Charles University in Prague

Faculty of Social Sciences
Institute of Economic Studies

RIGOROUS THESIS

Current Accounts in Monetary Union: The Role of Euro, Fiscal Policy and Financial System

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Declaration of Authorship

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Prague, 9th January 2015

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Abstract

This thesis examines the implications of euro for current account balances of countries using it. First, we summarize the main theoretical and empirical findings about determinants of current account deficits and possible implications of monetary union. Second, an empirical analysis of possible effects of single currency on current account is presented. We employ time-specific fixed effect estimator, corrected for possible endogeneity between fiscal policy stance and current account deficits. Our results support hypothesis of certain impact on current account balances as such. We also document positive effect of single currency on gross saving and investment rates. Our regression indicates that the role of fiscal balance and financial sector increased with introduction of single currency therefore implying less Ricardian behavior of private sector in eurozone. We further examined eventual break in the relationship between fiscal and current account balances suggesting that eurozone economies tend to become less Ricardian.

Abstrakt

Táto diplomová práca sa zaoberá dôsledkami eura na bežné účty krajín, ktoré ho používajú. Najskôr sumarizuje implikácie teoretických modelov a výsledky empirických štúdii venovaných problematike bežných účtov a možných dopadov menovej únie na tieto vzťahy. V druhej časti prezentujeme výsledky kvantitatívnej analýzy zameranej na možné štrukturálne zmeny spôsobené spoločnou menou. Pri regresii bol použitý panelový odhad s fixnými, časovo-špecifickými efektmi. Na základe našich výsledkov nemôžeme definitívne potvrdiť hypotézu postulujúcu vplyv eura na správanie bežných účtov ako takých, ale môžeme potvrdiť jeho vplyv na miery úspor a investícii. Navyše sme skúmali možnosť zmeny vzťahu medzi fiškálnymi deficitmi a deficitmi bežných účtov, ktoré by mohli byť pripísané spoločnej mene. V tomto prípade sme našli dôkaz zvýšenej citlivosti bežných účtov na vývoj fiškálnych ukazateľov a teda zníženej miery rikardiánskej odozvy súkromného sektora. Navyše sme potvrdili úlohu finančného sektora na balancie bežného účtu.

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Charakteristika tématu a jeho dosavadní zpracování žadatelem (rozsah do 1000 znaků): V rámci diplomovej práce som sa zaoberal vzťahom eura a vývoja stavu bežných účtov krajín, ktoré ho používajú. Na základe teoretických modelov by spoločná mena mala skôr posilňovať vzýjomné bilancie založené na strednedobom stave a výkone ekonomiky ako byť jendou z príčin týchto bilancií. Môj empirický výzkum ale jednoznačne nepotvrdil ani jeden z týchto efektov. V rámci práce som ale skúmal aj fiškálnu politiku ako jeden z hlavných determinantov bilancií bežných účtov. V tomto prípade kvantitatívny výzkum odhadil zmenu v správaní ekonomík v reakcii na fiškálne deficity, ktorá je spojená s členstvom v menovej únii.	
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> Vymezení podkladového materiálu (např. analyzované tituly a období, za které budou analyzovány) a metody (techniky) jeho zpracování:
>
> Budem používať makroekonomické dáta prístupné v databázach AMECO, Eurostat, OECD a IMF. Časové rozpätie vzorku bude siahať od roku 1974 do 2009.
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> Základní literatúra (nejméně 10 nejdůležitějších titulů k tématu a metdě jeho zpracování; u všech titulů je nutné uvést stručnou anotaci na 2-5 řadků):

1. Belke, A. & Ch. Dreger (2011): "Current Account Imbalances in the Euro Area: Catching Up or Competitiveness?." *Deutsches Insitut für Wirtschaftsordnung Discussion Paper 1106*, DIW. Research, Inc. - Autori sa venujú vzájomnej divergencii bilancií bežných účtov v krajinách eurozóny. Skúmajú, či je vývoj v deficitných krajinách daný medzičasovým vyhladzovaním spotreby ako predikuje intertemporálny prístup k bežným účtom alebo je skôr dôsledkom straty konkurencieschopnosti zvýraznenou nemožnosťou korekcií pomocou výmenných kurzov. Ako hlavnú príčinu divergencie identifikujú stratu konkurencieschopnosti.

2. Beetsma, R., M. Guiliodori & F. Klaassen (2008): "Current Account Imbalances in the Euro Area: Catching up or Competitiveness." *Ruhr Economic Papers nr. 241*, Das Rheinish-Westfälische Institut f ur Wirtschaftsordnung. - pomocu VAR modelu skúmajú efekt fiškálnej expanzie na HDP, export a import v EU.

3. Blanchard, O. & F. Giavazzi (2002): "Current Account Deficits in the Euro Area: The End of Feldstein-Horioka Puzzle?." *Brookings Paper on Economic Activity* **(2)**. - Skúajú efekt spoločnej meny na bežné účty Grécka a Portugalska. Tvrdia, že deficity sú znakom intertemporálnej substitúcie a sami o sebe nie sú dôvodom na obavy. Navyše spozorovali zníženie korelácie úspor a investícií v týchto ekonomikách.

4. Decressin, J. & E. Stavrev (2009): "Current Accounts in Currency Union." *IMF Working Paper 09/127* International Monetary Fund. - Publikácia ukazuje, že divergencia bilancií bežných účtov je v skutočnosti menšia relatívne ku krajinám používajúcim flexibilné menové režimy.

5. Gruber, J. W. & S. B. Kamin (2005): "Explaining the Global Pattern of Current Account Imbalances." *International Finance Discussion Papers 846* Board of Governors of the Federal System. - Autori modelujú vývoj bežných učtov pomocou determinantov plynúcich z intertemporálneho prístupu. Model vysvetľuje skutočné dáta lepšie v prípade, ak je do regresie zahrnutá aj premenná zachytávajúca finančné krízy.

6. JAUMOTTE, F. & P. SODSRIWIBOON (2011): "Current Account Imbalances in the Southern Euro Area." *IMF Working Paper 10/139* International Monetary Fund. - Táto publikácia skúma príčiny a následky a potencionálne prostriedky na zníženie deficitov v krajinách južnej periférie eurozóny.

7. NICKEL, C. & I. VANSTEENKISTE (2008): *"Fiscal Policies, the Current Account and Ricardian Equivalence." ECB Working Paper 935* European Central Bank. - Skúmajú ako sa mení rikardiánska odozva súkromného sektora s rastúcou hodnotou verejného dlhu.

8. RICCIUTTI, R. (2003): "Assessing Ricardian Equivalence." *Journal of economi suveys 17(1)*. - Ponúka prehľad ekonomického výzkumu zaoberajúceho sa rikardiánskou rovnosťou.

9. RÖHN, O. (2010): "Evidence on the Private Saving Offset and Ricardian Equivalence.." *OECD Economics Department Working Paper 762*, OECD. - Odhaduje vyváženie deficitnej fiškálnej expanzie súkromnými úsporami na 40 %. Ako najúčinnejší nástroj navrhuje verejné investície kde je vyváženie najmenšie.

10. SCHMITZ, B. & J. VON HAGEN (2011): "Current Account Imbalances and Financial Integration in the Euro Area." *Journal of International Money and Finance 30(8)*. - Autori rozdeľujú deficity krajín eurozóny na bilancie s eurozónou a s ostatným svetom. V rámci eurozóny ukazujú, že kapitál tečie z rozvinutých do rozvíjajúcich sa krajín.

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Autor, datum

Chapter 1

Introduction

This rigorous thesis is an elaboration of diploma thesis defended at the Institute of Economic Studies (Charles University in Prague) in June 2013. The text have been amended according to suggestions of diploma thesis opponents. Specifically, we utilize the most recent literature and interpret our findings with respect to it. The role of financial system has been analyzed in greater detail. Moreover, the text has been restructured, supplemented and various typing mistakes have been eliminated.

Modified version of diploma thesis has been published as IES Working Paper 27/2014. This paper has been added to the appendix.

The thesis discusses the problem of current account balances in monetary union gaining on importance in the last years since an evidence of increasing dispersion amongst eurozone members was observed. It further deals with the appropriateness of euro for all countries within the eurozone when asymmetric macroeconomic effects appear. The debate which has been revived by the Great Recession surrounds the current account deficits and long-term shifts in competitiveness in the monetary union. Strikingly, it is not clear whether an improvement in macroeconomic policies could make the eurozone more resistant to asymmetric shocks. Our thesis looks for answers to these questions. The basic question is whether the euro itself can be blamed for widening current account imbalances or there are other important determinants along with the single currency. In particular, we investigate the role of fiscal policy in determination of current account balances and possible changes to this relationship that might have occurred as a consequence of single currency adoption.

Answering this question seems to be essential for the debate as it could bring insights into the nature of the problem the eurozone is facing. In fact, if the euro currency as such had been responsible for larger imbalances (particularly deficits), it would be rather difficult to ensure the continuation of euro in the current eurozone as a whole and for the countries with the largest deficits it might be desirable to leave the eurozone and to adjust via depreciation of their currencies. If on the other hand there had been other important determinants of current account imbalances then single currency might be sustainable in all current eurozone members and the countries with larger current account imbalances should focus on improving the economic policies and competitiveness. Traditionally, fiscal balance is considered as one of the key determinants of current account balances, whose role might be affected by single currency environment. Its importance increases on monetary union because (individual) monetary policy is no longer available. This effect is further enhanced by absence of exchange rate whose movements usually impose certain constraints on level of indebtedness (and elimination of country risk premium that was observed after launch of euro as well).

Interestingly, the perception of current account (CA) deficits evolved dramatically over time and originally, larger current account deficits in the EU periphery were supposed to signal positive changes in competitiveness of those countries in the future. The arguments were based on inter-temporal approach to current accounts stating that deficits in less developed countries may be seen as a sign of consumption smoothing alleviated by increasing international goods and capital flows (the Lawson Doctrine). Blanchard & Giavazzi (2002) provide evidence from early years of eurozone confirming a view that current account deficits could be one of the benefits of monetary union.

On the other hand, exchange rate is a tool enabling (certain type of) automatic rebalancing of labor productivity differences as well as cushion for unexpected shocks hitting the economy. Its absence can be compensated by other measures (such as internal deflation); however they are more painful and difficult to design. Empirical research targeting interplay of current account and real exchange rates comprises for example Belke & Dreger (2011), claiming that current account deficits in eurozone are better explained by real exchange rate changes than by inter-temporal consumption smoothing. Another example is

Arghyrou & Chortareas (2008) confirming the role of real exchange rate in CA dynamics in Europe. Moreover, nominal exchange rate volatility is an indicator of international capital market's trust and can be reflected in the costs of borrowing therefore imposing certain borrowing constraint on the economy. Abolition of nominal exchange rate can thus lead to overly dispersed current account positions and pose a threat.

In this paper, we address role of the euro adoption in the emergence of large current account deficits in the South and surpluses in the North (in particular in Germany) prior the Great Recession empirically. We examine current account balances of EU members in order to estimate the effect of euro on them within context of other eventually relevant determinants with focus on longer-term dynamics. Determinants stem from the theory of inter-temporal approach, which determines the set of variables, such as national productivity or demographic structure of population whose interaction is responsible for evolution of current account balances. These determinants have been repeatedly tested and found significant (see for example Chinn & Prasad (2000) as the early attempt that deals with this issue or Barnes *et al.* (2010) for more recent work). We then add dummy variables to control for the effect of eurozone membership.

This approach helps us to eliminate other effects and target solely the effect of euro and allows us to capture eventual heterogeneity of responses of different types of the EU economies. If we find that the responses differ across groups of economies we can confirm significant role of euro in built-up of current account deficits in a group of south countries and surpluses in the core EU countries. However, the opposite results would lead to rejection of such hypothesis and shield euro from being blamed for (unsustainable) current account dynamics in the last years.

Our approach is somewhat comparable to the analysis by Jaumotte & Sodsriwiboon (2010), who investigated determinants of current account imbalances on global sample with special treatment on eurozone members. Their results confirm negative effect of euro on current account balances in eurozone vis a vis the global sample without significant difference in coefficient estimates for the southern periphery and core countries.

Furthermore, we focus explicitly on the interplay between fiscal policy and

current account deficits after the euro adoption. The importance of fiscal policy stance in the dynamics of current accounts increases rapidly in monetary union and so far, no consensus about the link between fiscal policy and current account balances emerged. Since there is certain evidence, e.g. Beetsma *et al.* (2008), suggesting that twin deficit hypothesis holds in the European Union, confirmation of this fact might lead to enhancement of economic policies so that they can properly target the problem of CA deficits (or take into consideration side effects on current accounts when designing measures oriented towards other goals). As far as we know, there is no other paper examining the effect of single currency on relationship of fiscal and current accounts.

An alternative hypothesis often forwarded in most recent papers stresses the role of financial system (Constâncio 2014). Opposite to the view that the crisis reflects fiscal indiscipline, shared mainly by economists and policy makers from Germany, this approach insists that the core problem was excessive lending not limited to public sector but available also for private players. We therefore include private credit to GDP ratio to our regression to capture the effect of private indebtedness.

We employ time-specific fixed effect estimator with robust standard errors. Static model was chosen due to danger of misleading estimates based on assumption of their homogeneity which is present in dynamic models (Pesaran & Smith 1995). Instead, 3-years non-overlapping averages were used to overcome problems with time dependencies in CA balances. This approach has been widely used in quantitative research regarding medium- (and long-) term determinants of CA balances (Ca' Zorzi *et al.* 2009). To investigate the effect of euro on current account deficits, we introduce a set of dummy variables for membership in eurozone into regressions of current account determinants. Analysis is further extended to national saving and investment rates. This extension allows us to better understand the channels through which single currency affects current account paths and derive conclusions for proper economic policy.

The dataset comprises data from years 1977- 2012. Observations from past periods allow us to capture patterns of current account dynamics of EU members irrespective on their membership in eurozone. Since we focus on the period of built-up of CA imbalances, our baseline estimation is performed on the sample ending in 2009. The period after 2009 is characterized by unwind-

ing balances and exceptional policy measures such as intra-European fiscal transfers, increasing TARGET imbalances, restrictive fiscal and unprecedented expansionary monetary policy, therefore not a part of our main analysis.

Our results show that certain negative effect of euro on current account was found in *south* countries in most of the specifications. Negative euro's impact was found for all the country subgroups, however estimates were significant only for the South. Additional regressions on saving and investment ratios confirmed important role of euro that was not captured by baseline regression as these effects are cancelled out by construction of current account statistics. They are of the same direction and similar magnitude for all the subgroups as well. Regarding the role of fiscal policy on CA balances, we provide an evidence of higher sensitivity of current account balances to fiscal policy stance after adoption of euro pointing to the importance of twin deficits nature of imbalances in the eurozone. Among the set of other determinants of CA imbalances the relative income and availability of credit to private sector were most significant suggesting that the built-up of imbalances in countries with relatively lower income would not have been possible without large financial market integration and capital inflows. In this respect, our results support the hypotheses that excessive lending belongs to the main causes of current account imbalances in the EU and that the risk of excessive lending in some countries of the eurozone should be addressed by the regulatory framework and macro-prudential policy. Even though the euro adoption seems to have the same, negative effect in all groups of countries, only in case of the southern periphery the effect is significant.

The thesis is structured as follows: chapter 2 presents a review of theoretical and empirical literature. We start with critical evaluation of the inter-temporal approach to current account balances that appeared in 1980s and introduced new way of looking at external balances of national states. Then, the empirical literature on determinants of current account deficits as well as role of the government is summarized. Chapter 3 examines theoretical implications derived for single currency area. Chapter 4 follows with description of methodology and data used and Chapter 5 presents the results. In Chapter 6, number of sensitivity tests are presented. Finally, conclusion concludes.

Modified version of diploma thesis has been published as IES Working Pa-

per 27/2014. This paper has been added to the Appendix.

Chapter 2

Theoretical Perspectives on Determinants of Current Account Deficits

2.1 Historical Views

We say that an economy is in external equilibrium, when it's income from international transactions equals the amount it spends abroad. The concept of equilibrium is however rather theoretical in the field of international economics, as such situations arise extremely rarely in reality and are usually more of a consequence of an accident than the work of underlying economic forces moving towards balanced external position[1]. Current account (CA) is a statistics recording the flow of international payments over a period and therefore a measure of a country's position towards the rest of the world for this period. It is given by equation

$$CA_t = NX_t + rB_t = X_t - M_t + rB_t \tag{2.1}$$

Or, alternatively

$$CA_t = S_t^P + S_t^G - I_t. \tag{2.2}$$

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[1]these forces comprise actions taken by government or central bank aimed at targeting external balances as well as drivers inherent to economic system such as international interest rates, business cycles and others. The problem is further complicated by latest theory suggesting that balanced current account is not always equilibrium. In what follows we refer to equilibrium as the state where CA balance = 0

where $NX_t = X_t - M_t$ represents net export (exports of a country for a given time period minus its imports for that period) and rB_t are the returns of net foreign asset position. S_t^P and S_t^G denote private and public savings (respectively). Finally, I_t stands for investment.

Since the times of first classical economists, there has been a controversy in the view on current account balances. Mercantilist trade theory considered current account surpluses to be the main source of country's wealth and explicitly advised the policymakers measures forcing this balance into surplus. On the other hand, there was famous Hume's mechanism showing that under some conditions external balances can be corrected automatically, hence of being of no concern for policymakers. Neither throughout the last century was the consensus found. During the discussion, comprehensively summarized for example in Obstlfeld & Rogoff (1995) the prevailing opinion changed several times. Until the late 1970s, the approach focusing on net export was dominant. The attention was paid to eq. (2.1) as the most important determinant of external balance. This view stood behind the period of elasticities approach. The analysis held the determinants of international expenditures and incomes fixed and focused on the price elasticities of supply and demand, which were considered to be the driving forces of international trade flows. Natural consequence of such approach was the era of "elasticities pessimism" , when the current account deficit was seen as negative phenomenon *per se* (Edwards 2002). Hence the international policy debates concentrated on the effects of devaluations and preventing the rise of beggar-thy-neighbor policies.

Later, inter-temporal dimension of current account based on pioneering work by Sachs *et al.* (1981) and Obstfeld & Rogoff (1994) amongst others and represented by eq. (2.2), gained on importance. The development of current account is seen as a consequence of choices of agents rationalizing their consumption (or savings) and investment due to expected lifetime income (expected net present value of investment, respectively) and therefore cannot be considered harmful without further examination of the causes. In fact, it can be one of the gains from international trade. Given some conditions, it allows the current account deficit to enhance the welfare both in deficit and surplus country because it firstly enables the consumers to smooth consumption over time according to their preferences and secondly, by equalizing the marginal product of capital internationally, provides more efficient allocation of resources. Eco-

nomic policy approach praising this view, letting CA balances to be of no concern for policymakers was popular in the 1980s. It was called Lawson Doctrine according to Nigel Lawson, Chancellor of the Exchequer. Following subsections summarize further theoretical links and overview of empirical literature verifying validity of conclusions derived from principles advocating pareto-optimality of uncontrolled CA paths.

2.1.1   Investment-driven Balances

Under the assumptions of perfect international capital market and decreasing marginal productivity it is rational for an investor to lend to a country with lower stock of capital (as lower stock of capital indicates higher marginal productivity). This inflow of long term capital must be balanced by deficits in current account, however the investment is likely to produce sufficient income to pay for it. Hence, such deficits should not be a case of concern[2]. According to the theory, we should witness the flow of sources from highly capital endowed economies to the less developed ones.

