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174

Mika Nieminen

Essays on Current Account Imbalances

JYVÄSKYLÄN YLIOPISTO

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ABSTRACT

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Global current account imbalances and intra-euro area imbalances have been at the forefront of academic and policy debates for the last ten years. This thesis examines the determinants of current account balances and external adjustment. It consists of an introduction and four empirical studies. This thesis highlights the importance of institutional factors such as differences in national cultures and cross-country differences in the coordination of wage bargaining on external balances.

The first study investigates the effects of deep determinants on current account balances. The point estimates are economically and statistically significant, suggesting that countries populated by Roman Catholics tend to have larger current account deficits than do non-Catholic countries. This finding is supported by microdata on values. The World Values Survey indicates that Roman Catholics do not consider thriftiness as important as other religious groups do. At the macrolevel, this finding is explained, at least to some extent, by an inclination of Catholic countries toward uncertainty avoidance.

The second study examines the determinants of the speed of adjustment of the current account toward its long-run equilibrium. The rate of current account reversion decreases monotonically with the degree of coordination of wage bargaining; that is, fragmented firm-level wage bargaining facilitates external adjustment. In addition, there is a negative interaction between the effects of the coordination of wage bargaining and exchange rate stability on the rate of current account reversion.

In the third and fourth studies, a country's intra-euro area trade balance is distinguished from its trade balance with the rest of the world. The third study shows that intra-euro trade balances have not become more sensitive to differences in per-capita incomes and also suggests that a variable measuring differences in national cultures (i.e., the dimension of individualism-collectivism) has explanatory power on intra-euro trade balances over the standard economic variables. The fourth study indicates that in spite of increased integration, there remain significant differences in the long-run relations among trade balance, real effective exchange rate, domestic GDP and foreign GDP trade balance across the EMU-12 countries.

Keywords: Current account, Current account dynamics, Trade balance, Culture, Institutions, Coordination of wage bargaining, European Monetary Union

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LIST OF ORIGINAL PUBLICATIONS

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Article 2. An abridged version of the second essay
Nieminen, M., Heimonen, K., Tohmo, T. Coordination of Wage Bargaining, Exchange Rate Stability and External Adjustment (in review process)

Article 3. pp. 94–125
Nieminen, M. 2015. Trade Imbalances within the Euro Area and with Respect to the Rest of the World. Economic Modelling 48, 306–314.

Article 4. A preliminary version of the short-run analysis in the fourth essay
Nieminen, M., Junttila, J. 2016. Short-run Dynamics of the Trade Balance in the EMU-12 Countries. The Manchester School 84 (S1), 56–83.

CONTENTS

CHAPTER 1
INTRODUCTION

1. Background and aims of this thesis

Both intertemporal trade (measured by current account balance) and external adjustment lie at the heart of international macroeconomics. Global current account imbalances and intra-euro area imbalances peaked on the eve of the 2008 financial crisis and the euro crisis. These rising imbalances arguably led to the crises. At the least, they directed economists' attention to this complex macroeconomic issue. This doctoral thesis contributes to the vast literature on the subject.

This thesis attempts to shed light on the following research questions: 1) What are the medium-term determinants of current account balances? 2) What are the determinants of the rate of current account reversion? And 3) What is the euro's effect on external balances? The first essay, "Culture and Current Account Balances," provides a new perspective on the determinants of current account balances. The second essay, "Labor Market Institutions, Exchange Rate Stability and Current Account Adjustment," sheds new light on the second research question. The third essay, "Trade Imbalances within the Euro Area and with Respect to the Rest of the World," and the fourth essay, "Long-run Determinants and Short-run Dynamics of the Trade Balance in the EU-15 Countries," attempt to address the third question.

The remainder of the Chapter 1 is as follows. Section 2 portrays how global current account imbalances and intra-euro area imbalances have evolved. Section 3 describes theories of current account determination. Section 4 summarizes the previous empirical studies on the medium-term determinants of current account balances. Section 5 explains both the contributions and the shortcomings of each essay. Section 6 presents the overall contribution of this thesis and discusses questions such as "Does the current account still matter?"

2. Global current account imbalances and intra-euro area imbalances

The essays contained in this doctoral thesis are empirical studies on external balances. In this section, I will portray how global current account imbalances and intra-euro area imbalances have evolved.

2.1. Evolution of global current account imbalances

The world economy is a closed economy. Surpluses and deficits sum up to zero. After the late 1990s, the world economy drifted into an imbalanced state as global current account imbalances tripled between 1993 and 2007 (see Figure 1).[1] In 2006, China's current account surplus overtook Japan's surplus. The term "global imbalances" once referred primarily to a dichotomy between the U.S. and developing economies (especially China) in current account balances. Since 2011, however, Germany has had the largest surplus. The OPEC countries' surplus seems very volatile, probably because of large fluctuations in oil prices.

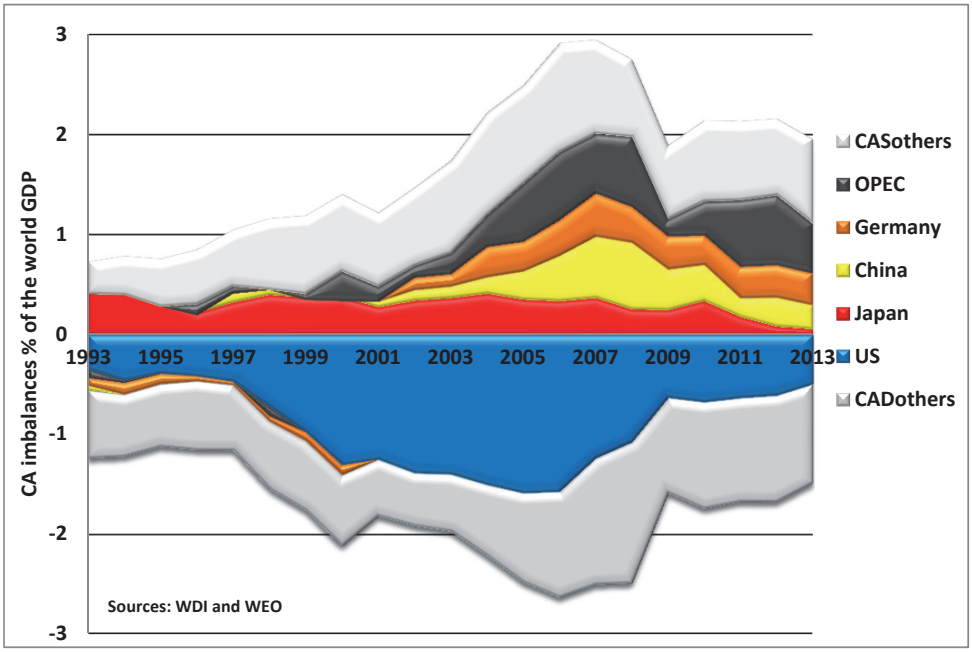

Figure 1. Global current account imbalances, 1993-2013

There is a broad consensus that in addition to other failures, global imbalances were an essential macroeconomic cause of the 2008 financial crisis

[1] Current account surpluses of other countries are stacked up to the CASothers component and current account deficits of other countries to the CADothers component.

(see, e.g., Bank for International Settlement (2009, pp. 4–5), Krugman (2009), and Obstfeld and Rogoff (2009)). In March 2009, Ben Bernanke, who was then chairman of the Federal Reserve, made the following statement: "In my view… it is impossible to understand this crisis without reference to the global imbalances in trade and capital flows that began in the latter half of the 1990s" (Bernanke 2009). After the 2008 financial crises, global current account imbalances narrowed. Whether the narrowing of the global imbalances is a temporary or a permanent phenomenon is an open question (see, e.g., Chinn, Eichengreen and Ito (2014) and Gagnon (2011)).

Belke and Schnabl (2013) summarize the evolution of global current account imbalances as four generations of global imbalances. The first generation of global imbalances emerged between Japan and the U.S. in the early 1980s. Japan had just liberalized international capital flows and the Federal Reserve at Paul Volcker's command attacked inflation by drastically increasing the federal funds rate. After the 1997 Asian financial crisis, China and several smaller Asian economies joined Japan to finance the U.S. current account deficit. Belke and Schnabl call this period the second generation of global imbalances. Perhaps it can be argued that this course of action was driven by a precautionary saving motive. The third generation of global imbalances emerged between oil-exporting countries and the U.S., along with a set of southern European countries. According to Belke and Schnabl, this generation was driven by a rapid increase in oil and raw material prices in 2003. The fourth generation of global imbalances emerged in Europe.[2] Belke and Schnabl note that the history of the four generations of global imbalances indicates that despite various attempts to restrain those imbalances, both their size and the number of countries involved have been growing. (Belke and Schnabl 2013.)

2.2. Descriptive analysis of the current account deficit in the U.S.

For most of the time, the U.S. current account deficit has accounted for more than one-half of the global deficit. Thus, a brief descriptive analysis of the U.S. current account deficit is provided in this section. The current account balance (CA) is the sum of surplus of the private sector (gross private savings minus gross private domestic investments, S-I) and the budget surplus (federal receipts minus federal outlays, T-G).[3] As shown in Figure 2, this decomposition is applied to the U.S. current account balance.[4] Since the 2008 financial crises, gross private savings has exceeded gross private domestic investments and the current account deficit has resulted from the huge budget deficit. However, it is important to remember that any causal inference on the determinants of current account balances should not

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2 Explanations for the intra-euro area imbalances are the subject of Section 2.5.

3 Wynne Godley's so-called sectoral financial balances analytical framework is based on this identity.

4 Because of measurement errors and small differences in databases, the surplus of the private sector and budget surplus do not always sum up exactly to the current account balance.

be derived from a descriptive analysis of this type. The U.S. used to have a large bilateral trade deficit against the OPEC countries, but recently, because of U.S. shale oil production and decreased oil prices, this deficit has disappeared (see Figure 3).

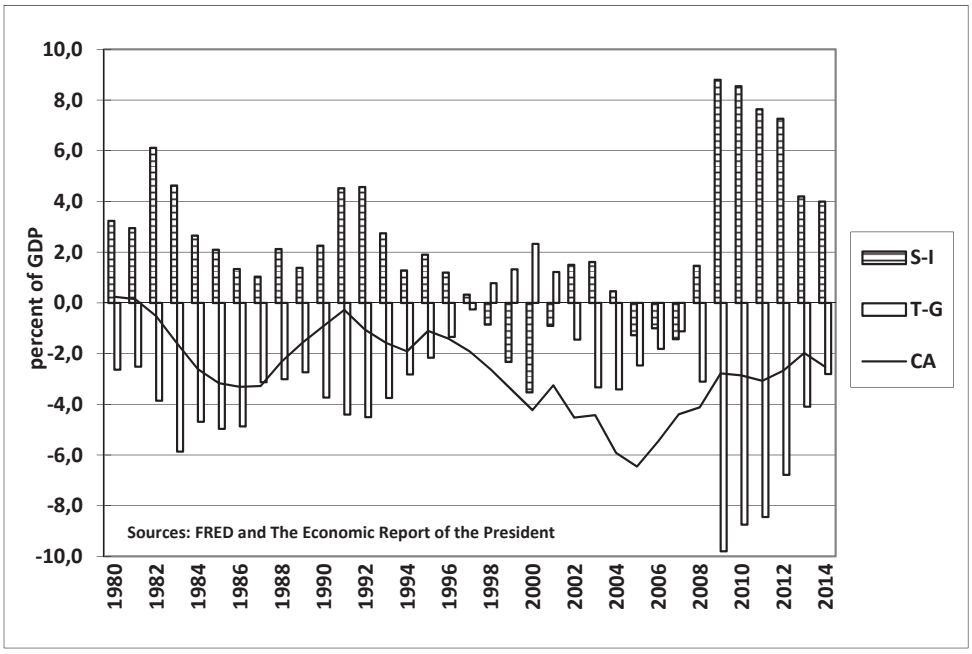

Figure 2. Composition of the U.S. current account balance, 1980-2014

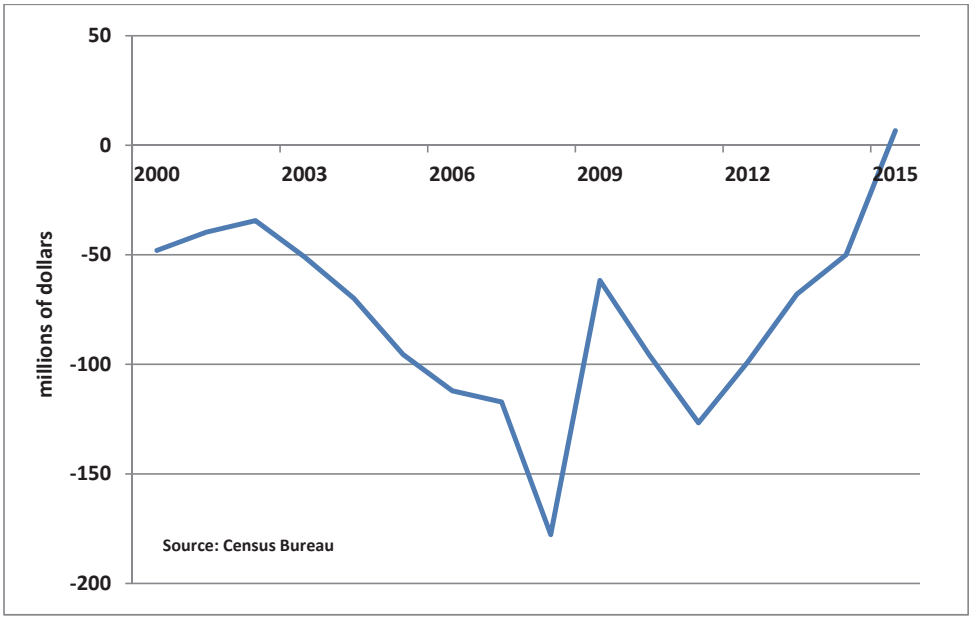

Figure 3. The U.S. bilateral trade balance with OPEC, 2000-2015

The U.S. dollar is the leading reserve currency. This has implications for the U.S. current account balance adjustment. Foreign central banks' reserve holdings consist of a large share of U.S. liabilities (see Figure 4). Consequently, to some extent, foreign central banks can manipulate the exchange rate of the U.S. dollar. There used to be a lively dispute on whether the Renminbi was undervalued against the dollar.

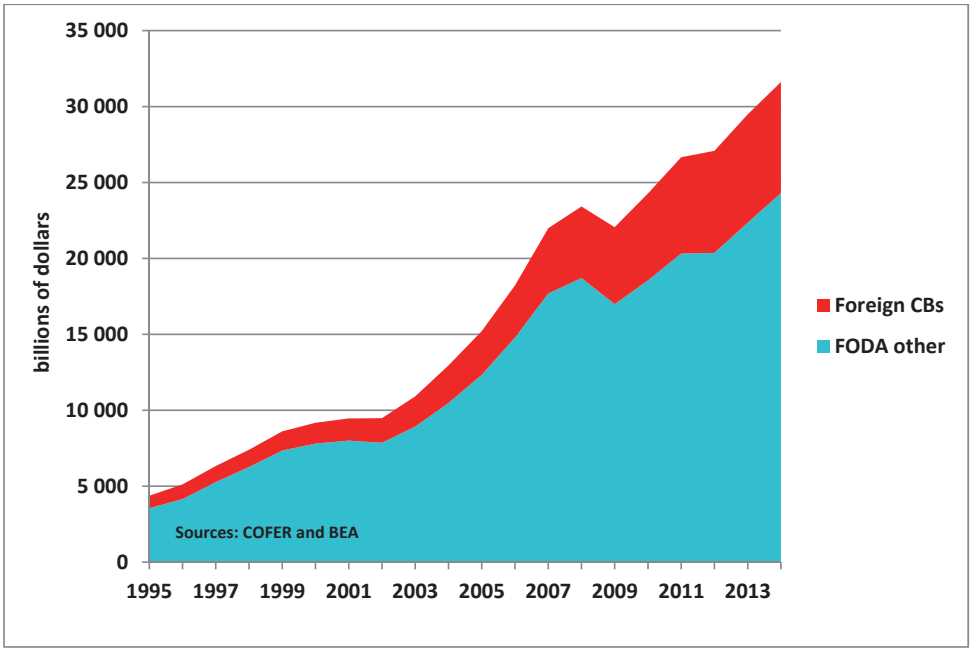

Figure 4. U.S. liabilities and foreign exchange holdings (claims in U.S. dollars), 1995-2014

Nevertheless, the compositions of U.S. assets and liabilities differ from each other (see Figures 5-6).[5] The U.S. asset portfolio is weighted toward riskier assets. This is one reason that the U.S. has earned higher returns on its foreign assets than foreigners have earned on its liabilities. In the literature, this is called exorbitant privilege (see, e.g., Gourinchas and Rey (2007a, 2014) and Prasad (2014)). One implication of exorbitant privilege is that the U.S. has been able to borrow from the rest of the world without accumulating debt (see Figure 7).

5 Financial derivatives are excluded from Figures 5-6 because the series do not begin until 2005. This explains the difference in total FODA between the Figures 4 and 6.

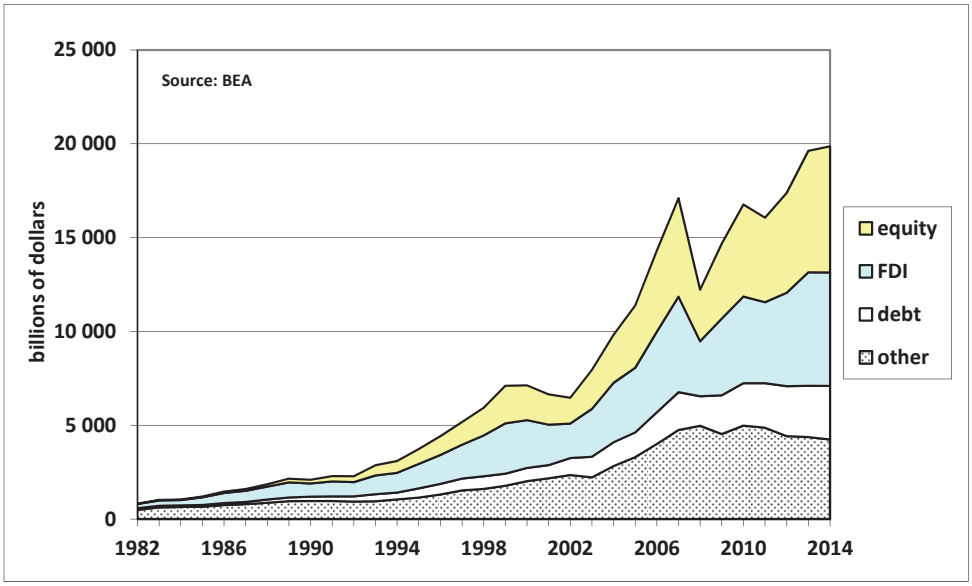

Figure 5. U.S. assets by functional categories, 1982-2014

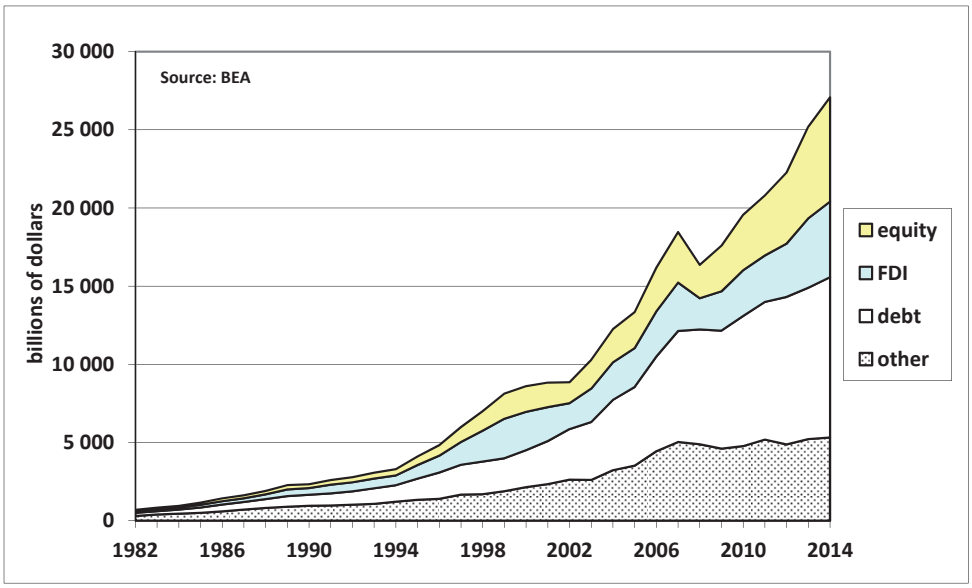

Figure 6. U.S. liabilities by functional categories, 1982-2014

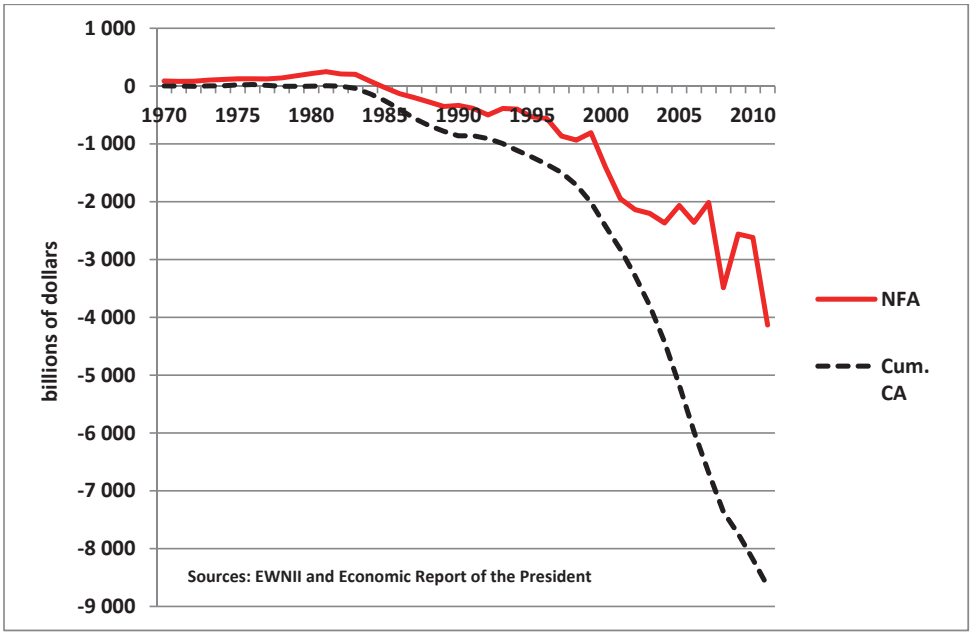

Figure 7. U.S. net foreign asset position and its cumulated current account balance, 1970-2011

2.3. Explanations of global imbalances[6]

Explanations for the U.S. current account deficit are numerous. That said, all of these explanations fall into one of two categories: made in the U.S.A. or made overseas. The first set of explanations stresses the importance of American factors, whereas the second set of explanations implies that the U.S. is unable to do anything. Blanchard and Milesi-Ferretti (2009) highlight the difficulty of finding decent explanations for global current account imbalances:

> Global imbalances are probably the most complex macroeconomic issue facing economists and policy makers. They reflect many factors, from saving to investment to portfolio decisions, in many countries. The cross-country differences in saving patterns, investment patterns, and portfolio choices are in part "good" – a natural reflection of differences in levels of development, demographic patterns, and other underlying economic fundamentals. But they are also in part "bad," reflecting distortions, externalities, and risks, at the national and international level. So it is not a surprise that the topic is highly controversial, and that observers disagree on the diagnosis and thus on the policies to be adopted. (p. 3)

Despite this complexity, perhaps the explanations for global current account imbalances could be categorized as local or global. The most common and best-established explanations include the global saving glut hypothesis proposed by

6 This section is closely related to Section 3.7 ("Global imbalances in a general equilibrium framework"), which is a more technical section.

Bernanke (2005); the Bretton Woods II hypothesis proposed by Dooley, Folkerts-Landau and Garber (2004); and the twin deficit hypothesis.

Bernanke (2005) argues that the U.S. current account deficit requires a global perspective. A combination of diverse forces created a significant increase in the global supply of savings, which helps explain both the U.S. current account deficit and the low level of real interest rates. This increase in the global supply of savings is called the global savings glut. Bernanke considers the shift that transformed developing and emerging economies from net borrowers to net lenders as a more important source of the global savings glut than the savings motive of rich countries with aging populations. Two questions remain: first, what caused the shift; and second, why does capital flow to the U.S. in particular? According to Bernanke, the shift was caused by a series of financial crises in developing countries from 1994 to 2002 and a sharp rise in oil prices at the beginning of the 2000s. The U.S. current account deficit increased because of endogenous changes in equity values, housing prices, real interest rates, and the exchange rate of the dollar. The effects of the increase in desired global savings were felt disproportionately in the U.S. relative to other industrial countries because of that country's sophisticated financial markets and the international status of the dollar. (Bernanke 2005.) The global savings glut hypothesis seems plausible and has been thoroughly examined. Eugeni (2015) formalizes the hypothesis and Coeurdacier, Guibaud and Jin (2015) provide its microfoundations.[7] In addition, several empirical studies have tested the global saving glut hypothesis (see, e.g., Chinn and Ito (2007)).

In the Bretton Woods system, currencies were pegged with a fixed rate to the U.S. dollar, and the dollar was pegged to gold. The system collapsed in 1971, when President Nixon closed the gold window. Dooley et al. (2004) interpret the global current account imbalance as a re-establishment of the Bretton Woods era, which they call Bretton Woods II. Asian countries (on the periphery) have now adopted the same strategy as Japan and Europe did after the Second World War. This periphery strategy is characterized by export-led growth supported by undervalued exchange rates, capital controls and the accumulation of reserve assets claims in the center country (the U.S.). (Dooley et al. 2004.) The Bretton Woods II hypothesis is not widely accepted. Contrary to the expectations by Dooley et al. (2004), the system turned out to be unstable. This might be one reason for its unpopularity. However, Dooley et al. (2009) argue that in spite of the 2008 financial crisis, the international monetary system continues to operate in the manner described by the Bretton Woods II hypothesis.

According to the twin deficit hypothesis, there is a positive causal relationship between the current account and budget deficits. The Ricardian equivalence, which was rediscovered by Barro (1974), implies that current account and budget balance are unrelated. However, there are several reasons that the Ricardian hypothesis might fail (see, e.g., Barro (1989) and Seater

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7 See also Justiniano, Primiceri, and Tambalotti (2014), along with the studies that will be presented in Section 3.7.

(1993)). Whether the twin deficit or the Ricardian hypothesis holds is an open question (see, e.g., Blanchard (1985), Normandin (1999) and Kim and Roubini (2008)).

More recently, Barattieri (2014) has proposed a service hypothesis asserting that a non-negligible fraction of global imbalances can be explained by the comparative advantage of the U.S. in services and the asymmetric trade liberalization in goods versus services trade.

2.4. Intra-euro area imbalances

When the euro was introduced, widening current account imbalances were not considered as a problem but instead were considered as a natural consequence of economic integration (see, e.g., Blanchard and Giavazzi (2002)). After a decade, a much more cautious view has been adopted by the European Union. A legislative package and a surveillance procedure for the prevention and correction of macroeconomic imbalances were enforced in 2011. The Macroeconomic Imbalance Procedure (MIP) stresses the importance of external balances.

Until the 2009 euro crisis, the euro area as a whole was in balance with the rest of the world. However, many EMU member countries experienced substantial current account imbalances (see Figure 8). These imbalances had a tendency to increase after the adoption of the common currency in 1999. Since 2010, the euro area has had an overall surplus (approximately 3% of the euro area GDP). If current account balances are measured in euros, none of the EMU countries had a large deficit in 2013, whereas Germany had a huge surplus. More specifically, Germany's trade surplus has resulted from the surplus in its extra balance (trade balance vis-à-vis the rest of the world), not from the intra-euro area balance (see, e.g., Nieminen (2015)). In Figure 8 the current account imbalances are measured as ratios to the euro area GDP and consequently the large coutries dominate. In Figures 9 and 10, current account balances are measured as ratios to the domestic GDP.

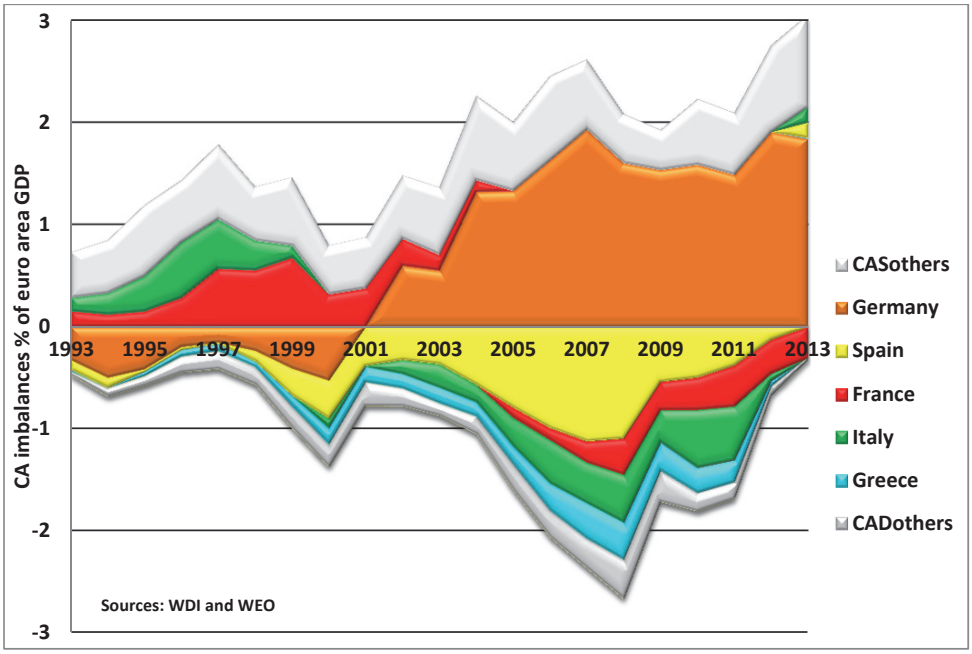

Figure 8. Current account imbalances in the euro area, 1993-2013

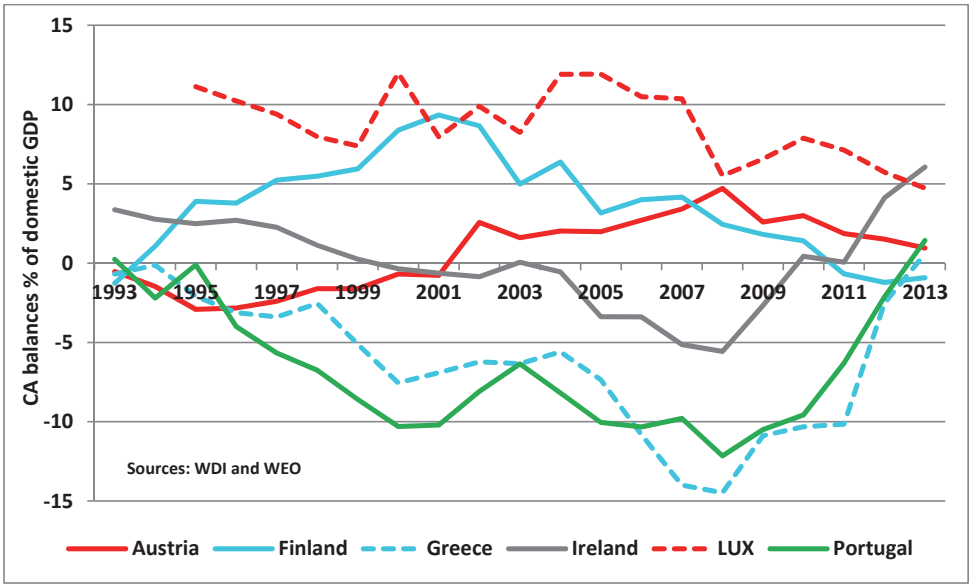

Figure 9. Current account balances in the small EMU member countries, 1993-2013

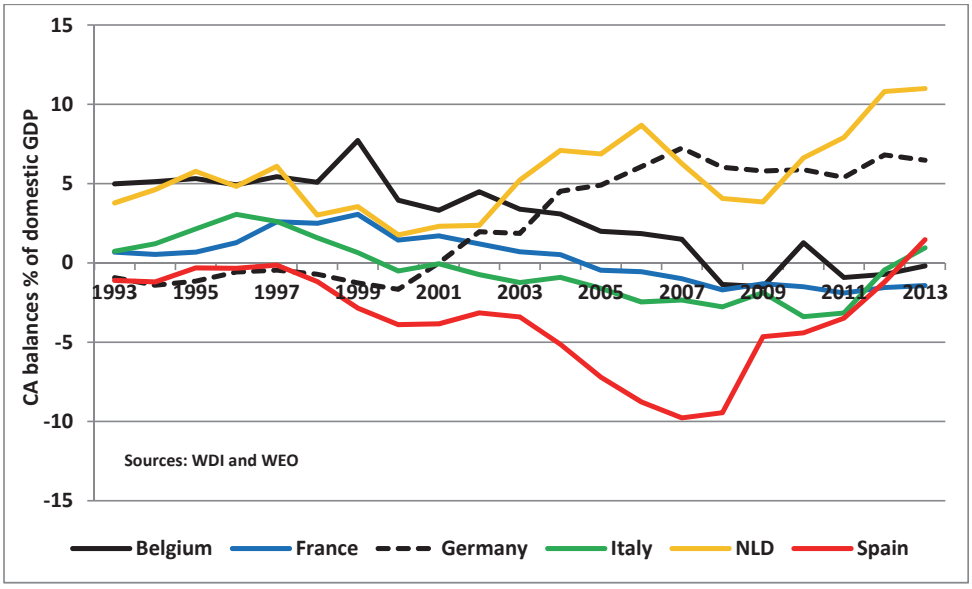

Figure 10. Current account balances in the large EMU member countries, 1993-2013

In addition to the decomposition of the aggregate trade balance into the intra balance and extra balance, one should also understand the decomposition of capital flows into the private capital and Target balances. Financial account is the sum of private financial account, a negative of the change in Target balance, and EU/IMF net inflow (see, e.g., Cour-Thimann (2013, p. 20)). Sinn and Wollmershäuser (2012) emphasize the role of Target balances for the deficit countries to sustain their large current account deficits during the euro crisis. At the time of the financial crisis, the direction of private capital flows changed and deficit countries financed a large portion of their current account deficits with the printing press. (Sinn and Wollmershäuser 2012.) When the Eurozone crisis broke out, a widening of the Target imbalances compensated for the outflow of private capital from debtor countries.[8] Liquidity support provided by the Eurosystem smoothed the external adjustment (Cour-Thimann (2013, p. 23)).

[8] In the end of December 2010, Ireland had 144.55 billions of euros worth of liabilities vis-à-vis the Eurosystem which corresponded approximately to 90% of its GDP in the year 2010. In the end of November 2011 Greece had 109.32 billions of euros' worth of liabilities vis-à-vis the Eurosystem which corresponded to approximately 55% of its GDP in the year 2011. See Figure 11.

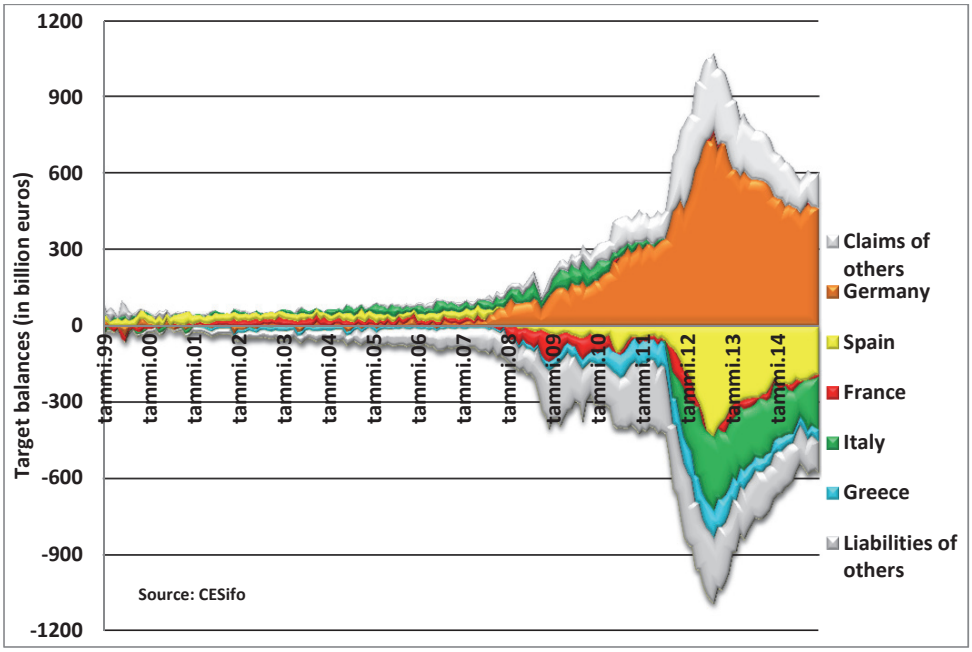

Figure 11. National central bank Target balances vis-à-vis the Eurosystem[9]

2.5. Explanations for intra-euro area imbalances

Typically, two alternative explanations for the widening current account imbalances in the euro area are presented: the catching-up process between rich Northern Europe and poor Southern Europe or the diverging competitiveness between the two regions. In the first case, widening imbalances are expected to be only temporary, whereas in the latter case, such imbalances might have undesirable consequences. These two alternatives will be discussed thoroughly in Chapters 4 and 5. In brief, both of these explanations are problematic. First, there has been no clear catching-up in the euro area. Second, according to a vast literature, there is no strong or simple relationship between the external balances and price competitiveness.

Both of the explanations presented above assume that the cause of the phenomenon occurred simultaneously with the phenomenon itself. Alternatively, it is possible that the cause preceded the phenomenon. This scenario is often overlooked. However, it is a well-known fact that there were large differences in the short-term interest rates among the EMU member countries before the EMU period (see Figures 12-13). [10]

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9 Data on Target balances: https://www.cesifo-group.de/dms/ifodoc/docs/politikdebatte/C_Haftungspegel/Target-countries/Target-countries-2015-05-08.xlsx.

10 The cumulative current account balance during the first 10 years after the adoption of the euro was negative for Greece, Portugal, Spain, Ireland and Italy. It was positive for the Netherlands, Finland, Belgium, Austria and France.

