustment channel in the EMU. In other words, I examine whether price movements can contribute to more economic sync across the members, according to the experience of the 2010-2018 period.

[1] For simplicity, I often use the terms 'price adjustment', 'price changes', 'price movements', 'price flexibility', 'price dynamics' etc. instead of, but referring to the adjustment, changes, movements, flexibility, dynamics of the price level (prices on average). Note that internal devaluation can impact the economy through several channels. Nonetheless, prices and their substitutional effect regarding exports and imports are one of the most relevant. (Especially because this mechanism is a direct theoretical alternative to nominal exchange rate adjustment.) The dissertation elaborates on price adjustment within the EMU in the first place.

The dissertation capitalizes on the research carried out during my university studies and the doctoral programme. The research has so far yielded three articles, the first of which was published in the Financial and Economic Review in 2017.[2] This forms the basis of *Chapter 2*. The findings of *Chapter 3* have been included in a paper accepted by *Acta Oeconomica* (forthcoming).[3] A further study has been written about crisis management within the euro area.[4] This paper examines a different dimension of intra-EMU adjustment and risk sharing, notable rescue fund established since the euro crisis (European Financial Stability Facility, European Stability Mechanism). Therefore, this paper complements and extends the scope of the research included in the dissertation.[5]

The dissertation is structured as follows. *Chapter 2* goes into the details of **the basic challenge of common currencies**, i.e. the possible consequences of monetary conditions not adequate for all members. The aim is to create a framework for thinking which arranges the key elements of the related literature (OCA theory, endogeneity versus specialization theory, imbalances, market and institutional coordination mechanisms), enabling **to investigate the background of the euro crisis.** The Chapter namely strives to uncover this background empirically: having overviewed the birth of the EMU and its institutional grounds, it estimates a panel model to identify the possible relationship between Taylor-rule residuals and foreign credit exposures. The last part of the Chapter reviews the fulfilment of the OCA criteria and some connected institutional reforms of the recent years to establish the future prospects for avoiding the endogenous monetary policy feedback in the EMU. (This excerpt presents the key points and findings of the parts of *Chapter 2*, and similarly in the case of *Chapter 3*.)

Chapter 3 examines **two related questions of price adjustment.** The first question is how export prices and domestic producer prices evolved in each member state between 2010 and 2018. The second asks whether the observed price changes were able to bring about better export performance (higher shares) in the internal market and promote import substitution, **supporting** the recovery of the periphery and consequently, **a more aligned conjunctural**

[2] Boros, Eszter (2017): Endogenous Imbalances in a Single Currency Area. *Financial and Economic Review*, Vol. 16, No. 2. (June 2017), pp. 86-116

[3] Boros, Eszter (forthcoming): Internal Devaluation: A Controversial Effort for Adjustment Within the Euro Area. *Acta Oeconomica* (accepted on 21 July 2020).

[4] Boros, Eszter (corresponding author) – Sztanó, Gábor (2020): The Evolution of European Bailout Arrangements and its Impact on Sovereign Bond Yields in the Aftermath of the Euro Crisis. *Society and Economy.* Accepted papers / online fist. Publication date: 3 November 2020.
https://akjournals.com/view/journals/204/aop/article-10.1556-204.2020.00024/article-10.1556-204.2020.00024.xml.

[5] No overlapping texts

pattern for monetary policy decisions (*ceteris paribus*). The dissertation focuses on internal (intra-area) adjustment. The analysis of *Chapter 3* relies upon the discussion of the role of prices in a monetary union, a review of the related empirical literature and the description of the methodology applied. The summary of the conclusions, policy suggestions and an outlook are going to follow in *Chapter 4*.

As it is already clear, **the dissertation takes an empirical approach.** Examining an area consisting of more economies and a period of several years, panel modelling comes as a 'natural tool.' I estimate a couple of panel models throughout the thesis, each of them relating to a particular question or sub-question. Therefore, the details of the actual methodology, data and data sources, variables and transformations are always discussed 'on the spot', i.e. in the corresponding chapter. (The dissertation includes a comprehensive list of data sources which is, however, not included directly in this excerpt.) Similarly, literature reviews closely related to specific questions can be found in the corresponding sections.

The most important results and conclusions of the dissertation are the following:

RESULT 1

According to the EMU members' individual base rates implied by the Taylor rule in the years preceding the crisis (2000-2007), there were always economies which would have required stricter or looser monetary conditions compared to the prevailing interest rate set by the European Central Bank (ECB). My calculations of retrospective Taylor-rule residuals suggest that the ECB interest rate was too low for the Mediterranean countries and Ireland. (But at the same time, higher interest rates could have been questioned from the viewpoint of other members.) This mismatch coincided with the rising external indebtedness of the periphery. The panel model shows that this was not pure coincidence: the discrepancy between individual needs and the ECB interest rate contributed to the accumulation of debts. Consequently, the endogenous feedback of the uniform monetary policy (or in a slightly broader sense, the existence of the euro as it was) cannot be disregarded when explaining the eurozone crisis.

I consider this result as original in part *(i.e. a partly new scientific result) because several authors have outlined the relationship between the uniform monetary conditions and the eurozone debt crisis; however, the empirical approach joining up Taylor residuals and external*

debt dynamics to test for Granger causality is my standalone one. This approach enables the formal empirical examination of one of the main explanations of the euro crisis, and has turned out to deliver a supportive outcome. I regard this insight as material because up to the present day, several economists and decision-makers are convinced that the euro crisis has been solely brought about by the 'irresponsibility' of some member states, violating the Maastricht rules. However, this standpoint does not take into account the role of systemic incentives.

RESULT 2

The overview of the OCA criteria (also with regard to their limitations) shows that the crisis has sparked and reinforced divergence in the euro area. The significance of heterogeneous characteristics and weaker adjustment mechanisms has come to light (at least more obviously than admitted by opinion leaders before). The sustainability of the common monetary policy in the medium term depends on the effectiveness of the institutional reforms under progress, especially the banking union. This effectiveness, in turn, will be ultimately determined by the attitudes towards sharing risks and adjustment burdens at the community level. A true EMU-wide consensus is needed at this crossroads.

I regard this result as original *because it places the OCA criteria in a framework for thinking with regard to the experience of the debt crisis, and leverages them to draw an empirically based, broad conclusion about the prospects for containing one-sided credit flows in the future. The result is also original because there is a relative lack of studies which explicitly highlight the role of the banking union in the early tackling of the risks implied by the harmful monetary feedback. This angle of view enables to re-discuss the common deposit insurance, too, which is the third, albeit still missing pillar of the banking union as envisaged in the aftermath of the crisis.*

RESULT 3

RESULT 3.1

According to data examined in *Chapter 3*, the respective price levels of EMU countries changed only slightly between 2010 and 2018. Moreover, it was not until 2013 that the expected change of price levels appeared (i.e. price movements in line with the tenet of internal devaluation).

RESULT 3.2

The price dynamics of Mediterranean exports were somewhat less strong than those of EMU core exports in the examined period. However, this typically meant only smaller increases rather than factual price cuts.

Cuts in Southern domestic producer prices were more pronounced (however, this decline was rather small and delayed, too).

RESULT 3.3

Adjustment burdens have proved to be asymmetric even in two regards.
On the one hand, they have been unevenly distributed between domestic producers and those supplying foreign EMU markets (i.e. exporters). Inland producers have been less able to fend off deflationary pressures compared to their exporting peers.

On the other hand, regions have also borne different proportions of the adjustment burden. A fully-fledged price adjustment requires not only the downward movement of prices in depressive regions, but also the upward movement of those in 'better-off' regions. However, this upswing has not been vivid in the core (such as Germany, characterised by a modest evolution of spending). So, this has been barely supportive for the adjustment efforts of the Mediterranean countries. The potential of internal devaluation has been strengthened rather by the fact that price changes delivered more incentive for import substitution in the South.

RESULT 3.4

Analysis on the sectoral level has uncovered differences between products and services (the latter have a less flexible price level). Furthermore, noticeable downward flexibility could only be identified in the case of industrial supplies.

I consider these results, as they appear here, to be original *for the reason that they provide a comprehensive overview of the related statistics, proxying price effects in different sectors (export, import, domestic). This helps to get an insight into one of the relevant channels of the post-crisis internal devaluation. In some sense, I even think that Result 3 is the most important outcome of my research because it highlights the different nature of adjustment through prices and currency exchange rates. The knowledge of price behaviour, complemented by Result 4, contributes to the identification of the right directions of EMU policies, with special regard to*

post-crisis reforms. (And what is quite the same, it helps find the focal points of further research.)

RESULT 4

RESULT 4.1

Panel models of adjusted exports and imports (corrected for shifts in demand) show that short-term changes of price levels cannot be regarded as effective enough in bringing about substitution between goods and services of different EMU countries. Thus, it can barely contribute to creating more symmetry/sync across members. The relationship between price changes and (adjusted) net exports could not be rejected, but the estimated effects are rather tiny and delayed. Regarding output on the macro level, these coefficients would produce meaningful results only in the case of vast price movements (*ceteris paribus*). (Which, however, have proved to be less likely according to *Result 3*.) With respect to exports, the panel model has also revealed counter-acting intra-area effects which again point to the uneven distribution of the adjustment burden (to the detriment of the Mediterranean periphery). The models have limited explanatory power, underlining the possible role of non-price factors.

RESULT 4.2

Analysis on the sectoral level has been possible in the case of exported products. The impact of annual average price changes has proved to be relevant for fast-moving goods of usually small absolute unit value (e.g. food and beverages, industrial supplies, consumer products). At the same time, there has been no relevant effect on capital goods. Consequently, forcing internal devaluation (or its certain channels) may reinforce low and medium tech specialization in the Mediterranean region.

I regard these results as original *because it has been produced by joining multiple relevant methodological steps, covering a wide panel (17 EMU members and every complete year since 2010) while other papers dealing with the impacts of internal devaluation typically cover one or a few economies with a narrower, country-specific scope. In contrast, the motivation of my research (i.e. to examine a possible way of fending off a bad monetary feedback) puts the analysis of prices in a wider context. This may help drawing more relevant conclusions regarding EMU policies. The results are also unique in the sense that they are dedicatedly focused at the most recent price changes, their speed and impact in themselves.*

My many thanks go to those who have made it possible to create the dissertation and supported me with their experience, knowledge and comments. First of all, I would like to thank Gábor Kürthy, my thesis advisor who has been sharing his expertise with me ever since my earlier years at university, contributing to my thinking with his bright suggestions. I would also like to thank Tamás Bánfi, Professor of Finance for the same reasons. Special thanks go to Gyula Bock, Professor of Macroeconomics and my BA thesis supervisor. He suggested my first readings about common currencies, including the fundamental works of the OCA theory. The elements of the framework which I elaborated under his supervision are still present in my PhD thesis. I thank István Madár, Lecturer in Economic Policy for having drawn my attention to the euro area. I would like to thank Irén Balogh and Viktória Kalmár for making me familiar with statistics, also through the possibility to serve as an undergraduate teaching assistant. Tibor Keresztély and Péter Vékás have helped me a lot with modelling and programming issues, so my thanks go to them, as well. I thank the Central Bank of Hungary, my workplace, for opportunities for professional development, as well as flexible working arrangements. All of this has largely facilitated my research.

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2 The Endogenous Feedback of Common Monetary Policy and its Relevance in the EMU

This chapter goes into the details of the inherent problem of currency unions, i.e. the consequences of uniform monetary conditions not suitable for all members. Thus, the first objective is to create a framework for thinking about the possible endogenous dynamics, incorporating the key elements of the literature on the topic (first of all the OCA theory, convergence or divergence after the introduction of the single currency, internal imbalances, market and institutional coordination mechanisms) (Chapter 2.1).