This implication has been empirically tested. There is a large pile of quantitative literature basically refuting the theorem on global scale. Firstly, there is a problem of high correlation of domestic savings and investment firstly described by Feldstein & Horioka (1980). Since publication of their original article, the regression was re-estimated and re-interpreted many times, but the correlation is persistent throughout different countries, time spans and specifications. Extensive survey of literature dealing with Feldstein-Horioka puzzle and offering explanations of this problem is provided by Coakley *et al.* (1998). On the other hand, the nexus between international capital flows and CA balances was verified by Faruqee & Lee (2009), who explain growing dispersion in CA balances by financial globalization. However capital flows seem to move "uphill", it means towards highly capital endowed countries. This fact was first noticed by Lucas (1990) who also offered several explanations of the paradox. Uphill-oriented pattern did not change even with progressing globalization and financial integration[3]. However, as will be described later, situation in eurozone

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[2]Giavazzi & Spaventa (2010) develop a model showing that in case when investment is oriented towards non-tradable sector, inter-temporal budget constraint might not hold. In this case, there would arise problems with sustainability of current account deficits.

[3]actually, it became worse as claimed by Prasad *et al.* (2006)

which is of primary object in our thesis is an exception to global trends in this field.

2.1.2   Consumption-driven Balances

This theory assumes households (which are individual decision makers in the case of consumption) to have perfect foresight and complete information about their economic environment. They want to smooth consumption over time for which they use borrowing and lending. Since they are assumed to live in an open economy, additional funds may flow to or originate abroad. Hence factors affecting their expected income and length of life aggregated over the whole nation are those affecting CA balance of a country as well. CA imbalances are thus instrument allowing national states to exploit the gains of international trade.

In euro area countries, consumption smoothing is said to cause around 75% of CA balance dispersion (Ca' Zorzi & Rubaszek 2008). Moreover, regressions on global set of countries designed to reveal medium-term determinants of external balances confirmed the role of consumption-smoothing factors in real economies (this research is extensively discussed in section 2.3).

2.2   Drawbacks of inter-temporal theory

Lawson Doctrine was challenged after several crises in developing countries in the 1990s. Eventual positive effects of CA imbalances *per se* were not refuted, however potential hidden costs and negative side effects of running external deficits were suddenly revealed. They were caused by existence of several distortions and externalities which could cause harmful imbalances through misallocation of global capital and increased national vulnerabilities (Barnes 2010). The approach (so-called prudential view) stressing such hindrances and concerning the sustainability of external positions was advocated mostly by IMF. Reisen (1998) summarizes the most important arguments for government intervention. Moreover, Blanchard (2007) develops a simple model of two-period economy with leisure, tradable and non-tradable goods. He shows how capital market imperfections may lead to suboptimal current account paths imposing

additional cost either on fiscal balance or on economy as a whole. Such distortions open space for discussion about government interventions, because in this setting, properly designed economic policy may improve the outcome for all the players. The most important arguments for CA management are listed below.

Wage price rigidities

Blanchard (2007) compares the outcomes of his model with the real development in southern members of european Union. Real economies experience substantially higher current account deficits than suggested by theory. He explains different outcomes by downward wage rigidities and as well as price rigidities in non-tradable sector. The empirical research in recent years[4] have shown significant downward wage rigidities, especially in european Union. These rigidities prevent consumers (and workers) to allocate their consumption according to inter-temporal preferences and may lead to excessive current account deficits.

Hindrances of export recovery

Long-term CA deficits are expected to depreciate the currency of deficit country and thus making it more competitive in the global markets. However stabilizing function can be impeded by financial constraints faced by export-oriented firms after (sufficiently) long periods of economic downturn. This argument was formed by Caballero & Lorenzoni (2007). Increasing financial integration might have softened these constraints (Faruqee & Lee 2009), however it is not likely to eliminate them at all.

Another argument, based on Krugman (1987), can be built by allowing learning-by-doing to enhance knowledge in the production function. Country that had to face a short-term exodus of export-oriented industry may thus lose its comparative advantage forever.

Sudden stops of capital inflow

Post Bretton Woods financial world order offered more capital to emerging economies, however with the risk of sudden stops of funding. Theoretically, it is a natural consequence of budget constraint, therefore nothing to be afraid of, however in reality sudden stops can be caused by a shifts on international capital markets rather than changes in an economy's fundamentals leaving it

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[4]Knoppik & Beissinger (2009), Dickens *et al.* (2007), Behr & Pötter (2010) and Holden & Wulfsberg (2007)

without necessary funding practically overnight (especially in the case of short-term financing). Furthermore, they bring costs in the form of loss of GDP growth[5]. Calvo & Reinhart (2008) identify 2 main channels through which sudden stops affect economy. They defined current account deficit as aggregate demand minus GNP. Therefore a sudden drop in current account deficit must lead to decline in AD (the case of sharp increase of GNP is neglected here). Following their reasoning the transmission channels are:

- Keynesian - due to downward inflexible prices and/or wages a fall in AD causes fall of output and employment.

- Fisherian - fall in AD causes fall of prices of non-tradable goods (price of tradable is given on the global market). Such change in the price of non-tradables increases the number of nonperforming loans. The economy may then end reducing investment or in banking crisis.

Public sector responsibility for private players

Sudden stops of short-term capital may bring additional costs to those addressed in the previous paragraph. The case is the balance-of-payments crisis in the financial and/or banking sector. For several reasons (Mishkin (2006) mentions the fear of economy-wide consequences, personal rewards and need of direct credit) the politicians are often ready to bail out the most important institutions of financial system, especially those that can be marked "too-big-to fail". Honohan & Klingebiel (2002) found that accommodating policies tend to add significantly and sizably to fiscal costs[6]. These costs may be seen as a transfer from taxpayers to stakeholders therefore only deterioration of fiscal balance rather than the costs for economy as a whole but they are a problematic issue because the act of turning private debt into public one or providing funds for deposit insurance restrains them to be used more efficiently. The problem is further complicated for the case of foreign stakeholders where public bail-out means direct transfer of country's wealth abroad.

IMF reports usually examine the sustainability and appropriateness of levels of deficits given the economic fundamentals of the country. It can be therefore

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[5]empirically confirmed by Hutchinson & Noy (2006) and estimated at 1.5% of GDP annually by Becker & Mauro (2006), respectively cumulatively at 1.4%-9.4% by Hutchinson *et al.* (2010)

[6]Hoggarth *et al.* (2002) estimate the fiscal costs of these bailouts at 4% of GDP (however, 22% of GDP in the case of twin crises, a phenomenon often occurring especially in emerging markets)

understood as some kind of compromise of previous approaches as it accepts and allows for welfare enhancing effects of external imbalances but inspects a country's ability to honor its liabilities as well. The question whether one can deem an external debt excessive is however difficult to answer. Firstly, the extent to which market distortions affect the decisions of economic agents has to be quantified and secondly, there is philosophical problem of competence of rational agents. For example, Lane & Pels (2012) studied the current account balances in EMU. Their conclusion is that they cannot be considered excessive (on the ground of optimizing behavior) because they are in line with decisions of consumption smoothing rational agents anticipating productivity growth due to european economic integration. However, Barnes (2010) argues that these expectations were overly optimistic and finally turned out to be wrong. The current account deficits they induced therefore imposed excessive costs on national economies which might have been avoided if national governments behaved more "prudentially". Quantitative research aimed at explaining patterns behind formation of these imbalances can be therefore helpful. Following section summarizes the evidence.

2.3   Review of Empirical Literature

There are number of competing hypothesis about the main drivers of CA deficits. They affect the decision makers via shaping the expectations and decision making process. The set of determinants implied directly by inter-temporal trade theory contains *levels of (and shocks to) productivity*, *demographic variables*, *net foreign asset positions*, *stage of economic development* or *quality of financial sector*. Empirical research further enhanced the set by including barriers to international trade (usually approximated by *degree of openness*) and *oil balance* - as a proxy for natural resources endowment. Theoretical channels through which these determinants exert influence on CA paths are presented in following section together with quantitative estimates of their roles. Financial system development is often presented as one of the main drivers of current account balances in the EU, therefore it is closely discussed in the next in the next section (section 2.4).

Productivity shocks
Glick & Rogoff (1995) analyzed productivity shocks and stressed the import-

ance between global and country-specific productivity shocks. The former are supposed not to have any effect on current account while the latter to be one of the most significant factors. Fournier & Koske (2010) build on their work and develop a DSGE model abstracting from investment and nominal issues in order to capture the links between productivity and saving behavior. They allow the shocks to differ in duration (temporary vs. permanent) and sector (tradable vs. non-tradable). Implications from their work can be considered as standard hypotheses of inter-temporal theory. Permanent positive economy-wide shock may shift the CA path to both, surplus or deficit depending on the consumption smoothing behavior of households. In the case, they smooth consumption rapidly, they are going to borrow from abroad (current account deficit) in the short run and later pay back from higher output (current account surplus). In the other case, when the smoothing parameter is low, the current account balance will end up in surplus even in short run. They further distinguish shocks by the sector they hit. If only tradable sector is affected by positive shock, consumption leads to CA deficits from 2 reasons: consumption is smoothed and frontloaded (as relative price of non-tradable is expected to rise in the future). Finally, if non-tradable sector is hit, the impact is ambiguous (similar implications as for economy-wide shock). In practice, it is difficult to predict the sign of a coefficient of a variable representing productivity shocks. The first problem arises when one has to differ between productivity shocks of tradable and non-tradable sector. The second, and more serious problem is the fact that households' response depends essentially on the duration of the shocks as perceived by them. In the case, the shock is perceived as temporary, households increase saving to finance future consumption from present earnings (positive effect on current account balance). In the case, it is perceived as permanent, households increase present consumption and plan to finance it from higher future income (negative effect on current account balance). Whatever is the case, productivity should is a significant determinant of external balance. Productivity measures (represented most often by GDP growth rates) are considered generally insignificant in specifications capturing the whole range of CA determinants. However, in studies, dealing exclusively with them, where they were approximated by other variables such as OECD productivity measure and Solow residuals (Bussière et al. 2005) or with real (PPP) GDP per worker (Kerdrain et al. 2010) their significance rapidly increased. But even in these papers, the problem with distinction of perceived duration of productivity shocks persists leaving the signs of estimates heterogeneous.

Demographic variables

Age structure of population is likely to be determinant of saving. Life cycle hypothesis stipulates, that working population should save while dependent population (children and old) are net consumers. Hence, dependency ratios should be negatively correlated with CA balances. However other factors, like desire to leave bequests or pension system run by government (pay-as-you-go) might be of importance and in that case the impact of demographic variables can be ambiguous.

The findings in most of the empirical research generally support the implications from theory of inter-temporal dimension of current account. Usually old and young dependency ratios (alternatively population growth) or expected old dependency ratios (the expected sign would be "+" in this case) are used. Significance of these variables varies throughout specifications and chosen indicators, but generally is high. Besides papers mentioned in table (2.1), results of Ca' Zorzi *et al.* (2009), IMF (2006a) or Higgins (1998) show similar pattern in the way demographic variables affect countries' external positions.

Stage of development

This variable captures the presumption of stages of development hypothesis already mentioned in previous section. If it holds, a flow of capital from developed to developing countries should be documented. The stage of development is usually approximated by GDP per capita. According to inter-temporal theory, lower GDP per capita levels indicate better investment opportunities and should be associated with current account deficits.

The estimates from large global samples support the implications from life cycle hypothesis. Generally, however the results are ambiguous, for there is a lot of research oriented especially on US external deficits showing the opposite (Cline 2005). Capital may flow from "poor" to "rich" countries and in the recent years it really does so (Prasad *et al.* 2006). The first explanations were based on human capital constraints (Barro *et al.* 1995), later the role of financial intermediation in global financial centers (IMF 2006a) or global saving glut hypothesis (Bernanke 2005) was forwarded. The recent evidence from european Union suggests it is valid at least for countries in europe[7].

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[7]for example Fagan & Gaspar (2006), Blanchard & Giavazzi (2002) or Schmitz & von Hagen (2011)

Initial stock of net foreign wealth

The role of initial foreign assets position is twofold. Since current account can be seen as sum of net exports and capital gains on foreign assets, excess returns on these assets may allow country to run CA deficits even without necessity of future trade surpluses (Gourinchas & Rey 2007). It may also serve as some kind of saving buffer shifting inter-temporal budget constraint further away. Effects on current account are straightforward. Higher initial wealth moves the budget constraint further away and allows a country to borrow more. A negative coefficient is therefore expected here.

Even though quantitative research confirmed the role of initial international wealth in formation of CA balances, the of coefficients are very close to 0, and of directly opposite signs as expected. However, when Lane & Milesi-Ferretti (2002) tested the effect of NFA only on trade balance, negative relationship was confirmed (well in line with expectations of less binding budget constraint). Explanation of this discrepancy may stem from the construction of CA statistics. Since it is sum of trade balance and factor incomes, countries with substantial initial foreign assets may earn high incomes whose impact on CA may suppress the deterioration caused by softer budget constraint.

Degree of openness

Degree of openness is generally used as a proxy for trade barriers. There is no expected sign here, because it just captures the ability of economy to participate in international trade. Whether country imports or exports is based on underlying macroeconomic and demographic fundamentals.

Oil balance

The variable does not have direct connection with inter-temporal approach but it rather determines the endowment with natural resources. It should therefore account for shift in the demand or in prices of it as these may also affect current account balances[8]. In our regression, fuel balance was used instead of oil balance. Figure 2.1 shows the correlations of CA balances and fuel balances for countries of EU. Correlations are generally positive, (with exception of several small export-oriented economies) what is in line with expectations. Average correlation of about 20% suggests significant role in CA paths.

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[8]See IMF (2006b) for detailed analysis oil market and its implications for current accounts. Similar conclusions are valid for other resources as well

Figure 2.1: Fuel balances and current accounts in EU
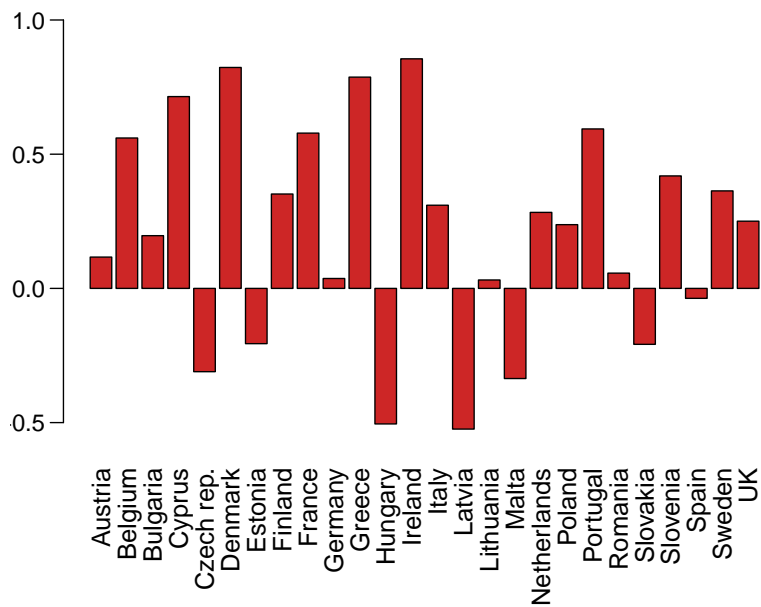
Correlations of annual observations, own calculations.

Table 2.1 shows results of research papers focused on estimation of impact of above mentioned variables. The results generally support implications from inter-temporal approach. Most of the estimates are significant and have expected signs. Moreover the table confirms the role of *fiscal balance* and *financial system* in the process. Since both of these them are of increased importance for our thesis, we dedicate a special section to each of them in the following text.

Table 2.1: Medium-term determinants of current account

	Chinn & Prasad (2000)	Gruber & Kamin (2005)	Chinn & Ito (2005)	Cheung *et al.* (2010)	Barnes *et al.* (2010)	J&S (2010)[a]
Net foreign assets	+	+	+	+	+	+
Fiscal balance	+	+	+	+	+	+
Rel. income	+	+	+	**mixed**	+	+
Demography	-	-	-	-	-	-
Openness	-	+	+	+	+	excluded
Oil balance	+	excluded	+	+	excluded	+
Fin. system	+	excluded	-	-	+	-
Productivity	mixed	-	+	mixed	+	-
Sample countries	99	61	117	94	25	49
Sample years	71-95	82-03	71-03	73-08	69-08	73-08

bold typed signs stand for coefficients with significance at least 10%
a = Jaumotte & Sodsriwiboon (2010)

2.4   Financial System and Current Account

Cheung *et al.* (2010) show how measures of financial deepening are negatively associated with current account balances again through relaxation of borrowing constraints. Moreover, Ju & Wei (2006) show how a bad quality of financial system can lead to current account surplus due to exodus of saving to more developed country. But on the other hand, a sound financial system can offer incentives to save more. Hence the coefficient is difficult to predict in this case. Even significance may be underestimated if it affects both investment and savings in the same way (recall eq. 2.2). Moreover, summarizing the literature on financial development and current account Herrmann & Winkler (2008) claim that underdeveloped domestic financial market is one of the major factors explaining why some emerging market economies do not run CA deficit as predicted by consumption-smoothing theory.

There is a number of measures of quality of financial sector, most often used are

- M2 to GDP - (Chinn & Prasad 2000)

- private credit to GDP - Chinn & Ito (2005), Cheung *et al.* (2010) or Barnes *et al.* (2010)

- financial liberalization index - Chinn & Ito (2005), Jaumotte & Sodsri-
  wiboon (2010), Danniger & Jaumotte (2008)

The ambiguity of the results is in line with expectations, however the dis-
tribution is little bit skewed towards negative values. Ca' Zorzi *et al.* (2009)
used Bayesian averaging techniques on more than 8000 regressions with differ-
ent selection of fundamentals. Fig. (2.2) shows the distribution of estimates of
financial integration variable. Several authors inspected the effects of financial
system on savings and investment separately. The impact of this variable on
investment is positive and significant but impact on savings varies across used
proxies and specifications with no general conclusion.

Figure 2.2: Distribution of estimates of financial integration
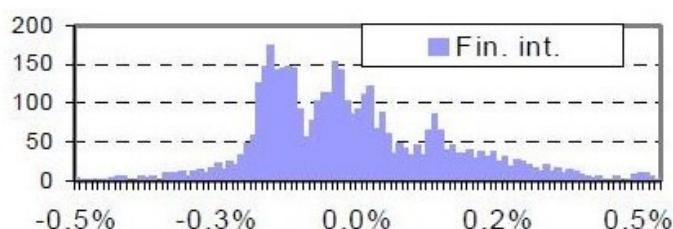
Source: Ca' Zorzi *et al.* (2009)

2.5   The Role of Government

Previous sections abstained from implications of government actions on current
account behavior. It is because consumption smoothing approach assumes the
impact of government only indirectly through impact on consumption decisions
of private agents. Even though such assumption is valid[9] the analysis must
be extended as variety of other theories suggesting direct causal relationship
between government actions and current account levels exists.

Fiscal policy is typically less used when external balances are considered
as monetary policy driven exchange rate movements offer more straighforward
tool to deal with unwished positions. Its importance however increases in

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[9]structural reforms of labor or financial markets can be used as examples of government
actions affecting behavior of private agents with respect to CA balances. Kerdrain *et al.*
(2010) offer an extensive survey of recent literature on structural reforms and their effects
on current accounts.

monetary union as monetary policy is not available any more. Lane (2010) distinguished 3 channels through which government spending influences current account even in single currency area. Firstly, public savings can codetermine current account deficit, secondly, through tax policy and designed consumption, government can smooth the adjustment process in case of excessive external imbalances and thirdly, through guiding current account path, it can prevent the formation of unwished external position.

Following subsection summarizes economic theory dealing with relationship of these two in greater detail. It also presents empirical research that has been conducted so far.

2.5.1   Fiscal Policy as a Determinant of External Balance

The recent state-of-art of economic science offers 4 feasible casual relationships between fiscal and current account deficits.

