THE EURO PLUS PACT
COMPETITIVENESS AND EXTERNAL CAPITAL FLOWS IN THE EU COUNTRIES[1]

Hubert Gabrisch
Halle Institute for Economic Research (IWH)

Karsten Staehr
Tallinn University of Technology, Bank of Estonia

The Euro Plus Pact was approved by 23 EU countries in March 2011. The Pact stipulates a range of quantitative targets meant to strengthen competitiveness and convergence with the ultimate aim of preventing the accumulation of unsustainable financial imbalances. This paper uses Granger causality tests and vector autoregressive models to assess the short-term linkages between changes in the relative unit labour cost and changes in the current account balance. The sample consists of data for 27 EU countries for the period 1995–2012. The main finding is that changes in the current account balance precedes changes in relative unit labour costs, while there is no discernable effect in the opposite direction. This suggests that the divergence in the unit labour cost between the countries in Northern Europe and countries in Southern and Central and Eastern Europe prior to the global financial crisis partly was the result of capital flows from the core of Europe to its periphery. The results also suggest that measures in the Euro Plus Pact to restrain unit labour costs may not have immediate effects on possible current account imbalances.

Keywords: European integration, policy coordination, unit labour costs, current account imbalances, economic crisis

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e-mail: karsten.staehr@ttu.ee.

The global financial crisis had pronounced effects on all European economies from as early as 2008, leading to substantial output losses in most EU countries. In a short time the crisis metamorphosed into a debt crisis as lending dried up and growth prospects deteriorated. Governments in the geographical periphery had to seek assistance from the IMF, the European Commission and other official lenders. Given this background, European economic governance structures came under scrutiny and a host of reforms were adopted with the aim of reducing the probability of future crises occurring in individual countries. Among the reforms adopted were *Europe 2020*, a new growth strategy; the *Euro Plus Pact*, in part to ensure financial stability; and the *Fiscal Compact*, setting new fiscal targets.[2] This paper discusses the core component of the Euro Plus Pact and seeks to assess its likely effectiveness.

The preparation of the Euro Plus Pact can be traced back to the autumn of 2010 when the diverging economic fortunes of European countries in the euro area became very noticeable (*The Economist,* 2011; Groll and van Roye, 2011). Consultations between the German and French governments led to the *Competitiveness Pact*, which was unveiled in February 2011. After some alterations had been made and a new name given, the Euro Plus Pact was adopted at a European Council meeting on 25 March 2011 (European Council, 2011).[3] All the euro area countries and the other EU countries except the Czech Republic, Hungary, Sweden and the United Kingdom signed up to the pact.

The goal of the Euro Plus Pact is to foster competitiveness and convergence among the participating countries with the aim of avoiding the build-up of financial and economic imbalances. The Pact stipulates a number of policy measures which should be applied for these goals to be reached, including a review of wage setting arrangements, indexation schemes, public sector wages and structural reforms to enhance productivity. There are also

2. The webpage http://www.ecb.int/mopo/eaec/ecopolicy/html/index.en.html depicts the many reforms and provides links to source material.

3. The word *plus* in the Euro Plus Pact is presumed to have two meanings. First, the Pact imposed new governance structures in addition to those in place at the time of its inception. Second, while participation in the Pact is compulsory for the euro area countries, other EU countries are also able to join.

measures to foster employment, enhance the sustainability of public finances and improve financial stability. The measures of the Pact must be applied by individual countries, but the *open method of coordination* entails the "naming and shaming" of countries that fall behind. The European Commission has been put in charge of monitoring and to that end collects and publishes various indicator variables, including movements in unit labour costs, which capture the progress of individual countries.

The rationale behind the Euro Plus Pact is evident in its original name, the Competitiveness Pact, and also in its current subtitle: "Stronger economic policy coordination for competitiveness and convergence" (European Council 2011, p. 13). Deteriorating competiveness in individual countries is seen as a source of economic and financial instability. This view is directly stated in the conclusions from the European Council meeting at which the Euro Plus Pact was adopted (European Council 2011, p. 5):

> The Euro Plus Pact [...] will further strengthen the economic pillar of EMU and achieve a new quality of policy coordination, with the objective of improving competitiveness and thereby leading to a higher degree of convergence [...].

The core of the Pact is the obligation of each participating country to retain competitiveness in order to avoid the build-up of financial imbalances, chiefly in the form of large current account deficits. This underlying economic "philosophy" is spelt out in Marzinotto (2011, p. 93):

> Implicit to the design of the recent economic governance reform is the idea that southern European countries have accumulated large current account deficits because poor price competitiveness impeded them to export abroad.

The same point has been made by other commentators and analysts.[4] The policy-making process meant that the Euro Plus Pact ended up including a large number of policy commitments regarding flexicurity, pension sustainability, health care, social benefits and tax policy coordination, but these measures are seen

4. One example is the succinct account in Gros (2011, p. 1): "The (relative) unit labour costs of GIP(S) countries Greece, Ireland, Portugal and Spain have increased: this is the fundamental cause of their problems as export performance must have been bad, pushing them into current account deficits."

as instruments for improving competitiveness in individual member countries.

The Euro Plus Pact has been subject to several policy-oriented analyses, especially in the months prior to and right after its adoption in March 2011. The policy discussion has brought up many important points relating to its underlying economic philosophy and to its practical implementation. Groll and van Roye (2011) argue that it is the *level* of unit labour costs, not changes in these costs, which provides the most appropriate measure of the convergence that has been achieved. Gros and Alcidi (2011) make a similar point and explain that the indices of relative unit labour costs can convey very different messages depending on the base year and the length of the sample used. They also argue that important issues have been left out of the Euro Plus Pact because measures to address the issues are politically inconvenient for the core countries in the euro area.

Gros (2011) argues that the Euro Plus Pact is based on flawed economics as competitiveness indicators are weak predictors of future export performance; Estonia, for example, has had rapidly increasing relative unit labour costs but also strong export growth over extended periods of time. Wyplosz (2011) argues that it is inappropriate to focus on unit labour costs relative to euro area countries as more informative competitiveness measures would include all trading partners. Marzinotto (2011) is also critical of the underlying rationale of the Euro Plus Pact, but points out that a solution to the economic problems in the peripheral countries must include measures to strengthen their competitiveness.

Holinski *et al.* (2012) find that the capital flows from North European to South European countries in the period 1992–2007 led to the accumulation of imbalances as they cannot be explained by fundamentals such as differentials in productivity growth. De Grauwe (2011) argues that monetary unions are especially susceptible to fiscal crises as governments do not have access to inflationary financing and are therefore exposed to sudden changes in capital flows. Krugman (2012) states that "the roots of the euro crisis lie not in government profligacy but in huge capital flows from the core (mainly Germany) to the periphery during the good years. These capital flows fuelled a peripheral boom, and sharply rising wages and prices in the [recipient] countries relative to Germany".

In the context of the Euro Plus Pact the question is whether weak competitiveness leads to capital inflows (current account deficits) or whether capital inflows lead to weak competitiveness. Obviously the policy conclusions differ depending on the answer to this question. We establish the direction of the relationship through the time dimension using Granger causality tests and vector autoregressive models comprising the two variables in question, i.e. changes in the relative unit labour cost and changes in the current account balance. In this way the paper can be seen to address the question: "What comes first, competitiveness or capital flows?"

The empirical analyses are undertaken using a panel dataset comprising approximately 15 years of data for 27 EU countries. The use of panel data makes reliable estimations possible in spite of the short time frame. The panel data estimations assume homogeneity of the slope coefficients across the countries in the sample, and the estimated slope coefficients or marginal effects may thus be seen as *average* values for all the countries in the sample. The Euro Plus Pact has been adopted by almost all EU countries and it is therefore reasonable to base assessments of the Pact on estimates of the average effects for 27 EU countries or different subsets of the 27 countries in the dataset.

This paper is the first to assess the contents of the Euro Plus Pact using an econometric analysis of the main causal assumption underlying the Pact. As such the paper contributes to the important discussion of economic governance in the euro area and the European Union at large. The issue discussed in the paper is, however, also of importance in its own right. The linkages between capital flows and the real exchange rate or other measures of competitiveness are widely debated, and there is a large literature that provides quantitative estimates of these linkages, particularly for emerging market economies (see the literature survey in Section 1). The paper contributes to this literature by providing estimates for the European Union and for different subsets of EU countries. The paper is also testing for linkages in both directions, not only in one direction as typically seen in the literature. Finally, the use of VAR models allows a more complete modelling of the dynamics, but is relatively unusual within this literature.

The rest of the paper is organised as follows: Section 1 discusses the existing literature on the links between competitiveness and

capital flows. Section 2 presents the dataset, time series properties and various crossplots. Section 3 shows the results of simple Granger causality tests. Section 4 presents different VAR models and their impulse responses. Finally, Section 5 summarises the paper and draws some policy conclusions.