The elaboration of the theoretical framework naturally raises interest in the question whether the endogenous feedback has been affecting the euro area in reality (and if yes, to what extent and what the consequences are). To get closer to the answer, two more specific questions need to be addressed. (1) Has the uniformity of the monetary conditions contributed to the outbreak of the euro crisis? (2) Has the EMU become more prepared for (or on the contrary, less capable of) sustaining the common currency in the light of the post-crisis market adjustment and/or certain institutional reforms? An interconnected analysis of these questions is delivered by Chapters 2.2 and 2.3.

Question (1) has already been widely discussed in the literature. Although a clear consensus has not been reached yet, the conclusion of a large part of the related papers can be summarized as follows (Hypothesis 1).

HYPOTHESIS 1

After the introduction of the euro and before the 2010-2012 euro crisis, the needs of the EMU members in terms of monetary policy stance were considerably different. Thus, the uniform common interest rate generated an endogenous feedback, contributing to the rising indebtedness of some economies and ultimately, to the debt crisis.

[Insert *Result 1* here for a direct link between this hypothesis and the conclusions of the dissertation.]

The examination of Hypothesis 1 is all the more crucial because it creates the rationale and background for the narrower focus of the dissertation, i.e. price adjustment (Chapter 3). But staying still here, Question (2) and the related Hypothesis 2 also rely on Hypothesis 1 and its forthcoming conclusions. Regarding Hypothesis 2, the objective is not to discuss particular

steps of the EMU crisis management or certain reforms case by case. Instead, the dissertation aims for a high-level interpretation of the post-crisis developments and an overarching evaluation of the mechanisms supporting the sustainability of the euro. This prepares the detailed study of the impacts of price changes in Chapter 3.

HYPOTHESIS 2

The EMU can only draw upon limited (impaired) market adjustment mechanisms and a confined level of real economic homogeneity to avoid or attenuate the endogenous feedback of the common monetary policy.

[Insert *Result 2* here for a direct link between this hypothesis and the conclusions of the dissertation.]

In what follows, I provide a brief overview of each section of Chapter 2, highlighting the most important points and arguments of my dissertation.

2.1 Monetary Unions: The Inherent Risk of Endogenous Crises

The basic problem of currency areas lies in the fact that members abandon their own currencies, meaning not only the loss of own nominal exchange rates (as a short-term adjustment channel of booms and busts), but also giving up the possibility of any material unilateral monetary policy action. In other words, **participants 'import' a monetary policy which has to take into account the developments of the entire area** (i.e. the area as a whole) (Mundell 1961, Krugman–Obstfeld 2003, De Grauwe 2003, 2012a, 2018). It is a common argument (see e.g. Palánkai 2012), especially in the case of small open economies that monetary conditions cannot be tailored to the individual needs of an economy anyway. While this is true well enough, it must be noted that upon accession to a currency area, even the possibility becomes unimaginable, also as regards any meaningful steps in times of crisis.

Members of a monetary union can either be sovereigns (states) or regions. The difference can be very important, especially as regards the stabilization function of states as fiscal authorities (Giavazzi and Spaventa 2010, CBH 2011). Nevertheless, to overview the basic challenge of currency unions, it is sufficient to refer to 'economies' generally. In this sense, **an economy is a unit characterised by a high level of internal labour mobility and more moderate external flows of labour at the same time** (Mundell 1961).

Giving up monetary independence basically means a sacrifice for economies, which they may decide to accept in exchange for the potential benefits offered by the single currency. So, prior to the discussion of the sacrifice (*Chapter 2.1.2*), the benefits are listed (*Chapter 2.1.1*). Even a list without further details shows that the advantages of a common currency are interdependent, one catalysing the other. Having highlighted both the pros and cons, *Chapter 2.1.3* deals with the OCA theory in the light of the two dominant theoretical approaches of money.

2.1.1 Benefits of Common Currencies

The dissertation goes into the details of the following possible benefits of the membership in a monetary union (references include Tavlas 1993, Frankel and Rose 2002, De Grauwe 2003, 2012a, 2018, Krugman 2011):

- reduction of transaction costs,
- elimination of nominal exchange rate risk,
- enhanced price transparency and competition,
- trade boost,
- certain further risk mitigating effects (and e.g. lower CDS spreads for sovereigns).

2.1.2 The Sacrifice: Exposure to the Risk of Unfit Monetary Conditions

Although the above list of benefits includes different risk mitigating effects, the overall risk outcome of joining a monetary union is dubious (a positive result cannot be taken for granted). Members namely **lose any leeway for unilateral monetary policy action**.

Own exchange rates can serve as automatic stabilizers, constraining external imbalances. (This is because of the standard expectation that exchange rates affect foreign trade and investments. If an economy starts to run rising external deficits, for whatever reason, its currency is likely to depreciate. This depreciation, however, constrains external deficits by encouraging exports and discouraging imports.) In a broader sense, individual monetary policy can play such **a corrective role**, too. This way of rebalancing is lost for any single member of a monetary union as the central bank of the area cannot dedicatedly address any idiosyncratic developments (which are not reflected in the situation of the union as a whole).

Even more plastically, the common monetary policy stance may not be in line with the needs of all members, and this creates an endogenous feedback with **booms exaggerated and/or recessions deepened in some parts of the area** (Mundell 1961, McKinnon 1963, Kenen 1969).

Stronger upswings do not only tend to come with higher inflation, but also with more financial stability concerns, i.e. (external) over-indebtedness and ultimately, insolvencies. Payment difficulties can easily **'bring down' the entire monetary union** even if problems initially show up in certain economies exclusively. This is because a large portion of creditors, incurring losses due to insolvencies, resides in the remaining parts of the area. Hale and Obstfeld (2014) show that reduced transaction costs and the elimination of the nominal exchange rate risk encourage intra-area lending, i.e. **a declining ratio of credit extended from outside the currency area.** Due to financial markets and institutions, gross credit flows (certainly larger than net external financing positions) create extraordinarily complex linkages of different actors (states, banks, private sector) (Acharya et al. 2014, Bracke et al. 2010, Borio and Disyatat 2011, Obstfeld 2012).

An obvious question arising here is about the prospects of reducing the endogenous risks, so that the benefits of introducing a common currency become available for certain sets of economies. The OCA theory aims to solve this particular problem by listing different criteria for market adjustment and economic homogeneity (see them below). In the light of the standard OCA logic, expecting the fulfilment of the conditions before accession, it may be surprising that some authors emphasize an 'on the move' synchronizing effect. Confusingly enough, this approach is called **'endogeneity theory.'** Here, endogeneity refers to the idea that it is the single currency itself which makes the area more homogeneous, more able to pursue common monetary policy in a prosperous way. Evidence or arguments for this is presented, among others, by Artis and Zhang (1997), Frankel and Rose (1998) and Inklaar et al (2008).

This idea of endogeneity is in sharp contrast to the endogeneity issue set out above. The dissertation's problem at hand is aligned with the so-called **'specialization theory'**, suggested by Krugman (1993) and Krugman and Venables (1996). As opposed to the synchronization argument of the 'endogeneity theory', these authors point to the potential divergence in members' economic (industrial) structures. The free flow of capital and the substantial decline in transaction costs reinforce specialization based on comparative advantages. If the participating economies get more specialized, they become more vulnerable to asymmetric shocks at the same time, and the dilemma of the central bank is expected to appear more frequently.

2.1.3 Optimum Currency Areas and Links to the Two Interpretations of Money

According to OCA theory, a currency area can be regarded as optimal if it can avoid the dilemma of the central bank. Kenen's (1969, p. 41) definition is key in this respect: 'If the prevailing exchange-rate regime, fixed or flexible, can maintain external balance without causing unemployment (or, on the other side, demand-induced wage inflation), that regime is optimal.' To achieve this quality, a set of economies aiming to introduce a common money needs to comply with the following criteria as much as possible:

(1) internal labour mobility,
(2) capital mobility and integrated financial markets,
(3) flexibility of wage and price levels,
(4) integrated markets in goods and services (economic openness),
(5) diversified and similar economic (industrial) structures,
(6) synchronised business cycles, similar growth rates and preferences for inflation rates.

The dissertation goes into detail on each of these 'OCA criteria'. Note that items (1)-(3) capture the need for **alternative market adjustment mechanisms** (i.e. other than nominal exchange rates as a substitute for them). In addition, items (4)-(6) draw upon the importance of **homogeneity,** limiting the possibility of unaligned or asymmetric developments. Note also that these criteria are not a comprehensive list of one author, but the collected results of many contributions to what is called OCA theory as an umbrella term.

Although it is not a monolithic strand, the OCA theory can be associated with a particular paradigm in economics, and more narrowly, to a specific interpretation of money. To compare the costs and benefits of a single currency and deciding to introduce it in the case of a positive balance is a true kind of Metallist thinking. Metallists namely hold that the value of money derives from the fact that it can be used as a means of payment (and for other purposes), allowing for the reduction of transaction costs. In this sense, the OCA theory is **a geographical extension of the Metallist view** (Goodhart 1998). More broadly, it can be connected to the **new classical macroeconomics**, stressing rational expectations and the self-correcting nature of markets. All of this actually explains why the OCA theory does not endorse the interaction between the value of money and the state's potential stabilizing role. (There appears only a narrow, rather negatively biased point of view: the fear for 'fiscal alcoholism' as a source of idiosyncratic shocks.) An approach taking into account the tax-collection capacities and fiscal space of the state would be a Cartalist one (see Ábel et al. 2016). That would lead to a very

different view on **'stateless currency unions'** (i.e. different from the Metallist line ultimately reflected in the structure of the EMU) (Barba and De Vivo 2013, Cesaratto 2015). It is possibly not an accident that there have been no examples of spatial separation of monetary and fiscal powers (except for the case of the euro). The state budget is namely a crucial source of (even automatic) adjustment, capable of synchronising conjunctural patterns within its territory (Godley 1992, Feldstein 1992, De Grauwe 2012a). **The type of 'economies' forming a currency union** (i.e. states with own fiscal power or regions being spanned by a substantial federal budget) **is not indifferent in this regard**. In a 'stateless' case, however, the solution may not necessarily entail the creation of a full fiscal union; a reasonable coordination of fiscal policies might also suffice (CBH 2011).

2.2 The Role of Uniform Monetary Conditions in Sparking the Euro Crisis

This chapter examines *Hypothesis 1*. First, *Chapter 2.2.1* is dedicated to an overview of the creation and first decade of the euro, with special regard to macroeconomic and financial developments in the years leading up to the crisis. *Chapter 2.2.2* applies the Taylor rule and panel modelling to interpret these developments and uncover a possible link between Taylor rule residuals and external indebtedness.

2.2.1 The Creation of the EMU and its First Decade Leading up to the Crisis

In this chapter, the dissertation takes a brief overview of the European integration process, starting after World War II, with special regard to the lessons of the exchange rate regimes (applied by the bloc to confine exchange rate fluctuations to promote stability and community trade) and the institutional setup of the common currency. The **three most important conclusions** are the following. Firstly, the permanent pressure on exchange rates made re-valuations unavoidable, signalling (maybe as a harbinger with hindsight) **doubts on the sustainability of fixed arrangements** within this particular set of countries. Secondly, the established EMU framework was characterised by **a strong belief in market efficiency and self-stabilization,** and at the same time, a substantial distrust in the state and government(s) (see e.g. Stockhammer and Sotiropoulos 2014). The creation of **a monetary union without any significant federal fiscal capacity and crisis management tools**, along with setting the Maastricht-type nominal convergence criteria aiming to constrain excessive public spending, are mostly reflections of this mindset. Thirdly and perhaps most importantly, the introduction of the euro as it happened **was not an obviously right step according to its underlying**

theoretical framework, either. Most interestingly, papers adopting the OCA theory usually concluded that the members had not achieved a degree of homogeneity, sync and/or market flexibility to constitute an optimum currency area. Although many believed in the arguments of the 'endogeneity theory', the 'euro project' was indeed set into motion not on economic, but **political grounds.** Briefly, this political ground was the spirit of European integration, suggesting bright prospects on further unity and welfare gains. (See e.g. Krugman 2011.)