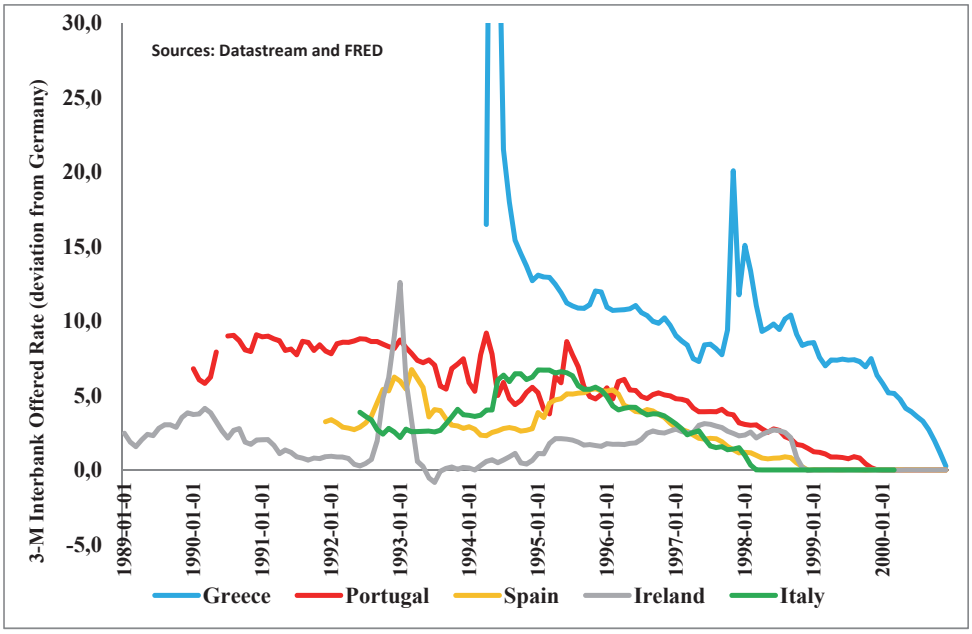

Figure 12. Short-term interest rates in deficit countries (deviation of 3-month interbank offered rates from Germany), 1989-2000

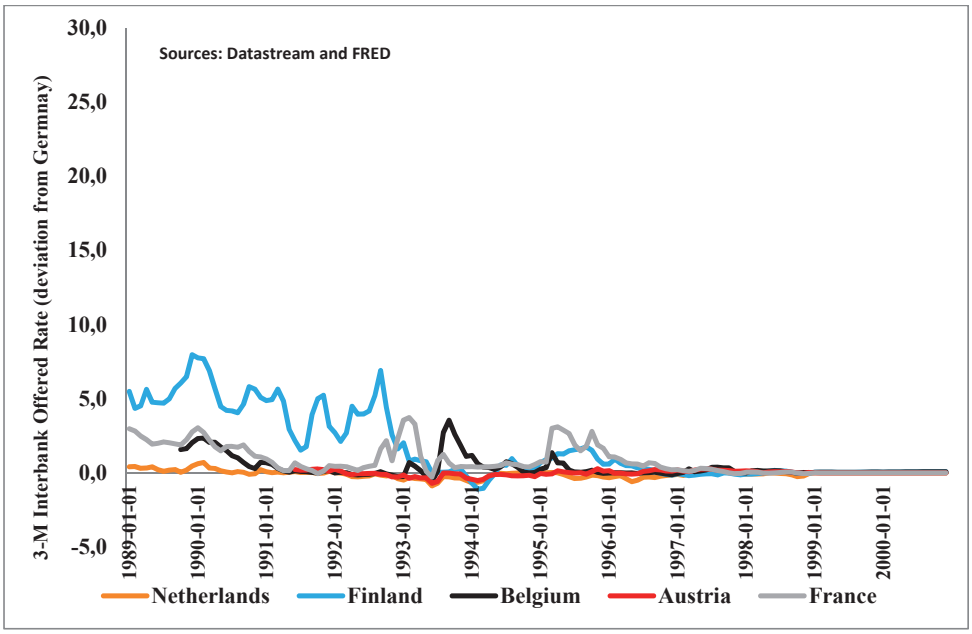

Figure 13. Short-term interest rates in surplus countries (deviation of 3-month interbank offered rates from Germany), 1989-2000

The scatter plot in Figure 14 suggests a strong linear relation between the interest rate (deviation of the 3-month interbank offered rate from Germany) before the adoption of the euro and the cumulative current account balance after the adoption of the euro. Consequently, the euro crisis was possibly, at least to some extent, a consequence of the initial convergence shock. Indeed, the question of why the short-term interest rates varied so widely is an interesting one. Part of the difference is probably caused by economic factors such as heterogeneity in the state of the domestic financial market. However, it is also possible that there are even more fundamental differences among the EMU countries.

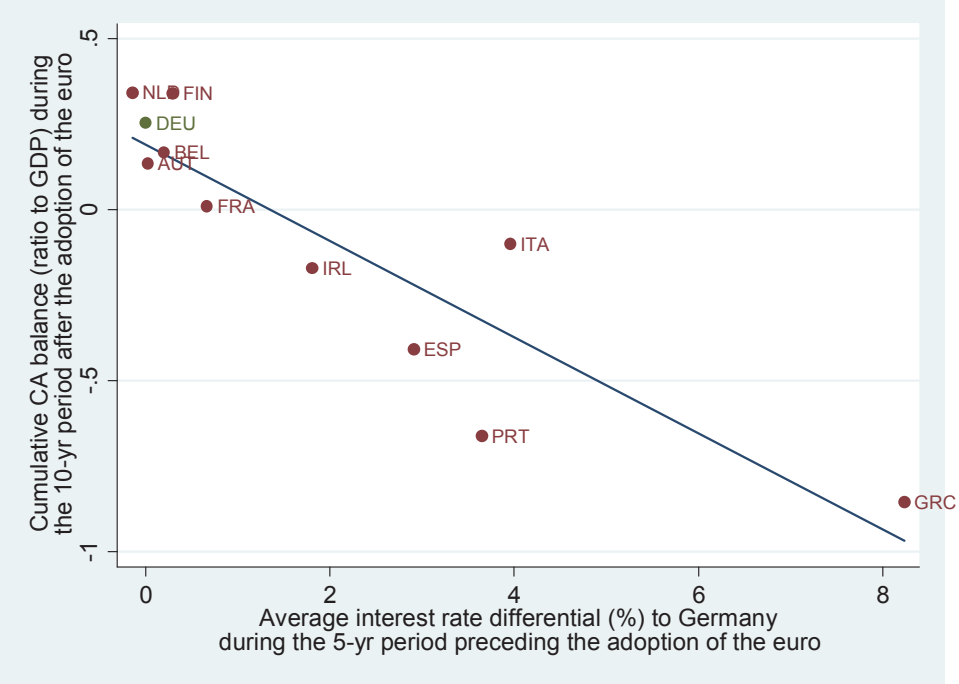

Figure 14. Relation between the short-term interest rate level before adoption of the euro and the cumulative current account balance after the adoption of the euro[11]

11 For Greece, the time periods are 1996-2000 (interest rate differential) and 2001-2010 (cumulative current account balance).

3. Theories of current account determination

The essays contained in this doctoral thesis are empirical studies. Nevertheless, it is necessary to briefly present the most important theories of current account determination. [12] These theories include traditional Keynesian models, the microfounded intertemporal optimization approach, and the New Open Economy Macroeconomics, which attempts to preserve the empirical wisdom embodied in the Keynesian models without sacrificing the theoretical insights of modern dynamic macroeconomics. More recently, as stocks of gross foreign assets and liabilities have grown, the role of valuation channel in external adjustment has increased. Open Economy Financial Macroeconomics examines international portfolio choices in standard two-country general equilibrium models. Despite the complexity of global imbalances, there are several models of global imbalances. This section will briefly discuss those models.

The first two of Dani Rodrik's (2015) ten commandments for economists given are as follows:

1. Economics is a collection of models; cherish their diversity.
2. It's a model, not the model. (p. 213)

Indeed, there are several theories of current account determination and various models of global imbalances. In a perfect garden, all flowers flourish.

3.1. Non-optimizing models

Current account can be expressed as exports minus imports, incomes minus expenditures, or savings minus investments.[13] Keynesian models view current account as a static balance between exports and imports. According to the elasticity approach, trade balance depends on export and import price elasticities (i.e., the Marshall-Lerner condition). According to the absorption approach, trade balances can be adjusted by either expenditure-switching (i.e., the exchange rate) or expenditure-reducing (i.e., domestic demand relative to foreign demand) policies. Overall, the Keynesian non-optimizing models focus on the demand side of the economy (see, e.g., Singh (2007, Section 2.1) and Obstfeld (2001, Section 1) for reviews).

In the 1970s, the monetary approach to balance of payments was developed. According to this approach, the disequilibrium of balance of payments is a monetary phenomenon. (Singh 2007, p. 28.)

In these non-optimizing models, external balance is defined as a zero official settlement balance (i.e., no change in the central bank's reserves).[14] The

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12 An attempt was made to minimize the number of equations.

13 More precisely, the current account is exports minus imports plus net factor income from abroad.

14 Long-run budget constraint is the cornerstone of the intertemporal approach to the current account.

lack of microfoundations is the primary weakness of these non-optimizing models. Nevertheless, the Keynesian models (e.g., the Mundell-Fleming model) have remained dominant in policy circles.

3.2. The intertemporal approach: a small open economy

An open economy can borrow from or lend to the rest of the world. Consequently, it can choose to invest a different amount than what it saves provided the long-run budget constraint is met. Since the early 1980s, the current account has been considered as an outcome of intertemporal choices of households, firms and governments (see, e.g., Sachs (1981)). In other words, the intertemporal approach, presented coherently by Obstfeld and Rogoff (1995, 1996) and Végh (2013), stresses the third identity (i.e., savings minus investments). The current account act as a shock absorber against temporary shocks, allowing consumption smoothing. The intertemporal approach extends Friedman's (1957) permanent income hypothesis to open economies' optimal external borrowing (Singh (2007, p. 44)). The merit of the intertemporal approach is that aggregate outcomes, such as the current account, are derived from agents' optimization behavior (see Razin (1995) and Singh (2007) for reviews). Thus, the theory is microfounded.

Let us consider a one-good small, open economy inhibited by representative, infinitively-lived agents with rational expectations and quadratic utility in a stochastic setting with riskless and perfect capital mobility (see Obstfeld and Rogoff (1996, Section 2.3.4), and Végh (2013, Section 1.5)). The intertemporal approach views the current account as an outcome of forward-looking, utility-maximizing saving decisions and forward-looking, profit-maximizing investment decisions. Productivity shocks affect both savings and investment. The response of external accounts (i.e., current account and trade balance) to productivity shocks depends on the relative strength of the saving and investment effects. For investments, the response to productivity shocks depends directly on the persistence of the shock. A one-period increase in productivity does not produce any change in investment. If a productivity increase is temporary or permanent, investment increases in the current period. These increases in investment build up capital stock and therefore, the expected future level of output rises. Savings behavior is solely driven by a consumption-smoothing motive. A one-period increase in productivity increases savings as current output increases; however, expected future output does not change. A permanent increase in productivity decreases savings because expected future output is higher than current output. Capital stock takes time to adjust and therefore, expected future output increases more than current output. The response of savings to temporary productivity depends on the difference between current and expected future levels of output. The higher the persistence of the positive productivity shock, the more likely it is that savings will decrease. In conclusion, external accounts are countercyclical either if investment effect dominates or if the expected future level of output is above

the current level of output. In other words, external accounts are countercyclical if the duration of the productivity shock is sufficiently long.[15]

Obstfeld and Rogoff (1996, p. 90) show that if consumption is determined by the certainty equivalence principle (quadratic utility) and if the real interest rate is constant and equal to the rate of time preference, it is possible to derive the following two equations (1)-(2) for the current account in a stochastic setting:

$$CA_t = \left(Y_t - E_t\widetilde{Y_t}\right) - \left(G_t - E_t\widetilde{G_t}\right) - \left(I_t - E_t\widetilde{I_t}\right), \quad (1)$$

where CA_t is the current account balance in period t, Y_t is output in period t, G_t is government consumption in period t, I_t is investment in period t, and $E_t\widetilde{X_t}$ is a conditional expected value for any variable X,

$$E_t\widetilde{X_t} = \left(\frac{r}{1+r}\right)\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} E_t X_s,$$

where r is the interest rate. If we define net output Z as output minus government consumption and investment, equation (1) gives $CA_t = Z_t - E_t\widetilde{Z_t}$ which can be rearranged as:

$$CA_t = -\sum_{s=t+1}^{\infty}\left(\frac{1}{1+r}\right)^{s-t} E_t\Delta Z_s, \quad (2)$$

where CA_t is the current account balance in period t, r is the interest rate, $Z \equiv Y-G-I$ (i.e., net output), and $\Delta Z_s = Z_s - Z_{s-1}$. Consequently, the current account is in deficit when the present discounted value of future net output changes is positive.[16] This illustrates that according to the intertemporal approach, movements in a country's current account are determined by the difference between the country's current situation and its long-run circumstances (Gourinchas and Rey (2014, p. 586)).

Consumption smoothing and global equality in the marginal product of capital are the two building blocks of the intertemporal approach. Countries should borrow either whenever their current income is below their permanent income or whenever the return to domestic capital exceeds the cost of borrowing. The amount of borrowing (or lending) is pinned down by the

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15 Aguiar and Gopinath (2007) document that trade balance is more strongly countercyclical in emerging countries than in developed countries. They provide evidence that although filtered output in emerging countries displays the same autocorrelation as filtered output in developed countries, the two groups of countries experience a different combination of trend and transitory shocks. In emerging countries, the business cycle is driven by shocks to trend growth, whereas developed countries have relatively stable trends.

16 Equation (2) implies that if net output is stationary in first differences, then the current account is stationary in levels (see, e.g., Sheffrin and Woo (1990)).

requirement to satisfy the long-run budget constraint, and the return to capital is equated across countries. (Gourinchas and Rey 2014, p. 586.)

3.3. Intertemporal approach and the data

The intertemporal approach to the current account is a theory with many implications. However, present-value models (PVM) of the current account are perhaps the most straightforward way to test the empirical predictions of the theory. Sheffrin and Woo (1990), Otto (1992) and Ghosh (1995) proxy future values of Z in equation (2) by using the information in past values of the current account.[17] Following Obstfeld and Rogoff (1995), an expectation of future values of ΔZ can be formed by first estimating the following first-order vector-autoregressive model:

$$\begin{bmatrix}\Delta Z_t \\ CA_t\end{bmatrix} = \begin{bmatrix}\psi_1 & \psi_2 \\ \psi_3 & \psi_4\end{bmatrix}\begin{bmatrix}\Delta Z_{t-1} \\ CA_{t-1}\end{bmatrix} + \begin{bmatrix}\varepsilon_{1t} \\ \varepsilon_{2t}\end{bmatrix} \tag{3}$$

and then making use of its implication that

$$E_t\begin{bmatrix}\Delta Z_{t+k} \\ CA_{t+1}\end{bmatrix} = \begin{bmatrix}\psi_1 & \psi_2 \\ \psi_3 & \psi_4\end{bmatrix}^k\begin{bmatrix}\Delta Z_t \\ CA_t\end{bmatrix} \tag{4}$$

to form an estimated current account, $\widehat{CA}_t$. If $\mathbf{I}$ is an identity matrix and $\mathbf{\Psi}$ the matrix of ψs, then equations (2) and (4) imply that

$$\begin{aligned}\widehat{CA}_t &= -[0 \quad 1]\left(\frac{1}{1+r}\mathbf{\Psi}\right)\left(\mathbf{I} - \frac{1}{1+\mathrm{r}}\mathbf{\Psi}\right)^{-1}\begin{bmatrix}\Delta Z_t \\ CA_t\end{bmatrix} \\ &\equiv [\Phi_{\Delta Z} \quad \Phi_{CA}]\begin{bmatrix}\Delta Z_t \\ CA_t\end{bmatrix}.\end{aligned} \tag{5}$$

It can be shown that if the version of the intertemporal approach embodied in equation (1) is true, then the theoretically predicted value of $[\Phi_{\Delta Z} \quad \Phi_{CA}]$ in (5) is simply $[0 \quad 1]$. (Obstfeld and Rogoff 1995, pp. 1785-1786) Consequently, the present-value model of the current account can be used to predict the current account.

Sheffrin and Woo (1990) have data on Belgium, Canada, Denmark and the United Kingdom from 1955-1985. They implement two priories on the interest rate (r=0.04 and r=0.14) and two information sets (t-1, and t-2). The restriction $\widehat{CA}_t = CA_t$ is rejected for Canada, Denmark and the United Kingdom in all specifications at 10% level of significance. For Belgium, in three of the four specifications, the restriction cannot be rejected. For Belgium and Denmark, the forecasted values of current account from the VAR fits the actual current account. Otto (1992) has data on the U.S. from 1950:1-1988:4 and on Canada

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17 Obstfeld and Rogoff (1996, pp. 90-94) and Ghosh and Ostry (1995) were among the first to test the present value model of the current account.

from 1950:1-1987:4. Consistent with the present-value model, the hypothesis that the current account does not Granger-cause changes in net output can be rejected for the U.S. at a 1% level of significance. This does not hold for Canada. Formal tests of the restrictions implied by the present-value relationship are rejected for both the U.S. and Canada. Nevertheless, for the U.S., the forecasted values of current account from the VAR fit the actual current account. According to Otto (1992) the results are not sensitive to the choice of real interest rate in the range of 2% to 8%.

Ghosh (1995) analyzes the U.S., Japan, Germany, the U.K., and Canada from 1960-1988. The hypothesis that the current account does not Granger-cause changes in net output can be rejected only for the U.S.. In U.S., Japan and Canada the correlation between the forecasted values of current account and actual series was over 0.95. In Germany the correlation was 0.81 and 0.70 in the U.K.. Consequently, the present-value model did relatively well in explaining current account movements. Feldstein and Horioka (1980) find that domestic saving and investment ratios are highly correlated. They interpret this finding as evidence for limited capital mobility (the Feldstein-Horioka puzzle). Ghosh (1995) argues that a positive correlation between savings and investment does not provide evidence against capital mobility per se. A persistent (but not permanent) productivity shock would increase both savings and investment. He finds that in Japan, Germany, the U.K. and Canada, the current account has been much more volatile than what perfect capital mobility and consumption smoothing would imply.

Obstfeld and Rogoff (1995, p. 1789) remark that one shortcoming of the early PVM of the current account was that they implicitly assumed that all shocks to net output are purely idiosyncratic. Glick and Rogoff (1995) derive tractable equations for investments and the current account in a one-good small country model with quadratic utility and adjustment cost to investment.[18] They build on the distinction between global and country-specific shocks. Assuming that country-specific productivity follows a random walk (which they were unable to reject for the G-7 countries), the model makes the following predictions: 1) Although both the country-specific and global productivity shocks increase investments, the former has a larger effect because the interest rate increases in the case of global shock; 2) A country-specific productivity shock contributes negatively to the current account balance, whereas a global shock has no effect; and 3) Measuring by the absolute values, a country-specific productivity shock has a larger effect on the current account balance than on investment. For the most part, estimated results were in line with the intertemporal model. However, the third prediction was consistently incorrect because investments responded more sharply to country-specific productivity shocks than the current account. Because the consumption response to an

18 Bussiére, Fratzscher and Müller (2010) extend the intertemporal model by Glick and Rogoff (1995) by assuming that a fraction of households spend their disposable income in each period. Consequently, a country-specific component of changes in government budget affects the current account and the dynamics of the current account are governed by both productivity shocks and the government budget.

income shock drops very dramatically if productivity is slowly mean-reverting instead of a random walk, Glick and Rogoff argue that the distinction between random walk and near-random walk productivity might explain the contradiction.

In general, the problem with present-value models of the current account has been the inability to match the volatility of the actual current account. More recently, there have been several attempts to improve the empirical performance of present value models of the current account by modifying the simple model along several dimensions. Bergin and Sheffrin (2000) allow for variable interest rates and exchange rates. Gruber (2004) introduces habit formation in consumption.[19] According to Nason and Rogers (2006), non-separable preferences, country-specific fiscal and world real-interest shocks, imperfect international capital mobility and an internalized risk premium are the potential factors in empirical rejections of the present-value models of the current account. In the latest volume of Handbook of International Economics, Gourinchas and Rey (2014) summarize the intertemporal approach to the current account as follows: "From a conceptual point of view, this approach constitutes a giant leap forward. From an empirical perspective, however, the theory has yielded mixed results and its key empirical predictions have often been rejected by the data, a point already noted by Obstfeld and Rogoff (1995)" (p. 586).

3.4. New Open Economy Macroeconomics

New Open Economy Macroeconomics is characterized by a combination of microfoundations, market imperfections and nominal rigidities (see, e.g., Lane (2001) and Corsetti (2007) for reviews). Obstfeld and Rogoff (1996, Chapter 10) provide an example of how to build a dynamic sticky-price general equilibrium model that preserves the empirical wisdom embodied in the Keynesian models (i.e., the Mundell-Fleming-Dornbusch model) without sacrificing the theoretical insights of modern dynamic macroeconomics (see also Obstfeld (2001, Section 3)). Bergin (2006) is one of the rare examples of how to advance the New Open Economy Macroeconomics in an empirical direction. He compares a two-country model estimated by a maximum likelihood method to data from the U.S. and an aggregate of the remaining G7. The model performs moderately well for the exchange rate and the current account.

3.5. The new rule of the current account

Financial globalization enables gains from consumption smoothing, efficient investment and diversification of risk (Feenstra and Taylor (2008, p. 653)). However, the intertemporal approach considers only the first two of these advantages. The intertemporal approach implies that a one-period increase in

[19] Kano (2009) shows that a habit-forming present-value model is observationally equivalent to the present-value model augmented with persistent transitory consumption induced by world interest rate shocks.

productivity results in a current account surplus. Ventura (2003) argues that the inconsistency between the data on the current account and the intertemporal approach can be reconciled by introducing investment risk and adjustment costs. Kraay and Ventura (2000, 2003) propose a new rule: the current account's response to a temporary income shock equals the change in savings generated by the shock multiplied by a ratio of net foreign assets to wealth. Consequently, the sign of the current account response depends on the sign of the net foreign asset position. Kraay and Venture argue that agents allocate the marginal unit of wealth between foreign and domestic assets in the same proportion as the average unit of wealth unless shocks have large effects on the distribution of asset return. Therefore, the new rule is a natural implication of the intertemporal approach if investment risk is high and diminishing returns in capital are weak. Ventura (2003) shows that the traditional result (i.e., positive response of current account to a temporary income shock) can be reinterpreted as a special case of a more general theory in which diminishing returns are strong and investment risk is weak.

The new rule introduced by Kraay and Ventura (2000) can be interpreted as a portfolio-choice model of current account. Tille and van Wincoop (2010) analyze the new rule using the two-country DSGE model of portfolio choice. According to the new rule, increased savings are invested domestically because of portfolio home bias. If this was the case, and if we had decreasing return to capital, a natural implication would follow: the marginal product of capital falls in the home country. Logically, this would lead domestic agents to shift toward foreign assets; that is, there would be a rise in net capital outflow. Consequently, the new rule cannot hold whenever we assume decreasing return on capital. However, the assumption of constant returns to scale is a necessary but not a sufficient condition for the new rule. Domestic agents cannot unilaterally determine the ratio of net foreign assets to wealth. Whenever agents in both countries have cross-border asset holdings, the ratio depends not only on the portfolio allocation of domestic agents but also on the portfolio allocation of foreign agents, and furthermore, on the relative wealth of the two countries. Therefore, as Tille and van Wincoop show, the new rule needs one-way capital flows so that only domestic agents can make a cross-border investment in addition to constant returns to scale.

The new rule was initially sold as a proposition arising from the data. Nevertheless, it is derived entirely from the cross-sectional data. Tille and van Wincoop note that this cross-sectional evidence reflects behavior in the steady state. Here, there is a logical contradiction because the new rule dealt exactly with the dynamic current account response to a temporary income shock, which is by nature a purely short-term fluctuation.

Tille and van Wincoop also discuss whether the portfolio theory or the intertemporal theory best describes current account dynamics. According to the portfolio theory of current account, capital flows are driven by agents' decisions about portfolio allocation. In this framework, investing in foreign assets reflects the need to diversify portfolios. The intertemporal approach is built on

consumption smoothing, which determines saving and equality between marginal products of capital across countries, which then determines investment. If there are constant returns to scale, the marginal product of capital is not related to the size of capital stock. In this case, investment and the current account are determined by portfolio allocation. Tille and van Wincoop conclude that the truth lies somewhere in between the models.

3.6. Open Economy Financial Macroeconomics

If riskless bonds with a constant rate of return are the only assets traded internationally, the long-run budget constraint implies that the present value of current and future trade balances is equal to minus the present value of external wealth (Sections 3.2 and 3.3). In reality, the financial landscape is characterized by large cross-border holdings of a vast set of assets denominated in various currencies. Consequently, net foreign asset position changes via trade and valuation channels. (Gourinchas and Rey 2014, pp. 631-634.) Traditionally, only the trade channel (i.e., net exports) has been taken into account. Gourinchas and Rey (2007a) argue that this shortcoming explains why the key empirical predictions of the intertemporal approach have been rejected by the data. Alternatively, the external adjustment may come from high expected net foreign portfolio returns. This is the valuation channel introduced by Gourinchas and Rey (2007a).

Valuation effects are driven by changes in asset prices and exchange rates. There is a great deal of empirical evidence indicating that the valuation effect can be large (see, e.g., Tille (2003), Obstfeld (2004), Gourinchas and Rey (2007b), Lane and Milesi-Ferretti (2007) and Gourinchas (2008) for a review). The increased importance of capital gains is consistent with growing stocks of gross foreign assets and liabilities. Obstfeld (2012) illustrates that for several countries, the average of gross foreign assets and liabilities as a ratio to GDP rose from 0.5 in the late 1990s to 2 in 2010. He also shows that the changes in net foreign asset position that are not attributable to current account flows are much larger than current account balances. Nevertheless, as Devereux and Sutherland (2010) note, until recently these empirical findings had little impact on the modeling of current account in open economy macro models. They refer to difficulties in incorporating classic principles of portfolio choice into the conventional dynamic general equilibrium open economy model.

It is important to distinguish between valuation effects and a valuation channel. Valuation effects are decomposed into an unpredictable and a predictable component. Unpredictable valuation effects dominate movements in net foreign asset positions. However, expected capital gains and losses on gross positions (i.e., predictable valuation effect) constitute the valuation channel (Gourinchas and Rey (2007a).

As discussed in Section 3.5, Kraay and Ventura (2000, 2003) analyze the implications of portfolio choice on capital flows in a partial equilibrium small open economy model. Recent methodological advances in Open Economy Financial Macroeconomics provide that portfolio decisions can be analyzed in

two-country, dynamic, stochastic, general equilibrium (DSGE) models (see Coeurdacier and Rey (2013, Section 3) for a review).[20] Both Devereux and Sutherland (2010) and Tille and van Wincoop (2010) use methods that are similar to standard approximation methods in DSGE models (i.e., local approximation around the deterministic steady state).[21] By focusing on an endowment economy and assuming log-linear preferences, Pavlova and Rigobon (2010) obtain an exact closed-form characterization of the equilibrium.

According to Gourinchas and Rey (2014 p. 635), the valuation channel has accounted for approximately 30% of the process of the U.S.'s external adjustment to its long-run solvency constraint. Despite the methodological advances in New Open Financial Macroeconomics, the existing models have had difficulties in producing such large expected gains and losses on net foreign asset positions. Ghironi, Lee and Rebucci (2015) separate asset prices from quantities in the definition of net foreign assets and produce non-negligible, predictable valuation effects.

3.7. Global imbalances in a general equilibrium framework

A simple neoclassical growth model predicts that capital will flow from rich capital-abundant countries to poor capital-scarce countries because the marginal product of capital is positive but strictly decreasing in the stock of capital. In reality, however, we have observed just the opposite as China and other developing countries, together with the OPEC countries, have financed the current account deficit of the U.S.. This contradiction is the so-called Lucas paradox. Lucas (1990) himself proposes four candidate answers to this paradox: differences in human capital, external benefits of human capital (i.e., learning by doing), capital market imperfections, and the legacy of European colonialism (the optimal policy for an imperialist was to retard capital flows to a colony in order to keep wage levels as low as possible). In this section, I will present some of the most influential theoretical papers on the allocation puzzle.[22]

Gertler and Rogoff (1990) build a two-country general equilibrium model for North-South capital flows. There is informational asymmetry between lenders and borrowers but no enforcing problems. All domestic capital market imperfections are determined endogenously and depend solely on a country's, or to be more precise, on an entrepreneur's, wealth. Gertler and Rogoff assume that one country is poor, and the other is rich, but in such a manner that entrepreneurs in neither country can finance first-best investment levels without borrowing. Because there are no enforcement problems, and financial markets are fully integrated, the pattern of investment would be totally

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20 The term "Open Economy Financial Macroeconomics" was inherited from Coeurdacier and Rey (2013). A paper by Kouri (1983) is an example of a portfolio balance model.

21 Devereux and van Wincoop (2011) show that in order to analyze portfolio choice in DSGE models, one must combine a second-order approximation of the portfolio selection equation with a first-order approximation of the remaining parts of the model.

22 This Section is closely related to Section 2.3 ("Explanations for global imbalances").

independent of the cross-country wealth distribution under conditions of perfect information. Nevertheless, information asymmetries have a dampening effect on investments in the poor country because entrepreneurs cannot obtain financing of their projects. This lack of financing, which results from the agency costs of lending, is a bigger problem in the poor country than in the rich country. In the equilibrium under asymmetric information, marginal products of capital are not equalized between the countries; instead, the marginal product of capital will be higher in the poor country. The pattern of world investment depends on the relative agency costs of lending between the countries. This in turn depends on the relative wealth of entrepreneurs between the countries. Gertler and Rogoff prove that as a result of information asymmetries, there is less of a savings flow from the rich country to the poor country, and it is even possible that the direction of net capital flows will be reversed.

The papers by both Caballero, Farhi, and Gourinchas (2008) and Mendoza, Quadrini and Ríos-Rull (2009) show that several features of global imbalances can be explained as an equilibrium outcome of financial integration across countries with heterogeneous domestic financial markets. Although these two papers are closely related, they differ both in how they derive the motivation of their general equilibrium model and in how they model the heterogeneity in domestic financial markets. Caballero et al. (2008) motivate their model using the following three observations: 1) The U.S. has run a persistent current account deficit since the early 1990s; 2) The long-run real interest rate has declined; and 3) The importance of U.S. assets in global portfolios has increased. Mendoza et al. (2009) derive this motivation from the following three observations: 1) Financial development varies widely, with the U.S. on top; 2) Persistent decline in the U.S. net foreign asset position began in the early 1980s together with a gradual process of international financial integration; and 3) The portfolio composition of U.S. net foreign assets is characterized by increased holdings of risky assets and a large increase in debt.[23]

Caballero et al. (2008) divide the world into four groups: The U.S. (U); the euro area; Japan; and the rest of the world (R). Financial imperfections are captured by the regions' ability to supply financial assets in a world without uncertainty. They analyze global equilibrium in a U-R world, including the implications not only of a collapse in asset markets in (R) but also of a gradual financial integration of fast-growing R economies. They show that both phenomena generate a rise in capital flows toward U, a decline in real interest rates, and an increase in the importance of U's assets in global portfolios. Consequently, U's inability to produce assets for savers can explain why capital flows from high- (R) to low- (U) growth economies.[24]

Mendoza et al. (2009) assume that countries are inhabited by ex ante identical agents who experience two types of risk because of idiosyncratic

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23 This remark was highlighted in Section 2.2.

24 Gourinchas and Rey (2014, Section 4.1) generalize the model by Caballero et al. (2008) to a production economy with overlapping generations.

endowment shocks and idiosyncratic investment shocks. Investment shocks can be avoided by choosing not to purchase a productive asset (capital income). Because there is a distinction between riskless and risky investments, it is possible to analyze how financial market heterogeneity affects not only net foreign asset positions but also their composition. Countries differ in their financial development, which is defined as the extent to which a country's legal system can enforce financial contracts among its residents so that they can use these contracts as insurance against idiosyncratic risks.[25] Mendoza et al. analyze the implication of financial globalization and financial market heterogeneity in a two-country model that is calibrated to both the U.S. and the rest of the world.[26] Contingent claims (i.e., insurance against idiosyncratic risk) are partially available in the U.S. and unavailable in the rest of the world. They show that in the steady state, the U.S. accumulates a net positive position in productive assets but a much larger negative position in contingent claims (bonds).[27]

There is a vast theoretical literature on the allocation puzzle (see Gourinchas and Rey (2014, Sections 3-4) for a survey). Benhima (2013b) builds a two-country model that is closely related to both Caballero et al. (2008) and Mendoza et al. (2009). Unlike Caballero et al. (2008), growth is endogenous in Benhima's framework. Eugeni (2015) is also closely related to both Caballero et al. (2008) and Mendoza et al. (2009). Eugeni builds a two-country overlapping-generations model with production and provides a formalization of Bernanke's global saving glut hypothesis. Angeletos and Panousi (2011) build a two-country incomplete-markets model that is closely related to Mendoza et al. (2009). Kraay et al. (2005) highlight the role of sovereign risk in explaining the low level of capital inflow to developing countries and inefficient renegotiation in explaining a bias toward loans. Ju and Wei (2010) distinguish between property rights protection and financial system efficiency and between financial capital and foreign direct investments. They show that a country with the highest property rights protection and the highest financial system efficiency attracts financial capital from all countries and dispenses direct investment around the world. Wang, Wen and Xu (2016) build a model that reproduces China's increasing financial capital outflow and FDI inflow (i.e., two-way capital flows). Both Gourinchas and Jeanne (2013) and Benhima (2013a) build on the neoclassical growth model. Gourinchas and Jeanne (2013) augment the Ramsay-Cass-Koopmans model with a saving wedge that distorts saving decisions and an investment wedge that distorts investment decisions. They find that the saving wedge is essential for the observed pattern of net capital flows across developing countries. In addition, they find that the accumulation

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25 One should note that in Gertler and Rogoff's model (1990), domestic capital market inefficiencies are endogenous, whereas in both Caballero et al.'s (2008) model and in Mendoza et al.'s (2009) model, they are exogenous.

26 In addition, they generalize the model to include any finite number of countries and calibrate a three-country model.

27 The empirical study by Vermeulen and de Haan (2014) confirms these theoretical predictions.

of international reserves plays an important role in explaining the allocation puzzle. [28] Benhima (2013a) incorporates uninsurable investment risk. [29] Coeurdacier et al. (2015) analyze the interaction between growth differentials and household credit constraints. They provide microfoundations for the global saving glut and a potential answer to the allocation puzzle.

There is also vast empirical literature on the allocation puzzle (see, e.g., Alfaro, Kalemli-Ozcan and Volosovych (2008, 2014), Azémar and Desbordes (2013), Göktan (2015), Papaioannou (2009), Forbes (2010), and Vermaulen and de Haan (2014)).

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28 Bayoumi, Gagnon and Saborowski (2015) analyze the effect of net official flows (i.e., foreign exchange intervention) on the current account.

29 The specification of Gourinchas and Jeanne (2013) is nested in Benhima's model (see Benhima (2013a, p. 333)).

4. Medium-term determinants of current account balances

Many studies have explored the medium-term determinants of current account balances. In this section, I will list the variables that have become standard in these types of empirical studies. The summarization of previous results is based on the studies of Debelle and Faruqee (1996), Calderon, Chong and Loayza (2002), Chinn and Prasad (2003), Bussière, Fratzscher and Müller (2006), Chinn and Ito (2007), Gruber and Kamin (2007), Cheung, Furceri and Rusticelli (2010), Ca' Zorzi, Chudik and Dieppe (2012), and Chinn et al. (2014). In addition to these studies, there are papers that have concentrated on the EU countries.

A brief description of the evolution of the previous panel studies might be helpful. Calderon et al. (2002) and Bussière et al. (2006) use annual data and dynamic panel data models. The work of Chinn and Prasad (2003) is seminal, and since then, it has become standard to use multi-year nonoverlapping averages and the pooled OLS estimator.[30] Chinn and Ito (2007) and Gruber and Kamin (2007) include some institutional variables describing both heterogeneity in the domestic financial markets and differences in political stability.

Budget balance: If an economy is populated by infinitely living representative consumers, the Ricardian equivalence holds by a self-evident proposition. In order to find current account responses to a budget deficit, we must adopt richer demographic assumptions. If consumption is determined by current disposable income instead of lifetime income, the Ricardian equivalence fails; that is, failures of the permanent income hypothesis lead to failures of the Ricardian equivalence (Romer (2006, p. 571)). Phenomena such as precautionary saving and liquidity constraints are much more relevant in poor developing countries than in rich countries. It is highly probable that a budget deficit has a stronger deteriorating impact on current account balances in poorer countries. When considering overlapping-generations models, we expect to see a twin deficit; that is, a government budget deficit that results in a current account deficit.

There is strong empirical evidence for a positive correlation between the budget balance and the current account balance. In other words, the Ricardian equivalence does not seem to hold in the real world. Typically, the coefficient of the budget balance is statistically significant at the 0.05 level and lies between 0.1 and 0.3. This means that if the budget balance improves by 10% of GDP, it results in a 1–3% GDP improvement in the current account. This positive relationship is a very robust result across the panel regression studies. Compared to other determinants, only the positive correlation between the net foreign assets position and the current account balance is more robust. There is some evidence that the coefficient is larger for developing countries than for advanced countries (see, e.g., Chinn and Prasad (2003, p. 59) or Cheung et al. (2010, p. 12)).

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30 For understanding cross-country variation in current account, including country fixed effects would undermine much of the economically meaningful aspects of the econometric analysis (Chinn and Prasad (2003, pp. 66-68).

Dependency ratios: According to Modigliani's (1986) simple version of the life-cycle hypothesis, lifetime is divided into two parts: income is constant until retirement and zero thereafter. This means that during the first stage, individuals save a positive amount, and during the second stage, they spend what they have accumulated in order to maintain a constant level of consumption. There are no bequests in this simple version. Therefore, we arrive at the following prediction: the faster the population growth is, the higher the aggregate saving rate. Therefore, it is also true that the lower the dependency ratio is, the larger the current account surplus. The extent of this demographic effect depends on the length of retirement. If the second phase is relatively long compared to the first phase, the demographic structure truly matters. (Modigliani 1986, pp. 300–301.)

Typically, the age-dependency ratio is split into the old dependency ratio (the number of people aged 65 or more divided by the number of people aged 15–64) and the young dependency ratio (the number of people aged 0–14 divided by the number of people aged 15–64). There is some empirical evidence for a negative correlation between both dependency ratios and the current account balance; however, dependency ratios are often found to be statistically insignificant.

Relative income: If we assume that all countries share the same technological level, differences in income levels result from differences in capital intensity. Initially, the marginal product of capital is higher in the (poor) capital-scarce country than in the (rich) capital-abundant country. As a result, capital will flow from the rich country to the poor country. Agents living in the rich country obtain higher returns when investing in the poor country. This is the state of affairs until the marginal products of capital are equalized; that is, until countries have the same capital intensity.

There is some empirical evidence for a positive correlation between relative income and the current account balance. This implies that high-income countries tend to be capital exporters; however, relative income is often found to be statistically insignificant.

Growth: According to the intertemporal approach, current account response to total factor productivity shock depends on the persistence of that shock. When using multi-year nonoverlapping averages, GDP growth gauges permanent shocks, whereas temporary shocks are filtered away.