1. Competitiveness and external capital flows

This section reviews and discusses contributions to the literature on the linkages between external capital flows and competitiveness. The linkage from competitiveness to capital flows is discussed first, the linkage from capital flows to competitiveness afterwards. In each case some theoretical underpinnings are reviewed, followed by brief surveys of empirical and policy-oriented studies.

It is evidently a simplification to consider the linkages between competitiveness and external capital flows in isolation. There may for instance be factors that affect both the current account balance and the real exchange rate, e.g. the net foreign asset position, energy prices or economic policies (Obstfeld and Rogoff 1995; Ostry, 1988; Lartey 2008).[5] In the discussion below it is argued, however, that there will likely be many cases in which either competitiveness or external capital flows are affected by largely exogenous or autonomous factors.

1.1. From competitiveness to capital flows

The theoretical starting point is the standard Keynesian model of an open economy in which net export is assumed to be a negative function of the real exchange rate, where the real exchange rate is defined as the price of domestic production relative to the price of foreign production measured in the same currency unit (Krugman and Obstfeld 2003, Ch. 16). The underlying assumption is that both domestic demand and export demand depend negatively – and strongly – on price. The Marshall-Lerner condition states that if the trade balance is initially in balance, the sum of the

5. The interaction between the two variables may also depend on the characteristics of the shocks affecting the economy, such as whether shocks are temporary or permanent and whether they are anticipated or unanticipated (Agenor, 1998).

numerical values of the price elasticities of domestic and foreign demand must exceed one in order for a real depreciation to improve the trade balance and hence the current account balance. The numerical elasticities might be small in the short term because of long-term contracts and sluggish substitution, which implies that the trade balance deteriorates in the short term and only improves in the longer term, the celebrated *j*-curve effect.

Changes in the real exchange rate, unit labour costs or other measures of competitiveness can be autonomous or independent in the sense that they are not influenced by changes in external capital flows. This would be the case when factors like nominal exchange rates, productivity and nominal wage rates change because of exogenous factors. An example of this is changes in trade union power or labour market institutions that may affect nominal wages and/or productivity without any impetus from external capital flows.

The link from competitiveness to the current account balance is also at the core of many concepts of an *equilibrium exchange rate* (Williamson 1985, 1994). The equilibrium exchange rate is then taken to be the real exchange rate – or another suitable competitiveness indicator – that is compatible with a desired current account balance. This is the idea behind the *Macroeconomic Balance Framework* developed by the International Monetary Fund to access misalignment of the real exchange rate (Isard *et al.*, 2001; Isard, 2007). The real exchange rate is seen to be misaligned if it differs markedly from the estimated equilibrium value over a period of time. The real exchange rate is overvalued if it is associated with excessive current account deficits.

A large number of studies have tested the hypothesis of a link from competitiveness to current account developments, using datasets from both developed and developing economies. The overall conclusion is that the effect is non-existent or very subdued in the short term, but that the effect might be more pronounced in the longer term. There seems to be some heterogeneity across the sample countries.

Rose (1991) finds that the hypothesis of a link from the real exchange rate to the trade balance gains little support in a sample of five OECD countries and conjectures that the numerical import

and export price elasticities are small. Bachman (1992) finds that measures of competitiveness have very little explanatory power for the current account balance in the USA. Bahmani-Oskooee and Kara (2003) estimate co-integration models for nine industrialised countries and reach the conclusion that there is no consistent finding; the reaction of trade flows to changes in import and export prices varies substantially across the countries. Boyd *et al.* (2008) use a sample of eight OECD countries and find that there is an effect from the real exchange rate on the trade balance in most of the sample countries, but the effect occurs after a substantial delay, providing support for the *j*-curve effect.

After the outbreak of the global financial crisis, many studies have discussed a possible link from competitiveness to the trade balance or current account balance. The results are mixed and occasionally difficult to interpret. Zemanek *et al.* (2009) argue that a lack of competitiveness led to large current account deficits in some euro area countries prior to the global financial crisis. The empirical analysis suggests that structural reforms in the deficit countries may help strengthen the current account balance.

Belke and Dreger (2011) investigate the relative importance of competiveness and income convergence for the current account in 11 euro area countries. The current account balance, the relative real effective exchange rate and the relative income level are all found to exhibit unit roots and to be co-integrated. An appreciation of the relative real effective exchange rate is associated with a worsening of the current account balance.

Some analytical studies have drawn attention to deteriorating competitiveness in countries in the geographical periphery of Europe. Fischer (2007) uses various concepts of real equilibrium exchange rates and finds that Germany gained competitiveness and several South European countries lost competitiveness between the introduction of the euro in January 1999 and the end of 2005. It is concluded that these developments to some extent reversed previously existing disparities. Dullien and Fritsche (2008) find that several South European countries experienced rapid increases in unit labour costs and, furthermore, that deviations from a long-term equilibrium level only closed very slowly. Jaumotte and Sodsriwiboon (2010) find that the real exchange rate in the South European euro countries was substantially overvalued

relative to its equilibrium value at the onset of the global financial crisis. The finding results, however, from current account balances being above levels deemed sustainable, and the analysis does not detect the direction of the linkage.

1.2. From capital flows to competitiveness

The direction from capital flows to competiveness has a long history in the literature, starting with Böhm-Bawerk's (1924) famous statement that the capital balance rules the trade balance and not *vice versa*. Keynes emphasised the destabilising effects of external capital flows. In the Keynes-Ohlin controversy on wartime reparations, Keynes referred to a *transfer paradox*: the reparations to be paid by Germany after World War I, would worsen the competitiveness of the recipient countries through an appreciation of the real exchange rate, i.e. a negative terms-of-trade effect (Keynes, 1929).[6]

A similar effect may also be the result of increased prices or production of export products. The increased export revenue may lead to a real exchange appreciation, which worsens competitiveness in other export industries and in import-competing sectors (Corden, 1984). The mechanisms underlying this *Dutch Disease* are parallel to those of the *transfer paradox* as the export revenue amounts to a capital inflow.

This paper uses the term the *transfer effect* about the short-term phenomenon that increased capital inflows lead to real exchange rate appreciation and increased capital outflows lead to real exchange rate depreciation. The main theory explaining the transfer effect is based on short-term changes in demand for non-traded products (Sy and Tabarraei, 2009; Edwards, 1988; Corden and Neary, 1982).

The models typically assume two traded goods, an import good and an export good, and one non-traded good. Inflow of capital implies *ceteris paribus* that additional traded resources are available for domestic absorption, while outflow of capital implies that less traded resources are available. Consider an inflow of capital caused by an independent factor such as lower interest rates abroad. The

6. In the early 1940s, Keynes proposed a common currency, the *Bancor*, plus a clearing union in order to deal with excessive debit balances (Keynes, 1942, p. 20).

capital inflow makes additional resources available for domestic absorption such as consumption and investment, and the increased demand will typically be directed towards both traded and non-traded goods. While the prices of the traded goods are determined from abroad, the increased demand for the non-traded good drives up the price of the product and of production factors such as labour. The result of the capital inflow is an appreciation of the real exchange rate (the price of traded goods relative to the price of non-traded goods) or deteriorating competitiveness as measured by higher unit labour costs. A capital outflow will have the opposite effect as lower demand for non-traded goods will lead to a real depreciation or lower unit labour costs.

The effect of a capital inflow will reflect the characteristics of the economy. It will depend on how the increased demand is divided between traded and non-traded goods and it may also depend on the distribution between consumption and investment and the distribution of investment between the traded and non-traded sectors. *Ceteris paribus*, the real appreciation is likely to be smaller if the capital inflow is spent on productivity-enhancing investments in the non-traded sector.

It is possible that capital flows are autonomous and independent of the state of competitiveness of the economy. The financial fragility hypothesis by Minsky (1982, pp. 117-162) suggests that boom-bust cycles in financial markets can be the result of "euphoric expectations". This may be particularly relevant in the European case, where the introduction of the euro and integration of Central and Eastern Europe can be seen as triggers for the build-up of euphoric expectations in the Minsky sense. Gabrisch (2011) points out that the euphoric expectations may lead to capital inflows directed toward financial assets and real estate and, thus, set in motion an asset price boom. This can spread to the investment sector and other industries and also to unit labour costs, depending on how the labour market functions.

The empirical evidence is mixed. Calvo *et al.* (1993) show that countries in Latin America at different times experienced episodes of substantial capital inflows and the result was real appreciations. The capital inflows occurred in countries with very diverse economic conditions, suggesting that the capital flows were in large part driven by events outside the region. Calvo *et al.* (1996)

show that developments in both Asian and Latin American countries in the late 1980s and early 1990s were consistent with the transfer effect. The papers did not apply any econometric testing. Rajapatirana (2003) uses data for the period 1985-2000 and reaches the same conclusion as Calvo *et al*. (1996), but also finds that the real appreciation following net capital inflows was much larger in Latin American countries than in Asian countries, possibly because of different compositions of the capital flows.

