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Macroeconomic Imbalances and Business Cycle Synchronization. Why Common Economic Governance Is Imperative for the Eurozone*

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Abstract

This paper investigates a new category of influential factors on business cycle synchronization (BCS), so far hardly regarded in the BCS literature: It provides an empirical assessment of the impact of macroeconomic imbalances, as monitored by the European Commission by the scoreboard indicators since 2011, on BCS in the Eurozone. We use a quarterly data set covering the period 2002-2012 and estimate the direct and indirect effects of macroeconomic imbalances in the pre- and post-crisis period in a simultaneous equations model. Business cycle correlation between EA members is measured by the recently proposed dynamic conditional correlation of Engle (2002) which can better identify synchronous and asynchronous behaviour of BC than the commonly used measures. We find that appearing differences between EA members in the current account, in government deficit and public debt, in private debt and unit labor cost developments have reduced BCS in the EA, even more in the post-crisis period than before. Moreover, these explanatory factors of BCS, generally reinforce each other and are also influenced by other critical macro imbalances. Since BCS is essential in a monetary union, this paper provides clear support that a stronger, common economic governance would be important for the functioning and survival of the Eurozone.

Keywords: Business cycle synchronization; Macroeconomic imbalances; Monetary union; Euro Area, Simultaneous equations model, Panel data

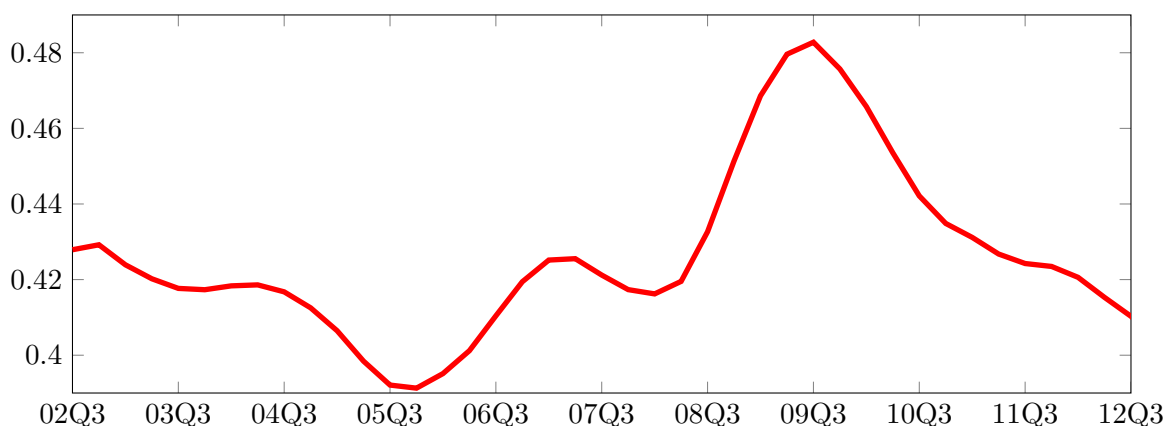
JEL codes: E32, E60, E61, F45, C33

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1 Introduction

Since the introduction of the Euro in 1999, the degree of business cycle synchronization (BCS) within the European Monetary Union (EMU) has varied substantially. EA business cycles exhibit a stronger co-movement in the economic downturn but drift apart in the upswing. According to Figure 1 which shows the correlation of business cycles in the EA, BCS was relatively high during the economic stagnation in 2002-2003 and even more during the latest global financial and economic crisis of 2008-2009. In contrast, business cycles in the EA decoupled each time in the period following these downturns. After 2002/03 the periphery countries experienced an extraordinary boom compared to the core countries. After the great economic crisis the set in of the recovery varied widely, with the core recovering faster than the periphery.

Figure 1: Development of business cycle correlation in the Euro Area



The importance of business cycle synchronisation for the smooth operation of a common currency area has been highlighted in the seminal works on optimum currency area (OCA) theory (see, Kenen, 1969; McKinnon, 1963; Mundell, 1961), as well as, in more recent contributions (see, for instance, Mundell, 1997; Frankel and Rose, 1998; Alesina et al., 2002). The decoupling of EA business cycles has raised concerns whether the European Monetary Union can function optimally (see, for instance, Kouparitsas, 1999; Agnello et al., 2013).

Macroeconomic imbalances are potentially important for business cycle synchronization. Arising imbalances in one country are likely to lead to different output development in the respective Euro country and thus to a decoupling in economic activity from the Eurozone. The European Union, aiming to establish an early warning mechanism when a crisis in one of its members builds up which could threaten the stability of the Euro, introduced the surveillance of macroeconomic imbalances with EU regulation 1176/2011 in November 2011.

This procedure assesses macroeconomic imbalances on the basis of the so-called scoreboard indicators which include: (i) the real effective exchange rate (which inside the Eurozone is equivalent to the inflation differential), (ii) the nominal unit labor cost, (iii) the export market share, (iv) the development of real housing prices, (v) the unemployment rate, (vi) the current account balance, (vii) the net international investment position, (viii) private sector credit flows and private debt and (ix) public sector debt.

Indicators (i) and (ii) relate to the development of a country's competitiveness. Its deterioration will reduce the export performance (indicator iii) which reduces output growth and leads to a deterioration of the current account balance (indicator vi). Persistent current account deficits need to be financed by international debt which worsens the international investment position (indicator vii) and can lead to a worsening of financing conditions. Indi-

cators (iv) and (v) reflect deviations of a country's economic activity from the group which makes a common monetary policy unsuitable for that country and may even aggravate it. Indicators (vii), (viii) and (ix) relate to the financial stability of a country. Excessive accumulation of debt in a EA member raise the interest level and may finally result in a debt crisis which would be followed by a serious fall in economic activity. In summary, the appearance of such macroeconomic imbalances in the Eurozone would indicate the risk that a EA member drifts apart from the rest in economic activity. The further short and medium consequence would be that BCS in the EA deteriorates.

How important are the phenomena addressed by the scoreboard indicators in fact for business cycle synchronization in the Eurozone? Do differences in competitiveness among Euro countries lead to current account imbalances and reduce BCS? To which extent do real estate booms in one country or excessive unemployment problems decouple a country from the Euro business cycle? To which extent does the accumulation of private or public debt in a Euro country reduce its BC co-movement? This paper wishes to propose answers to these important issues.

While the existing literature on BCS in the Eurozone has emphasized the contribution of trade relations (Akin, 2012; Déés and Zorell, 2012; Duval et al., 2014; Imbs, 2004; Siedschlag and Tondl, 2011), elimination of exchange rate fluctuation (Akin, 2012; Bőwer and Guillemineau, 2006; Duarte et al., 2007), financial integration (Akin, 2012; Herrero and Ruiz, 2008; Kalemlı-Ozcan et al., 2013), sector specialization (Imbs, 2004; Herrero and Ruiz, 2008; Siedschlag and Tondl, 2011; Akin, 2012; Déés and Zorell, 2012) and differentials in public sector deficits (Frankel and Rose, 1998; Clark and van Wincoop, 2001; Darvas et al., 2005; Antonakakis and Tondl, 2014), hardly any of the existing studies, to our best knowledge, has addressed the importance of the full set of macroeconomic imbalances as addressed by the macroeconomic imbalance procedure (MIP) scoreboard indicators.¹

We evaluate the effect of macroeconomic imbalances in a EA member and the consequently arising imbalances across members in a model of simultaneous equations following Imbs (2004) and Antonakakis and Tondl (2014). The model will focus on the effects on BCS arising from the phenomena of (i) competitiveness and current account imbalances, (ii) imbalances in fiscal deficits and public/private debt, (iii) imbalances in wage development, and (iv) decoupling (as shown by housing prices and unemployment). Knowing about the role of these phenomena on BCS will permit to judge the potential of the surveillance of macroeconomic imbalances to prevent decoupling of business cycles in the Eurozone. If we can detect a strong impact of the scoreboard indicators, we will have supportive evidence for strengthening the role of the EU in economic governance. The simultaneous equations model will permit us to account for reverse causality between imbalances and BC correlation as well as for endogeneity between macroeconomic imbalances indicators. In this way we will see the direct and indirect effect of a scoreboard indicator on BCS. We will be able to understand the transmission channels of such imbalances.

The investigation will cover the period 2002 - 2012 and distinguish further between the pre-crisis period until the end of 2007 and the recession- and post-crisis period from 2008-2012 accounting for the changing pattern of relationships between these distinct periods. To measure BCS we will use the dynamic conditional correlation (Engle, 2002) proposed recently in the BC literature (Antonakakis, 2012; Siklos, 2012). This approach takes into account both time variation and conditional heterogeneity in business cycles correlations, and thus has several advantages. First, it is able to identify negative correlations due to episodes in single periods, synchronous behavior during stable periods and asynchronous behavior in turbulent periods. Unlike rolling windows, the proposed measure does not suffer

¹Exceptions are the studies of Inklaar et al. (2008) and Siklos (2012) that consider business cycle synchronization determinants similar to some of the scoreboard indicators.

from the so-called ghost feature, as the effects of a shock are not reflected in m consecutive periods, with m being the window span. In addition, under the proposed measure there is neither a need to set a window span, nor a loss of observations, nor is subsample estimation required.

We find in our estimations that imbalances across EA members in current account balance, in government deficit, in public and private debt, and in the development of unit labor costs have a decoupling effect on BCS in the EA which increased in the post-crisis period. Moreover, these explanatory factors of BCS are mostly interlinked with each other in such a way that they reinforce each other. Therefore, the Eurozone is advised to establish a political, institutional framework that guarantees that in the key areas addressed by the scoreboard indicators its members follow highly coordinated economic policies, guided by common economic policy goals. Even more, our study provides clear support that the establishment of strong, common economic governance in the Eurozone is imperative for the functioning and survival of the European Monetary Union. However, in our estimations we also find that there exists generally endogeneity between the regarded key scoreboard indicators and BCS. If a coordinated economic governance in the Eurozone succeeds to achieve stronger BCS this would subsequently make it more easy for EA members to agree on common economic policies.