1. *Twin deficit hypothesis* predicates that running deficits in government budget will eventually lead to worsening of external balance. The causality stems either from Mundell-Fleming framework, where budget deficit induces increase in interest rates, further causing capital inflows and exchange rate appreciation and hence trade balance deterioration or from Keynesian absorption theory, where budget deficit boosts domestic absorption and therefore imports which (*ceteris paribus*) lead to trade balance deterioration as well. Another approach to causality of fiscal and CA balances comes from Friedman's Permanent Income Hypothesis (equation D.1). It states that CA is determined by short term deviations from trends of main economic variables. Substantial government spending (increase G_t) is said *ceteris paribus* to induce deficits on current transactions.

$$CA_t = (Y_t - Y^*) - (G_t - G^*) - (I_t - I^*) \qquad (2.3)$$

The results of empirical research however show certain ambiguity. Firstly, there are studies examining the roots of current account imbalances on large samples (already mentioned in table 2.1) These studies find highly significant positive relationship between fiscal and CA deficits with coefficients of magnitudes of 0.25-0.30, even though usually only in emerging economies. In case of industrial countries, the importance is noticeably

lower (both, in terms of significance and of estimated coefficients). The problem with this approach is that the direction of causality is not specifically examined[10] and concerns of endogeneity are legitimate in this relationship. Secondly, there is a literature aimed exclusively on twin deficit hypothesis. Empirical findings from some of these studies are reported in table D.1[11]. In average research support twin deficit hypothesis (at least to some extent). Heterogeneity appears mostly in studies working with US data where even twin divergence was found[12] (Kim & Roubini 2008). An explanation of this irregularity may be uniqueness of US economy. Perotti (2002) notices its special structure in comparison with OECD economies when inspecting responses to fiscal shocks employing VAR methodology.

There are also studies incorporating nonlinearity into households' reaction to fiscal deficit. The level of indebtedness has been repeatedly found significant determinant of their response. Berben & Brosens (2005) and Nickel & Vansteenkiste (2008) conclude that the more indebted countries tend to become more Ricardian (fiscal expansion is accompanied by fall of private consumption) and twin deficits are therefore less likely.

2. *The current account targeting hypothesis* was firstly presented by Summers (1988). It postulates a reverse relationship to that of twin deficit hypothesis meaning causality running from current account to fiscal balances. Perfect capital mobility is assumed here, but government acting in a way to keep the external position balanced. A shift in external position forces it to take an adequate action. There are only a few studies investigating directly the causality of twin deficits, Kalou & Paleologou (2011) summarize the work done in this field. CA targeting hypothesis has been confirmed but only to a limited number of countries and only for certain time periods.

3. *Bi-directional relationship* - a compromise between twin deficit hypothesis and current account targeting theory.

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[10]even though robustness checks with IV estimators are often employed the results are only marginally commented

[11]there is a pile of literature examining the hypothesis from somewhat different point of view, for example Röhn (2010) reports private saving offset to fiscal policy changes of magnitude of 0.41 or similarly de Mello *et al.* (2004) with offset of magnitude between 1/2 and 1/3. These studies can be interpreted as proofs of partial Ricardian equivalence, as well.

[12]The term refers to causality from fiscal to CA balances however the direction of influence is opposite (negative)

4. *Barro-Ricardian equivalence* - the concept of neutrality of debt and taxes was firstly formed by David Ricardo. Its renaissance is accredited to work of J. M. Barro, who in his influential articles questioned the wealth effect of government bonds (Barro 1974) and built up a new approach to fiscal expansions (Barro 1989). The hypothesis states, that deficit-financed fiscal expansion will have no affect on national saving (and output) as households anticipate future tax increases inevitably linked with such policies and therefore reduce private consumption to offset expected tax burden. Ricardian equivalence crucially depends on underlying assumptions such as perfect credit market, non-distortionary taxation, absence of uncertainty about future economic variables and infinite planning horizon of economic agents. In spite of implausibility of these assumptions, the schism in consequences of fiscal expansions motivated extensive empirical research. According to survey by Ricciuti (2003), the evidence is mixed with results of tests depending on the way of testing and specification issues. The prevailing view is that Ricardian equivalence holds at least partially, being influenced by institutional factors and country-specific characteristics. Moreover, even when the Ricardian equivalence itself does not hold, private saving may offset fiscal actions due to other effects. When marginal propensity to consume is less than one, households will put aside some of the available funds or fiscal deficit may induce changes in interest rates and inflation, which are said to be the main determinants of saving behavior. de Mello *et al.* (2004) offer two other explanations of the contradiction. It can be caused by "inflation tax" which has already been imposed, therefore reducing the real debt burden or government debt crowding out credit to household sector, hence increasing the number of credit-constrained households (which are not Ricardian).

Table 2.2: Estimates of effect of fiscal balance on current account

	estimate	sample	methodology
Bussière *et al.* (2005)	**0.07**	21 OECD countries	GLS
Beetsma *et al.* (2008)	**-0.83**[a]	14 EU countries	VAR
Abbas *et al.* (2010)	0.38	124 countries	contry-specific FE
Nickel & Vansteenkiste (2008)	(-0.11, **0.45**)[b]	22 industrial countries	dynamic panel threshold model
Schmitz & von Hagen (2011)	**0.08, 0.22**[c]	EU15	Feasible GLS, FE
Jaumotte & Sodsriwiboon (2010)	**0.204**	49 countries	OLS
Gehringer (2013)	**0.267**	20 EU member states	pooled OLS

bold typed values represent estimates significant for $\alpha = 10\%$
a - response (in %) to 1% increase in government spending after 1 year, baseline specification
b - changes with levels of public indebtedness (threshold) - the higher the debt the lower the coefficient
c - dependent variable is intra european trade balance

Even though the numbers reported in table 2.2 seem rather heterogenenous closer examination reveals positive correlation between fiscal and CA balances or negative correlation between fiscal deficits and saving rates (implying negative effect on current accounts). Majority of studies used data from european Union countries, however as far as we know, the impact of single currency on this relationship has not been directly estimated yet.

Chapter 3

Current Accounts in Monetary Union

In this chapter we analyze theoretical implications as well as preliminary empirical evidence of behavior of current accounts in monetary unions. This environment is supposed to emphasize cross-border capital flows enabling simplified consumption smoothing as well as increasing efficiency of capital allocation. Therefore certain CA dispersion might be expected. In fact, it can be interpreted as a sign of economic agents being obviated of some limits to consumption smoothing such as exchange rate risk[1] and thus as one of the benefits of single currency. However exchange rate is also a tool dealing with differences in competitiveness whose absence might hinder inevitable adjustment process and therefore pose a threat to macroeconomic stability.

Besides competitiveness adjustment, the question of sustainability must be revised because exchange rates (and exchange rate risk premium) are absent here. And since it is the evolution of these variables that poses a budget constraint for national spending, sustainability conditions of external balances have to be revised. Following sections deal with the implications in greater detail.

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[1]intra-european capital flows are further supported by convergence of national legislative

3.1   The Role of Capital Market Frictions and Exchange Rate Risk

Many quantitative as well as qualitative works stress the role of capital market frictions reduction as the main driver of CA positions. Obstfeld & Rogoff (2000) noticed that incorporating trade barriers to international trade models can substantially increase their explaining power when targeting CA patterns globally. In european Union, these frictions (as well as exchange rate risk) are reduced due to common legislative and supranational authorities accompanying the process of integration. The extent to which it influences financial markets has been analyzed by a number of authors. Lane (2008) offers survey of their results validating the view of highly integrated european financial markets. Prevailing structure of financial system thus overcomes the drawbacks present in global capital markets and implies "downhill" capital flows within europe. There is large and robust evidence for it including for example Herrmann & Winkler (2008), Danniger & Jaumotte (2008) Jaumotte & Sodsriwiboon (2010) or Polito & Wickens (2014). Throughout 2013, the role of banking sector and the necessity to macroeconomic implications of regulatory activities entered mainstream policy discussions and finally lead to steps towards the banking union in the EU (Goyal *et al.* 2013).

A popular proxy capturing the path of capital market frictions is *Capital openness index* formed by Chinn & Ito (2008). Figure 3.1 shows the average values of the index for several european country groupings. There is no significant effect of euro on this index when concentrating on early 2000's when it was officially launched, however there is a significant one-time shock at time of signing of Maastricht Treaty. Participating countries agreed to ERM II, a system of fixed exchange rates, therefore this shock can be attributed to exchange rate risk elimination. However other convergence criteria[2] possibly affecting capital openness were accepted as well hence we cannot attribute the whole effect to sole exchange rate risk reduction. The shock, moreover increased and equalized the values of the index for all the countries and kept it constant since then. Countries that entered afterwards are adjusting to this level.

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[2]such as fiscal deficit caps or inflation targets

Figure 3.1: Financial liberalization in EU
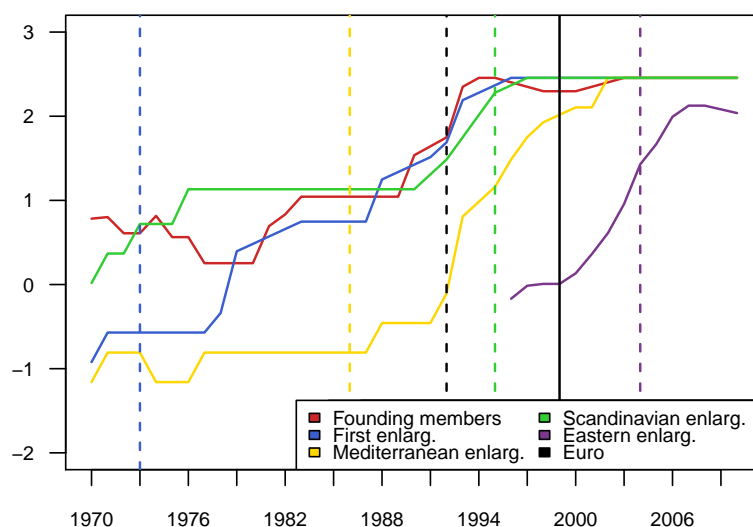
Details of country groupings in appendix (table A.2). Solid lines denote average values of index for each group, dashed lines year of entering EU. Dashed black line is Maastricht Treaty, solid black line represents launch of euro

3.2   The Role of Real Exchange Rate Movements

Common currency is a part of common european market project which is supposed to increase welfare of consumers by enhancing competition. However, the economies of EU member states suffer from several rigidities[3] varying from country to country. They cause imbalances in bilateral trade relationships and in an environment where they cannot be corrected by flexible exchange rates these imbalances tend to widen (Berger & Nitsch 2010). Real exchange rates can be seen as proxies of relative production costs considering also country-specific features of production process, hence their evolution and impact on CA balance is often estimated. For EMU, Arghyrou & Chortareas (2008) provide evidence confirming the role of real exchange rate movements in the CA balances dynamics. Belke & Dreger (2011) even add that CA deficits in eurozone are better explained by real exchange rate appreciation rather than deficit countries "catching up" the core, especially when the first years were removed from the sample. Contrary, Schnabl, Gunther and Wollmershäuser, Timo (2013) argue that effect of real exchange rate is not very robust and largely depends on specification. They forward the role of fiscal policy instead.

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[3]already mentioned labor market rigidities are an example

Introduction of common currency may also boost trade between countries sharing it (so-called Rose effect). For euro area, it is estimated to range from 5 to 10%[4]. Even though the impact on current accounts is ambiguous, in conjunction with real exchange rates effects it can add to divergence in CAs.

Real exchange rates may further reflect different phases of economic cycle or country-specific shocks, whose smoothening would therefore be decelerated in currency union as well. Absence of possibility of properly designed monetary policy[5] for all the participating countries further adds to current account diversion tendencies. However Decressin & Stavrev (2009) examined the evolution of country-specific shocks finding that their size actually decreased (although the duration prolonged) in europe.

3.3 Fiscal Balances and Inter-temporal Budget Constraint

Since single currency removes exchange rate risk as well as fears of inflationary pressures in individual countries it allows economic agents to borrow abroad at lower costs softening their budget constraint. Country risk-premium reduction that occurred after single currency was adopted could be seen as an evidence of budget constraint relaxation. However this reduction cannot be attributed to euro *per se*, as its adoption was preceded by a period of sound macroeconomic policies. Therefore increased borrowing that appeared afterwards can be considered welfare increasing and one of the benefits of currency union. However this holds only conditionally on perfect markets assumptions. Otherwise, such process may end up in national over-borrowing especially in the case when the structure of the union (or historical experience) prevents credible implementation of no-bailout clause. As exchange rate movements provide certain limits to debt levels, abolition of these limits creates dangerous environment that is prone to excessive borrowing. And as long as financial markets do not distinguish between individual members of the club (*i.e.* financial markets are not perfect), the question of sustainability becomes crucial. The implications for fiscal policy are of various forms because on one side larger pool of saving is

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[4]For more details see Baldwin (2006)

[5]Costs of "one size fits all" monetary policy is often used as an argument against currency union

available, but on the other side a sustainable path should be kept.

If unsustainable indebtedness is allowed a risk of additional costs the whole system is introduced. Country not able to honor its liabilities can either default on her debts threatening stability of european financial system or can be saved by other members of eurozone. In this case however danger of devolving into transfer union (where resources will be transferred from responsible to profligate countries) or danger of pressuring common central bank into inflationary policy arises. Both of options create precedence where "the less responsible" are compensated by "the more responsible" and incentives for behavior that is not tenable in the long run. The problem deserves attention especially in the case of governments since because of their institutional power, role in the economy and special structure of revenues and obligations they are extraordinary category of debtors. In contrast to private debtors where the total amount of loans is dispersed amongst a large number of individuals allowing certain risk management, the volumes of debt issued by governments may constitute thread to stability of european financial system (even relatively small economies such as Greece) in cases they fall into financial distress. The situation is further complicated by their institutional power hindering exaction as would be executed for private agents. It is therefore crucial to implement credible rules governing international lending[6] to prevent such outcome.

As claimed by a number of authors certain consolidation fatigue might have appeared in public finance domain of some european countries. Fiscal consolidation efforts, strengthened in 1990s as a consequence of Maastricht treaty decreased after entering eurozone. Quick look on deficits of eurozone members (figure 3.2) does not provide evidence for this. After somehow diverse and widespread fiscal balances across european Union, Maastricht Treaty from 1992 seem to provide a break in the behavior of governments. Consolidation efforts seem peaked around 2001 and weakened afterwards. After a short revival, global financial crisis hindered any further efforts. The issue is complicated by mutual relationship of public finance and evolution of GDP. Extensive GDP growth means public higher revenues so improvement of deficit series can be

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[6]monetary union *per se* does not provide any reason why country risk premium should be reduced. The fact that it actually happened in eurozone can understood either as evidence of financial market imperfections or lack of no-bailout clause credibility. Whatever the case is, the fact that it occurred only increases the appropriateness of inter-temporal budget constraint concerns

more of a consequence of peak of business cycle than consolidation efforts. The correlation of fiscal balances and output gap throughout the whole sample is 0.34 which suggest certain role of business cycle in the process.

Figure 3.2: General government deficits of eurozone members

as percents of GDP
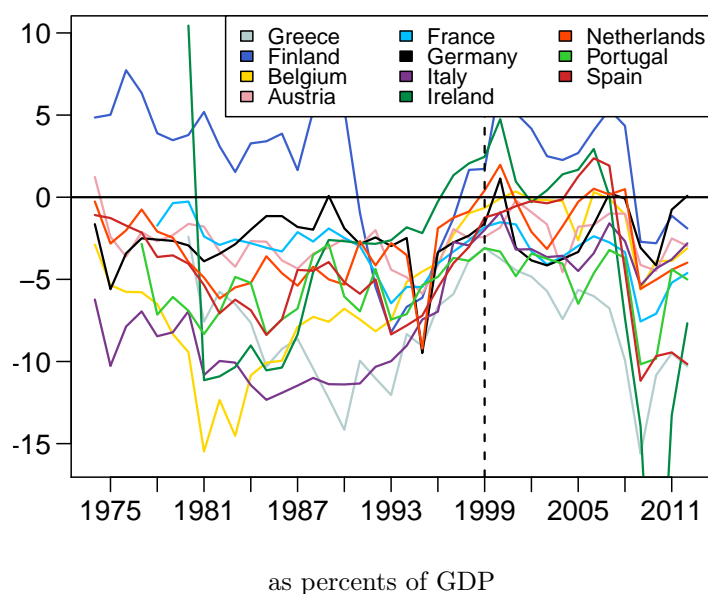
However as rapid converge of the balances throughout eurozone suggests, change in the government reaction is still important (especially when compared with period before). It is not likely that business cycles are synchronized over whole monetary union to the extent suggested by figure 3.2 hence certain adjustment of government behavior must have taken place. The question whether these adjustments were sufficient to compensate for environment without limitations of exchange rate movements (or country-specific risk premium) however persists. Afonso & Rault (2007) point out that fiscal balances, except for some special cases were still sustainable (even though the last observations they used originated in 2006). Wyplosz (2006) concludes in similar way attributing certain fiscal profligacy to global economic turbulence. Similarly Finckle & Greiner (2011) applying time-varying coefficients model support sustainability view[7]. Although sustainability was confirmed, the sensitivity of government spending decreased in some cases again signaling relaxation of budget constraint. Results correspond with those of Baskaran & Hessami (2012). They found a break in the behavior of governments which they date to 2005 after the reform of

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[7]Bohn (1998) proposed this way of testing debt sustainability. The aim is to analyze whether the primary budget surplus relative to GDP is positive function of the debt ratio. Such policy would make the GDP debt ratio a mean reverting, therefore sustainable process.

Stability and Growth Pact.

There is additional view of looking at sustainability in relationship with current account balances and their main drivers - national saving and investment rates. We have to shift attention from sole public sector to national economy as a whole and concentrate on validity of twin deficit hypothesis in relationship with national inter-temporal budget constraint. Recall eq. 2.2 - deficits of current account increase external indebtedness of an economy because they show difference between total saving and investment. Saving balance consists of public and private saving. Therefore if we see excessive spending (dissaving) in one part (we assume public spending increase), either the second part (private saving) or investment should react. If the reaction does not appear, the inter-temporal budget constraint has been relaxed and certain concerns about sustainability become legitimate. But the evidence does not allow us to conclude unsustainability without further examination. It rather suggests that inherent national mechanism limiting the scope of foreign lending (for example expectations of higher future taxes) has been reduced. The implications of such outcome is that CA deficits can be corrected by fiscal prudence more effectively at least up to point where private sector becomes more sensitive again.

3.4 Evolution of Current Account Deficits in euro-zone

CA paths of EU members (they are captured on figures B.1 and B.2 in the appendix) seemed to follow similar pattern up to 1990s. They moved in relatively short cycles quite close to balanced positions (with an exception of Ireland around 1980). There was one exclusive creditor (the Netherlands) and no exclusive debtors. The introduction of common currency is marked by dotted vertical line. There are some changes in the external positions appearing afterwards. The cycles were prolonged and the differences between certain groups of countries widened. Germany, Austria and Belgium became net european creditors (even though the Belgium had strong position since 1980s). On the other hand, countries of southern periphery - Greece, Portugal, Spain and Italy (often referred to as PIGS) experienced massive, long-lasting CA deterioration of large magnitudes. The extent to which such dispersion was a consequence of common currency has to be studied in greater detail taking into consideration

other influential factors to avoid *post hoc ergo propter hoc* kind of mistake. The fact that Denmark and Sweden, which are not members of eurozone accumulated surpluses as well, suggests cautiousness when interpreting the facts. Around 2008, the imbalances were reduced on both sides due to global financial crisis[8].

Even though countries entering EU in 2004 or 2007 did not adopt euro or use it only for a couple of years, they will be also included in most parts of following analysis. There are two main reasons for that. Firstly, in this thesis, the effects of european Union and eurozone are to be distinguished and the larger the sample we have the more the information we can extract. Secondly, any CA path of eurozone country is codetermined by conditions outside euro area, too. There are however only three members of EU15 without euro. The information from new members will increase this sample hence helps us to capture time-specific factors independent on common currency.

For countries entering in 2004, CA deficits that were already present before entrance itself (possibly due to ongoing integration or economic transformation) strengthened after accession (figure B.3). When inspecting the individual time series of countries participating in eurozone, no signs of shocks after accession appeared (however, the time span is extremely short for most of the cases). As in previous graphs, there is an evidence of a strong reversal around 2008.