Bakardzieva *et al*. (2010) found for a panel of emerging market economies (including Eastern European countries) that net total capital inflows led to an appreciation of the real effective exchange rate. The effects, however, differed depending on the type of capital flow. For most types of capital (portfolio investment, loans, foreign aid, remittances or income transfers), a capital inflow led to a real appreciation, but this was generally not the case for capital stemming from foreign direct investments.

Saborowski (2009) use a broad sample of 84 countries during the period 1990-2006 to investigate the effect of capital flows on the real exchange rate. The study finds that capital inflows in the form of FDI generally lead to an appreciation of the real exchange rate. Importantly, the tendency towards real appreciation is attenuated if the recipient country has a highly developed financial sector.

Morande (1988) tests whether real appreciation came before foreign capital inflows or *vice versa* in Chile. The analysis is based on small VAR models estimated on monthly data for the period 1977-1983. The conclusion is that the direction of the linkage is from capital inflows to real exchange rate appreciation.

The importance of capital flows on competitiveness has received only little attention in the debate on European governance reform. Perez-Caldenty and Vernengo (2012) argue that the large current account surpluses in the core euro countries contributed to the misalignment of real exchange rates within Europe. Schnabl and Zemanek (2011) similarly highlight current account trends within Europe and the possible destabilising consequences.

1.3. Direction of relationship

The literature on international competitiveness and the current account balance includes simple and straightforward theories

explaining causation in either direction. It is not possible *ex ante* to ascertain the direction of the linkage; only empirical studies on a concrete sample can provide such information. There are empirical studies that find a link from competitiveness to the current account balance and numerous other studies establishing a link in the opposite direction. It is noticeable, however, that very few empirical studies include tests that allow for linkages in both directions – a notable exception is Morande (1988) – and this omission limits the policy conclusions of the studies.

2. Data and time series properties

The dataset used in the empirical analysis is a panel of annual data from 1995 until 2012 for 27 EU countries (all except Croatia which joined in 2013).

The variables used in the empirical analysis follow directly from the discussion of the Euro Plus Pact in introduction. The Pact aims to restrain the growth of unit labour costs in order to prevent current account imbalances. The analyses therefore focus on these two variables. To keep the analyses simple and easily comprehensible, no other variables except country fixed effects are used. The parsimonious specifications should be seen as reduced form models. Section 5 discusses extensions of the analyses including the use of additional variables. The panel is unbalanced as observations of unit labour costs at the beginning of the sample are missing for some countries. All data were downloaded from the Eurostat database on 4 November 2013.

As is customary in the literature, the capital flow variable is taken to be the current account balance (Reinhart and Reinhart 2009). By definition, the sum of the current account balance, the financial account balance and the *reduction* in official reserves is nil (in the absence of errors and omissions), where the financial account balance is the sum of net foreign direct investment, net portfolio investment and net other investment (loans etc.). The current account balance is typically measured more precisely and more consistently than the financial balance and its components.[7]

7. A current account deficit is financed through a financial account surplus and/or a reduction in official reserves. Reinhart and Reinhart (2009) argue that the measure of capital flows should ideally be computed as the current account balance plus the *reduction* in official reserves. One argument for removing changes in official reserves is that that they are the result of administrative, non-private, decision making.

The current account balance as a percentage of GDP is denoted CA (classifier *bop_q_gdp*). A current account surplus, CA > 0, is tantamount to a net capital outflow and indicates the accumulation of net foreign assets. A current account deficit, CA < 0, shows a net capital inflow and implies a deterioration of the net foreign asset position. In the baseline specifications, the change in the current account, DCA = CA – CA(-1), is used.

The variable GRULC denotes the percentage *growth* of the unit labour cost in the individual EU country *relative* to the percentage growth of the *unit labour cost* in the EA12, i.e. the 12 first euro area countries, with the unit labour cost is expressed in terms of common currency units (ECU/EUR). The index of the nominal unit labour cost is defined as the ratio between the nominal compensation per employee and the productivity per employee (Eurostat classifier *nama_aux_ulc*[8]). The unit labour cost is converted to common currency units (ECU/EUR) using market exchange rates.[9] An increase in the relative unit labour cost, GRULC > 0, signifies a worsening of competitiveness relative to the EA12, while a decrease in the relative unit labour cost, GRULC < 0, signifies an improvement in competitiveness relative to the EA12.

It is noticeable that the GRULC variable is a variable depicting changes in competitiveness relative to the EA12, not the entire group of EU and non-EU trading partners of a country. The CA variable, meanwhile, refers to the total current account balance of a country, not only towards to EA12. To examine the importance of the asymmetry in the country coverage of the two variables, we include real effective exchange rate indices, deflated using unit labour costs or consumer prices from the 37 largest trading partners of each country. The variable is GREER_ULC, which is the percentage change in the real effective exchange rate against

8. The unit labour cost is not available for Greece and Malta for 1996–2000 and for Romania for 1996–1999 due to missing source data. A few data points for early parts of the sample are downloaded from earlier versions of the Eurostat database.

9. For the euro area countries Eurostat expresses the nominal unit labour cost as "euro fixed" values for the years prior to the introduction of the euro, i.e. data in the national currency values are converted to EUR/ECU values using the irrevocably fixed exchange rate at the time of the introduction of the euro. The use of fixed conversion factors rules out comparison across countries and the euro fixed values are therefore converted into EUR/ECU values using the market exchange rates of the national currencies against EUR/ECU (classifier *ert_bil_conv_a*). For the 10 countries outside the euro area, the nominal unit labour cost is converted to ECU/EUR using the nominal exchange rates (classifier *ert_bil_eur_a*).

37 trading partners deflated using the unit labour cost in the total economy (classifier: *ert_eff_ic_a*). The variable is GREER_CPI which is the percentage change in the real effective exchange rate against 37 trading partners deflated using consumer price indices (classifier: *ert_eff_ic_a*).

The time series properties of the data series are important for the choice of empirical methodology. Table 1 shows the results of panel data unit root tests, with common and with country-specific roots, for the data series GRULC, CA and DCA. The result is that GRULC is panel stationary while CA has a unit root (although the PP-Fisher test suggests a borderline case), and DCA, the first difference of CA, is panel stationary. The analyses in this paper generally use the two stationary variables GRULC and DCA, but the possible borderline result for CA suggests that it is judicious to use this variable in robustness analyses.

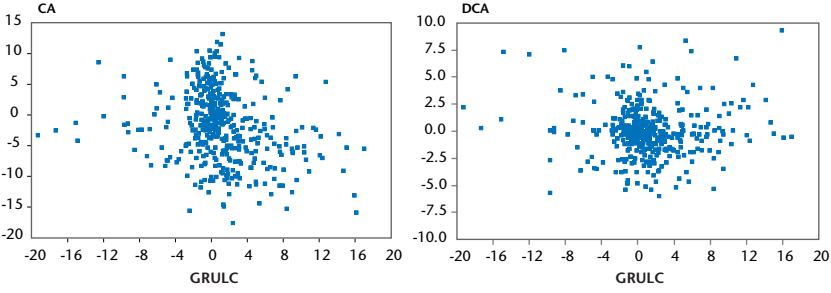
Table 1. Tests of unit roots of panel data series, 1997–2012

	Levin, Lin, Chu[a]	Im, Pesaran and Shin[b]	ADF-Fisher[b]	PP-Fisher[b]
GRULC	-12.388 [0.000]	-9.198 [0.000]	192.688 [0.000]	249.950 [0.000]
CA	-0.940 [0.174]	-0.932 [0.176]	64.896 [0.147]	57.0726 [0.339]
DCA	-7.901 [0.000]	-7.902 [0.000]	165.069 [0.000]	309.707 [0.000]

a. The test assumes a common unit root across the countries.
b. The test allows for different unit roots across the countries.
Notes: The null hypothesis is in all cases that the variable has a unit root. The tests allow for country-specific intercepts in the test regressions. The values in square brackets are *p*-values.

Figure 1 shows crossplots of the growth in the relative unit labour cost GRULC and the current account balance CA or the change in the current account balance DCA for 27 EU countries for the period 1995–2012, the scales being chosen so that a few extreme observations have been left out. Both crossplots exhibit weak negative correlations, but no clear patterns are apparent. Moreover, the possible directions of any possible linkages cannot be ascertained without econometric analysis.

Figure 1. Crossplots GRULC and CA or DCA; annual data 1997–2012, 27 EU countries



Note: GRULC is the change in the relative unit labour cost as a percentage, CA is the current account balance as a percentage of GDP, DCA is the change in the current account balance in percentage points of GDP. A small number of observations for which GRULC is below -20 percent or above 20 percent or CA is below -20 percent of GDP or above 20 percent of GDP have been omitted.