Due to enhanced 'financial efficiency' (less transaction costs etc.), the euro could have potentially generated meaningful **benefits,** albeit **estimates on their size, distribution and future dynamics differ to a huge extent** (see Santos Silva and Tenreyro 2010, De Sousa 2011, Mongelli 2013). Anyway, the overall picture gets gloomier for sure if the **macroeconomic uncertainty** brought about by the euro crisis is taken into account, as well. As a continuation of the global financial meltdown, the 2010-2012 EMU crisis revealed problems which, having been accumulated for years, even threatened with the collapse of the common currency. It was the unsustainable levels of debts and burst asset price bubbles in the Mediterranean and Irish economies and the (potentially) unbearable losses of their creditors in the core that made this crisis so specific, going beyond a 'simple' spill-over of the Great Recession. As a background, it is striking that **the introduction of the euro had brought down yields throughout the currency area,** with all EMU government bonds selling virtually at the same yields as the German Bund. Markets were excessively optimistic about the future prospects of the euro, supported by the view that members of a currency union cannot go bankrupt, at least because their peers would anyway rescue them (in spite of an official 'no bail-out clause') (Hankel et al 2010, Surányi 2012, Baldwin et al 2015). **External financing positions getting growingly polarized** (and signalling huge one-sided credit flows from the core to the periphery) were disregarded or, at best, seen as a natural sign of catching-up. The crisis has ultimately made it clear that credit had mostly been used to finance consumption and housing booms, rather than productive investments, causing an 'unhealthy', unbalanced growth in the Mediterranean countries and Ireland. With all the credit risk materialised, liquidity quickly dried up and yields were rocketing for the distressed countries, forcing them to resort to EU and IMF bailouts. However, it is clear that emergency credit also 'rescued' the core economies as much as it did the periphery, averting the collapse of the German and French banking systems in fact.

2.2.2 Analysis of the Suitability of the Uniform Interest Rate Based on the Taylor Rule. Monetary Union and Debt Crisis: Cause and Consequence?

This chapter aims to investigate the background of the euro crisis (sketched above) in a formal empirical way. In other words, the potential relationship between uniform monetary conditions and debt dynamics is tested to uncover whether there was a systemic incentive for some euro area economies to get more and more indebted.

The dissertation resorts to the well-known monetary policy rule, i.e. the **Taylor rule to calculate individually fitting interest rates** for each of the 12 EMU members (first introducing the euro) on a quarterly basis between 2000 and 2007. 'Individual fit' means that only own inflation and GDP data are taken into account for every member. That is, *Equation (1)*, applied for each member separately, yields **an own base rate** (*i*) **which would have been required by a particular country in a given quarter according to its own economic developments.**

$$i = \pi + \alpha_y \cdot 100 \cdot \frac{Y - Y^*}{Y^*} + \alpha_\pi \cdot (\pi - \pi^*) + r \qquad (1)$$

Where

- *i*: base rate (to be set by the central bank as implied by inflation and GDP dynamics),
- π: average inflation rate over the past 4 quarters,
- π*: inflation target,
- *Y*: quarterly real GDP (seasonally adjusted)
- *Y**: trend value of real GDP (linear trend according to Taylor 1993),
- *r:* equilibrium real interest rate (steady state growth rate of GDP, proxied by the growth rate of trend real GDP as suggested by Taylor 1993),
- α_π, α_y: coefficients of the inflation gap and the output gap, both set to 0.5.[6]

Note that the calculation is retrospective in the sense that I use inflation and GDP data already available to determine individual needs for base rates with hindsight. Data has been collected from Eurostat (see *List of Data Sources* for more details).

Own base rates are then used to calculate the so-called **'Taylor-residuals'** (*TR*) for each country (subscript *i*) and each quarter (subscript *t*) based on *Equation (2)*:

[6] The dissertation also applies a Taylor rule with inflation gap only, but it is not presented here because the main panel model relies on the outcome of *Equation (1)* containing both gaps.

$$TR_{i,t} = i_{i,t} - ECB\_base\ rate_t \quad (2)$$

The ECB base rate is the same for all countries in a certain quarter, it is namely the actual common interest rate set by the ECB and effective at the time. *TR* is positive if an economy needed a tighter monetary policy (in terms of the base rate) compared to that of the ECB for the time being. Conversely, *TR* is negative if requiring a looser interest rate level. Accordingly, **a higher value of *TR* means that a certain economy was in need for tightening in a general sense.** The main conclusion of *TR* calculations is that before the crisis, there were always economies which would have required a higher or looser interest rate level compared to the prevailing ECB rate. *TR* values of **the Mediterranean countries and Ireland** were dominantly positive, meaning that **the common interest rate kept on being too low for them** up until the crisis. It was Ireland and Greece displaying maximum *TR* values among the 12 countries, while minimums (in the negative territory) belonged to core countries without exception after the full introduction of the euro in 2002. In other words, **the relatively sluggish performance of the core would have made an interest rate hike unreasonable.** That perfectly sounds like the dilemma of the common monetary policy.

This observation refers to a period when sizeable debts were being accumulated by the periphery as described above in *Chapter 2.2.1*. Rising indebtedness is directly revealed by BIS data[7] on **consolidated claims of foreign banks on counterparties resident in Greece, Spain, Portugal, Italy and Ireland** (each country separately; denoted by $Claims_{i,t}$ below). These time series show that between 2000 and the first quarter of 2008, Greek foreign liabilities increased by 316%. This number is 494% for Spain, 275% for Portugal, 189% for Italy and 601% for Ireland. Exposures to EMU core banks rose by very similar rates and at an even higher pace in Greece. (While the share of core creditors in outstanding consolidated foreign claims on Greek residents stood at 42% in the first quarter of 2000, it jumped to a pre-crisis maximum of 65% in late 2004, and stayed at 55% at the onset of the global crisis in 2008.)

To formally test whether the unfit common interest rate[8] could have contributed to the accumulation of debts, a panel model is estimated as given by *Equation (3)*.

$$logdiff\_Claims_{i,t} = \beta_0 + \beta_1 logdiff\_Claims_{i,t-1} + \beta_2 TR_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

[7] Bank for International Settlements
[8] Unfit for EMU members separately

As it was the countries of the periphery which piled up debts, **the equation is only applied to Mediterranean and Irish data.** Thus, subscript *i* refers to Greece, Spain, Portugal, Italy and Ireland ($i = 1,\ldots, 5$). The calculation involves 32 quarters between 2000 and 2007 ($t = 1,..., 32$). Regarding transformations and lags, the number of observations per variable (N) equals to 150. Foreign banks' claims are included as the dependent variable, reflecting their quarterly growth rates (differences of logarithms). *Equation (3)* takes a form applicable to test for Granger causality as described by Rappai (2011).[9] Here, individual Taylor-rule residuals (*TR*) can be regarded as a Granger cause for the pace of foreign indebtedness if β_2 turns out to be significant. And it is expected to be positive, by the way. If so, common ECB interest rates too loose have provided a systemic incentive for the periphery to take out more loans.

The estimated outcome is the following:[10]

$$logdiff\_Claims_{i,t} = 0.047 - \mathbf{0.266} * logdiff\_Claims_{i,t-1} + \mathbf{0.005} * TR_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

Coefficients which are significant at $\alpha = 10\%$ are indicated in bold. (For a detailed model output, refer to *Annex 1*.) Accordingly, Taylor residuals reflecting the difference between the individual need and the prevailing common interest rate can be considered as a Granger cause for the dynamics of foreign banks' claims on the Mediterranean countries and Ireland. As the coefficient is positive, it can be inferred that **uniform interest rates too lose for the periphery have contributed to the accumulation of liabilities towards foreign banks.**[11] In other words, the relevance of the endogenous bad feedback could not be rejected in the pre-crisis period, **supporting *Hypothesis 1*.**

The dissertation also estimates *Equation (3)* with $logdiff\_Claims_{i,t}$ being the growth rate of core banks' claims exclusively. The results are perfectly in line with those of *Equation (4)*.

As a background and rationale for *Chapter 3*, **the post-crisis results of *Equation (2)*** are of special interest, as well. **Individual needs for base rates also display considerable dispersion**

[9] The dissertation tests the significance of coefficients (here β_2) which, if significant, point to a relationship in line with the definition of Granger causality. Conclusions are then made to suggest the existence or non-existence of Granger causality, although most ideally, this would require longer time series. Nevertheless, the research questions relate to particular time periods spanning over a given number of finished years.

[10] The Levin-Lin-Chu test suggests that both time series are stationary ($\alpha = 5\%$) for all countries involved. Anyway, the test could even have been omitted due to the relatively small number of observations available for modelling.

[11] Remember that a higher TR means that a given country needs a more stringent interest rate level. As all periphery countries had dominantly positive TR values in the examined period, a "higher *TR*" literally implies that the even more tightening would have been required compared to the prevailing ECB rate. According to *Equation (4),* a higher *TR* is expected to come with a higher growth rate of *Claims (ceteris paribus)*, or more simply, with higher levels of foreign claims on the respective economy.

from 2010 onwards. Although the entire area obviously needed monetary easing in the aftermath of the crisis, separate Taylor-rule residuals indicate that this has been required by particular members to a various extent and/or for different time spans. It is well known that the quantitative easing programs of the ECB were most badly needed by some periphery countries back in 2012 when Mario Draghi's 'Whatever it takes' speech (announcing the Outright Monetary Transactions) was the only factor saving the Mediterranean government bond markets from collapsing. Anyway, without going into the details of the ECB's monetary policy, it can be stated that **the EMU periphery has been in need for any further economic boost,** may it come from a (truly effective) price adjustment. So, it is clear that alternative adjustment mechanisms including price adjustment have had a room for manoeuvre to contribute to recovery. *Chapter 3* evaluates the outcomes in this respect.

2.3 Evaluation of the EMU's Performance in Terms of the OCA Criteria

This chapter aims to examine *Hypothesis 2* by providing an overview of whether and to what extent the EMU meets the OCA criteria (as listed in *Chapter 2.1.3*). The analysis also considers institutional factors as a supplement to standard OCA theory. The evaluation indeed helps to answer the question **whether the euro area is and will be able to correct the harmful effects of monetary feedback** (which proved to be relevant in the preceding chapter). As it has already been stated the objective is not to discuss every OCA criterion in great detail. The dissertation focuses on one of them (i.e. price adjustment) in the next chapter. The others are reviewed in this chapter based on a few key variables (time series) which capture the essence of each particular criterion. Emphasis is placed on the post-crisis period to ascertain divergence / convergence in the aftermath of the turmoil.