For euro area members CA balances are examined in greater detail. Estimates of standard deviations of CA balances of founding eurozone members[9] (figure D.1) document described behavior. Relatively modest dispersion can be observed in the decade preceding euro adoption. However immediately after the adoption the differences amongst eurozone members skyrocketed. The process peaked around 2007, return to lower values was probably caused by global financial crisis (Atoyan *et al.* 2013). One has to be careful when explaining visible dispersion by common currency environment because there are more possible explanations. Firstly, similar development was observed also in countries not participating in single currency area so it may be caused by a common global or european trend (capital flowing from some of the most developed eurozone members to newcomers from Eastern enlargement is one the most probable).

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[8]see Atoyan *et al.* (2013) for more details

[9]these countries are Belgium, Germany, Ireland, Spain, France, Italy, the Netherlands, Austria, Greece, Portugal and Finland

Alternatively, CA paths in 1990s could be seen as unusually constraining given the data from previous and next periods (for example due to strict conditions of eurozone entry that were ratified by Maastricht Treaty). As soon as a country was admitted to monetary union the threat of not becoming a part of it was alleviated and the dispersion returned to previous levels.

Figure 3.3: CA of eurozone countries

(a) CA balances as share of GDP

(b) Standard deviations
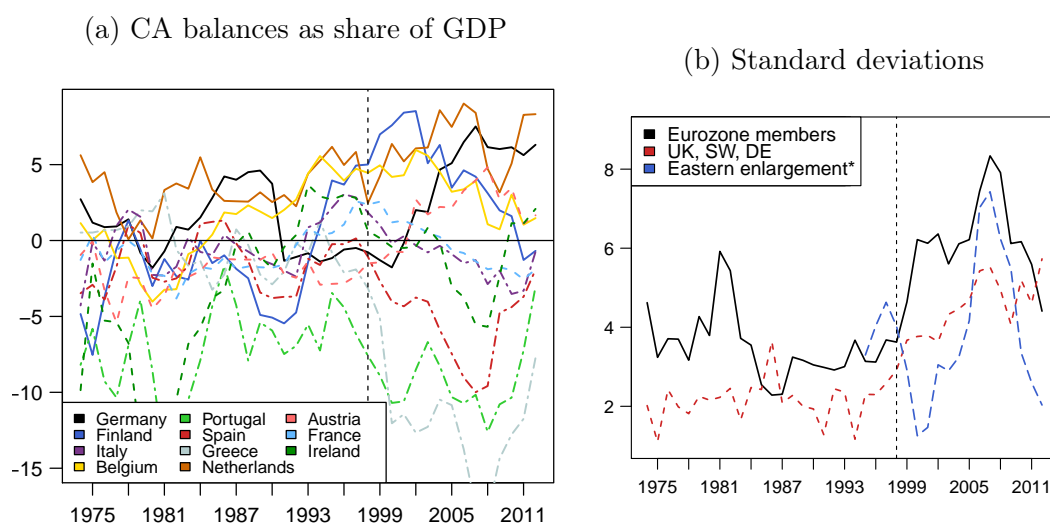
Another important question is the interaction of fiscal and CA balances. Figure D.2a shows annual correlation of fiscal and CA balances for founding eurozone members. While in the 1970s and 1980s, these values are unstable shifting from negative to positive, substantial change is clearly visible in 1990s. Since then fiscal and CA move in similar pattern. Positive long-term correlation suggest rising importance of twin deficit hypothesis. The pattern becomes a bit distorted in the last years however still persists. Figure D.2b shows the distribution of fiscal balances with respect to CA. Regression lines are provided as well. For observations outside eurozone the slope of fiscal variable is rather small (dashed red line). Scatter plot however revealed eventual influential observations for this sample which were then dropped and regression was run again. Solid red line depicts the fit. The slope got steeper (from 0.015 to 0.13) however estimates on observations from euro area are still substantially higher (about 0.55).

Figure 3.4: Fiscal and CA balances

(a) Correlation   (b) Scatter plot
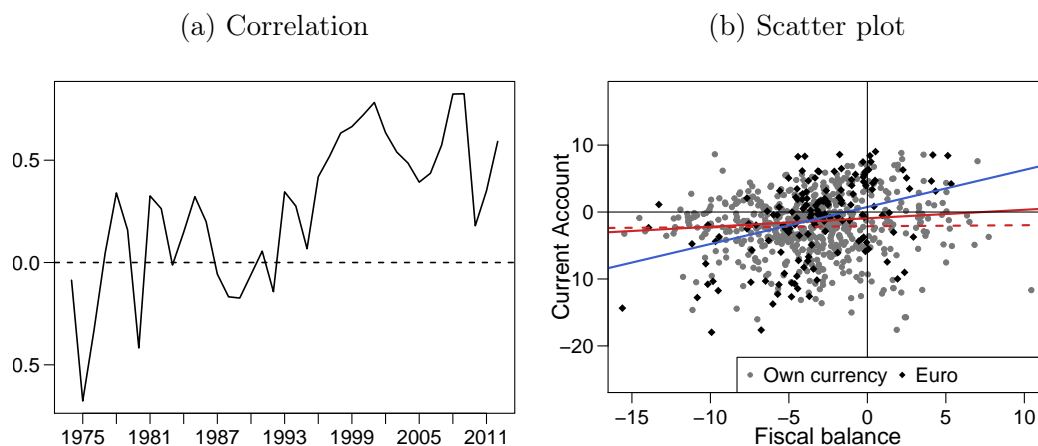
Correlation: eurozone members. Own calculation.
Lines for linear fit: Blue line - observations from eurozone. Dashed red line
- observations outside eurozone. Solid red line - observations outside eurozone
where CA < 10%.

We constructed similar statistics for relationship of financial development
approximated by private credit to GDP ratio[10] and current account balance.
Figure (3.5a) shows that these two are generally positively correlated, however
there are periods where correlation is close to zero or even negative. Contrary
to figure D.2a this plot does not reveal any significant change that could be
attributed single currency. The second part (figure 3.5b) advocates importance
of financial system. Estimate from simple OLS model is positive and highly
significant (green line).

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[10]It is measured as deviation from european average.

Figure 3.5: Financial system and CA balances
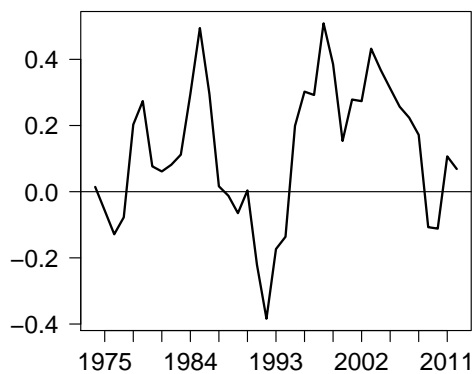
(a) Correlation   (b) Scatter plot
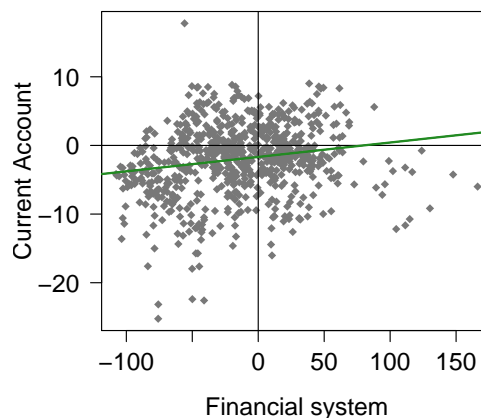
Correlation: EU members - own calculation.
Scatter plot:
Green line - observations from EU, financial system significant

Presented evidence suggests that there might have been changes in the CA balances that could be attributed to single currency. The evidence on relationship of financial system and fiscal balances is less persuasive. Countries with lower levels of income started to run sizeable deficits by the time it was started. However we cannot accept any hypothesis before examining the effects conditional on development of other determinants. Similarly, the exclusive positive correlation of fiscal and CA balances after 1990s is new situation but before accepting hypothesis of any change in the relationship the evolution of other determinants must be taken into consideration. Following sections present the methodology that is employed in the main analysis.

Chapter 4

Data and Methodology

4.1 Methodology

We estimated our model with a set of regressions. The effect of euro has been modeled using dummy variable of eurozone membership. The relationship we are interested in is summarized in eq. D.2

$$ca_{it} = \alpha + X'_{it}\beta + \gamma_1 F_{it} + \gamma_2(D_{it} * F_{it}) + \epsilon_{it} \tag{4.1}$$

where ca_{it} is current account balance. β is a vector of order $(K+3)x1$. K is a number of explanatory variables, in our case 11. X is a vector of explanatory variables containing eventual current account determinants discussed in section 2.3: *net foreign assets position, relative income* and *square of relative income*[1], *output gap, young* and *old dependency ratios, predicted old dependency ratio, depth of financial system, trade openness, fuel balance* and *membership in European Union* (as a dummy variable) and 3 dummies. Their choice was based on information criteria, adjusted R^2 and significance in regressions[2]. F captures the effect of fiscal balances and $D * F$ was created by multiplication of fiscal balance and dummy variable having value of 1 in the case of membership in monetary union (irrespectively on subgroup) and 0 otherwise[3]. It was designed to distinguish between the effect of fiscal balance outside and inside

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[1]it was added to capture eventual nonlinearities

[2]A set of indicators that were dropped from the regression comprises for example *Capital Openness Index, real Chinese GDP* - as proxy for increasing share of Asian economies on global trade, *oil balance, population growth, real GDP per capita growth* and *real GDP growth* and a set of dummies for specific conditions in time series of individual countries (*e.g* German unification or role of London in global financial markets)

[3]Similar approach was implemented by Schmitz & von Hagen (2011) to estimate the effect of eurozone on relative income as determinant of current account balances

eurozone. Finally α is a scalar, i denotes cross-sections and t time periods. It should be noted that we impose causality leading from fiscal to current account balances in the case of significant estimates of γ_1 or γ_2. Economic theory of twin deficits explains the assumption while importance of fiscal policy as the only macroeconomic tool for smoothing business cycles legitimates such assumption for eurozone countries. It is moreover supported by most recent quantitative research (recall table D.1).

We estimate the regression both with and without the set of dummies. This approach allows us to inspect eventual changes in roles of other determinants that could be attributed to common currency.

The examination is however complicated by possibility of heterogeneity of single currency effects on current account balances. Such concerns are legitimate since the evidence provided revealed that differences in current account tend to widen and basically divide countries of eurozone into members of southern periphery experiencing massive deterioration of external positions and group of core countries keeping the levels at surplus or at more or less balanced positions. Moreover, ambiguity of effect of euro has been consistently confirmed by empirical literature (for example Jaumotte & Sodsriwiboon (2010) or Barnes *et al.* (2010)) as well. The causes of heterogeneous reaction of individual economies can be traced to initial income per capita levels and different accompanying policies[4]. Besides, evidence of increasing intra-eurozone capital flows has been already presented. The direction leads from more developed to less developed countries (from *core* to *south* and *east*). Therefore surpluses in more developed and deficits in less developed countries are naturally created. We expect euro to affect these movements so omitting such heterogeneity from regression might cause the effects to cancel out mutually and underestimate the real impact of common currency. We include dummy for countries entering eurozone after 2007 even though the time sample is extremely short for them. Their income levels were substantially below European averages as well but they differ from countries of *south* by experiences from economic transformation and different stage of cohesion process. Besides possibility of different reaction to single currency, specific global conditions during which they entered union caused

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[4]There is an ongoing discussion about other possible causes. Some argue that there are institutional factors in play such as labor market rigidities hindering the adjustment of CA account balances to more balanced paths. For example,Cheung *et al.* (2010) used regression on global sample to find that institutional development affects CA balances build-up.

massive corrections of CA balances within eurozone and might mitigate the impact of single currency. This contamination with time specific effects can cause underestimation of effect of Euro therefore they were allocated to separate subgroup. Data from these countries will also help us to capture so-called *statistical effect* of Eastern enlargement of European Union. Division into different subgroups together with dates of euro adoption are listed in table D.2.

Table 4.1: Distribution of eurozone countries to subgroups

Country	*south*	*core*	*central*
Austria		1999	
Belgium		1999	
Finland		1999	
France		1999	
Germany		1999	
Greece	2001		
Ireland		1999	
Italy	1999		
Netherlands		1999	
Portugal	1999		
Spain	1999		
Cyprus			2008
Malta			2008
Slovakia			2009
Slovenia			2007

Years in the table refer to years when individual countries started to use Euro. Countries using their own currencies are excluded.

Position of Italy is specific since it did not undergo current account deterioration that was common for other countries in the group. Even per capita income levels reached values above EU in early 1990s. However before Euro adoption relative income started falling and the trend did not revert since then. Moreover Italy is also institutionally closer to *south* countries than to *core*.

4.1.1 Estimation Methodology

There is a variety of econometric techniques that could be utilized in our analysis. Basic division allocates them into two main classes depending on whether we want to model the relationship dynamically (it means to include past values of CA in the regression) or statically. Preferred techniques for dynamic modeling are GMM or IV estimators. The main limitation of dynamic approaches

is assumption of homogeneity of coefficients across groups of countries. If the assumption does not hold, the estimates are inconsistent and can be highly misleading as was shown by Pesaran & Smith (1995). They also proposed solution to the problem using m-year non-overlapping averages in order to eliminate bias from individual country dynamics. Longer term averaging allows correction of bias from individual country dynamics. And sufficiently high m further assures that this approach can overcome the problem of consistency. Besides, filtering high frequency movements allows us to abstain from short run dynamics which is not of primary interest in our thesis and to use static models[5]. We employed 3-year non-overlapping averages (even though 4 to 5 averages are common in literature), to be able to get enough observations even for relatively young post communist countries.

Common problem with estimation of panel models are invariant effects that could be attributed to individual units (in our case countries) or years. Estimating regression without taking these effects into consideration might lead to heterogeneity bias. However including time-invariant individual factors could wipe out much of the influence of individual-specific factors and might significantly affect estimates of membership in monetary union which is of primary concern in our thesis. Thus country-specific fixed effects would not make much sense. Time-fixed effect is an alternative specification stating that instead of invariant characteristics being linked to individuals they might be connected with certain time periods. We tested time-specific fixed effects by Lagrange multiplier tests and they were found significant (see table C.2), therefore they were included into regressions.

Thus the methodology that has been used is time-specific fixed effect estimator, where we allow the error component ϵ_{it} to consist of two parts - time-invariant μ_t and idiosyncratic ν_{it}. Equation D.2 is therefore altered to

$$ca = Z\theta + Z_\mu\mu + \nu \tag{4.2}$$

with matrix Z of all explanatory variables of order $NTx(K+4)$ and Z_μ is

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[5]Using non-overlapping averages is common for majority of papers dealing with determinants of CA balances because besides correcting for inconsistency of estimates it also provides solution to concerns about quality of the data - see for example Chinn & Prasad (2000). Further discussion about advantages and drawbacks of different approaches is extensively summarized in Ca' Zorzi *et al.* (2009)

a matrix of individual dummies of order $NTxT$. Fixed effect estimator uses deviations from means so denoting $\bar{y}_t = \frac{1}{N}\sum_{i=1}^{N} y_{it}$ ($\bar{Z}_t$ and $\bar{\nu}_t$ similarly) and subtracting the means transforms the regression into

$$(y_{it} - \bar{y}_t) = (Z_{it} - \bar{Z}_t)\theta + (\nu_{it} - \bar{\nu}_t) \tag{4.3}$$

Values of μ_t are constant over individuals so the transformation wipes them from the regression. Their estimates are then obtained from

$$\hat{\mu}_t = (\bar{y}_t - \bar{y}) - \hat{\beta}(\bar{Z}_t - \bar{Z}) \tag{4.4}$$

putting $\bar{y} = \sum_{t=1}^{T} \bar{y}_t/T$. Equation 4.3 is than estimated by OLS, hence several assumptions on residuals have to be imposed. Homoskedasticity and no autocorrelation of residuals are necessary in order to properly calculate t-statistics of coefficients. However heteroskedasticity-robust approaches can be employed to overcome problem with non-constant variance of residuals. For panel data, technique proposed by Arellano (1987) which is able to deal with heteroskedasticity as well as serial correlation is generally used. This method was also employed in our thesis. Described specification will be further referred to as baseline regression. Time-specific fixed effect estimator of CA determinants have been already employed by a number of studies such as Gruber & Kamin (2005) or Barnes *et al.* (2010).

As a check for methodology sensitive results we employed feasible GLS. In this case we do not perform any transformation that could wipe out time-specific effect so we have to include them specifically with dummy variables. Therefore the number of regressors increases by 12. As in the previous case, 3 year non-overlapping averages were used allowing us to look at the dataset as on cross-sections so we can omit t index and write only $i = 1, ..., NT$.
Feasible GLS is designed to deal specifically with heteroskedasticity by application of weighted least squares. We impose assumption on variance of residuals

$$Var(\epsilon|X) = \sigma^2 exp(\psi_0 + X\psi_1 + Q\psi_2) \tag{4.5}$$

where X is a matrix of order $NTx(K+4)$ of original regressors and Q is the matrix of their squares[6]. This procedure firstly runs OLS on equation D.2 and then auxiliary regression, where the logs of squared residuals from first OLS

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[6]without those whose squares are the same as original regressors to prevent multicollinearity

are regressed on original independent variables and their squares (eq. 4.5).
Fitted values from auxiliary regression are then used as weights for WLS in the
form 1/exp(fitted value). This approach might deal with heteroskedasticity
more efficiently as besides adjusting t-statistics affects also estimates of coeffi-
cients. It however depends on the character of heteroskedasticity (because of
employing only variables itself and their squares). FGLS estimator is consist-
ent but no longer unbiased so it is only asymptotically more efficient than OLS.

The same specification and methodologies were used on subbalances forming
CA - saving and investment to reveal the channels through different determ-
inants affect resulting balance and to detect any impacts on investment and
saving that could cancel each other out on the CA balance as a whole. Moreover
the estimates enable us to derive further conclusions and comments based on
effects on saving or investment such as Ricardian equivalence crowding out in-
vestment by public actions.

4.2 Data

The dataset contains data from all members of European Union except Lux-
embourg[7] giving us total of 26 countries. First observations are dated in 1974
however for some of the countries they were absent and time series start in
later periods. This is specifically the case of former communist countries. The
first observations in this subgroup vary from 1989 to 1995. For older EU mem-
bers, some problems were connected with Portugal, Greece and Germany (data
available from 1980). The last observations are from 2009 as for some of the
regressors further years were not available. There are several countries from
eastern enlargement that are already part of monetary union. However the
earliest entrances took place in 2007 so observations from this subgroup are
relatively short and vulnerable to financial crisis period. For Germany before
1991, data refer to Western Germany.

The main data sources are World Bank's *World Development Indicators*
(WDI) and European Commision's *Annual Macroeconomic Database* (AMECO).
Further details are provided in table A.1 in appendix.

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[7]due to data availability and special structure of its economy

Current account balance as a percent of GDP as well as variables representing investment and saving rates expressed in percents of GDP originate in AMECO database.

Net foreign assests measures come from database created by Lane & Milesi-Ferretti (2006) that was updated to year 2007. Productivity measure - output gap was downloaded from AMECO. Relative income was approximated by deviations from EU14 (*i.e.* EU15 less Luxembourg) average of PPP GDP per capita. The measure was downloaded from WDI and occasionally appended by data from OECD *Economic Outlook*.

Young and old dependency ratios originate in WDI. Dependency ratios represent the ratios of dependent population to working population. Expected dependency is a predicted old age dependency ratio (to working population) 30 years ahead. It was calculated (where necessary) from population projections by Eurostat. As these projections come only in 5 year periods, they were linearly interpolated. As in the case of old dependency ratios, the statistic shows a fraction of dependent population to working population. All the demographic variables were further averaged (EU26 average) and only deviations from these averages were used.