3. Granger causality tests

The discussion in Section 1 suggests that the possible effect of competitiveness on the current account is likely to occur with a time lag (*j*-curve effect) and, conversely, the possible effect of the current account on competitiveness may also appear with a time lag, especially in cases with a fixed exchange rate. It is therefore reasonable to identify the direction of causality using the time dimension, i.e. causality is associated with the lagged values of a variable having explanatory power over the other variable.[10]

This section presents the results of the Granger causality tests, which ascertain the time-based relationship between the two variables of interest, in this case between GRULC, the percentage growth in the relative unit labour cost, and DCA, the change in the current account balance in percentage points of GDP. The tests are carried out for a large number of specifications and for different country groups in order to examine the robustness of the results. The baseline Granger causality tests include annual changes in the relative unit labour costs and annual changes in the current account balance. The results therefore relate to the short or medium term horizon, while the long-term relation between the variables is not modelled.

10. Morande (1988) also tests for time-based (Granger) causality using different VAR models including variables such as the real exchange rate and external capital flows. The methodology is also related to the co-integration analysis in Belke and Dreger (2011) although the latter does not seek to identify the direction of causality.

The Granger causality test is performed in a model in which the dependent variable is explained both by one or more lags of itself and one or more lags of an independent explanatory variable (and possibly control variables). The Granger causality test is a standard Wald test with the null hypothesis that the coefficient or coefficients of the lagged independent explanatory variable are zero. The test statistic follows an *F*-distribution or, in the case of the System GMM estimation, asymptotically a χ^2-distribution. If the null hypothesis is rejected, the lagged variable is said to *Granger cause* the other variable. Granger causation implies that an independent explanatory variable precedes and helps to explain the dependent variable, but no fundamental causation can be ascertained as the independent explanatory variable will typically not be exogenous.

To avoid that outliers affect the results unduly, a few extreme observations have been trimmed from the dataset. Observations in which GRULC is below -20 percent or above 20 percent and observations for which CA is below -20 percent of GDP or above 20 percent have been omitted. These observations typically relate to episodes of extreme economic or financial instability. In total, 10 observations have been omitted due to this trimming of the dataset. The results are generally not very sensitive to the specific choice of cut-off points; the results only change marginally if instead the low cut-off point is taken to be -15 percent and the high cut-off point to be 15 percent.

Table 2 shows the results of panel data estimations used to test whether lags of DCA have explanatory power towards GRULC when one or more lags of GRULC are included, i.e. to test whether GRULC Granger causes DCA. Column (2.1) shows a simple estimation with country fixed effects and one lag of both variables. The null hypothesis of no explanatory power of GRULC cannot be rejected. The same applies in Column (2.2) in which the fixed effects are omitted and the model is estimated using ordinary least squares. It is noteworthy that the estimation results in Columns (2.1) and (2.2) are so similar. This is the result of the country fixed effects generally be very small, ranging from -0.46 to 0.54. A Wald test cannot reject the null hypothesis that the fixed effects are redundant (i.e. all 0) as the *F*-distributed test statistic is 0.159 (*p*-value = 1.000).

Table 2. Panel data Granger causality tests. Dependent variable = DCA

	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)
DCA(-1)	0.125 *(0.069)*	0.133 *(0.099)*	0.222 *(0.071)*	0.116 *(0.088)*	-0.032 *(0.123)*	0.188 *(0.117)*
DCA(-2)	..	..	..	-0.221 *(0.045)*	0.101 *(0.043)*	-0.273 *(0.054)*
GRULC(-1)	0.053 *(0.047)*	0.056 *(0.038)*	0.083 *(0.044)*	0.047 *(0.038)*	-0.016 *(0.045)*	0.053 *(0.044)*
GRULC(-2)	..	..	..	0.036 *(0.032)*	-0.046 *(0.021)*	0.055 *(0.039)*
Granger causality[a]	1.20 [0.270]	2.21 [0.138]	3.65 [0.056]	0.88 [0.427]	2.56 [0.113]	1.15 [0.359]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	408	408	408	383	220	138
Estimation	FE	OLS	System GMM	FE	FE	FE

a. The null hypothesis of the Granger causality test is that the lagged value(s) of the independent variable do(es) not Granger cause the dependent variable. The test statistic is *F*-distributed except in the System GMM estimation in which case it is χ^2-distributed; the values in square brackets are *p*-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

In a panel, the presence of the lagged dependent variable may lead to biased estimates when the model is estimated with OLS or fixed effects OLS (*Nickell bias*). This should not be a major problem in the present model as the coefficient of the lagged dependent variable is small and the country fixed effects are anyway economically and statistically insignificant. To assess this issue the model is estimated using the two-step System GMM methodology developed by Arellano and Bover (1995) and Blundell and Bond (1998).

The two-step System GMM estimations are undertaken using the Stata command xtabond2. The lagged dependent variable is instrumented, while the lagged independent explanatory variable is not instrumented. In the difference equation the instruments of the lagged dependent variable are, inter alia, expanding lags of its level lagged 2 and 3 years (truncated); in the level equation the instrument is the lagged difference of the dependent variable. The weighting is based on the $h(2)$ weighting matrix.

The estimated coefficients are qualitatively similar to those obtained using fixed effects least squares. The hypothesis of no

Granger causality can be rejected at the 5 percent level and the coefficient of GRULC(-1) is *positive*, which taken at face value indicates that higher unit labour costs are followed by an increase in (an "improvement" of) the current account balance. Qualitatively similar results are attained with different truncations of the instruments and if the lagged independent variable is also instrumented. This confirms a possible bias due to inclusion of the lagged dependent variable is little importance.

The conclusion at this stage is that changes in relative unit labour costs do not appear to precede changes in the current account balance and, if any effect is present, then the higher unit labour costs may be followed by an improvement of the current account balance. Moreover, inclusion of the lagged dependent variable and possibly endogeneity of the lagged independent variable does not appear to bias the fixed effect results unduly so fixed effect estimation appears to be appropriate in this case.

The next step is to allow a richer dynamic structure of the model. Column (2.4) shows the results when two lags of both variables are introduced as explanatory variables. In this case Granger causality entails the rejection of the joint hypothesis that the coefficients of GRULC(-1) and GRULC(-2) are 0. The hypothesis cannot be rejected (p-value = 0.427), suggesting that the inclusion of two lags of changes in the unit labour cost does not change the results obtained previously. Column (2.5) shows the results when the sample is restricted to the EU15 countries, i.e. the first 15 EU countries from Western Europe. The result is that the null hypothesis cannot be rejected even at the 10 percent level, but it is noticeable the estimated coefficient of GRULC(-1) and GRULC(-2) in this case that are negative although numerically small. Column (2.6) shows the results when the sample is restricted to the 10 CEE countries and the overall picture is as for the full sample and the EU15 countries. The conclusion of the models with lags up to two years is again that changes in relative unit labour costs have no apparent effect on changes in the current account in the short term.

Table 3 shows the results when the opposite direction of Granger causality is investigated. To this end, the change in the relative unit labour cost, GRULC, is explained by autoregressive terms and lagged changes in the current account balance, DCA. Column (3.1) shows the results when one lag is included and the

panel is estimated using fixed effects. The lagged current account balance has substantial explanatory power; an increase in the change of the current account balance ("capital outflow") of one percentage point of GDP is associated with 0.392 percent lower growth in the unit labour cost the following year, i.e. a considerable improvement in international competitiveness. By the same token, a capital inflow leads to deteriorating competitiveness the following year. Similar results follow from the OLS estimation in Column (3.2) and the System GMM estimation in Column (3.3).

Table 3. Panel data Granger causality tests. Dependent variable = GRULC

	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)
DCA(-1)	-0.392 *(0.104)*	-0.381 *(0.086)*	-0.315 *(0.139)*	-0.289 *(0.105)*	-0.340 *(0.116)*	-0.312 *(0.150)*
DCA(-2)	..	..	..	-0.285 *(0.079)*	-0.344 *(0.115)*	-0.356 *(0.104)*
GRULC(-1)	0.097 *(0.059)*	0.129 *(0.059)*	0.159 *(0.053)*	0.088 *(0.045)*	0.184 *(0.073)*	0.057 *(0.053)*
GRULC(-2)	..	..	..	-0.127 *(0.051)*	-0.058 *(0.042)*	-0.150 *(0.066)*
Granger causality[a]	14.24 [0.001]	19.71 [0.000]	5.13 [0.024]	10.29 [0.001]	5.62 [0.016]	9.60 [0.006]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	408	408	408	383	220	138
Estimation	FE	OLS	System GMM	FE	FE	FE

a. The null hypothesis of the Granger causality test is that the lagged value(s) of the independent variable do(es) not Granger cause the dependent variable. The test statistic is *F*-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are *p*-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

Column (3.4) shows the results when two lags are included. The coefficients of the two lags of the current account variable are both negative. They are highly significant in both economic and statistical terms. The null hypothesis of no explanatory power of the two lags of the current account is rejected, i.e. changes in the current account Granger cause changes in the relative unit labour costs. Column (3.5) shows the results when the sample comprises the EU15 countries and Column (3.6) shows the results for the sample of CEE countries. In these samples too, the estimated coef-

ficients of the lagged changes in the current account balance are negative; changes in current account balance are found to Granger cause changes in the relative unit labour cost.