If we consider a permanent increase in total factor productivity, we should observe negative current account responses in the short run. The permanent level of output increases more than the current output, even though the level of TFP is constant after the shock because the optimal level of capital rises. In the future, capital stock is larger, which is also why the level of output is higher despite no additional rise in productivity. Thus, the current account deficit is the result of risen investment and consumption smoothing.

There is some evidence for a negative correlation between GDP growth and the current account balance. It is important to realize, however, that we expect negative current account responses in the short run. If we are using

multi-year nonoverlapping averages, our focus is on the longer term. Perhaps this is the reason that GDP growth is sometimes found to be statistically insignificant.

Terms of trade volatility: This variable is sometimes included in the regressions because it is a proxy for economic instability, which might generate precautionary saving. It is rational to assume that the precautionary saving motive declines as the agent's wealth increases.

Developing countries, especially China, have accumulated huge reserves. There might be other motives for this, such as exchange rate manipulation, but one motive has been precautionary saving. Fearing a sudden interruption in a country's ability to borrow from foreigners has resulted in reserve accumulation. Because they have huge reserves, these countries are less vulnerable to sudden stops. In light of all this, we should expect that if we include change in reserves as a separate variable, the statistical significance of terms of trade volatility becomes weaker. Naturally, the terms of trade volatility is large for oil exporters. Often, the terms of trade volatility is found to be statistically insignificant (see, e.g., Chinn et al. (2014, p. 468)).

Fuel exports: It has become customary to control for oil exports, although variables calculated differently have been used. Oil exporters tend to be capital exporters.[31] If oil trade balance is included, there is typically a positive correlation between the oil balance and the current account balance. This correlation is almost trivial.

NFA position: Net factor income from abroad is recorded in the current account, thus, it is unsurprising that there is a strong positive correlation between the two. This is most likely the most robust correlation found in the previous studies. To avoid endogeneity, one must measure the net foreign asset position either in the previous period or at the beginning of the period.

Private credit: There is a large heterogeneity in domestic financial markets across countries. Despite the financial integration, financial development has not been a global phenomenon (Mendoza et al. (2009, p. 373)). For example, Caballero et al. (2008) and Mendoza et al. (2009) show that financial integration together with heterogeneity in domestic financial markets results in a net capital flow from an underdeveloped country to a highly-developed country.[32] Therefore, we would expect to find a negative correlation between the state of the domestic financial markets and the current account balance.

It has become standard to use private credit ratios as a proxy for the state of domestic financial markets. There is some empirical evidence for a negative correlation between the private credit ratio and the current account balance; however, private credit is often found to be statistically insignificant.

Political stability: The logic behind controlling for political stability is the same as the logic behind controlling for the private credit ratio: most likely, international investors are more willing to invest in a country with good legal

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31 See Allegret et al. (2014) for a detailed empirical analysis of the oil price-current account relation.

32 This argument was examined in Section 3.7.

institutions than in a country that does not have good legal institutions. In other words, we expect to find a negative correlation between political stability and the current account balance. Indeed, this is what is usually observed in the empirical studies.

Trade openness: It is possible that the results are conditional on how much a country trades with other countries. Thus, the sum of exports and imports (ratio to GDP) is usually included as a control variable.

Financial account openness: It is possible that the results are conditional on how much a country regulates cross-border capital flows. Therefore, it is wise to include the Chinn-Ito index, which measures a country's degree of financial account openness, as a control variable.

5. Overview of the essays

In this section, I will give an overview of the four essays. Here, I do not attempt to rewrite the content of any of the essays. Instead, I attempt to explain how the essays are related and how they differ. I also attempt to describe the learning process, including why and how I ended up implementing a particular research plan. Finally, I do my best to note the main shortcomings of each essay and how my work could be continued. The main findings of this doctoral thesis overall are discussed in Section 6.1.

5.1. Culture and current account balances

Since Chinn and Prasad (2003), several papers have explored the medium-term determinants of current account balances (see, e.g., Chinn and Ito (2007), Gruber and Kamin (2007), Cheung et al. (2010), Gagnon (2011), and Chinn et al. (2014)).[33] Ca' Zorzi et al. (2012) analyze literally thousands of models using the Bayesian Averaging of Classical Estimations (BACE) approach and portray histograms of coefficient estimates on all possible combinations of explanatory variables. They summarize their findings as follows: "Out of thousands/ millions of models, one consistent story emerges. The chance that current accounts were aligned with fundamentals prior to the financial crisis appears to be, according to this approach, minimal" (Ca' Zorzi, Chudik and Dieppe 2012, p. 1333). Therefore, it was not easy to contribute to the literature. We adopted a fairly simple methodology and a set of standard explanatory variables from the literature but attempted to think about the current account from a different point of view. In the growth literature, the focus had shifted from proximate determinants such as capital and technology to deep determinants such as religion, culture, institutions and geography. However, the current account literature and perhaps the open economy macroeconomics literature more generally had concentrated on the proximate determinants. The fact that the key predictions of the intertemporal approach related to the current account have been rejected by the data urged us to abandon the standard theory and propose something unconventional. It seemed that the division of Europe into the Protestant North and the Roman Catholic South coincides with the division into the net lending North and the net borrowing South. We were puzzled: was this pure chance?

In the first essay, titled "Culture and Current Account Balances," coauthored with Kari Heimonen and Esa Mangeloja and published in 2015 in the Applied Economics Letters, we use a large sample of countries and the same set of control variables as in the previous studies. Our point estimates are economically and statistically significant, suggesting that countries populated by Roman Catholics tend to have larger current account deficits or smaller current account surpluses by 2 percent of GDP. This finding is supported by

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[33] This literature was summarized in Section 4. In addition, Debelle and Faruqee (1996), Calderon et al. (2002), and Bussière, Fratzscher, and Müller (2006) examine the determinants of current account balances using panel data methods.

microlevel data on values: it turns out that Roman Catholics do not consider thrift as important as other religious groups. In order to explain our unconventional finding at the macro level, we look to Hofstede's database on dimensions of national cultures, which is used frequently in economics. It is common knowledge that there is a strong positive correlation between uncertainty avoidance and the share of Roman Catholics in a population (see, e.g., Hofstede (2001, pp. 198–200)). It turns out that this cultural trait might produce a strong relation between the proportion of Roman Catholics and current account balances. Referring to the quotation by Ca' Zorzi, Chudik and Dieppe (2012) mentioned above, our results suggest a new story. Current accounts are partly determined by deep parameters such as culture or religion. That is the novelty of the essay.

In order to further elaborate on the story, it is necessary to build a theoretical model of the relation between culture and net lending. Falk et al. (2015) present novel data on individual preferences. They show that religion explains a large fraction of cross-country variances in patience. Papers by Doepke and Zilibotti (2008, 2014) provide an example of how to link traits (e.g., time preference) with long-run economic outcomes. However, the idea that cultural factors affect time preference and autarky interest rate originates with Fisher (1930). According to the intertemporal approach, current account serves as a buffer against temporary output shocks. If indeed there are large cross-country differences in patience (i.e., heterogeneity in time preference) and these differences are partly caused by culture or religion, this hypothesis should be systematized in the future.

5.2. Labor market institutions, exchange rate stability and current account adjustment

In the second essay, the focus shifts from the current account balance to the first derivative of the current account balance. The first essay analyzes the determinants of the current account in its long-run equilibrium, whereas the second essay analyzes the determinants of the speed of adjustment of the current account toward its long-run equilibrium. The latter research question has not been examined as thoroughly as the former. Perhaps one reason is that when focusing on the speed of adjustment of the current account toward its long-run equilibrium, the scope is rather limited. As Chinn and Wei (2013, p. 168) remark, there is no guarantee that faster adjustment would present higher welfare. Perhaps it would be more appropriate to examine the prerequisite for smooth adjustment. Nevertheless, in the second essay, titled "Labor Market Institutions and Current Account Adjustment" and coauthored with Kari Heimonen and Timo Tohmo, we adopt this limited scope and suggest a new direction for the research. The previous empirical literature on the rate of reversion of the current account has been limited to examining the role of the exchange rate regime (see, e.g., Chinn and Wei (2013), or Ghosh, Qureshi and Tsangarides (2013)). We propose that the degree of coordination of wage bargaining affects the speed of current account adjustment.

Standard macroeconomic theory has traditionally stressed the importance of real exchange rate adjustment in restoring or sustaining the external balance. Naturally, this leads to the comparison of different exchange rate regimes. However, this paradigm assumes aggregate shocks. More recently, there has been a large amount of evidence indicating that idiosyncratic shocks explain a large fraction of aggregate volatility in output or exports. This implies that economy-wide adjustment mechanisms such as exchange rates are inefficient in restoring external balance. Firm-level wage coordination enables firms facing idiosyncratic shocks to adjust their price competitiveness. It has been shown that the type and degree of wage bargaining coordination affects macroeconomic performance. However, the literature on the rate of reversion of current account has been limited to examining the role of exchange rate regimes. The second essay of this thesis is the first attempt to build a bridge between these two types of literatures.

We find that fragmented firm-level wage bargaining facilitates external adjustment. The half-life of current account balance deviations is 6.9 years under the centralized wage coordination, compared to 2.0 years under firm-level wage coordination. The rate of current account reversion is monotonic in the degree of wage bargaining coordination. We also find a negative interaction between the effects of coordination of wage bargaining and the effects of exchange rate stability on the rate of current account reversion. When the exchange rate stability is low, the degree of coordination of wage bargaining greatly slows down the rate of current account reversion. As exchange rate stability increases, the effect of wage bargaining coordination on external adjustment diminishes.

Ju, Shi and Wei (2014) provide theoretical reasoning and empirical evidence that cross-country heterogeneity in labor market rigidities results in differences in current account adjustment. While exploring the determinants of current account reversion, we also find that the variable used by Ju, Shi and Wei (2014) for measuring labor market rigidity might be problematic. The correlation between the speed of current account adjustment and labor market rigidity seems to be specific to the particular sample. Nevertheless, this does not undermine their theoretical contribution. The same uncertainty applies to our empirical finding on the coordination of wage bargaining. Although the ICTWSS database has the largest country coverage on wage bargaining coordination variables, the number of countries is relatively small. Empirical results are always conditional on both the model and the sample. Consequently, it is possible that in the future someone will find that the variable we used is problematic if a larger sample of countries can be used. This discussion highlights that theoretical models with microfoundations are necessary for understanding cross-country heterogeneity in the adjustment speed of current account.

5.3. Trade imbalances within the euro area and with respect to the rest of the world

In the third essay, titled "Trade Imbalances within the Euro Area and with Respect to the Rest of the World," I explore the determinants of trade balances using annual data and relatively simple panel data methods. Consequently, the third essay is closely related to the first essay, "Culture and Current Account Balances." In addition, for the most part, the sets of explanatory variables are equal. The main difference in the third essay is that I use bilateral trade data to distinguish a country's intra-euro area trade balance from a country's trade balance with the rest of the world. This decomposition first used by Schmitz and von Hagen (2011) is one tool that enables us to identify the effect of the euro on the determinants of trade balance. Intra-euro area trade imbalances have contributed to a substantial portion of the EMU countries' current account imbalances. Consequently, it is important to analyze the intra-euro area trade balances.

The main contribution of the third essay, published in 2015 in Economic Modelling, is to illustrate that the result introduced by Schmitz and von Hagen (2011) is not robust to including the set of explanatory variables that has become standard in the current account literature. More precisely, the result that intra-euro trade balances would have become more sensitive to the differences in per-capita incomes does not hold if we control for the dependency ratios. In addition, in the third essay, I show that variables measuring cultural heterogeneity have explanatory power over the standard economic variables on intra-euro area trade balances and portray the contribution of each explanatory variable on both intra balances (i.e., trade balances vis-à-vis the euro area) and extra balances (i.e., trade balances vis-à-vis the rest of the world) for each country.

Perhaps the main weakness of the third essay, inherited from Schmitz and von Hagen (2011), is to use net capital flows as a proxy for the trade flows. If we disregard measurement errors, there is a one-to-one relation between net capital flows (i.e., a country's financial account) and current account balance (i.e., a country's current account). If we replace current account balance with aggregate trade balance, the identity still applies, at least approximately. However, there is not necessarily any relation between financial flows and trade flows, if we analyze, for example, intra-euro area flows instead of aggregate flows. While writing the essay in the fall of 2013, I understood the problem but decided to follow the terminology used by Schmitz and von Hagen (2011). In order to examine the robustness of someone else's results, it is necessary to adopt their premises. More recently, Hobza and Zeugner (2014) have shown that trade flow actually provides a poor indication of financial flow both for intra balances and for extra balances. There is also another problem. Johnson and Noguera (2012) note that official trade statistics record the gross value of goods at each border crossing instead of the net value added between border crossings. Any country's net exports (i.e., the total trade balance) are by definition the same when measured in gross or value-added terms (di Mauro, Nagengast and Stehrer 2016).

However, Johnson and Noguera (2012) show that bilateral imbalances measured in value added differ from gross trade imbalances. Nagengast and Stehrer (2016) apply their decomposition framework to intra-European trade imbalances and show that gross trade balances have become increasingly less representative of value-added balances.

5.4. Long-run determinants and short-run dynamics of the trade balance in the EU-15 countries

The European Commission (2010a, p. 8) claims that differences in domestic demand and price competitiveness have both contributed to the divergence of current account balances. A paper by the European Central Bank (2013, p. 69) shows that intra-euro area imbalances have been a large part of this divergence. In the fourth essay, we utilize the decomposition of trade balances into the intra balance and extra balance on a time series analysis of external balances. Our prime interest is to determine not only whether the aggregate trade balance can be adjusted by the real exchange rate or domestic demand policies as suggested by the European Commission (2010) but also whether the intra-euro area balance differs from the aggregate trade balance or the extra balance in this respect. Therefore, the fourth essay is a policy-oriented paper.

In the first three essays, panel data methods and annual data are used. In the fourth essay, titled ”Long-run Determinants and Short-run Dynamics of the Trade Balance in the EU-15 Countries” and coauthored with Juha Junttila, we use methods of time series analysis and quarterly data. We follow Arghyrou and Chortareas (2008) using the Johansen-Juselius cointegration methodology. Based on the previous studies (listed in Chapter 5, Table 1), we were expecting to find a robust long-run cointegration relation between the trade balance, the domestic output, the foreign output, and the real effective exchange rate. However, it turns out that in order to find a cointegration vector, we had to rely on backwards recursive estimation. In addition, we discover that because of the inability to reject the zero restrictions on the trade balance variable, and/or the inability to reject the weak exogeneity of the trade balance variables, there is no error-correction representation for the trade balance variables. Consequently, we were largely unable to answer our research question. However, we do find that despite increased integration, there remain significant differences in the long-run relations between the trade balance, the real effective exchange rate, domestic GDP and the foreign GDP trade balance across the EMU-12 countries. In the future, we might take Target balances and real interest rate differentials into account. In addition, it might be important to measure the domestic demand and its effect on exports more carefully. One way to further elaborate on the study would be to decompose each variable into common and idiosyncratic components and analyze the role of international spillovers and domestic factors in the long-run relationship.

6. Discussion

6.1. Main findings of this thesis

This thesis highlights the effects of institutional factors on external balances. These factors include differences in national cultures and cross-country differences in coordination of wage bargaining. Religion (e.g., the share of Roman Catholics in a population) and culture (e.g., the dimension of individualism-collectivism) are deep determinants of current account balances and intra-euro area trade balances. This is the first main finding of this thesis. Previous studies have concentrated only on the proximate determinants and neglected the fundamentals. However, countries populated by Roman Catholics or countries with a high uncertainty avoidance score tend to have larger current account deficits than non-Catholic countries. This finding does not imply that all Catholic countries run current account deficits all the time. The share of Catholics and the degree of uncertainty avoidance seem to be factors among many others that affect the current account. However, the finding suggests that a pattern of current account imbalances might be relatively persistent and beyond the reach of policy makers. In addition, there is a positive relation between an individualism score and intra-euro area trade balances.[34] These findings shed new light on the first research question: What are the medium-term determinants of current account balances?

The degree of coordination of wage bargaining affects the speed of current account adjustment. This is the second main finding of this thesis. Previous studies of the determinants of the rate of current account reversion have been limited to examining the role of exchange rate regimes. The rate of current account reversion decreases monotonically with the degree of coordination of wage bargaining; that is, fragmented firm-level wage bargaining facilitates external adjustment. In addition, there is a negative interaction between the effects of the coordination of wage bargaining and exchange rate stability on the rate of current account reversion. This suggests that firm-level wage flexibility and economy-wide exchange rate flexibility are not substitutes for shock absorption. These findings shed new light on the second research question: What are the determinants of the rate of current account reversion?

The third research question is as follows: What is the euro's effect on external balances? This question might be poorly defined. At least, it is a very broad question. Nevertheless, this thesis suggests two observations. First, contrary to previous belief, intra-euro area trade balances do not respond more strongly to differences in GDP per capita than they did before the introduction of the euro. Second, despite increased integration, there remain significant differences in the long-run relations between the trade balance, the real effective exchange rate, domestic GDP and foreign GDP trade balance across the EMU-12 countries.

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[34] The finding is consistent with Gorodnichenko and Roland (Forthcoming), who show that a more individualist culture leads both to more innovation and to higher growth.

6.2. The difficulty in analyzing current account balances

Referring to the quotation from Blanchard and Milesi-Ferretti (2009, p. 3), it can be argued that it is difficult to solve the mystery of current account determination.[35] There are probably several reasons for this difficulty. However, my impression is that the identity between the current account surplus and the financial account deficit is one of the primary suspects. The current account needs to be analyzed in a general equilibrium framework. One's surplus is another's deficit. It is hard to make a distinction between the pushing factors and the pulling factors, and it might be even harder to determine the side of the balance of payments on which they are operating. Without a valid theory, it is impossible to make sense of the data. Unfortunately, as Gourinchas and Rey (2014, p. 586.) conclude, key empirical predictions of the intertemporal approach to the current account have often been rejected by the data.

6.3. Does the current account still matter?

Several plausible arguments can be made to show that current account imbalances are irrelevant and governments should not intervene. Blanchard (2007) summarizes the so-called Lawson doctrine[36]: "This 'doctrine' is a restatement of the first welfare theorem: To the extent that current account deficits reflect private saving and investment decisions, that there are no distortions, and that expectations are rational, there are no reasons for the government to intervene" (p. 193). However, as Rodrik (2015) puts it, "The world is (almost) always second best" (p. 213). Obstfeld (2012) assesses perhaps a more reasonable argument: the case of focusing on gross flows and positions. It is gross exposures that carry the risks of a balance sheet crisis regardless of whether the country has a current account deficit or surplus. Because of the expanding gross asset and liability positions, the role of asset price changes in external adjustment has increased. In light of recent experiences, Obstfeld considers increasingly implausible the argument that current account deficits are self-correcting, cross-border financial flows promote efficient risk-sharing, and private-sector self-interest leads to efficient allocation. However, it is possible to argue that the current account balance itself is of little significance because advanced countries reside increasingly in an ocean of two-way financial flows and experience large capital gains and losses on their gross international assets and liabilities. Why continue to worry about the current account? Obstfeld groups the answers into three main categories: the current account as a symptom of related problems; the macroeconomic implications of significant changes in current account imbalances; and the likelihood that in the long run, the cumulated current account tracks the net foreign asset position. (Obstfeld 2012.) Therefore, the current account still matters.

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35 "Global imbalances are probably the most complex macroeconomic issue facing economists and policy makers" (Blanchard and Milesi-Ferretti (2009, p. 3).

36 The Lawson doctrine is named after former Chancellor of the Exchequer Nigel Lawson.

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CHAPTER 2
CULTURE AND CURRENT ACCOUNT BALANCES*

Abstract

This paper contributes to the literature of current account balances by introducing cultural variables that until now have been omitted. The World Values Survey indicates that the Roman Catholics do not consider thrift as important as others. We propose that Catholic countries tend to run current account deficits. This result remains robust even if we control for close to all of the determinants that have been included in previous studies. We find evidence that the inclination of Catholic countries to have high levels of uncertainty avoidance goes to a great length in explaining the result.

Keywords: current account; culture; religion

JEL classifition: F21; F41; Z1

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1. Introduction

We analyze the medium-term determinants of current account balances. Our contribution to the existing literature is the following: we introduce culture as a fundamental factor that may be important but has, until now, been unrecognized. We argue that countries with higher proportion of Roman Catholics tend to be capital importers. This seems to result from cross-country differences in uncertainty avoidance.

It may seem that current account balances and religion are unrelated. The following three observations made us to question this common wisdom: Firstly, Guiso et al. (2006) and De Castro Campos et al. (2013) provide evidence that individual preferences concerning the value of teaching thrift to children explains large part of the cross-country differences in national (or private) saving. Secondly, according to World Values Survey Catholics do not consider thrift as important as others (see Table 1). Thirdly, Europe is divided into Protestant North and Catholic South and this division seems to coincide with net lending North and net borrowing South (see Figures 1–2).

Table 1. Comparing Catholics to other religious groups (World Values Survey)

Variable	Catholics		Other groups		Comparison
What should children learn 1: thrift	Proportion: 0.198 (0.003)	Obs: 22 051	Proportion: 0.268 (0.002)	Obs: 49 546	z-stat: -20.044***
Important child qualities: thrift saving money and things	Mean: 0.336 (0.002)	Obs: 54 534	Mean: 0.383 (0.001)	Obs: 168 198	t-stat: -20.284***

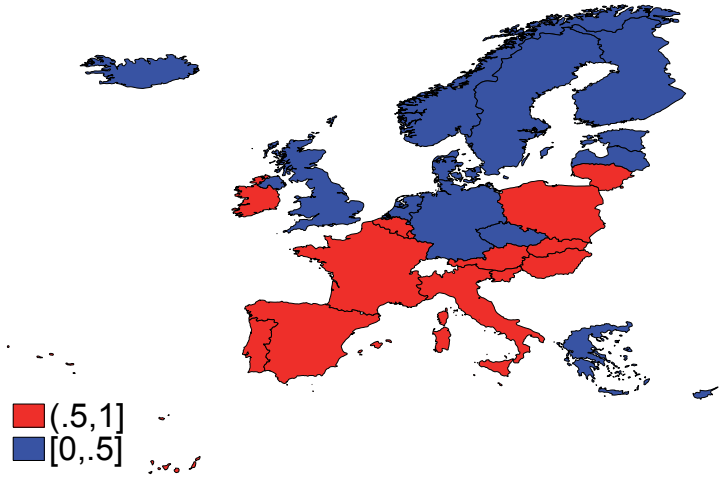

Figure 1. The share of Roman Catholics in the year 2000

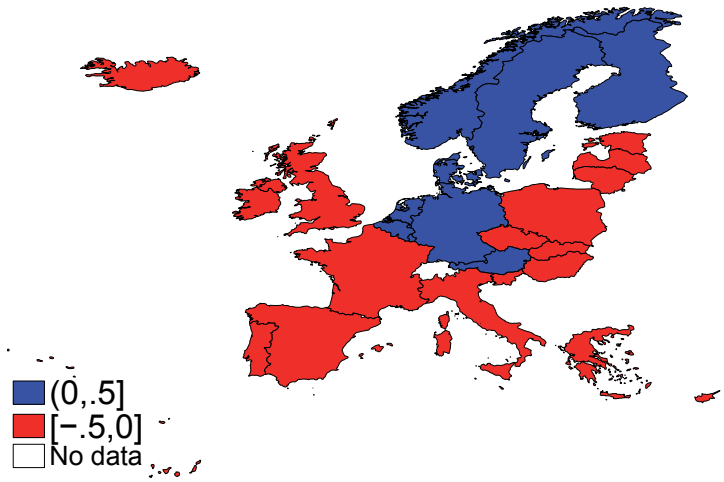

Figure 2. Current account balances (ratio to GDP) during the period of 2003-2007

2. Literature

There is a vast literature on medium-term determinants of current account balances (see, e.g., Chinn and Prasad (2003), Chinn and Ito (2007), Gruber and Kamin (2007), Ca' Zorzi et al. (2012), Lo Prete (2012)). The standard set of explanatory variables in this literature covers government budget balance, dependency ratios, relative income level, GDP per capita growth, terms of trade volatility, fuel exports, net foreign asset position and variables measuring institutional quality.

3. Results

Methodologically we content to follow the previous studies: we use pooled OLS, 5-year nonoverlapping averages and control for the so-called rest of the world effect. We have included all countries, 77 in total, for which we have data on the pre-crisis period (1993–2007). At first we run the baseline model of current account balances and in specification (1) we are able to replicate the typical results from previous studies (see Table 2). When we include religious denominations in our model, we proceed from a broad denomination (Christianity) to a more precise denomination (Catholics).[1] The deterioration effect of Christianity on current account balances is driven by Catholics. Our model predicts that the current account surplus (deficit) of a fully Catholic country is 2.0 percent of the GDP smaller (larger) than a non-Catholic country.

Both Akaike and Schwarz information criteria indicate that we should include our religious variable even if we control for all other determinants (see Table 3). Consequently, the result concerning the share of Catholics was not an accident. We did consider that the relationship between Catholics and current account balances might be nonlinear; however, because the squared term did not turn out to be statistically significant and a two-way scatterplot indicated a linear relationship between these two variables, we were satisfied with the linear model.

[1] Notice that there are plenty of small religious denominations that are found in only one or a few countries. In such cases it is trivial to find statistically significant results for religious denominations.

Table 2. Extending the baseline model of current account balances

Dependent variable	Current account balance (ratio to GDP)		
Specifications	(1)	(2)	(3)
Budget balance	0.403***	0.434***	0.396***
	(0.128)	(0.129)	(0.123)
Dependency ratio (old)	-0.029	-0.019	-0.027
	(0.020)	(0.019)	(0.020)
Dependency ratio (young)	-0.018	-0.014	-0.017
	(0.014)	(0.013)	(0.013)
Relative income	0.079***	0.074**	0.069**
	(0.029)	(0.029)	(0.029)
Growth	-0.377**	-0.425**	-0.434***
	(0.165)	(0.166)	(0.162)
Terms of trade volatility	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Fuel exports	0.021	0.015	0.016
	(0.019)	(0.020)	(0.019)
NFA position	0.059***	0.058***	0.060***
	(0.011)	(0.010)	(0.010)
Private credit	-0.019	-0.024	-0.024
	(0.017)	(0.018)	(0.017)
Regulatory quality	-0.060**	-0.065**	-0.061**
	(0.025)	(0.025)	(0.026)
Voice and accountability	-0.047**	-0.027	-0.040*
	(0.023)	(0.021)	(0.022)
Trade openness	0.002	0.002	0.002
	(0.005)	(0.004)	(0.004)
Capital account openness	-0.003	-0.001	-0.001
	(0.003)	(0.003)	(0.003)
Christians		-0.025**	
		(0.010)	
Catholics			-0.019**
			(0.009)
Time period dummies	Yes	Yes	Yes
R^2	0.627	0.640	0.637
Observations	210	210	210

Notes: In addition, all regression iclude a constant. Panel robust SEs are in parenthesis. The number of observations refers to the number of 5-year nonoverlapping averages. *, **, and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Table 3. Information criteria for different combinations of explanatory variables

Set of explanatory variables	Best model (Akaike)	Best model, if religious variable is excluded (Akaike)	Best model (Schwarz)	Best model, if religious variable is excluded (Schwarz)
Budget balance, Dep. ratio (old), Dep. ratio (young), Rel. income, Growth, ToT volatility, Fuel exports, NFA position, Private credit, Regulatory quality, Voice and accountability, Trade openness, Capital account openness, *Catholics*	Budget balance, Rel. income, Growth, Fuel exports, NFA position, Regulatory quality, Voice and accountability, *Catholics*	Budget balance, Rel. income, Growth, Fuel exports, NFA position, Regulatory quality, Voice and accountability	Budget balance, Rel. income, Growth, Fuel exports, NFA position, Regulatory quality, *Catholics*	Budget balance, Rel. income, Growth, Fuel exports, NFA position, Regulatory quality, Voice and accountability
14 variables and 16383 models in total	value: -763.771 rank: 1.	value: -759.229 rank: 139.	value: -735.614 rank: 1.	value: -732.452 rank: 5.

It is an interesting result that Catholics countries tend to run current account deficits. However, we should go further and try to understand why this is the case. Naturally the share of Catholics per se does not affect current account balances. There must be some aspect of underlying culture that this variable is grasping. Hofstede's database on dimensions of national cultures has been used widely to measure differences in national cultures. While individualism, masculinity, and power distance are all unrelated to current account balances, it turns out that there is a strong negative relation between uncertainty avoidance and current account balances (see Table 4). On the other hand, it is well documented there is a strong positive correlation between uncertainty avoidance and the share of Catholics (see, e.g., Hofstede (2001, 198–200)). If both the uncertainty avoidance index and Catholics are included into the set of explanatory variables, the latter becomes statistically insignificant.[2] The interpretation is clear: at least to some extent it is this inclination to uncertainty avoidance of Catholics that causes the negative relationship between current account balances and the share of Catholics. In other words, with regard to current account balances our two variables Catholics and Uncertainty avoidance are measuring the very same things.

Table 4. Current account balances using Hofstede cultural dimension

Dependent variable	Current account balance (ratio to GDP)		
Specifications	(4)	(5)	(6)
The same set of control variables as in specification (3)	Yes	Yes	Yes
Catholics	-0.020**	-0.015	
	(0.009)	(0.009)	
Uncertainty avoidance		-0.034**	-0.044***
		(0.017)	(0.016)
Time period dummies	Yes	Yes	Yes
R^2	0.706	0.713	0.708
Observations	174	174	174

Notes: In addition, all regression iclude a constant.
Panel robust s standard errors are in parenthesis.
*, **, and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

[2] Notice that the number of observations decreases, when uncertainty avoidance index is included.

4. Conclusion

We found evidence of a fundamental determinant of current account balances that previous studies have omitted: culture. In our regressions, the variable measuring the proportion of Catholics in the population was negatively and significantly associated with current account balances. Our result remained fairly robust although we controlled for almost all the variables that have been included in previous studies. Our finding has practical implications: compared to non-Catholic countries, Catholic countries tend to have larger current account deficits or smaller current account surpluses by 2 percent of the GDP. This is comparable to the effect of a 6 percent of GDP deterioration in the budget balance. We do not assert that all Catholic countries run current account deficits all the time. The share of Catholics seems to be one factor among many others that affects current accounts.

After using Hofstede's measures of culture we found out that in Catholic countries uncertainty avoidance is relatively high and that there is a negative relation between uncertainty avoidance and current account balances. This inclination of Catholics to uncertainty avoidance seems to explain at least partially why Catholic countries tend to be capital importers. However, this issue needs to be examined more in depth in the future.

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Appendix: Data sources

Table A1.

Variable	Source[a]
Current account balance	WDI , WEO
Budget balance	WDI, WEO, IFS, GFS, OECD, Eurostat, IFS yearbook, AFDB, AMF,
Dependency ratios	WDI
Relative income	WDI, WEO/IFS
Growth	WDI, WEO
Terms of trade volatility	WDI, WEO
Fuel exports	WDI, WEO2013, OPEC
NFA position	LM
Private credit	BD, WDI
Regulatory quality	PRS
Voice and accountability	PRS
Trade openness	WDI, IFS/WDI
Capital account openness	CI
Christians	McCleary
Catholics	McCleary
Uncertainty avoidance	Hofstede
Table 1	WVS
Figures 1–2 (shape file)	TM

[a] AFDB: African Development Bank Group; AMF: Arab Monetary Fund; BD: Financial institutions and markets across countries and over time by Beck and Demirgüç-Kunt (2009); CI: A new measure of financial openness by Chinn and Ito (2008); EBRD: European Bank for Reconstruction and Development; Eurostat; GFS: Government Finance Statistics; IFS: International Financial Statistics; Hofstede: <http://www.geerthofstede.com/media/651/6%20dimensions%20for%20website.xls>; IFS yearbook: International Financial Statistics Yearbook 1998; LM: updated and extended version of the External Wealth of Nations Mark II database by Lane and Milesi-Ferretti (2007); McCleary: Religion Adherence Data by McCleary; OECD: OECD Economic Outlook 88 database; OPEC: Annual Statistical Bulletin 1999; PRS: Political Risk Services' International Country Risk Guide (free of charge version); TM: <http://thematicmapping.org/downloads/world_borders.php>; WEO: World Economic Outlook Database, October 2010; WEO2013: World Economic Outlook Database, April 2013; WDI: World Development Indicators; WVS: World Values Survey.

CHAPTER 3
LABOR MARKET INSTITUTIONS, EXCHANGE RATE STABILITY AND CURRENT ACCOUNT ADJUSTMENT*

Abstract

The literature on the determinants of the rate of current account reversion has been limited to examining the role of exchange rate regimes. We propose that the degree of coordination of wage bargaining affects the speed of current account adjustment. Our point estimates are economically and statistically significant, suggesting that fragmented firm-level wage bargaining facilitates external adjustment. The rate of current account reversion is monotonic in the degree of wage bargaining coordination. The result seems theoretically plausible as the aggregate shocks in the exporting sector are largely driven by idiosyncratic shocks and the presence of idiosyncratic shocks increases the importance of labor market flexibility. We also find a strong negative interaction between the effects of wage bargaining coordination and exchange rate stability on the rate of current account reversion.

Keywords: Current account dynamics, Coordination of wage bargaining, Labor market institutions, Exchange rate stability

JEL classification: F32, F41

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1. Introduction

It is well documented that the type and the degree of wage bargaining coordination affects macroeconomic performance (see, e.g., Flanagan 1999 or Aidt and Tzannatos 2010 for reviews). However, the literature on the rate of reversion of the current account has concentrated solely on examining the role of exchange rate regimes (see, e.g. Chinn and Wei 2013 or Ghosh et al. 2013). Our empirical study is the first attempt to build a bridge between these two distinct literatures. We find clear empirical evidence on the effects of wage bargaining coordination on the speed of current account adjustment.

Exchange rate flexibility is not the only determinant of the rate of current account reversion. Ju, Shi, and Wei (2014) were the first to provide microfoundations to understand the cross-country heterogeneity in the adjustment speed of current account. They illustrate that an economy's response to a shock involves a combination of intertemporal trade (current account adjustment) and intra-temporal trade (goods trade). Their theoretical model and empirical results indicate that labor market rigidities hinder the adjustment of current account towards its long-run equilibrium. On a more general level there is a vast literature on how labor market institutions affect macroeconomic performance (see, e.g., Flanagan (1999), or Aidt and Tzannatos (2010) for reviews).

In this paper we will test which aspects of labor market institutions are the most important in explaining cross-country differences in the speed of current account adjustment. Our main empirical finding is that the rate of current account reversion is monotonic in the degree of wage bargaining coordination. Fragmented firm-level wage bargaining facilitates current account adjustment. In addition, we find that there is a strong negative interaction between the effects of coordination of wage bargaining and exchange rate stability on the rate of current account reversion. Hence, the effect of coordination of wage bargaining on the rate of current account reversion diminishes as the exchange rate stability increases. This implies that firm-level wage flexibility and economy-wide exchange rate flexibility are not substitutes for shock absorption.

An economy can absorb shocks by means of current account adjustment. In order to explain the reasoning behind our main finding we will tackle the three following issues. The first issue is whether or not the aggregate shocks in the exporting sector are driven by firm-specific shocks. If productivity growth is driven solely by aggregate-level shocks, adjustment is faster under centralized bargaining compared to industry-level bargaining (see, e.g., Aidt and Tzannatos (2008, pp. 263–264), or Carlin and Soskice (2006, pp. 748–749)). This would contradict our finding. The second issue is whether or not there is a link between high variance of idiosyncratic shocks and labor market flexibility. The third issue is whether wages are more responsive to firm-specific shocks under fragmented firm-level wage bargaining or centralized wage bargaining. Based on a careful review of the relevant literature (Section 2), we deduce that our macro-level results (Section 3) are in line with both economic theory and micro-

level evidence on firm sales (the granular hypothesis), pattern of country exports across sectors, and wages. Firm-specific competitiveness is most easily merged with firm-level wage bargaining. While exploring the determinants of the current account reversion (Section 3), we also find that the variable which Ju, Shi and Wei (2014) used for measuring the labor market rigidity might be problematic. The correlation between the speed of current account adjustment and labor market rigidity seems to be specific to the particular sample. However, this does not undermine their theoretical contribution.

2. Relevant literature

Our goal is to analyze the determinants of the rate of current account reversion. However, we do not claim that a faster current account reversion would always be desirable.[1] The question of whether or not flexible exchange rate regime or firm-level wage bargaining facilitate external adjustment is first and foremost empirical. The view that flexible exchange rate regime facilitates external adjustment was proposed by Friedman (1953). Contrary to this common knowledge, Chinn and Wei (2013) provide evidence that there is no strong or monotonic relationship between the de facto exchange rate regime classifications and the speed of current account adjustment. According to Ghosh et al. (2013) the de facto exchange rate regime classifications are inadequate in measuring exchange rate flexibility. They show that if exchange rate flexibility is calculated from the trade-weighted bilateral exchange rate volatility, flexible exchange rate indeed facilitates current account adjustment.[2] Berger and Nitsch (2013) analyze the euro's effect on the intra-euro area trade imbalances. Their estimations suggest that after the introduction of the euro, the intra-euro area imbalances became larger and more persistent.

Ju, Shi and Wei (2014) provide theoretical reasoning and empirical evidence that cross-country heterogeneity in labor market rigidities result in differences in current account adjustment. They build a dynamic general equilibrium model and propose that an economy can adjust to shock via intertemporal or intra-temporal trade. Instead of importing capital by running a current account deficit (i.e. intertemporal trade) a country may increase both the imports of capital intensive goods and exports of labor intensive good (i.e. intra-temporal trade). However, rigid factor markets increase the need for current account to adjust and slow down the speed of adjustment of current account towards its long-run equilibrium. They also present empirical evidence consistent with the theory.

Several studies have analyzed the relationship between the wage bargaining structure and the natural rate of unemployment. Calmfors and Driffill (1988) suggested a hump-shaped relation between centralization and real wage. As explained by Carlin and Soskice (2006, p. 114), this hypothesis results from the two following expectations: the union's expectation on how employment responds to a change in the wage (i.e. competitiveness effect) and the union's expectation on how the economy-wide price level is affected by a wage increase (general equilibrium effect). If wage bargaining takes place at firm-level, the union is concerned that a wage increase has a negative effect on

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1 There are several studies on optimal exchange rate policy (see, e.g., Frankel (1999), Klein and Shambaugh (2010), or Rose (2011)) and even more studies on optimal monetary policy in open economies (see, e.g., Corsetti, Dedola and Leduc (2010) for a review).

2 On the other hand, if a measure of regimes is based on the trade-weighted bilateral exchange rate volatilities, it may be more subject to endogeneity than the de facto exchange rate classifications. To some extent endogeneity concerns can be mitigated by using discrete regime classifications (see Ghosh, Qureshi and Tsangarides (2014)).

employment because the firm loses competitiveness compared to other firms. If wage bargaining is centralized, the union recognizes that nominal wage rise will generate an increase in the economy-level price level and real wages do not rise. Industry-level bargaining will produce the worst outcome (i.e. the highest rate of natural unemployment). However, the empirical evidence on the hump-shaped hypothesis is fragile (see, e.g., Flanagan (1999), or Aidt and Tzannatos (2010) for reviews).