Financial system development was approximated by domestic credit to private sector as a share of GDP time series from WDI. Again, deviations from EU14 averages were used. Fiscal balance statistics come mostly from AMECO, few missing values was added from OECD *Economic Outlook* and IMF *WEO*[8]. It reports the fiscal balance to GDP ratio denoting fiscal deficits with negative signs and fiscal surpluses with positive signs. As a measure of trade openness, a sum of country's export and imports as a share of GDP was used. Fuel balance was included to account for distribution of natural resources. Most authors use oil balance as a proxy for this. We used fuel balance (containing items from section 3 of SITC) partly due to data availability and ability to capture endowment not only with petroleum but also other important resources. The balance had to be computed from fuel imports and exports provided by WDI. It is used in percents of GDP terms.

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[8]there are difficulties with appending data from various sources as different organizations might use different methodologies. However, we checked for differences in observations available in both sources and only minor differences (in second decimal places) were found

Chapter 5

Results

Our regressions show (tables 5.1 and 5.2) that there is certain ambiguity in development of current accounts of European countries and the adoption of common currency seem to coincide with the period where the divergence strengthened. However other important factors seem to be at play as well. Specifically, net foreign asset positions (+), GDP per capita levels (+), demographic factors (young dependency ratio + and predicted old dependency +) and financial system (-).

5.1 The effect of euro

We firstly comment on results for euro dummy variable. The effect is ambiguous for core countries, which might either point up to heterogeneity within country groups or limited role of common currency for exports of these countries on European markets. The estimates from both methodologies roughly match only for the southern countries with negative values (which is in line with Jaumotte & Sodsriwiboon (2010)), however even in this case they are not significant. For countries from Eastern enlargement, the time span is so short, that is it difficult to derive any conclusions. To summarize, we can say that euro had some negative effect of CA paths of southern economies however we do not find any evidence for positive effects in other country groups that would justify the claims that it might be responsible for intra-european divergence.

Table 5.1: Determinants of CA

	Feasible GLS		Fixed-effects	
	(1)	(2)	(3)	(4)
Net foreign assets	0.036 ***	0.023 ***	0.034 *	0.025 *
	(0,008)	(0.007)	(0.017)	(0.014)
Relative income	0.791 ***	0.594 ***	0.585 ***	0.592 ***
	(0.080)	(0.079)	(0.174)	(0.170)
Relative income squared	0.017 ***	0.006	0.004	0.002
	(0.004)	(0.004)	(0.008)	(0.008)
Output gap	-0.213 **	-0.452 ***	-0.448 ***	-0.515 ***
	(0.101)	(0.105)	(0.098)	(0.102)
Young dep. ratio	0.291 ***	0.237 ***	0.195 *	0.179 *
	(0.061)	(0.066)	(0.081)	(0.073)
Old dep. ratio	-0.135 *	0.037	-0.124	-0.026
	(0.070)	(0.068)	(0.154)	(0.127)
Predicted old dependency	0.199 ***	0.244 ***	0.228 *	0.255 *
	(0.068)	(0.062)	(0.108)	(0.099)
Financial system	-0.042 ***	-0.037 ***	-0.040 ***	-0.034 ***
	(0.007)	(0.006)	(0.010)	(0.072)
Fiscal balance	0.048	0.013	0.169 *	0.035
	(0.062)	(0.058)	(0.077)	(0.072)
Trade openness	0.010	0.010	0.007	0.003
	(0.007)	(0.007)	(0.011)	(0.012)
Fuel balance	0.184	0.225 **	0.068	0.058
	(0.116)	(0.106)	(0.181)	(0.178)
EU membership	0.075	0.438	0.092	0.099
	(0.440)	(0.436)	(0.847)	(0.782)
D_{core}		0.211		-0.714
		(0.887)		(1.568)
D_{south}		-1.610		-2.334
		(1.158)		(1.557)
D_{east}		0.450		-0.784
		(1.199)		(1.575)
D_{fiscal}		0.735 ***		0.723 **
		(0.160)		(0.226)
Adjusted R^2	0.709	0.819	0.528	0.573

***, ** and * represent coefficient significant on 1%, 5% and 10% α levels, respectively
standard errors are in parentheses

Table 5.2: Determinants of saving and investment

| | Savings | | Investment | |
	(5)	(6)	(7)	(8)
Net foreign assets	0.027 ***	0.003	-0.014 **	-0.014
	(0.008)	(0.020)	(0.006)	(0.013)
Relative income	0.218 ***	0.311	-0.319 ***	-0.301 *
	(0.079)	(0.195)	(0.060)	(0.158)
Relative income squared	-0.005 *	-0.003	-0.015 ***	-0.007
	(0.003)	(0.008)	(0.003)	(0.007)
Output gap	0.019	0.233 *	0.618 ***	0.640 ***
	(0.096)	(0.127)	(0.069)	(0.129)
Young dep. ratio	-0.111 **	-0.101	-0.292 ***	-0.227 ***
	(0.045)	(0.113)	(0.046)	(0.084)
Old dep. ratio	-0.538 ***	-0.353 ***	-0.426 ***	-0.320 ***
	(0.066)	(0.135)	(0.050)	(0.121)
Predicted old dependency	0.329 ***	0.261	-0.057	0.013
	(0.061)	(0.177)	(0.052)	(0.107)
Financial system	-0.027 ***	-0.032 **	0.011 **	0.004
	(0.007)	(0.014)	(0.005)	(0.014)
Fiscal balance	0.110 **	0.194 ***	0.095 ***	0.090
	(0.046)	(0.069)	(0.034)	(0.077)
Trade openness	0.013	0.005	0.002	0.007
	(0.008)	(0.023)	(0.006)	(0.012)
Fuel Balance	-0.094	-0.091	-0.236 **	-0.104
	(0.124)	(0.248)	(0.105)	(0.162)
EU membership	-2.162 ***	-1.665 **	-2.237 ***	-1.769 **
	(0.429)	(0.685)	(0.384)	(0.716)
D_{core}	1.872	2.158	2.015 ***	2.719 **
	(1.200)	(1.946)	(0.662)	(1.264)
D_{south}	2.664 *	1.398	2.690 ***	4.315 ***
	(1.351)	(1.538)	(0.943)	(1.428)
D_{east}	2.730	1.514	0.940	0.871
	(3.813)	(2.324)	(2.653)	(2.012)
D_{fiscal}	0.870 ***	0.831 ***	0.077	0.182
	(0.190)	(0.290)	(0.128)	(0.208)
Adjusted R^2	0.744	0.431	0.740	0.345

***, ** and * represent coefficient significant on 1%, 5% and 10% α levels, respectively. Columns (5) and (7) present feasible GLS, columns (6) and (8) from time-specific fixed effects.

Standard errors in parentheses

Regressions on saving and investment bring additional insights into the mechanisms of CA balances formation and the role euro plays in the process. Estimates suggest that it significantly boosted investment in both south and core countries (with higher magnitude in the south). Our quantitative research therefore supports the hypothesis that eurozone membership promotes investment across whole area. The effect is estimated to be higher in less developed members (relatively to core countries). The relationship is robust to methodology choice and it also corresponds with previous research (Jaumotte & Sodsriwiboon 2010). Causes behind the positive slopes might be expectations of higher growth prospects from larger market and improvement of macroeconomic policies.

Positive impact on national saving rates is somehow surprising however limited significance does not allow us to derive any strong conclusions. Roots of this development might originate in strict rules of Maastricht Treaty responsible for improved macroeconomic policies. Still *south* group results are to certain extent opposite to findings from previous literature where negative effect of euro is presented. This paradox may be partially explained by close examination of southern saving rates (figure 5.1). After euro adoption (vertical dashed line), certain improvement in downward-heading trend is noticeable, especially in the cases of Italy and Spain. Further decrease appearing around 2004 could be attributed to exceptional conditions of financial crisis or development of other determinants, such as relative income levels (recall fig. B.4).

Figure 5.1: Saving rates of *south* countries
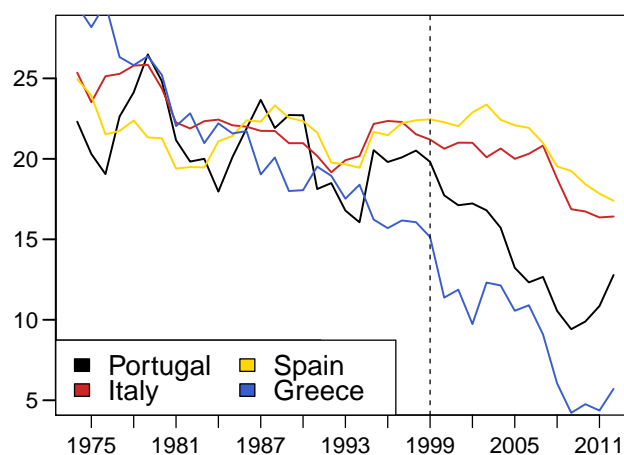
Gross national savings as a share of GDP

We further used linear restrictions to test whether the effect of euro differed for country subgroups. Test statistics are summarized in table 5.3.

Table 5.3: Different effect of euro on subgroups

restriction:	$D_{core} = D_{south} = D_{east}$		
dep. variable	Current account	Saving rate	Investment rate
p-value	0.534	0.884	0.232

p-values from F test of linear restrictions

The test does not allow us to conclude heterogeneity of responses within eurozone and but rather supports evidence of the effect being the same for all the country subgroups and for all the dependent variables that were examined. It does not tell us much about significance of euro's impact but it suggests that single currency is not to be blamed for CA dispersion as the same influence on all eurozone members cannot be rejected by the data. Statisticcally closest to rejection is the restriction for the investment regression, which supports estimates from baseline regression with more sensitive response for southern countries independently of chosen methodology.

5.2 Fiscal Balance, Common Currency and Current Account

Positive correlation between fiscal balance and current account balance already noted in figure 3.4a was confirmed. The effect is strong both significance and magnitude especially since euro was introduced and is valid even after other determinants are taken into account. Therefore fiscal deficits we could have witnessed in the years before the crisis may be one of the drivers of current account positions.

Regression on investment and saving proved fiscal balance contemporaneously affects CA balances through influence on saving[1]. While no direct contemporaneous effect on investment was found, the impact on national saving rates is extremely strong. Moreover F-test based on linear restriction did not

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[1]the structure of the regression does not allow us to tell anything about the effect of fiscal balances either on investment or on saving in future periods

reject perfect validity of twin deficit hypothesis (*i.e.* fiscal deficit induces CA account deficit of the same magnitude) as shown in table 5.4.

Table 5.4: Test for twin deficit hypothesis

restriction	$D_{fiscal} = 1 - Fiscal\ balance$
dep. variable	Current account
p-value	0.4089

p-values from F test of linear restrictions

5.3   Financial system and other variables

Regarding other variables: significant and robust role of output gap supports concerns of balance of payment crisis within eurozone in case of asymmetric shocks and calls for enhanced policies fostering optimum currency area characteristics. Similarly, variable representing depth of financial system has been repeatedly found highly significant with negative effect on current account balances. Credit expansions that could have been observed in south countries and which were financed by capital inflows from core countries of eurozone can therefore constitute one of the main drivers of their unbalanced CA paths. In this respect, the results provide support for extension of regulatory framework and creation of Banking union. Similar argumentation have been presented in recent works by Pisani-Ferry (2013), Gibson *et al.* (2014) or Constâncio (2014). For demographic variables, estimates have expected signs, negative effect on current account was achieved mostly via saving channel as expected. There are however two interesting facts appearing in the regression. Firstly, estimates of old dependency ratio decrease by about 50% when eurozone dummies are introduced and secondly investment is negatively correlated with young dependency ratios. While the first fact can be explained by aging of European Union inhabitants, the second fact is puzzling and might deserve attention in further research.

Main implications for economic policy can be summarized into several points.

- Our results suggest that single currency adoption may have caused negative shock to current account balances of countries sharing it even after heterogeneity and different initial conditions were taken into account,

specifically for countries of southern periphery. For core countries the estimates are ambiguous. Proposed evidence therefore cannot confirm significant role of euro in built-up of CA imbalances we that were observed before financial crisis. Hence return to individual currency would not be sufficient tool for correcting CA dispersion as long as it is not accompanied by certain exchange rate adjustments and abolition of institutional framework of European financial markets. The scope for these adjustments is however limited as they might trigger spontaneous painful reactions of economies and/or their euroization.

- We have proved that there is an evidence of structural break in the relationship between fiscal and current account balances as that could be attributed to single currency. Evidence of increased sensitiveness of current account behavior on public finance suggests that excessive (unwished) development of CA balances can be corrected by proper management of fiscal deficits more efficiently in eurozone than in countries using their own currencies.

- Reduced validity of Ricardian equivalence (which is implied by change in public saving-current account relationship) supports certain concerns about validity of inter-temporal budget constraint in eurozone since besides absence of exchange rate movements, private saving offset - another mechanism constraining national spending is weakened. On the other hand, such results suggest that deficit financed fiscal expansions can evocate higher impact on growth in eurozone than outside since private sector is less sensitive to public saving balances than in countries using their own currencies.

Chapter 6

Robustness Check

The magnitude of estimated response to eurozone membership together with observed patterns of fiscal and CA balance movements in certain countries impose additional questions about dependence of implications on underlying econometric assumptions and their vulnerability to minor dataset changes. In this section we provide additional robustness checks of our results either by reducing the original sample into several subsamples or by including additional variables that might affect the implications from section 5.

6.1 Instrumental Variables Estimation

To be able to derive robust conclusions we have to check whether our estimates were not affected by endogeneity bias. Possible drawback of our approach might arise due the fact that fiscal balance can react to CA balances as well, therefore introducing eventual bi-directional relationship. This concern is often discussed in literature and usually solved by estimation of regression with instrumental variable replacing fiscal balance as such. Instrument should not be vulnerable to endogeneity but it should be correlated with regressor. We follow similar approach here hence finding the proper instrument is a task of crucial importance, even though rather problematic. The most common instrument is lagged value of fiscal balance. It is however mostly employed in cases when fiscal policy is not of the main interest. It is not plausible for us because of effects on investment that fiscal policy exerts (under the assumption that expansionary policy is correlated with deficits, which is feasible). The time delay of these measures is well documented phenomenon therefore using lagged fiscal

balance as an instrument could influence the estimates by introducing link to investment which is not present in baseline specification.

Alternative proposal comes from Cheung *et al.* (2010) who approximate fiscal balances by government effectiveness index issued by World Bank [1]. The index ranges from -2.5 (poor performance) to 2.5 (excellent performance). We proceed with this index in spite of its limitations. The most important problem in this case is the size of the data sample since first observations come from 1996 (and up to 2002 are issued on biennial basis). They rapidly decreased number of observations, therefore increasing standard deviations and limit the asymptotic properties of estimators. To at least partially overcome the problem we replaced the missing values from 1996 to 2002 by averages of previous and following years. Instrumental variable regression did not alter the estimates except for certain changes in magnitudes due to limited range of instrument. The most important variables are presented in table C.4.

Table 6.1: Regression with instrumental variable

	estimate	std. error	p-value
D_{Core}	-13.117	(6.305)	**
D_{South}	-11.587	(4.642)	**
D_{East}	-8.123	(4.217)	*
Fiscal balance	0.348	(2.114)	
D_{fiscal}	6.082	(3.153)	*

Number of observations = 96
Time-specific fixed effects estimator with heteroskedasticity robust standard errors was used.

The coefficients on eurozone dummies are largely magnified but this is partially offset by increase in standard error estimates. The signs correspond to those from baseline regression, although their significance increased. It can be interpreted as evidence of negative effect of single currency, however the impact is the same on all the subgroups and actually stronger for core countries that do not have problems with CA deficits. Similar conclusions are valid for fiscal balance estimates. Estimated values of coefficients increased, but it is

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[1]This index captures perceptions of that quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. It is composed from 17 indicators (Source: World Bank Worldwide governance indicators)

not unexpected with respect to limited range of explanatory variable, which is moreover compensated by higher standard errors. We have to proceed with caution when interpreting results from this estimation especially regarding significance of coefficients. Arellano's method of covariance matrix estimation is based on asymptotic properties and our instrument reduces the sample size to one half therefore certain concerns about validity of asymptotic assumption are appropriate. Moreover the reduction of sample size to limited time period may affect the estimates as well. Thus we stick to coefficients from baseline regression and interpret instrumental variable results as check for eventual endogeneity. Generally the results did not change much so implications from baseline regression cannot be considered prone to endogeneity bias and.

6.2   Specific Time Periods

The question of specific conditions linked to certain time period is legitimate. Assuming existence of periods when major changes in CA balances appeared further leads to concerns about observations from these times and their relative weights in the estimation process[2]. An example of such period might be the global economic crisis of 2007 - 2009, where massive external rebalancing occurred in many countries. To reveal eventual effects of such phases we re-run the regression always excluding one period. The estimates of variables of major interest are listed in table C.5 in appendix. They confirm the impact of crisis on the CA balances and reveal possible source of structural break in regression. In fact it is not surprising since countries affected by the crisis had to adapt austerity measures pushing governments' deficits to zero. Decreasing purchasing power of inhabitants of mostly affected countries lead to falling consumption and therefore imports reduction which should be captured as surplus on current account. Moreover economic recession negatively affects investment activity thus introducing another channel of pushing the balance to surplus.

6.3   Influential Observations

Since OLS estimator is based on minimizing the sum of squared residuals, it is susceptible to problem of influential observations. In following subsection we dropped all the observations of CA balances that exceed the threshold of

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[2]time-invariant component of fixed effect model should deal with this kind of problem, however it allows only one way adjustments in intercept which might be insufficient

10% of GDP and re-estimated the regression with limited time sample. We include only the variables of main interest for us, the rest of the estimates is in appendix (table C.6).

Table 6.2: Exclusion of influential observations

	estimates
D_{Core}	-1.342
D_{South}	**-2.397**
D_{East}	**-2.253**
Fiscal balance	0.111
D_{fiscal}	**0.412**

Bold typed values are significant for $\alpha = 10\%$.
Time-specific fixed effects estimator with heteroskedasticity robust standard errors was used.

Estimates from table C.6 reveal influential observations had only minor effect on fiscal balance variables and eurozone dummies. Regarding the other variables, certain adjustments occurred however almost exclusively in non-significant parameters.

6.4   *R*ole of Southern Countries

Another source of eventual bias is heterogeneity within eurozone. We have used number of dummies respective to different subgroups when the effect of euro was estimated. Here we follow different approach. We separated all the observations from *south* subgroup and run the regression without them in order to test the robustness of fiscal balance estimates. Southern countries are characteristic of substantial correlations of fiscal and CA balances and hence the estimates for them may be different biasing the estimate for the whole sample.

The results are captured in table C.6. Slopes of fiscal variables and eurozone dummies are again listed in the table 6.3 below.

Estimates coincide with baseline regression. Impact of single currency impact on the role of fiscal balances seems smaller than for whole datasets what is in line with observed correlations of fiscal and CA balances in southern subgroup. However the pattern still persists and the implication is further supported by significance measures.

Table 6.3: Exclusion of *south* countries

	estimates
D_{Core}	-0.538
D_{South}	-
D_{East}	-1.332
Fiscal balance	0.047
D_{fiscal}	**0.517**

Bold typed values are significant
for $\alpha = 10\%$.
 Time-specific fixed effects estim-
ator with heteroskedasticity ro-
bust standard errors was used.

6.5   Common Time Trend

The impact of single currency that we have found in previous sections might
not be connected to monetary union as such but instead can be common trend
(at least) in the whole european Union. To verify our results with respect to
common time trend we added another determinant into baseline regression. It
was a multiple of fiscal balance and a dummy reaching values of 1 for years 2001
- 2009 and zero otherwise but only for countries using their own currencies. So
it is in fact the same measure as D_{fiscal} but for countries outside monetary
union. The results of main variables of interest are in table 6.4, all the others
then in table C.7 in appendix.