The conclusions from the Granger causality tests in Tables 2 and 3 are clear. Lags of GRULC do not help explain DCA in estimations in which lags of DCA are included. In other words, changes in the relative unit labour cost do not Granger cause changes in the current account balance. This holds across different samples of countries and across a number of estimation methodologies. In contrast to these results, lags of DCA appear in most cases to have substantial explanatory power over changes in GRULC in models where lags of GRULC are included. In other words, changes in the current account balance Granger cause changes in the relative unit labour cost. This implies that for instance an increasing inflow of capital (a deteriorating current account balance) leads to deteriorating competitiveness.

The estimations presented in Tables 2 and 3 were carried out using the change in the relative unit labour cost, GRULC, and the change in the current account balance, DCA. As argued earlier, it may also be of interest to test for Granger causality between GRULC and the *level* of the current account balance, CA. Tables A1 and A2 in Appendix A show the results when the estimations in Tables 2 and 3 are made using the level of the current account balance, CA, instead of its change, DCA.

In qualitative terms most of the results remain unchanged. Table A1 shows the results of estimations in which changes in the current account balance are explained by autoregressive terms and lagged changes in the relative unit labour cost. Lagged changes in the relative unit labour cost do not Granger cause the current account balance, irrespective of the sample or estimation method. Table A2 presents the results of estimations where the dependent variable is the change in the relative unit labour cost. In all specifications the level of the lagged current account balance is found to Granger cause changes in the relative unit labour cost at least at the 10 percent level of statistical significance. The rejection is stronger for the CEE countries than for the EU15 countries.

Another robustness test entails replacing the change in the relative unit labour cost, GRULC, by other measures of changes in competitiveness. Two measures are available, i.e. the change in the real effective exchange rate computed using the unit labour cost as deflator (GREER_ULC) and the change in the real effective exchange rate based on the consumer (GREER_CPI). The three variables are closely correlated; the correlation coefficient is 0.86 between GRULC and GREER_ULC and 0.64 between GRULC and GREER_CPI.

Tables B1 and B2 in Appendix B show the results when the GREER_ULC is the measure of changes in competiveness. The results are qualitatively the same as when GRULC is used, i.e. competitiveness does not Granger cause changes in the current account, but changes in the current account do seem to Granger cause the competitiveness measure. The group of EU15 countries emerge as a partial exception to this picture, cf. the results in Column (B1.5), but it is noticeable that the estimated coefficients of the two lags of GREER_ULC are numerically small and take on different signs.

Tables C1 and C2 in Appendix C provide the results when the GREER_CPI is the measure of changes in competiveness. The results are again qualitatively as when GRULC is used although the results are less clear for the group of EU15 countries. The results in Column (C2.5) suggest a negative relationship between lags of changes in the current account balance, but the individual coefficients are not statistically significant and the Granger causality test of the coefficients both being equal zero cannot be rejected. Further analysis (not reported) shows that the imprecisely estimated coefficients is largely attributable to events in five euro area crisis countries in 2012; the results change markedly if these five observations are excluded from the sample.

The upshot of the robustness analyses reported in Appendices B and C is that the specific choice of competitiveness measure generally is of little importance when assessing the relation between competitiveness and external capital flows. This result is in line with other studies. Dieppe *et al.* (2012) find that different measures of competitiveness are closely correlated within the euro area. Ca' Zorzi and Schnatz (2007) find that different measures of competitiveness are equally suitable for forecasting of export performance.

4. VAR models

This section extends the analysis in Section 3 by modelling changes in relative wage cost competitiveness and the current account balance in a vector autoregressive (VAR) model. This allows a deeper investigation of the interactions between the two variables over time. In particular, the reaction of the two variables to shocks can be computed using different assumptions for the temporal relation between the variables, including no lag between the change in one variable and the resulting change in the other variable. We will focus on changes in the relative unit labour cost, GRULC, and changes in the current account balance, DCA. Both variables are panel stationary.

Even allowing for simultaneous dependence between the two variables GRULC and DCA, the system can be reduced so as to contain only lags of the two variables as explanatory variables. Estimations are made using two lags and considering three different country samples: 27 EU countries (all except Croatia), the EU15 countries and the 10 CEE countries. The results of the system estimations, presented in Table 4, correspond to the results in Columns (2.4)-(3.4), (2.5)-(3.5) and (2.6)-(3.6). The panel VAR systems are estimated using fixed effect least squares as the method

Table 4. Estimation of panel VAR models, GRULC and DCA

	(4.1)		(4.2)		(4.3)	
	DCA	GRULC	DCA	GRULC	DCA	GRULC
DCA(-1)	0.116 *(0.053)*	-0.289 *(0.077)*	-0.032 *(0.078)*	-0.340 *(0.124)*	0.188 *(0.085)*	-0.312 *(0.130)*
DCA(-2)	-0.221 *(0.052)*	-0.285 *(0.075)*	0.101 *(0.080)*	-0.344 *(0.127)*	-0.273 *(0.082)*	-0.356 *(0.125)*
GRULC(-1)	0.047 *(0.027)*	0.088 *(0.039)*	-0.016 *(0.040)*	0.184 *(0.063)*	0.053 *(0.040)*	0.057 *(0.060)*
GRULC(-2)	0.036 *(0.025)*	-0.127 *(0.036)*	-0.046 *(0.036)*	-0.058 *(0.058)*	0.0555 *(0.037)*	-0.150 *(0.056)*
Time sample	1998-2012		1998-2012		1998-2012	
Countries	EU27		EU15		CEE	
Observations	383		220		138	

Notes: Standard errors are shown in round brackets. Country fixed effects are included in all estimations but are not reported.

is generally robust when the time dimension is not too short (Canova and Ciccarelli 2013). The estimations are undertaken in Eviews which does not allow for clustering of the standard errors; the ordinary standard errors are generally somewhat smaller than the clustered standard errors which entails that the confidence intervals of the presented impulse responses are relatively small.

The coefficient estimates are identical to those of the corresponding estimations in Tables 2 and 3 and the standard errors only differ slightly. Across all three country samples, the lags of GRULC exert little explanatory power on DCA, while lags of DCA exert substantial explanatory power on GRULC, both in statistical and economic terms.

This paper seeks to ascertain the most probable direction of the linkages between the two main variables of interest, GRULC and DCA. The VAR model allows a more sophisticated identification of cause and effect than the Granger causality tests in Section 3 which assumed very simple dynamic linkages between the two variables. We will consider three different identification schemes of the VAR models, which entail different causal dynamics between the two variables of interest.

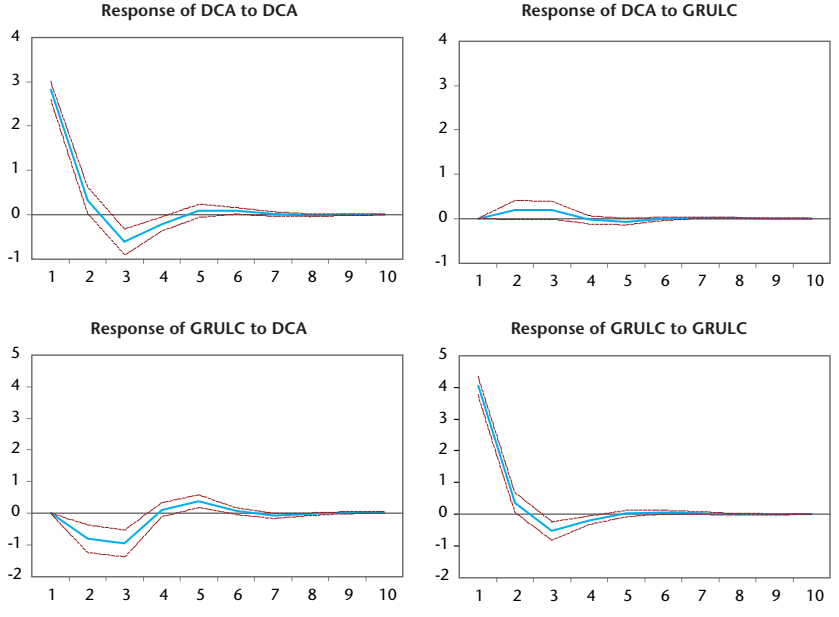
a) There are no contemporaneous effects between the two variables, only lagged effects. This is a case of over-identification as all off-diagonal elements in the variance-covariance matrix are zero (non-orthogonalisation).
b) GRULC can affect DCA contemporaneously, while DCA can only affect GRULC with a lag. This is a case of exact recursive identification based on Cholesky decomposition of the variance-covariance matrix.
c) DCA can affect GRULC contemporaneously, while GRULC can only affect DCA with a lag. This is another case of Cholesky decomposition but with the opposite direction of temporal effects from those in b).