The rest of the paper is organized as follows. Section 2 presents the main hypotheses, discusses empirical developments and relates to the existing literature. Section 3 presents the model specification for the empirical estimation, section 4 the data set and employed measures, section 5 the results. Section 6 concludes.

2 Main Hypotheses, Empirical Developments and Relation to Existing Literature

In this section, we set out our main hypotheses concerning the role of macroeconomic imbalances between member states as determinants of business cycle (de-)synchronization in the Euro Area and relate them to the existing literature. This discussion, is supplemented by a short description of the actual developments of these determinants observed in our data set.

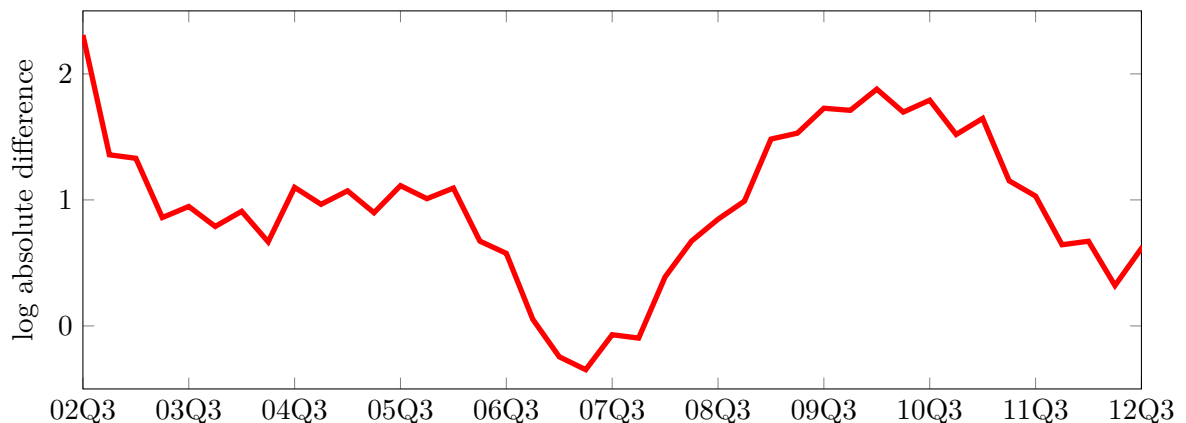
Hypothesis 1: *Differences in current account balances between member states lead to lower BCS in the Euro Area.*

Disparities in the current account balance across countries refer to a situation where, e.g., one country experiences a trade surplus and the other a trade deficit, or, where one country experiences a large trade surplus and the other a small trade surplus. In such cases, business cycles between these countries will decouple due to the fact that, e.g., the heavy exporter country would enjoy additional domestic growth from export demand, while the high import bill of the net importer will lead to lower domestic demand and thus lower economic growth. However, the reason behind current account imbalances leading to lower BCS is not only linked to demand effects. Current account imbalances could also lead to business cycle de-synchronization through their effect on the net foreign investment position.

For instance, if a country registers a steady current account deficit this will raise its international debt. This could lead to unsustainable foreign borrowing that raises borrowing costs as lenders perceive that the risk of a debt default increases. The increasing financing costs would dampen private investment and make government financing overly costly so that fiscal adjustment will occur. This in turn will produce a contractive effect in the country concerned and decouple it from the EA BC. Consequently, we see that current account differences across EA members can threaten BCS via demand effects and financing effects. Since this question has not yet been investigated in the literature our investigation will provide

a first contribution on this issue. According to Figure 2, we can observe that differences in current account positions across EA members have developed rather heterogeneously over time. While the differential declined in successive steps since the euro came into circulation, it followed a sharp increasing trend on the eve of the global financial crisis before starting to decline again in 2010. The reason is that in the first half of the 2000s, current account deficits improved in the EA periphery, but deteriorated slightly in some core members. On the eve of the financial crisis, in contrast, current account deficits grew again in the EA periphery while some core members, for example Germany, the Netherlands and Austria continuously built up a current account surplus.

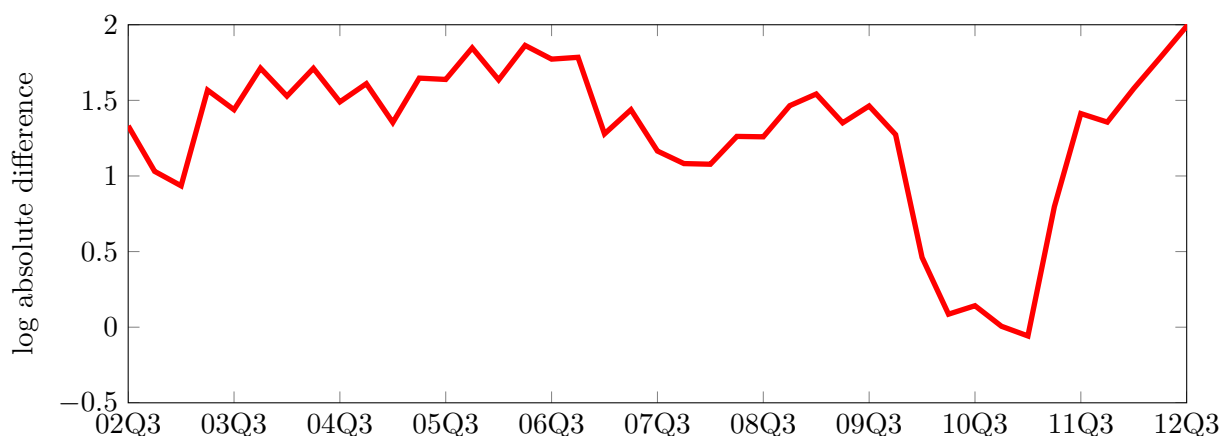
Figure 2: Development of differences in current account balance in the Euro Area (average absolute difference between countries)



Hypothesis 2: *Differences in fiscal deficits between EA member states can either reduce or strengthen their BCS.*

Differences in fiscal deficits (the indicator is derived from countries primary government deficits) have been constantly pronounced in the EA since a part of the members always followed a more expansionary fiscal policy while others a more conservative. Only during the sovereign debt crisis 2009/10 differences in fiscal deficits shortly dropped when all EA members broke the excessive deficit rule and consequently had to consolidate their budgets (see Figure 3). A country incurring a fiscal deficit will show higher government expenditures than a country with a balanced budget. The extra government expenditures in the deficit country will generate demand and consequently extra income growth. Thus, countries with higher deficits will generate higher domestic output growth. Therefore, differences in fiscal policies, either if one country has a high fiscal deficit while the other a modest, or if one country has a fiscal surplus while the other a deficit, should reduce BCS. However, one has to consider a second possibility. Since an active fiscal policy could also help to smooth business cycles, i.e. neutralize a country-specific shock, differences in fiscal deficits could also enhance BCS. Most of the empirical literature finds a decoupling effect of diverging fiscal policies (see, for instance, Clark and van Wincoop, 2001; Darvas et al., 2005; Crespo-Cuaresma et al., 2011; Antonakakis and Tondl, 2014).

Figure 3: Development of differences in government deficits in the Euro Area
(average absolute difference between countries)

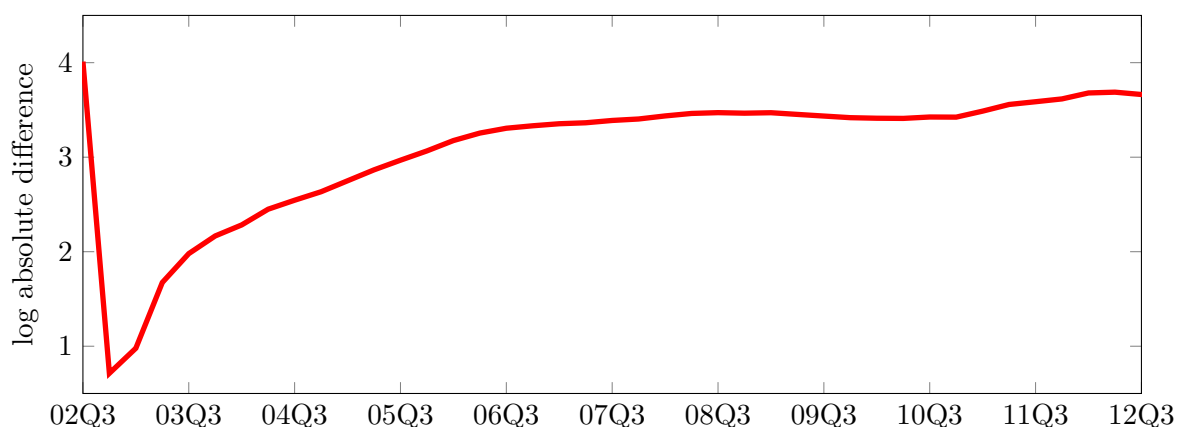


Hypothesis 3: *Differences in public debt levels between EA members produce decoupling effects on BCS.*

Public debt differences have significantly increased in the EA in the pre-crisis period and have grown slightly further in the crisis period (see Figure 4). Might this development threaten BCS in the EA? First, disparities in public debt levels reflect differences in past fiscal policies, but also different financing costs of debt. In the sense that the rapid accumulation of public debt in an economy indicates highly expansionary fiscal policies that result in high output growth in successive periods, mounting differences in government debt levels in the EA should also be visible in output growth differences across the EA and thus reduced BCS. Second, since excessive public debt levels will result in financial stress and soaring credit costs, the resulting unsustainability and necessary efforts for budgetary consolidation would reduce output in the respective country. Thus differences in public debt in the EA would entail different needs for budgetary consolidation with different consequences on output and finally result in less BCS. In the case of common budgetary consolidation — irrelevant of the debt level — however, all economies would suffer a decline of output, manifesting in high BCS. Third, high debt levels limit the ability for pro-active fiscal policies so that recessions in high debt countries will be more severe (Checherita and Rother, 2012) and lead to less BCS. Unlike the effects of divergence in government deficits on BCS, the long term effects of public debt on BCS have practically not been evaluated in the literature.²

²Only Darvas et al. (2005) report to use public debt in a sensitivity analysis to confirm the negative coefficient of budget deficit on BCS.