Table 6.4: Common trend in Europe

	estimates
D_{Core}	-0.705
D_{South}	**-2.320**
D_{East}	-0.778
Fiscal balance	0.036
D_{Fiscal}	**0.721**
$D_{Nonfiscal}$	-0.008

Bold typed values are significant
for $\alpha = 10\%$.
 $D_{Nonfiscal}$ is variable capturing
possible breaks in fiscal balance
slopes around 2000 for countries
outside eurozone
 Time-specific fixed effects estim-
ator with heteroskedasticity ro-
bust standard errors was used.

Regressions have shown that no similar change occurred in the countries using their own currencies and increased importance of fiscal balance is connected only with eurozone members.

6.6 Impact of Interest Rates

The role of interest rate is often discussed concerning both saving and investment. They are also present in inter-temporal consumption smoothing behavior as cost of frontloading (gain of postponing) consumption and they are a measure of opportunity cost as well as price of capital when investment decisions are formed. However they can be seen as an outcome of interaction of variables already included in the regression (regressors and current account balance as well). Given properties rise concerns about eventual endogenity behavior therefore real interest rates are usually omitted in the estimation CA regressions (especially when medium term relationship is of main interest). One can argue that in monetary union, where supranational authority (ECB) is responsible for nominal interest rates for the whole block the pattern may be different and the role of interest rates may gain on importance. Thus regression controlling for effect of real long-term interest rate was employed. The measure is constructed by deflating nominal values by private consumption deflator[3]. The variable was not significant and changed the estimates only slightly.

Table 6.5: Impact of interest rates

	estimates
D_{Core}	-0.891
D_{South}	-2.531
D_{East}	-2.277
Fiscal balance	-0.002
D_{Fiscal}	**0.793**
Real interest rate	0.146

Bold typed values are significant for $\alpha = 10\%$.
Time-specific fixed effects estimator with heteroskedasticity robust standard errors was used.

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[3]it si provided by european Commision's Annual Macroeconomic Database. For details of construction see *http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm*

Qualitative results from baseline regression hold even after interest rate as specific determinant is included. Therefore implications from section 5 were confirmed here. Evidence of euro's impact on current accounts is further strengthened and its importance is stronger in countries of *south* subgroup because, with one exception, all the specifications confirm significant negative impact on their CA balances. The other subgroups were not affected on such scale. Secondly, highly significant change of role of fiscal balance is to certain extent prone to inclusion of data from *south* countries as well as from financial crisis. However common trend of increasing importance of fiscal balance on current account determination was rejected further confirming the presence of break attributable to monetary union environment.

Chapter 7

Conclusion

This thesis examined the direct effect of single currency on current account balances of countries sharing it. Applied theoretical model originates in intertemporal trade theory and implies a set of determinants of CA balances. We employed time-specific fixed effect panel regression to test their significance. We tested the effect of single currency in Europe conditional on these determinants. Eurozone members were divided into three groups (*core*, *south* and *east*) and different effect for each one of them was allowed. The results did not provide conclusive evidence supporting opinion of euro being responsible for CA diversion. Certain negative impact has been revealed for southern countries (1.5% - 2.5% of CA to GDP ratio although with varying levels of significance depending on specification and data sample). On the other hand, no effect has been discovered for eurozone core countries.

Regressions on national savings and investment using the same specifications confirmed significant positive impulse to investment rate of magnitude around 2% for all country subgroups with an evidence of stronger impact in countries of southern periphery. Positive coefficients of approximately the same values were confirmed for saving balances as well however ambiguity in significance levels does not allow us to derive conclusions.

Eventual change in the relationship of fiscal and current account balances was verified with evidence of a change occurring through saving channel. European economies seem to become less Ricardian in eurozone with implication of higher effectiveness of CA management by fiscal policy. Abolition of Ricardian behavior implies higher impact of deficit financed fiscal expansions on growth (due

to diminishing private offset) but on the hand supports certain concerns about sustainability of national inter-temporal budget constraints due to reduction of inherent mechanism controlling national levels of indebtedness (such as expectation of higher taxes in the future).

Additionally, we have proven that current account developments were also driven by changes in financial sector in particular increased private credit. This finding implies that financial sector regulation could be considered as an instrument for treating external imbalances.

Regressions on subsamples revealed that the shift in fiscal and current account relationship is present especially in countries of southern periphery and it also dependent on inclusion the data from financial crisis 2007-2008. For core countries of eurozone, the evidence is less persuasive.

Research could be further extended to search for other determinants of current account balances and examining the changes of their role in current account dynamics in monetary union vis-a-vis countries using national currencies.

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Appendix A

Data and descriptions

Table A.1: Data sources

variable	code	source
Balance on current trans. with the rest of the world	UBCA	AMECO
Gross national saving	USGN	AMECO
Gross fixed capital formation at current prices	UIGT	AMECO
Gross domestic product at current market prices	UVGD	AMECO
Net foreign assets	-	LM-F[‡]
GDP at 2005 market prices per head of population	RVGDP	AMECO
GDP per capita, PPP (constant 2005 international $)	NY.GDP.PCAP.PP.KD	WDI
Gap between actual and potential GDP at 2005 market prices	AVGDGP	AMECO
Population growth (annual %)	SP.POP.GROW	WDI
Age dependency ratio, young (% of working age population)	SP.POP.DPND.YG	WDI
Age dependency ratio, old (% of working age population)	SP.POP.DPND.OL	WDI
1st January population by sex and 5-year age gropus	proj_10c2150p	Eurostat
Domestic credit to private sector (% of GDP)	FS.AST.PRVT.GD.ZS	WDI
Net lending or net borrowing: general government	UBLG	AMECO[†]
Imports of goods and services at current prices	UMGS	AMECO
Exports of goods and services at current prices	UXGS	AMECO
Merchandise exports (current US$)	TX.VAL.MRCH.CD.WT	WDI
Fuel exports (% of merchandise exports)	TX.VAL.FUEL.ZS.UN	WDI
Merchandise imports (current US$)	TM.VAL.MRCH.CD.WT	WDI
Fuel imports (% of merchandise imports)	TM.VAL.FUEL.ZS.UN	WDI
GDP (current US$)	NY.GDP.MKTP.CD	WDI

† - missing values for Greece were added from IMF *World Economic Outlook*, missing values for Austria, Finland and Italy from OECD *Economic Outlook*

‡ - Lane & Milesi-Ferretti (2006)

Table A.2: European Union members

date of entry	European Union	Eurozone
Founding members		
Belgium	25. 3. 1957	1. 1. 1999
France	25. 3. 1957	1. 1. 1999
Germany	25. 3. 1957	1. 1. 1999
Italy	25. 3. 1957	1. 1. 1999
Netherlands	25. 3. 1957	1. 1. 1999
First enlargement		
Denmark	1. 1. 1973	-
Ireland	1. 1. 1973	1. 1. 1999
United Kingdom	1. 1. 1973	-
Mediterranean enlargement		
Greece	1. 1. 1981	1. 1. 2001
Portugal	1. 1. 1986	1. 1. 1999
Spain	1. 1. 1986	1. 1. 1999
Scandinavian enlargement		
Austria	1. 1. 1995	1. 1. 1999
Finland	1. 1. 1995	1. 1. 1999
Sweden	1. 1. 1995	-
Eastern enlargement		
Bulgaria	1. 1. 2007	-
Cyprus	1. 5. 2004	1. 1. 2008
Czech republic	1. 5. 2004	-
Estonia	1. 5. 2004	1. 1. 2011
Hungary	1. 5. 2004	-
Latvia	1. 5. 2004	-
Lithuania	1. 5. 2004	-
Malta	1. 5. 2004	1. 1. 2008
Slovakia	1. 5. 2004	1. 1. 2009
Slovenia	1. 5. 2004	1. 1. 2007
Poland	1. 5. 2004	-
Romania	1. 1. 2007	-

Luxembourg was omitted because of data availability and special structure of its economy causing it to be an outlier in international trade statistics

Appendix B

Figures

Figure B.1: CA: Founding members and 1st enlargement countries
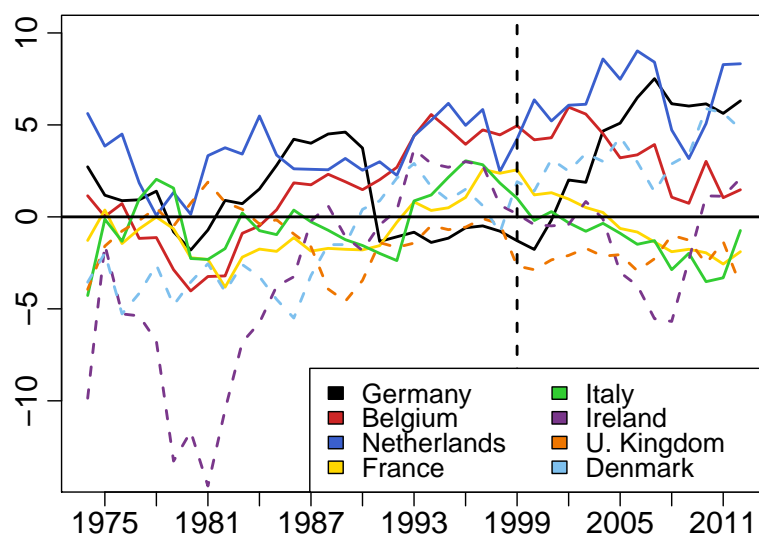
Figure B.2: CA: Mediterranean and Scandinavian enlargements countries
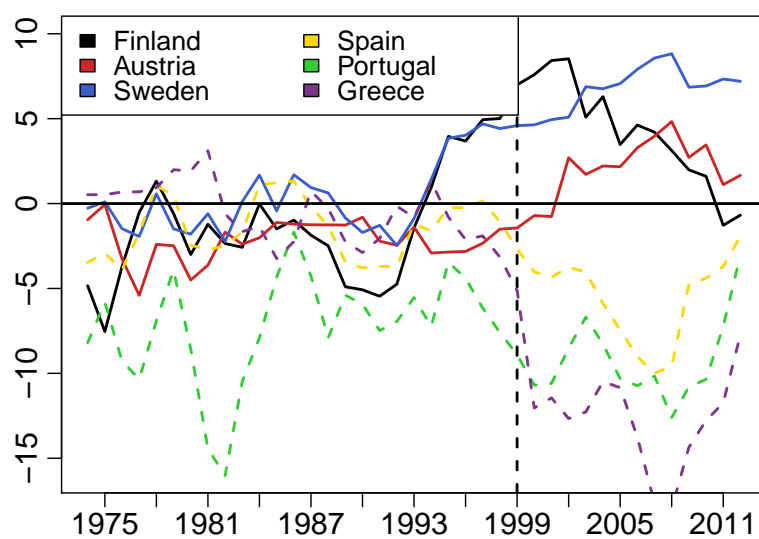
Figure B.3: CA: Eastern enlargement countries
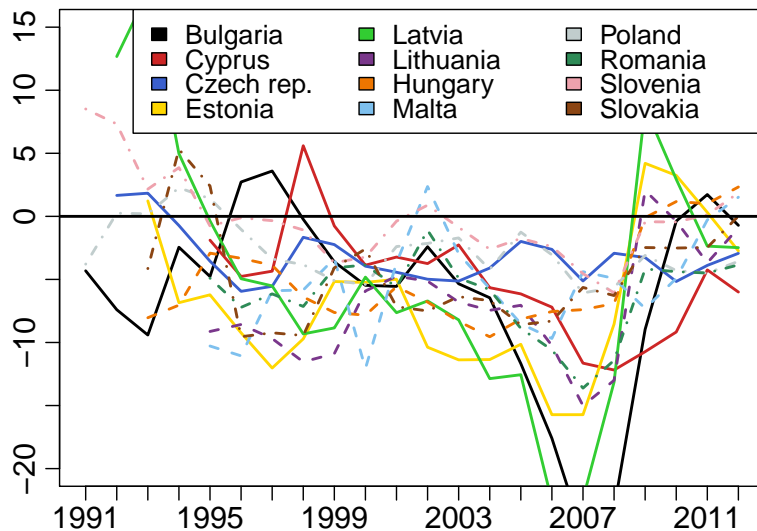
Figure B.4: Relative income in South and East Eurozone members
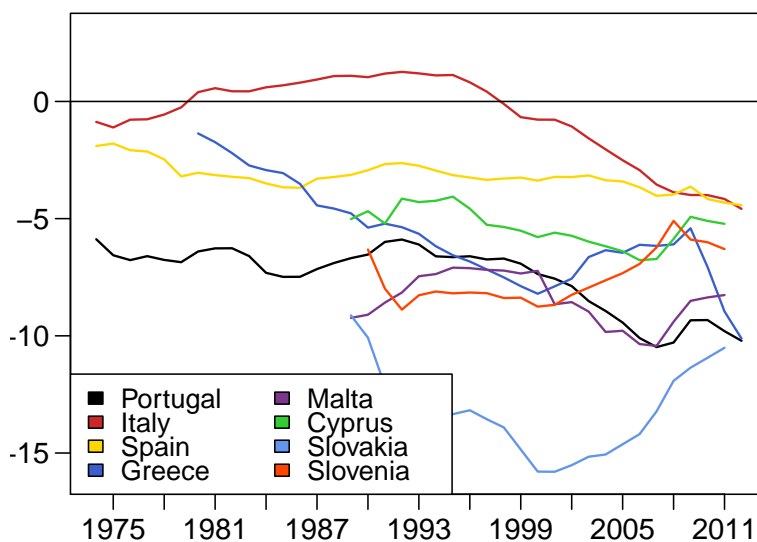
Values show deviations from EU14 mean in thousands of USD

Appendix C

Tables

Table C.1: Estimates of time- specific effects

	Fixed-effects			Heteroskedasticity-corrected		
	coefficient		std. error	coefficient		std. error
1975	−1.308		(1.199)	−1.609	*	(0.823)
1978	−1.503		(1.132)	−1.501		(1.278)
1981	−3.016	**	(1.182)	−1.749	**	(0.842)
1984	−1.551		(1.222)	−0.625		(0.901)
1987	−0.068		(1.127)	−0.005		(0.770)
1990	−0.112		(1.122)	−0.553		(0.832)
1993	−0.406		(1.178)	−0.872		(0.908)
1996	1.158		(1.215)	0.791		(1.019)
1999	1.739		(1.195)	−0.069		(0.845)
2002	2.590	**	(1.244)	0.726		(0.927)
2005	1.541		(1.381)	1.115		(1.063)
2008	1.653		(1.393)	1.060		(1.006)

Table C.2: Tests for time-specific fixed effects

test	Honda	Breush-Pagan
p-value	0.03964	0.03964

Table C.3: Subsample regression on saving

	D_{Core}	D_{South}	D_{East}	Fiscal balance	D_{fiscal}
2004 - 2006	2.323	2.245	1.873	**0.171**	**0.958**
2007 - 2009	2.368	1.475	-	**0.213**	**0.728**

Time span written as a name of column represents the time period that was excluded from the sample.
Bold typed values are significant for $\alpha = 10\%$.
Time-specific fixed effect estimator with heteroskedasticity-robust standard errors were used.

Table C.4: Regression with instrumental variable - full results

	estimate	std. error	p-value
Net foreign assets	0.009	0.014	0.546
Relative income	0.755	0.161	1.130e-05
Relative income squared	0.004	0.008	0.609
Output gap	-0.467	0.190	0.016
Young dep. ratio	0.285	0.192	0.141
Old dep. ratio	0.005	0.164	0.977
Predicted old dependency	0.301	0.301	0.010
Financial system	-0.046	-0.046	4.652e-05
Fiscal balance	0.348	0.348	0.844
Trade openness	-0.016	-0.016	0.223
Fuel Balance	0.034	0.034	0.851
EU membership	-3.189	-3.189	0.034
D_{Core}	-13.117	6.305	0.041
D_{South}	-11.587	4.642	0.015
D_{East}	-8.123	4.217	0.058
D_{fiscal}	6.082	3.153	0.057
number of obs.	96		
Adj. R^2	0.284		

Bold typed values are significant for $\alpha = 10\%$.
Time-specific fixed effect estimator with heteroskedasticity-robust standard errors were used.

Table C.5: Period exluding regressions

	D_{Core}	D_{South}	D_{East}	Fiscal balance	D_{fiscal}
1974 - 1976	-0.613	**-2.562**	-0.817	0.044	**0.715**
1977 - 1979	-0.714	-2.366	-0.777	0.031	**0.732**
1980 - 1982	-0.778	-2.154	-0.532	0.016	**0.738**
1983 - 1985	-0.747	-2.407	-0.612	0.025	**0.730**
1986 - 1988	-0.796	-2.415	-0.808	0.054	**0.697**
1989 - 1991	-0.771	-2.524	-0.795	0.057	**0.702**
1992 - 1994	-0.811	-2.475	-0.618	0.022	**0.741**
1995 - 1997	-0.888	-2.337	-0.598	0.016	**0.740**
1998 - 2000	-1.095	-2.540	-1.627	0.015	**0.741**
2001 - 2003	-0.566	-2.155	-1.177	0.038	**0.665**
2004 - 2006	0.131	-0.845	-0.288	0.036	**0.991**
2007 - 2009	-0.802	**-2.909**	-	0.059	0.482

Time span written as a name of column represents the time period that was excluded from the sample.
Bold typed values are significant for $\alpha = 10\%$.
No important change appeared in other estimates.
Time-specific fixed effect estimator with heteroskedasticity-robust standard errors were used.

Table C.6: Regressions on limited dataset

	CA < 10%		Without south countries	
Net foreign assets	0.019		0.018	
	(0.014)		(0.015)	
Relative income	0.549	***	0.546	***
	(0.177)		(0.203)	
Relative income squared	0.004	**	-0.001	
	(0.007)		(0.009)	
Output gap	-0.372	***	-0.497	***
	(0.087)		(0.101)	
Young dep. ratio	0.282	***	0.143	
	(0.061)		(0.102)	
Old dep. ratio	0.019		-0.015	
	(0.118)		(0.156)	
Predicted old dependency	0.308	***	0.235	*
	(0.084)		(0.123)	
Financial system	-0.031	***	-0.033	***
	(0.011)		(0.009)	
Fiscal balance	0.111		0.047	
	(0.072)		(0.087)	
Trade openness	0.002		0.002	
	(0.012)		(0.013)	
Fuel Balance	-0.092		0.018	
	(0.207)		(0.183)	
EU membership	0.607		0.220	
	(0.679)		(0.885)	
D_{Core}	-1.342		-0.538	
	(1.441)		(1.635)	
D_{South}	-2.397	*	-	
	(1.301)			
D_{East}	-2.253	*	-1.332	
	(1.243)		(1.619)	
D_{Fiscal}	0.412	**	0.517	***
	(0.158)		(0.184)	
number of obs.	188		154	
Adj. R^2	0.557		0.532	

Time-specific fixed effect estimator with heteroskedasticity-robust standard errors were used.

Table C.7: Regressions with additional variables

	Common trend		Effect of interest rates	
Net foreign assets	0.025	***	0.020	
	(0.009)		(0.012)	
Relative income	0.593	***	0.470	***
	(0.079)		(0.167)	
Relative income squared	0.002		-0.011	
	(0.003)		(0.010)	
Output gap	-0.515	***	-0.326	**
	(0.098)		(0.150)	
Young dep. ratio	0.180	**	0.216	***
	(0.083)		(0.077)	
Old dep. ratio	-0.025		-0.073	
	(0.032)		(0.138)	
Predicted old dependency	0.256	***	0.369	***
	(0.050)		(0.102)	
Financial system	-0.034	***	-0.030	***
	(0.007)		(0.007)	
Fiscal balance	0.036		-0.002	
	(0.048)		(0.083)	
Trade openness	0.003		0.014	
	(0.202)		(0.013)	
Fuel Balance	0.058		0.118	
	(0.168)		(0.195)	
EU membership	0.104		-0.167	
	(0.436)		(0.867)	
D_{Core}	-0.705		-0.891	
	(0.692)		(1.635)	
D_{South}	-2.320	**	-2.531	
	(1.063)		(1.701)	
D_{East}	-0.779		-2.277	
	(0.782)		(1.666)	
D_{Fiscal}	0.721	***	0.793	***
	(0.230)		(0.219)	
$Variable$	-0.008		0.146	
	(0.043)		(0.149)	
number of obs.	199		182	
Adj. R^2	0.570		0.588	

$Variable$ is variable that was added to regression. In first two columns it is $D_{Nonfiscal}$ with value of fiscal deficit (for selected countries) for period 2001 - 2009 and 0 otherwise in third and fourth row it is real interest rate.