This excerpt presents the main findings in *Table 1*. **The results support *Hypothesis 2*.** That is, historically high levels of trade, implying substantial market integration, and relatively similar economic structures underscore the idea of using a common currency, but there are **non-negligible differences and rather weak market adjustment mechanisms.** The crisis has prompted and highlighted most of these. The chapter points to the lesson that institutional steps are needed to ensure the positive impacts of some OCA criteria, such as financial integration. The post-crisis EMU institutional reforms under way can be key in creating a more sustainable euro. To this end, **a reassuring consensus is needed about the degree and way of sharing risks and adjustment burdens among the members.**

TABLE 1. AN OVERVIEW OF THE EMU'S PERFORMANCE REGARDING THE OCA CRITERIA

Criterion	Results
Internal labour mobility	• The **dispersion** of unemployment rates was growing for several years due to the crisis, and it has been decreasing slowly since then. • This even holds for well-educated young people, which raises **concerns about labour mobility** (i.e. capability and willingness to move) as sectoral labour shortages (partial demand for labour) exist within the EMU. • What is needed and could be encouraged is an 'organic' flow of labour in more directions and also of temporary kind (instead of ex post pressures and irreversible processes due to large economic breakdowns).
Capital mobility and integrated financial markets	• Accelerated financial integration is not sufficient in itself: it can collapse due to polarized excessive capital flows. An evidence for that is the **defragmentation** of EMU financial markets after 2010. • The most promising **post-crisis institutional reforms** are targeted at financial markets, and they **can support a proactive management of risks related to the endogenous feedback.**
Integrated markets in goods and services	• **Strong integration** of EMU markets in goods and services, even if the relevance of external trade relations has been increasing since the crisis. • Relatively more isolated members in the periphery
Diversified and similar industrial structures	• **Diversified economies** (based on the statistical breakdown used), diversification has proved to be permanent. • One impediment possibly hindering market adjustment derives from the **relatively different shares of industry and services** in members' value added.
Synchronized business cycles	• **Output gaps mostly move in the same direction, but in cross-sections, there is always a substantial dispersion** among the members (positive and negative output gaps at the same time). • Inflation preferences have been proving to be different, and a **deflationary bias** can be observed, mostly due to the limited willingness of Germany and other core countries to spend.

SOURCE: Own edition

3 Price Adjustment in the EMU

This chapter aims to investigate the possible role of price changes in bringing about adjustment within the euro area. The special attention is not only justified by the literature, but also by the practical fact that the expected impact of internal devaluation (including price cuts) has been one of the cornerstones of EU and IMF policies in the 'program countries.' Prices have been put under pressure primarily through cuts in public spending (public sector wages, pensions and social benefits). It is no exaggeration to say that these steps have influenced the paths of several EMU countries for many years, and indirectly, even the prospects of building a consensus on the future of the euro.

The question arising here is twofold: 1) How was the price level evolving in member countries after the outbreak of the euro crisis?[12] *2) What was the impact of the observed price changes on exports and imports? In other words, did price movements result in higher levels of export competitiveness and import substitution in the Mediterranean countries, facilitating their recovery and a more balanced conjunctural pattern within the EMU?*

The questions are visibly focused on the period during and after the euro crisis. This is because these recent developments are most relevant to understand the current economic developments and even more importantly, the debates concerning institutional reforms and the future of the eurozone. In other words, the chapter does not cover the topic of pre-crisis price movements and their contribution to intra-area imbalances. Related comments are made in Chapter 2.2 of the dissertation regarding inflation gaps up until the crisis.

The above questions are discussed in this chapter both on the aggregate and sectoral level (where detailed data are available). Question (1), along with its related Hypothesis 3, is examined in Chapter 3.1. Hypothesis 3 draws upon the assumption of short-term macro-level price inflexibility. As an introduction, the importance of price adjustment is discussed with regard to the inherent risk of currency unions and possible channels of automatic stabilization. Then, actual intra-EMU price developments are reviewed. (Note that a deeper empirical examination of the background of the observed patterns, e.g. a relationship to wages, would go beyond the reasonable scope of the dissertation. Thus, only high-level comments are made in this regard.) Question (2) about the impacts of price changes, as reflected in Hypothesis 4 below, is analysed in Chapter 3.2. This investigation relies on the results of Chapter 3.1 as

[12] Regarding different indicators, see *Chapter 3.1.2*.

price dynamics is included in the estimated panel models as an independent variable. Prior to modelling, a brief literature review is delivered, followed by the description of the own methodology and data sets.

HYPOTHESIS 3

Regarding intra-area prices, price adjustment only happened to a limited extent after 2010 (even in spite of crisis management policies putting downward pressure on prices). The price level decreased only slightly in the periphery while there were moderate price movements in the core, as well. Thus, the Southern and Irish economies could improve the relative price-competitiveness of their products and services only to some degree. Nonetheless, the extent of price inflexibility was not the same in different sectors (industries).

[Insert *Result 3* here for a direct link between this hypothesis and the conclusions of the dissertation.]

As Result 3 shows, the observed slight differences in price dynamics of the periphery and the other parts of the area (especially the core) have provided some chance for rearranging market shares (in favour of the products and services of the periphery). Therefore, the related impacts (potential intra-area substitution effects) can be examined.

HYPOTHESIS 4

The impacts of relative price changes *in terms of eliciting substitution between goods and services of different EMU members* are not substantial enough to change output levels to a meaningful extent. Thus, this mechanism may not be considered effective in promoting short-term economic sync across EMU countries.

This is so even though there are differences between sectors in terms of the price effect.

[Insert *Result 4* here for a direct link between this hypothesis and the conclusions of the dissertation.]

In what follows, I provide a brief overview of each section of Chapter 3, highlighting the most important points and arguments of my dissertation.

3.1 Price Changes in the Euro Area from 2010 Onwards

3.1.1 The Importance of Price Adjustment in Currency Unions

In this chapter, the dissertation goes into detail on how price adjustment can be a solution to the inherent problem of currency areas. The bottom line is that **theoretically, price changes can play the same role as exchange rates could.** Regarding the research focus (i.e. the post-crisis EMU), the most relevant example for this is the following. If a member of a monetary union is in a recession while its peers are not (or to a lesser extent), then its price level is expected to fall, making its products and services more competitive than they would have been at their original prices. The idea is that the recessive members' exports therefore start to expand while its imports decrease. As a consequence, the recession is eliminated. If the member was running external deficits before (and by the way, the recession followed from unsustainable levels of debt), the described price mechanism is also suited to the correction of this imbalance. (Rising exports and decreasing imports reduce deficits or create surpluses.) It must be stressed, however, that a favourable symmetric price adjustment also requires relatively stronger price dynamics (more simply, price increases) on the part of the peers which are doing better. In other words, these economies must be **willing to reflate/inflate.** Another important remark is that this price mechanism **can be an automatic stabilizer.** Thus, policies are important, but ideally secondary, to invoke and facilitate this effect. Such a smooth automatic stabilization function would be helpful for sure, but it must be carefully examined to what extent this channel is operable in reality.

Policies putting downward pressure on prices should be applied only in case of a convincing positive outcome of this investigation, i.e. if prices prove to be both flexible and impactful enough to result in a considerable change in output. Otherwise, **drawbacks associated with price cuts can be severe** (see e.g. Stiglitz 2016). These are related to the fact that workers and businesses see their revenues and incomes fall in the (very) short run while nominal debt burdens remain the same. Shrinking revenues can also hinder access to day-to-day financing due to the procyclicality of financial intermediation (e.g. tightened lending conditions in case of crises). Adjustment through price cuts involves the entire economy, i.e. the non-tradable sector, as well, bringing about general depressive impacts, generally reduced economic activity as a trap if the adjustment is not fast and effective enough. To compare, exchange rate changes typically occur much quicker and do not affect the non-tradable sector directly, nor do they

directly influence the repayment of debts denominated in the domestic currency. This is why the magnitude and impact of price changes must be empirically studied in currency unions.

3.1.2 Price Indices and Data

The dissertation deals with **two kinds of annual price changes on the individual EMU members' level**: first, those of intra-EMU export prices and second, the difference between price changes of intra-EMU imports and domestic output. They **relate to two aspects of internal devaluation:** the first is enhancing 'export competitiveness' (in the sense of expansion in intra-area foreign markets), and the second is relevant in terms of import substitution. The dissertation covers price changes not only on the aggregate, but also the sectoral level. However, this excerpt only goes into detail on aggregate calculations.

The **annual price index of intra-EMU aggregate exports** ($I_{i,t}^{EX}$, denominated later as $XP_{i,t}$) is calculated as follows:

$$I_{i,t}^{EX} = \frac{\sum_{BEC}\left(q_{BEC,i,t}^{EX} * I_{BEC,i,t}^{EX}\right) + q_{services,i,t}^{EX} * SPPI_{i,t}}{\left(\sum_{BEC} q_{BEC,i,t}^{EX}\right) + q_{services,i,t}^{EX}} \quad (5)$$

Where

- i refers to individual EMU members (i = 1,…, 17, excluding Malta and Luxembourg),
- t refers to years between 2010 and 2018 (t = 1,…, 9),
- BEC refers to product groups according to the Broad Economic Categories (BEC) classification, without BEC3 and BEC7,[13]
- I_{BEC}^{EX}: price index of intra-EMU exports of a particular BEC product group,[14]

[13] BEC = 1,2,4,5,6. BEC1: food and beverages, BEC2: industrial supplies not elsewhere specified, BEC4: capital goods except transport equipment, and parts and accessories thereof, BEC5: transport equipment and parts and accessories thereof, BEC6: consumer goods not elsewhere specified. (Groups omitted are BEC3: fuels and lubricants and BEC7: other goods not elsewhere specified.)

[14] Data is collected from **Eurostat's E-Comext database** which **does not contain price indices in a very precise sense, but unit value indices (UVIs).** These are based on the most detailed breakdown of goods, and for each item, the annual change in *trade value per quantity* is calculated. These data are then aggregated, i.e. weighted to approximate changes in the price level (of intra-EMU exports for example). Therefore, **to some extent, UVIs also embody effects other than price changes** (e.g. possible changes in the selection and quality of the underlying products.) **Due to this statistical background, results need to be interpreted more cautiously. However, the dissertation argues that in an overall sense, Eurostat's E-Comext data base is a reasonable choice for the purposes of the research** (not least because any corrections regarding product quality do also raise questions in any cases of modern-day price indexes). Note that **for simplicity, the dissertation refers to "prices", "price indices"** throughout the text, which must be certainly interpreted as relying partly on UVIs.

- SPPI: service producer price index, used to approximate price changes of services,[15]
- q^{EX}: intra-EMU real exports (volumes) of products or services, respectively.

As *Equation (5)* shows, the price index for intra-EMU aggregate exports is a weighted average of price indices of different subcategories of exports, with weights corresponding to export structure. **Data** are downloaded from Eurostat's E-Comext database (trade flows of products and respective indexes), and from Eurostat's central database (trade flows of services and SPPI). Trade volumes are generally produced using trade data at current prices and volume indices. For more details, see the *List of Data Sources*.

In the case of imports, the difference between price changes of intra-EMU aggregate imports and domestic output are calculated. Domestic price changes are captured by producer price indices for products (PPI) and services (SPPI), for which a weighted average is produced, with weights equal to ratios in inland value added. Price movements of imports are treated similarly as in *Equation (5)* for exports. That is, indices for imports per product group and SPPIs of intra-area trade partners are weighted to create an aggregate index. If this index is higher than that of domestic production, then intra-area imports display stronger price dynamics, meaning that inland products and services get closer to a relative price advantage. Theoretically, this incentivizes import substitution and tends to boost domestic output. In this excerpt, page constraints do not allow for the detailed discussion of the calculations and results for import substitution. Thus, **equations regarding imports are not presented in this document.**

3.1.3 Price Changes of Intra-EMU Aggregate Exports

Here, conclusions about the dynamics of annual price indices of intra-EMU aggregate exports (calculated for each member using *Equation (5)*) are summarized. Regarding larger groups of EMU members (Southern and Irish periphery, core, Eastern periphery comprising the Baltic and Central European countries), price indices on average follow quite similar patterns over the course of time (**between 2010 and 2018**). More precisely, **intra-EMU aggregate exports of all regions were characterized by moderate price changes.** However, cross-sections display some variability. **Changes in export prices proved to be relatively more moderate in the Southern and Irish periphery**, overperformed by the core to some extent.