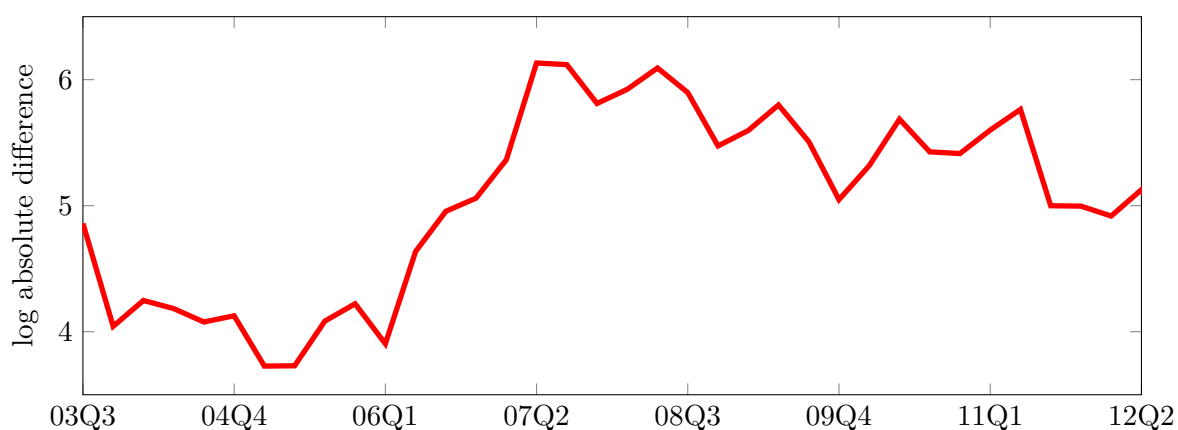
Figure 4: Development of differences in government debt in the Euro Area
(average absolute difference between countries)



Hypothesis 4: *Differences in private debt levels in the EA lead to a divergence of BCS.*

Private sector debt differences have importantly increased in the pre-crisis period in the EA (see Figure 5). The accumulation of private debt in a country enables higher private demand expenditures and higher output growth in an initial period. Thus differences in private debt accumulation in the EA should manifest in different growth performance and reduced BCS. In a second stage, private debt levels may become unsustainable, as it happened during the financial crisis. In economies with high private debt, insolvencies would increase, leading to income loss, sudden drop in demand and contracting output. Particularly in recession periods, the drop in output would be higher in countries with high private debt (Randveer et al., 2012). Consequently, it can be assumed that differences in private sector debt should have led to different output growth in the EU and to reduced BCS.

Figure 5: Development of differences in private sector debt in the Euro Area
(average absolute difference between countries)

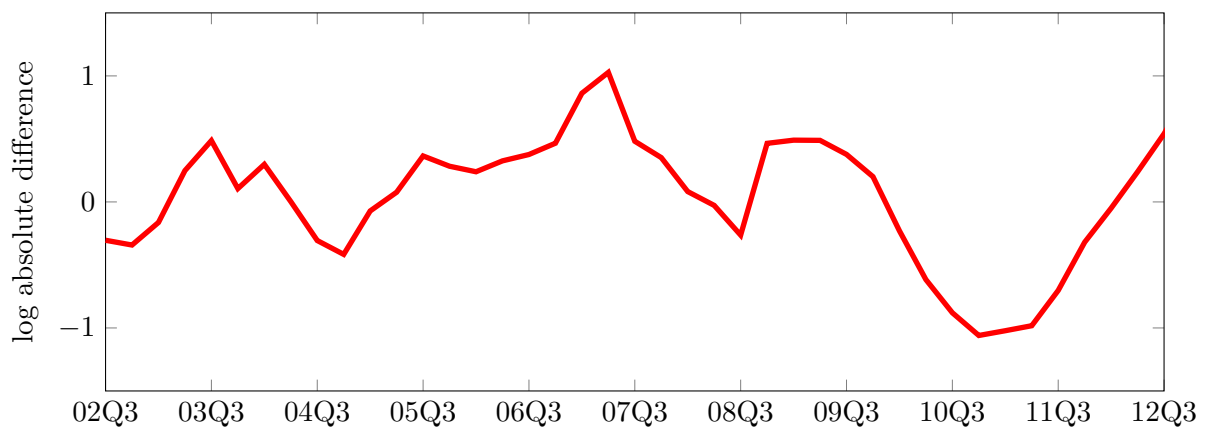


Hypothesis 5: *Different developments in wages between EA members can improve or reduce BCS.*

Different wage developments will arise due to different output situations of economies and will constitute an adjustment instrument, so that economies in a boom will watch an increase of wages that slows down growth, and economies in a recession will watch a modest

development of wages so that they will be able to recover in output growth. Thus different wage developments may serve BCS. However, excessive wage demands or undue wage restrictions in a country and the ensuing immediate demand effects can lead to overheating of the concerned economy and result in a reduction of BCS (Gächter et al., 2016). Since there are no complete statistics on quarterly wage developments we focus on real unit labor cost developments as a proxy. Real unit labor cost developments have seen mainly periods of dissimilarity in the EA, interrupted by a short period of more similar developments during the debt crisis (see Figure 6), as pointed out also in Estrada et al. (2013) and Felipe and Kumar (2014). We will test whether different unit labor cost developments improve or reduce BCS which hardly has been investigated in the literature, with the recent exception of Gächter et al. (2016).

Figure 6: Differences in growth of labor unit costs in the Euro Area
(average absolute difference between countries)



Besides the impact of the scoreboard indicators: current account, government deficit, public debt, private debt and unit labor cost development, we will test the impact of additional indicators of the scoreboard list within the auxiliary equations of our model and present conjectures on their effect in the discussion of the model in the next section.

3 Model Specification

We build on Imbs (2004) and follow Antonakakis and Tondl (2014) and estimate a system of simultaneous equations based on a panel data set which, however, is far more complex than that in previous studies. The bilateral correlation of business cycles is explained by five variables which are all considered to be endogenous, so that each is modeled within the system separately. In this way we can examine a variety of diverse indirect effects, that have been so far overlooked in the literature. Since each variable is itself explained by two to five other endogenous variables plus exogenous variables, in this complexity, the variables are very well defined. This is confirmed by a high explanatory power of the estimations, as we shall see below.

We estimate the proposed effects in the following simultaneous equations model based on a quarterly panel data set for EA 12 in the period 2002 to 2012.

$$2COR_{ijt} = \alpha_0 + \alpha_1 CA_{ijt} + \alpha_2 GOVDEF_{ijt} + \alpha_3 GOVDEBT_{ijt} + \alpha_4 PRIVDEBT_{ijt} + \alpha_5 \Delta LUNIT_{ijt} + \mu_{1ij} + \lambda_{1t} + \varepsilon_{1ijt} \quad (1)$$

$$CA_{ijt} = \beta_0 + \beta_1 COR_{ijt} + \beta_2 GOVDEF_{ijt} + \beta_3 \Delta LUNIT_{ijt} + \beta_4 \Delta EXRATE_{ijt} + \beta_5 CONSTR_{ijt} + \beta_6 CONSUM_{ijt} + \mu_{2ij} + \lambda_{2t} + \varepsilon_{2ijt} \quad (2)$$

$$GOVDEF_{ijt} = \gamma_0 + \gamma_1 GOVDEF_PAST1_{ijt} + \gamma_2 COR_{ijt} + \gamma_3 POLIDEO_{ijt} + \gamma_4 POLBC_{ijt} + \gamma_5 INFL_{ijt} + \gamma_6 \Delta UNEMPL_{ijt} + \gamma_7 TAX_{ijt} + \gamma_8 PRIVDEBT_{ijt} + \mu_{3ij} + \lambda_{3t} + \varepsilon_{3ijt} \quad (3)$$

$$GOVDEBT_{ijt} = \delta_0 + \delta_1 COR_{ijt} + \delta_2 NETLEND_PAST3_{ijt} + \delta_3 BONDRATE_{ijt} + \delta_4 PRIVDEBT_{ijt} + \mu_{4ij} + \lambda_{4t} + \varepsilon_{4ijt} \quad (4)$$

$$PRIVDEBT_{ijt} = \eta_0 + \eta_1 BONDRATE_{ijt} + \eta_2 INV_PAST2_{ijt} + \mu_{5ij} + \lambda_{5t} + \varepsilon_{5ijt} \quad (5)$$

$$LUNIT_{ijt} = \zeta_0 + \zeta_1 CA_{ijt} + \zeta_2 COR_{ijt} + \zeta_3 \Delta UNEMPL_{ijt} + \zeta_4 \Delta TOT_L2_{ijt} + \zeta_5 \Delta HOUSEPRICE_{ijt} + \mu_{6ij} + \lambda_{6t} + \varepsilon_{6ijt} \quad (6)$$

where i, j and t are the index country pairs (i, j) in period t , and ε is the error term. Each equation includes a set of exogenous control variables employed in the system to achieve identification and to minimize any potential omitted variables bias. μ_{kij} and λ_{kt} , where $k = 1, \dots, 5$, are the country-pair fixed effects and time fixed effects, respectively.³

In the principal equation, Equation (1), COR_{ijt} is a dynamic conditional correlation measure of business cycles⁴ between country i and j . The indicator will be explained in detail in Section 4. CA_{ijt} denotes the current account deficit differential between a country pair. $GOVDEF_{ijt}$ is the primary deficit differential between two countries and can be seen as an indicator of fiscal policy coordination. $GOVDEBT_{ijt}$ is the government debt differential between two countries. $\Delta LUNIT_{ijt}$ refers to the differential of the change in real unit labor costs and $PRIVDEBT_{ijt}$ is the private debt differential.

In addition to the principal equation, Equation (1), the system consists of five auxiliary equations which capture the simultaneity contained in Equation (1).

In Equation (2), the current account differential between a country pair is explained by COR , the dynamic conditional correlation of business cycles, $GOVDEF$, the fiscal deficit differential, $\Delta LUNIT$, the differential of changes in real unit labor cost, and a set of exogenous variables, among them, the differential of the change in real effective exchange rate, $\Delta EXRATE$, the differential of the share of construction in gross value added, $CONSTR$, and the consumption propensity differential, $CONSUM$. This should permit us to find out what are the causes of large differences in current account balances between EA countries. We would expect the higher the differences are in COR , in fiscal spending, in unit labor cost developments, in real exchange rate developments, in the share of construction and in consumption propensity, the higher should be current account differentials between these countries. On the contrary, if countries have similar real exchange rate developments or fiscal deficits then we expect them to exhibit small differences in current account balances. Why?