Traxler and Brandl (2012) propose that in open economy (i.e. economy with tradable and nontradable sectors) the macro effects of bargaining on price competitiveness depend on its ability to take into account inter-sectoral productivity differentials. Industry-level bargaining is superior, if the exposed-sector dominates the wage coordination. They find that the wage bargaining structure has statistically significant effect on the growth rate of nominal labor cost and current account balance. More specifically, with respect to current account surplus, exposed-sector pattern bargaining outperforms other wage bargaining structures. The recognition of inter-sectoral productivity differentials and the Balassa-Samuelson effect by Traxler and Brandl (2012) made a contribution to the research. However, one should realize that there are large productivity differentials between individual firms within the tradable sector (see, e.g., Syversen (2011), or Bernard et al. (2012)).

Due to the empirical evidence on large and persistent productivity differences among establishments within narrowly defined industries, recent literature has introduced heterogeneous firms into models of international trade (see, e.g., Melitz (2003), Bernard et al. (2003), Melitz and Redding (2014), or Eaton, Kortum and Kramarz (2011)). However, Eaton, Kortum and Sotelo (2012) point out that the convention of treating firms as points on a continuum means that shocks on individual firms cannot have an aggregate effect. They provide an example of how a standard heterogeneous-firm trade model can be elaborated to allow for only an integer number of firms. The paper by Eaton, Kortum and Sotelo (2012) is a major advance in trade theory because Gabaix (2011) finds that the US idiosyncratic shocks to the top 100 firms explain one-third of the aggregate volatility in output.

Di Giovanni and Levchenko (2012) argue that the existence of very large firms can explain why smaller countries are more volatile (high concentration of firm sales in small economies) and more open countries are more volatile (only largest firms export). Their calibrated model indicates that in small open economies trade can increase aggregate volatility up to 20 percent. Canals et al. (2007) use bilateral trade data by 2-digit SITC categories and find that shocks affecting only a particular country-industry flow explain one half of the total variance of trade balance. One explanation might be that firms are non-atomistic. As Canals et al. (2007) analyze Japan more closely, they observe that between 1983 and 1999 the top five Japanese firms account for around 20% of total Japanese exports and the top 25 almost a half of total exports. Their estimation suggests that 7.4% of the total variation in Japanese exports is due to idiosyncratic shocks to individual firms. Del Rosal (2013) provides evidence

that idiosyncratic shocks to the main products have significant effect on total exports in Portugal, Greece and Ireland. In these countries the granular residual explains approximately 30% of the export growth. According to Freund and Pierola (2015) exports are highly concentrated. They show that among 32 developing countries, the top firm accounts for 14% and the top five firms for 30%, on average, of a country's total nonoil exports. Considering all these pieces of evidence it appears that a large fraction of aggregate volatility in exports or in net exports results from firm-specific shocks.[3]

Cuñat and Melitz (2012) build a theoretical model which highlights the importance of labor market flexibility as volatility (i.e. the variance of the firm-specific shocks in a sector) increases. Labor market flexibility is a source of comparative advantage in high-volatility sectors. They also provide empirical evidence consistent with their model. The exports of countries with relatively flexible labor markets are biased towards high-volatility sectors. The paper by Cuñat and Melitz (2012) is important for our deductive reasoning, because it proves that international differences in labor market flexibility affect how firms can adjust to idiosyncratic shocks.

Barth and Zweimüller (1995) show theoretically that in the case of unequally profitable firms, more decentralized wage bargaining increases wage differentials among equally productive workers, if the central union aims to maximize the total wage bill. In other words, inter-firm wage differentials are likely to be strictly lower under centralized bargaining regime. Guertzgen (2009) analyzes linked employer-employee data from Germany and finds out that individual wages are positively related to firm-specific quasi-rents (i.e. value-added minus the opportunity cost of labor) in the non-union sector and under firm-specific contracts. On the contrary, industry-wide wage contracts are associated with a significantly lower responsiveness of wages to local conditions. Compared to contracts without any flexibility provisions, wages under opt-out clauses (i.e. possibility to deviate from standards stipulated in the industry-level agreement) are more responsive to local profits in below-average-performing establishments in Germany (Garloff and Guertzgen 2012). Consequently, both economic theory and empirical microlevel evidence from Germany indicate that wages are more responsive to firm-specific profitability under fragmented firm-level wage bargaining than under centralized wage bargaining.

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[3] Canals et al. (2007) highlight the importance of considering disaggregated data when modeling the current account.

3. Empirical results

First, we will estimate the effect of the coordination of wage bargaining on the rate of reversion of the current account by using a two-step procedure (Section 3.1) and a one-step procedure (Section 3.2). Second, we will estimate the interaction effect of wage bargaining coordination and exchange rate stability on the rate of reversion of the current account (Section 3.3).

3.1. Two-step procedure

In a two-step procedure, we measure the country-specific rate of current account adjustment by estimating the following equation using the OLS estimator for each country:

$$\Delta CA_{it} = \beta_{0,i} + \beta_{1,i} CA_{it-1} + \varepsilon_{it}, \quad (1)$$

where ΔCA_{it} is the first difference of the current account balance (ratio to GDP) of country i in period t, $\beta_{0,i}$ and $\beta_{1,i}$ are country-specific parameters, CA_{it-1} is the current account balance (ratio to GDP) of country i in period t-1, and ε_{it} is a residual.[4] Values of $\beta_{1,i}$ close to minus one imply a high speed of adjustment of the current account toward its long-run equilibrium, whereas values close to zero imply a slow speed of adjustment of the current account towards it long-run equilibrium.[5] Potential serial correlation in the residual is eliminated by including higher orders of the lags of the dependent variable.

In the second stage of the two-step procedure, we estimate the following cross-sectional regression model by the OLS estimator:

$$\beta_{1,i} = \alpha + \gamma_j \sum_{j=1}^{k} LaborMarket_{ji} + \boldsymbol{x}_i'\boldsymbol{\delta} + \varepsilon_i, \quad (2)$$

where β_1 is the speed of adjustment of the current account toward its long-run equilibrium (i.e., β_1 in equation (1)) in country i, α is an intercept, $Coord_{ji}$ is a binary dummy variable for coordination of wage bargaining in country i in regime j, $\mathbf{x}_i$ is a vector of control variables of country i, and ε_i is a residual.

The degree of coordination of wage bargaining is not measured on the metric scale. Therefore, we use the mode of the sample period for the wage bargaining coordination variable and model different degrees of coordination of wage bargaining by a set of binary dummy variables. If we include the mode of coordination of wage bargaining as such instead of a set of binary dummy variables, we impose a monotonic relationship between the degree of coordination of wage bargaining and the rate of current account reversion.[6]

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4 This two-step procedure is applied, for example, by Ju, Shi and Wei (2014).

5 In the sample analyzed in Table 1 the values of β_1 vary between -0.690 (Slovakia) and -0.055 (Germany).

6 We will apply this latter approach in models (4), (17) and (19).

Although the ICTWSS database has the largest country coverage on wage bargaining coordination variables, the number of countries is relatively small.[7] Consequently, we were compelled to test only a few control variables (i.e., GDP per capita and/or financial openness index) and exclude unnecessary control variables.[8]

Compared to fragmented firm-level wage bargaining (our reference category), centralized wage bargaining slows down the speed of adjustment of the current account toward its long-run equilibrium (Table 1). Due to the central role of the US dollar in the world economy, the US has had an exorbitant privilege, which relaxes its external constraint (see, e.g., Prasad (2014)). If we include a dummy variable for the US, the result becomes even stronger (model (2)).[9] In model (3), we make a distinction between the two subcategories of centralized wage bargaining.[10] In model (4), we include coordination of wage bargaining as such. This identification assumes that the relationship between the rate of current account reversion and the degree of coordination of wage bargaining is monotonic. According to the two-step procedure, the speed of adjustment of the current account toward its long-run equilibrium decreases monotonically with the degree of coordination of wage bargaining. The finding is theoretically plausible as the aggregate shocks in the exporting sector are largely driven by idiosyncratic shocks and the presence of idiosyncratic shocks increases the importance of labor market flexibility. It is also consistent both with the theory on collective bargaining and wage dispersion and with microlevel evidence on wages, because firm-level wage bargaining increases the responsiveness of wages to firm-specific profitability.

At first it seems that the length of collective wage agreements affects the rate of current account reversion (model (5)). However, it turns out that this result is driven by one country: India (see Figure A2). If we exclude India, the coefficient of length of collective wage agreements is not statistically significant even at the 30% level.

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7 ICTWSS is the most widely used database on the wage bargaining coordination. See the details in Visser (2013) and Kenworthy (2001). See the country coverage in Table A2.

8 The set of control variables is derived from Ju et al. (2014, Tables 3-4), Chinn and Wei (2013, Tables 5-11), and Ghosh et al. (2013, Table 3). A control variable is considered unnecessary, if it is statistically insignificant in all phases of the particular analysis.

9 After including the US dummy, the financial openness index becomes statistically insignificant.

10 The "Centralized with peace obligation" category has only three countries, and for most cases, we lump the two subcategories of centralized wage bargaining together. This does not affect the results.

Table 1. Labor market institutions and the rate of current account reversion (mainly advanced countries)
Dependent variable: the speed of adjustment of the current account towards its long-run equilibrium (i.e. β_1 in equation (1))

Variable	(1)	(2)	(3)	(4)	(5)
Coordination of wage bargaining:					
Industry and firm-level	0.105	0.094	0.094		
	(0.085)	(0.076)	(0.077)		
Informal centralization	0.115	0.100	0.100		
	(0.091)	(0.094)	(0.095)		
Centralized bargaining:	0.191**	0.210***			
	(0.070)	(0.072)			
Centralized without peace obligation			0.214**		
			(0.080)		
Centralized with peace obligation			0.195***		
			(0.068)		
Coordination of wage bargaining (1=Firm-level,…, 5=Centralized)				0.056***	
				(0.018)	
Length of collective wage agreements					0.087**
					(0.041)
Financial openness	0.037*				
	(0.022)				
Log GDP per capita					0.050**
					(0.021)
Constant	-0.425***	-0.399***	-0.399***	-0.436***	-0.417***
	(0.071)	(0.061)	(0.062)	(0.058)	(0.071)
US dummy variable		0.314***	0.314***	0.295***	
		(0.061)	(0.062)	(0.042)	
R^2	0.198	0.220	0.221	0.197	0.222
Number of countries	41	41	41	41	34

Notes: The dependent variable is a country-specific regression coefficient for an AR process with lags that characterizes the speed of adjustment of the current account toward its long-run equilibrium. Heteroscedasticity robust standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels. Fragmented firm-level wage coordination is the reference category for the coordination of wage bargaining in models (1)-(3).

In Table 2 we regress the $\beta_{1,i}$ on labor market rigidity and a set of control variables. In models (6)-(8) we replicate the result from Ju, Shi and Wei (2014).[11] It seems that there is a strong correlation between the speed of current account convergence and labor market rigidity (see also Figure A3). However, if we expand the sample to a larger number of countries and for a longer time period, this correlation disappears (see also Figure A4).[12] Consequently, it might be that

[11] Both the set of countries and the sample period (1980-2005) are the same. Data on labor market rigidity is from Ju, Shi and Wei (2014). See details in Tables A3-A4. The set of control variables is almost the same.

[12] In models (9)-(11) we included all countries for which we had data. Only countries with at least 20 consecutive annual observations including observation from the 2000s were considered. However, if the country became independent after the collapse of the Soviet Union this rule was not always observed.

this empirical result in Ju, Shi and Wei (2014) was specific to the particular sample.

Table 2. Labor market rigidity and the rate of current account reversion (mainly developing countries)
Dependent variable: the speed of adjustment of the current account towards its long-run equilibrium (i.e. β_1 in equation (1))

Variable	(6)	(7)	(8)	(9)	(10)	(11)
Labor market rigidity	0.607**	0.708**	0.921***	0.079	0.126	0.050
	(0.278)	(0.337)	(0.325)	(0.176)	(0.182)	(0.194)
De facto exchange rate regime:						
Crawling peg		0.004	0.009		0.026	0.081*
		(0.087)	(0.090)		(0.045)	(0.047)
Managed float		-0.018	-0.045		-0.038	-0.024
		(0.102)	(0.097)		(0.056)	(0.057)
Float					0.225**	0.225*
					(0.107)	(0.122)
Free falling		-0.174	-0.177		0.013	0.005
		(0.123)	(0.112)		(0.049)	(0.043)
Constants	-0.576***	-0.562***	-0.590***	-0.418***	-0.431***	-0.397***
	(0.062)	(0.065)	(0.103)	(0.029)	(0.039)	(0.047)
Financial openness			0.094***			-0.029
			(0.029)			(0.021)
Log GDP per capita			0.006			0.028*
			(0.028)			(0.017)
R^2	0.060	0.117	0.290	0.001	0.041	0.180
Number of countries	49	49	43	106	106	99

Notes: The dependent variable is a country-specific regression coefficient for an AR process with lags that characterizes the speed of adjustment of the current account toward its long-run equilibrium. Heteroscedasticity robust standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels. De facto peg is the reference category for the de facto exchange rate regime in models (7)-(8) and (10)-(11).

3.2. One-step procedure

Within a one-step procedure, we can measure the speed of current account adjustment by using two different approaches. The first approach relies on estimating the following equation using the OLS estimator for each category of wage bargaining coordination:

$$CA_{it} = \rho_0 + \rho_1 CA_{it-1} + \varepsilon_{it}, \quad (3)$$

where CA_{it} is the current account balance (ratio to GDP) of country i in period t, ρ_0 is an intercept, and ε_{it} is a residual.[13] In the second approach, we estimate the following equation using the OLS estimator:

[13] This approach is applied for example, by Chinn and Wei (2013, Tables 1 and 3).

$$CA_{it} = \rho_0 + \rho_1 CA_{it-1} + \gamma_{0j} \sum_{j=1}^{k} Coord_{jit} + \gamma_{1j} \left(CA_{it-1} \sum_{j=1}^{k} Coord_{jit} \right) + \varepsilon_{it}, \qquad (4)$$

where CA_{it} is the current account balance (ratio to GDP) of country i in period t, ρ_0 is an intercept, $Coord_{jit}$ measures the degree of coordination of wage bargaining, and ε_{it} is a residual.[14]

Table 3 presents the results from equation (3) for each category of wage bargaining coordination. Countries under the centralized wage bargaining coordination experience slower external adjustment than countries under the fragmented firm-level wage bargaining coordination. The half-life of current account balance deviations is 6.9 years under centralized wage bargaining compared to 2.0 years under firm-level wage bargaining. The difference between the extreme opposite categories is statistically significant at the 5% level (see Figure A5).

Table 3. Coordination of wage bargaining and the speed of current account adjustment
Dependent variable: current account balance (ratio to GDP)

	(12)	(13)	(14)	(15)
		Coordination of wage bargaining:		
Variable	Centralized	Informal centralization	Industry and firm-level	Fragmented firm-level
CA_{t-1}	0.905***	0.928***	0.826***	0.712***
	(0.022)	(0.036)	(0.051)	(0.030)
R^2	0.813	0.809	0.703	0.530
Observations	428	262	330	226

In addition all regressions include a constant.
Notes: CA_{t-1} is the lagged term of current account balance. Panel robust standard errors are in parenthesis (clustering on the panel variable). *, ** and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 4 presents the results from equation (4). The two approaches of the one-step procedure give similar results. According to model (17), the relationship between the degree of coordination of wage bargaining and the rate of current account reversion is monotonic. Consequently, the one-step procedure confirms the finding of the two-step procedure.

14 This approach is applied for example, by Chinn and Wei (2013, Table 2) and by Ghosh et al. (2013, Tables 1-2). Again, by including coordination of wage bargaining as such, instead of a set of binary dummy variables, we impose a monotonic relationship between the degree of coordination of wage bargaining and the rate of current account reversion (model (17)).

Table 4. Coordination of wage bargaining and the speed of current account adjustment
Dependent variable: current account balance (ratio to GDP)

Variable	(16)	(17)
CA_{t-1}	0.712***	0.720***
	(0.029)	(0.061)
CA_{t-1} x Industry and firm-level bargaining	0.115*	
	(0.059)	
CA_{t-1} x Informal centralization	0.217***	
	(0.045)	
CA_{t-1} x Centralized bargaining	0.193***	
	(0.037)	
CA_{t-1} x Coordination of wage bargaining		0.055***
		(0.016)
Coordination of wage bargaining:		
Industry and firm-level	0.004	
	(0.004)	
Informal centralization	0.011***	
	(0.003)	
Centralized bargaining:	0.012***	
	(0.003)	
Coordination of wage bargaining		0.003***
(1=Firm-level,…, 4=Centralized)		(0.001)
Constant	-0.010***	-0.011***
	(0.003)	(0.003)
R^2	0.784	0.809
Observations	1246	1246

Notes: Panel robust standard errors are in parenthesis (clustering on the panel variable). *, ** and *** denote statistical significance at the 10%, 5% and 1% levels. Fragmented firm-level wage coordination is the reference category for the coordination of wage bargaining in model (16).

3.3. Interaction between coordination of wage bargaining and exchange rate stability

In this section, we analyze the interaction effect of wage bargaining coordination and exchange rate stability on the rate of current account reversion. We measure exchange rate stability by the exchange rate stability index introduced by Aizenman et al. (2010). We estimate the following equation by the OLS estimator:

$$\beta_{1,i} = \alpha + \gamma_{1j} \sum_{j=1}^{k} Coord_{ji} + \gamma_{2j} \left(ERS_i \sum_{j=1}^{k} Coord_{ji} \right) + \gamma_3 ERS_i + \varepsilon_i, \quad (5)$$

where β_1 is the speed of adjustment of the current account towards its long-run equilibrium (i.e., β_1 in equation (1)) in country i, $Coord_{ji}$ is a binary dummy

variable for the coordination of wage bargaining of country i in regime j, and ERS_i measures exchange rate stability in country i.[15]

There is a strong negative interaction between the effects of coordination of wage bargaining and exchange rate stability on the rate of current account reversion (model (18)). Imposing the assumption of monotonicity on the coordination of wage bargaining does not change the result (model (19)).

15 The exchange rate stability index does not cover the US. Consequently, compared to Table 1, the number of countries decreases from 41 to 40 in Table 5. We chose to use the exchange rate stability index instead of the de facto exchange rate regime classifications because the former is continuous, whereas the latter are dichotomous. We use the mean value of the exchange rate stability index of the sample period for the exchange rate stability. The values of exchange rate stability vary between 0.245 and 0.837.

Table 5. Coordination of wage bargaining, exchange rate stability and the rate of current account reversion
Dependent variable: the speed of adjustment of the current account towards its long-run equilibrium (i.e. β_1 in equation (1)

Variable	(18)	(19)
Coordination of wage bargaining:		
Industry and firm-level	0.161	
	(0.214)	
Informal centralization	0.418*	
	(0.225)	
Centralized bargaining:	0.535***	
	(0.173)	
Coordination of wage bargaining		0.167***
(1=Firm-level,…, 4=Centralized)		(0.052)
Interaction between Coordination of wage bargaining and Exchange rate stability:		
Industry and firm-level wage bargaining x Exchange rate stability	-0.226 (0.388)	
Informal centralization x Exchange rate stability	-0.726 (0.495)	
Centralized wage bargaining x Exchange rate stability	-0.713** (0.315)	
Coordination of wage bargaining x Exchange rate stability		-0.218** (0.094)
Exchange rate stability	0.573* (0.284)	0.757** (0.304)
Constant	-0.642*** (0.154)	-0.806*** (0.166)
R^2	0.273	0.253
Number of countries	40	40

Notes: The dependent variable is a country-specific regression coefficient for an AR process with lags that characterizes the speed of adjustment of the current account toward its long-run equilibrium. Heteroscedasticity robust standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels. Fragmented firm-level wage coordination is the reference category for the coordination of wage bargaining in model (18).

Figure 1 illustrates that when exchange rate stability is low, the degree of coordination of wage bargaining greatly slows down the rate of current account reversion. As exchange rate stability increases, the effect of wage bargaining coordination on external adjustment diminishes. Similarly, exchange rate stability greatly slows down the rate of current account reversion, if wage bargaining occurs at the firm level. If wage bargaining is centralized (i.e., a high degree of coordination of wage bargaining), exchange rate stability has no effect on the rate of current account reversion. Figure 1 graphically portrays the marginal effects of the explanatory variables on the rate of current account reversion. More specifically, if the exchange rate stability is at its minimum, an increase in the degree of coordination of wage bargaining by one standard

deviation increases the β_1 by 0.13 which is 0.76 standard deviations of β_1. If the exchange rate stability is at its maximum, an increase in the degree of coordination of wage bargaining by one standard deviation decreases the β_1 by 0.02 (0.11 standard deviations of β_1). If the degree of coordination of wage bargaining is at its minimum, an increase in the exchange rate stability by one standard deviation increases the β_1 by 0.09 (0.53 standard deviations of β_1). If the degree of coordination of wage bargaining is at its maximum, an increase in the exchange rate stability by one standard deviation decreases the β_1 by 0.02 (0.12 standard deviations of β_1).

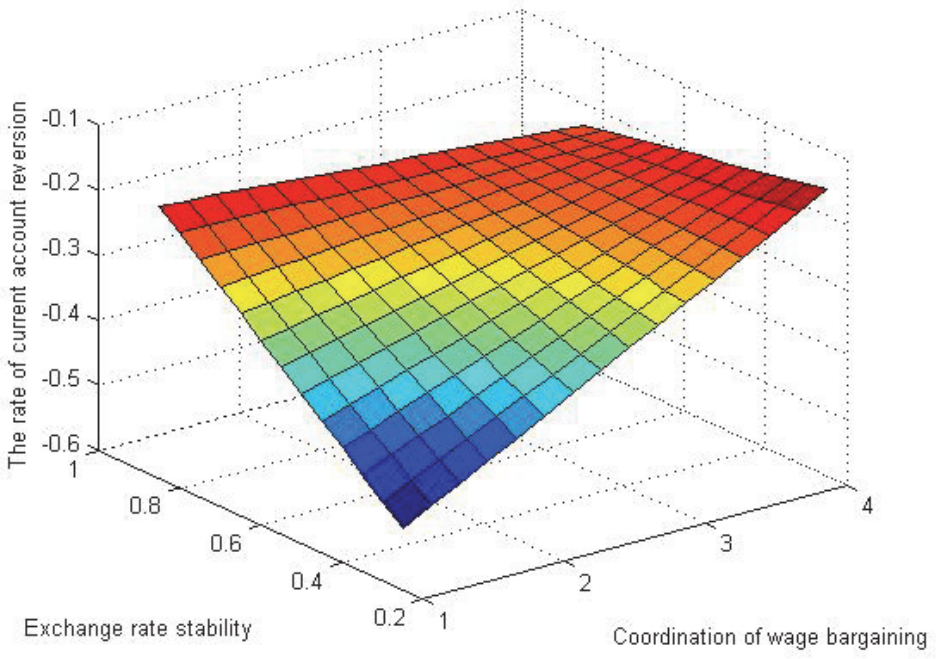

Figure 1. The interaction effect of coordination of wage bargaining and exchange rate stability on external adjustment (model (19))

A negative interaction term between coordination of wage bargaining and exchange rate stability implies that firm-level wage flexibility and economy-wide exchange rate flexibility are not substitutes for shock absorption. We are not aware of any theoretical model that would explicitly analyze the interaction effect of these two adjustment channels on external adjustment. According to Du and Liu (2015), labor market flexibility affects the real exchange rate. They show both theoretically and empirically that a more flexible labor market leads to a lower real exchange rate. Obviously, the result by Du and Liu (2015) does not greatly overlap with our finding. Intuitively, it appears reasonable that

exchange rate adjustment is sufficient, if all shocks are aggregate shocks. On the other hand, if all shocks are idiosyncratic shocks, external balance is obtained faster by firm-level wage adjustment than by economy-wide exchange rate adjustment. The interaction effect of wage bargaining coordination and exchange rate stability on external adjustment needs to examined more closely in the future.

4. Conclusion

This paper provided empirical evidence on the role of the degree of coordination of wage bargaining for the speed of adjustment of the current account toward its long-run equilibrium. Our estimates suggested that fragmented firm-level wage bargaining facilitates external adjustment. The half-life of current account balance deviations is 6.9 years under the centralized wage coordination, compared to 2.0 years under the firm-level wage coordination. The rate of current account reversion is monotonic in the degree of wage bargaining coordination. We also found that coordination of wage bargaining and exchange rate stability are mutually related to the rate of current account reversion. When exchange rate stability is low, the degree of coordination of wage bargaining greatly slows down the rate of current account reversion.

As the previous empirical literature on the rate of reversion of current account has been limited to examining the role of exchange rate regime, our results propose a new direction for research. However, it is important to realize the limitations on the scope of our study. First, literature on the intertemporal approach to the current account has demonstrated that integrating the empirical predictions of the theory with the data can be very difficult. Nevertheless, theoretical model with microfoundations would be necessary for understanding the cross-country heterogeneity in the adjustment speed of the current account. Second, there is no guarantee that a faster current account reversion necessarily represents higher welfare. Third, it might be important to take into account asymmetric effects (i.e. the reversion rate might differ for a debtor as opposed to a creditor). Due to the small sample size we were unable to evaluate such effects. The interaction between coordination of wage bargaining and exchange rate regime should also be examined more closely in the future.

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Appendix

Table A1. Data description

Variable	Description	Source[a]
Current account balance	Current account balance (ratio to GDP).	WDI; WEO
Coordination of wage bargaining	Mode of coordination of wage-setting during the sample period. 1=fragmented firm-level wage bargaining, 2=mixed industry and firm-level bargaining, 3=informal centralization, 4=centralized bargaining without peace obligation, 5= centralized bargaining with peace obligation.	ICTWSS
Length of collective wage agreements	Average length of wage clauses in collective agreements (in year).	ICTWSS
Labor market rigidity	Percent of firms identifying labor regulations as a major constraint.	Enterprise Surveys (The World Bank); Ju, Shi and Wei (2014)
De facto exchange rate regimes	Mode of the de facto exchange rate regime during the sample period. Coarse classification of de facto exchange rate regime. 1=de facto peg, 2=de facto crawling peg, 3=managed float, 4=freely floating, 5=freely falling.	IRR
Exchange rate stability	Mean of the exchange rate stability index during the sample period. The index is normalized between 0 and 1. Larger values imply more stable exchange rate.	AIC
Financial openness	Mean of the Chinn-Ito index during the sample period. The index measures financial account openness. Scaled between -1.87 and 2.44..	CI
GDP per capita	GDP per capita in the year 2000 (in tens of thousands of US dollars)	WDI
Net international investment position	Net foreign assets (millions of current US dollars)	EWNII

[a] AIC: The Trilemma indexes by Aizenman, Chinn and Ito; CI: Chinn and Ito; EWNII: External Wealth of Nations Mark II database by Lane and Milesi-Ferretti; ICTWSS: Database on Institutional Characteristics of Trade Unions, Wage Setting, State Interventions and Social Pacts; IRR: Ilzetzki, Reinhart and Rogoff; WEO: World Economic Outlook Database, October 2015 (IMF); WDI: World Development Indicators (The World Bank).

Table A2. Coordination of wage bargaining (41 countries, Table 1)

Country	Abb.	Sample period	Country	Abb.	Sample period
Australia	AUS	1965-2012	Korea	KOR	1976-2012
Austria	AUT	1967-2012	Latvia	LVA	1992-2012
Brazil	BRA	1975-2012	Lithuania	LTU	1993-2012
Bulgaria	BGR	1980-2012	Malta	MLT	1971-2012
Canada	CAN	1960-2012	Netherlands	NLD	1967-2012
China	CHN	1982-2012	New Zealand	NLZ	1972-2012
Cyprus	CYP	1980-2012	Norway	NOR	1975-2012
Czech Rep.	CZE	1993-2012	Philippines	PHL	1977-2012
Denmark	DNK	1975-2012	Poland	POL	1985-2012
Estonia	EST	1992-2012	Portugal	PRT	1975-2012
Finland	FIN	1975-2012	Romania	ROU	1987-2012
France	FRA	1975-2012	Singapore	SGP	1972-2012
Germany	DEU	1971-2012	Slovakia	SVK	1993-2012
Greece	GRC	1976-2012	Slovenia	SVN	1992-2012
Hungary	HUN	1982-2012	South Africa	ZAF	1960-2012
India	IND	1975-2012	Spain	ESP	1975-2012
Indonesia	IDN	1981-2012	Sweden	SWE	1970-2012
Ireland	IRL	1974-2012	Switzerland	CHE	1977-2012
Israel	ISR	1965-2011	UK	GBR	1970-2012
Italy	ITA	1970-2012	US	USA	1970-2012
Japan	JPN	1977-2012			

Table A3. Labor market rigidity, small sample (49 countries, Table 2 models (6)-(7))

Country	Abb.	Sample period	Country	Abb.	Sample period
Algeria	DZA	1980-2005	Kyrgyzstan	KGZ	1993-2005
Armenia	ARM	1993-2005	Latvia	LVA	1992-2005
Azerbaijan	AZE	1995-2005	Lithuania	LTU	1993-2005
Bangladesh	BGD	1980-2005	Madagascar	MDG	1980-2005
Belarus	BLR	1993-2005	Malaysia	MYS	1980-2005
Brazil	BRA	1980-2005	Mali	MLI	1980-2005
Bulgaria	BGR	1980-2005	Moldova	MDA	1994-2005
Cambodia	KHM	1993-2005	Nicaragua	NIC	1980-2005
China	CHN	1982-2005	Pakistan	PAK	1980-2005
Croatia	HRV	1993-2005	Philippines	PHL	1980-2005
Czech	CZE	1993-2005	Poland	POL	1985-2005
Ecuador	ECU	1980-2005	Portugal	PRT	1980-2005
Egypt	EGY	1980-2005	Romania	ROU	1987-2005
El Salvador	SLV	1980-2005	Senegal	SEN	1980-2005
Estonia	EST	1992-2005	Slovenia	SVN	1992-2005
Greece	GRC	1980-2005	South Africa	ZAE	1980-2005
Guatemala	GTM	1980-2005	Spain	ESP	1980-2005
Honduras	HND	1980-2005	Sri Lanka	LKA	1980-2005
Hungary	HUN	1982-2005	Syrian Arab Rep	SYR	1980-2005
India	IND	1980-2005	Thailand	THA	1980-2005
Indonesia	IDN	1981-2005	Turkey	TUR	1980-2005
Ireland	IRL	1980-2005	Uganda	UGA	1980-2005
Kazakhstan	KAZ	1995-2005	Ukraine	UKR	1994-2005
Kenya	KEN	1980-2005	Zambia	ZMB	1992-2005
Korea	KOR	1980-2005			

Albania and Guyana were excluded because Ju, Shi, Wei (2014) did not have these countries in their sample.

Table A4. Labor market rigidity, large sample (106 countries, Table 2 models (9)-(10))

Country	Abb.	Sample period	Country	Abb.	Sample period	Country	Abb.	Sample period
Albania	ALB	1984-2012	Germany	DEU	1971-2012	Nigeria	NGA	1977-2012
Algeria	DZA	1977-2012	Ghana	GHA	1975-2012	Pakistan	PAK	1976-2012
Angola	AGO	1985-2012	Greece	GRC	1976-2012	Panama	PAN	1977-2012
Antigua Bar.	ATG	1977-2012	Grenada	GRD	1977-2012	Paraguay	PRY	1975-2012
Argentina	ARG	1976-2012	Guatemala	GTM	1977-2012	Peru	PER	1977-2012
Armenia	ARM	1993-2012	Guinea	GIN	1986-2012	Philippines	PHL	1977-2012
Azerbaijan	AZE	1995-2012	Guyana	GUY	1992-2012	Poland	POL	1985-2012
Bahamas	BHS	1976-2012	Honduras	HND	1974-2012	Portugal	PRT	1975-2012
Bangladesh	BGD	1976-2012	Hungary	HUN	1982-2012	Romania	ROU	1987-2012
Barbados	BRB	1970-2010	India	IND	1975-2012	Rwanda	RWA	1976-2012
Belarus	BLR	1993-2012	Indonesia	IDN	1981-2012	Senegal	SEN	1974-2010
Belize	BLZ	1984-2012	Ireland	IRL	1974-2012	Sierra Leone	SLE	1977-2012
Benin	BEN	1974-2010	Jamaica	JAM	1976-2012	Slovakia	SVK	1993-2012
Bolivia	BOL	1976-2012	Jordan	JOR	1972-2012	Slovenia	SVN	1993-2012
Botswana	BWA	1975-2012	Kazakhstan	KAZ	1995-2012	South Africa	ZAE	1960-2012
Brazil	BRA	1975-2012	Kenya	KEN	1975-2012	Spain	ESP	1975-2012
Bulgaria	BGR	1980-2012	Korea	KOR	1976-2012	Sri Lanka	LKA	1975-2012
Burundi	BDI	1985-2012	Kyrgyzstan	KGZ	1993-2012	St. Kitts Nevis	KNA	1980-2012
Cambodia	KHM	1993-2012	Lao PDR	LAO	1984-2012	St. Lucia	LCA	1979-2012
Cameroon	CMR	1977-2012	Latvia	LVA	1992-2012	St. Vincent Gre	VCT	1978-2012
Cape Verde	CPV	1986-2012	Lesotho	LSO	1975-2012	Suriname	SUR	1977-2012
Chile	CHL	1975-2012	Lithuania	LTU	1993-2012	Swaziland	SWZ	1974-2010
China	CHN	1982-2012	Madagascar	MDG	1974-2005	Syrian Arab Rep	SYR	1977-2010
Colombia	COL	1968-2012	Malawi	MWI	1977-2002	Tanzania	TZA	1988-2012
Costa Rica	CRI	1977-2012	Malaysia	MYS	1974-2012	Thailand	THA	1975-2012
Cote d'Ivoire	CIV	1975-2010	Mali	MLI	1975-2010	Trinidad Tobago	TTO	1975-2011
Croatia	HRV	1993-2012	Mauritius	MUS	1976-2012	Turkey	TUR	1974-2012
Czech Rep.	CZE	1993-2012	Mexico	MEX	1979-2012	Uganda	UGA	1980-2012
Dominica	DMA	1977-2012	Moldova	MDA	1994-2012	Ukraine	UKR	1994-2012
Dominican	DOM	1968-2012	Mongolia	MNG	1981-2012	Uruguay	URY	1978-2012
Ecuador	ECU	1976-2012	Morocco	MAR	1975-2012	Vanuatu	VUT	1982-2012
Egypt	EGY	1977-2012	Mozambique	MOZ	1980-2012	Venezuela	VEN	1970-2012
El Salvador	SLV	1976-2012	Namibia	NAM	1990-2011	Yemen	YEM	1990-2011
Estonia	EST	1992-2012	Nepal	NPL	1976-2012	Zambia	ZMB	1992-2012
Ethiopia	ETH	1981-2012	Nicaragua	NIC	1977-2012			
Fiji	FJI	1979-2010	Niger	NER	1974-2010			

Only countries with at least 20 consecutive annual observations including observation from the 2000s were considered. However, if the country became independent after the collapse of the Soviet Union this rule was not always observed.
Congo Rep. and Gabon were excluded because the period from which the Beta-coefficient was calculated did not include the year of labor marker rigidity information. Togo was excluded because we were unable to eliminate the serial correlation from the residual.
If we had several values for labor market rigidity from Ju, Shi and Wei (2014) and Enterprise Surveys, we took a country-specific average of the values which were included to the CA period. For example, if for country X we get 11% from Ju, Shi and Wei (2014) and 13% from Enterprise Surveys in 2009. Country X's labor market rigidity is 12, if the current account balance data extends to the year 2009. Country X's labor market rigidity is 11, if the current account balance data ends before 2009.