Time-specific fixed effect estimator with heteroskedasticity-robust standard errors were used.

Appendix D

IES Working Paper

Introduction

The Great Recession revived the debate about appropriateness of the euro for all countries within the eurozone when asymmetric macroeconomic effects appear. The lively debate surrounds the current account deficits and long-term shifts in competitiveness in the monetary union. These issues put into question the long-term sustainability of the eurozone and persistent intra-european imbalances pose a serious challenge for the policy makers. Strikingly, it is not clear whether an improvement in macroeconomic policies could make the eurozone more resistant to asymmetric shocks. The basic question is whether the euro itself can be blamed for widening current account imbalances or there are other important determinants along with the single currency.

Answering this question seems to be essential for the debate as it could bring insights into the nature of the problem the eurozone is facing. In fact, if the euro currency as such had been responsible for larger imbalances (particularly deficits), it would be rather difficult to ensure the continuation of euro in the current eurozone as a whole and for the countries with the largest deficits it might be desirable to leave the eurozone and to adjust via depreciation of their currencies. If on the other hand there had been other important determinants of current account imbalances, e.g. fiscal policy, then single currency might be sustainable in all current eurozone members and the countries with larger current account imbalances should focus on improving the economic policies and competitiveness.

Interestingly, the perception of current account (CA) deficits evolved dramatically over time and originally, larger current account deficits in the EU periphery were supposed to signal positive changes in competitiveness of those countries in the future. The arguments were based on inter-temporal approach to current accounts stating that deficits in less developed countries may be seen as a sign of consumption smoothing alleviated by increasing international

goods and capital flows (the Lawson Doctrine). Blanchard & Giavazzi (2002) provide evidence from early years of eurozone confirming a view that current account deficits could be one of the benefits of monetary union.

On the other hand, exchange rate is a tool enabling (certain type of) automatic rebalancing of labor productivity differences as well as cushion for unexpected shocks hitting the economy. Its absence can be compensated by other measures (such as internal deflation); however they are more painful and difficult to design. Empirical research targeting interplay of current account and real exchange rates comprises for example Belke & Dreger (2011), claiming that current account deficits in eurozone are better explained by real exchange rate changes than by inter-temporal consumption smoothing. Another example is Arghyrou & Chortareas (2008) confirming the role of real exchange rate in CA dynamics in Europe. Moreover, nominal exchange rate volatility is an indicator of international capital market's trust and can be reflected in the costs of borrowing therefore imposing certain borrowing constraint on the economy. Abolition of nominal exchange rate can thus lead to overly dispersed current account positions and pose a threat.

In this paper, we address role of the euro adoption in the emergence of large current account deficits in the South and surpluses in the North (in particular in Germany) prior the Great Recession empirically. We examine current account balances of EU members in order to empirically estimate the effect of euro on them within context of other eventually relevant determinants with focus on longer-term dynamics. Determinants stem from the theory of inter-temporal approach, which determines the set of variables, such as national productivity or demographic structure of population whose interaction is responsible for evolution of current account balances. These determinants have been repeatedly tested and found significant (see for example Chinn & Prasad (2000) as the early attempt that deals with this issue or Barnes *et al.* (2010) for more recent work). We then add dummy variables to control for the effect of eurozone membership.

This approach helps us to eliminate other effects and target solely the effect of euro and allows us to capture eventual heterogeneity of responses of different types of the EU economies. If we find that the responses differ across groups of economies we can confirm significant role of euro in built-up of current account

deficits in a group of south countries and surpluses in the core EU countries. However, the opposite results would lead to rejection of such hypothesis and shield euro from being blamed for (unsustainable) current account dynamics in the last years.

Our approach is somewhat comparable to the analysis by Jaumotte & Sodsriwiboon (2010), who investigated determinants of current account imbalances on global sample with special treatment on eurozone members. Their results confirm negative effect of euro on current account balances in eurozone vis a vis the global sample without significant difference in coefficient estimates for the southern periphery and core countries.

Furthermore, we focus explicitly on the interplay between fiscal policy and current account deficits after the euro adoption. The importance of fiscal policy stance in the dynamics of current accounts increases rapidly in monetary union and so far, no consensus about the link between fiscal policy and current account balances emerged. Since there is certain evidence, e.g. Beetsma *et al.* (2008), suggesting that twin deficit hypothesis holds in the European Union, confirmation of this fact might lead to enhancement of economic policies so that they can properly target the problem of CA deficits (or take into consideration side effects on current accounts when designing measures oriented towards other goals). As far as we know, there is no other paper examining the effect of single currency on relationship of fiscal and current accounts.

We employ time-specific fixed effect estimator with robust standard errors. Static model was chosen due to danger of misleading estimates based on assumption of their homogeneity which is present in dynamic models (Pesaran & Smith 1995). Instead, 3-years non-overlapping averages were used to overcome problems with time dependencies in CA balances. This approach has been widely used in quantitative research regarding medium- (and long-) term determinants of CA balances (Ca' Zorzi *et al.* 2009).

The dataset comprises data from years 1977- 2012. Observations from past periods allow us to capture patterns of current account dynamics of EU members irrespective on their membership in eurozone. Since we focus on the period of built-up of CA imbalances, our baseline estimation is performed on the sample ending in 2009. The period after 2009 is characterized by unwind-

ing balances and exceptional policy measures such as intra-European fiscal transfers, increasing TARGET imbalances, restrictive fiscal and unprecedented expansionary monetary policy, therefore not a part of built-up process.[1]

Our results suggest that there is certain negative effect of euro on current account imbalances in southern eurozone, whereas the effect is insignificant for other countries using euro. Even though the euro adoption seems to have the same, negative effect in all groups of countries, only in case of the southern periphery the effect is significant. Regarding the role of fiscal policy on CA balances, we provide an evidence of higher sensitivity of current account balances to fiscal policy stance after adoption of euro pointing to the importance of twin deficits nature of imbalances in the eurozone. Among the set of other determinants of CA imbalances the relative income and availability of credit to private sector were most significant suggesting that the built-up of imbalances in countries with relatively lower income would not have been possible without large financial market integration and capital inflows. In this respect, our results support the hypotheses that excessive lending belongs to the main causes of current account imbalances in the EU and that the risk of excessive lending in some countries of the eurozone should be addressed by the regulatory framework and macroprudential policy.

This paper is structured as follows: Section two presents the main facts about the recent developments of current account balances in the EU and the third section presents literature review. In the next section description of methodology and data is provided. Section 5 presents the results, implications for economic policy and section D robustness checks. The final section concludes.

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[1]The results for the full sample are provided as a useful robustness check.

Current accounts in the EU member states

The dynamics of current accounts in the EU member states had followed relatively similar pattern up to the early 2000's (see Figure D.1a). They evolved quite close to balanced positions, there was one exclusive creditor (Netherlands) and no exclusive debtors. After the introduction of common currency (dotted vertical line), some changes became evident. Persistence of deficits and surpluses increased and the differences between certain groups of countries widened. Germany, Austria and Belgium became net the creditors, on the other hand, countries of southern periphery - Greece, Portugal, Spain and Italy experienced massive, long-lasting deterioration of current account balances of relatively large magnitudes.

Figure D.1: CA of Eurozone countries

(a) CA balances as share of GDP

(b) Standard deviations
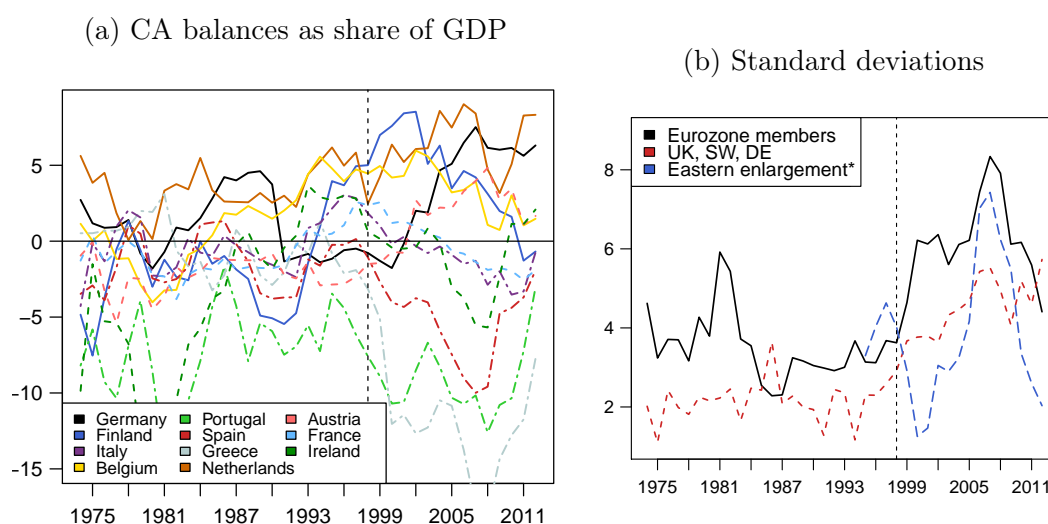
However, it is not possible to argue that such dispersion of the current accounts dynamics was a consequence of common currency due to a risk of *post hoc ergo propter hoc* kind of mistake. First, there might be other influential factors in play and second, current account imbalances widened also in non-euro countries such as Denmark, Sweden and United Kingdom. Also around 2008, the imbalances were reduced on both sides most probably due to global financial crisis (Atoyan *et al.* 2013). Estimates of standard deviations of CA balances of the EU member states complement previous findings (Figure D.1b). Relatively modest dispersion can be observed in the decade preceding euro adoption with the differences amongst eurozone skyrocketing afterwards. The dispersion peaked around 2007 and reversed after again as a consequence of global financial crisis. Interestingly, the fiscal policy stance evolved in line with

the current account balances. Figure D.2a reports annual correlation of fiscal and CA balances for the founding eurozone members[2]. While in the 1970s and 1980s, the correlation between the two deficits was rather low, since the mid 1990's the fiscal and current account balances have become positively correlated. The positive long-term correlation suggest rising importance of twin deficit hypothesis for explanation of rising current account deficits. The pattern becomes a bit distorted in the last years however it still persists.

Figure D.2b shows a scatter plot of fiscal balances and current account balances. Blue line represents the regression on observations since the euro adoption with a positive slope and significant slope (estimated coefficient is 0.55). The red lines connect the observations prior the euro adoption and countries outside the eurozone. In this case the correlation almost disappears (dashed red line) and becomes insignificant even when eventual influential observations with very large current account deficits were excluded from the sample (solid red line)[3].

Figure D.2: Fiscal and CA balances

(a) Correlation   (b) Scatter plot
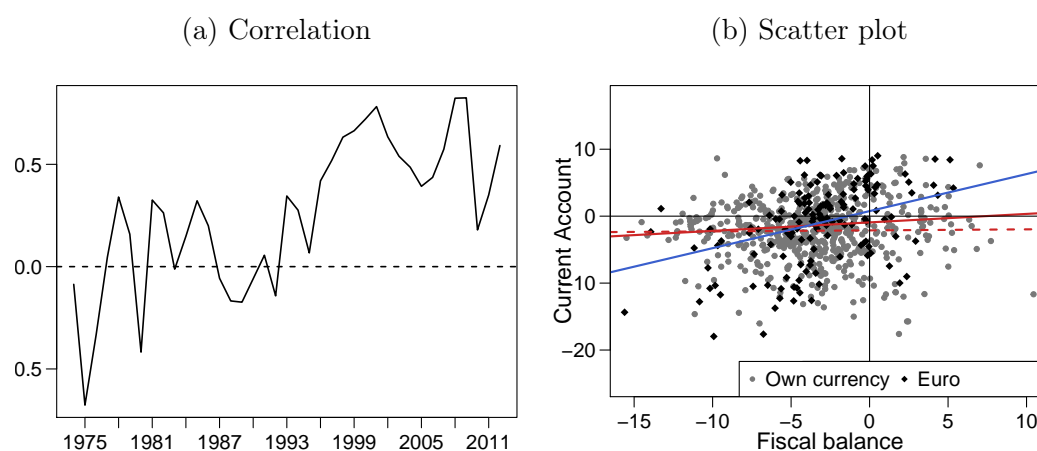
Correlation: Eurozone members - own calculation.
Scatter plot:
Blue line - observations from Eurozone, fiscal bal. significant
Dashed red line - observations outside Eurozone, fiscal bal. not significant
Solid red line - observations outside Eurozone (CA < 10%), fiscal bal. significant

Presented evidence suggests that the dynamics of current account balances changed around 1999. In the following sections we try to find out to what

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[2]These countries are Belgium, Germany, Ireland, Spain, France, Italy, the Netherlands, Austria, Greece, Portugal and Finland

[3]Regressions were calculated using standard OLS method

extend it can be attributed to the single currency and to what extend other variables, in particular fiscal policy, are more important determinants of current account balances in the EU member states.

Literature review

The current literature on determinants of current account balances is based on intertemporal trade theory (Sachs *et al.* 1981; Obstfeld & Rogoff 1994). This theory sees current account balance as a consequence of choices of agents rationalizing their consumption (or savings) and investment with respect to expected lifetime income (expected net present value of investment, respectively). It is therefore driven by variables determining consumption choices. As a result of interplay of underlying determinants, current account deficits cannot be considered harmful without further examination of the causes. In fact, it can be one of the gains from international trade and given certain conditions, it can enhance the welfare both in deficit and surplus countries by firstly enabling consumers to smooth consumption and secondly providing more efficient allocation of capital resources by equalizing the marginal product of capital internationally. The set of the main variables affecting inter-temporal choices comprises productivity (productivity shocks), demographic variables, initial stock of foreign assets, level of intermediation in financial sector, degree of economic openness, natural resources endowment and other variables - see for example Jaumotte & Sodsriwiboon (2010) or Barnes *et al.* (2010).[4] Variables commonly considered in the literature are included in our regression to distinguish the impact of euro adoption from other effects.

Current accounts in eurozone

Overall, the effect of common currency on current accounts is supposed to increase cross-border capital flows along with elimination of other barriers to trade. In the EU, the frictions are further reduced due to common legislative and supranational authorities accompanying the process of integration. Several authors analyzed to what extent financial markets reflex these factors. Lane (2008) offers survey of literature concluding that the euro reshaped financial markets and international investments significantly and that financial markets

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[4]The up-to-date research on inter-temporal trade theory is summarized in Table 2.1 in Appendix A.

across the eurozone became highly integrated.[5] However, the advances in financial integration posed new challenges, namely increased risk of over-borrowing, overly deficit-financed consumption and investments in low productivity sectors leading to a steady loss of competitiveness and further deficits in countries importing capital and surpluses in countries exporting it.[6]

The existence of a link between the euro adoption and current account deficits especially in the south of the eurozone is documented by Jaumotte & Sodsriwiboon (2010). They claim that deficits in countries like Greece, Spain or Portugal were larger than can be explained by the fundamentals itself (and some variation across countries). The view that euro adoption lead to an increase of current account deficits in the South of the eurozone is further supported by Abiad *et al.* (2007), Herrmann & Winkler (2008) or Danniger & Jaumotte (2008) which identify financial integration as the main channel through which this effect appeared. The dynamics of the process is that as a consequence of capital inflow the real exchange rates (reflecting the relative production costs) appreciated causing further deterioration of current accounts. This view is also supported by the empirical research that verified the significance of real exchange rates for development of the current account imbalances (see for example Arghyrou & Chortareas (2008); Berger & Nitsch (2010)). Belke & Dreger (2011) even add that current account deficits in eurozone are better explained by real exchange rate appreciation rather than by the hypothesis that deficit countries are continuously "catching up" the core countries. Moreover the view that capital inflows and insufficient regulation in eurozone allowed for persistent current account deficits gained a lot of popularity recently. The dominant role of developments of financial sector, deregulation and especially excessive lending in the european crisis are emphasized for example in Pisani-Ferry (2013) and Gibson *et al.* (2014). Contrary, Schnabl, Gunther and Wollmershäuser, Timo (2013) argue that the effect of real exchange rate is not very robust, depends on specification strongly and they see the main role of fiscal policy in built-up of current account imbalances.

Suggested effects of real exchange rate movements and capital flows impose

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[5]This view is also supported by evolution of the Capital openness index in EU (Chinn & Ito 2008).

[6]Besides mentioned effect on current account dynamics, recent literature identifies risk of twin crisis (banking and public finances) originating from european financial integration (Pisani-Ferry 2013).

doubts about optimality of longer-term deficits as implied by inter-temporal trade theory. In order to distinguish it's effect from euro, capital flows, and fiscal balance (which are of main interest for us) we added real effective exchange rate index along with the determinants suggested by the intertemporal theory to our model.

Fiscal policy and current accounts in the eurozone

The narrative evidence shows that with euro adoption fiscal deficits followed similar pattern as the current account deficits and both became largely correlated. There are two main competing hypotheses in the literature regarding their relationship – the twin deficit hypothesis and Ricardian equivalence.[7]

First, the *Twin deficit hypothesis* predicts that pursuing fiscal deficits will eventually lead to worsening of external balance. The causality stems either from the Keynesian absorption theory, where budget deficit boosts domestic aggregate demand and therefore imports leading to deterioration of trade balance. Also, the twin deficits hypothesis arises in the Mundell-Fleming framework, under which the budget deficit induces increase in interest rates, further causing capital inflows and exchange rate appreciation and hence trade balance deterioration as well. Finally, the causality from of fiscal to current account balances stems from the Friedman's Permanent Income Hypothesis (Equation D.1). It states that current accounts balances results from short- term deviations from trends of main economic variables. Substantial government spending (increase G_T) is said to induce deficits on current transactions.

$$CA_t = (Y_t - Y^*) - (G_t - G^*) - (I_t - I^*) \qquad \text{(D.1)}$$

The *Barro-Ricardian equivalence hypothesis* (Barro 1974; 1989) postulates, that deficit-financed fiscal expansion will have no affect on national saving (and output) as households anticipate future tax increases inevitably linked with such policies and therefore reduce private consumption to offset expected tax burden. This hypothesis can be reinterpreted as absence of any relationship between fiscal policy and current account.[8] Ricardian equivalence crucially depends on underlying assumptions such as perfect credit market,

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[7]Kalou & Paleologou (2011) also mention current account targeting hypothesis and bidirectional relationship between fiscal and current account deficits. The evidence for these relationships is however scarce and limited only to individual countries and time periods.

[8]Ricardian equivalence deals specifically with link between public and private saving.

non-distortionary taxation, absence of uncertainty about future economic variables, and infinite planning horizon of economic agents.

Even though there is not any clear consensus about casual relationship, observed correlation supports twin deficit hypothesis. Moreover empirical research (see Table D.1 summarizing results of some of the recent papers) confirms the twin deficit hypothesis as well.[9] Besides, Schnabl, Gunther and Wollmershäuser, Timo (2013) even explain differences in current account positions (in loosened monetary environment) by divergences in fiscal policies. Similar conclusion regarding the role of fiscal policy was presented by Merler & Pisani-Ferry (2012).