³For the system to be identified it is necessary that for each endogenous variable in an equation, an equal number of exogenous variables, differently from the exogenous used in another equation, is present. Thus each equation requires a different set of exogenous variables (Wooldridge, 2006).

⁴The measure is taken from Engle (2002).

Differences in the current account balance sheet should reflect different fiscal policies since there is a direct relation between current account deficit and fiscal deficit accumulation as the increased fiscal expenditures will increase imports and worsen the current account (Herrmann and Jochem, 2005; Trachanas and Katrakilidis, 2013). Differences in the development of real exchange rates and real unit labor costs lead to different levels of competitiveness between countries and thus different export performance. This point was raised in the literature by Estrada et al. (2013) who find that the accumulation of current account deficits is linked to unit labor cost developments and Herrmann and Jochem (2005) and Brissimis et al. (2012) who verify a negative effect of exchange rates movements on the current account balance. Countries with a high consumption propensity and a large construction sector would have a higher import share (Gehring, 2013). Thus differences in consumption and construction share should result in current account differences among EA members.

Equation (3) explains differences in primary fiscal deficits, $GOVDEF$,⁵ between country pairs using past primary fiscal deficit differentials (average over the previous year), $GOVDEF_PAST1$, differences in economic growth, COR , and a set of exogenous variables. Among them is the differential of an index of political ideology between two countries, POL_IDEO , the differential in the political business cycles (measured by the number of quarters to the next election), POL_BC , the inflation differential, $INFL$, the differential between two countries in the change in unemployment rate, $\Delta UNEMPL$, the differential of the share of income taxes in GDP, TAX , and the differential of the share of private debt in GDP, $PRIVDEBT$. This should permit us to examine whether large differences in past fiscal deficits among two countries entail large present fiscal deficit differences among them as well as whether similarities in business cycles lead to similar fiscal deficit patterns. We further hypothesize that differences in fiscal deficits co-move with the exogenous variables. Fiscal spending can be assumed to be influenced by the political ideology, with conservative governments being more opposed to deficits, and by the political business cycle, with expenditures increasing before elections. Differences in the two indicators between two countries thus can be expected to result in divergent fiscal policies and differences in government deficits. Institutional determinants of fiscal deficits have been previously investigated by Bayar and Smeets (2009) and Agnello et al. (2013). High unemployment levels would increase the need for social spendings and, hence, increase the deficit (Bayar and Smeets, 2009). Different developments in unemployment should therefore result in differences of fiscal deficits. Similarly, differences in tax revenues should increase differences in fiscal deficits. Differences in inflation rates can result in differences of deficit accumulation rates and, as an outcome, in divergence of the deficit differential. In summary, an increasing differential in these variables would increase the deficit differential in the EA.

Equation (4) explains differences in government debt between country pairs, $GOVDEBT$, by developments in business cycles correlation, COR , and a set of exogenous variables, among them the differences in average net lending over the past three years, $NETLEND_PAST3$, in the government bond rate, $BONDRATE$, and in the share of private debt in GDP, $PRIVDEBT$. We assume that the less synchronized business cycles are between country pairs, the further away are their government debt levels. Countries in a recession have higher expenditures and thus accumulate more debt (Sinha et al., 2011). Less BCS should therefore increase debt differentials with low growth countries accumulating debt and high growth countries decreasing debt. However, there might also be the possibility of a positive relation between BCS and government debt. Due to differences in fiscal policy implementation styles among governments, countries with rather de-synchronized business cycles can still experience similar debt levels. Or despite synchronized business cycles, countries

⁵Our variable is derived from primary fiscal deficits since this is the most direct measure of present fiscal policy and thus clearly has to be preferred to government net lending which would include interest payments.

might show very dissimilar debt levels because of different interest burdens. Big differences in past fiscal deficits should lead to different levels of debt accumulation and thus high present differences in public debt. Since high interest levels would further increase debt, differences in long term government bond rates should result in higher differences in government debts.

Equation (5) refers to private debt and proposes that differences in the private debt level arise from different business cycles, *COR*, from differences in past investment behavior, i.e. differences in the average investment rate over the past 2 year *INV_PAST2*, and differences in long-term interest rates, *BONDRATE*. When two countries show a similar investment behaviour in the past, they are expected to have little differences in private debt accumulation. Furthermore, when countries face similar long-term interest rates, they are also likely to show similar patterns of private debt accumulation.

Equation (6) posits that differences in the change of real unit labor costs, $\Delta LUNIT$, are explained by business cycle correlation, *COR*, current account differentials, *CA*, and exogenous variables, among them, the differential of the change in unemployment, $\Delta UNEMPL$, differences in the change of the terms of trade over the past 2 years, ΔTOT_L2 , and differences in the change of housing prices, *HOUSEPRICE*. We postulate a positive relation between these variables. The position in the business cycle influences wage bargaining, with real wages increasing during booms and dropping during recessions. Less BCS should therefore be accompanied by big differences in unit labor cost developments. Empirically, so far, the pro-cyclicality of real wages has not been generally confirmed (see Messina et al., 2009). Differences in the current account position in the EA indicate that countries are exposed to a different extent to competitive pressure. Export-oriented countries might watch their unit labor cost development more cautionary. Different unemployment levels in the EA would put trade unions in a quite different wage bargaining position. With low/high unemployment, changes in wages are supposed to be higher/lower (Dvorkin and Shell, 2015). Unemployment differentials should thus entail different changes in unit labor costs. Differences in inflationary development, captured by the housing prices and terms of trade should translate into increasing wage differentials in the EA since an increase in the housing price or in import prices would lead to higher wage demands.

As it is often unrealistic to expect the equation errors in our system to be uncorrelated, we employ a seemingly unrelated regression (SUR) system approach proposed by Zellner (1962). The SUR model is estimated using the feasible generalized least squares (FGLS) method, which is essentially a two-step procedure; in the first step we estimate the parameters of our system by ordinary least squares, and use the residuals obtained from this step to estimate the disturbance terms' variances and covariances in the second step.

4 Data

Our data set has a quarterly frequency (in some cases quarterly data is calculated from monthly data). The sample covers 12 Euro Area countries.⁶ The time spans from 2002Q2 to 2012Q4. Additionally we use samples of 3 periods: the full sample which covers the whole time span, the pre-crisis sample which covers the period before the Great Recession (2002Q2 - 2007Q4) and the crisis and post-crisis sample which refers to the years since the Great Recession (2008Q1 - 2012Q4). This results in 66 bilateral pairs for each variable across 43 time periods in total.

As a measure of business cycle correlations we employ a method proposed by Engle (2002) - the dynamic conditional correlation method.⁷ This model is from a class of multi-

⁶These are the 11 initial Euro members Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and Greece which adopted the Euro in 2001

⁷We are indebted to Nikolaos Antonakakis for support in computing business cycle correlations.

variate Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) models and it is capable of estimating large time-varying covariance matrices (Engle and Sheppard, 2001). It combines the flexibility of GARCH models (the correlation matrix is time-varying) but is easy to estimate using a 2-step procedure.

As an input we take monthly data of the industrial production index (IPI). Let us suppose that the demeaned IPI is normally distributed with covariance matrix H_t or

$$\overline{IPI}_t \sim \mathbb{N}(0, H_t)$$

and

$$H_t = D_t R_t D_t$$

where D_t is the k by k diagonal matrix of time varying standard deviations from univariate GARCH models with $\sqrt{h_{it}}$ on the i th diagonal, and R_t is the time-varying correlation matrix (Engle and Sheppard, 2001).

Elements of D_t are assumed to follow a univariate GARCH(p,q) model process so that:

$$h_{it} = \omega_i + \sum_{p=1}^{P_i} \alpha_{ip} \overline{IPI}_{it-p}^2 + \sum_{q=1}^{Q-i} \beta_{iq} h_{it-p} \quad (7)$$

with $i_{1..k}$, i is running from 1 to k .

The resulting dynamic conditional correlation structure is the following:

$$Q_t = (1 - \sum_{m=1}^M \alpha_m - \sum_{n=1}^N \beta_n) \bar{Q} + \sum_{m=1}^M \alpha_m (\epsilon_{t-m} \epsilon'_{t-m}) + \sum_{n=1}^N \beta_n Q_{t-n} \quad (8)$$

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1}, \quad (9)$$

where R is time-varying correlation matrix, $\epsilon_t = D_t^{-1} \overline{IPI}_t$, \bar{Q} is the unconditional covariance of the standardized residuals from the first estimation step and

$$Q_t^* = \begin{bmatrix} \sqrt{q_{11}} & 0 & \dots & 0 \\ 0 & \sqrt{q_{22}} & \dots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \dots & \sqrt{q_{kk}} \end{bmatrix}$$

is a diagonal matrix with square root of elements of Q_t on its diagonal. In this way the correlation matrix R_t is composed of elements of the form: $\rho_{ijt} = \frac{q_{ijt}}{\sqrt{q_{iit}q_{jjt}}}$.

Importantly, this method accounts for short-term developments in our monthly data of the industrial production index used to calculate business cycle correlations.

The definition of variables of the complete data set, how it is calculated, its input indicator and the sources of it are given in Table I in the Appendix.

The time series for explanatory variables undergo a two-step transformation. In the first step, in order to make valid conclusions when comparing performances of macroeconomic indicators across EA countries all initial data series are transformed as:

- a percentage of a country's GDP level to account for differences in the countries' size and population, e.g. $CONSUM_{it} = \frac{\text{Consumption expenditures of country } i \text{ at time } t}{\text{GDP of country } i \text{ at time } t}$, or

- a year to year change (in case of indexes), e.g. $\Delta LUNIT_{it} = (LUNIT_{it}/LUNIT_{it-4} - 1) * 100$.