Figure A1. Coordination of wage bargaining and the rate of current account reversion

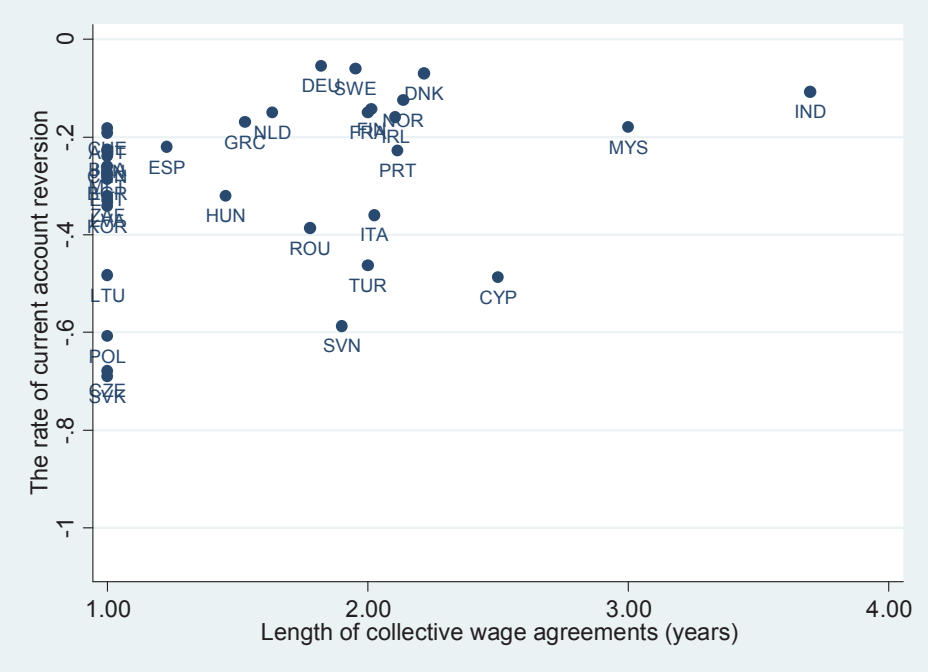

Figure A2. Length of collective wage agreements and the rate of current account reversion

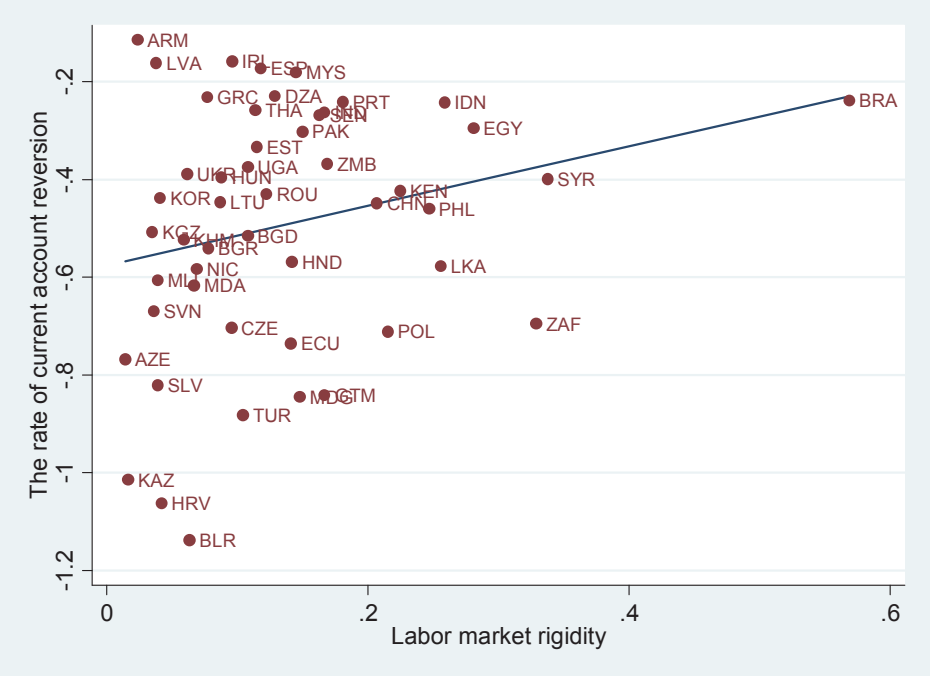

Figure A3. Labor market rigidity and the rate of current account reversion (n=49)

Figure A4. Labor market rigidity and the rate of current account reversion (n=106)

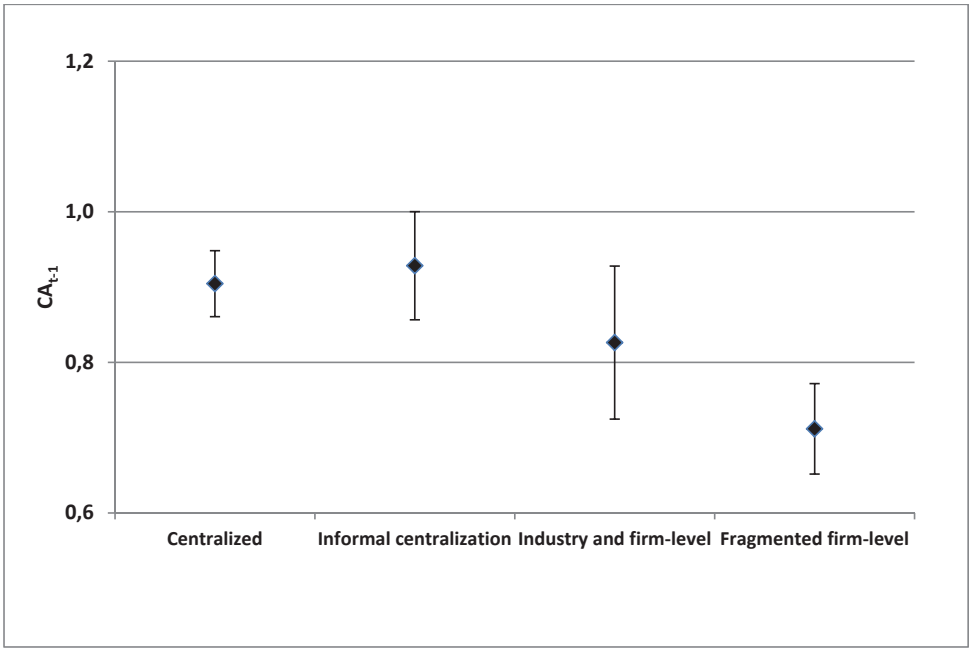

Figure A5. Confidence intervals for ρ_1 in equation (3).

CHAPTER 4
TRADE IMBALANCES WITHIN THE EURO AREA AND WITH RESPECT TO THE REST OF THE WORLD*

Abstract

Many studies have explored the determinants of current account balances in Europe. However, only in a few studies trade balance has been decomposed into intra balance, trade balance vis-à-vis the euro area, and extra balance, trade balance vis-à-vis the rest of the world. This decomposition is necessary for us to understand why some core euro area countries are acting as financial intermediaries for the periphery countries. Furthermore, the determinants of intra and extra balances might be different because nominal exchange rate cannot adjust between the EMU countries while their financial markets are highly integrated. Thus, we apply this decomposition and supplement the previous studies by including a larger set of theoretically plausible explanatory variables, which is derived from the current account literature. Our contribution is twofold: We observe that, contrary to Schmitz and von Hagen (2011), the introduction of common currency has not increased the elasticity of net capital flows to per capita incomes within the euro area for the member countries. On the other hand, there is a great heterogeneity among the usual determinants of trade balances whether those contribute to intra balances or extra balances. These results increase our understanding of the imbalances in the euro area.

Keywords: Current account, Trade balance vis-à-vis the euro area, Trade balance vis-à-vis the rest of the world, European monetary union, Culture, Institutions

JEL classification: F21, F32, F33, F36, Z10

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1. Introduction

Despite the fact that the euro area as a whole has been in balance with the rest of the world, many euro area member countries have had substantial current account imbalances. These imbalances had a tendency to grow after the adoption of the common currency in 1999. However, in order to fully understand these imbalances we need to look at how these imbalances have been distributed between balances against the euro area and balances against the rest of the world (see, e.g., Eichengreen (2010)). Thus, we follow the decomposition made in Schmitz and von Hagen (2011) and decompose trade balances into intra balances and extra balances. Intra balance measures the trade balance vis-à-vis the euro area, whereas extra balance measures the trade balance vis-à-vis the rest of the world. In some cases, a country has had a positive intra balance but a negative extra balance, or vice versa (see Figures 1–2). The Netherlands and Belgium-Luxembourg act as financial intermediaries since there is a net capital flow from the rest of the world to these countries and a net capital flow from these countries to the other EMU countries. One aim of this paper is to understand these patterns.

Our analyzing framework provides interesting insights. In particular, we can detect whether the determinants are different between intra and extra balances. This might help us to understand why some countries have positive intra balances but yet negative extra balances, or vice versa. Using data on the EU-15 countries from 1984 to 2011, we are able to see whether the relative importance of some variables changed for the euro area member countries after they adopted the euro.

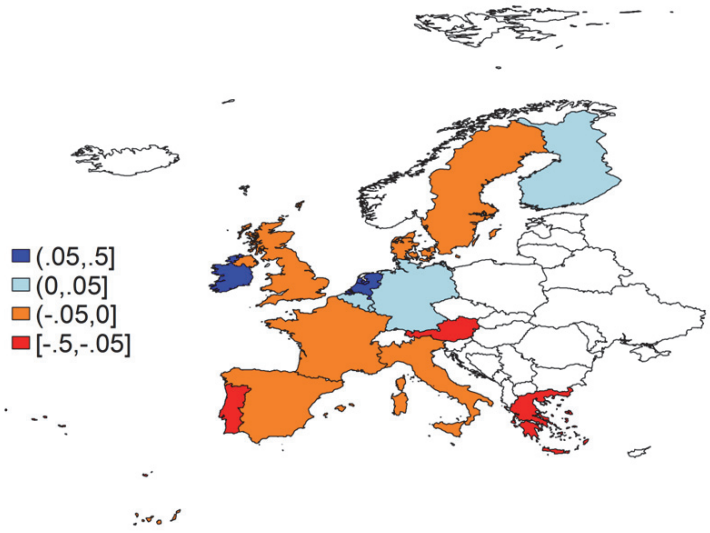

Figure 1. Intra balances for the EU-15 countries (ratio to GDP) during the period of 1999–2011

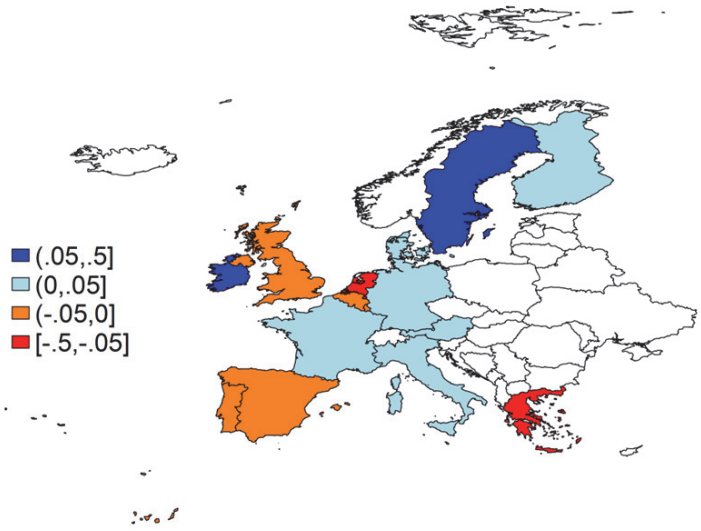

Figure 2. Extra balances for the EU-15 countries (ratio to GDP) during the period of 1999–2011

Schmitz and von Hagen (2011, 1676) found that "with the introduction of the common currency the elasticity with respect to per-capita incomes of net capital flows within the euro area has increased for the members of the euro zone." However, they included only government budget balances and oil prices as additional explanatory variables. Our paper provides some evidence that if

we include a set of explanatory variables that has become standard in the current account literature, this result largely disappears.

Our set of explanatory variables is derived from the current account literature. Therefore, in Section 2 we summarize this literature. In Section 3, we describe our data more closely and explain the reasons we choose to use the Prais-Winsten estimation with panel corrected standard errors. We present our results in Section 4. Section 5 concludes the paper.

2. Current account imbalances in the euro area

2.1. Empirical literature on current accounts

Chinn and Prasad (2003) explored the medium-term determinants of current account balances using data on 18 industrial and 71 developing countries over the period of 1971–1995. The following set of economic fundamentals turned out to be statistically significant: government budget balances, relative income, dependency ratios, terms of trade volatility, financial deepening, and net foreign assets. Chinn and Ito (2007) and Gruber and Kamin (2007) included institutional variables to account for heterogeneity in the domestic financial markets and the quality of government institutions because investors are more willing to invest in countries that are highly developed in these respects.

There is a strand of literature that follows Chinn and Prasad (2003) in methodology but tries to uncover the special features of the euro area with respect to current account dynamics. Slavov (2009) used data on 39 different episodes of common currency agreements between 1976 and 2005. He found that common currency participants had larger current account imbalances.[1] Further, in a monetary union, the current accounts of the member countries become more sensitive to the economic fundamentals, including relative income. (Slavov 2009.) According to Jaumotte and Sodsriwiboon (2010), the Southern euro area countries have had current account deficits far beyond what can be explained by the IMF's macroeconomic balance (MB) approach or external sustainability (ES) approach (see also International Monetary Fund (2006)). Barnes et al. (2010) came very close by pointing out that the predictive power of standard models to explain the imbalances in the euro area has become weaker (see also Ca' Zorzi et al. (2012)).

2.2. A catching-up process or diverging competitiveness?

Two alternative explanations for the widening current account imbalances in the euro area are often emphasized: the ongoing catching-up process between rich Northern Europe and poor Southern Europe or the diverging competitiveness between the two. In the first case widening imbalances are expected to be only temporary, while in the latter those might have undesirable consequences.

By using a simple intertemporal model, Blanchard and Giavazzi (2002) show that for a converging country the recommended level of current account deficit increases with the expected output growth (relative to others) and with the elasticity of substitution between domestic and foreign goods and decreases with the wedge between the domestic interest rate and foreign interest rate. The single European market, goods market integration, has increased the elasticity of substitution, and the monetary union has decreased the wedge within the

[1] Berger and Nitsch (2010) used bilateral trade data on 18 European countries from 1948 to 2008. They observed that, as a result of introduction of the euro, the trade imbalances among the euro area members widened and became more persistent.

euro area. In addition, as financial integration reduces the costs to finance investments, investments and the expected future output will increase. Hence, it has become optimal for the poorer countries to run larger deficits. They provide evidence that for the euro area, the relation between the current account balance and income per capita was much stronger during the 1994–2000 period than during the 1985–1993 period. (Blanchard and Giavazzi 2002.)

Schmitz and von Hagen (2011) empirically test whether, among the EU-15 countries, the net capital flows follow differences in per capita incomes. They distinguish between trade balances against euro area and the rest of the world. Their main finding is that the net capital flows follow differences in per capita incomes and that, as a result of introduction of the euro, this elasticity increased but only concerning the net capital flows, which are proxied by the trade flows, inside the euro area. They interpret this as evidence of deepened financial market integration in the euro area and conclude that the widening of current account balances within the euro area should be considered a sign "of the proper functioning of the euro area rather than a sign of improper macroeconomic adjustment". (Schmitz and von Hagen 2011.)

Giavazzi and Spaventa (2010) note that in contrast to Blanchard and Giavazzi's (2002) model, foreign borrowing is not necessarily devoted to the production of tradable goods. If a country is borrowing to finance the production of nontradables, it might be unsuccessful in generating the required trade surpluses in the future. (Giavazzi and Spaventa 2010.) Arghyrou and Chortareas (2008) explore the role of real exchange rates in current account determination for the euro member countries. They observe that the real exchange rate enters the cointegrating vector with a nonzero coefficient for most of the countries. (Arghyrou and Chortareas 2008.) By using data for the 11 euro countries from 1982 to 2011 and applying the pooled mean group estimator, Belke and Dreger (2013) examine the relative importance of catching up and competitiveness for the current accounts. Both of these components are statistically significant with correct signs, but a one percent decrease in competitiveness relative to the euro area average has a larger deteriorating effect on the current account balance than a one percent decrease in real per capita income relative to the average. (Belke and Dreger 2013.)

Schnabl and Freitag (2012) remind us that a large number of developing countries have pegged their currencies more or less to the US dollar. By contrast, a large number of European countries have pegged their currencies to the euro. Schnabl and Freitag use the concepts of a dollar bloc and euro bloc, which they define in the following way: In the dollar bloc, the U.S. serves as the center country, and East Asia, the Middle East, Latin America, and the Commonwealth of the Independent States are considered the periphery. In the euro bloc, Germany is the center country, and the emerging Europe and industrialized Europe are considered the periphery. They detect an interesting distinction between the two blocks. In the euro bloc, capital flows from the rich center country, Germany, to the poorer periphery. This difference might be explained by the fact that the dollar periphery countries have a higher degree of

freedom in managing international capital flows and doing non-market-based interventions than the euro periphery countries. (Schnabl and Freitag 2012.)

Chen et al. (2013) make an important observation by saying that the explanations for euro area current account imbalances highlighted above, namely, the catching-up process and diverging competitiveness, rely on intra-euro area factors. However, the euro area as a whole is an open economy; therefore, trade and financial linkages between the euro area and the rest of the world are also important. They detect the following pattern: Debtor countries, namely, Greece, Ireland, Italy, Portugal, and Spain, experienced real appreciation, but this largely resulted from the strengthening of the euro.[2] Greece, Portugal and Spain had a trade deficit not only against the Eurozone but also against the rest of the world. The investors outside the euro area primarily invested in core euro area countries such as Germany and France, whereas private capital flows from the core countries financed the deficits of the GIIPS countries. Consequently, they put forth a hypothesis that external shocks might have had an asymmetric impact on the export performance of Germany and the GIIPS countries. They find evidence that there were differences on how the rise of China, higher oil prices, and the integration of Central and Eastern European countries affected the trade performance of the GIIPS countries compared to Germany. (Chen, Milesi-Ferretti, and Tressel 2013.) Sinn and Wollmershäuser (2012) emphasize the role of Target balances for the deficit countries to sustain their large current account deficits during the euro crisis. At the time of the financial crisis, the direction of private capital flows changed, and deficit countries financed a large part of their current account deficits with the printing press. (Sinn and Wollmershäuser 2012.) Eurosystem liquidity support has made the external adjustment smoother (Cour-Thimann 2013, 23).

2.3. One currency, two ways of living

In the economic growth literature, there has been a debate on the relative importance of formal economic institutions and culture (see, e.g., Acemoglu (2009, 122–136), Acemoglu and Robinson (2012, 56–63), Weil (2009, 407–436), Landes (1999, 516), Tabellini (2010), and Greif (1994)). It might also be the case that differences in institutional quality result from differences in culture. Maseland (2013) notes that proving this would be difficult not only because of endogeneity problems but also because it is difficult to isolate one from the other. Maseland himself uses Toxoplasma gondii as an instrumental variable for certain aspects of culture because this infection tends to change an individual's personality. However, its prevalence rate is not related to any aspect of economic development. First, toxoplasma seroprevalence has a strong negative effect on cultural indicator (the first principal component of Hofstede's power distance, individualism, and uncertainty avoidance and World Values Survey's distrust).[3]

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2 Greece, Ireland, Italy, Portugal and Spain are commonly called as GIIPS countries.

3 Power distance, uncertainty avoidance and distrust loaded negatively whereas individualism positively.

Second, culture has a strong positive effect, instrumented by toxoplasma seroprevalence, on institutional quality (the first principal component of the quality of political institutions, governance and rule of law.) (Maseland 2013.)

Gorodnichenko and Roland (2010) build a Schumpeterian growth model with some new flavors: collectivist cultures are more efficient in combining (existing) intermediate inputs, individualist entrepreneurs obtain higher utility from producing intermediate goods of higher than average quality, and the government acts in a predatory way by expropriating the profits from innovations. They are able to prove that the ratio of labor devoted to research increases with the level of individualism, decreases with the strength of the predatory government institutions and is independent of the collectivist culture's competitive edge in the production of final goods. Thus, although collectivism generates static efficiency gains, it has no effect on economic growth, which is largely determined by innovations. Using genetic distance to population in the US as an instrumental variable, Gorodnichenko and Roland also provide empirical evidence that individualistic culture has a strong causal effect on economic development. (Gorodnichenko and Roland 2010.)

Although all of the EU-15 countries can be considered developed economies, large cultural differences exist between the countries. Holinski et al. (2012) claim that fundamental economic factors cannot explain the combination of no convergence in per capita incomes and persistent imbalances within the euro area between the South and North. They call for recognition of cross-country differences in time preference, planning horizon, and risk aversion as a way to proceed. (Holinski, Kool, and Muysken 2012.) De Castro Campos et al. (2013) provide evidence that indicators of thrift, trust and religiosity from the World Values Survey / European Values Study help to explain cross-country heterogeneity in private saving.

3. Data and empirical methodology

Our sample consists of the EU-15 countries, but because Belgium and Luxembourg are aggregated, we actually have 14 countries.[4] The sample covers the period from 1984 to 2011. Neither the countries that adopted the euro after 2001 nor the countries that joined the EU after 1995 are included into our sample. There are three reasons for this: First, these countries would differ substantially from the EU-15 countries. Second, those countries that adopted the euro after 2001, namely, Slovenia in 2007, Cyprus and Malta in 2008, Slovakia in 2009, and Estonia in 2011, have only a brief experience with the common currency. Third, we want to follow Schmitz and von Hagen (2011) as closely as possible.

The correlation between trade balances (excluding services) and current account balances is strong: 0.59 when Ireland is included and 0.81 when it is excluded.[5] Hence, the current account literature is a good starting point for finding the main determinants of trade balances as well.[6] Typically, for the EU-15 countries, intra trade has accounted for approximately half of their trade (see Appendix A, Table A2).

Descriptive statistics for the sample are provided in Table 1. Domestic credit by banks is a commonly used proxy for the quality of domestic financial markets. Bureaucracy quality from the Political Risk Services' International Country Risk Guide is a good proxy for the quality of government institutions.[7] We use Hofstede's (2001) dimensions of national culture to measure the potential cultural differences among the EU-15 countries (see detailed information about the individualism index from the Appendix A). [8] Individualism index is time-invariant, but on the other hand, national cultures change only very slowly. We also include the real interest rate and changes in unit labor costs into our model. We include the real interest rate instead of Taylor rule deviations because it would be very difficult to derive monetary policy reaction functions for the euro member countries from 1984 onwards. All our explanatory variables are derived from the current account literature, which we summarized in Chapter 2.

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4 Belgium and Luxembourg are aggregated because, before 1997, there are no numbers for these countries separately in the IMS's Direction of Trade Statistics. Consequently, with regard to our dependent variables, Intra balance and Extra balance, and Target balance, we use aggregated numbers for Belgium-Luxembourg. With regard to other explanatory variables, we use values of Belgium because the relative size of Luxembourg is so small. (Between 1984–2011 GDP of Luxembourg was only 7.6% of the of Belgium.)

5 The numbers for the current account balances were taken from WDI and WEO. For Belgium-Luxembourg, we used Belgium's numbers.

6 The evolution of our dependent variables, intra balances and extra balances, are presented in Appendix A, Table A1. Neither intra balance nor extra balance includes services.

7 Political Risk Services' International Country Risk Guide was used for example in Chinn and Ito (2007).

8 Hofstede's dimensions of national culture have been used by several economists (see, e.g., Altug and Canova (2014), Gorodnichenko and Roland (2011), or Maseland (2013)).

Table 1. Descriptive statistics of the sample

Variable	Units	Mean	Min	Max	St. dev.	share of over time variance
Intra balance	ratio to GDP	0.004	-0.108	0.244	0.063	0.138
Extra balance	ratio to GDP	-0.004	-0.171	0.124	0.043	0.289
GDP per capita	in tens of thousands of euros	2.103	0.322	4.318	0.884	0.662
Fiscal balance	ratio to GDP	-0.034	-0.309	0.070	0.042	0.704
Oil price	euros/barrel*0.01	0.291	0.114	0.807	0.185	1.000
Dependency ratio (aged)		0.232	0.162	0.319	0.032	0.496
Dependency ratio (child)		0.271	0.202	0.495	0.045	0.445
Domestic credit by banks	ratio to GDP	1.138	0.482	2.344	0.403	0.824
Bureaucracy quality	index, scaled from 0 to 4	3.640	1.750	4.000	0.551	0.215
Real interest rate	percentages multiplied by 0.01	0.029	-0.051	0.123	0.028	0.966
Change in RULC[a]	change in the index value (2005=100 for all	-0.000	-0.089	0.085	0.018	0.980
Hofstede's individualism	Index (original numbers were multiplied by 0.01)	0.646	0.270	0.890	0.166	0.000
Change in Target balances	ratio to GDP	-0.003	-0.586	0.244	0.046	0.953

[a] RULC: real unit labor costs

Even though we are using annual data, both the intra balance and extra balance vary more across countries than within countries over time. Therefore, it is not meaningful to use a within estimator. Beck and Katz (1995) provide evidence that the Parks-Kmenta method, FGLS for panel models accounting for heteroskedasticity, cross-correlation, and serial correlation of the residuals, is overconfident, for example, when N=15 and T=30. For these reasons, we use the Prais-Winsten estimation with panel-corrected standard errors, which allows residuals to be contemporaneously correlated across panels. This is crucial in our context when we are estimating Intra balances. Within the euro area, the economies are closely linked, and the surplus of one country is always the deficit of another country. In addition to contemporaneous correlation, our standard errors allow for panel-level heterogeneity and a common AR(1) autocorrelation structure. Schmitz and von Hagen (2011) used the Prais-Winsten estimator with panel-corrected standard errors. We do not include period dummies in our model because these cannot be identified when we are including Oil price, which is assumed to be the same for all countries. Consequently, our regression model has the following very simple form:

$$balance_{it} = \alpha + \boldsymbol{x}'_{it}\boldsymbol{\beta} + \varepsilon_{it}, \quad (1)$$

where $balance_{it}$ is either the intra balance (ratio to GDP) excluding services or the extra balance (ratio to GDP) excluding services for country i in period t, α is a constant (common for all countries), $\mathbf{x}_{it}$ is a column vector including all explanatory variables for country i in period t, $\boldsymbol{\beta}$ is a column vector including all estimated coefficients (common for all countries) and ε_{it} is an error term.

4. Empirical findings

In our empirical analysis, we take Schmitz and von Hagen (2011) as a starting point. We augment their model by dependency ratios, variables measuring institutional quality, real interest rate, and variables measuring changes in competitiveness. In the last phase, we add variables measuring the dimensions of national culture developed by Hofstede (2001). We include the following dummy variables: EMU, which equals one if the country has adopted the euro and zero otherwise; DKSEUK, which equals one for Denmark, Sweden, and the UK throughout the sample period; and Non-EMU, which equals one if the country has not adopted the euro after the euro was introduced and zero otherwise. Thus, we allow Sweden, Denmark, and the UK to differ from the EMU member countries even before the introduction of the common currency in some respects that our variables fail to measure. By including an interaction term between the EMU dummy variable and GDP per capita, we can detect if the introduction of the euro somehow changed the sensitivity of net capital flows on differences in per capita incomes. Chen et al. (2013) criticized previous studies for concentrating on intra-euro area factors. In our case, this is what we desire because we are trying to understand trade imbalances within the euro area.

4.1. Panel regressions

In model (1), we are able to replicate the main results of Schmitz and von Hagen (2011): GDP per capita contributes positively to intra balances, and the introduction of common currency increased the elasticity of net capital flows to per capita incomes within the euro area for the member countries.[9] However, if we include dependency ratios in our model, the latter disappears (see model (2)). The aged dependency ratio has a negative effect on intra balances, whereas the child dependency ratio has a positive effect. Neither of these contributes to the extra balances. This result remains robust throughout the different specifications. In model (3), we include variables measuring institutional quality. The private credit ratio (domestic credit by banks) is our proxy for the state of the domestic banking sector. Bureaucracy quality measures the quality of government institutions. Within the euro area, capital tends to flow from the highly developed countries to the less developed countries. To some extent, this results from the differences in the quality of domestic financial markets and government institutions. By contrast, domestic credit by banks contributes negatively to extra balances. In the current account literature, usually both the state of domestic financial markets and the quality of government institutions contribute negatively to current account balances. This finding is very interesting and indicates that in this respect, the euro area differs from the world economy as a whole. Countries with the most sophisticated domestic financial sector such as

[9] In Appendix A, Table A7, we use the period of 1981–2005 and fixed effect panel estimator in addition to the Prais-Winsten estimator just like in Schmitz and von Hagen (2011), and we are able to replicate their results.

the Netherlands tend to be financial intermediaries with a positive intra balance and a negative extra balance.

Table 2. Regression results for trade balances and per capita incomes in Europe 1984–2011

	Dependent variable: **Intra balance**			Dependent variable: **Extra balance**		
Variables:	(1)	(2)	(3)	(1)	(2)	(3)
EMU	-0.072***	0.011	0.002	-0.006	-0.009	-0.003
	(0.026)	(0.016)	(0.016)	(0.013)	(0.014)	(0.014)
DKSEUK	0.021	0.051***	0.036**	0.032**	0.030**	0.023
	(0.013)	(0.016)	(0.017)	(0.014)	(0.015)	(0.016)
Non-EMU	-0.032	0.000	-0.003	-0.007	-0.009	-0.004
	(0.023)	(0.015)	(0.014)	(0.018)	(0.019)	(0.019)
GDP per capita	0.019***	0.036***	0.030***	0.019***	0.017***	0.020***
	(0.007)	(0.007)	(0.007)	(0.005)	(0.006)	(0.006)
GDP per capita*EMU	0.028**	-0.006	-0.001	0.002	0.004	0.002
	(0.012)	(0.008)	(0.007)	(0.006)	(0.007)	(0.007)
GDP per capita*DKSEUK	-0.020***	-0.032***	-0.029***	-0.008	-0.007	-0.005
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)
GDP per capita*Non-EMU	0.012	0.001	0.002	0.005	0.005	0.003
	(0.009)	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Fiscal balance	-0.010	-0.040	-0.020	-0.038	-0.038	-0.069*
	(0.057)	(0.042)	(0.043)	(0.039)	(0.040)	(0.041)
Oil price	-0.030**	-0.001	-0.005	-0.051***	-0.051***	-0.045***
	(0.012)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
Dependency ratio (aged)		-0.552***	-0.509***		-0.003	0.012
		(0.162)	(0.155)		(0.123)	(0.124)
Dependency ratio (child)		0.358***	0.412***		-0.044	-0.056
		(0.135)	(0.123)		(0.107)	(0.104)
Domestic credit by banks			0.018***			-0.019***
			(0.006)			(0.006)
Bureaucracy quality			0.017***			0.005
			(0.004)			(0.004)
R^2	0.144	0.174	0.264	0.156	0.157	0.188
Observations	387	387	387	387	387	387

In addition, all regressions include a constant. *Notes*: Estimation was performed using the Prais-Winsten estimator with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from the autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)). Panel-corrected standard errors are in parenthesis.

* Denotes statistical significance at the 10 percent level.

** Denotes statistical significance at the 5 percent level.

*** Denotes statistical significance at the 1 percent level.

In Table 3, we present the models that we prefer. In model (4), we include the real interest rate, and real unit labor costs. We expect a low real interest rate to have a deteriorating effect on trade balances because a low real interest rate can reflect a loose monetary policy. However, in model (4), we observe that real interest rate is not statistically significant. The explanatory power of our model increases dramatically when we include real unit labor costs (compare models (3) and (4)). Real unit labor costs are measured at the total economy level and relative to the rest of the EU-15 countries (see Appendix A, Table A3). Real unit labor costs have the expected sign: if a country loses its price competitiveness

relative to the EU-15 countries, its intra surplus (deficit) tends to decrease (increase).

Overall, our model is more capable of explaining intra balances than extra balances, which is understandable because our analysis relies mainly on intra-euro area factors. We write out interpretations for the regression coefficients that, according to model (4), differ statistically significantly from zero: Denmark, Sweden and the UK have, on average, 4% (of GDP) larger (smaller) intra surpluses (deficits) than the other EU-15 countries. If a country has a GDP per capita that is 10,000 euros larger, our model predicts that its intra surplus (deficit) is 3% (of GDP) larger (smaller). However, for Denmark, Sweden, and the UK, this effect is smaller, on average, only 1% (of GDP). If the aged dependency ratio increases by 0.1, a country tends to have a 6% (of GDP) smaller (larger) intra surplus (deficit). By contrast, if the child dependency ratio increases by 0.1, a country tends to have a 4% (of GDP) larger (smaller) intra surplus (deficit). If a country has a 10% higher private credit ratio, its extra deficit (surplus) tends to be 0.2% (of GDP) larger (smaller). For the intra balances, it is just the opposite. This result is interesting and in line with both Schnabl and Freitag's (2012) and Chen et al.'s (2013) observations concerning the direction of net capital flows inside the "euro bloc". In addition, bureaucracy quality has a positive effect on intra balances: if the index increases by one standard deviation, a country tends to have a 1% (of GDP) larger (smaller) intra surplus (deficit). If a country experiences a 10% increase in real unit labor costs relative to the other EU-15 countries, its intra balance will deteriorate by 1% (of GDP). If oil prices increase by 10 euros (per barrel), EU-15 countries will experience, on average, a 0.5% (of GDP) decrease in their extra balances. It is a bit strange that the government budget balance has a negative coefficient in the extra balance regression. However, this result is not robust for the different specifications.[10]

Current account imbalances or trade imbalances are always measured with respect to other countries; therefore, in the current account literature, the so-called rest of the world effect is usually taken into account using deviations from sample means. Hence, in model (5) we run regressions using deviations from the unweighted sample means. By comparing models (4) and (5), one can observe that our results are robust to this transformation, although naturally the values of the coefficients change.

In model (6), we provide preliminary empirical evidence that some dimensions of national culture are related to trade balances.[11] We include Hofstede's (2001) individualism versus collectivism index into model (6). According to Gorodnichenko and Roland (2011), this cultural variable

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10 Concerning Fiscal balance results for the period of 1981–2005 are well in line with Schmitz and von Hagen (2011, 1685, Table 4) (see Appendix A, Table A7).

11 We tested other cultural dimensions by Hofstede (2001), but Uncertainty avoidance and Individualism indices were much more strongly related to intra balances than masculinity and power distance. Due to the fact that Uncertain avoidance index was strongly correlated with the DKSEUK dummy (-0.711) we decided not to use it (see Appendix A, Table A6). However, results with Uncertainty avoidance can be found from the Appendix A, Table A10.

influences economic performance more robustly than other variables.[12] If a country has an individualism score that is one standard deviation higher, its intra balance tends to be 2% (of GDP) higher. The individualism index seems to be unrelated to extra balances.

Table 3. Regression results for trade balances and per capita incomes in Europe 1984–2011

	Dependent variable: **Intra balance**			Dependent variable: **Extra balance**		
Variables:	(4)	(5)	(6)	(4)	(5)	(6)
EMU	-0.000	0.006	0.002	-0.004	0.007*	-0.004
	(0.016)	(0.004)	(0.014)	(0.014)	(0.004)	(0.015)
DKSEUK	0.038**	-0.017*	-0.023	0.021	0.007	0.028
	(0.015)	(0.009)	(0.019)	(0.016)	(0.008)	(0.017)
Non-EMU	0.002	-0.009*	0.010	-0.003	0.008	-0.004
	(0.014)	(0.005)	(0.013)	(0.020)	(0.005)	(0.021)
GDP per capita	0.034***	0.025***	0.019***	0.020***	0.030***	0.023***
	(0.006)	(0.008)	(0.006)	(0.006)	(0.008)	(0.007)
GDP per capita*EMU	-0.001	0.010	0.001	0.002	-0.004	0.002
	(0.007)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)
GDP per capita*DKSEUK	-0.028***	-0.015	-0.008	-0.004	-0.003	-0.006
	(0.007)	(0.010)	(0.008)	(0.007)	(0.011)	(0.007)
GDP per capita*Non-EMU	-0.002	-0.003	-0.007	0.003	-0.001	0.003
	(0.006)	(0.007)	(0.006)	(0.007)	(0.008)	(0.008)
Fiscal balance	-0.014	0.008	0.005	-0.069*	-0.066	-0.071*
	(0.043)	(0.052)	(0.043)	(0.041)	(0.052)	(0.041)
Oil price	-0.007	0.003	-0.004	-0.045***	-0.036***	-0.045***
	(0.009)	(0.006)	(0.009)	(0.010)	(0.008)	(0.010)
Dependency ratio (aged)	-0.575***	-0.559***	-0.529***	0.008	0.066	0.006
	(0.137)	(0.168)	(0.129)	(0.122)	(0.133)	(0.118)
Dependency ratio (child)	0.438***	0.410***	0.355***	-0.054	-0.053	-0.040
	(0.105)	(0.111)	(0.099)	(0.102)	(0.102)	(0.102)
Domestic credit by banks	0.018***	0.019***	0.021***	-0.021***	-0.022***	-0.022***
	(0.006)	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)
Bureaucracy quality	0.019***	0.017***	0.008**	0.005	0.005	0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Real interest rate	-0.058	-0.032	-0.077*	-0.031	0.017	-0.027
	(0.043)	(0.048)	(0.044)	(0.044)	(0.052)	(0.044)
Change in RULC	-0.084**	-0.090**	-0.087**	-0.021	-0.037	-0.023
	(0.040)	(0.040)	(0.039)	(0.041)	(0.044)	(0.042)
Hofstede's individualism			0.174***			-0.019
			(0.019)			(0.020)
R^2	0.370	0.352	0.490	0.196	0.201	0.202
Observations	387	387	387	387	387	387

In addition, all regressions include a constant. *Notes*: In model (5) we used deviations from unweighted sample means. Estimation was performed using the Prais-Winsten estimator with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from the autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)). Panel-corrected standard errors are in parenthesis.

* Denotes statistical significance at the 10 percent level.

** Denotes statistical significance at the 5 percent level.

*** Denotes statistical significance at the 1 percent level.

12 Hofstede (2001, 211) has made this same observation.

In Section 1, we made an observation that some countries have positive intra balances but negative extra balances or vice versa. Now, we will use our regression model to explain some of these patterns. In Figure 3, we represent graphically the contribution of different components for the intra balances. We employ model (5), which is similar to model (4) in all other aspects, but it is estimated using deviations from unweighted sample means. The actual numbers that we put into the regression equation are the country-specific 1999–2011 averages of these deviations. For the change in real unit labor costs, labeled drulc in the figure, we input the percentage change between 1999 and 2011. Figure 4 is drawn in the same fashion for the extra balances. This analysis enables us to explain some of the patterns seen in Figures 1–2. During the 1999–2011 period, Ireland had a huge intra surplus (15.6% of the GDP on average) but a smaller extra surplus (7.4% of the GDP on average). Based on our regression analysis, dependency ratios are statistically significant only for the intra balances. Ireland had the lowest old dependency ratio (this variable has a negative effect on intra balance) and the highest child dependency ratio (this variable has a positive effect on intra balance) in our sample. The Netherlands had a positive intra balance, whereas its extra balance was negative. To some extent, this comes from the fact that the Netherlands has had the most developed banking sector. Domestic credit by banks, which we used as a proxy for the state of the domestic banking sector, contributes positively to intra balances and negatively to extra balances. Naturally, this explains only a small fraction of the difference in the Netherlands' intra and extra balances. Italy's intra balance was negative, but its extra balance was positive. Italy had the lowest bureaucracy quality in our sample. Bureaucracy quality contributes positively to intra balances but is statistically insignificant for extra balances.

