Unit Labour Costs and Capital Efficiency in the Euro Area: a new competitiveness indicator

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1. Introduction

Competitiveness is a controversial concept. Although Paul Krugman (1994;1996) has called policy makers' concern with competitiveness "a dangerous obsession", the compulsion of blaming Europe's crisis on competitiveness continues. The Euro Group has discussed the issue of competitiveness divergences repeatedly, and the European Commission has argued that "over the first decade of the century, the EU has registered serious gaps in competitiveness and major macroeconomic imbalances".[1] A new surveillance and enforcement mechanism, the *Macroeconomic Imbalance Procedure,* has been set up in December 2011 in order "to prevent the emergence of harmful macroeconomic imbalances and correct the imbalances that are already in place". The European Commission now also produces regularly a number of "competitiveness reports." In the 2010 report it argues that "a smooth adjustment of intra-Euro Area competitiveness divergences and macroeconomic imbalances is key for the recovery and, more generally, for the successful and sustainable functioning of EMU in the long term" (European Commission 2010). Thus, the question of how to measure competitiveness is an important issue for the design of macroeconomic policies in the Euro Area.

The literature reveals a wide variety of competitiveness notions, measures and applications (Buckley et alt. 1988). Some studies concentrate on firms, some on economic sectors, many on countries. The complexities of phenomena contributing to the evaluation of competitiveness are often combined into a single index that assesses improvements or deteriorations in competitive positions. The European Commission uses a scoreboard that combines different indicators and observes their evolution over time. In the present work we add another indicator to the already long list, because we think it is particularly appropriate for assessing

[1] http://ec.europa.eu/economy_finance/economic_governance/macroeconomic_imbalance_procedure/index_en.htm (accessed 29.5.2013)

national economies within the European monetary union, although it can also be used even beyond this limited field.

A broad definition of international competitiveness frequently used in the literature is: "the degree to which [a country] can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over time" (OECD, 1992; Boltho, 1996; Keyder*et alt*. 2004). The British Aldington Report (1985) wrote "the definition of competitiveness for a nation must (…) be tied to its ability to generate the resources required to meet its national needs". Bennett *et al*. (2008) take "Competitiveness to mean the success of an economy in seizing the opportunities afforded by an increasingly integrated international economic environment to deliver sustained growth in living standards". This definition allows them interpreting competitiveness as a "production technology", where the conditions determining exports are the "input" into improving living standards.

In this chapter we take a different, narrower approach, but we also interpret competitiveness as a production function because we see competitiveness as a process in which input variables, such as the relative costs of labour and capital, relative prices, productivities and profits generate macroeconomic output data like exports, imports, trade balances, current accounts and foreign direct investment, all of which are relevant for sustained growth of living standards. We develop a new competitiveness indicator which includes the role of capital efficiency and profit rates together with labour costs: the CER Competitiveness Index (CCI). It includes both production factors, labour and capital, and it measures competitiveness as the ratio between unit labour costs and their equilibrium level, with the latter determined by the equality between a country's profit rate and the average one. We then test the performance of our compound index against the standard measures.

The structure of the paper is the following: in the next section, we will review the main input and output measures and highlight their characteristics and shortcomings. In section 3 we introduce the role of capital efficiency and formally develop the CCI. In section 4 we will test econometrically the performance of the CCI while sections 5 concludes.