The political ideology and political business cycle variables are taken without transformation in days/quarters respectively. A description of each constructed variable is presented in Table I.

As a second step we construct bilateral coefficients by using the log of the absolute difference between country pairs. The resulting variables are of the form:

$$VAR_{ijt} = \log | VAR_{it} - VAR_{jt} |$$

In this way we only consider mutual dynamics of variables between a country pair. When there is no difference of values between countries (or this difference is negligibly small) we assign a zero value to such observation.

Lastly, we apply a 5-periods overlapping rolling windows transformation on the final variables. We construct an average over two preceding observations, current position of the variable and its two periods ahead values. In this way we lose only few observations and it helps to smooth overly fluctuations arising sometimes from different seasonality patterns in countries.

To sum up, one has to remember that the variables are constructed as differentials between countries. In this respect a positive effect of variable 1 on variable 2 means that the further away are the observations underlying variable 1 between two countries (large absolute value of their differential) the higher is the differential expressed in variable 2. For example, a positive coefficient of the variable *UNEMPL* in the *GOVDEF* equation would mean, the more unequal are changes in unemployment, the more different is the government deficit between two countries. In contrast, a negative effect of variable 1 on variable 2 means, the higher is the difference of the indicator underlying variable 1 between the two countries, the lower is the difference expressed in variable 2. For example, a negative coefficient of *GOVDEF* in the *COR* equation would mean that big differences in government deficit between a country pair result in a low correlation of business cycles.

5 Results

The results of our estimations are presented in Table 1. The table reports the estimations for the full sample period 2002Q2-2012Q4 and separately for the pre-crisis period 2002Q2-2007Q4 and for the crisis/post-crisis period 2008Q1-2012Q4 to which we refer as "post-crisis period". For the post-crisis period, a second estimation has been performed including private debt (for which no complete time series is available for the first period).

In all samples, differences in CA balance, in the change in unit labor cost and in fiscal deficit show a negative relationship with BCS. Differences in government debt reveal a negative relation with BCS in the pre-crisis period, but a positive in the post-crisis period and over the whole sample period. Differences in private debt show a negative relation with BCS. The estimations show a high explanatory power — which is equally found in the auxiliary estimated equations of the system — with an R^2 of 0.73-0.79.

Differences in primary government deficits, i.e. differences in fiscal policy, have an immediate decoupling effect on BC. This effect is almost twice as high in the post-crisis period than in the pre-crisis period. In contrast, the consequence of government debt on BCS is not consistent. In the pre-crisis period, where the estimates reveal a negative effect, we are in a period when some countries accumulated debt more quickly than others due to persistent expansionary policies. Those permitted higher growth in these countries with the consequence

Table 1: Estimation results

	Full sample	Pre-crisis	Post-crisis	Post-crisis incl. PRIVDEBT
COR equation				
<i>CA</i>	-0.0103*** (0.0029)	-0.0138*** (0.0043)	-0.0221*** (0.0026)	-0.0219*** (0.0027)
<i>GOVDEF</i>	-0.0215*** (0.0028)	-0.0138*** (0.0039)	-0.0238*** (0.0027)	-0.0169*** (0.0028)
<i>GOVDEBT</i>	0.0135*** (0.0026)	-0.0429*** (0.0045)	0.0075*** (0.0023)	0.0139*** (0.0024)
<i>PRIVDEBT</i>				-0.0106*** (0.0011)
$\Delta LUNIT$	-0.0247*** (0.0025)	-0.0129*** (0.0031)	-0.0238*** (0.0024)	-0.0190*** (0.0025)
R^2	0.7512	0.7988	0.7351	0.7432
CA equation				
<i>COR</i>	-0.3960*** (0.1248)	-0.2580 (0.1569)	-1.1005*** (0.1274)	-1.0221*** (0.1318)
<i>GOVDEF</i>	0.0035 (0.0180)	0.0389* (0.0236)	0.0001 (0.0185)	-0.0213 (0.0192)
$\Delta LUNIT$	-0.0491*** (0.0163)	0.1945*** (0.0182)	-0.2067*** (0.0162)	-0.2608*** (0.0165)
$\Delta EXRATE$	0.0749*** (0.0138)	0.0270* (0.0151)	0.0642*** (0.0139)	0.0961*** (0.0145)
<i>CONSTR</i>	0.0733*** (0.0170)	0.1234*** (0.0240)	0.0511*** (0.0150)	0.0349** (0.0145)
<i>CONSUM</i>	0.2615*** (0.0227)	0.1011*** (0.0375)	0.3116*** (0.0226)	0.2928*** (0.0234)
R^2	0.7044	0.8115	0.6413	0.6570
GOVDEF equation				
<i>GOVDEF_PAST1</i>	0.2108*** (0.0104)	0.1016*** (0.0159)	0.2068*** (0.0099)	0.2011*** (0.0104)
<i>COR</i>	-0.9777*** (0.1211)	-0.8804*** (0.1669)	-1.0642*** (0.1144)	-0.6836*** (0.1206)
<i>POL_IDEO</i>	0.0137 (0.0106)	0.0477*** (0.0138)	0.0206** (0.0101)	0.0056 (0.0106)
<i>POL_BC</i>	-0.0005 (0.0094)	0.0252* (0.0151)	-0.0102 (0.0090)	-0.0221** (0.0093)
<i>INFL</i>	0.0626*** (0.0129)	0.0355** (0.0176)	0.0846*** (0.0125)	0.1096*** (0.0132)
$\Delta UNEMPL$	0.0644*** (0.0113)	0.0833*** (0.0157)	0.0588*** (0.0111)	0.0323*** (0.0119)
<i>TAX</i>	0.1079*** (0.0239)	0.1776*** (0.0293)	0.1059*** (0.0226)	0.1007*** (0.0237)
<i>PRIVDEBT</i>				0.0386*** (0.0074)
R^2	0.5466	0.6027	0.5226	0.5449
GOVDEBT equation				
<i>COR</i>	0.7477*** (0.1429)	-1.6963*** (0.1486)	0.5360*** (0.1444)	0.9382*** (0.1537)
<i>NETLEND_PAST3</i>	0.0713*** (0.0155)	0.1339*** (0.0191)	0.0628*** (0.0153)	0.0635*** (0.0159)
<i>BONDRATE</i>	0.0283*** (0.0104)	0.0327** (0.0129)	0.0422*** (0.0106)	0.0466*** (0.0110)
<i>PRIVDEBT</i>				-0.0221*** (0.0091)
R^2	0.7595	0.9064	0.7114	0.7117
PRIVDEBT equation				
<i>COR</i>				-3.1352*** (0.3219)
<i>BONDRATE</i>				0.1727*** (0.0227)
<i>INV_PAST2</i>				0.1161*** (0.0375)
R^2				0.6796
$\Delta LUNIT$ equation				
<i>COR</i>	-1.4555*** (0.1463)	-1.0558*** (0.2178)	-1.5279*** (0.1426)	-1.4234*** (0.1509)
<i>CA</i>	-0.0737*** (0.0225)	0.3900*** (0.0359)	-0.2573*** (0.0200)	-0.3292*** (0.0211)
$\Delta UNEMPL$	0.0566*** (0.0138)	0.0023 (0.0206)	0.0406*** (0.0137)	0.0354** (0.0144)
ΔTOT_L2	0.0333** (0.0178)	0.0769*** (0.0253)		
$\Delta HOUSEPRICE$	0.0074 (0.0169)		0.0486*** (0.0164)	0.0575*** (0.0172)
R^2	0.5001	0.4766	0.4739	0.477

All estimations with country pair specific and time specific effects
 * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

of a desynchronization of BC. In the post-crisis period where the coefficient of debt becomes positive, EA countries have entered a period where debt levels in all countries had risen, although to a different extent, and practically all countries were violating the Maastricht public debt criteria. Consequently, EA countries were simultaneously consolidating their budgets. Growth in all countries was dampened. Therefore we find a positive coefficient in the case of these mounting debt differences on BCS.⁸ Our result confirms the findings of Caporale and Girardi (2013).

In summary, before a certain debt threshold, higher debts bring countries on a higher growth track and result in BC decoupling. When debt levels become unsustainable, a concerted effort of fiscal adjustment would not reduce BCS.

The negative effect of differences of current account balances, which have prevailed at most dates in the 2000s across EA members, plays an equally high negative role for BCS as divergent fiscal policies. In the post-crisis period this negative effect becomes even higher. We consider this as an evidence that differences in export performance across EA members lead to a different growth development and produce a decoupling of BC.

Divergent developments in real unit labor costs are an important factor behind BC decoupling which - again - has become even more important in the post-crisis period. We interpret this as evidence that different wage developments primarily produce demand effects. Excessive increases in real wages would surge output while declining wages cut demand and result in output losses. This result is in line with the recent findings of Gächter et al. (2016).

Finally, the estimates indicate that different rates of private debt in EA countries reduce BCS. The big differences that have built up during the credit boom in the periphery countries have remained until 2010. We find our hypothesis of decoupling effects on BC of private debt differences confirmed and ascribe this effect to the substantial demand and output effects that have resulted from the credit boom in the periphery. As countries with high private debt levels were seriously hit by the financial crisis, they watched a more substantial decline in demand and output in the Great Crisis than the less indebted countries.

Besides these direct effects of differences in current account balances, in fiscal policy, in debt and in unit labor cost developments on BCS, our estimates show also (i) how these factors affect indirectly BCS via another endogenous variable, and furthermore, (ii) the estimates indicate a number of other factors which determine the key explanatory variables. Both is captured in the auxiliary equation of *COR*, *GOVDEF*, *GOVDEBT*, *PRIVDEBT* and *ΔLUNIT*.

In the auxiliary equation explaining CA differences, we find a significant negative coefficient of output correlation, *COR*, and significant positive coefficients for differences in exchange rate developments, differences in unit labor cost developments (only pre-crisis period), different shares of the construction sector and different consumption propensity, and different government deficits (in the pre-crisis period).