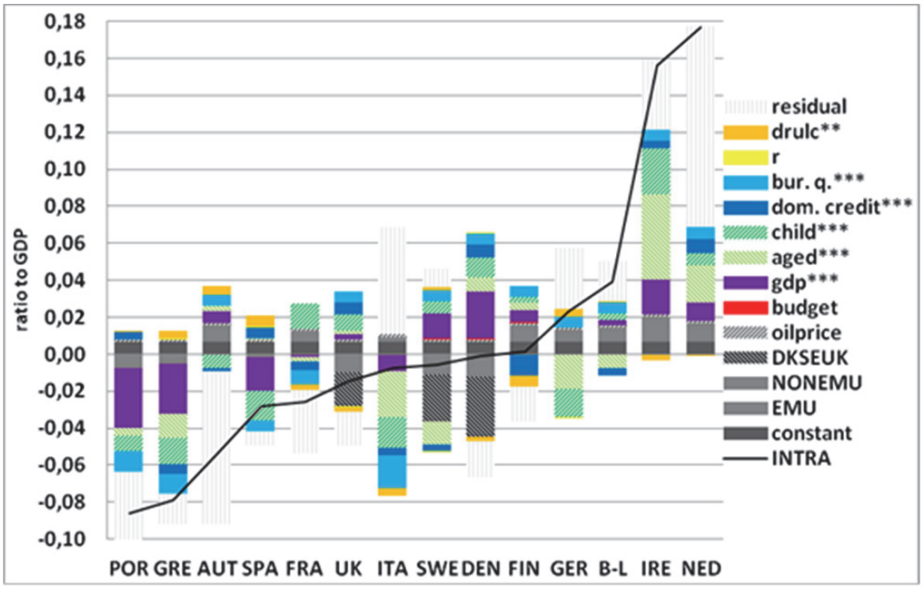

Figure 3. Contribution of different components for the intra balances (model (5) and 1999–2011 averages)

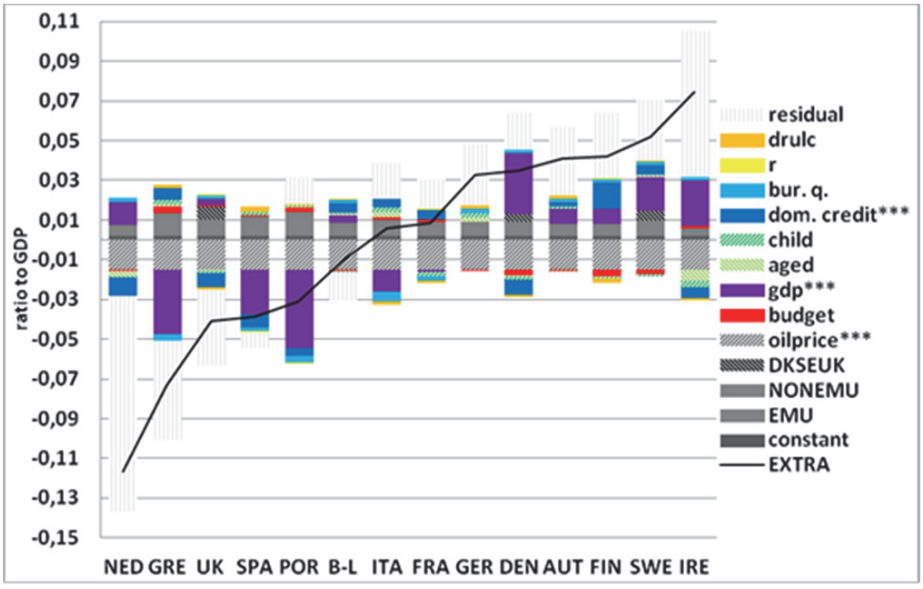

Figure 4. Contribution of different components for the extra balances (model (5) and 1999–2011 averages)

4.2. Robustness checks

Figures 3–4 indicate that the Netherlands is potentially an outlier in our sample. To some extent, this might result from the Rotterdam effect. For example, part of

Germany's overseas imports are incorrectly recorded as Dutch overseas imports and then as a Germany's import from the Netherlands when goods are shipping via Rotterdam's port (see, e.g., Baldwin 2006, 59, and Flam and Nordström 2006, 6). Consequently, the Rotterdam effect has a tendency to increase Netherlands' intra exports and extra imports. In Fig 3-4, the Netherlands exhibits a large positive residual term in the intra balances and a large negative residual term in the extra balances. However, we are unable to detect how large fractions of these residuals are caused by the Rotterdam effect. The simplest way to control for the Rotterdam effect is to subtract trade with the Netherlands from the intra balances and to include a dummy variable for the Netherlands in both regressions. Naturally, this is a very crude thing to do because we are assuming that all intra trade between the Netherlands and rest of the EU-15 countries consist of transit between overseas countries and rest of the EU-15 countries.[13] These results are shown in Table 4. The statistical significance of the aged dependency ratio shifts to some extent from intra balances towards extra balances compared to Table 3. The statistical significance of domestic credit by banks becomes weaker; however, in model (8), it is still positively statistically significant at the 0.10 level. Finally, in model (8), Hofstede's individualism index becomes statistically significant and positive for the extra balances.

[13] A less crude way to control for the Rotterdam effect is to just add a dummy for the Netherlands, which is done in Appendix A, Table A8.

Table 4. Regression results for trade balances and per capita incomes in Europe 1984–2011 (subtracting the trade with Netherlands from the intra balances)

	Dependent variable: **Intra balance** (subtracting NED)		Dependent variable: **Extra balance**	
Variables:	(7)	(8)	(7)	(8)
EMU	-0.006	-0.005	0.002	0.002
	(0.014)	(0.013)	(0.016)	(0.015)
DKSEUK	0.028**	-0.020	0.031*	0.019
	(0.014)	(0.017)	(0.016)	(0.018)
Non-EMU	0.003	0.008	-0.004	-0.003
	(0.013)	(0.012)	(0.020)	(0.019)
Netherlands	0.099***	0.076***	-0.098***	-0.104***
	(0.017)	(0.016)	(0.017)	(0.016)
GDP per capita	0.029***	0.018***	0.025***	0.022***
	(0.006)	(0.006)	(0.007)	(0.007)
GDP per capita*EMU	0.003	0.004	-0.001	-0.001
	(0.006)	(0.006)	(0.007)	(0.007)
GDP per capita*DKSEUK	-0.022***	-0.008	-0.010	-0.006
	(0.006)	(0.007)	(0.007)	(0.007)
GDP per capita*Non-EMU	-0.002	-0.005	0.003	0.002
	(0.005)	(0.005)	(0.007)	(0.007)
Fiscal balance	-0.024	-0.011	-0.061	-0.057
	(0.040)	(0.040)	(0.038)	(0.038)
Oil price	-0.001	0.002	-0.051***	-0.050***
	(0.008)	(0.007)	(0.011)	(0.010)
Dependency ratio (aged)	-0.216*	-0.232*	-0.346***	-0.348***
	(0.128)	(0.126)	(0.130)	(0.131)
Dependency ratio (child)	0.449***	0.362***	-0.065	-0.090
	(0.098)	(0.095)	(0.093)	(0.092)
Domestic credit by banks	0.007	0.010*	-0.009	-0.008
	(0.005)	(0.005)	(0.006)	(0.006)
Bureaucracy quality	0.016***	0.009**	0.008*	0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Real interest rate	-0.043	-0.060	-0.045	-0.049
	(0.039)	(0.039)	(0.043)	(0.043)
Change in RULC	-0.072*	-0.072**	-0.033	-0.032
	(0.038)	(0.035)	(0.037)	(0.036)
Hofstede's individualism		0.137***		0.039**
		(0.015)		(0.016)
R^2	0.476	0.542	0.323	0.328
Observations	387	387	387	387

In addition, all regressions include a constant. *Notes*: Estimation was performed using the Prais-Winsten estimator with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from the autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)). Panel-corrected standard errors are in parenthesis.

* Denotes statistical significance at the 10 percent level.

** Denotes statistical significance at the 5 percent level.

*** Denotes statistical significance at the 1 percent level.

To further check the robustness of our baseline results (model (4)), we exposed our specification to some testing. We included changes in target balances into our model because during the euro crisis, debtor countries financed their deficits through Target balances as private capital flew away. However, we were unable to find any statistically significant results for this

variable, which is most likely because the importance of Target balances increased only recently (see Appendix A, Table A9, model (11)).

We also checked whether our results were robust to the manner in which the autocorrelation parameter was calculated or whether we allowed the autocorrelation parameter to be panel specific (see Appendix A, Table A9). None of these had an effect on our results. In addition, we performed the following test: We dropped interaction terms between country group dummies and GDP per capita from model (4) and instead included interaction terms between country group dummies and every explanatory variable one by one.[14] We were unable to find a single case in which both the explanatory variable and its interaction term with the EMU dummy would have been statistically significant. Thus, our largely linear specification in model (4) is approved in this respect.

[14] In the interest of space, these are not reported.

5. Conclusions

Schmitz and von Hagen (2011) provide evidence that the elasticity of net capital flows to per capita incomes within the euro area for the member countries increased as a result of the euro. When we augment their model using standard variables from the current account literature, we find out that this result largely disappears. However, their framework of analysis is fascinating; one can obtain some interesting new results by decomposing trade balance into intra balance (trade balance vis-à-vis the euro area) and extra balance (trade balance vis-à-vis the rest of the world). The child dependency ratio has a positive effect on intra balances but no effect or a negative effect on extra balances, whereas the aged dependency ratio has a negative effect on intra balances. These factors explain relatively well why Ireland has had a huge intra surplus but a smaller extra surplus.

The sophistication of the banking sector has a positive effect on intra balances but a negative effect on extra balances. This finding is very interesting as it helps us to understand why the countries with the most sophisticated financial markets have had positive intra balances and negative extra balances. These countries are effectively acting as financial intermediaries for the rest of the EMU countries. However, this result is, to some extent, sensitive to how the Netherlands and the possible Rotterdam effect have been tackled. Additionally, bureaucracy quality has a positive effect on intra balances. In the current account literature, both the quality of the domestic financial sector and the quality of government institutions are assumed to have negative effects on current account balances. In the world economy, there is a net capital flow from the poor developing countries to the US. In the euro area, capital tends to flow from the highly developed countries to the less developed countries. Our model is capable of capturing this phenomenon, indicating that the positive relation between the intra balances and the quality of domestic financial markets as well as the positive relation between the intra balances and the quality of government institutions has caused this to occur.

Our paper provides also preliminary evidence that some dimensions of national culture, such as individualism, are important for the intra balances and extra balances. Overall, our model seems to perform better in explaining intra balances than extra balances. It is very likely that with respect to extra balances, external factors, such as the euro's exchange rate, dominate.

For example, with respect to Greece and Portugal, which have had the largest cumulative trade deficits during the euro era, our model points a finger at their low relative income (the two poorest countries in our sample), low bureaucracy quality (the second and the third worst systems in our sample after Italy) and collectivistic culture (the two countries with the lowest individualism scores).[15] Naturally reducing their real relative unit labor costs further might help also, although those are not above the long-run averages. For Portugal, a

[15] Alternatively, Portugal and Greece were the two countries with the highest uncertainty avoidance scores.

major part of its trade deficits has resulted from trade with the EMU countries. If, along the integration process, both its GDP per capita and bureaucracy quality converge to the EU-15 averages, its trade balance will become more balanced in the future. It will most likely take much longer for the national culture to change. Greece's trade deficit has resulted from both intra and extra trade. To improve its extra balance, Greece might need the euro to devalue and, consequently, for example, Germany's trade surplus vis-à-vis the rest of the world to decrease.

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Appendix. Supplementary data

Table A1. Intra balances and extra balances (ratio to GDP) for the EU-15 countries during the period of 1984–2011

Country		1984	1993	2002	2011
Austria	(Intra balance)	-0.055	-0.038	-0.031	-0.068
	(Extra balance)	-0.003	-0.006	0.033	0.028
Bel-Lux		-0.020	0.039	0.027	0.015
		-0.021	-0.006	0.021	-0.023
Denmark		-0.030	0.015	-0.002	-0.004
		0.018	0.031	0.045	0.042
Finland		-0.006	0.018	0.027	-0.024
		0.027	0.042	0.058	0.000
France		-0.012	0.002	-0.016	-0.041
		-0.001	0.009	0.018	-0.001
Germany		0.013	0.009	0.028	0.007
		0.013	0.009	0.032	0.035
Greece		-0.042	-0.053	-0.075	-0.053
		-0.059	-0.055	-0.069	-0.048
Ireland		0.060	0.144	0.188	0.149
		-0.061	0.006	0.106	0.101
Italy		-0.010	0.007	-0.008	-0.010
		-0.016	0.014	0.014	0.005
Netherlands		0.094	0.077	0.142	0.244
		-0.068	-0.031	-0.086	-0.171
Portugal		-0.018	-0.063	-0.074	-0.066
		-0.093	-0.033	-0.023	-0.025
Spain		0.011	-0.014	-0.028	-0.008
		-0.042	-0.024	-0.025	-0.040
Sweden		0.000	0.008	-0.001	-0.022
		0.022	0.029	0.063	0.026
UK		-0.014	-0.007	-0.007	-0.022
		-0.010	-0.018	-0.029	-0.050

Table A2. Share of intra trade of total trade (excluding services) for the EU-15 countries during the period of 1984–2011[a]

Country		1984	1993	2002	2011
Austria	(Exports)	0.506	0.606	0.546	0.504
	(Imports)	0.594	0.650	0.632	0.610
Belgium				0.609	0.606
				0.611	0.575
Denmark		0.346	0.460	0.433	0.384
		0.435	0.489	0.506	0.448
Finland		0.235	0.343	0.327	0.289
		0.281	0.354	0.330	0.342
France		0.434	0.489	0.491	0.482
		0.466	0.514	0.565	0.563
Germany		0.456	0.453	0.426	0.403
		0.450	0.448	0.415	0.432
Greece		0.494	0.541	0.304	0.280
		0.461	0.513	0.457	0.398
Ireland		0.359	0.402	0.383	0.402
		0.238	0.205	0.203	0.240
Italy		0.427	0.490	0.445	0.409
		0.423	0.513	0.499	0.443
Netherlands		0.638	0.634	0.631	0.619
		0.472	0.496	0.418	0.339
Portugal		0.473	0.641	0.666	0.636
		0.367	0.647	0.698	0.660
Spain		0.425	0.603	0.582	0.535
		0.286	0.547	0.569	0.465
Sweden		0.412	0.454	0.394	0.388
		0.448	0.499	0.489	0.463
UK		0.468	0.485	0.525	0.463
		0.480	0.460	0.468	0.418

[a] Intra trade is defined in the same fashion as intra balance. Consequently, partner countries include Austria, Belgium-Luxembourg, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

Table A3. Data description

Variable	Description	Source[a]
Bilateral trade balances	Trade balance (ratio to GDP) excluding services against the euro area; Trade balance excluding services against the rest of the world	DOTS/WDI[16]
GDP per capita	Gross domestic product at current market prices per head of population (1000 EUR) divided by 10, "HVGDP"	AMECO[17]
Fiscal balance	Net lending (Mrd EUR) "UBLG" divided by Gross domestic product at current prices (Mrd ECU/EUR) "UVGD"	AMECO[17], WEO, GFS, IFS yearbook 1998
Oil price	Crude oil dated brent U$/BBL divided by the US to euro exchange rate multiplied by 0.01	Datastream (Thomson Reuters)
Dependency ratios	Number of people aged 65 or more (or aged 0–14) divided by the number of people aged 15–64	WDI[18]
Domestic credit by banks	Domestic credit provided by banking sector (ratio to GDP)	WDI[18]
Bureaucracy quality	International Country Risk Guide: The political risk components: Bureaucracy quality	PRS[17]
Real interest rate	Real short-term interest rates, deflator GDP "ISRV"	AMECO[18]
Change in RULC	Change (0.01 denotes 1%) in real unit labour costs: total economy (performance relative to the rest of the former EU-15: double export weights (2005=100) "QLCDQ"	AMECO[18]
Hofstede's individualism	Hofstede's dimensions of national cultures: Individualism (high values) versus collectivism (low values)	Hofstede[18]
Change in Target balances	Change in Target balances divided by the GDP (current LCU)	CESifo/WDI[19]

[a] AMECO: Annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs; CESifo: <http://www.cesifo-group.de/dms/ifodoc/docs/politikdebatte/C_Haftungspegel/Target-countries/Target-countries-2013-10-07.xls>. 3.9.2013; DOTS: Direction of Trade Statistics, International Monetary Fund; GFS: Government Finance Statistics; Hofstede: <http://www.geerthofstede.com/media/651/6%20dimensions%20for%20website.xls>. 8.4.2013; IFS yearbook: International Financial Statistics Yearbook 1998; PRS: Political Risk Services' International Country Risk Guide (Table 3B); WEO: World Economic Outlook Database, October 2010; WDI: World Development Indicators, The World Bank.

16 Intra balance was calculated by summing up the bilateral trade balances with respect to Austria, Belgium, Luxembourg, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain (not by using "Euro Area" as a partner country). Extra balance was calculated as a remainder of bilateral trade balance with respect to World and intra balance. Both of these numbers were divided by GDP (current US$) from WDI.

17 For Belgium-Luxembourg values of Belgium was used and for Germany between 1984–1990 values of West Germany was used.

18 For Belgium-Luxembourg values of Belgium was used.

19 GDP is from WDI. We created zeros for Austria, Belgium-Luxembourg, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal and Spain from 1984 to 1998 (pre-euro period), for Greece from 1984 to 2000 (pre-euro period), and for Denmark, Sweden and UK from 1984 to 2011 (the whole period).

Hofstede's (2001) description of the individualism index:

> Individualism stands for a society in which the ties between individuals are loose: Everyone is expected to look after him/herself and her/his immediate family only. Collectivism stands for a society in which people from birth onwards are integrated into strong, cohesive in-groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty. (Hofstede 2001, p. 225)

The list of countries in the sample: Austria (adopted euro in 1999), Belgium-Luxembourg (adopted euro in 1999), Denmark, Finland (adopted euro in 1999), France (adopted euro in 1999), Germany (adopted euro in 1999), Greece (adopted euro in 2001), Ireland (adopted euro in 1999), Italy (adopted euro in 1999), Netherlands (adopted euro in 1999), Portugal (adopted euro in 1999), Spain (adopted euro in 1999), Sweden, United Kingdom.

Table A4. Omitting observations

Variable	Number of lacking annual observations	Lacking observations	Created values
Intra balance	0/392		
Extra balance	0/392		
GDP per capita	0/392		
Fiscal balance	5/392	Greece 1984–1987, Ireland 1984	
Oil price	0/28		
Dependency ratio (aged)	0/392		
Dependency ratio (child)	0/392		
Domestic credit by banks	4/392	Austria 1998, Belgium-Luxembourg 1998, France 1998, Netherlands 1998	Austria 1998, Belgium-Luxembourg 1998, France 1998, Netherlands 1998
Bureaucracy quality	0/392		
Real interest rate	0/392		
Change in RULC	0/392		
Hofstede's individualism	0/14		
Change in Target balances	0/141	zero (euro countries during the pre-euro period and DKSEUK during the whole period)	

Table A5. Data for the figures and tables

Figure	Variable / Code	Source
Figures 1–2	Trade balances / GDP	DOTS / WDI
Figures 1–2	Shape file (TM_WORLD_BORDERS_SIMPL-0.3.zip package)	Downloaded from <http://thematicmapping.org/downloads/world_borders.php>. 26.11.2012.
Tables 5–6	Trade balances / GDP	DOTS / WDI
Table 6	Current account balances	WDI, WEO

Table A6. Correlation matrix (calculated without created values, 383 observations)

Variable	Intra bal	Extra bal	EMU	DKSE UK	Non-EMU	GDP per capita	Fiscal bal	Oil price	Dep. Ratio aged	Dep. Ratio child	Dom. credit by banks	Bureau cracy	Real interes t rate	Chang e in rulc	Hofste de IDV	Chang e in Target
Intra balance	1															
Extra balance	0.015	1														
EMU	0.093	-0.034	1													
DKSEUK	-0.093	0.221	-0.405	1												
Non-EMU	-0.084	0.125	-0.264	0.612	1											
GDP per capita	0.315	0.374	0.436	0.271	0.433	1										
Fiscal balance	0.166	0.268	0.120	0.208	0.230	0.411	1									
Oil price	-0.003	-0.047	0.569	-0.006	0.236	0.585	0.037	1								
Dep. ratio (aged)	-0.443	0.080	0.354	0.264	0.186	0.321	0.062	0.414	1							
Dep. ratio (child)	0.397	-0.006	-0.392	0.094	0.015	-0.246	-0.046	-0.273	-0.599	1						
Domestic credit	0.137	-0.160	0.370	0.089	0.315	0.543	-0.077	0.595	0.243	-0.280	1					
Bureaucracy quality	0.435	0.372	-0.137	0.347	0.195	0.466	0.391	-0.046	-0.119	0.088	0.073	1				
Real interest rate	-0.020	0.012	-0.563	0.078	-0.171	-0.444	-0.170	-0.477	-0.331	0.314	-0.422	0.143	1			
Change in RULC	-0.107	-0.009	-0.008	0.068	0.015	0.082	0.134	-0.008	0.036	-0.069	-0.002	0.007	0.164	1		
Hofstede IDV	0.532	0.218	-0.165	0.422	0.232	0.418	0.206	-0.005	-0.017	0.162	0.082	0.612	0.115	0.034	1	
Change in Target balances	0.022	-0.065	-0.095	0.038	0.025	0.009	0.270	-0.078	0.042	0.006	-0.172	0.086	-0.037	-0.041	0.100	1

Table A7. Regression results for trade balances and per capita incomes in Europe 1981–2005

Variables:	Dependent variable: **Intra balance**		Dependent variable: **Extra balance**	
	PW-OLS with PCSE	FE	PW-OLS with PCSE	FE
EMU	-0.074**	-0.058***	-0.022**	-0.023
	(0.030)	(0.019)	(0.011)	(0.033)
DKSEUK	0.020*		0.045***	
	(0.012)		(0.009)	
Non-EMU	-0.039	-0.027**	-0.008	-0.027
	(0.026)	(0.010)	(0.016)	(0.023)
GDP per capita	0.020***	0.011**	0.025***	0.018**
	(0.006)	(0.005)	(0.004)	(0.008)
GDP per capita*EMU	0.031**	0.023**	0.009	0.010
	(0.014)	(0.010)	(0.005)	(0.015)
GDP per capita *DKSEUK	-0.021***	-0.001	-0.015***	-0.020
	(0.006)	(0.008)	(0.005)	(0.013)
GDP per capita *Non-EMU	0.015	0.005	0.005	0.015*
	(0.010)	(0.003)	(0.006)	(0.008)
Fiscal balance	0.034	0.075	-0.000	0.011
	(0.049)	(0.102)	(0.040)	(0.050)
Oil price	-0.017	-0.010	-0.066***	-0.064***
	(0.017)	(0.020)	(0.015)	(0.015)
R^2	0.154		0.263	
R^2 within		0.244		0.269
R^2 between		0.453		0.003
Observations	339	339	339	339

In addition all regressions include a constant. Notes: PW-OLS with PCSE: Prais-Winsten regression with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)); FE = within estimator using panel robust standard errors (clustering on the panel variable). Panel-corrected standard errors or panel robust standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels.

Table A8. Regression results for trade balances and per capita incomes in Europe 1984–2011 (including a dummy for the Netherlands)

	Dependent variable: **Intra balance**		Dependent variable: **Extra balance**	
Variables:	(9)	(10)	(9)	(10)
EMU	0.002	0.003	-0.006	-0.006
	(0.015)	(0.014)	(0.015)	(0.014)
DKSEUK	0.036**	-0.010	0.025	0.009
	(0.015)	(0.017)	(0.016)	(0.016)
Non-EMU	0.004	0.011	-0.004	-0.003
	(0.014)	(0.013)	(0.020)	(0.019)
Netherlands	0.100***	0.078***	-0.101***	-0.109***
	(0.018)	(0.016)	(0.018)	(0.017)
GDP per capita	0.033***	0.023***	0.022***	0.018***
	(0.006)	(0.006)	(0.006)	(0.007)
GDP per capita*EMU	-0.002	-0.000	0.003	0.003
	(0.007)	(0.006)	(0.007)	(0.006)
GDP per capita*DKSEUK	-0.025***	-0.010	-0.008	-0.003
	(0.007)	(0.008)	(0.007)	(0.007)
GDP per capita*Non-EMU	-0.003	-0.007	0.003	0.002
	(0.006)	(0.006)	(0.007)	(0.007)
Fiscal balance	-0.018	-0.002	-0.065*	-0.061*
	(0.043)	(0.044)	(0.037)	(0.036)
Oil price	-0.010	-0.008	-0.043***	-0.042***
	(0.008)	(0.008)	(0.010)	(0.010)
Dependency ratio (aged)	-0.295**	-0.324**	-0.274**	-0.276**
	(0.130)	(0.127)	(0.123)	(0.125)
Dependency ratio (child)	0.533***	0.457***	-0.137	-0.170*
	(0.101)	(0.095)	(0.090)	(0.089)
Domestic credit by banks	0.010*	0.013**	-0.012**	-0.011**
	(0.006)	(0.005)	(0.005)	(0.005)
Bureaucracy quality	0.015***	0.008*	0.009**	0.007*
	(0.004)	(0.004)	(0.004)	(0.004)
Real interest rate	-0.046	-0.063	-0.040	-0.046
	(0.043)	(0.045)	(0.041)	(0.041)
Change in RULC	-0.092**	-0.095**	-0.016	-0.015
	(0.041)	(0.041)	(0.036)	(0.035)
Hofstede's individualism		0.126***		0.049***
		(0.014)		(0.015)
R^2	0.503	0.576	0.334	0.340
Observations	387	387	387	387

In addition, all regressions include a constant. Notes: Estimation was performed using the Prais-Winsten estimator with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from the autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)). Panel-corrected standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels.

Table A9. Regression results for trade balances and per capita incomes in Europe 1984–2011 (including change in Target balances, changing the method to calculate autocorrelation parameter, or allowing autocorrelation to be panel-specific)

	Dependent variable: **Intra balance**			Dependent variable: **Extra balance**		
Variables:	(11)	(12)	(13)	(11)	(12)	(13)
EMU	0.001	0.000	-0.005	-0.004	-0.005	0.001
	(0.016)	(0.016)	(0.015)	(0.014)	(0.014)	(0.014)
DKSEUK	0.038**	0.035**	0.034**	0.020	0.024	0.045***
	(0.015)	(0.016)	(0.014)	(0.015)	(0.018)	(0.016)
Non-EMU	0.002	0.001	0.004	-0.005	-0.001	0.001
	(0.014)	(0.014)	(0.015)	(0.021)	(0.018)	(0.018)
GDP per capita	0.034***	0.031***	0.038***	0.022***	0.013*	0.025***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)
GDP per capita*EMU	-0.001	-0.001	0.000	0.002	0.003	-0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
GDP per capita*DKSEUK	-0.028***	-0.027***	-0.029***	-0.004	-0.003	-0.012*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
GDP per capita*Non-EMU	-0.002	-0.001	-0.004	0.003	0.002	0.002
	(0.006)	(0.006)	(0.006)	(0.008)	(0.007)	(0.007)
Fiscal balance	-0.029	-0.018	-0.004	-0.067	-0.063*	-0.072**
	(0.042)	(0.042)	(0.037)	(0.041)	(0.038)	(0.037)
Oil price	-0.005	-0.004	-0.012	-0.046***	-0.042***	-0.045***
	(0.009)	(0.009)	(0.008)	(0.010)	(0.010)	(0.010)
Dependency ratio (aged)	-0.585***	-0.550***	-0.389***	0.027	-0.038	-0.104
	(0.138)	(0.146)	(0.131)	(0.115)	(0.151)	(0.115)
Dependency ratio (child)	0.432***	0.410***	0.562***	-0.039	-0.120	-0.048
	(0.107)	(0.115)	(0.108)	(0.096)	(0.124)	(0.075)
Domestic credit by banks	0.018***	0.017***	0.015***	-0.024***	-0.014**	-0.014**
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Bureaucracy quality	0.019***	0.018***	0.029***	0.006	0.002	0.004
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)
Real interest rate	-0.055	-0.060	-0.056	-0.027	-0.041	-0.029
	(0.043)	(0.041)	(0.041)	(0.046)	(0.040)	(0.041)
Change in RULC	-0.078**	-0.079**	-0.096**	-0.029	-0.011	-0.016
	(0.039)	(0.037)	(0.039)	(0.044)	(0.034)	(0.036)
Change in Target balances	0.015			-0.006		
	(0.019)			(0.019)		
R^2	0.368	0.308	0.536	0.214	0.161	0.244
Observations	387	387	387	387	387	387

In addition all regressions include a constant. Notes: In models (12)-(13) estimation was performed using Prais-Winsten estimator with panel-corrected standard errors: In model (12) panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from regression using lags (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(regress)* options). In model (13) panel-level heteroskedastic and correlated across panels, panel-specific AR(1) autocorrelation structure, which is estimated from autocorrelation of residuals (*xtpcse* command in STATA with *correlation(psar1)* and *rhotype(tscorr)* options). Panel-corrected standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels.

Table A10. Regression results for trade balances and per capita incomes in Europe 1984–2011 (including Uncertainty avoidance index instead of Individualism index)

	Dependent variable: **Intra**	Dependent variable: **Extra**
Variables:	(14)	(14)
EMU	-0.005	-0.006
	(0.013)	(0.014)
DKSEUK	-0.069***	-0.031
	(0.019)	(0.021)
Non-EMU	0.003	-0.003
	(0.012)	(0.017)
GDP per capita	0.012*	0.009
	(0.006)	(0.006)
GDP per capita*EMU	0.002	0.003
	(0.006)	(0.006)
GDP per capita*DKSEUK	-0.013*	0.003
	(0.007)	(0.007)
GDP per capita*Non-EMU	-0.002	0.003
	(0.005)	(0.007)
Fiscal balance	-0.012	-0.067*
	(0.039)	(0.040)
Oil price	-0.004	-0.043***
	(0.008)	(0.009)
Dependency ratio (aged)	-0.234**	0.167
	(0.116)	(0.137)
Dependency ratio (child)	0.266***	-0.146
	(0.085)	(0.099)
Domestic credit by banks	0.020***	-0.019***
	(0.006)	(0.006)
Bureaucracy quality	0.008**	-0.000
	(0.004)	(0.004)
Real interest rate	-0.067*	-0.036
	(0.039)	(0.042)
Change in RULC	-0.074**	-0.015
	(0.034)	(0.038)
Hofstede's uncertainty avoidance	-0.170***	-0.083***
	(0.017)	(0.020)
R^2	0.483	0.224
Observations	387	387

In addition, all regressions include a constant. Notes: Estimation was performed using the Prais-Winsten estimator with panel-corrected standard errors (panel-level heteroskedastic and correlated across panels, common AR(1) autocorrelation structure, which is estimated from the autocorrelation of residuals (*xtpcse* command in STATA with *correlation(ar1)* and *rhotype(tscorr)* options)). Panel-corrected standard errors are in parenthesis. *, ** and *** denote statistical significance at the 10, 5 and 1 percent levels.

CHAPTER 5
LONG-RUN DETERMINANTS AND SHORT-RUN DYNAMICS OF THE TRADE BALANCE IN THE EU-15 COUNTRIES*

Abstract

Several studies have analyzed the long-run determinants of current account balances using panel cointegration techniques. In this paper we will study both the long-run determinants and the short-run dynamics of the trade balances in the EU-15 countries. We will analyze each country separately and decompose the aggregate trade balance into the intra balance (trade balance vis-à-vis euro area) and the extra balance (trade balance vis-à-vis the rest of the world). Overall, our results suggest that there are significant differences in the long-run relations across the EU-15 countries which might be overlooked in the panel cointegration studies. In most of the countries there is a long-run cointegration relation between the trade balance, real effective exchange rate, domestic GDP and foreign GDP, but in many cases the coefficient of the trade balance variable is statistically insignificant in the relation. Our results on the short-run dynamics indicate that in general the aggregate trade balance cannot be adjusted by expenditure-switching or expenditure-reducing policies.

Keywords: Trade balance, Competitiveness, European Monetary Union

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1. Introduction

When the euro was introduced, widening current account imbalances were not considered as a problem but instead were considered as a natural consequence of economic integration (see, e.g., Blanchard and Giavazzi 2002). After a decade, a much more cautious view has been adopted by the European Union. A legislative package and a surveillance procedure for the prevention and correction of macroeconomic imbalances were enforced in 2011. [1] The Macroeconomic Imbalance Procedure (MIP) stresses the importance of external balance and competitiveness.[2] Apparently the majority of the indicators in the MIP scoreboard have been derived from the standard Mundell-Fleming model, according to which external adjustment can occur through expenditure switching (a change in exchange rate) or expenditure shifting (a change in domestic demand). The European Commission (2010a, p. 8) claims that differences in domestic demand and price competitiveness have both contributed to the divergence of current account balances, and intra-euro area imbalances have been a large part of this divergence (see, e.g., European Central Bank 2013, p. 69, or Darvas 2012).

We use Johansen and Juselius (1992) cointegration methodology to test if there is a long-run cointegration relation between the trade balance, the real effective exchange rate, the foreign output and the domestic output. The intertemporal approach to current account balance emphasizes other variables. However, in this study we focus on the variables listed above, because the key predictions of the intertemporal approach to the current account have been rejected several times by the data (see, e.g., Gourinchas and Rey 2014, p. 586) and the MIP stresses the importance of price competitiveness among other indicators. Our prime interest is to find out if the aggregate trade balance can be adjusted by expenditure-switching or expenditure-reducing policies and if the intra-euro area balance differs from the aggregate trade balance or the extra balance in this respect. To our knowledge, this is the first study using quarterly data on the intra-euro area and extra-euro area trade balances separately in statistical analysis.[3]

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1 Regulation (EU) No 1176/2011 of the European Parliament and of the Council of 16 November 2011 on the prevention and correction of macroeconomic imbalances (OJ L 306, 23.11.2013, pp. 25-32) and Regulation (EU) No 1174/2011 of the European Parliament and of the Council of 16 November 2011 on enforcement measures to correct excessive macroeconomic imbalances in the euro area (OJ L 306, 23.11.2011, pp. 8-11).

2 The scoreboard consists of current account balance, net international investment position, export market shares, nominal unit labor costs, real effective exchange rates, private sector debt, private sector credit flow, changes in the house price index, general government sector debt, and unemployment rate and there is a threshold value for each of these indicators. These indicators are claimed to focus on the most relevant dimensions of macroeconomic imbalances and competitiveness losses. (European Commission 2012a).

3 Schmitz and von Hagen (2011) were the first to use annual data. Intra balance is the trade vis-à-vis the EMU-12 countries and extra balance is the trade balance vis-à-vis the rest of the world.

We find that in most of the EU-15 countries there is a long-run cointegration relation between the aggregate trade balance, the real effective exchange rate, the foreign output, and the domestic output. However, the coefficient of the aggregate trade balance is often statistically insignificant in the cointegration vector. Only in Germany (1995Q4-2013Q3), Italy (1994Q1-2013Q3) and the UK (1994Q1-2013Q3) we obtain exactly one cointegration vector and a statistically significant trade balance coefficient. When we consider intra-euro area balances or extra balances, we encounter another problem: weak exogeneity. Neither the intra balances nor the extra balances adjust to the disequilibrium error. Thus, in most of the cases we cannot apply the error-correction representation. Consequently, we use VAR-models and first differenced series for short-run analysis. This analysis indicates that in general the trade balances cannot be adjusted by expenditure-switching or expenditure-reducing policies.

The remainder of this paper is organized as follows. In Section 2 we will briefly summarize the vast empirical literature in which the relation between the aggregate trade balance, the real exchange rate, and the foreign demand has been studied. Our emphasis is on the discussion about the factors that have contributed to the diverging current account imbalances in the euro area. In Section 3 we describe our data and explain our empirical methodologies. In Section 4 we will present the results on both the long-run relation and the short-run adjustment. Concluding remarks are presented in Section 5.

2. Literature

Our paper is related to a vast amount of literature on open-economy macroeconomics. This short literature review is organized as follows. In Section 2.1 we discuss the time series properties of current account balances. In Section 2.2 we summarize the studies in which cointegration methods have been applied to EMU countries. In Section 2.3 we will present some important studies on trade balance and price competitiveness.

2.1. Stationarity of current account balances and the long-run budget constraint

The time series properties of current account balances have been analyzed quite a lot.[4] The starting point in these analyses is that the long-run budget constraint, which is essentially the foundation for the intertemporal approach to current account balances, implies stationarity. If current account balance is nonstationary and non-mean reverting, a country may accumulate an infinite level of external debt (see, e.g., Coakley et al. 1996). Taylor (2002) collected annual data on current account balances for 15 countries over a hundred years. He found that savings (ratios to GDP) and investments (ratios to GDP) are nonstationary, whereas current account balances (ratios to GDP) are stationary. Consequently, savings and investments are cointegrated and the long-run budget constraint holds.[5] Taylor considers the long-run budget constraint as an explanation for the so-called Feldstein-Horioka puzzle (i.e. high correlation between savings and investments under free capital mobility).[6] (Taylor 2002.) Raybaudi et al. (2004) propose a different procedure. They use a Markov-switching unit root test which allows for the possibility that a country enters a nonsustainable regime in several sub-periods even though the external debt might be sustainable in the long-run. (Raybaudi et al. 2004.)

Clower and Ito (2012) have a large sample of countries (72 countries over 205 quarterly observations) and they find that while the ADF-GLS (Augmented Dickey-Fuller), KPSS (Kwiatkowski-Phillips-Schmidt-Shin) and HEGY (Hylleberg, Engle, Granger and Yoo) unit root tests all imply rejection of unit root in the current account balance in less than 20% of countries, the rejection rate increases substantially if a structural break in trend and/or intercept is allowed. They also explore determinants that increase the probability of a country entering a non-stationary regime. For the developing and emerging countries both the fixed exchange rate regime and financial openness increase this probability. (Clower and Ito 2012.)

Net foreign asset positions can change both via trade channel and valuation channel (see, e.g. Gourinchas and Rey (2007). Hence, there is no deterministic relationship between the current account balances and the net

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4 Chen (2011) includes a survey on the existence of unit roots in current account series.
5 By definition the current account balance equals savings minus investments.
6 Coakley et al. (1996) propose this same argument.

foreign asset position. Theoretically a country could constantly run trade deficits and still satisfy the long-run budget constraint. Thus, we cannot rule out the possibility that the trade balance series contains a unit root for an extended period of time.

2.2. Cointegration studies on current account balances with EMU countries

There are several studies in which the cointegration relationship between current accounts, price competitiveness, domestic demand and foreign demand have been analyzed in EMU countries (see Table 1 for a summary). Arghyrou and Chortareas (2008) use the Johansen-Juselius cointegration methodology and find that for most of the EMU-12 countries the real exchange rate has a statistically significant coefficient in the cointegration vector. Consequently, if real exchange rate depreciates, this has a positive effect on the current account balance in the long-run. However, in most cases the coefficients on the income variables are larger in absolute value than the coefficient on real exchange rate, which implies that a one percentage point change in these variables has a larger effect on current account balances than a one percentage point change in the price competitiveness. For none of the countries the lagged values of real effective exchange rates are jointly significant in the linear VECM of current account balance. Hence, the real exchange rate does not seem to be important for the short-run adjustment towards the equilibrium. For most of the countries, the real effective exchange rate is weakly exogenous which implies rigidity of the price variables. More importantly, tests reject the null hypothesis of linear current account adjustment for most of the countries. Usually the external adjustment is faster, if the current account balance is below a threshold. (Arghyrou and Chortareas 2008.)

Afonso and Rault (2009) were among the first to examine panel cointegration between the current account balances and its determinants in EMU countries. When they performed SUR estimation, they found that the government budget balance had a positive effect on the current account balance in Austria, Belgium and Ireland, and a negative effect in Italy, Luxembourg, Spain and the UK. The real effective exchange rate had a negative effect on the current account balance in all countries excluding Austria (positive), Denmark (positive), Ireland (positive), France (not significant at the 5% level), Luxembourg (not significant) and the UK (not significant). (Afonso and Rault 2009.)

Belke and Dreger (2013) analyze the importance of price competitiveness (unit labor cost-based real effective exchange rate) and catching up (measured by the GDP per capita relative to the euro area average) for the current account balances in a panel of 11 EMU countries. They find that both of these components are statistically significant, but a 1% increase in the relative price competitiveness has had a larger positive effect on the current accounts than a 1% increase in the relative per capita income. However, when they divide the sample into deficit and surplus countries, the results change. The per capita incomes have had a statistically significant negative effect on the current

account balances in Greece, Portugal and Spain during the post-1990 period. In the surplus countries the real effective exchange rate has been statistically insignificant. In addition, they find that government debt has had a negative effect on the current account balance whereas real interest rate has had no effect. (Belke and Dreger 2013.)