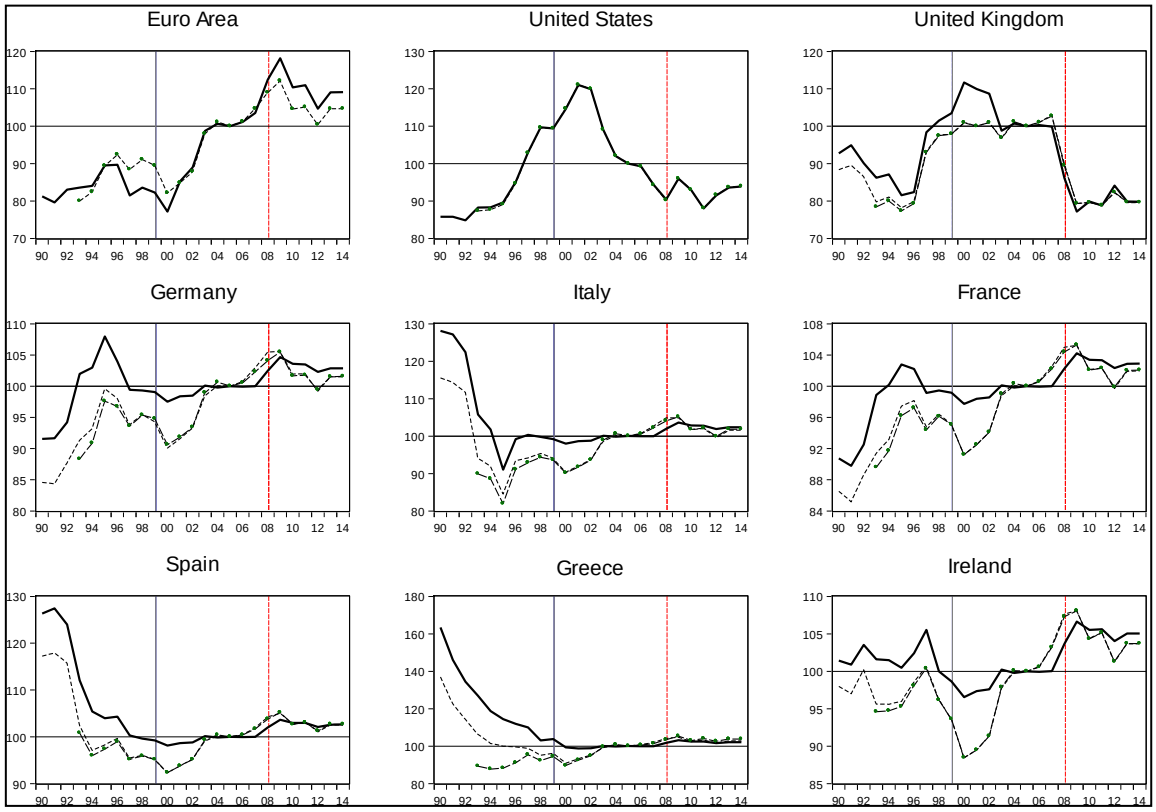
2. "Input" and "output" measures of competitiveness

2.1 Input measures

The most commonly used "input" measures for competitiveness are indices of relative prices or costs, either in levels or rates of change. These indices imply certain assumptions of equilibrium. For example, the *Law of One Price* states that, abstracting from transport and transaction costs, freely traded identical commodities should have the same price in a common currency denomination. *Purchasing power parity* (ppp) applies this law to similar baskets of goods. *Dynamic ppp* says that nominal exchange rate variations should reflect inflation differential between two economies. The *real effective exchange rate* (REER) broadens this idea to a trade-weighted index of relative prices. Deviations from these equilibria may be caused by market imperfections, oligopolistic competition, pricing to market or by using inconsistent price indices, such as consumer prices, whole sale price indices or GDP deflators (Keyder, 2004). All major international economic organisations like IMF, OECD, BIS, central banks, etc. publish indices for trade-weighted relative prices and costs. The European Commission calculates REER for a broad group of 41 countries, two smaller groups of 36 and 24 industrial countries, the 27 Member States of the European Union (EU) and the Euro Area countries (EA) (see ECFIN 2012). In international economics, real effective exchange rates convert prices in the currency of trade partners into local currency. Given that the exchange rate is an asset price with high volatility, distortions in REERs from *PPP* are frequent, normal and disturbing. Nevertheless, in a single currency area, this noise factor has been eliminated, so that relative prices between sectors or regions reflect demand and supply conditions.

Because price indices often amalgamate tradable and non-tradable goods, while for the latter trade arbitrage will not ensure convergence to equilibrium, unit labour cost (ULC) indices are often preferred. Unit labour costs are defined as total wage remuneration per unit of output produced. Focussing on ULC in the manufacturing sector is considered a good proxy for relative labour costs in the tradable sector. Figure 1 shows the ULC-based REER indices for some countries. The huge fluctuations of over 50 percent over a decade under flexible exchange rate regimes contrast clearly with the stability after the introduction of the single currency in the European Union, even after the 2008 financial crisis.

Figure 1. Real Effective exchange rates based on ULC



Source: AMECO

Table 1 confirms that Euro member states experienced a small real appreciation against the most important trade partners within the European Union, and that this was mainly due to the weakening of the British pound and in the first decade of the euro against the Swedish crown. Greece also depreciated before it joined the Euro Area in 2001. However, against 34 industrial trade partners (including the 15 EU countries), the variations are much bigger, because they reflect the trade of partners with different currencies and different inflation rates. The Euro Area as a whole has appreciated against its main non-Euro partners by 17 percent before 2007, and has on average kept its real exchange rate stable since then. Thus, Europe's competitive environment has become much more stable in monetary union. Instead of wasting resources on arbitrage trade caused by relative cost distortions, European firms could concentrate on competing for more efficient production processes and better output of goods and services.