[15] This proved to be the only available measure of price changes of services as no separate index can be found for services exports in databases of international organizations and statistical offices. It must be noted, however, that SPPI exclusively covers services listed in the European Union's regulation on short-term statistics (STS Regulation). This means that unfortunately, it does not account for price changes in tourism, hotels and restaurants.

This in general reflects the efforts of **the Mediterranean countries and Ireland** to spike internal devaluation. Nonetheless, it must be noted that **an actual decrease of export price levels occurred only to a limited extent, with a considerable time lag and for a quite short period** (2013-2014). It was only Cyprus which managed to achieve about 1.5% annual decrease for a longer period of time. (For years between 2013 and 2016, the island recorded an average fall in intra-area export prices of 4.8%, 3.5%, 1.6% and 1.4%, respectively.) Due to generally weak demand and sluggish economic activity, **a considerable upward movement of core export prices did not happen.** Only German and Austrian exports got somewhat more expensive on average, increasing by at least 1.5% in most years between 2012 and 2016.

To sum up, conclusions are twofold here. On the one hand, internal devaluation in terms of true price decreases remained very confined. This most probably points to the relevance of the drawbacks related to falling revenues and overall depressive short-term impacts (mentioned in *Chapter 3.1.1*). Exporting firms must have really stuck to their prices, and this must have been enabled by such factors as competition in target markets, participation in international supply chains etc. On the other hand, and most importantly from the viewpoint of the dissertation, the Mediterranean countries and Ireland still got closer to prices more favourable to consumers. Therefore, **the impacts of their slightly weaker price dynamics can be examined** (*Chapter 3.2.3*). (Conclusions derived from a sectoral analysis can be found in *Result 3*.)

3.1.4 Difference Between Price Changes of Intra-EMU Aggregate Imports and Domestic Output

The dissertation has concluded that **changes in intra-area import prices on average outperformed those in domestic producer prices in most EMU countries,** and thus, in all three regions mentioned above. **The relatively biggest difference, favouring inland production, can be observed in the Mediterranean countries and Ireland** (even if such a difference only started to appear with some delay, in 2013). This difference, potentially incentivizing import substitution, was created by **actual domestic price cuts** (i.e. 'not only' smaller increases relative to the EMU core). (It is especially true in Cyprus where inland producer prices fell by an annual average of 3.2% between 2013 and 2016.) If compared to the above results regarding export prices (*Chapter 3.1.3*), it is clear that **it was the domestic producers (supplying inland markets) who were less resistant to internal devaluation pressures in the South and Ireland.** This, in certain respect, strengthens the common observation that the weakest (i.e. *not* the big exporting companies) had to take most of the

adjustment burden deriving from internal devaluation policies. Nevertheless, **incentives to buy domestically produced goods and services became stronger,** and somewhat **more so in the South than in the core.** Potential impacts on import substitution are examined in the dissertation (in its *Chapter 3.2.4*).

3.2 The Relationship Between Price Changes and Intra-Area Trade Performance

This chapter analysis *Hypothesis 4* to uncover whether the Mediterranean economies, which were most severely hit by the crisis and subsequent internal devaluation pressures, have been able to increase their intra-area trade performance and so, output (*ceteris paribus*), due to their relatively favourable price changes discussed in the previous chapter.

3.2.1 Results and Methodological Insights from Empirical Literature

In this chapter, the dissertation reviews the following papers: Villanueva et al (2018), Uxó et al. (2014), Malliaropulos and Anastasatos (2011, 2013). These authors all aim to establish the impacts of internal devaluation on trade and external financing positions. Most of them focus their attention on the specific experience of one or few countries in the South. This is a point where **the dissertation aspires to take a more comprehensive, wider approach** and carry out an analysis covering all EMU members and each year after the onset of the euro crisis. The literature review takes into account methodological issues, and draws upon the fact that **most of the above papers separate / filter out general demand effects** which could result in misleading results regarding trade performance (market expansion to the detriment of competitors in intra-EMU foreign markets and within the domestic market as a possible consequence of more favourable short-term price dynamics). **The high-level conclusion of this literature review is** that internal devaluation policies have achieved only very limited results in countries such as Spain and Greece. The authors establish that **most of the post-crisis external adjustment** (i.e. reduced deficits) **is attributable to a general fall in aggregate demand** (an overall contraction in spending), bringing down imports, as well. In other words, a decrease in Southern imports (or an expansion of exports) *due to* changing market shares are much less relevant. Thus, price adjustment has only played a marginal role compared to collapsing consumption and investment in the periphery which would have decreased imports anyway.

3.2.2 Methodology: Measuring Relevant Trade Performance and Panel Modelling

As a **first step**, 'true' trade performance (i.e. trade volumes resulting from market expansion exclusively) must be established through a transformation of 'raw' trade data. The result is going to be used as the dependent variable in panel models, which create a link with price changes discussed so far. In the case of exports, corrected volumes called **'adjusted exports'** ($AdjExp_{i,t}$) are produced using *Equation (7)* below. To understand this equation, the **corrective term ($XC_{i,t}$)** must be explained first. Based on Oblath (2010), *Equation (6)* is used to define and calculate this variable:

$$\Delta x_{i,t} = \underbrace{x_{i,t-1}\frac{\Delta M_t}{M_{t-1}}}_{GD_{i,t}} + \underbrace{\sum_{j=1}^{J}\left[x_{i,j,t-1}\left(\frac{\Delta M_{j,t}}{M_{j,t-1}} - \frac{\Delta M_t}{M_{t-1}}\right)\right]}_{STR_{i,t}} + \underbrace{\sum_{j=1}^{J}\left[x_{i,j,t-1}\left(\frac{\Delta x_{i,j,t}}{x_{i,j,t-1}} - \frac{\Delta M_{j,t}}{M_{j,t-1}}\right)\right]}_{XC_{i,t}} \quad (6)$$

Equation (6) decomposes the annual change of the aggregate intra-EMU export volume (x) (excluding BEC3 and BEC7 products but including services) sold by a member state (i). Δ refers to the change from the previous year (t-*1*) to the current one (t). Put differently, *Equation (6)* is separately calculated for each EMU member and each year between 2010 and 2018. It separates changes attributable either to the change in demand or in market shares. Demand is captured by the overall worldwide imports (M) of the target market, i.e. EMU peers. As patterns of demand can be different on the aggregate and the sectoral level, demand effects must be identified on the latter, too (in interaction with the export structure of exporter i). Thus, product groups are also taken into account and they are referred to by index j (j = BEC1, BEC2, BEC4, BEC5, BEC6 and services). Notice that $x_{i,t} = \sum_{j=1}^{J} x_{i,j,t}$; $M_t = \sum_{j=1}^{J} M_{j,t}$.

Accordingly, the components of *Equation (6)* can be interpreted as follows:

- The first component is the so-called 'general demand effect' ($GD_{i,t}$) which shows the extent to which intra-EMU exports of country i would have decreased or increased due to the change in foreign aggregate demand exclusively.
- The second component is called 'structural effect' ($STR_{i,t}$) which shows the extent to which intra-EMU exports of country i would have decreased or increased due to the fact that demand for different product groups could have varied and thus, had different volume impacts in light of the export structure. This is ultimately a composition effect

related to the previous year distribution of exports which is also a given (not related to current market success or failure).

- Finally, the third component capturing 'export competitiveness' ($XC_{i,t}$) is key to the dissertation. It shows the extent to which intra-EMU exports of country *i* would have either decreased because the growth rates of its exports were outperformed by demand in all or most of the submarkets or increased because of the opposite happened. Note that **more moderate price dynamics can be regarded as effective if higher values of $XC_{i,t}$ are achieved.**

XC is used to produce adjusted exports as shown in *Equation 7)*:

$$AdjExp_{i,t} = \begin{cases} NA & if\ t = 1 \\ OrigExp_{i,t-1} + XC_{i,t} & if\ t = 2 \\ AdjExp_{i,t-1} + XC_{i,t} & if\ t > 2 \end{cases} \quad (7)$$

Basically, **original time series of intra-EMU real exports are substituted by new ones** ($AdjExp_{i,t}$) **for each member country.** In these, the initial export volume ($OrigExp_{i,1}$) is corrected so that volumes in $t = 2$ and subsequent years only follow the change reflected in *XC*s (i.e. the volume impact of the overall change in market shares).

A similar correction is made for the original time series of intra-area imports, but that decomposition and correction are not displayed in this excerpt.

The **second step** is the estimation of **panel models** as discussed in the next chapter. All data are collected from Eurostat's E-Comext database and some auxiliary tables on services trade (as already discussed in *Chapter 3.1.2*).

3.2.3 The Relationship of Adjusted Exports and Price Changes

This chapter presents **the main model regarding aggregate exports,** estimated using a panel of 17 EMU countries (*i*) and 9 years between 2010 and 2018 (*t*) (yielding an initial number of observations N = 153). The general form of the equation to be estimated is the following:

$$logdiff\_AdjExp_{i,t} = \beta_0 + \beta_1 logdiff\_AdjExp_{i,t-1} + \gamma_1\left(logdiff\_AdjExp_{i,t-1} * Med_i\right) + \beta_2 XP_{i,t-1} + \gamma_2\left(XP_{i,t-1} * Med_i\right) + \varepsilon_{i,t} \quad (8)$$

The variables *AdjExp* and *XP* have been introduced in the former chapters. For the sake of clarity, the variables are to be interpreted for country *i* in year *t* as follows:

- *logdiff_AdjExp:* the annual growth rate of adjusted intra-EMU exports (i.e. export volumes with a trajectory reflecting the impact of rearranging market shares only) (%),
- *XP:* the annual price index of intra-EMU aggregate exports (%) (see *Footnote 15*),
- *Med:* a dummy variable for the 5 Mediterranean countries (*Med* = 1 if *i* = Cyprus, Greece, Italy, Portugal or Spain, and 0 otherwise). This dummy has been introduced to uncover whether the impact of price changes is different for the Mediterranean region, compared to other parts of the area, or not. Relying on this dummy, interactions with the independent variables (including *XP*) can be created. Interactions are useful because if they are significant, *Equation (8)* **can be practically split** and so, two equations arise. (If *Med* = 1, then $\beta_{1,\text{Med}} = (\beta_1 + \gamma_1)$ and $\beta_{2,\text{Med}} = (\beta_2 + \gamma_2)$.)

Note that instead of a single constant (β_0), there can be country-specific constants in the equation(s) if the estimation of a fixed effects model proves to be necessary according to the relevant panel test (Chow test). Note also that *Equation (8)* takes the form applicable to test for Granger causality as already discussed in *Chapter 2.2.2*.