The estimates indicate that CA differences in the EA are determined by different developments in competitiveness, resulting from the uneven development of the real effective exchange rate — which can be largely attributed to different inflation development since for intra-EU trade the nominal exchange rate is the same for all EA members — and of unit labor costs. Different developments of unit labor costs are, however, only responsible for spreads in CA balances in the pre-crisis period. The positive coefficient in the post-crisis sample suggests that the reduction of unit labor cost differentials in the immediate crisis period could not prevent an increase in CA differences in the Eurozone. The decrease in the unit labor cost differential per se did not result in smaller current account differences among member states. Lower unit labor costs need to be passed to price reductions — as the

⁸Similarly, Cecchetti et al. (2011) finds that the growth effect of government debts turns from positive into negative after a certain threshold is reached.

positive real exchange rate coefficient shows — in order to improve the current account. The estimation of the current account equation nicely shows how the scoreboard indicators are interrelated. Our estimates provide evidence that the indicators wage and price development are important for explaining the current account position. A more uniform development of wages and inflation rates would assure that disparities in the current account balance between EA members diminish.

The different size of the construction sector in the EA generates differences in CA. Economies with a large construction sector depend more heavily on imports and show a lower share of export industries.

Differences in consumption propensity in the EA, which for example is much higher in Southern EA countries such as Greece and Portugal, lead to CA differences.

Differences in government deficits among EA members contributed to current account differences in the pre-crisis period which would indicate that government deficits were externally financed in that period. As the coefficient loses significance in the post-crisis period this would indicate that deficits were financed from domestic savings.

Finally there is a significant endogeneity between output correlation and CA differences. An increase in BCS would help to reduce CA differences in the EA.

In summary, more equal price developments, consumption shares and economic structures would help to reduce CA differences that are prohibitive for BCS. The same can be partly said for the impact of public deficit and unit labor costs.

In the auxiliary equation explaining differences in primary government deficit, *GOVDEF*, we find a significant negative coefficient of output correlation, a significant positive coefficient of differences in the average government deficit in the past 3 years, in inflation, in changes in unemployment and in the income tax to GDP ratio. There is also a positive coefficient of differences in political ideology in both sub samples, but not for the full sample in this specification.⁹ Differences in the political business cycle also have a significantly positive coefficient in the pre-crisis period, but not in the other samples. Furthermore, private debt shows a significantly positive coefficient in the post-crisis period.

The estimations suggest that differences in government deficits appear as a response to different BCS. Thus we find an endogeneity between government deficit development and BCS in the EA. More similar fiscal policies promote BCS in the EA, but more BCS would also serve to achieve more similar budgetary positions in the EU. Differences in fiscal deficits are persistent. Countries showing differences in fiscal policies in the past will continue to do so since fiscal policy instruments cannot be changed instantly. For example, it would be practically impossible for a government to get parliamentary consent to cut all existing social transfers. The response of fiscal policy differences to inflation differentials shows that fiscal policies are further highly pro-cyclical. During an individual boom, a country will therefore increase its differential in fiscal policy. Also do differences in the development of unemployment trigger differences in government deficits since countries would face a different load of unemployment benefit payments. Different tax shares among EA members or across time lead to differences in fiscal deficits. Since our data shows that differences in unemployment and in income tax rates are highly correlated with per capita income differences in the EA, differences in fiscal policies are also a matter of income disparities across the EA. There is also an institutional factor behind the different development of public deficits. Differences in fiscal policy rise when EA governments show very opposite ideologies. The positive coefficient of *POL_BC* in the pre-crisis period suggests that differences in government deficit were related to differences in the political business cycle of governments in that period. In the post-crisis period, however, the coefficient becomes negative suggesting that differences

⁹When the specification of the *GOVDEF* equation is slightly changed the coefficient of *POL_IDEO* is also significantly positive in the full period.

in government deficits had decreased despite different political business cycles. The role of the institutional factor for government deficits in the EA has not been found so clearly in the previous literature (Bayar and Smeets, 2009). Finally, the positive coefficient of private debt in the post-crisis period indicates that mounting differences in government deficits are also a consequence of differences in the private debt level in the EA. An interpretation can be that a high level of private debt can result in financial problems of banks which the government has to save from bankruptcy.

In the auxiliary equation explaining government debt, *GOVDEBT*, we find a positive relationship between government debt and BCS over the full sample period and in the post-crisis period,¹⁰ but a negative in the pre-crisis period. This provides econometric evidence confirming the statistical patterns in our data (see Section 2). First, the increase in public debt differentials built up in the boom period, unequally strong in EA members and thus resulting in lower BCS, when several EA governments in the core but also in the periphery (Ireland and Spain) could reduce their debt while in others, notably in Greece and in Portugal public debt constantly increased. Then, during the crisis which hit all EA members and thus lead to higher BCS, debt differentials surprisingly increased further. The positive coefficient with growth correlation in this period could be the result of a different response of tax receipts and expenditures to output decline, or the result of increasingly high burdens of interest payments in highly indebted EA countries.

One has to conclude that, unlike the positive effect of BCS on government deficit differentials, differences in public debt across EA members are not automatically reduced by enforced BCS. The estimates suggest that other factors can clearly explain the mounting public debt differences and have become more important in the post-crisis period. First, past differences in government net lending, i.e. primary deficits plus interest payments, show a positive coefficient in all samples and thus determine the differences in accumulated debt. Second, we find a significant positive relation of debt differences with differences in government bond rates which reflect the risk rating of a country and its credit costs. Thus differences in credit costs have resulted in important differences of accumulated public debt in the EA. Finally, in the post-crisis period for which we have data on private debt, we find a significant negative coefficient of private debt on public debt which can be interpreted as a substitution between the two. Due to the takeover of private debt by governments, while private debt differentials decreased government debt differentials increased.

The auxiliary equation on private debt, *PRIVDEBT*, shows a statistically significant negative coefficient of business cycle correlation and a positive of differences in government bond rates and in investment. Thus evidently, the different accumulation of private debt in the EA appears as a consequence of different output growth and different investment behaviour. They are, however, also a consequence of different interest rates, proxied by government bond rates. Higher credit costs increase private debt. As with public debt, credit risk which increases with mounting indebtedness propels interest rate payments upward and worsens indebtedness further.

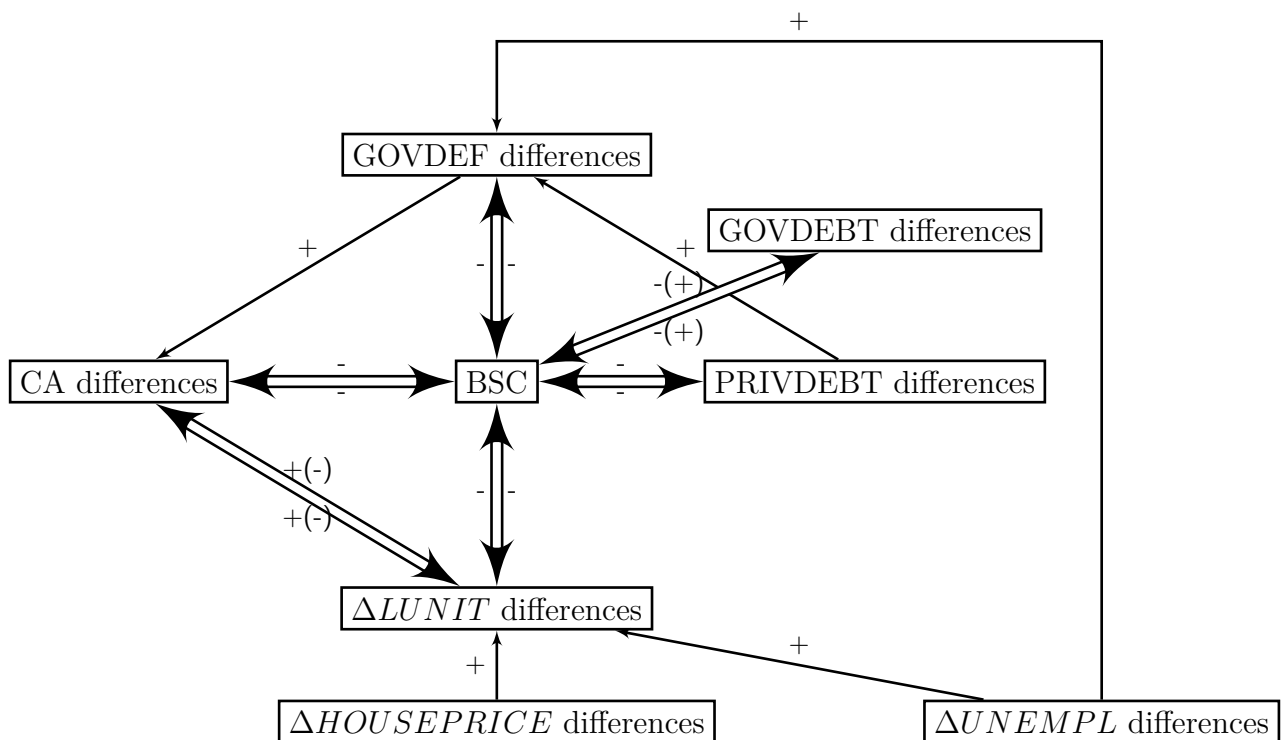
In the auxiliary equation of differences in unit labor cost developments, $\Delta LUNIT$, our estimates identify a robust positive relation with differences in the terms of trade — a general indicator for inflationary developments — and unemployment. The positive coefficient of housing price differences proposes that wage developments in the EA were also driven by different price developments in the housing market. Further the significant negative coefficient with output correlation suggests that labor cost differentials appear between economies in a different business cycle. The positive coefficient with unemployment differentials points

¹⁰This result is similar to the findings of Panizza and Presbitera (2014) who study the relationship between economic growth and government debt and find that once they control for endogeneity the negative link between growth and debt disappears.

into the same direction. Diverging wage developments appear due to different output growth and corresponding labor market differences. In high growth countries higher wage bargains would be agreed than in low growth countries. Furthermore, we find a significant negative coefficient of CA differences — except for the pre-crisis period. An interpretation of the positive coefficient can be that in case of large current account differences, the country with a surplus would pursue narrow wage increases to ensure competitiveness while in the country with a current account deficit labor would demand higher wages to balance higher import prices. Increasing current account differences would then be followed by increasing spread of labor unit costs. The appearing negative relation in the post-crisis period could mean that in a situation of big current account differences the surplus countries might have seized to moderate in wage development while the deficit countries finally attempt to limit wage claims to restore competitiveness.