Gossé and Serranito (2014) elaborate on the analysis of Belke and Dreger (2013) in two ways. First, they include a larger set of variables. Secondly, they use a panel VECM to analyze the short-run adjustment. Budget balance seems to be important only in the long-run, whereas the real effective exchange rate is important both in the long-run and short-run. In the short-run the coefficient is even larger in absolute terms. External adjustment is rather slow as only 15% of the disequilibrium (the difference between actual current account balance and the structural long-run level of current account balance) of the previous year is corrected at the current year. Hansen's F-test indicates that there is one structural break in the short-run external adjustment. With exogenous zero threshold level they find that the half-life of deviations is much shorter if a country is below its structural long-run level than if it is above it. With an endogenous threshold level they find that if surplus is above 5.5% (of GDP), there is no significant adjustment of the current account balance. (Gossé and Serranito 2014.)

Comunale and Hessel (2014) differ from Belke and Dreger (2013) in three respects. First, they model exports, imports and trade balances separately. Secondly, they use the mean group estimator (coefficients are allowed to be heterogeneous both in the short-run and in the long-run). Thirdly, they use quarterly data. Foreign demand has a positive effect on exports in the short-run and in the long-run the effect is even stronger. Real effective exchange rate appreciation has a negative effect on the exports in the short-run, but no effect in the long-run. The domestic demand and the exports have positive effects on the imports both in the short-run and in the long-run. Price competitiveness seems to be insignificant for the imports. Neither the GDP-based nor the unit labor cost-based real effective exchange rate is significant for the trade balance. With respect to the fiscal cycle, the results depend on which proxy is used. (Comunale and Hessel 2014.)

According to Lane and Milesi-Ferretti (2002) the real exchange rate depreciation is strongly associated with trade surplus. However, a much larger depreciation is needed for a given improvement in trade balance in the G3 countries than in the non-G3 countries. Also the relative price of nontraded goods co-moves with the trade balances. (Lane and Milesi-Ferretti 2002.)

Table 1. Cointegration studies on current account balances with EMU countries

Study	Sample	Unit root test	Cointegration	Estimation
Arghyrou and Chortareas (2008)	Quarterly data (except GR), EMU12 (exc. IE and LU), 1980Q1-2005Q3. Variables: ca, reer, ys, ys7.	Not specified: all series are I(1).	Johansen-Juselius cointegration test (Johansen and Juselius 1990, 1992) and Engle-Granger (Engle and Granger 1987): one cointegration vector (two in Finland).	VECM system estimated using the full information maximum likelihood (FIML) and after tests (Luukkonen et al. 1988; Granger and Teräsvirta 1993) indicate nonlinear adjustment logistic smooth threshold error-correction model (L-STECM) (e.g. van Dijk et al. 2002).
Afonso and Rault (2009)	Annual data, EU15, 1970-2007. (Also larger panels with smaller T.) Variables: ca, reer, budget.	Bootstrap tests (Smith et al. 2004): the null of a unit root cannot be rejected.	Panel bootstrap cointegration test (Westerlund and Edgerton 2007): the null of cointegration cannot be rejected	Seemingly Unrelated Regression (SUR) method
Belke and Dreger (2013)	Annual data, 11 EMU countries, 1982-2011. Variables: ca, reer, y, r, debt (all are expressed relative to the euro area average).	Covariate-augmented Dickey-Fuller test (Pesaran 2007): all series are I(1).	Panel test of cointegration with cross-sectional dependence (Westerlund 2007): in most of the cases the null of no cointegration is rejected.	Pooled mean group estimator (Pesaran et al. 1999)
Gossé and Serranito (2014)	Annual data, 21 OECD countries, 1974-2009. Variables: ca, reer, y, r, prod, fb, oil, credit, dep, tot (HP-filter to all except fb). Data is demeaned.	First generation tests (Levin et al. 2002; Im et al. 2003) and Covariate-augmented Dickey-Fuller test (Pesaran 2007): all series are I(1), except r is I(0).	Panel test of cointegration with cross-sectional dependence (Westerlund 2007): in most of the cases the null of no cointegration is rejected.	1) Panel DOLS to estimate the long-run structural values of ca (after this a normalization to country-specific intercept (Elbadawi et al. 2011) and 2) both linear panel VECM (derived from ARDL (1, 1, 1) model (Pesaran and Shin 1999)) and nonlinear panel VECM (Hansen 1999)
Comunale and Hessel (2014)	Quarterly data, 17 EMU countries, 1994Q1-2012Q3. Three systems: [exp, reer, fd]; [imp, reer, dd, exp]; [tb, reer, fcycle]. Imports are demeaned.	Im et al. (2003) and Covariate-augmented Dickey-Fuller test (Pesaran 2007): all series are I(1), except tb is I(0).	Panel test of cointegration with cross-sectional dependence (Westerlund 2007): in most of the cases the null of no cointegration is rejected.	Mean group estimator (Pesaran and Smith 1995)
Lane and Milesi-Ferretti (2002)	Annual data, 20 OECD countries, 1970-1998. Variables: tb, reer, y, yd, tot, rp, rprod.	Hadri (2000): the null of stationarity can be rejected in all series.	Pedroni (1999): the null of no cointegration can be rejected.	Dynamic Ordinary Least Squares (DOLS) estimator (Stock and Watson 1993)

Abbreviations: Greece (**GR**), Ireland (**IE**), Luxembourg (**LU**), ratio of the current account balance to GDP (**ca**), ratio of the exports to GDP (**exp**), ratio of the imports to GDP (**imp**), ratio of the trade balance to GDP (**tb**), real effective exchange rate (**reer**), seasonally-adjusted real GDP volume (**ys**), GDP per capita (**y**), GDP per capita relative to trading partners (**yd**), domestic demand (**dd**), seasonally-adjusted real GDP volume of the G-7 area (**ys7**), foreign demand (**fd**), proxies for the financial cycle (**fcycle**), real interest rate (**r**), general government budget balance (**budget**), ratio of the government fiscal balance to GDP (**fb**), ratio of the cyclically adjusted government debt to GDP (**debt**), labor productivity of the total economy (**prod**), labor productivity in the traded goods' sector relative to the nontraded goods' sector (**rprod**), ratio of the oil balance to GDP (**oil**), ratio of the private credit to GDP (**credit**), dependency ratio (**dep**), terms of trade (**tot**), price of nontraded goods relative to traded goods (**rp**).

2.3. Trade balance and price competitiveness

Demirden and Pastine (1995) stress the importance of feedback effects between the trade balance, real exchange rate, domestic income and foreign income in a flexible exchange rate regime. Hence, they assert that VAR methodology in which all variables are allowed to be endogenous is well suited for this purpose. More recently some studies have utilized structural VAR models for exchange rates and current account balances that are based on the implications of the intertemporal approach to current account. Lee and Chinn (2006) estimate a VAR model including exchange rates and current account balances. They suggest that one reason for the difficulty to uncover the relationship between exchange rate and the current account has been the inability to control for permanent shocks which dominate movements of the real exchange rate. Their key assumption is that temporary effects (nominal shocks) have no long-run effects on the real exchange rate.[7] Fisher and Huh (2002) point out that in the more recent intertemporal models with sticky prices nominal shocks can have a long-run effect on the real exchange rate as well as on the trade balance. Gourinchas and Rey (2014, p. 586) remark that the key predictions of the intertemporal approach to the current account have been rejected several times by the data.[8]

European Central Bank (2012) is an extensive analysis on the factors that have contributed to the diverging current account balances in the euro area. Some EMU member countries have suffered competitiveness losses (measured by the unit labor cost-based real effective exchange rate). The appreciation of unit labor cost-based real effective exchange rate indicates that the development of labor costs was not driven by changes in productivity. A wage determination mechanism with wage spillovers from non-traded or public sector to the traded-sector might explain this disconnection. Given the high taxes on labor incomes, a country can improve its competitiveness by fiscal devaluation, i.e. a shift from direct taxes and social security contributions towards indirect taxes. On the other hand, productivity growth can increase competitiveness via price competitiveness (enhanced process efficiency, improved skills etc.) or non-price competitiveness (higher product quality etc.). The only problem is that it is difficult to measure the ability to innovate.[9] Based on disaggregated sectoral data, the price and non-price competitiveness factors have been equally important for the trade balance in most of the EMU countries. Model simulations on four different models ranging from a Dynamic Stochastic General Equilibrium (DSGE) model to an empirical Global Vector Autoregressive Model (GVAR) suggest that a 5% to 10% temporary reduction in relative wages is needed for the current account balance to improve by 1% of

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7 Giuliodori (2004) expands this model by including a demand shock.

8 Nason and Rogers (2006) is a good summary of the potential reasons for the shortcomings. See also Bergin (2006), Kano (2008), and Campa and Gavilan (2011).

9 See Nieminen (2015) in which he found that there is a strong positive link between Hofstede's Individualism index and intra-euro area trade balances. Based on Gorodnichenko and Roland (2010) the Individualism index is a very good proxy for the ability to innovate.

GDP in the medium term. However, the short-run impulse responses vary substantially across models. The peak of the current account response could be 3 quarters or 13 quarters after the shock depending on the model. (European Central Bank 2012.)

Zemanek et al. (2010) employ a dynamic panel model (system GMM estimator) to find out whether structural reforms or private sector adjustments affect bilateral trade balances. They find, for example, that the changes in unit labor costs are statistically insignificant in explaining the changes in bilateral trade balances. According to European Commission (2010b) foreign demand and real effective exchange rate accounted for only a half of the variation in exports of the EMU member countries during 1998-2008. Furthermore, the correlation between exports and real exchange rate has actually been positive. This has been interpreted as evidence for the fact that price competitiveness is only one of the factors determining the export performance. (European Commission 2010b, p. 29.) Import intensity of exports may weaken the relation between real effective exchange rate and exports (see European Commission 2012b, p. 31, Graph 3.1, or European Central Bank 2012, pp. 30-32).

Collignon and Esposito (2014) point out that wages do not measure the total cost structure of economy. Hence, they develop a competitiveness index which also includes capital efficiency and profit rates. However, there is not a significant difference between the real effective exchange rate and their own index in the explanatory power for the trade balances. Wyplosz (2013) claims that the competitiveness narrative of the Eurozone crisis is misleading and based on the faulty use of data. He has three arguments for this interpretation. First, EMU member countries do not only compete with each other and therefore unit labor costs should be measured with respect to all countries, not just relative to the EMU countries. Secondly, changes in total economy unit labor costs might result merely from the nontraded goods sector. Thirdly, there is no reason to set indices to 100 at an arbitrary year as if real effective exchange rates were in equilibrium at this arbitrary year. It is more reasonable to assume that the real effective exchange rates are in equilibrium in the long-run. If these points were taken into consideration, the divergence in competitiveness would probably be much less dramatic. On the other hand, the competitiveness narrative does not explain why inflation has been higher in Southern European countries. It is very likely that changes in competitiveness have been endogenous and driven by domestic demand shocks. Countries that entered the EMU with above-average inflation rates had lower-than-average real interest rates and this resulted in credit booms and high domestic demand. (Wyplosz 2013.) Related to this view, Fratzscher et al. (2010) build a Bayesian structural VAR model and show that asset market reactions (equity market shocks and housing price shocks) were much more important than the behavior of exchange rate in explaining the US current account balance.

3. Data and methodology

3.1. Data

We use quarterly data on trade balances, real exchange rates, domestic GDP per capita and foreign GDP per capita.[10] Our dataset includes the EU-15 countries except Belgium, Luxembourg, Austria, and Ireland.[11] The length of the sample period varies from 135 quarters (1980Q1-2013Q3, Greece, Italy and Sweden) to 171 quarters (1971Q1-2013Q3, France, Germany, Spain and the UK). There is strong seasonality not just in the output series but also in the trade balance series. Consequently, we apply the linear X-11 filter and take logarithms of the series.[12] We use the CPI-based real exchange rates, because this is the indicator that was included in the Macroeconomic Imbalance Procedure scoreboard.[13]

Both in the long-run and in the short-run analyses we examine three systems of four variables. The three systems differ with respect to the set of partner countries. In the first system we have the aggregate trade balance (as a ratio to GDP), domestic GDP per capita, GDP per capita in the world economy, and the CPI-based real effective exchange rate.[14] Hence, the set of partner countries consists of the whole world. In the second set we have the intra balance (as a ratio to GDP), domestic GDP per capita, GDP per capita in the rest of the EMU-12 countries, and the CPI-based real exchange rate against the EMU-12 countries. In these models the set of partner countries consists of the EMU-12 countries. In the third system we have extra balance (as a ratio to GDP), domestic GDP per capita, GDP per capita in the non-EMU-12 countries, and the CPI-based real exchange rate against the non-EMU-12 countries. In this case the set of partner countries consists of the non-EMU-12 countries. In the short-run analysis we use first differenced series and estimate the VAR models for each country.

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10 We chose to exclude interest rate differentials from the cointegration analysis due to three reasons. First, interest rate differentials are stationary. Second, nominal interest rate differentials are zero in the EMU member countries from 1999 onwards. Third, including interest rate differentials would imply a shift from a Keynesian model to the monetary approach.

11 The problem with Belgium and Luxembourg is that prior to the year 1997 there is no data for these two countries separately in the IMS's Direction of Trade Statistics. For Ireland and Austria the pre-EMU sample length is too short (4 quarters for Ireland and 40 quarters for Austria). However, all these countries are included as partner countries, when intra balances or real exchange rates against the EMU-12 countries are calculated.

12 We did not take logarithms of trade balance series, because these include negative values. However, it is possible to calculate trade balance variables as log of exports minus log of imports divided by log of GDP. Both of these alternatives have been used in the previous studies. We report the results of the long-run analysis for the trade balance variables in logs in Tables A2-A6. Our main results and conclusions are not sensitive to the functional form of trade balances.

13 Note that in order to calculate the real exchange rates against an arbitrary group of countries (EMU-12 countries or non-EMU-12 countries), one needs to re-scale the trade weighting matrix.

14 See details in Table A1.

3.2. Long-run analysis

Most of our time series contain a unit root (see Table 2). In some series there is a structural break. For all countries at least two of the four variables are I(1). Consequently, we use the Johansen-Juselius cointegration methodology to test if there is a long-run cointegration relation between the trade balance, the domestic output, the foreign output, and the real effective exchange rate. We use Johansen and Juselius (1992) cointegration methodology instead of Engle and Granger (1987) cointegration test as it allows for the possibility of several cointegration vectors. We apply backwards recursive estimation due to the following reasons. First, the existence of cointegration is sensitive to the time interval chosen. Second, in most of the countries the series contains a structural break in the beginning of the EMU convergence period in the 1990s. In order to avoid the existence of a structural break in the sample, the country-specific sample periods do not begin until after the structural break.[15]

[15] For Greece we also estimated a sample excluding the euro crisis period.

Table 2. Results of the unit root tests

	Finland 1975Q1-2013Q3			France 1971Q1-2013Q3			Germany 1971Q1-2013Q3			Greece 1980Q1-2013Q3			Italy 1980Q1-2013Q3		
Unit root test:	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT
tradebalance	I(1)	I(1)***	1991Q3	I(1)	I(1)***	2004Q2	I(1)	I(0)	1990Q2	I(0)**	I(1)***	2008Q4	I(1)	I(1)***	1992Q3
$y_{domestic}$	I(1)	I(1)**	1990Q3	I(1)	I(1)***	2007Q2	I(1)	I(1)***	1990Q1	I(1)	I(1)***	2008Q3	I(1)	I(1)***	2008Q2
y^*_{world}	I(1)	I(0)	1981Q2	I(0)**	I(0)	1980Q2	I(0)**	I(0)	1980Q2	I(1)	I(0)	1987Q2	I(1)	I(0)	1987Q2
$reer_{world}$	I(1)	I(1)**	1991Q4	I(0)**	I(0)	1980Q4	I(1)	I(1)**	1980Q1	I(1)	I(1)**	1991Q3	I(1)	I(1)**	1992Q4**
Number of I(1) variables	3			2			2			2			3 or 2		
Δtradebalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
$\Delta y_{domestic}$	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
Δy^*_{world}	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
$\Delta reer_{world}$	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
intrabalance	I(1)	I(1)***	1990Q1	I(1)	I(1)***	1998Q4	I(1)	I(1)***	2007Q2	I(1)	I(1)***	2008Q3	I(1)	I(1)***	1990Q2
y^*_{EMU-12}	I(1)	I(1)***	2007Q4	I(1)	I(1)***	2007Q2	I(1)	I(1)**	1997Q2	I(1)	I(1)***	2008Q3	I(1)	I(1)***	2008Q3
$reer_{EMU-12}$	I(0)**	I(1)***	1991Q4***	I(0)***	I(0)	1993Q4***	I(0)**	I(1)**	1992Q4***	I(1)	I(1)***	1985Q2	I(1)	I(1)**	1992Q4***
Number of I(1) variables	3			3			3			4			4 or 3		
Δintrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
Δy^*_{EMU-12}	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
$\Delta reer_{EMU-12}$	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
extrabalance	I(1)	I(1)***	1992Q3	I(0)**	I(1)**	2005Q3	I(1)	I(1)***	2001Q1	I(0)**	I(1)**	2000Q2	I(1)	I(1)***	1998Q4
y^*_{RoW}	I(1)	I(1)***	2003Q3	I(1)	I(1)***	2005Q2	I(1)	I(1)***	2005Q2	I(1)	I(1)***	1993Q3	I(1)	I(1)***	1993Q2
$reer_{RoW}$	I(1)	I(1)**	1992Q4	I(1)	I(0)	1980Q4	I(1)	I(0)	1980Q2	I(1)	I(0)	1999Q1	I(1)	I(1)**	1992Q4
Number of I(1) variables	4			2			3			2			4		
Δextrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
Δy^*_{RoW}	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
$\Delta reer_{RoW}$	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		

Abbreviations: Augmented Dickey Fuller test (ADF), Kwiatkowski-Phillips-Schmidt-Shin test (KPSS), Zivot-Andrews endogenous structural break test (ZIVOT), for others see Table A1.
Notes: In Augmented Dickey Fuller test (with a constant and a trend, lag structure by Bayesian information criterion) the null hypothesis is that the series contains a unit root. In Kwiatkowski-Phillips-Schmidt-Shin test (with trend, four lags) the null hypothesis is that the series is trend stationary. Zivot-Andrews is endogenous structural break test. Bold font indicates that the series contains a unit root. Most of the time series contain a unit root, but all first differences are stationary. Δ denotes period-to-period changes. **, *** denote statistical significance at 5% and 1% levels.

Table 2. Results of the unit root tests (continues)

	Netherlands 77Q1-2013Q3			Portugal 1978Q1-2013Q3			Spain 1971Q1-2013Q3			Denmark 77Q1-2013Q3			Sweden 1980Q1-2013Q3			UK 1971Q1-2013Q3		
Unit root	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVO	ADF	KPSS	ZIVO	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT
tradebalance	I(0)**	I(0)	1997Q1**	I(1)	I(1)**	1984Q2	I(1)	I(1)**	1977Q	I(1)	I(1)**	1986Q	I(1)	I(1)**	2006Q2	I(1)	I(1)**	1977Q2
$y_{domestic}$	I(1)	I(1)**	2008Q1	I(1)	I(1)**	1988Q1	I(1)	I(1)**	1998Q	I(1)	I(1)**	2008Q	I(1)	I(1)**	1990Q2	I(1)	I(1)**	1994Q1
y^*_{world}	I(1)	I(0)	1987Q2	I(1)	I(0)	1987Q2	I(0)**	I(0)	1980Q	I(1)	I(0)	1987Q	I(1)	I(0)	1987Q2	I(0)**	I(0)	1980Q2
$reer_{world}$	I(1)	I(1)**	2001Q1	I(1)	I(1)**	1990Q1	I(1)	I(1)**	1992Q	I(1)	I(0)	1986Q	I(1)	I(1)**	1998Q3	I(1)	I(0)	2007Q2
Number of I(1) variables	2			3			3			2			3			2		
Δtradebalanc	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
$\Delta y_{domestic}$	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
Δy^*_{world}	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
$\Delta reer_{world}$	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
intrabalance	I(1)	I(1)**	1986Q1**	I(0)**	I(1)**	1996Q3	I(1)	I(1)**	1986Q	I(1)	I(1)**	1987Q	I(1)	I(1)**	1990Q2*	I(1)	I(1)**	1990Q2
y^*_{EMU-12}	I(1)	I(1)**	2008Q1	I(1)	I(1)**	2008Q2	I(1)	I(1)**	2007Q	I(1)	I(1)**	2008Q	I(1)	I(1)**	2008Q3	I(1)	I(1)**	2007Q2
$reer_{EMU-12}$	I(1)	I(1)**	1983Q1	I(1)	I(1)**	1990Q4**	I(1)	I(1)**	1992Q	I(1)	I(0)	1986Q	I(0)**	I(0)	1992Q4	I(1)	I(0)	1979Q1
Number of I(1) variables	3			3 or 2			4			3			3 or 2			3		
Δintrabalanc	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**	I(0)**		I(0)**		
Δy^*_{EMU-12}	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**	I(0)**		I(0)**		
$\Delta reer_{EMU-12}$	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**	I(0)**		I(0)**		
extrabalance	I(1)	I(1)**	1985Q2	I(1)	I(1)**	1984Q3**	I(1)	I(1)**	1983Q	I(0)**	I(1)**	1983Q	I(1)	I(1)**	1993Q3	I(0)**	I(1)**	1977Q3*
y^*_{RoW}	I(1)	I(1)**	2003Q3	I(1)	I(1)**	2003Q3	I(1)	I(1)**	2005Q	I(1)	I(1)**	2003Q	I(1)	I(1)**	1993Q2	I(1)	I(1)**	2005Q2
$reer_{RoW}$	I(1)	I(1)**	2002Q2	I(1)	I(0)	1989Q3	I(1)	I(0)	1992Q	I(1)	I(0)	1985Q	I(1)	I(1)**	1997Q1	I(0)**	I(0)	1996Q4
Number of I(1) variables	4			3 or 2			3			2			4			2		
Δextrabalanc	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
Δy^*_{RoW}	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		
$\Delta reer_{RoW}$	I(0)**			I(0)**			I(0)**			I(0)**			I(0)**			I(0)**		

Abbreviations: Augmented Dickey Fuller test (ADF), Kwiatkowski-Phillips-Schmidt-Shin test (KPSS), Zivot-Andrews endogenous structural break test (ZIVOT), for others see Table A1.
Notes: In Augmented Dickey Fuller test (with a constant and a trend, lag structure by Bayesian information criterion) the null hypothesis is that the series contains a unit root. In Kwiatkowski-Phillips-Schmidt-Shin test (with trend, four lags) the null hypothesis is that the series is trend stationary. Zivot-Andrews is endogenous structural break test. Bold font indicates that the series contains a unit root. Most of the time series contain a unit root, but all first differences are stationary. Δ denotes period-to-period changes. **, *** denote statistical significance at 5% and 1% levels.

When choosing the country-specific sample periods, we face a constrained optimization problem. We maximize the sample length, but try to ensure that the following conditions hold: cointegration rank equals one (based on the trace test with small sample correction) and the sample does not contain structural breaks (according to the Zivot-Andrews endogenous structural break test). The sample period is country specific, but common to all three different systems for each country. In most cases this is feasible (see Table 3).[16] However, for example in the Netherlands we cannot find a long-run relation. The same applies to the EMU-12 and the rest of the world systems in Portugal, Denmark and the UK as well as to the EMU-12 system in Sweden.[17] If the trace test confirms that the cointegration rank equals one, we estimate the cointegration vector and normalize it with respect to the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance). However, before estimating the cointegration vectors we impose zero restrictions on the trade balance variables. Only if we can reject the zero restriction, we estimate the cointegration vector. We will present the results on long-run relations in Section 4.1.

Some studies run cross-section regressions in which changes in the trade balance or changes in current account balance are explained by changes in the real effective exchange rate and GDP per capita growth rate (see, e.g., Estrada et al. 2013, Table 1). However, these regressions have some problems. First, it is very difficult to claim that the real exchange rate could be considered exogenous with respect to the trade balances. Secondly, it is very likely that the countries differ in respect to the adjustment dynamics. When we ran such cross-section regressions with the EU-15 countries using 5-year rolling averages, we observed one additional problem: the results are very sensitive to the time interval (see Figure A1). For example, the estimated value of the t-statistics for the parameter on real effective exchange rate varies from -3.87 (2002Q1-2007Q1) to 6.22 (2005Q4-2010Q4) in less than four years.

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16 When comparing the results in Table A3 to the results in Table 3, it turns out that the determination of cointegration rank is not sensitive to whether the trade balance variables are in logs or not. The only difference is that the results in Table A3 suggest that the cointegration rank of the EMU-12 system in Germany equals two. In addition, when the trade balance is in logs, we were unable to perform the trace test for the whole world system in Italy due to the non-invertible matrix.

17 For Greece 1999Q1-2013Q3 we were unable to perform the trace test because the matrix was non-invertible.

Table 3. Determination of cointegration rank (trace test with small sample correction)

			Set of partner countries:	
	Null hypothesis:	The whole world	EMU-12 countries	The rest of the world
FI	H_0: r=0	0.047	0.014	0.008
	H_0: r≤1	0.186	0.869	0.038
	H_0: r≤2	0.902	0.979	0.844
	time period	1991Q4-2013Q3 based on st. break in $reer_{EMU-12}$ and backwards recursive estim.		
FR	H_0: r=0	0.004	0.007	0.001
	H_0: r≤1	0.126	0.900	0.197
	H_0: r≤2	0.177	0.856	0.135
	time period	1998Q1-2013Q3 based on st. break in $reer_{EMU-12}$ and backwards recursive estim.		
DE	H_0: r=0	0.033	0.001	0.006
	H_0: r≤1	0.157	0.280	0.065
	H_0: r≤2	0.283	1.000	0.399
	time period	1995Q4-2013Q3 based on st. break in $reer_{EMU-12}$ and backwards recursive estim.		
GR	H_0: r=0	0.006		0.000
	H_0: r≤1	0.611		0.106
	H_0: r≤2	0.707		0.241
	time period	1999Q1-2013Q3 based on backwards recursive estimation		
GR	H_0: r=0	0.001	0.000	0.000
	H_0: r≤1	0.748	0.119	0.388
	H_0: r≤2	0.850	0.272	0.839
	time period	1994Q1-2007Q4 based on backwards recursive estim. (starting from 2007Q4)		
IT	H_0: r=0	0.034	0.008	0.040
	H_0: r≤1	0.127	0.153	0.551
	H_0: r≤2	0.777	0.339	0.566
	time period	1994Q1-2013Q3 based on st. breaks both in $reer_{world}$ and $reer_{EMU-12}$ and backwards recursive estim.		
NL	H_0: r=0	0.130	0.268	0.093
	H_0: r≤1	0.374	0.705	0.547
	H_0: r≤2	0.592	0.772	0.740
	time period	1997Q1-2012Q3 based on st. break in trade bal. and backwards recursive estim.		
PT	H_0: r=0	0.043	0.178	0.124
	H_0: r≤1	0.216	0.674	0.288
	H_0: r≤2	0.550	0.574	0.489
	time period	1999Q3-2013Q3 based on st. breaks both in extra bal. and $reer_{EMU-12}$ and backwards recursive estim.		
ES	H_0: r=0	0.045	0.001	0.013
	H_0: r≤1	0.676	0.825	0.763
	H_0: r≤2	0.413	0.812	0.521
	time period	1998Q1-2013Q3 based on backwards recursive estimation		
DK	H_0: r=0	0.012	0.474	0.094
	H_0: r≤1	0.225	0.787	0.197
	H_0: r≤2	0.428	0.646	0.277
	time period	1998Q2-2013Q3 based on backwards recursive estimation		
SE	H_0: r=0	0.021	0.164	0.016
	H_0: r≤1	0.472	0.694	0.177
	H_0: r≤2	0.946	0.694	0.898
	time period	1991Q4-2013Q3 based on st. break in intra bal. and backwards recursive estim.		
UK	H_0: r=0	0.008	0.763	0.550
	H_0: r≤1	0.497	0.937	0.591
	H_0: r≤2	0.488	0.957	0.966
	time period	1994Q1-2013Q3 based on st. break in extra bal. and backwards recursive estim.		

Notes: We report the p-values of rejecting the null hypotheses using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation). r indicates the number of cointegration vectors (i.e. cointegration rank).

3.3. Short-run analysis

Our results on the long-run relations imply that in general there is no error-correction representations for the trade balance variables.[18] Thus, we perform the short-run analysis using VAR models and first differenced series which are stationary. In the short-run analysis we estimate the VAR models for the country-specific sample periods which were derived from the long-run analysis. The Akaike information criterion often suggests only one lag. However, in order to eliminate serial correlation from the residuals, we included four lags (see Table A7).[19] Consequently, in the short-run analysis we estimate the following VAR(4) model:

$$x_t = \nu + A_1 x_{t-1} + \cdots + A_p x_{t-p} + u_t, \quad (1)$$

where $x_t = (\Delta y^*_t, \Delta reer_t, \Delta y_t, \Delta tradebalance_t)'$ is a column vector, A_i are coefficient matrices, ν is a column vector of intercept terms, u_t is an innovation process, and with four lags p equals four.

We use conventional VAR modelling, because it would be difficult to derive identifying restrictions for the effects of intra and extra balances. Lee and Chinn (2006) focused on current account balances and real effective exchange rates and they assumed that the temporary effects (nominal shocks) have no long-run effects on the real exchange rates. Fisher and Huh (2002) questioned such identification restrictions. Actually, it would be difficult to explore the effects of nominal shocks on trade balances using our sample, because all EMU countries face the same monetary policy. Lee and Chinn (2006) claimed that the ordering of variables in the VAR models for this type of analysis is arbitrary in the Choleski factorization. We use the following ordering: foreign GDP per capita, the real effective exchange rate, domestic GDP per capita, and the trade balance. This implies that the real exchange rate shock has a contemporaneous effect on the trade balance, but not vice versa. We also tested an alternative ordering: foreign GDP per capita, domestic GDP per capita, the trade balance, and the real effective exchange rates. Concerning the aggregate trade balances none of our results changed. This robustness is based on the fact that the correlations between the different shocks are typically very low. Taking into account previous empirical studies and our results, it might be questionable to use for example the sign restriction approach.[20] We will present the results on short-run dynamics in Section 4.2.

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18 This inference is based on the lack of cointegration between the variables, and/or the inability to reject the zero restrictions on the trade balance variable, and/or the inability to reject the weak exogeneity of the trade balance variables.

19 Actually this is the maximum number of lags that we can put into our model. On average we have 70 periods, 280 observations and with four lags the number of parameters is 17 (16 lags and a constant).

20 There is no consensus on exchange rate devaluation having a positive effect on exports or net exports (see Section 2.3). The correlation between exports and real exchange rate was actually positive in the EMU countries during the period of 1998-2008 (European Commission (2010b)). See also Bahmani-Oskooee and Ratha (2004).

4. Results

4.1. Long-run trade balance determination

Before estimating the cointegration vectors we impose zero restrictions on the trade balance variables (the aggregate trade balance, the intra balance, and the extra balance) (see Table 4). It turns out that in many cases we cannot reject the restricted model.[21] Only if the zero restriction can be rejected at the 5% significance level, we estimate the cointegration vector.[22]

Table 4. Testing the zero restrictions on the trade balance variables

	Set of partner countries:			
	The whole world	EMU-12 countries	The rest of the world	Time period
FI	0.096	0.002	0.052	1991Q4-2013Q3
FR	0.235	0.000	0.003	1998Q1-2013Q3
DE	0.007	0.450	0.095	1995Q4-2013Q3
GR	0.684		0.032	1999Q1-2013Q3
GR	0.764	0.000	0.705	1994Q1-2007Q4
IT	0.037	0.002	0.001	1994Q1-2013Q3
NL	0.535	0.587	0.232	1997Q1-2013Q3
PT	0.054	0.019[a]	0.365	1999Q3-2013Q3
ES	0.110	0.083	0.000	1998Q1-2013Q3
DK	0.361	0.522	0.080	1998Q2-2013Q3
SE	0.248	0.354	0.373	1991Q4-2013Q3
UK	0.000	0.005[a]	0.231	1994Q1-2013Q3

Notes: The null hypothesis is that the coefficient of the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) is zero in the cointegration vector. We report the p-value of rejecting the null hypothesis (the chi-square test with small sample correction) using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation). [a] The trace test did not confirm any long-run cointegration relation.

The estimated cointegration vectors are presented in Table 5.[23] The long-run relations are normalized on the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance).[24] We expect the following signs of coefficients in Table 5: for the domestic GDP per capita positive, for the

21 When comparing the results in Table A4 to the results in Table 4, it turns out that only in Greece some of the results are sensitive to whether trade balance variables are in logs or not. In addition, the results of the rest of the world system both in the Netherlands and in the UK depend on whether the extra balances are in logs or not.

22 In addition, the rank of cointegration has to be equal to one.

23 Country-specific sample periods were derived from Table 3 (the trace test and the backwards recursive estimation).

24 In order to restore the normal interpretation of effects (trade balance on the left-hand side and the rest of the variables on the right-hand side) the coefficients of domestic output, foreign output and real effective exchange rate should be multiplied by -1.

foreign GDP per capita negative, and for the real effective exchange rate positive. The coefficient of α captures the adjustment of the trade balance variable to the disequilibrium error. We expect that the aggregate trade balance adjusts to the disequilibrium error which implies that the coefficient of α is statistically significant and negative. Red font indicates that the sign of the coefficient is theoretically implausible and the coefficient is statistically significant.

In most cases the signs of coefficients are theoretically plausible. On the other hand, in the UK the coefficients of domestic output and foreign output have theoretically wrong signs.[25] However, these particular results are sensitive to whether the trade balance variables are in logs or not (see Table A5). In Greece both the intra-euro area relation before the euro crisis and the extra balance relation during the EMU period contain several coefficients with theoretically implausible signs. Overall, we observe that there are large differences in the long-run relations across the EU-15 countries.[26]

For a meaningful error-correction model the trade balance variables (the aggregate trade balance, the intra balance, or the extra balance) should not be weakly exogenous (see Table 6). The intra-euro area balance and the extra balance are frequently weakly exogenous and consequently do not adjust to the disequilibrium error. Consequently, we could only apply error-correction representation to 6 out of 35 cases and there is no country where we could perform a comparison between the three systems.[27]

Germany is the largest economy in the euro area and in 2011 its current account surplus surpassed China's surplus. According to our results domestic GDP per capita had no deteriorating effect on Germany's trade balance during the 1995Q4-2013Q3 period. In addition, weak exogeneity of the trade balance is rejected only at the 10% significance level and the coefficient of α is much smaller in absolute value than for example in Italy or in the UK. This implies that in Germany the trade imbalances are relatively persistent.

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25 Also Lee and Chinn (2006) noticed that in the UK the current account dynamics differed from other G7 countries.

26 When comparing the results in Table A5 to the results in Table 5, it turns out that the coefficients of the cointegration vector are not sensitive to whether trade balance variables are in logs or not. The only exceptions are the adjustment of the intra balance to the disequilibrium error in Italy, the coefficient of real effective exchange rate in the rest of the world system in Spain, and the coefficients of domestic output and foreign output in the whole world system in the UK.

27 If the trade balance variables are in logs, the number is 5 out of 34 (see Table A6).

Table 5. Cointegration vectors based on the Johansen-Juselius method

		Set of partner countries:			
	Variables:	The whole world	EMU-12 countries	The rest of the world	Time period:
FI	tradebalance		1.000		1991Q4-
	α		0.035		2013Q3
	y		-0.239		
	y*		0.166		
	reer		-0.749***		
FR	tradebalance		1.000	1.000	1998Q1-
	α		-0.352***	-0.426***	2013Q3
	y		-0.073	0.249***	
	y*		0.036	-0.245***	
	reer		0.356***	0.019***	
DE	tradebalance	1.000			1995Q4-
	α	-0.130**			2013Q3
	y	0.116			
	y*	-1.273***			
	reer	0.199**			
GR	tradebalance			1.000	1999Q1-
	α			-0.084	2013Q3
	y			-0.051**	
	y*			0.566***	
	reer			0.175***	
GR	tradebalance		1.000		1994Q1-
	α		-0.276***		2007Q4
	y		-0.231***		
	y*		-0.186***		
	reer		-0.068*		
IT	tradebalance	1.000	1.000	1.000	1994Q1-
	α	-0.256***	-0.125	-0.260***	2013Q3
	y	0.315***	0.372***	0.245***	
	y*	-0.481***	-0.409***	-0.220***	
	reer	0.292***	0.090***	0.109***	
ES	tradebalance			1.000	1998Q1-
	α			-0.164	2013Q3
	y			0.211***	
	y*			0.051	
	reer			-0.019***	
UK	tradebalance	1.000			1994Q1-
	α	-1.193***			2013Q3
	y	-0.065***			
	y*	0.236***			
	reer	0.017*			

Abbreviations: Adjustment of the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) to the disequilibrium error (α), domestic GDP per capita (y), foreign GDP per capita (y*), real effective exchange rate (reer).
Notes: Only if the zero restriction on the trade balance variables (the aggregate trade balance, the intra balance, or the extra balance) can be rejected at the 5% significance level and the trace test confirms that the cointegration rank is equal to one, the cointegration vector is estimated. The Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation). Red font indicates that the sign of the coefficient is theoretically implausible. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Table 6. Testing the weak exogeneity of the trade balance variables

	Set of partner countries: The whole world	EMU-12 countries	The rest of the world	Time period
FI		0.385		1991Q4-2013Q3
FR		0.000	0.000	1998Q1-2013Q3
DE	0.059			1995Q4-2013Q3
GR			0.550	1999Q1-2013Q3
GR		0.007		1994Q1-2007Q4
IT	0.004	0.209	0.000	1994Q1-2013Q3
ES			0.205	1998Q1-2013Q3
UK	0.000			1994Q1-2013Q3

Notes: Only if the zero restriction on the trade balance variables (the aggregate trade balance, the intra balance, or the extra balance) can be rejected at the 5% significance level and the trace test confirms that the cointegration rank is equal to one, the cointegration vector is estimated. If the null hypothesis cannot be rejected, the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) is weakly exogenous in the cointegration vector. This implies that the trade balance does not adjust to the disequilibrium error. We report the p-value of rejecting the null hypothesis using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation).

4.2. Short-run trade balance determination

We estimated VAR models using the first differenced series which are stationary. Our VAR analysis indicates that the trade balances respond neither to changes in foreign output, changes in the real effective exchange rate, nor to changes in domestic output (see Table 7). However, there are some exceptions such as Spain. In Spain, domestic GDP per capita growth has Granger caused changes in trade balance. Impulse responses of the trade balance, intra balance and extra balance for Spain are shown in Figure 1.[28] The red dotted lines represent the 95% error bands (based on a Monte Carlo integration with 10000 draws). Apparently, domestic GDP per capita has had a deteriorating effect both on the aggregate trade balance and on the extra balance in Spain.

[28] For Finland, Greece and the UK impulse responses of aggregate trade balances are portrayed in Figures A2-A4.