Table D.1: Estimates of effect of fiscal balance on current account

	estimate	sample	methodology
Bussière *et al.* (2005)	**0.07**	21 OECD countries	GLS
Beetsma *et al.* (2008)	**-0.83**[a]	14 EU countries	VAR
Abbas *et al.* (2010)	0.38	124 countries	contry-specific FE
Nickel & Vansteenkiste (2008)	(-0.11, **0.45**)[b]	22 industrial countries	dynamic panel threshold model
Schmitz & von Hagen (2011)	**0.08, 0.22**[c]	EU15	Feasible GLS, FE
Jaumotte & Sodsriwiboon (2010)	**0.204**	49 countries	OLS
Gehringer (2013)	**0.267**	20 EU member states	pooled OLS

bold typed values represent estimates significant for $\alpha = 10\%$
a - response (in %) to 1% incerase in government spending after 1 year, baseline specification
b - changes with levels of public indebtness (threshold) - the higher the debt the lwer the coefficient
c - dependent variable is intra European trade balance

Proposed evidence suggests that fiscal balance might have significant effects on current accounts at least in Europe; therefore it is reasonable to add it as

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The impact of fiscal policy on investment is beyond the scope of this paper. Besides it appeal with certain time delay therefore we can abstract from it in our analysis.

[9]See Ricciuti (2003) for survey oriented on validity of Ricardian equivalence (and twin deficit hypothesis). Then there is a pile of literature examining Ricardian equivalence from somewhat different point of view, for example Röhn (2010) reports private saving offset to fiscal policy changes of magnitude between 1/2 and 1/3. These studies can also be interpreted as proofs of partial Ricardian equivalence.

determinant to our regression. Validity of twin deficit hypothesis (positive significant estimate) would have important consequences on identifying causes of current imbalances as well as designing measures to unwind them. On the other hand, insignificant estimates would support Barro-Ricardian equivalence and therefore no direct impact of fiscal policy stance on current account.

Methodology and data

We proceed with panel regression. It is specified as follows:

$$ca_{it} = \alpha + X'_{it}\beta + \gamma_1 F_{it} + \gamma_2(D_{it} * F_{it}) + \gamma_3 D_{core,it} + \gamma_4 D_{south,it} + \gamma_5 D_{east,it} + \epsilon_{it}$$
(D.2)

where ca_{it} is current account balance, α is a scalar and β is a vector of coefficients of order Kx1. i denotes cross-sections and t time periods. X is a matrix of explanatory variables containing current account determinants derived from inter-temporal trade theory[10] and real effective exchange rate. Fiscal balance is expressed by variable F and we also include a cross-product of dummy variable D_{it} and fiscal balance. D_{it} has value 1 if country was part of eurozone in given year and 0 otherwise. This variable allows us to capture a possibility of change in the relationship between fiscal and current account balances in eurozone.

Finally, three additional variables were added to separate the effect of eurozone membership into different groups: south, core and east (see Table D.2 for the division of countries into specific groups).[11] We also include new EU member states into our analysis. Even though most of the countries entering EU in 2004 or 2007 did not adopt euro yet, these countries serve as a control sample to separate the effects of other variables from the effect of the euro itself. Also so-called statistical effect of eastern enlargement might have altered

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[10]Choice of determinants was based on information criteria, adjusted R^2 and significance in regressions

[11]Preliminary evidence revealed that differences in current account dynamics may divide countries of eurozone into members of southern periphery experiencing massive deterioration and group of core countries keeping the levels at surplus or at more or less balanced positions. The causes can be traced to initial income per capita levels, different accompanying policies and increasing volumes of intra-eurozone capital flow leading from more developed to less developed countries (from core to south and east). Therefore surpluses in more developed and deficits in less developed countries are naturally created. This divergence must be taken into account in our regression.

capital flows within EU and eurozone which is another reason for including them into regression.

Table D.2: Distribution of Eurozone countries to subgroups

Country	*south*	*core*	*east*
Austria		1999	
Belgium		1999	
Finland		1999	
France		1999	
Germany		1999	
Greece	2001		
Ireland		1999	
Italy	1999		
Netherlands		1999	
Portugal	1999		
Spain	1999		
Cyprus			2008
Malta			2008
Slovakia			2009

Years in the table refer to years when individual countries started to use euro. Countries using their own currencies are excluded.

We employ the estimator by Pesaran & Smith (1995) that marries benefits of dynamic approaches and it still allows for heterogeneity of coefficients across groups of countries. We use 3-year non-overlapping averages (even though 4 to 5-year averages are common in literature), to be able to get enough observations even for relatively young post-communist countries.[12] The group-specific fixed effects (in the form of dummies) are preferred over country specific fixed effects that could wipe out much of the influence of individual-specific factors and might significantly affect estimates of membership in monetary union, which is of our primary concern. Additionally, the LM test suggests presence of time-fixed effects, (see Table C.2). Therefore time-specific fixed effect estimator with heteroskedasticity-robust standard errors was used. [13]

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[12]Using non-overlapping averages is common for majority of papers dealing with determinants of CA balances because besides correcting for inconsistency of estimates it also provides solution to concerns about quality of the data - see for example Chinn & Prasad (2000). Further discussion about advantages and drawbacks of different approaches is presented in Ca' Zorzi *et al.* (2009).

[13]Covariance matrix as proposed by Arellano (1987) allowing for fully general structure with respect to heteroskedasticity and cross-sectional correlation.

Data

The dataset contains data from all members of European Union except Luxembourg, Estonia, Litva, Lithuania, Slovenia and Croatia[14] giving us total of 22 countries. The time sample depends on data availability and is country specific. For most countries, the first observations are from 1977, for Germany, Portugal and Greece the sample starts in 1980 and for the post-communist countries the first observations are from the 1990's. In total, we utilize unbalanced panel with 177 observations.

The main data sources are World Bank's World Development Indicators (WDI) and European Commision's Annual Macroeconomic Database (AMECO). Current account balance as a percent of GDP originates in AMECO database. The net foreign assests measure comes from database created by Lane & Milesi-Ferretti (2006) that was updated to year 2011. Productivity measure – output gap comes from AMECO. Relative income is calculated as the deviations from the EU14 (i.e. EU15 less Luxembourg) average of PPP GDP per capita (WDI and OECD Economic Outlook).

The demographic variables comprise young and old dependency ratios[15] (WDI), and projection of the old dependency ratio 30 years ahead (referred as the Projected old dependency).The projected old dependency ratio is calculated from the population projections by Eurostat and interpolated to annual data from 5 year periods. Deviations from the EU26 averages are used for calculations.

Financial system development is represented by domestic credit to private sector as a share of GDP (WDI, deviations from EU14 averages are used). Fiscal balance reports the fiscal balance to GDP ratio denoting fiscal deficits with negative signs and fiscal surpluses with positive signs. The data are derived from AMECO; few missing values were added from OECD Economic Outlook and IMF WEO. It reports the fiscal balance to GDP ratio denoting fiscal deficits with negative signs and fiscal surpluses with positive signs. Finally, the trade openness is a sum of country's export and imports as a share of GDP and the fuel balance (calculated from fuel exports and imports, % of

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[14]Omitted because of data availability and in the case of Luxembourg also special structure of the economy

[15]Dependency ratios represent the ratios of dependent population to working population

GDP, WDI) is included to account for natural resources endowment. More details are provided in Table A.1 in appendix.

Results

The decline in current accounts in many countries of the eurozone coincided with introduction of the euro, however the regression analysis shows that there are also other important determinants, often more significant than the euro adoption itself (Table D.3).[16] The set of significant variables comprise relative income (+), output gap (-), predicted old dependency (+) and, importantly, we provide evidence of the negative effect of the financial system development on current accounts.

The effect of euro adoption is slightly significant (at 10%) in the southern euro area countries, for other groups of countries the effect has been insignificant. The insignificant estimates of the dummy variables representing euro adoption in the other groups point most likely to heterogeneity of the nature of CA balances within each group itself. In this respect, our results are in line with Jaumotte & Sodsriwiboon (2010) and others claiming significant role of common currency in the built-up process of current account imbalances in the southern countries.

Additionally, our results indicate that the effect of euro has been weak in other groups of eurozone countries, with some tendency to the same, negative direction, as in the southern part. Hence, we may conclude that our results provide evidence that the deterioration of current account balances in the southern countries might have been caused by euro adoption, however, we do not find any sizeable positive effect of euro adoption in other groups that would justify the claims that euro might have caused divergence of current accounts.

With respect to fiscal policy, we confirm the positive correlation between fiscal balances and current accounts, although this relationship is much stronger after euro adoption than before (as seen from significance of variable D_{fiscal}). Hence, the evidence of twin deficits in the eurozone pointed out already in sec-

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[16]We report results from regression without eurozone dummies as well to verify that adding these dummies did not notably alter estimates of other determinants.

Table D.3: Determinants of CA

	Fixed-effects	
Net foreign assets	0.034 *	0.022
	(0.019)	(0.017)
Relative income	0.518 ***	0.543 ***
	(0.109)	(0.103)
Output gap	-0.484 ***	-0.537 ***
	(0.136)	(0.135)
Real effective exch. rate	-0.023	-0.028
	(0.040)	(0.036)
Young dep. ratio	0.162 *	0.134
	(0.088)	(0.091)
Old dep. ratio	-0.120	0.001
	(0.172)	(0.137)
Predicted old dependency	0.236 *	0.265 **
	(0.120)	(0.110)
Financial system	-0.041 ***	-0.032 ***
	(0.011)	(0.009)
Fiscal balance	0.229 *	0.088
	(0.083)	(0.078)
Trade openness	0.011	0.007
	(0.013)	(0.013)
Fuel balance	0.126	0.073
	(0.243)	(0.245)
European union	-0.169	0.004
	(0.885)	(0.912)
D_{core}		-0.773
		(1.615)
D_{south}		-3.063 *
		(1.613)
D_{east}		-6.326
		(5.723)
D_{fiscal}		0.653 ***
		(0.233)
Adjusted R^2	0.493	0.544

***, ** and * represent coefficient significant on 1%, 5% and
10% α levels, respectively
 standard errors are in parentheses

tion D (Figure D.2) is fairly robust even after other determinants of current account balances are included in regressions. Fiscal policy is therefore important determinant of current accounts and negative fiscal balances that we could have witnessed in the years preceding crisis were one of the driving factors as well.

The existence of twin deficits can be considered as evidence of reduced validity of Ricardian equivalence in monetary union and it supports certain concerns about validity of national inter-temporal budget constraints when exchange rate movements are absent.

Interestingly, we find that the effect of real effective exchange rate on current account is insignificant and hardly distinguishable from zero, so one of the usual suspects can be sorted out. We believe that this result can be interpreted as a support for views approaching to real exchange rate appreciation prior the eurozone debt crisis as a consequence of capital inflows rather than being cause of the CA imbalances by itself, a view presented for example in Schnabl, Gunther and Wollmershäuser, Timo (2013) and Gabrisch & Staehr (2012). Moreover significant and robust role of output gap supports concerns of balance of payment crisis within eurozone in case of asymmetric shocks and corroborates necessity of policies enhancing optimum currency area characteristics.

Overall, we can derive three main policy implications from the results. First, to some extent, the evolution of current account balances in the southern eurozone was caused by the euro adoption and the dynamics was different from the rest of the eurozone or the EU members.

Secondly, the results support the hypothesis of twin deficits in the eurozone as the current account balances become more increasingly sensitive on public finance developments, suggesting that excessive and unwished development could have been related to loosened fiscal policy as well.

Finally, persistent deficits were allowed due to financial sector developments that allowed strong credit expansion leading to over-borrowing and excessive lending. In this respect, our results provide support for creation of the Banking union and extension of the regulatory framework, since without the credit ex-

pansion, persistent current account imbalances would have been hardly allowed (see Pisani-Ferry (2013); Gibson *et al.* (2014); Constâncio (2014), for similar argumentation on the role of banking sector in persistent imbalances in the EU).

Robustness check

We performed a battery of sensitivity checks to see whether the main results are not subject to change with minor changes in specification.

Endogeneity concerns

First, we investigated, whether our results are not subject of endogenity bias. Endogeneity might arise due to the fact that fiscal balance could contemporaneously react to CA balances, therefore an eventual bi-directional relationship might exist. To check whether our estimates were not affected by such interference, we re-estimated the model using instrumental variable (IV) estimator. The most common instrument used in literature is lagged value of variable under scrutiny. It is however not plausible here because of effects on investment that fiscal policy exerts.[17] Alternative proposal comes from Cheung *et al.* (2010) who proxy fiscal balances by government effectiveness index issued by World Bank.[18] The index ranges from -2.5 (poor performance) to 2.5 (excellent performance). We opted for this approach despite the need to restrict the sample due to the fact that the first observations of the index come from 1996. The main results are listed in Table D.4, full results are available in Table D.5 in Appendix D.

The qualitative results are unchanged; however, certain changes in magnitudes appear. The coefficients on eurozone dummies were largely magnified but this was partially offset by increase in standard error estimates. The signs are negative, but although their significance increased the impact is still the

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[17]Under the assumption that expansionary fiscal policy is correlated with fiscal deficits. The time delay of fiscal policy measures is well documented phenomenon therefore using lagged fiscal balance as an instrument could bias the estimates by introducing link to investment which is not in the scope of our analysis.

[18]This index captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. It is composed from 17 indicators (Source: World Bank Worldwide governance indicators).

Table D.4: Regression with instrumental variable

	estimate	std. error	p-value
D_{Core}	-13.027	(6.084)	**
D_{South}	-12.416	(4.555)	***
D_{East}	-4.084	(7.757)	
IV†	0.052	(1.761)	
$D_{IV}{}^\dagger$	6.020	(3.096)	*

† - Instrumental variable - government effective-ness index
Number of observations = 82
Time-specific fixed effects estimator with het-eroskedasticity robust standard errors clustered with respect to individual countries was used.

same on all subgroups. Note, that this regression revealed significant and negative effect of euro adoption also for the core countries.

Influential observations

We dropped all the observations of CA balances that exceeded the threshold of -10% of GDP to study the impact of influential observations.

These estimates reveal that influential observations had only minor effect on our original conclusions and support the importance of the twin deficits hypothesis. Again, the dummies for core and south euro area countries are of the same, negative direction in both subgroups (the effect being more significant in the south). On the other hand, both fiscal balance and financial sector developments remained significant and both signs and magnitudes consistent with the baseline results. Hence, the hypothesis of twin deficits allowed by financial sector developments has been confirmed even when influential observations have been eliminated. The detailed results are presented in Table D.6 in the appendix.

Similarly, we reestimated the model without observations from the southern eurozone countries (Table D.7). The twin deficit problem is somewhat relaxed, although still significant at 10% level after euro adoption and the impact of the developments of financial sector remains significant and negative.

Impact of Great Recession

We further extended our time sample with most recent data from years 2010-2012. This period is characteristic of unwinding of current account imbalances (Atoyan *et al.* 2013) and unprecedented policy measures (strong expansionary monetary policy, international fiscal transfers, and fiscal austerity). Examining data from the period of rebalancing allows us to evaluate effectiveness of policy tools that could be used to fight already unbalanced positions. The results show that only a little has changed after the crisis (Table D.8).

Importance of fiscal policy as a determinant decreased which substantially lowers importance of fiscal policies in targeting current account dynamics. This result might serve as evidence that public finances austerity might not be helpful in correcting current account imbalances even though previous results confirmed that they are one of the causes of such development. On the other hand, D_{south} is still significant; supporting view that euro might still hinder rebalancing process in southern periphery.

However significance of other variables needs to be taken into consideration before deriving conclusions. The most robust variables in the whole regressions are relative income level and output gap. Therefore economic reforms targeting productivity and economic growth could be concerned as alternative (and preferable) tools for targeting imbalances of current accounts. Also, the contribution of financial system developments (measured by share of credit to private sector on GDP) to current account imbalances remains significantly negative.

Conclusion

In this paper we have examined the effect of euro on current account balances of the eurozone members prior the Great Recession using time-specific fixed effect panel regression on determinants of current account balances. Eurozone members have been divided into three groups (core, south and east) and different effect for each group was allowed to check whether the effect of common currency has been similar in all countries or diverse.

We have found that to some extent, the introduction of euro contributed to built-up process of external imbalances in southern eurozone members. Furthermore, we have investigated the interplay between the current account deficits and fiscal deficits to verify eventual changes in their relationship that could be attributed to single currency. We have documented substantial shift in the role of fiscal policy after the euro adoption and our results imply stronger link between current account deficits and fiscal deficits in monetary union, hence the twin deficits phenomenon. Additionally, we have proven that the current account deficits were driven also by developments of financial sector, in particular, increased private credit. This finding implies that financial sector regulation could be considered as an instrument treating also the external balances.

The results with an extended sample covering the period following the Great Recession characterized by fiscal austerity have shown that twin deficits are a matter of coincidence but not causal relationship. With fiscal consolidation effort the link between fiscal and current account balances decreased. Rather macroprudential policy and banking regulation on the European level could contribute to gradual elimination of current account imbalances.

Full results

Table D.5: Regression with instrumental variable

	estimate	std. error	significance
Net foreign assets	0.003	(0.018)	
Relative income	0.701	(0.161)	***
Output gap	-0.349	(0.167)	**
Real effective exch. rate	-0.109	(0.088)	
Young dep. ratio	0.308	(0.212)	
Old dep. ratio	0.059	(0.210)	
Predicted old dependency	0.329	(0.148)	**
Financial system	-0.045	(0.012)	***
Instrumental variable†	0.052	(1.761)	
Trade openness	-0.015	(0.017)	
Fuel Balance	0.024	(0.230)	
EU membership	-3.039	(1.675)	*
D_{Core}	-13.027	(6.084)	**
D_{South}	-12.416	(4.555)	***
D_{East}	-4.084	(7.757)	
$D_{IV}{}^\dagger$	6.020	(3.096)	*
number of obs.	82		
Adj. R^2	0.573		

$\dagger$ - Government effectiveness index

Table D.6: Regression without observations where CA $> -10\%$

	estimate	std. error	significance
Net foreign assets	0.014	(0.010)	
Relative income	0.465	(0.072)	***
Output gap	-0.346	(0.134)	**
Real effective exch. rate	-0.027	(0.024)	
Young dep. ratio	0.264	(0.067)	***
Old dep. ratio	0.071	(0.087)	
Predicted old dependency	0.310	(0.074)	***
Financial system	-0.029	(0.008)	**
Fiscal balance	0.191	(0.072)	**
Trade openness	0.002	(0.009)	
Fuel Balance	-0.283	(0.154)	
EU membership	0.509	(0.630)	
D_{Core}	-1.780	(1.032)	
D_{South}	-3.639	(1.280)	***
D_{East}	-10.168	(8.113)	**
D_{Fiscal}	0.313	(0.214)	*
number of obs.	168		
Adj. R^2	0.534		

Table D.7: Regression without observations from south countries

	estimate	std. error	significance
Net foreign assets	0.010	(0.019)	
Relative income	0.422	(0.124)	***
Output gap	-0.473	(0.134)	***
Real effective exch. rate	-0.042	(0.037)	
Young dep. ratio	0.099	(0.097)	
Old dep. ratio	0.033	(0.165)	
Predicted old dependency	0.249	(0.115)	**
Financial system	-0.028	(0.011)	***
Fiscal balance	0.126	(0.093)	
Trade openness	0.006	(0.015)	
Fuel Balance	-0.024	(0.273)	
EU membership	0.001	(0.990)	
D_{Core}	-0.6001	(1.615)	
D_{South}	-	-	-
D_{East}	-5.173	(6.531)	
D_{Fiscal}	0.398	(0.037)	**
number of obs.	134		
Adj. R^2	0.472		

Table D.8: Regression with data from 2010 - 2012

	estimate	std. error	significance
Net foreign assets	0.000	(0.014)	
Relative income	0.496	(0.109)	***
Output gap	-0.428	(0.144)	***
Real effective exch. rate	-0.032	(0.035)	
Young dep. ratio	0.070	(0.089)	
Old dep. ratio	-0.000	(0.129)	
Predicted old dependency	0.268	(0.098)	***
Financial system	-0.021	(0.010)	**
Fiscal balance	0.121	(0.080)	
Trade openness	0.015	(0.012)	
Fuel Balance	0.057	(0.205)	
EU membership	0.282	(0.788)	
D_{Core}	-0.429	(1.838)	
D_{South}	-4.683	(2.050)	**
D_{East}	1.475	(1.758)	
D_{Fiscal}	0.337	(0.280)	
number of obs.	195		
Adj. R^2	0.527		