The obtained results are given in *Equations (9) and (10)* which are a split form coming from estimating *Equation (8)* using panel data described above. ***Equation (9)*** **belongs to non-Mediterranean countries while *Equation (10)* to the Mediterranean ones.**

$$logdiff\_AdjExp_{i,t} = -49.283 + 0.035 * logdiff\_AdjExp_{i,t-1} + \mathbf{0.503} * XP_{i,t-1} + \varepsilon_{i,t} \quad (9)$$

$$logdiff\_AdjExp_{i,t} = 101.376 - \mathbf{0.352} * logdiff\_AdjExp_{i,t-1} - \mathbf{0.989} * XP_{i,t-1} + \varepsilon_{i,t} \quad (10)$$

Significant coefficients are indicated in bold ($\alpha = 10\%$). This is a fixed effects model, so average fixed effects are displayed here as intercepts. (For a detailed model output, refer to *Annex 2*.) XP_{t-1} has proved to be significant for both regions, i.e. annual price changes can be possibly regarded as a cause for intra-area market expansion, with a different exact impact for the Mediterranean countries. In other words, **the relevance of price movements as an adjustment channel cannot be rejected in the euro area,** based on its post-crisis experience. This primarily holds for the South as the coefficient (γ_2) of the interaction between *Med* and XP_{t-1} is

significant even at a 1% level.[16] This suggests that compared to other members, price adjustment is a more effective process/policy for the Mediterranean periphery to correct for idiosyncratic developments. However, its impact is still limited **because the explanatory power of the model is rather scant** (R^2 = 11%). Thus, patterns in intra-EMU export performance must be explained by other, non-price factors to a much larger extent.

It is surprising that **the estimated impacts of price changes have different signs for the two parts of the EMU** examined here. The sign is negative for the Mediterranean countries which corresponds to the logic of internal devaluation. That is, if Southern products and services (to be sold within the euro area) get, on average, cheaper by 1%, the growth rate of adjusted exports will expectedly increase by almost 1 percentage point in the next year (all other things being equal). In short, more moderate price dynamics tend to come with stronger market expansion in the case of Mediterranean businesses. For non-Mediterranean ones, the estimated impact is just the opposite. Loosely interpreted, a positive coefficient means that price increases do not hurt the market shares of exporters resident in the core or Eastern countries. It can be argued that **price effects of different signs reduce the operability of this particular channel of internal devaluation,** or more precisely, make it even more controversial. This is because different signs, i.e. a positive sign on the non-Mediterranean part, suggest **the lack of supportive intra-area patterns** and consequently, an uneven distribution of the adjustment burden. Increases in core and Eastern export prices should namely function as a disincentive to buy their products, in order to make room for other EMU producers bound to internal devaluation. As this is not the case, the Mediterranean countries find themselves in a rather unpleasant situation if **a breakdown similar to the 2010-2012 crisis** is to be corrected (and the remedy is expected to come from price adjustment in the first place). **In such a case, the Southern economies are forced to put a disproportionate pressure on their price levels,** i.e. disproportionate in the sense that they can hardly hope for any additional sales lost by other EMU sellers due to their stronger price dynamics.

It is essential to discuss the **effect size,** too. As stated above, a 1% average decrease in export prices in the previous year is expected to raise the growth rate of adjusted exports by less than 1 percentage point for the Mediterranean countries. (And this impact is even less for the remaining parts of the area: it is only half of a percentage point with the opposite sign.) **It would**

[16] And at the same time, β_2 could even be deemed as insignificant if α were set to be lower because the p-value for β_2 is equal to 8.5%.

take quite sizeable price changes (or several consecutive years) **to achieve truly measurable output impacts** on the basis of these coefficients. However, as the dissertation has uncovered, **such vast price movements are less likely** given the small annual changes of export price levels during the post-crisis period. In sum, the weak relationship and small coefficients found in Equations (9) and (10) **do not allow to regard price adjustment as a primary or material channel for synchronizing output patterns across EMU members.**

It is worth comparing this result to the possible characteristics of exchange rate adjustment in the same context. **The drawbacks of having to rely on prices is the most salient at this point of the analysis:** measurable extra output is namely made quite impossible by the fact that price levels prove to be inflexible. **Exchanges rate changes** are, however, much more vivid and possibly also bigger, which **could result in larger additional amounts of exports even if the same coefficients prevailed for a unit change.**

Note that all effects of price changes mentioned so far are lagged, i.e. if export prices on average decrease by 1% in year *t-1*, the foreseeable extra 1 percentage point growth in adjusted exports is realized in the next year (*t*). The dissertation has also tested **the contemporaneous impacts of price changes** (by complementing *Equation (8)* with $XP_{i,t}$ and its interaction with *Med*), but these **proved to be insignificant.** So, it also takes quite a long time for price changes to generate the estimated small effects (as seen in *Equations (9) and (10)*). **This, again, reduces the attractiveness of price adjustment** compared to exchange rates, and eventually, the attractiveness of common currencies, at least if policy makers stick to pressurize prices and fail to find other ways for synchronization. (See further deliberations on this in *Chapter 4*.)

One last note should be made on *Equations (9) and (10)*. The lagged value of the dependent variable, i.e. the growth rate of adjusted exports has only turned out to be significant in the case of the **Mediterranean countries.** This coefficient is negative, implying that **better export performance in the previous year does not tend to persist** (*ceteris paribus*). This may be explained by non-price factors such as customer experience related to goods / services expanding in a certain period and thus, tried by many for the first time. If satisfaction is low, the expansion can halt. **This negative autoregressive effect can be considered as a drawback in situations requiring internal devaluation** as it is more difficult to produce additional output for longer.

3.2.4 The Relationship of Adjusted Imports and the Difference Between Price Changes of Imports and Domestic Production

Due to page constraints, equations of this chapter are not presented in the excerpt. The title appears in order to reflect the structure of the dissertation in its entirety. All conclusions reached in this part are discussed in *Chapter 4.*

4 Conclusions and Outlook

The dissertation has aimed to contribute to a better understanding of the problem set related to the euro crisis. The 2010-2012 meltdown causing severe political and social tension occurred in a group of countries bundled up by a single currency. Many spectators, ranging from decision-makers to the public and countries in and yet outside the EMU, raise the question whether the monetary union has contributed to the crash and if yes, how this can be avoided in the future. These doubts have been emerging about a financial setup which was widely considered as a major success and one of the engines of Europe up until 2010. To try to address the questions, empirical evidence is vital, informing initiatives of EMU institutional reforms, either already under way or to be discussed. Based on a comprehensive framework and econometric approach, the objective of my research has been to contribute to these deliberations or debates in two respects. First, I have analysed **the possible role of uniform monetary conditions in bringing about the euro crisis.** Second, **the effectiveness of the price channel of internal devaluation,** a possible option for adjustment being at the forefront of EU and IMF 'programs', has been examined. The impacts of wage and price cuts (one form of the so-called 'expansionary contraction') are especially ambiguous. Although the logic of austerity is aligned with some certain mainstream strands of economic thought, its potential for adjustment and welfare impacts can well be questioned. This controversy is even more salient when considering that monetary unions, lacking intra-area nominal exchange rates, can more easily find themselves having to rely on depressed wages and prices. The management of future crises can be either more powerful or calamitous (similarly to the case of 2010-2012), depending on what experts can establish about the effectiveness of internal devaluation. Studying the feedback arising from uniform monetary conditions and the solutions may help raise consciousness on crises which the EMU can be especially prone to.

The dissertation has been striving for an overarching approach which does not only embody the conventional OCA theory and its background of standard macroeconomics, but also the role of

credit flows, financial institutions and the essence of money itself. Accordingly, *Chapter 2* has delivered an overview of the related literature, creating the theoretical framework. At its core, the chapter has discussed **the inherent problem of common currencies**, i.e. the dilemma of the central bank. This lies in the fact that members of a monetary union abandon their own currencies, and this does not simply mean the loss of the own nominal exchange rate (as a short-term channel for adjusting booms and busts), but also giving up the possibility of any material unilateral monetary policy action. In other words, participants 'import' a monetary policy which has to take into account the developments of the entire area (i.e. the area as a whole). It is a common argument, especially in the case of small open economies, that monetary conditions cannot be tailored to the individual needs of an economy anyway (i.e. even if it has an own currency because it cannot divert from the stance set by a handful of globally important central banks). While this is true well enough, it must be noted that upon accession to a currency area, even the possibility becomes unimaginable, also as regards any meaningful own monetary policy measures in times of crisis. The members may accept this in the hope of benefitting from plenty of advantages, most probably the reduction of transaction costs, the elimination of the nominal exchange rate risk, enhanced price transparency, the increase of trade and certain further risk mitigating impacts. Nevertheless, the sacrifice does not simply entail a reduced leeway for autonomous monetary policy action (in theory or actually). Namely, there appears the risk of uniform conditions exaggerating the amplitude of business cycles and the impact of shocks in certain situations. (Or at least, this risk becomes more salient compared to the case of having to adapt to the global stance in general.) The 'imported' area-wide monetary conditions can catalyse unidirectional excessive credit flows and the accumulation of debts. This **endogenous feedback** is referred to as the basic problem of monetary unions. It can materialize in rising private and/or public indebtedness, coupled with asset price bubbles and links between states and banks, contributing to 'vicious circles' later on. Indebtedness in currency areas may well have specific features, one of them being the intra-area concentration of credit risk. Credit is expected to flow from some members to their peers in ever larger proportions. (These peers tend to be of course those for which the prevailing common interest rate is too low, encouraging a credit boom.)

Several **conditions for avoiding and mitigating the basic problem of monetary unions** have been collected by the **OCA theory,** one of the main strands of the related literature. The 'optimum currency area' approach can be easily linked to a particular paradigm in economics, and more narrowly, to a specific thought on the value of money. Born in the 1960s, the OCA

theory makes an effort to determine the range of use (i.e. territory) of a currency based on cost-benefit analysis. Benefits from enhanced 'financial efficiency' must of course outweigh the costs of accepting more instability due to the abovementioned factors. To achieve this positive outcome, the dilemma of the common central bank must be averted – through different **market adjustment mechanisms and aspects of economic homogeneity,** or shortly the 'OCA criteria'. This is in line with the **Metallist view of money** because the common currency is linked to the efforts of markets for cost efficiency. In this sense, the OCA theory is a geographical extension of the Metallist view. This actually explains why it does not endorse the interaction between the value of money and the state's potential stabilizing role. (There appears only a narrow, rather negatively biased point of view: the fear from 'fiscal alcoholism' as a source of idiosyncratic shocks.) All of this indicates that more broadly, the OCA theory is embedded in the contemporary mainstream **new classical macroeconomics,** stressing rational expectations and the self-correcting nature of markets. The linkage is also underscored by the fact that according to some parts of the literature (the so-called **'endogeneity theory'**), the introduction of a common currency could itself facilitate the fulfilment of the OCA criteria. However, this optimist view did not sufficiently take into account the role and disruptive power of excessive credit flows, asset price bubbles and one-sided financing patterns.

Chapter 2 has shown that this approach stressing the superiority of markets exerted significant influence **on the institutional framework of the euro area upon its creation.** What is more, the introduction of the euro as **a marked political objective** in itself supported the selection of certain supportive arguments. In this sense, the euro can be regarded as a political project. Nonetheless, the chapter has also pointed to the advancements of the European integration process which certainly provided a basis for thinking about monetary unification in (Western) Europe. (Even if experiences with different fixed exchange rate regimes had not been convincing at all.) The dissertation has not aimed to go into the details of the institutional structure of the EMU. Instead, the overview of the birth and first decade of the euro served as a basis for examining **the possible relationship between the pre-crisis credit growth and the common monetary policy** (i.e. the fact that uniform monetary conditions were being applied). So, the econometric model in *Chapter 2* has tested for whether the gap between the prevailing ECB interest rate and the individual needs of member states can be regarded as a Granger-cause for the dynamics of external debts.