Figures 2-3 present impulse responses for model (4.1) estimated on the full sample of 27 EU countries using the three different identification schemes a)-c).

Figure 2 shows the impulse responses for identification scheme a) in which there are no contemporaneous effects. The upper left plot shows the impulse response of DCA to a one standard devia-

tion shock in DCA in period 1. The effect of the shock dies out relatively quickly but with some overshooting in the third and fourth years. The upper right plot shows the effect on DCA of a one standard deviation increase in GRULC. It follows that the effect is very subdued in both statistical and economic terms, and possibly with the "wrong" sign, i.e. a shock implying higher growth in relative unit labour cost has a positive effect on the change in the current account balance (an "improvement").

Figure 2. Response of DCA and GRULC to innovations in GRULC and DCA, non-factorised innovations, 27 EU countries



Note: The solid line depicts the impulse response and the dashed lines ± two standard deviations. The standard deviation of GRULC is 4.4 percentage points and the standard deviation of DCA is 2.9 percentage points.

The lower left plot shows the impulse response of GRULC to a shock in DCA amounting to a one standard deviation in period 1. The result is a reduction of GRULC for two periods of approximately one percentage point in each period. The effect on GRULC accumulated over all 10 periods is -1.3 percentage points. In other words, a one percentage point increase in net capital outflows (increased capital outflow or reduced capital inflow) leads to a

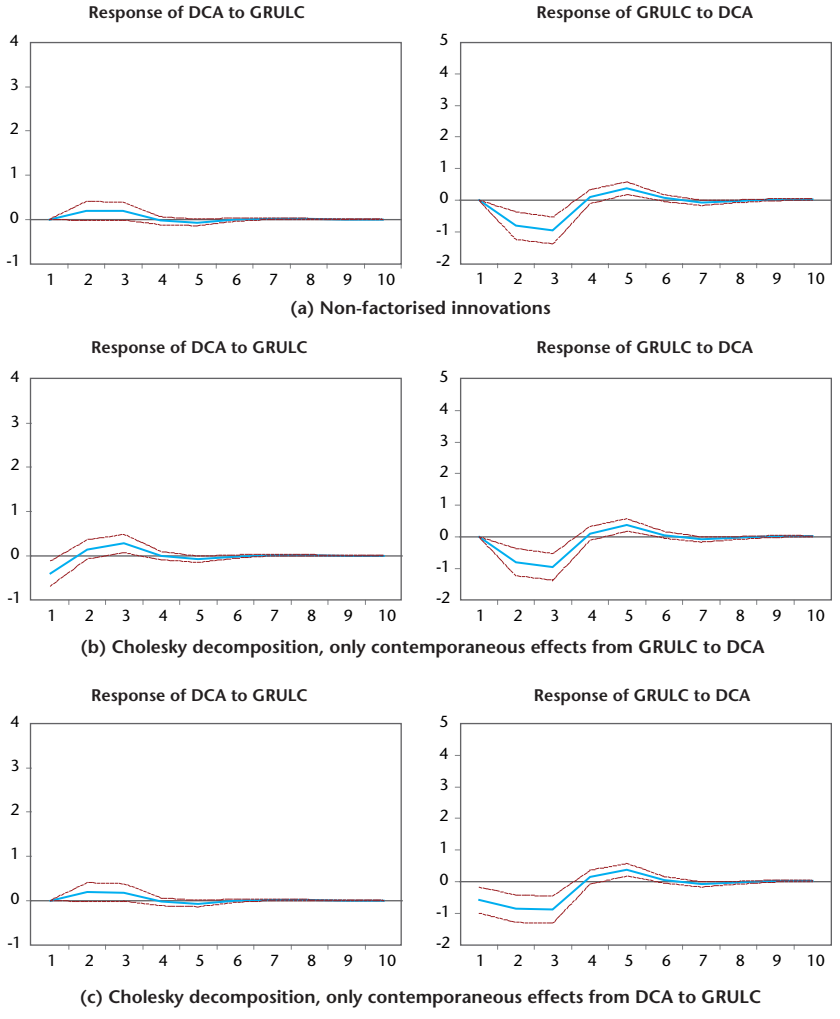
decrease of approximately 0.5 percent in unit labour costs over time. The magnitudes also seem to be significant in an economic sense. Finally, the lower right plot shows the impulse response of GRULC to a one standard deviation shock in GRULC.

Figure 3 presents impulse responses for each of the three identification schemes, a)-c), facilitating easy comparison across the identification schemes. To save space the autoregressive impulse responses are omitted as they resemble those shown in the upper left and lower right plots in Figure 2 in all cases. The upper panel depicts impulse responses for identification scheme a) in which there are no contemporaneous effects. These are the same impulse responses that were presented in upper right and lower left panels in Figure 2.

The centre panel presents the impulse responses for identification scheme b) in which GRULC can affect CA immediately, while the reverse is ruled out. The left plot depicts the response of DCA to a one standard deviation increase in GRULC in period 1. In this case the immediate response is negative, although the effect is not statistically significant at the 5 percent level, while the response is positive in periods 2 and 3 and subsequently dies out. Thus, a possible negative effect on DCA of a one-deviation-increase in GRULC is imprecisely determined and is anyway reversed already from the following period. The right plot shows the response of GRULC to a shock in DCA; the dynamics resemble the dynamics of the corresponding impulse responses in the non-orthogonalised model.

The bottom panel shows the impulse responses for identification scheme c), which assumes that DCA can affect GRULC immediately while effects in the opposite direction take place with a lag. It follows from the left plot that GRULC has little effect on DCA and the previously observed "wrong sign" also appears with this orthogonalisation. It follows from the right plot that a shock in DCA now has an immediate negative effect on GRULC, although not one that is statistically significant at the 5 percent level, and then negative effects the following two years as also observed with identification schemes a) and b).

Figure 3. Response of DCA and GRULC to innovations in GRULC and DCA, different identification schemes, 27 EU countries



Note: The solid line depicts the impulse response and the dashed lines ± two standard deviations. The standard deviation of GRULC is 4.4 percentage points and the standard deviation of DCA is 2.9 percentage points.

The conclusion from the impulse responses in Figure 3 is that irrespective of the identification scheme, the main results from Section 3 also apply in the VAR model. First, changes in the relative unit labour cost generally have little effect on the current account balance. In most cases the effect appears to be positive, implying that improved competitiveness leads to larger net capital inflows,

i.e. a "worsening" of the current account balance.[11] The exception is identification scheme b) where GRULC can affect CA contemporaneously, but the negative effect is short-lived and not statistically significant. Second, changes in the current account balance seem to affect the relative unit labour cost. Increasing current account deficits, signifying increasing capital inflows, are followed by deteriorating competitiveness in the form of the unit labour cost increasing faster than it does in the core euro area countries.

The results obtained are robust not only to the choice of identification scheme, but also to the sample of countries, the time sample and the measure of capital flows. We will briefly discuss some of the robustness analyses we have undertaken.

Country samples. The impulse responses for the sample of EU15 countries and for the sample of CEE countries take the same shape as those for the full sample presented in Figures 2 and 3. This point is illustrated in Figure D1 in Appendix D in which the impulse responses for the CEE countries, cf. Column (4.3) in Table 4, are shown. It is noticeable that the effect of a one standard deviation DCA shock on GRULC is somewhat larger for the sample of CEE countries than for the full sample.

Time samples. We have re-estimated the VAR models in Table 4 using the time sample 1998-2007, i.e. the sample end before the outbreak of the global financial crisis. The lower number of observations reduces the precision with which the coefficients are estimated, but otherwise the changes are small. The impulse responses depict the previously observed pattern of directions (not shown).[12]

Measures of capital flows. We estimated a VAR model with GRULC and the current account balance CA (instead of changes in the current account balance, DCA). The impulse responses using identification schemes a)–c) are reproduced in Figure E1 in Appendix E. The results are essentially as before; changes in the

11. The impulse responses with the "wrong" sign would be consistent with an improvement in competitiveness making the country more attractive as an investment destination and leading to capital inflows. The effect is, however, statistically insignificant in all three identification schemes.

12. A further reduction of the sample to include only the EU15 countries is a partial exception as the effect on GRULC of changes in DCA is slower and less pronounced than when the full sample is used.

relative unit labour cost have no or counter-intuitive effect on the current account balance, whereas innovations in the current account balance affect changes in the relative unit labour cost. The use of real effective exchange rate indices as measures of competitiveness also leads to impulse responses entailing the same qualitative results.