Table 1. Changes in REER (in %)

	relative to EU 15		relative to 34 industrial	
	1999-2007	*2007-2014*	*1999-2007*	*2007-2014*
Austria	0.6	1.5	4.8	*-0.4*
Belgium	0.8	2.5	6.1	0.4
Denmark	1.1	1.6	5.7	*-1.2*
Finland	1.2	1.4	8.1	*-1.4*
France	0.9	2.9	7.5	*-0.1*
Germany	1.0	2.9	7.9	*-0.7*
Greece	*-3.6*	2.0	7.4	2.3
Ireland	1.4	5.0	10.2	0.5
Italy	0.8	2.4	9.1	*-0.3*
Luxembourg	0.7	2.1	3.0	0.9
Netherlands	0.8	2.8	5.1	0.9
Portugal	0.6	2.0	4.5	0.4
Spain	0.8	2.6	6.8	1.0
Sweden	*-4.2*	13.3	2.5	9.5
United Kingdom	*-3.4*	*-20.2*	4.9	*-22.5*
Euro Area			17.0	*-0.0*

Source: Ameco, own calculations

Given this plethora of competitiveness measures, why invent a new one? Unfortunately, none of the above-mentioned indicators is able to provide a full view of the causes and effects of competitiveness. Maybe the most complete picture is given by the *World Economic Forum Competitiveness Report* and the IMD World Competitiveness Center (WCC), which compare the competitiveness of 60 nations on the basis of over 300 criteria. However, while these surveys allow interesting overall rankings between countries, if it is desirable to focus on variables which can be affected by policies in a more direct way.

From this perspective, nominal unit labour costs often serve as a privileged variable, as they have the advantage of reflecting wage settlements relative to labour productivity, so that wage policy recommendations can be derived from their developments. In fact, unit labour costs fulfill a double role. On the one hand, they anchor the price level, so that following the rule of keeping average wage increases equal to the sum of increases in labour productivity and the central bank's inflation target will maintain price stability and support monetary policy. On the other hand, if the inflation target is actually achieved, such rule will also stabilize the distribution of income between labour and all other claims. The operating surplus of the economy, i.e. the aggregate profit margin, which is the complement of the wage share in GDP, would remain constant.

However, despite these useful functions, unit labour costs have some shortcomings as indicator for competitiveness. First, they take account of labour but not of capital productivity. This can cause distortions in comparing overall costs and in the incentives for the accumulation of capital and labour when capital productivity is not constant. Second, given that unit labour cost indices are constructed by GDP deflator indices with arbitrary base years, it is impossible to judge what is the equilibrium *level* of relative costs; only movements can be traced by these indices.

A typical example of such nominal ULC indicators is Figure 3.1 in chapter 3 and not surprisingly it yields whopping cost gaps of 25 percent between Italy and Germany, which would indicate a serious competitive disadvantage for Italy. No doubt the evolution of these indicators is interesting information, but it would be wrong to argue that in 1999 labour costs in Germany and Italy were in equilibrium, say reflecting the law of one price in the labour market, and since then Italy has become hopelessly uncompetitive. Taking account of this criticism, de Grauwe (2011) has proposed to take the average for a long period 1970-2010 as the index base. However, this *ad hoc* methodology yields just as arbitrary results as any other index and it has no theoretical foundation. We therefore need a different approach.

2.2 Output measures

In our production function approach, the "output measures" of competitiveness are aggregates reflecting the economic performance of a country. This "output" of competitiveness is usually measured in terms of exports, imports, trade balances or current account balances and their rates of change. Here trade balances and current accounts are a popular measure for competitiveness. Exports are a source of foreign exchange earnings, while imports may improve the quality and productivity of local production technologies.[2] If exports perform well, it is easier to finance the upgrading of domestic production facilities through imports. For this reason the trade balance is considered to be the direct outcome of a country's competitiveness. With these assumptions, recent papers have investigated the determinants of trade flows and their balances in European economies (Guerrieri and Esposito 2012, 2013, Chen et al. 2013).

[2] These improvements are not necessarily restricted to investment goods, but consumer imports may indirectly also improve competitiveness by setting quality standards against which local firms have to prove themselves.