RESULT 1

According to the EMU members' individual base rates implied by the Taylor rule in the years preceding the crisis (2000-2007), there were always economies which would have required stricter or looser monetary conditions compared to the actual ECB interest rate. My calculations of retrospective Taylor-rule residuals suggest that the ECB interest rate was too low for the Mediterranean countries and Ireland. (But at the same time, higher interest rates could have been questioned from the viewpoint of other members.) This mismatch coincided with the rising external indebtedness of the periphery. The panel model shows that this was not pure coincidence: the discrepancy between individual needs and the ECB interest rate contributed to the accumulation of debts. Consequently, the endogenous feedback of the uniform monetary policy (or in a slightly broader sense, the existence of the euro as it was) cannot be disregarded when explaining the eurozone crisis.

The dissertation has revealed **the financial patterns following the introduction of the euro:** these entailed **polarising external financing positions** and **burgeoning gross credit flows** in the background. The periphery kept on taking out loans, extended mostly by banks headquartered in the EMU core. This was happening in an **environment of extremely low interest rates,** not only due to the global 'liquidity glut', but also to the creation of the EMU which brought down the yields of all participating sovereigns to the level of the German Bund. **Imbalances mostly appeared in the private sector,** and 'only' Greece faced a debt problem originating particularly from public accounts. Due to cheap loans mainly used to finance consumption and real estates, the inflation dynamics of the periphery became stronger, and growth rates started to exceed their longer-term potential levels. Positive inflation and output gaps calculated retrospectively suggest that the Mediterranean countries and Ireland would have needed an interest rate hike by the ECB, but this, at the same time, would not have been justified by the moderate conjunctural developments of other members (such as Germany). According to the estimated panel equation, **the different and unfulfilled needs regarding the common interest rate have proved to be a cause for soaring external debts.** Therefore, *Result 1* provides an empirical insight challenging the widespread view which points to the 'irresponsibility' of some Southern members and their non-compliance with the Maastricht rules as the prominent reasons for the euro crisis.

RESULT 2

The overview of the OCA criteria (also with regard to their limitations) shows that the crisis has sparked and reinforced divergence in the euro area. The significance of heterogeneous characteristics and weaker adjustment mechanisms has come to light (at least more obviously than admitted or voiced before). The sustainability of the common monetary policy in the medium term depends on the effectiveness of the institutional reforms under progress, especially the banking union. This effectiveness, in turn, will be ultimately determined by the attitudes towards sharing risks and adjustment burdens at the community level. A true EMU-wide consensus is needed at this crossroads.

Chapter 2 has also included the dynamic analysis of the OCA criteria, reflecting on their criticism or limitations as well. The aim has been to get a comprehensive insight into how these conditions can help fend off the dilemma of the common monetary policy in the EMU. In terms of labour mobility, the dissertation has concluded that a truly integrated internal labour market displaying multi-directional short-term flows of workers has not been achieved yet. The integration of financial markets was largely stalled by the crisis. However, the most important institutional reforms since 2010 have mainly been targeted at the financial system and linkages. These initiatives seem to be promising in terms of the timely management of the risks arising from one-sided excessive credit flows. This is all the more crucial because even though **the two adjustment mechanisms** (i.e. labour mobility and price changes – see also *Results 3 and 4*) **endorsed by the OCA theory have turned out to be limited, most of the remaining OCA criteria broadly justify the use of the euro at least by a subset of the current members**. (These factors are first of all the integration in goods and services markets and the diversified industrial structures of the participating economies.) To grant the success of institutional reforms and the smooth functioning of the EMU in the future, it is imperative to **bridge the gap among the countries regarding risk sharing and the corroboration of new adjustment channels** (fiscal centralization/coordination, some common debt instruments, the completion of the banking union, i.e. establishing the common deposit insurance etc.). The results of *Chapter 3* tell even more about the preferable policy lines.

Chapter 3 has examined **price adjustment,** one of the possible channels for avoiding internal imbalances within a monetary union. The question addressed in the chapter has been twofold. First, how were respective price levels evolving in the EMU countries after the outbreak of the euro crisis? Second, what was the impact of the observed price changes on exports and imports

(regarding substitution between goods and services of different members)? In other words, did price movements result in higher levels of export competitiveness and import substitution in the Mediterranean countries, facilitating their recovery and more balanced conjunctural patterns within the EMU? Although this problem set is interesting mainly because it is closely related to the debate on EU-IMF bailout packages, its relevance goes well beyond that. The dissertation has highlighted that price adjustment can even function as an important automatic stabilizer. Namely, it can be an antidote for different conjunctural developments within a currency union, even without any policy interference. However, this ideal case can only prevail if price levels are flexible in the (very) short run. This is, of course, not self-evident. Due to the sluggishness of internal devaluation, economies may become entrapped in depression, further catalysed by the procyclicality of financial intermediation, and this makes the expected welfare gains all the more doubtful. Thus, **regarding the future, EMU decision makers must pay particular attention to whether it is worth putting prices under pressure by austerity policies,** or another approach is required to tackle endogenous crises. The dissertation has aimed to contribute to the debate by applying its own empirical methodology which extracts information on market performance from trade data, and puts it into a panel model to capture any possible relationship with respective price indicators.

RESULT 3

RESULT 3.1

According to data examined in *Chapter 3*, the respective price levels of EMU countries changed only slightly between 2010 and 2018. Moreover, it was not until 2013 that the expected change of price levels appeared (i.e. price movements in line with the tenet of internal devaluation).

RESULT 3.2

The price dynamics of Mediterranean exports were somewhat less strong than those of EMU core exports in the examined period. However, this typically meant only smaller increases rather than factual price cuts.

Cuts in Southern domestic producer prices were more pronounced (however, this decline was rather small and delayed, too).

RESULT 3.3

Adjustment burdens have proved to be asymmetric even in two regards.

On the one hand, they have been unevenly distributed between domestic producers and those supplying foreign EMU markets (i.e. exporters). Inland producers have been less able to fend off deflationary pressures compared to their exporting peers.

On the other hand, regions have also borne different proportions of the adjustment burden. A fully-fledged price adjustment requires not only the downward movement of prices in depressive regions, but also the upward movement of those in 'better-off' regions. However, this upswing has not been vivid in the core (such as Germany, characterised by a modest evolution of spending). So, this has been barely supportive for the adjustment efforts of the Mediterranean countries. The potential of internal devaluation has been strengthened rather by the fact that price changes delivered more incentive for import substitution in the South.

RESULT 3.4

Analysis on the sectoral level has uncovered differences between products and services (the latter have a less flexible price level). Furthermore, noticeable downward flexibility could only be identified in the case of industrial supplies.

Results 3.1 and 3.2 underpin the limited flexibility of price levels in the short run. So, they draw attention to the fact that quick and substantial price changes are not likely in the euro area or in its particular regions, not even in the case of severe austerity. (Only Cyprus was exhibiting noticeable annual price changes for some years.) According to *Result 3.4*, it has been found that price levels in some product groups tend to adjust relatively more vividly. However, salient changes could not be identified in these cases, either. *Result 3.3* indicates distortions/biases related to imperfect price adjustment. Internal devaluation policies exert more pressure on producers supplying the domestic market, so adjustment burdens mostly fall on these enterprises, typically small and medium-sized, employing a substantial share of the workforce. (And a positive outcome is rather questionable based on the results below.) That is, in a scenario similar to that of the 2010-2012 crisis, the lion's share of the rebalancing (within reach) has to be done by Southern producers supplying domestic markets. From a certain point of view, I think ***Result 3*** **is the most important outcome of the research as it reveals that price adjustment is much more difficult compared to changes in exchange rates.** Regarding the

EMU, it is impossible to empirically test the case of individual floating exchange rates (at least in a way producing results comparable to the above). This is because there are no such data due to the decades-long fixed (managed) arrangements of Western-European currencies.[17] However, general experience shows that exchange rates can adjust much more quickly and to a much larger extent. Consequently, even if the outcome in *Result 4* were likely unchanged when examining exchange rate adjustment (as a factor for boosting price-competitiveness), that certain effect size would be realized in a much timelier and less painful way. This is not to say that the existence of the euro is an obvious disadvantage for the participating countries. **What can be decisive** in this regard, **is ultimately the policy line (the overhaul of the 'euro house'),** discussed below in relation to *Result 4*.

RESULT 4

RESULT 4.1

Panel models of adjusted exports and imports (corrected for shifts in demand) show that short-term changes of price levels cannot be regarded as effective enough in bringing about substitution between goods and services of different EMU countries. Thus, it can barely contribute to creating more symmetry/sync across members. The relationship between price changes and (adjusted) net exports could not be rejected, but the estimated effects are rather tiny and delayed. Regarding output on the macro level, these coefficients would produce meaningful results only in the case of vast price movements (*ceteris paribus*). (Which, however, have proved to be less likely according to *Result 3*.) With respect to exports, the panel model has also revealed counter-acting intra-area effects which again point to the uneven distribution of the adjustment burden (to the detriment of the Mediterranean periphery). The models have limited explanatory power, underlining the possible role of non-price factors.

RESULT 4.2

Analysis on the sectoral level has been possible in the case of exported products. The impact of annual average price changes has proved to be relevant for fast-moving goods of usually small absolute unit value (e.g. food and beverages, industrial supplies, consumer

[17] Even so, I earlier tried to examine the relationship between exchange rate changes and the export competitiveness component (*XC*) for the period up until 1999. However, the time series of exchange rates are really involatile. Besides, there are many missing data in the time series of trade for these earlier years of European integration. In addition, page constraints do not allow for the examination of floating exchange rates based on the example of the world's other regions.

products). At the same time, there has been no relevant effect on capital goods. Consequently, forcing internal devaluation (or its certain channels) may reinforce low and medium tech specialization in the Mediterranean region.

Result 4 corroborates the conclusion of *Result 3* as it points to the limitations of price adjustment. Although the relationship between actual price changes and net exports could not be rejected (first of all in the case of goods for everyday consumption), the period 2010-2018 shows that vast price movements needed for measurable macro outcomes are less likely. Moreover, the directions of the estimated effects point to intra-group biases which further **undermine the rationale for price adjustment.** (In the case of a Mediterranean crisis, Southern exports are not further catalysed by stronger price dynamics in other parts of the area.)