5. Final comments

The Euro Plus Pact adopted in March 2011 establishes monitoring by the European Commission of a number of variables presumed to predicate financial imbalances in individual EU countries. The chief target variable of the Pact is the development of competitiveness as measured by changes in the relative unit labour cost in common currency terms.

The paper uses Granger causality tests and VAR models to analyse the short-term dynamics between changes in the relative unit labour cost and the current account balance. The conclusions of the empirical analyses are robust to a number of sample and specification changes and can be summarised in two points. First, there is little or no effect from changes in the relative unit labour cost on changes in the current account balance (or the level of the current account balance). Second, there is a relatively strong and statistically significant link from changes in the current account balance on changes in the growth of the relative unit labour cost within a horizon of 1–3 years.

These conclusions are consistent with a situation in which capital flows in large part depend on events outside the individual country, i.e. capital flows exhibit a substantial exogenous component. The results are thus in line with findings on other datasets, cf. Calvo *et al*. (1996), Kim (2000), Lipschitz *et al*. (2002) and Jaumotte and Sodsriwiboon (2010). A country may experience a positive "confidence shock" and become a major recipient of capital inflows. An inflow of capital leads to a nominal appreciation if the country has a floating exchange rate or drives up domestic wages and prices. The net result, irrespective of exchange rate regime, is a real exchange rate appreciation or deteriorating international wage cost competitiveness. The opposite may be a negative confidence shock that leads to a capital outflow, which

over time improves competitiveness through lower wages and prices and/or a depreciating nominal exchange rate. The interpretation is consistent with findings based on other dataset, *cf.* Saborwoski (2009) and Bakardzieva *et al.* (2010).

The finding that capital flows are likely to entail changes in competitiveness in the short term while the reverse effect is subdued or non-existent suggests that current account developments may be an important indicator of future macroeconomic performance. The same conclusion is reached by Giavazzi and Spaventa (2010) and Jaumette and Sodsriwiboon (2010). The findings, however, raise the question of whether the Euro Plus Pact targets the messenger of economic imbalances rather than (one of) the underlying causes. Countries subject to large capital inflows experience upward pressure on relative unit labour costs, while countries with large capital outflows will experience downward pressure on relative unit labour costs. The developments in unit labour costs are endogenous and partly determined by capital flows. This may suggest that the Euro Plus Pact may have limited ability to impact unit labour costs and even if it is possible, this may have little effect on the accumulation of current account imbalances.

The results of this paper should not be taken to imply that competitiveness does not matter for economic performance in the longer term. The relative unit labour cost or other measures of competitiveness may still signal the emergence of "imbalances" in individual economies. The argument of this paper is merely that competitiveness is an endogenous variable, which is determined by a whole range of factors in the individual economy and the surrounding economic environment. One such factor is international capital flows, proxied in this paper by the current account balance, and this factor seems to have substantial explanatory power in the sample of EU countries (see also De Grauwe, 2011; Holinski *et al.*, 2012).

The analysis in this paper provides clear results that are largely robust to different samples and specifications. Even so, the analysis may be substantiated or extended in a number of ways. First, additional variables could be included in the VAR model in order to model the adjustment processes in more detail. A richer specification of the VAR may also be a way to investigate the underlying

economic mechanisms behind the identified linkages between the two variables. Second, quarterly data might make it easier to establish the direction of the linkages and estimate the adjustment patterns for different innovations. Third, it might be possible to ascertain the linkages between international competitiveness and capital flows using other means of identification such as instrumentation and event studies. Fourth, it could be useful to divide capital flows into different components, including foreign direct investment, portfolio investment and loans etc., as this would provide information on whether different components affect competitiveness in different ways (Bakardzhieva *et al.* 2010). It may also be expedient to consider a measure of capital flows in which changes in the official reserves are eliminated (Reinhart and Reinhart 2009). Finally, it may be possible to undertake analyses of linkages between competitiveness and capital flows in individual countries in cases where long data series are available.

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APPENDIX A. Additional Granger causality tests

Table A1. Panel data Granger causality tests. Dependent variable = CA

	(A1.1)	(A1.2)	(A1.3)	(A1.4)	(A1.5)	(A1.6)
CA(-1)	0.125 *(0.069)*	0.133 *(0.099)*	0.222 *(0.071)*	0.116 *(0.088)*	-0.032 *(0.123)*	0.188 *(0.117)*
CA(-2)	..	..	..	-0.221 (0.045)	0.101 (0.043)	-0.273 *(0.054)*
GRULC(-1)	0.053 *(0.047)*	0.056 *(0.038)*	0.083 *(0.044)*	0.047 (0.038)	-0.016 *(0.045)*	0.053 *(0.044)*
GRULC(-2)	..	..	..	0.036 (0.032)	-0.046 *(0.021)*	0.055 *(0.039)*
Granger causality[a]	1.20 [0.270]	2.21 [0.138]	3.65 [0.056]	0.88 [0.427]	2.56 [0.113]	1.15 [0.359]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	408	408	408	383	220	138
Estimation	FE	OLS	System GMM	FE	FE	FE

a. The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is F-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are p-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

Table A2. Panel data Granger causality tests. Dependent variable = CGRULC

	(A2.1)	(A2.2)	(A2.3)	(A2.4)	(A2.5)	(A2.6)
CA(-1)	-0.243 *(0.080)*	-0.123 *(0.040)*	-0.136 *(0.057)*	-0.477 *(0.108)*	-0.293 *(0.125)*	-0.713 *(0.111)*
CA(-2)	..	..	..	0.199 *(0.095)*	0.324 *(0.150)*	0.151 *(0.096)*
GRULC(-1)	0.090 *(0.062)*	0.119 *(0.057)*	0.183 *(0.069)*	0.086 *(0.047)*	0.209 *(0.065)*	0.017 *(0.045)*
GRULC(-2)	..	..	..	-0.128 *(0.049)*	-0.044 *(0.042)*	-0.170 *(0.062)*
Granger causality[a]	9.23 [0.005]	9.39 [0.002]	5.61 [0.018]	10.00 [0.001]	2.74 [0.099]	24.10 [0.000]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	408	408	408	382	220	138
Estimation	FE	OLS	System GMM	FE	FE	FE

a. The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is F-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are p-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

APPENDIX B. Alternative competitiveness measure

Table B1. Panel data Granger causality tests. Dependent variable = DCA

	(B1.1)	(B1.2)	(B1.3)	(B1.4)	(B1.5)	(B1.6)
DCA(-1)	0.090 *(0.070)*	0.098 *(0.097)*	0.183 *(0.077)*	0.088 *(0.086)*	-0.002 *(0.116)*	0.177 *(0.118)*
DCA(-2)	..	..	..	-0.235 *(0.043)*	0.113 *(0.041)*	-0.283 *(0.051)*
GREER_ULC(-1)	0.041 *(0.048)*	0.045 *(0.037)*	0.065 *(0.046)*	0.032 *(0.038)*	0.041 *(0.018)*	0.046 *(0.049)*
GREER_ULC(-2)	..	..	..	0.030 *(0.036)*	-0.073 *(0.022)*	0.067 *(0.047)*
Granger causality[a]	0.73 [0.401]	1.54 [0.215]	2.05 [0.152]	0.42 [0.660]	11.58 [0.001]	1.02 [0.399]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	410	410	410	388	222	139
Estimation	FE	OLS	System GMM	FE	FE	FE

[a] The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is *F*-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are *p*-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

Table B2. Panel data Granger causality tests. Dependent variable = GREER_ULC

	(B2.1)	(B2.2)	(B2.3)	(B2.4)	(B2.5)	(B2.6)
CA(-1)	-0.344 *(0.107)*	-0.335 *(0.077)*	-0.275 *(0.145)*	-0.291 *(0.108)*	-0.234 *(0.129)*	-0.332 (0.162)
CA(-2)	..	..	..	-0.206 (0.077)	-0.258 (0.144)	-0.288 *(0.099)*
GREER_ULC(-1)	0.122 *(0.059)*	0.153 *(0.058)*	0.163 *(0.067)*	0.139 *(0.052)*	0.259 (0.052)	0.083 *(0.063)*
GR EER_ULC(-2)	..	..	..	-0.121 *(0.049)*	-0.054 *(0.032)*	-0.155 *(0.072)*
Granger causality[a]	11.38 [0.003]	19.18 [0.000]	3.60 [0.058]	7.77 [0.002]	2.88 [0.090]	9.06 [0.007]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	410	410	410	388	222	139
Estimation	FE	OLS	System GMM	FE	FE	FE

[a] The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is *F*-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are *p*-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