Current accounts balances are often used as what we call "output" competitiveness indicators as they closely reflect the balance of goods and services on the one hand and net transfers on the other. Between countries *with different currencies* the importance of current accounts to measure a country's competitiveness is beyond dispute as they add to foreign assets/liabilities and affect foreign exchange reserves with the possibility of causing currency crises as experienced in Europe in 1992-1993 or in Asia in 1998, but within a monetary union current accounts partly lose their original meaning as the problem of foreign exchange reserves is no longer present (Ingram 1973, Collignon 2013, see also chapter 1). In addition, net transfers include net earnings from rents, interest, profits, and dividends, and net transfer payments (such as pension funds and worker remittances) both with other EMU countries and with the rest of the world. These flows are not necessarily related with competitiveness although important studies have shown their relation to investment bubbles in Spain and Ireland (Giavazzi and Spaventa 2010).

As pointed out by the structural current account approach (Buiter 1981, Sachs 1981, Obstfeld and Rogoff, 1995), current accounts depend also on the interest rate, the age structure of the population, the relation between saving and investment and so on. On the latter, Blanchard and Giavazzi (2002) have used the saving-investment balance approach to explain the disappearance of the Feldstein-Horioka (1980) puzzle, noting that national saving and investment in the countries belonging to monetary union were increasingly disconnected. The authors conclude that this result was the outcome of the proper functioning of the monetary union as capital has flown from rich to poor countries, but the emergence of huge imbalances during the last decade and their reduction during the recession in southern Europe has generated a growing literature criticising this assumption.[3]

Both trade and current account balances depend on relative prices, but also on aggregate demand in the importing countries and this fact may distort the competitiveness measure. A better measure for competitiveness output is therefore the export market share of an economy in world or regional trade. A gain of market share implies a better trade performance than the rest of the world and this may reflect an improvement in competitiveness for a given country - but of course also a loss for the rest of the world as market share is a zero-sum game.

[3] See the introduction to the book.

While being unrelated to the exporting country's domestic demand, market shares are still influenced by foreign demand factors as they can increase if exports are concentrated on rapidly expanding markets, either in terms of products or regions. This means that the geographical and sectoral specialisation as well as their interactions influence the levels and dynamics of market shares. For example in recent years, Germany has benefitted from high demand for cars (product effect) in the Chinese market (market effect). These demand effects can be separated from supply-side conditions by the methodology of the constant market share analysis (CMS henceforth) (Richardson 1971a/b, Fagerberg and Sollie 1987, Milana 1988, ECB 2005). The residual of the total market share variation after deducting product and market effects yields the pure competitive supply side effect. This measure, although not directly observed is a tight measure of changes in a country's competitive position.

Another "output" variable of our competitiveness function is foreign direct investment (FDI): if a specific region is "competitive" it is likely to attract investment funds, which will increase economic and export growth. These capital inflows shift the foreign exchange constraint and may, in accordance with comparative advantages, improve the efficiency and productivity of the economy. In this sense, competitiveness would deliver sustained growth in living standards.

The output measures of competitiveness will be used in section 5 in order to test the explanatory power of traditional input measures in comparison with the index we develop in the next section.

3. The CER Competitiveness Index

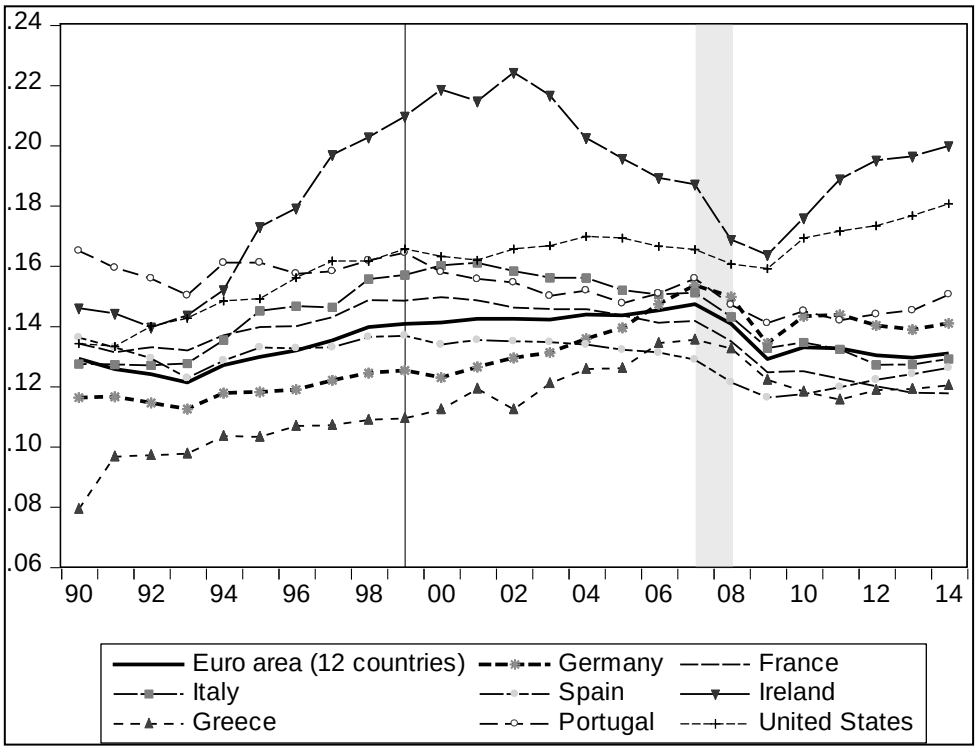
3.1 Competitiveness and returns to capital