The dissertation has hinted at the possibility of strengthening overall price flexibility in the EMU as a potential policy perspective. Structural measures aiming to increase competition, raise price transparency and consumers' price awareness, upgrade the non-price competitiveness of regions and producers lagging behind (as a supplementary factor in this regard) are all standard 'recipes' often suggested to reach a nimbler adjustment of prices. By the way, EU and IMF policies have themselves resorted to such measures in the so-called 'program countries' (which had been bailed out). These steps have mainly proved to be controversial, resulting in an even higher vulnerability and *de facto* competitive disadvantage of domestic producers (see for example Stiglitz 2016, Varoufakis 2017). The problem, faced by the researcher when contemplating suggestions for such reforms, is indeed a paradox. Being able to use only a data set with small price movements, one can, of course, figure out that the estimated small effects of a unit change would induce larger impacts if multiplied. However, in reality, there is no data set containing such multiplied (i.e. sizeable) price changes, so there is no chance for a direct estimation in this regard. Thus, **I suggest being cautious about structural policies targeted at enhancing overall price flexibility.** This is not to say that these policies must be rejected as it is worth remembering that prices can even act as automatic stabilizers. (Which is a desirable feature in itself if it is realistic.) Nevertheless, the identification of the right policies and policy designs in this regard obviously requires **much more empirical research,** including the better understanding of **the factors behind price behaviour.** It is necessary to investigate the influence of wages and other aspects related to the abovementioned policy choices (i.e. competition and its barriers, non-price competitiveness, consumer perceptions etc.). Most of these factors could be put into the panel models of this dissertation,

too. (Although this would then not entail the examination of price behaviour, but a complementary analysis of adjusted exports and imports.[18])

Along with all of that, my results mostly reinforce the proposal to place much less emphasis on price adjustment and internal devaluation policies in the EMU. The most obvious advice is to **strengthen other approaches and channels facilitating intra-area conjunctural sync.** Certainly, the impacts of these must be monitored, as well. Regarding the post-crisis EU/EMU reforms, the dissertation has highlighted the role of the **banking union** which may identify and 'discourage' one-sided excessive credit flows at an early phase. To achieve this, the supervision of systemically important credit institutions at the euro area level might provide a broader (and probably more objective) angle of view. The crisis has shed more light on the importance of interdependences within the policy mix (Cœuré 2015). But even so, there are still relatively few papers creating a direct and obvious link between the banking union and the endogenous feedback of the uniform monetary policy. Empirical research is thus needed to compare outcomes before and after the introduction of the Single Supervisory Mechanism (2014). (The compared outcomes can be the risk profiles of banks' credit portfolios, but also Pillar II and higher-level capital requirements and/or liquidity requirements if a broader focus on banks' resilience is adopted.[19])

Another relevant issue is the common deposit insurance which has not been established yet. The delay is mainly attributed to the core countries' fear from moral hazard. However, the lack of this element of the banking union can threaten the success of the whole project, or even make the situation worse than it was before (Stiglitz 2016). It is fair to say that failing to create the common safety net for depositors may hamper the systemic stabilization capacity of the centralized supervisory and resolution framework. *Result 1* is helpful to look at worries about the related moral hazard problem from another perspective. This is because the result has revealed the importance of systemic incentives, which, at least to a certain degree, blur the validity of the 'irresponsibility' argument. (That is, if the bad endogenous feedback can be confined, there will be less anomalies which could also have been interpreted as the realization of moral hazard.)

[18] This research would go beyond the framework and page constraints of the dissertation. However, I have already made preparations to carry out such an analysis (data on non-price factors such as investments, innovation, sales channels, participation in international supply chains, foreign ownership etc. have already been collected).
[19] I have already taken steps to do this research.

The identification of systemic effects may be further supported by the **Macroeconomic Imbalance Procedure** (MIP), launched within the broader framework of the policy coordination scheme called 'European Semester.' At least two questions are open in this regard. The first is whether MIP proposals will significantly depart from conventional adjustment policies (such as internal devaluation, austerity and forcing 'market flexibility' at any price). The second question is to what extent the procedure will get embedded in the top-level national and EU decision making processes.

The dissertation has mentioned **fiscal issues** in terms of intra-area stabilization. It is clear that a change of mindset is needed in this field, too. The conventional approach relying only on a handful of indicators of 'fiscal discipline' is not sufficient to enhance the sustainability of the euro.

Due to post-crisis institutional reforms, euro area members can resort to **macroprudential policies** to hamper endogenous effects. It is important that, in contrast to the banking union and other centralised mechanisms, most macroprudential decisions can be made by Member States individually (subject to certain coordination requirements). This can be interpreted as a tool granted by the system to ditch idiosyncratic developments unresolvable through any other channels. This is necessary because the EMU continues to display a high degree of heterogeneity.

Nevertheless, the ultimate realistic objective is not the overall confinement of this diversity. Instead, the objective should be much more to find **a sound ideological and policy consensus** which sets the commonly agreed rules and extent of risk sharing, cooperation and the individual responsibility of Member States. In the long run, such a true agreement can be the only basis for maintaining the euro.

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List of Data Sources

This list only includes data sources which have been used to calculations mentioned in this excerpt. Items are listed in a sequence as referred to in the text.

European Central Bank: ECB interest rate statistics, long-term interest rate for convergence purposes, debt security issued (10 years). Downloaded: 31.07.2019 https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/long_term_interest_rates/html/index.en.html

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Eurostat: GDP and main components (output, expenditure and income, [namq_10_gdp]), Gross domestic product at market prices, chain linked volumes (2005), million euro, seasonally and calendar adjusted data. Downloaded: 01.09.2018 and 01.08.2019 http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=namq_10_gdp&lang=en

Bank of International Settlements (BIS): Consolidated positions on counterparties resident in Greece/Spain/Portugal/Italy/Ireland. Amounts outstanding (stocks), at the end of the quarter, in million USD. http://stats.bis.org/statx/srs/table/b4?c=gr&p=20064. Downloaded: 06-07.08.2019

Eurostat, E-Comext: EU trade since 1988 by BEC product group (DS-057555), exports and imports of €19 countries to/from €19 countries, values at EUR, 2000-2018; Indices by BEC classification, volume indices (2010=100%) for intra-€19 exports/imports by €19 country. http://epp.eurostat.ec.europa.eu/newxtweb/. Downloaded: 17.08.2019

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Annexes

All outputs presented here are own calculations produced by R.

Annex 1 Model Output for *Chapter 2.2.2*

Pooled model for *logdiff_Claims*$_{i,t}$ as the dependent variable:

```
Pooling Model

Call:
plm(formula = logdiff_Claims ~ lag1_logdiff_Claims + lag1_TR,
    data = taylorgaps, model = "pooling")

Balanced Panel: n = 30, T = 5, N = 150

Residuals:
      Min.    1st Qu.     Median      3rd Qu.         Max.
-0.1244687 -0.0359029 -0.0045992     0.0277115      0.1621270

Coefficients:
                           Estimate  Std. Error  t-value  Pr(>|t|)
(Intercept)                0.0468426  0.0057123  8.2003  1.094e-13 ***
lag1_logdiff_Claims       -0.2656619  0.0730184 -3.6383  0.0003792 ***
lag1_TR                    0.0052510  0.0012724  4.1268  6.137e-05 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    0.48435    Residual Sum of Squares: 0.41269
R-Squared:      0.14794            Adj. R-Squared: 0.13635
F-statistic: 12.7618 on 2 and 147 DF, p-value: 7.7529e-06
```

Fixed effects model for *logdiff_Claims*$_{i,t}$ as the dependent variable, for comparison purposes (codes for fixed effects: 1: Greece, 2: Spain, 3: Portugal, 4: Italy, 5: Ireland):

```
Oneway (individual) effect Within Model (fix_TR_1)

Call:
plm(formula = logdiff_Claims ~ lag1_logdiff_Claims + lag1_TR,
    data = taylorgaps, model = "within", index = c("ID", "Date"))

Balanced Panel: n = 5, T = 30, N = 150

Residuals:
      Min.    1st Qu.     Median    3rd Qu.       Max.
-0.1158606 -0.0325995 -0.0024797  0.0265482  0.1578982

Coefficients:
                           Estimate  Std. Error t-value  Pr(>|t|)
lag1_logdiff_Claims       -0.2887159  0.0730972 -3.9498  0.0001224 ***
lag1_TR                    0.0044801  0.0013870  3.2302  0.0015351 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    0.4588        Residual Sum of Squares: 0.39533
R-Squared:      0.13834                Adj. R-Squared: 0.10219
F-statistic: 11.4797 on 2 and 143 DF, p-value: 2.379e-05

> fixed effects:
         1          2          3          4          5
0.04313160 0.06604712 0.03858261 0.03968134 0.05955340
```

Deciding on the final model based on the Chow test:

```
    F statistic

    data:  logdiff_Claims ~ lag1_logdiff_Claims + lag1_TR
    F = 1.57, df1 = 4, df2 = 143, p-value = 0.1855
    alternative hypothesis: unstability
```

H_0: Choosing the pooled model is appropriate.

As the estimated p-value exceeds all conventional significance levels, H_0 is expected and the pooled model is chosen (→ *Equation (4)* in *Chapter 2.2.2*).

* * *

Annex 2 Model Output for *Chapter 3.2.3*

Pooled model for *logdiff_AdjExp$_{i,t}$* as the dependent variable:

```
Pooling Model

Call:
plm(formula = logdiff_AdjExp ~ logdiff_AdjExp_lag1 + Int_ldAdjExpl1_Med +
    XP_lag1 + Int_XPl1_Med, data = aggrexp, model = "pooling")

Balanced Panel: n = 7, T = 17, N = 119

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-21.60770  -2.68663  -0.11142   2.55451    18.80997

Coefficients:
                     Estimate Std. Error t-value  Pr(>|t|)
(Intercept)         21.1574242 25.1888637  0.8400  0.40269
logdiff_AdjExp_lag1  0.3116547  0.1250677  2.4919  0.01415 *
Int_ldAdjExpl1_Med  -0.4591630  0.1908664 -2.4057  0.01775 *
XP_lag1             -0.1955370  0.2483859 -0.7872  0.43278
Int_XPl1_Med        -0.0018538  0.0115273 -0.1608  0.87253
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    3872.9
Residual Sum of Squares: 3629.3
R-Squared:      0.062895
Adj. R-Squared: 0.030014
F-statistic: 1.91282 on 4 and 114 DF, p-value: 0.11305
```

Int_ldAdjExpl1_Med = $(logdiff\_AdjExp_{i,t-1} * Med_i)$
Int_XPl1_Med = $(XP_{i,t-1} * Med_i)$
$Med_i = 1$ if $i =$ Cyprus, Greece, Italy, Portugal, Spain, and 0 otherwise

Fixed effects model for *logdiff_AdjExp$_{i,t}$* as the dependent variable, for comparison purposes:

```
Oneway (individual) effect Within Model


Call:
plm(formula = logdiff_AdjExp ~ logdiff_AdjExp_lag1 + Int_ldAdjExpl1_Med +
    XP_lag1 + Int_XPl1_Med, data = aggrexp, model = "within",
    index = c("ID", "Year"))

Balanced Panel: n = 17, T = 7, N = 119

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-24.48211  -2.20266   0.11871   2.25854  12.47188

Coefficients:
                  Estimate Std. Error t-value Pr(>|t|)
logdiff_AdjExp_lag1  0.034856   0.137869  0.2528 0.800937
Int_ldAdjExpl1_Med  -0.387347   0.197455 -1.9617 0.052635 .
XP_lag1              0.502579   0.289017  1.7389 0.085188 .
Int_XPl1_Med        -1.491372   0.567507 -2.6279 0.009972 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Total Sum of Squares:    3143.8
Residual Sum of Squares: 2787.8
R-Squared:      0.11324
Adj. R-Squared: -0.067736
F-statistic: 3.12856 on 4 and 98 DF, p-value: 0.018144

>fixed effects
 Austria        Belgium        Cyprus         Estonia        Finland
-51.08326       -51.38191      105.42642      -49.16993      -48.65385
 France         Germany        Greece         Ireland        Italy
 -52.43152      -52.36209      99.47110       -47.84546      99.26720
 Latvia         Lithuania      Netherlands    Portugal       Slovakia
 -48.77295      -43.89757      -50.21228      103.48841      -47.41044
 Slovenia       Spain
 -48.17070      99.22596
```

Deciding on the final model based on the Chow test:

```
    F statistic

    data:  logdiff_AdjExp ~ logdiff_AdjExp_lag1 + Int_ldAdjExpl1_Med
           + XP_lag1 + Int_XPl1_Med
    F = 1.8488, df1 = 16, df2 = 98, p-value = 0.03499
    alternative hypothesis: unstability
```

H_0: Choosing the pooled model is appropriate.

Based on the estimated p-value (<10%, and actually also <5%), H_0 is rejected and the fixed effects model is chosen (→ *Equations (9) and (10)* in *Chapter 3.2.3*).