APPENDIX C. Alternative competitiveness measure

Table C1. Panel data Granger causality tests. Dependent variable = DCA

	(C1.1)	(C1.2)	(C1.3)	(C1.4)	(C1.5)	(C1.6)
DCA(-1)	0.082 *(0.069)*	0.089 *(0.096)*	0.173 *(0.074)*	0.091 *(0.085)*	-0.008 *(0.122)*	0.196 *(0.109)*
DCA(-2)	..	..	..	-0.250 *(0.042)*	0.128 *(0.045)*	-0.328 *(0.032)*
GREER_CPI(-1)	0.021 *(0.047)*	0.034 *(0.043)*	0.028 *(0.045)*	0.018 *(0.046)*	0.068 *(0.016)*	0.010 *(0.063)*
GREER_CPI(-2)	..	..	..	-0.018 *(0.028)*	-0.095 *(0.029)*	0.017 *(0.037)*
Granger causality[a]	0.20 [0.661]	0.65 [0.422]	0.39 [0.532]	0.25 [0.782]	19.85 [0.000]	0.13 [0.876]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	410	410	410	388	222	139
Estimation	FE	OLS	System GMM	FE	FE	FE

a The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is F-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are p-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

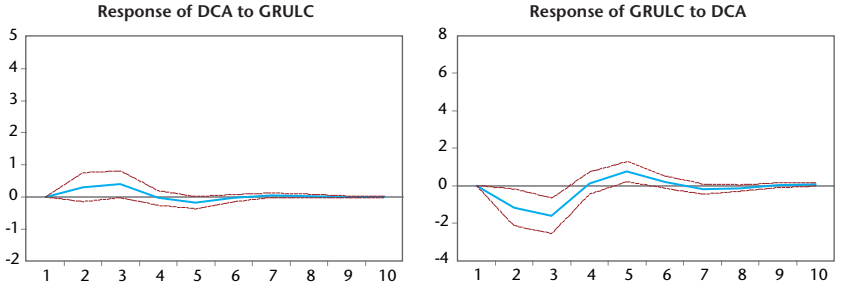
Table C2. Panel data Granger causality tests. Dependent variable = GREER_CPI

	(C2.1)	(C2.2)	(C2.3)	(C2.4)	(C2.5)	(C2.6)
DCA(-1)	-0.181 *(0.049)*	-0.177 *(0.053)*	-0.193 *(0.061)*	-0.194 *(0.046)*	-0.102 *(0.114)*	-0.226 *(0.052)*
DCA(-2)	..	..	..	-0.116 *(0.047)*	-0.035 *(0.092)*	-0.165 *(0.068)*
GREER_CPI(-1)	0.029 *(0.105)*	0.140 *(0.094)*	0.137 *(0.067)*	0.122 *(0.055)*	0.225 *(0.039)*	0.051 *(0.082)*
GREER_CPI(-2)	..	..	..	-0.099 *(0.035)*	-0.081 *(0.041)*	-0.113 *(0.059)*
Granger causality[a]	13.88 [0.001]	11.07 [0.001]	9.86 [0.002]	9.32 [0.001]	0.40 [0.679]	10.07 [0.005]
Time sample	1997-2012	1997-2012	1997-2012	1998-2012	1998-2012	1998-2012
Countries	EU27	EU27	EU27	EU27	EU15	CEE
Observations	410	410	410	388	222	139
Estimation	FE	OLS	System GMM	FE	FE	FE

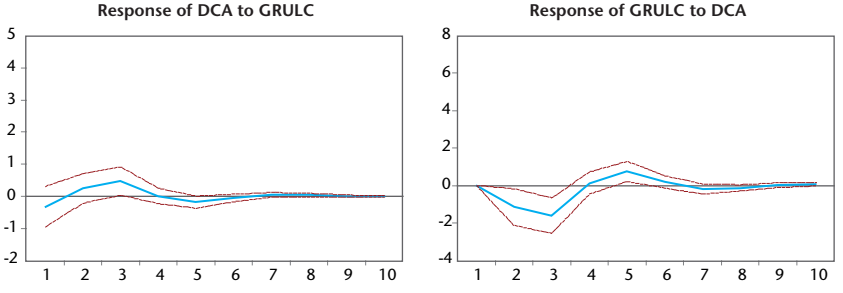
a The null hypothesis of the Granger causality test is that the lagged value(s) of the independent explanatory variable do(es) not Granger cause the dependent variable. The test statistic is F-distributed except in the case of the System GMM estimation in which it is χ^2-distributed; the values in square brackets are p-values.
Notes: Standard errors are clustered along the cross section and are shown in round brackets. A constant term is included in all estimations but not shown.

APPENDIX D. Impulse responses for VAR model with CEE countries

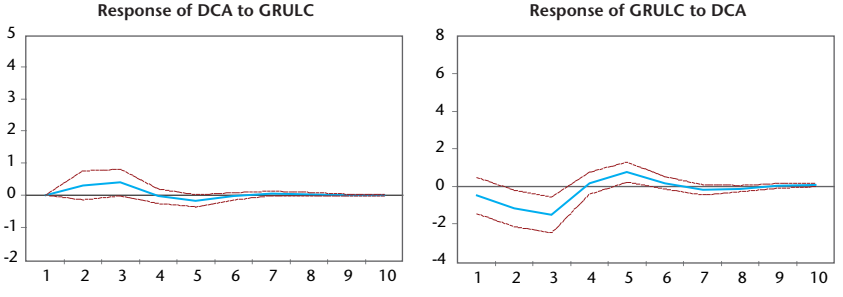
Figure D1. Response of DCA and GRULC to innovations in GRULC and DCA, different identification schemes, CEE countries



(a) Non-factorised innovations



(b) Cholesky decomposition, only contemporaneous effects from GRULC to DCA

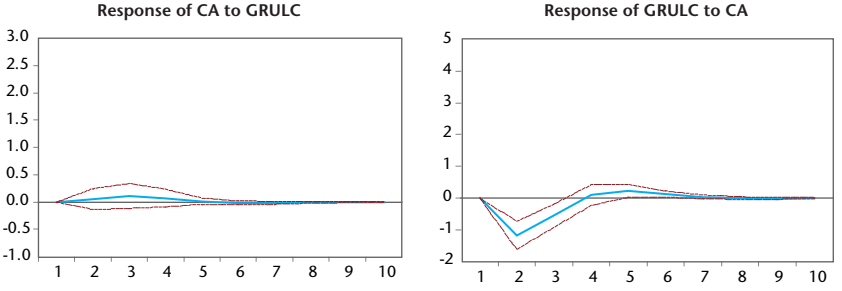


(c) Cholesky decomposition, only contemporaneous effects from DCA to GRULC

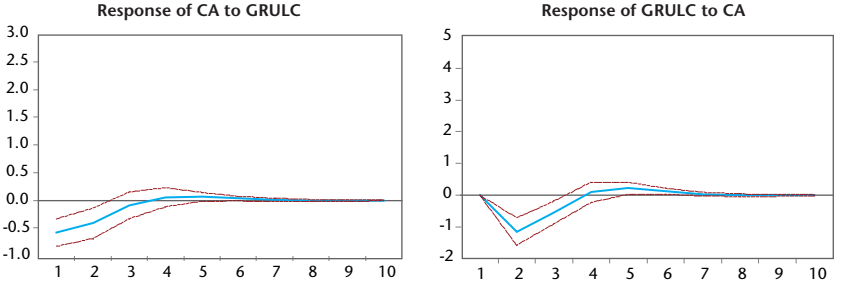
Notes: The solid line depicts the impulse response and the dashed lines ± two standard deviations. The standard deviation of GRULC is 6.2 percentage points and the standard deviation of DCA is 3.9 percentage points.

APPENDIX E. Impulse responses for VAR model with CA variable

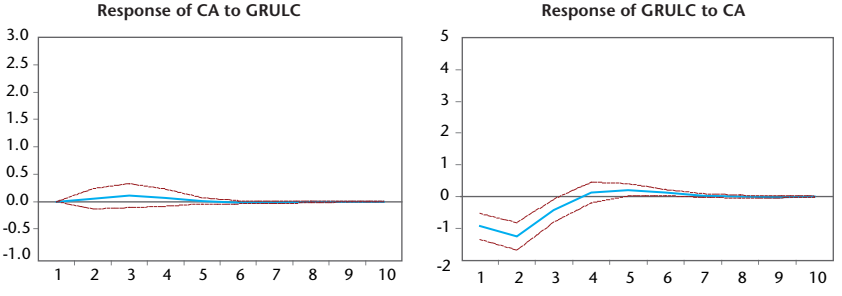
Figure E1. Response of CA and GRULC to innovations in GRULC and CA, different identification schemes, all countries



(a) Non-factorised innovations



(b) Cholesky decomposition, only contemporaneous effects from GRULC to DCA



(c) Cholesky decomposition, only contemporaneous effects from CA to GRULC

Notes: The solid line depicts the impulse response and the dashed lines ± two standard deviations. The standard deviation of GRULC is 4.4 percentage points and the standard deviation of CA is 5.8 percentage points.