Table 7. Granger causality test of the VAR models

	Null hypothesis (below):			Set of partner countries: The whole world	EMU-12 countries	The rest of the world	Time period:
FI	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	**0.042**	0.494	0.505	1991Q4-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.290	0.799	0.688	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	**0.023**	0.525	0.168	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.000	0.000	0.000	
FR	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.366	0.122	0.257	1998Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.821	0.415	0.471	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.707	0.404	0.777	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.053	0.403	0.003	
DE	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.995	**0.012**	0.401	1995Q4-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.261	0.273	0.126	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.384	0.316	0.062	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.518	0.086	0.005	
GR	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.090	0.333	0.390	1999Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	**0.022**	0.567	0.105	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.285	0.981	**0.040**	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.001	0.336	0.003	
GR	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.310	0.358	0.392	1994Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.332	0.384	0.636	2007Q4
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.705	0.072	0.073	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.002	0.117	0.036	
IT	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.611	0.302	0.205	1994Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.147	0.076	0.276	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.516	0.916	0.102	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.145	0.157	0.162	

Abbreviations: first difference of foreign GDP per capita (Δy*), first difference of real effective exchange rate (Δreer), first difference of domestic GDP per capita (Δy), first difference of trade balance variable (Δtradebal).

Notes: The null hypothesis is that foreign output (or real effective exchange rate, domestic output, or lagged value of trade balance) does not Granger cause the trade balance. We report the p-value of rejecting the null hypothesis. Bold font indicates that the null hypothesis is rejected at the 5% significance level. All models include an intercept term. All variables are measured as period-to-period changes. Akaike information criterion usually suggests only one lag, but we included four lags in all VAR-models.

Table 7. Granger causality test of the VAR models (continues)

	Null hypothesis (below):			Set of partner countries: The whole world	EMU-12 countries	The rest of the world	Time period:
NL	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.276	0.642	0.699	1997Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.354	0.874	0.980	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.818	0.858	0.499	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.001	0.918	0.200	
PT	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.523	0.949	0.150	1999Q3-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.371	0.735	0.436	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.853	0.339	0.234	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.380	0.298	0.037	
ES	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.088	0.495	0.051	1998Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.236	0.527	0.352	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	**0.032**	0.389	**0.011**	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.378	0.146	0.015	
DK	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.315	0.963	0.406	1998Q2-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.911	0.960	0.357	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.170	0.855	0.504	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.325	0.222	0.066	
SE	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.792	0.335	0.565	1991Q4-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.377	**0.008**	0.596	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.533	0.593	0.465	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.001	0.001	0.008	
UK	Δy^*_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	0.351	0.945	0.931	1994Q1-
	$\Delta reer_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.410	0.897	0.293	2013Q3
	Δy_{t-1}	$\not\rightarrow$	$\Delta tradebal_t$	**0.037**	0.903	**0.036**	
	$\Delta tradebal_{t-1}$	$\not\rightarrow$	$\Delta tradebal_t$	0.005	0.545	0.010	

Abbreviations: first difference of foreign GDP per capita (Δy^*), first difference of real effective exchange rate ($\Delta reer$), first difference of domestic GDP per capita (Δy), first difference of trade balance variable ($\Delta tradebal$).

Notes: The null hypothesis is that foreign output (or real effective exchange rate, domestic output, or lagged value of trade balance) does not Granger cause the trade balance. We report the p-value of rejecting the null hypothesis. Bold font indicates that the null hypothesis is rejected at the 5% significance level. All models include an intercept term. All variables are measured as period-to-period changes. Akaike information criterion usually suggests only one lag, but we included four lags in all VAR-models.

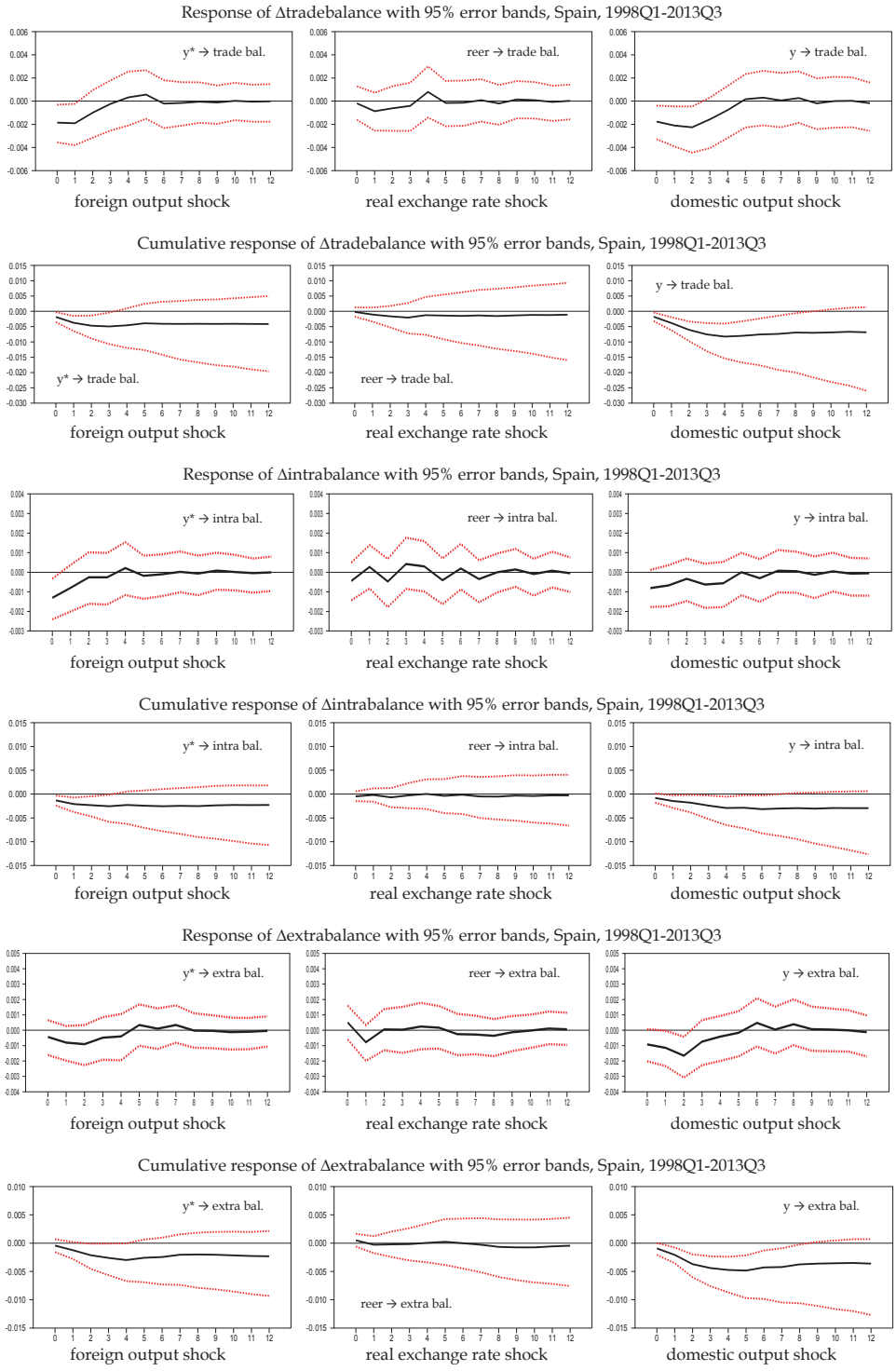

Figure 1. Impulse responses of trade balance, intra balance and extra balance, Spain

5. Concluding remarks

In this paper we analyzed the long-run determinants and the short-run dynamics of trade balance in the EU-15 countries. Consistent with the Macroeconomic Imbalance Procedure scoreboard and the Mundell-Fleming model our set of variables included the trade balance, the real effective exchange rate, domestic GDP per capita, and foreign GDP per capita. In the analysis we decomposed the aggregate trade balance into the intra balance (trade balance vis-à-vis the euro area) and the extra balance (trade balance vis-à-vis the rest of the world). Our two main findings can be summarized as follows. First, despite increased integration, there remain significant differences in the long-run relations between the trade balance, the real effective exchange rate, domestic GDP and the foreign GDP trade balance across the EMU-12 countries. Second, contrary to common knowledge, there is no robust long-run relation between the variables.

More specifically, in most of the countries there is a long-run cointegration relation between the variables, but in many cases the coefficient of the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) is statistically insignificant. The intra-euro area balance and the extra balance are in many cases weakly exogenous and consequently do not adjust to the disequilibrium error. In Germany (1995Q4-2013Q3) domestic GDP per capita had no deteriorating effect on the aggregate trade balance and the aggregate trade balance was nearly weakly exogenous. This implies that the trade surplus of Germany, which is only comparable to China's surplus, is relatively persistent.

Our results on the long-run relations implied that in general there is no error-correction representation. Thus, we performed the short-run analysis using VAR models and the first differenced series. Contrary to standard undergraduate textbook presentations and the Mundell-Fleming model we cannot find robust evidence that the aggregate trade balance could be adjusted by expenditure-switching or expenditure-reducing policies.

In the mass media internal devaluation and austerity policies are usually the only suggested remedies for the external adjustment. This same belief is reflected in the European Commission's Macroeconomic Imbalances Procedure which stresses the importance of price competitiveness. Our results call such a belief into question to a certain degree. We find no strong or clear relationship between the trade balance and price competitiveness in the EU-15 countries. Global supply chains may weaken the relationship between real effective exchange rate and exports. Since we analyzed net exports, our findings are unlikely to be explained solely by the increased importance of global supply chains.

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Appendix: Additional tables and figures

Table A1. Data description

Series	Filtering	Description	Frequency	Source
Δtradebalance	Linear X-11 filter	Δtradebalance is period-to-period change of trade balance (goods net exports). We observe goods net exports (in US dollars) for a reporting-country, trade balance, from DOTS, when World is chosen as the partner-country.	Same as below	Same as below
Δintrabalance	Linear X-11 filter	Δintrabalance is period-to-period change of intra balance, which was calculated as follows: Firstly, we calculated trade balance (in US dollars) excluding services against the euro area (EMU-12 countries) from bilateral balances. Secondly, we took quarterly data on GDPs (in national currencies) and converted these to GDPs (in US dollars) using quarterly averages of daily data on exchange rates between national currencies and US dollar. Thirdly, we calculated trade balances as ratios to GDPs.	Trade balance in US dollars: quarterly data 1960:Q1-2013:Q3; GDPs in national currency: quarterly data 1960:Q1-2013:Q3; Exchange rates: daily data 1.1.1960-9.30.2013 except for Denmark, Sweden and UK quarterly data 1960:Q1-2013:Q3	Trade balance in US dollars: Direction of Trade Statistics (IMF); GDPs in national currency: National sources via Datastream, Eurostat (for Greece), International Financial Statistics (IMF) (for the Netherlands, Portugal, Spain, Denmark and Sweden); Exchange rates: WM/Reuters via Datastream, International Financial Statistics (IMF) (for Denmark, Sweden and UK)
Δextrabalance	Linear X-11 filter	Δextrabalance is period-to-period change of extra balance, which was calculated as follows: Firstly, we calculated trade balance excluding services against the rest of the world by substracting the intra balance (in US dollars) from good net exports (in US dollars); that is extra balance equals trade balance minus intra balance. The second and third step as above.	Same as above	Same as above

Table A1. Data description (continues)

Series	Filtering	Description	Frequency	Source
$\Delta reer_{world}$	Linear X-11 filter and logarithm	$\Delta reer_{world}$ is period-to-period change in CPI-based real effective exchange rate with trade-weights (41 partner countries).	Quarterly averages of monthly data 1970:Q1-2013:Q3	Bruegel
$\Delta reer_{EMU-12}$	Linear X-11 filter and logarithm	$\Delta reer_{EMU-12}$ is period-to-period change in CPI-based real effective exchange rate in which set of partner countries consist of EMU-12 countries with trade-weights.	Quarterly averages of monthly data 1970:Q1-2013:Q3	Zsolt Darvas (Bruegel)
$\Delta reer_{RoW}$	Linear X-11 filter and logarithm	$\Delta reer_{RoW}$ is period-to-period change in CPI-based real effective exchange rate in which set of partner countries consist of 29 non-EMU countries with trade-weights.	Quarterly averages of monthly data 1970:Q1-2013:Q3	Zsolt Darvas (Bruegel)
Δy	Linear X-11 filter and logarithm	GDP per capita period-to-period changes in the home country	Quarterly data on levels 1960:Q1-2013:Q3	International Financial Statistics (IMF), National sources via Datastream (for Austria, Finland and Ireland), Eurostat (pre-2011:Q2 period for Greece)
Δy^*_{world}	Linear X-11 filter and logarithm	GDP per capita period-to-period changes in the world economy.	Quarterly data on growth rates 1969:Q1-2013:Q1	International Financial Statistics (IMF)
Δy^*_{EMU-12}	Linear X-11 filter and logarithm	GDP per capita period-to-period changes in the euro area (EMU-12 countries). The pre-1996:Q1 period: GDP-weighted average of EMU-12 GDP per capita year-to-year changes (different serie for every EMU countries as the reporting country is always excluded); Since then: Eurozone-12 GDP per capita year-to-year changes (same serie for all countries).	Quarterly data on levels 1960:Q1-2013:Q3	The pre-1996:Q1 period: International Financial Statistics (IMF), National sources via Datastream (for Austria, Finland and Ireland), Eurostat (pre-2011:Q2 period for Greece); Since then: Eurostat Eurozone-12
Δy^*_{RoW}	Linear X-11 filter and logarithm	GDP per capita perio-to-period changes in the rest of the the world. Let α be the share of the EMU-12 countries of the world economy, Δy_{world} the growth rate of the world economy, and Δy_{emu12} the growth rate of the EMU-12 countries. Then the following equality holds: $\Delta y_{row}=1/(1-\alpha)\Delta y_{world}+\alpha/(\alpha-1)\Delta y_{EMU-12}$. We applied this formula and used a constant weight, α, which is the sum of Austria, Finland, France, Germany, Greece, Italy, the Netherlands, Portugal and Spain GDPs in 1995 divided by the World GDP in 1995.	Same as above	Data on GDP levels in 1995: World Development Indicators (World Bank). Other series same as above.

Table A2. Results of the unit root tests (trade balance series in logs)

	Finland 1975Q1-2013Q3			France 1971Q1-2013Q3			Germany 1971Q1-2013Q3			Greece 1980Q1-2013Q3			Italy 1980Q1-2013Q3		
Unit root test:	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT
lntradebalance	**I(1)**	**I(1)*****	1991Q2	**I(1)**	**I(1)*****	2004Q2	I(1)	I(0)	2000Q4	**I(1)**	**I(1)*****	2008Q4	**I(1)**	**I(1)*****	1999Q1
Number of I(1) variables	3			2			2			3			3 or 2		
Δlntradebalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
lnintrabalance	**I(1)**	**I(1)*****	**1990Q1*****	**I(1)**	**I(1)*****	1989Q3	**I(1)**	**I(1)****	2007Q2	**I(1)**	**I(1)*****	1993Q2	**I(1)**	**I(1)*****	**1992Q3****
Number of I(1) variables	3			3			3			4			4 or 3		
Δlnintrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
lnextrabalance	**I(1)**	**I(1)*****	1992Q3	I(0)**	I(1)***	2004Q1	I(0)**	I(1)**	1978Q3	**I(1)**	**I(1)****	2008Q4	**I(1)**	**I(1)*****	1999Q1
Number of I(1) variables	4			2			2			2			4		
Δlnextrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		

	Netherlands 77Q1-2013Q3			Portugal 1978Q1-2013Q3			Spain 1971Q1-2013Q3			Denmark 77Q1-2013Q3			Sweden 1980Q1-2013Q3			UK 1971Q1-2013Q3		
Unit root test:	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT	ADF	KPSS	ZIVOT
lntradebalance	I(0)**	I(1)***	1982Q4	**I(1)**	**I(1)*****	1984Q1	**I(1)**	**I(1)*****	1977Q3	**I(1)**	**I(1)*****	1986Q4	**I(1)**	**I(1)*****	2006Q2	I(0)***	I(1)***	**1977Q1****
Number of I(1) variables	2			3			3			2			3			1		
Δlntradebalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		
lnintrabalance	**I(1)**	**I(1)*****	**1986Q1****	**I(1)**	**I(1)*****	1996Q3	**I(1)**	**I(1)*****	1986Q1	**I(1)**	**I(1)*****	1987Q1	**I(1)**	**I(1)*****	**1990Q2*****	**I(1)**	**I(1)*****	1990Q1
Number of I(1) variables	3			3			4			3			3 or 2			3		
Δlnintrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***	I(0)***		I(0)***		
lnextrabalance	**I(1)**	**I(1)*****	1984Q4	**I(1)**	**I(1)*****	**1984Q1****	**I(1)**	**I(1)*****	1977Q3	**I(1)**	**I(1)*****	1983Q1	**I(1)**	**I(1)*****	1993Q2	I(0)***	I(1)***	**1975Q1****
Number of I(1) variables	4			3 or 2			3			3			4			2		
Δlnextrabalance	I(0)***			I(0)***			I(0)***			I(0)***			I(0)***			I(0)***		

Abbreviations: Augmented Dickey Fuller test (ADF), Kwiatkowski-Phillips-Schmidt-Shin test (KPSS), Zivot-Andrews endogenous structural break test (ZIVOT), for others see Table A1.
Notes: All trade balance variables are calculated as (ln exports – ln imports)/ln GDP. In Augmented Dickey Fuller test (with a constant and a trend, lag structure by Bayesian information criterion) the null hypothesis is that the series contains a unit root. In Kwiatkowski-Phillips-Schmidt-Shin test (with trend, four lags) the null hypothesis is that the series is trend stationary. Zivot-Andrews is endogenous structural break test. Bold font indicates that the series contains a unit root. Most of the time series contain a unit root, but all first differences are stationary. Δ denotes period-to-period changes. **, *** denote statistical significance at 5% and 1% levels.

Table A3. Determination of cointegration rank (trace test with small sample correction, trade balance variables in logs)

		Set of partner countries:		
	Null hypothesis:	The whole world	EMU-12 countries	The rest of the world
FI	H_0: r=0	0.030	0.018	0.007
	H_0: r≤1	0.275	0.885	0.106
	H_0: r≤2	0.343	0.976	0.676
	time period	1991Q4-2013Q3 based on st. breaks both in $reer_{EMU-12}$ and intra balance and backwards recursive estim.		
FR	H_0: r=0	0.012	0.059	0.001
	H_0: r≤1	0.180	0.959	0.182
	H_0: r≤2	0.159	0.955	0.156
	time period	1998Q1-2013Q3 based on st. break in $reer_{EMU-12}$ and backwards recursive estim.		
DE	H_0: r=0	0.027	0.000	0.006
	H_0: r≤1	0.122	0.002	0.047
	H_0: r≤2	0.259	0.999	0.377
	time period	1995Q4-2013Q3 based on st. break in $reer_{EMU-12}$ and backwards recursive estim.		
GR	H_0: r=0	0.000		0.000
	H_0: r≤1	0.094		0.021
	H_0: r≤2	0.326		0.098
	time period	1999Q1-2013Q3 based on backwards recursive estimation		
GR	H_0: r=0	0.000	0.004	0.000
	H_0: r≤1	0.809	0.232	0.567
	H_0: r≤2	0.912	0.264	0.765
	time period	1994Q1-2007Q4 based on backwards recursive estim. (starting from 2007Q4)		
IT	H_0: r=0		0.013	0.021
	H_0: r≤1		0.145	0.645
	H_0: r≤2		0.265	0.650
	time period	1994Q1-2013Q3 based on st. breaks both in $reer_{world}$ and $reer_{EMU-12}$ and backwards recursive estim.		
NL	H_0: r=0	0.049	0.370	0.038
	H_0: r≤1	0.226	0.679	0.667
	H_0: r≤2	0.525	0.837	0.664
	time period	1997Q1-2012Q3 based on backwards recursive estimation		
PT	H_0: r=0	0.031	0.110	0.050
	H_0: r≤1	0.197	0.549	0.110
	H_0: r≤2	0.509	0.532	0.564
	time period	1999Q3-2013Q3 based on st. breaks both in extra bal. and $reer_{EMU-12}$ and backwards recursive estim.		
ES	H_0: r=0	0.035	0.003	0.006
	H_0: r≤1	0.755	0.882	0.445
	H_0: r≤2	0.498	0.874	0.309
	time period	1998Q1-2013Q3 based on backwards recursive estimation		
DK	H_0: r=0	0.016	0.487	0.122
	H_0: r≤1	0.275	0.801	0.310
	H_0: r≤2	0.458	0.682	0.394
	time period	1998Q2-2013Q3 based on backwards recursive estimation		
SE	H_0: r=0	0.022	0.162	0.009
	H_0: r≤1	0.497	0.651	0.118
	H_0: r≤2	0.822	0.681	0.816
	time period	1991Q4-2013Q3 based on st. break in intra bal. and backwards recursive estim.		
UK	H_0: r=0	0.002	0.779	0.252
	H_0: r≤1	0.406	0.935	0.524
	H_0: r≤2	0.635	0.954	0.977
	time period	1994Q1-2013Q3 based on st. break in extra bal. and backwards recursive estim.		

Notes: All trade balance variables are calculated as (ln exports – ln imports)/ln GDP. We report the p-values of rejecting the null hypotheses using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation). r indicates the number of cointegration vectors (i.e. cointegration rank). For the EMU-12 system in Greece (1999Q1-2013Q3) we were unable to perform the trace test because the matrix was non-invertible. The same applies to the whole world system of Italy.

Table A4. Testing the zero restrictions on the trade balance variables (trade balance variables in logs)

	Set of partner countries:			
	The whole world	EMU-12 countries	The rest of the world	Time period
FI	0.016	0.004	0.001	1991Q4-2013Q3
FR	0.282	0.000[a]	0.006	1998Q1-2013Q3
DE	0.010	0.136	0.149	1995Q4-2013Q3
GR	0.492		0.162	1999Q1-2013Q3
GR	0.802	0.257	0.195	1994Q1-2007Q4
IT		0.002	0.000	1994Q1-2013Q3
NL	0.138	0.272	0.013	1997Q1-2013Q3
PT	0.065	0.015[a]	0.796	1999Q3-2013Q3
ES	0.061	0.043	0.000	1998Q1-2013Q3
DK	0.112	0.484	0.030[a]	1998Q2-2013Q3
SE	0.227	0.676	0.410	1991Q4-2013Q3
UK	0.000	0.005[a]	0.029[a]	1994Q1-2013Q3

Notes: All trade balance variables are calculated as (ln exports – ln imports)/ln GDP. The null hypothesis is that the coefficient of the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) is zero in the cointegration vector. We report the p-value of rejecting the null hypothesis (the chi-square test with small sample correction) using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation).
[a] The trace test did not confirm a long-run cointegration relation at the 5% significance level.

Table A5. Cointegration vectors based on the Johansen-Juselius method (trade balance variables in logs)

		Set of partner countries:			
	Variables:	The whole world	EMU-12 countries	The rest of the world	Time period:
FI	tradebalance	1.000	1.000	1.000	1991Q4-
	α	-0.075	0.035	-0.273***	2013Q3
	y	-0.112***	-0.126	-0.032**	
	y*	0.477***	-0.016	0.376***	
	reer	-0.134***	-0.630***	-0.077***	
FR	tradebalance			1.000	1998Q1-
	α			-0.261***	2013Q3
	y			0.231***	
	y*			-0.187***	
	reer			0.012**	
DE	tradebalance	1.000			1995Q4-
	α	-0.190***			2013Q3
	y	0.032			
	y*	-0.200***			
	reer	0.029*			
IT	tradebalance		1.000	1.000	1994Q1-
	α		-0.210**	-0.322***	2013Q3
	y		0.254***	0.175***	
	y*		-0.300***	-0.174***	
	reer		0.086***	0.053***	
NL	tradebalance			1.000	1997Q1-
	α			-0.079	2013Q3
	y			-0.060***	
	y*			-0.167***	
	reer			-0.012**	
ES	tradebalance		1.000	1.000	1998Q1-
	α		0.013	-0.153	2013Q3
	y		0.513***	0.173***	
	y*		-0.107*	-0.008	
	reer		-1.684***	-0.002	
UK	tradebalance	1.000			1994Q1-
	α	-1.081***			2013Q3
	y	0.017*			
	y*	0.014			
	reer	-0.004			

Abbreviations: Adjustment of the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) to the disequilibrium error (α), domestic GDP per capita (y), foreign GDP per capita (y*), real effective exchange rate (reer).

Notes: All trade balance variables are calculated as (ln exports – ln imports)/ln GDP. Only if the zero restriction on the trade balance variables (the aggregate trade balance, the intra balance, or the extra balance) can be rejected at the 5% significance level and the trace test confirms that the cointegration rank is equal to one, the cointegration vector is estimated. The Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation). Red font indicates that the sign of the coefficient is theoretically implausible. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Table A6. Testing the weak exogeneity of the trade balance variables (trade balance variables in logs)

	Set of partner countries:			
	The whole world	EMU-12 countries	The rest of the world	Time period
FI	0.406	0.437	0.030	1991Q4-2013Q3
FR			0.005	1998Q1-2013Q3
DE	0.016			1995Q4-2013Q3
IT		0.052	0.000	1994Q1-2013Q3
NL			0.425	1997Q1-2013Q3
ES		0.129	0.236	1998Q1-2013Q3
UK	0.000			1994Q1-2013Q3

Notes: All trade balance variables are calculated as (ln exports – ln imports)/ln GDP. Only if the zero restriction on the trade balance variables (the aggregate trade balance, the intra balance, or the extra balance) can be rejected at the 5% significance level and the trace test confirms that the cointegration rank is equal to one, the cointegration vector is estimated. If the null hypothesis cannot be rejected, the trade balance variable (the aggregate trade balance, the intra balance, or the extra balance) is weakly exogenous in the cointegration vector. This implies that the trade balance does not adjust to the disequilibrium error. We report the p-value of rejecting the null hypothesis using the Johansen-Juselius cointegration method with four lags (linear trends in the variables and in the cointegration relation).

Table A7. Testing serial correlation in the residuals of the VAR(4) models

	Set of partner countries:			
	The whole world	EMU-12 countries	The rest of the world	Time period
FI	0.703	0.925	0.128	1991Q4-2013Q3
FR	0.888	0.157	0.846	1998Q1-2013Q3
DE	0.251	0.587	0.441	1995Q4-2013Q3
GR	0.170	0.096	0.525	1999Q1-2013Q3
GR	0.864	0.749	0.555	1994Q1-2007Q4
IT	0.900	0.062	0.875	1994Q1-2013Q3
NL	0.825	0.686	0.796	1997Q1-2013Q3
PT	0.891	0.739	0.067	1999Q3-2013Q3
ES	0.473	0.541	0.248	1998Q1-2013Q3
DK	0.211	0.168	0.255	1998Q2-2013Q3
SE	0.606	0.620	0.465	1991Q4-2013Q3
UK	0.803	0.795	0.686	1994Q1-2013Q3

Notes: In the Ljung-Box test the null hypothesis is that there is no serial correlation in the residuals. We report the p-value of rejecting the null hypothesis (for autocorrelations up to 12).

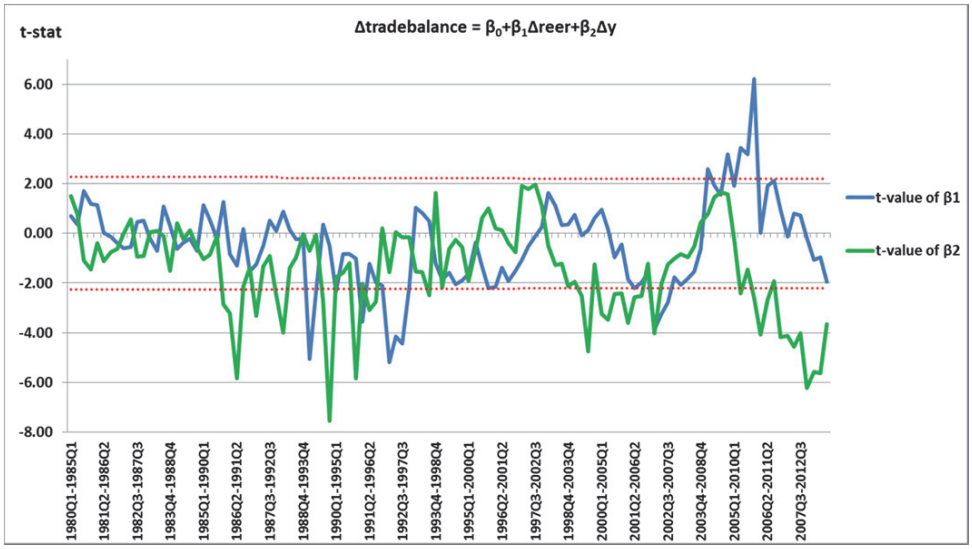

Figure A1. Cross-section regressions for the EU-15 countries with 5-year rolling averages (t-stats)

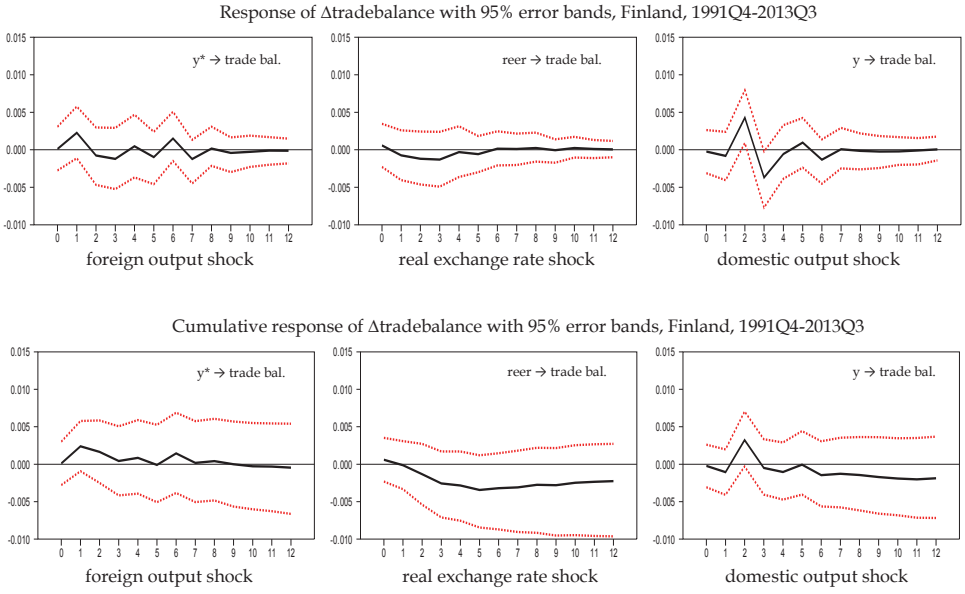

Figure A2. Impulse responses of trade balance, Finland

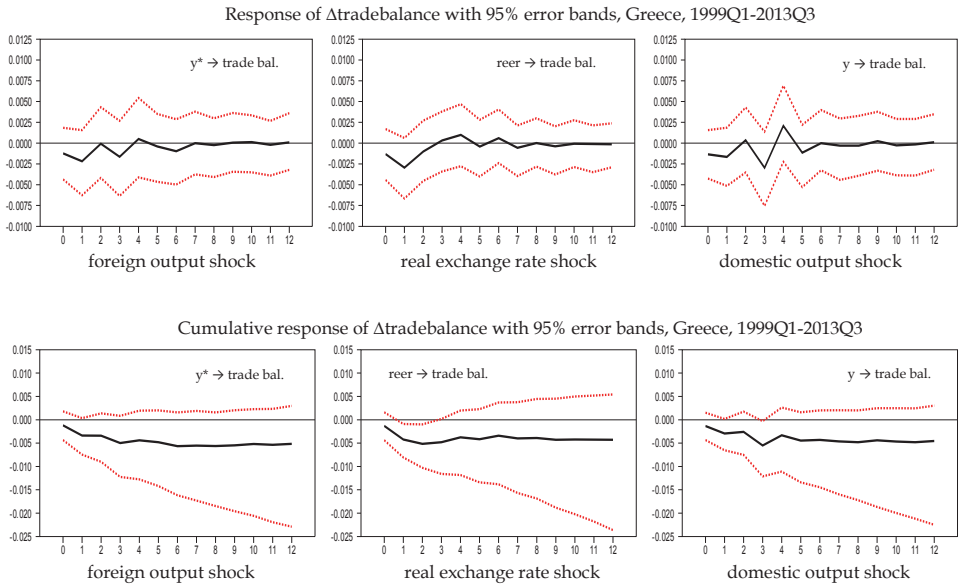

Figure A3. Impulse responses of trade balance, Greece

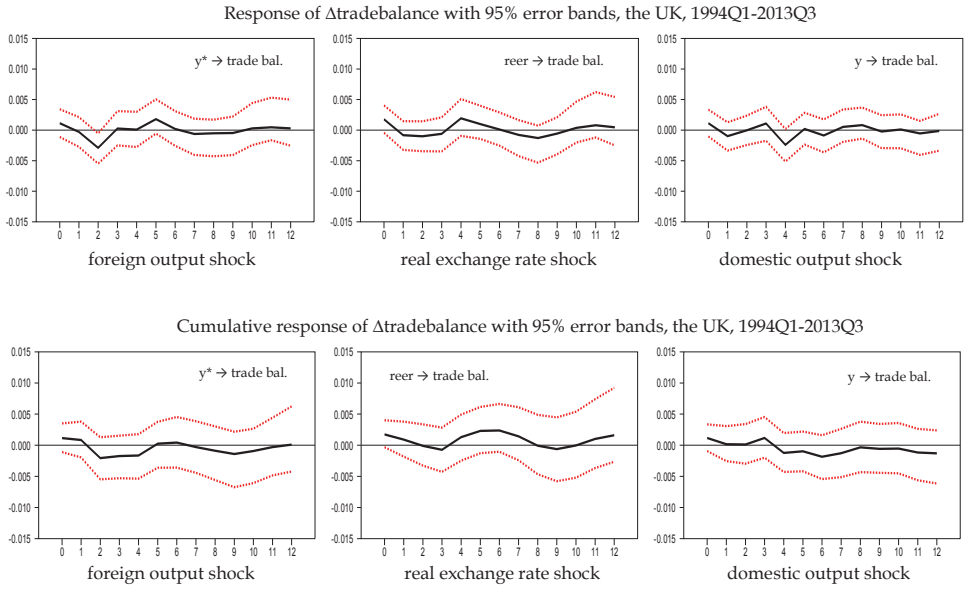

Figure A4. Impulse responses of trade balance, the UK

SUMMARY IN FINNISH (YHTEENVETO)

Esseitä vaihtotase-epätasapainoista

Vaihtotase kuvaa kansantalouden ulkomaista nettolainanottoa. Maailmanlaajuiset ja euroalueen sisäiset vaihtotase-epätasapainot kasvoivat ennennäkemättömän suuriksi vuonna 2008 puhjenneen finanssikriisin aattona. Ne olivatkin keskeinen makrotaloudellinen tekijä talouskriisien taustalla. Ilmiönä vaihtotase-epätasapainot on varsin monimutkainen. Edellä mainituista syistä johtuen vaihtotase-epätasapainot ovat olleet korkealla sekä taloustieteen tutkijoiden että talouspolitiikan tekijöiden asialistalla. Tämä väitöskirja keskittyy tarkastelemaan vaihtotaseen tasapainoon ja talouden ulkoiseen sopeutumiseen vaikuttavia tekijöitä. Väitöskirja koostuu johdantoluvusta ja neljästä empiirisestä tutkimuksesta. Väitöskirja tuo ilmi, että institutionaalisilla tekijöillä on vaikutusta talouden ulkoiseen tasapainoon ja myös siihen kuinka nopeasti talous ulkoiseen tasapainotilaan hakeutuu.

Ensimmäisessä tutkimuksessa tarkastellaan syvien tekijöiden kuten uskonnon ja kulttuurin vaikutusta vaihtotaseen tasapainoon. Tulokset osoittavat, miten aiemmin huomioitujen taloudellisten tekijöiden lisäksi myös uskonto ja kulttuuri vaikuttavat talouden ulkoiseen tasapainoon. Roomalais-katolisten väestöosuudella on negatiivinen vaikutus vaihtotaseen tasapainoon. Löydös saa tukea kyselytutkimuksista, jotka osoittavat, että roomalais-katoliset eivät pidä säästäväisyyttä yhtä tärkeänä arvona kuin muut uskonnolliset ryhmät. Makrotasolla katolilaisenemmistöisten maiden kulttuurinen taipumus epävarmuuden välttämiseen vaikuttaisi selittävän kyseistä löydöstä.

Toisessa tutkimuksessa tarkastellaan vaihtotaseen sopeutumisnopeuteen vaikuttaviin tekijöitä. Talouden ulkoinen sopeutuminen on sitä hitaampaa mitä keskitetympää palkkaneuvottelukoordinaatio on. Hajautettu yrityskohtainen palkkakoordinaatio nopeuttaa vaihtotaseen sopeutumista. Seuraavat näkökohdat antavat epäsuoraa tukea löydökselle: vientisektorin shokit ovat paljolti yrityskohtaisia, yrityskohtaisten shokkien ja työmarkkinoiden joustavuuden välillä on yhteys, hajautettu yrityskohtainen palkkaneuvottelu mahdollistaa sen, että palkat reagoivat yrityskohtaisiin shokkeihin. Lisäksi tutkimuksessa havaitaan, että palkkakoordinaatiolla ja kiinteällä valuuttakurssilla on negatiivinen yhteisvaikutus siten, että palkkakoordinaation vaikutus ulkoiseen sopeutumisnopeuteen on sitä suurempi mitä joustavampi valuuttakurssi on. Yrityskohtainen palkkakoordinaatio ja joustava valuuttakurssi eivät siis vaikuttaisi olevan vaihtoehtoisia sopeutumiskanavia.

Kolmannessa ja neljännessä tutkimuksessa kauppatase jaetaan kahteen eri komponenttiin siten, että jokaisen EU 15 -maan nettovientiä euroalueelle ja muuhun maailmaan tarkastellaan erikseen. Tämä jaottelu on yksi tapa, vaikkakaan ei ongelmaton, tarkastella yhteisvaluutta euron vaikutusta rahaliiton jäsenmaiden ulkoiseen tasapainoon. Kolmannessa tutkimuksessa osoitetaan, että vastoin aiempaa käsitystä euroalueen sisäiset kauppatase-epätasapainot eivät tulleet euroon siirtymisen myötä aiempaa herkemmiksi maiden välisille elin-

tasoeroille. Myös kulttuuritekijöillä näyttäisi olevan merkitystä, sillä yksilökeskeisyydellä on positiivinen vaikutus euroalueen sisäiseen kauppataseen tasapainoon. Tulos saa epäsuoraa tukea siitä, että individualismin on osoitettu olevan yhteydessä talouden kykyyn innovoida. Neljännessä tutkimuksessa havaitaan, miten syventyneestä yhdentymiskehityksestä huolimatta kauppataseen, reaalisen valuuttakurssin, kotimaisen tuotannon ja ulkomaisen tuotannon välinen relaatio vaihtelee varsin paljon EMU 12 -maiden kesken. Lisäksi tutkimus antaa viitteitä siitä, että nettoviennin ja hintakilpailukyvyn välillä ei ole kovinkaan selkeää yhteyttä.