In summary, our estimations have shown that the scoreboard indicators produce clear direct and indirect effects on BCS in the EA. Figure 7 summarizes how current account imbalances, differences in fiscal policies, in public and private debt and in unit labor cost developments affect BCS in the EA, either directly or indirectly through the other factor.

Figure 7: Summary of estimation results:
Direct and indirect effects of scoreboard indicators on BCS



+/- positive/negative effect is present in all samples
+(-) positive effect in pre-crisis period, but turns negative post-crisis
- (+) negative effect in pre-crisis period, but turns positive post-crisis

6 Conclusions and Policy Implications

Since 2011, the European Commission constantly observes the scoreboard indicators under its aim of surveillance of macroeconomic imbalances. These indicators comprise: the government

deficit, private and public debt, the current account balance, unit labor costs, unemployment, inflation, housing prices and the real effective exchange rate. This paper aimed to explore the impact of the scoreboard indicators on business cycle synchronization in the EA. Using a simultaneous equations model, we estimated how differences in the key indicators between EA members affect BCS among them. Thus the direct effect of differences in fiscal policies, in public and private debt, in current account balances and in unit labor cost developments on BCS was estimated. As a measure for BCS we used the dynamic conditional correlation of Engle (2002), recently proposed in the literature of the field. Our model specification permitted us not only to show the direct effects of the indicators just named, but also how these key scoreboard indicators act, together with other scoreboard indicators, on each other and thus produce indirect effects on BCS.

Our results offer clear evidence that the surveillance of these indicators is essential to assure BCS, which is of outmost importance for the European Monetary Union.

First, our study shows that differences in the current account balance between EA members produce a decoupling effect on BCS that has even grown in the post-crisis period. As significant differences in export rates are a major reason for different current account balances, EA members and the European Commission have to watch with concern that EA members develop an equal export performance. We found that competition factors, such as labor costs and real exchange rate differences are a major factor behind current account differences. Under this aspect the concern given in the macroeconomic imbalances procedure to observe inflation and wage development, is fully justified as it would help to keep current account balances of EA members more similar — the co-existence of export champions and hardly export oriented countries in the EA would lessen — which in turn would promote BCS.

Second, this study provides clear results that different fiscal policies or growing differentials in public debt among EA members produce immediate de-synchronization of business cycles in the EA. Divergent fiscal policies produce differences in output growth, so that the common monetary policy will hardly be suitable for all members. A rigorous control to stay within fiscal deficit thresholds under the straightjacket of the Maastricht Treaty and its enforcement by the macroeconomic imbalances procedure has to be judged as an important instrument to keep fiscal policies of EA members similar and provide for a well functioning EMU. However, fiscal discipline under tightly monitored common rules would also be easier with more BCS. There exists endogeneity between fiscal policy and BCS. More BCS should also reduce unemployment and inflation differentials in the EA which are an important reason for differences in government deficits. In addition, if policy makers subscribe commonly to the goal of enforcing labor market flexibility, this would serve to reduce unequal labor market developments in the EA and help to reduce differences in government budgetary positions. It further appears that fiscal policy disparities in the EA show a persistence. Efforts to align fiscal deficits to the thresholds imposed by the Stability and Growth Pact will only show noticeable results after a few years. Another important fact arises in this study. Political ideology as well as the wish for opportunistic behaviour in view of elections are factors explaining differences in government deficits. The style of fiscal policy is strongly affected by different ideologies which impose more or less interventions of the state. Consequently, the struggle to constrain EA countries' fiscal policy behavior by a common threshold is a challenge that requires a narrowing of political perceptions by EA members.

Third, concerning the mounting difference in public debt that has appeared in the EA in the 2000s, we find no clear evidence how this influences BCS. When debt differences have built up in the pre-crisis period this seems to have resulted in different growth records during the boom period. But continued differences in public debt across the EA did not weaken BCS which dominated in the crisis period as all countries were simultaneously affected

by the crisis. This should be seen as evidence that the early debt differences in the EA have resulted in unequal output growth, while with mounting un-sustainability of debt all countries suffer from reduced growth. Consequently, clear limits for public debt in the EA are highly important. The results suggest that public debt differentials in turn will continue to appear in the EA without strict common fiscal rules concerning current budget deficits. Furthermore, we find support that debt problems in the EA are highly linked to different financing costs of the sovereign which reflect different risk ratings of countries. Since the risk ranking deteriorates with the accumulated level of private and public debt this is another reason why it is important that the macroeconomic imbalances procedure monitors the public debt level.

Fourth, the estimates also show that the important differences in private debt between EA members have produced decoupling effects on BCS. First, the different accumulation of private debt, particularly in the periphery, produced unequal growth rates during the boom, then the different private debt level led to a much deeper recession in countries with high private debt. However, the relation between private debt and BCS is a two-way. Differences in private debt across the EA are also caused by different levels of output growth. Thus we also find an endogeneity between BCS and differences in private debt levels. Because of the negative effect of private debt differences for BCS it is important that the level of private debt is observed under the macroeconomic imbalances procedure. Furthermore, as we have found that private debt differences, equally as public debt differences, rise with interest differences, the emergence of interest differences also has to be monitored under the macroeconomic imbalances procedure.

Fifth, our estimations show that divergent real wage developments between EA members lead also directly to a decoupling of BC due to demand effects. The important wage increases in the peripheral member states in the boom years, or wage cuts in some member states required later by budgetary consolidation, would produce such demand effects and result in reduced BCS. Different unit labor cost developments in the EA in turn are generated by differences in output and unemployment development and different price developments. Again we find that the relationship between changes in real unit labor cost differentials and BCS runs in both directions. A monitoring of unit labor cost developments will be an important factor to assure BCS. Observing the development of wages under the macroeconomic imbalances procedure is thus a reasonable concern.

In summary, this study provides convincing evidence that a close monitoring of the indicators addressed by the scoreboard indicators is a necessity to guarantee BCS in the EA which is the most important condition to assure a smooth and beneficial working of the monetary union. Observing the development of the scoreboard indicators definitely will not be enough. The uniformly required development in the areas of the scoreboard indicators across EA members will only be possible by establishing the institutional framework for a common economic government at the EA level.

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Appendix

Table I: Data sources and definition of variables

Variable name	Variable definition	Indicator used as input	Definition input indicator	Source
<i>BONDRATE</i>	Differential of government bond rate between country i and country j: log of absolute difference of government bond rates	Government bond rate, in %	Harmonized long-term (10 year) interest rates for government bonds	ECB
<i>CA</i>	Current account balance differential between country i and j: log of absolute difference of current account as a % of GDP	Current account balance in % GDP	net exports goods and services, net income from abroad and net current transfers	Eurostat
<i>CONSTR</i>	Differential construction sector share between country i and j: log of absolute difference of construction share	Construction sector in % of total gross value added	Gross value added construction sector	Eurostat
<i>CONSUM</i>	Differential consumption propensity between country i and j: log of absolute difference of consumption in % of GDP	Consumption in % of GDP	Consumption expenditures of households, non-profit institutions serving households and governments on goods and services, not seasonally adjusted	calculated from data Eurostat
<i>COR</i>	Dynamic conditional correlation of IPI between country i and j, Engle's measure	Growth industrial production index (IPI)	Monthly changes in the price-adjusted output of industry	Calculated from data IMF
<i>GOVDEBT</i>	Government debt differential between country i and j: log of absolute difference of government debt in % GDP	Government debt in % GDP	General gross consolidated debt	Eurostat
<i>GOVDEF</i>	Primary deficit differential between country i and j: log of absolute difference of primary deficit in % GDP	Primary deficit in % GDP	General government receipts minus expenditures excluding debt interest payments, not seasonally adjusted	ECB
<i>GOVDEF_PAST1</i>	Average primary deficit differential between country i and j in previous year: log of absolute difference of primary deficit in % GDP	Primary deficit in % GDP, average over previous year	General government receipts minus expenditures excluding debt interest payments, not seasonally adjusted	calculated from data ECB
<i>ΔEXRATE</i>	Differential of change in real effective exchange rate between country i and j: log of absolute difference of change in real effective exchange rate index	Real effective exchange rate, y-o-y change	Real effective exchange rate index (2005=100) vis-à-vis 42 trading partners (EU27, EA, EU Member States, Turkey, Norway, Switzerland, Canada, United States, Mexico, Japan, Australia, New Zealand, Brazil, China, South Korea, Hong Kong, Russia)	Calculated from data Eurostat
<i>ΔHOUSE PRICE</i>	Differential housing prices change between country i and j: log of absolute difference of change in housing prices	HCPI housing, y-o-y change	Change harmonized consumer price index (2005=100) for housing rental, maintenance and repair of dwellings, services to dwellings (water, electricity, gas)	Calculated from data Eurostat
<i>INFL</i>	Inflation differential between country i and j: log of absolute difference of inflation	HCPI, y-o-y change	Harmonized consumer price index (HCPI), all goods, 2005=100	Eurostat
<i>INV_PAST2</i>	Differential investment rate between country i and j: log of absolute difference of investment rate	Investment rate in % GDP, average over past 2 years	Gross fixed capital formation, not seasonally adjusted	Calculated from data Eurostat
<i>ΔLUNIT</i>	Differential of change in unit labor cost between country i and j: log of absolute difference of change in unit labor costs	Real unit labor costs, y-o-y change	Change of index (2005=100) compensation per employee in current prices divided by GDP in current prices per total employment, not seasonally adjusted	Calculated from data Eurostat

Table I continued

Variable name	Variable definition	Indicator used as input	Definition input indicator	Source
<i>NETLEND_PAST3</i>	Net lending differential between country i and j: log of absolute difference of net lending	Government net lending in % GDP, average over past 3 years	General government receipts minus expenditures, not seasonally adjusted	Calculated from data Eurostat
<i>POLBC</i>	Political business cycle differential between country i and j: log of absolute difference of number of quarters before election	Political business cycle	Number of quarters before next parliamentary elections	EED
<i>POLIDEO</i>	Political ideology differential between country i and j: log of absolute difference of political ideology index	Political ideology index	The ideological complexion of government and parliament index multiplied by the number of days a parliament is already in power	Seki and Williams (2013)
<i>PRIVDEBT</i>	Private debt differential between country i and j: log of absolute difference of private debt in % GDP	Private sector debt in % GDP	(Stock of loans to households + non profit organisations serving HH) + (stock of loans to non financial organizations) + (stock of loans to MFIs)	Calculated from data ECB
<i>TAX</i>	Income tax share differential between country i and j: log of absolute difference of income tax in % of GDP	Income tax, in % of GDP	Current tax on income receivable	Eurostat
<i>ΔTOT_L2</i>	Terms of trade differential between country i and j: log absolute difference of terms of trade change	Terms of trade, change with respect to 2 years back	Exports over imports as price indices	Calculated from data Eurostat
<i>ΔUNEMPL</i>	Differential of change in unemployment rate between country i and j: absolute difference of log change unemployment	Unemployment rate, y-o-y change	Change in unemployment rate	calculated from data Eurostat

Table II: Correlation, rolling windows, full sample

	COR	CA	CONSTR	ΔTOT_I2	NETLEND_PAST3	GOVDEF	GOVDEF_PAST1	TAX	INFL	POLBIC	POLIDEO	GOVDEBT	PRIVDEBT	ΔHOUSEPRICE	ΔUNEMPL	ΔEXRATE	ΔLUNIT	CONS	INV_PAST2	BONDRATE
COR	1.00																			
CA	-0.28	1.00																		
CONSTR	-0.16	0.10	1.00																	
ΔTOT_I2	-0.10	0.06	-0.08	1.00																
NETLEND_PAST3	-0.25	0.19	0.04	0.22	1.00															
GOVDEF	-0.15	0.05	0.11	0.08	0.30	1.00														
GOVDEF_PAST1	-0.14	0.07	0.11	0.08	0.44	0.53	1.00													
TAX	-0.17	0.30	-0.04	0.14	0.32	0.37	0.39	1.00												
INFL	-0.25	0.17	0.12	0.09	0.23	0.18	0.18	0.18	1.00											
POLBIC	0.02	0.05	-0.03	-0.02	0.01	0.02	0.07	-0.06	0.01	1.00										
POLIDEO	-0.03	0.05	0.04	0.01	0.02	0.04	0.05	0.00	-0.02	0.27	1.00									
GOVDEBT	-0.16	0.02	-0.14	0.19	0.30	0.14	0.00	0.14	0.04	-0.07	0.06	1.00								
PRIVDEBT	-0.05	0.06	0.06	0.06	0.03	0.12	0.05	0.01	0.01	0.12	0.06	0.10	1.00							
ΔHOUSEPRICE	-0.22	0.08	-0.00	0.03	0.17	0.17	0.09	0.11	0.26	-0.05	-0.03	0.18	0.03	1.00						
ΔUNEMPL	-0.16	0.07	0.12	-0.01	0.06	0.13	0.06	-0.02	0.09	0.12	0.04	0.09	0.34	0.14	1.00					
ΔEXRATE	-0.22	0.05	0.10	0.09	0.22	0.18	0.11	0.11	0.53	-0.04	-0.05	0.09	0.10	0.21	0.19	1.00				
ΔLUNIT	-0.37	0.11	0.06	0.14	0.23	0.19	0.12	0.08	0.17	0.05	0.03	0.24	0.25	0.28	0.20	1.00				
CONSUM	-0.43	0.34	-0.06	0.18	0.38	0.02	0.08	0.07	0.13	0.03	0.05	0.17	0.14	0.14	0.11	0.40	1.00			
INV_PAST2	-0.17	0.20	0.60	-0.09	-0.02	0.13	0.11	0.02	0.08	-0.01	-0.03	-0.13	0.07	-0.09	0.05	0.01	-0.03	1.00		
BONDRATE	-0.11	0.09	-0.02	0.16	0.28	0.21	0.17	-0.01	0.10	0.15	0.14	0.29	0.22	0.27	0.06	0.22	0.25	-0.13	1.00	

Table III: Correlation, rolling windows, pre-crisis sample

	COR	CA	CONSTR	ΔTOT_I2	NETLEND_PAST3	GOVDEF	GOVDEF_PAST1	TAX	INFL	POLBEC	POLIDEO	GOVDEBT	PRIVDEBT	ΔHOUSEPRICE	ΔUNEMPL	ΔEXRATE	ΔLUNIT	CONS	INV_PAST2	BONDRATE
COR	1.00																			
CA	-0.37	1.00																		
CONSTR	-0.07	0.18	1.00																	
ΔTOT_I2	-0.02	0.05	-0.08	1.00																
NETLEND_PAST3	-0.21	0.21	-0.04	0.32	1.00															
GOVDEF	0.01	0.14	0.03	0.13	0.26	1.00														
GOVDEF_PAST1	0.03	0.11	-0.03	0.10	0.37	0.43	1.00													
TAX	-0.15	0.37	-0.02	0.15	0.33	0.45	0.45	1.00												
INFL	-0.15	0.20	0.08	0.11	0.20	0.04	0.07	0.19	1.00											
POLBEC	0.02	0.14	-0.03	0.02	-0.06	-0.05	-0.04	-0.07	0.03	1.00										
POLIDEO	0.02	-0.02	0.03	0.04	0.02	0.10	0.09	0.05	0.02	0.31	1.00									
GOVDEBT	-0.05	0.17	-0.13	0.12	0.33	0.20	0.03	0.11	-0.02	-0.03	-0.01	1.00								
PRIVDEBT	-0.05	0.17	0.08	0.06	0.01	-0.06	-0.10	-0.02	-0.05	0.12	0.13	0.16	1.00							
ΔHOUSEPRICE	-0.28	0.04	-0.01	0.02	0.21	0.01	0.02	0.08	0.24	-0.15	0.04	0.13	-0.06	1.00						
ΔUNEMPL	-0.13	0.03	0.00	-0.07	0.01	-0.01	-0.03	-0.08	0.03	0.06	0.02	0.04	0.24	0.00	1.00					
ΔEXRATE	-0.16	0.05	0.04	0.13	0.23	0.07	0.01	0.10	0.52	-0.02	-0.03	0.08	0.11	0.10	0.10	1.00				
ΔLUNIT	-0.40	0.20	-0.03	0.14	0.14	0.04	-0.06	0.03	0.06	0.06	0.07	0.28	0.20	0.02	0.02	0.11	1.00			
CONSUM	-0.49	0.30	0.03	0.11	0.37	0.02	-0.00	0.06	0.09	0.03	0.04	0.26	0.16	0.08	0.15	0.42	1.00			
INV_PAST2	-0.02	0.24	0.67	-0.14	-0.06	0.04	0.07	0.07	0.09	0.03	0.01	-0.12	0.16	0.04	0.06	-0.06	-0.04	1.00		
BONDRATE	-0.11	0.13	-0.18	0.22	0.17	0.00	-0.10	-0.02	0.04	0.17	0.11	0.36	0.27	0.08	0.25	0.38	-0.19	0.38	1.00	

Table IV: Correlation, rolling windows, post-crisis sample

	COR	CA	CONSTR	ΔTOT_I2	NETLEND_PAST3	GOVDEF	GOVDEF_PAST1	TAX	INFL	POLIBC	POLIDEO	GOVDEBT	PRIVDEBT	ΔHOUSEPRICE	ΔUNEMPL	ΔEXRATE	ΔLUNIT	CONS	INV_PAST2	BONDRATE
COR	1.00																			
CA	-0.17	1.00																		
CONSTR	-0.29	-0.01	1.00																	
ΔTOT_I2	-0.13	0.04	-0.10	1.00																
NETLEND_PAST3	-0.34	0.17	0.16	0.09	1.00															
GOVDEF	-0.39	0.02	0.27	0.01	0.29	1.00														
GOVDEF_PAST1	-0.34	0.08	0.30	0.01	0.47	0.61	1.00													
TAX	-0.13	0.27	-0.07	0.06	0.33	0.32	0.30	1.00												
INFL	-0.38	0.05	0.19	0.03	0.25	0.33	0.28	0.12	1.00											
POLIBC	-0.01	-0.07	-0.01	-0.11	0.07	0.11	0.19	0.06	-0.07	1.00										
POLIDEO	0.01	0.08	0.02	-0.07	0.01	-0.12	-0.06	-0.12	0.20	0.20	1.00									
GOVDEBT	-0.13	0.04	-0.15	0.25	0.24	-0.07	-0.12	0.21	0.12	-0.07	-0.04	1.00								
PRIVDEBT	-0.09	-0.04	0.09	0.05	0.00	0.23	0.13	0.04	0.05	0.07	-0.04	0.01	1.00							
ΔHOUSEPRICE	-0.23	0.09	0.01	0.04	0.05	0.15	0.03	0.16	0.38	-0.04	-0.12	0.21	0.00	1.00						
ΔUNEMPL	-0.25	0.09	0.32	0.02	0.06	0.14	0.09	0.06	0.09	0.04	0.00	0.11	0.37	0.15	1.00					
ΔEXRATE	-0.28	0.02	0.15	0.02	0.19	0.28	0.21	0.10	0.60	-0.12	-0.12	0.01	0.04	0.26	0.33	1.00				
ΔLUNIT	-0.38	0.02	0.14	0.08	0.29	0.31	0.26	0.15	0.31	0.04	-0.10	0.19	0.27	0.36	0.39	0.39	1.00			
CONS	-0.40	0.41	-0.07	0.25	0.41	0.04	0.15	0.12	0.20	-0.01	0.01	0.28	0.12	0.13	0.13	0.13	0.39	1.00		
INV_PAST2	-0.26	0.16	0.54	-0.05	0.06	0.30	0.21	-0.05	0.06	-0.02	-0.05	-0.14	0.06	0.10	0.05	0.09	-0.02	1.00		
BONDRATE	-0.29	0.07	0.25	0.13	0.34	0.13	0.24	0.00	0.20	-0.04	0.13	0.17	0.05	0.10	0.01	0.05	-0.14	0.09	1.00	