When setting an equilibrium benchmark for competitiveness, it is the *level* in relative costs that matters. Deviations from this benchmark generate incentives for profitable exports, imports, investment, capital flows, etc. Nominal unit labour costs indicating total wage compensation per unit of output, are important, because wages are the largest cost factor for the economy as a whole. Equality of ULCs in two different economies indicates, therefore, that no savings in labour costs can be made by relocating production.

Nevertheless, focusing on wages alone is not appropriate, as they are only one element in the total cost structure of an economy.

The second most important production factor is capital. In a single market with a single currency, the efficient allocation of capital requires that investors put their money wherever it yields the highest return. There is absolutely no reason why, say, Italian companies should only borrow from Italian households. The whole purpose of economic and monetary union is precisely to create a more efficient framework for the European economy that integrates goods and financial markets. If capital can circulate freely, relative profitability of capital will determine where investment is located. Thus, the proper measure of competitiveness within a currency area is the relative return of a sector or region compared to another and not relative unit labour costs. In the Euro Area, where all returns are denominated by the same currency, we can use the return to the aggregate euro-capital stock as the benchmark, so that the above average return on capital is an indicator of favourable competitiveness conditions, and below average returns for competitive disadvantages.

Figure 2. Returns to capital



Source: own elaboration on AMECO

Differences in profitability have consequences for macroeconomic aggregates. The creation of the euro has improved the efficiency of European financial markets and removed the external budget constraint for member states and as a consequence, investors have re-allocated their capital, firms have shifted their supply chain to more efficient sources and exporters have exploited new market opportunities. In other words, the structure of economic incentives has been profoundly transformed, especially in small member states in the European south, where firms used to be handicapped by high interest rates before they joined the euro. Hence, European monetary union has not only changed the relative returns to national capital stocks, but also the output variables of competitiveness such as exports, imports, current account positions and FDI.

Figure 2 shows the aggregate rates of return on national capital stocks in some selected member states. The Euro Area average has hardly moved in the first decade, but it dropped notably during the crisis and has now stabilised at a lower level. Ireland, Italy and Portugal, and also to some extent France, have had above average returns before the crisis although with a tendency to deteriorate during monetary union. In Ireland this fall in profits was drastic after 2002, but the situation has turned again in 2010. While Germany and Greece used to have below average returns all through the 1990s and 2000s, they have nevertheless steadily closed the gap relative to the Euro average during monetary union. After the labour market reforms in 2005, the German return on capital started to exceed the Euro Area rate and it has further improved in recent years. By contrast, Greece and France have suffered most from the crisis. In Spain, the return on capital has deteriorated significantly in monetary union until it has started to improve after 2010. This may indicate that the heavy net borrowing by Spanish corporations and households before the crisis was not driven by actual returns on capital, but by the irrational exuberance of the Spanish housing bubble (Croce-Angelini and Farina 2012, Giavazzi and Spaventa 2010). In the USA, rates of return have consistently been higher than in Europe and the gap has become larger since the crisis. Hence, for many investors lending to the rest of the world must have been more attractive than placing their funds in the Euro Area.

Our definition of competitiveness as the ability to generate or attract sustained investment assigns a critical role to wages and wage bargaining, but also to productivity of labour and capital. The macroeconomic rate of return on capital can be written as the product of the profit margin times capital productivity:

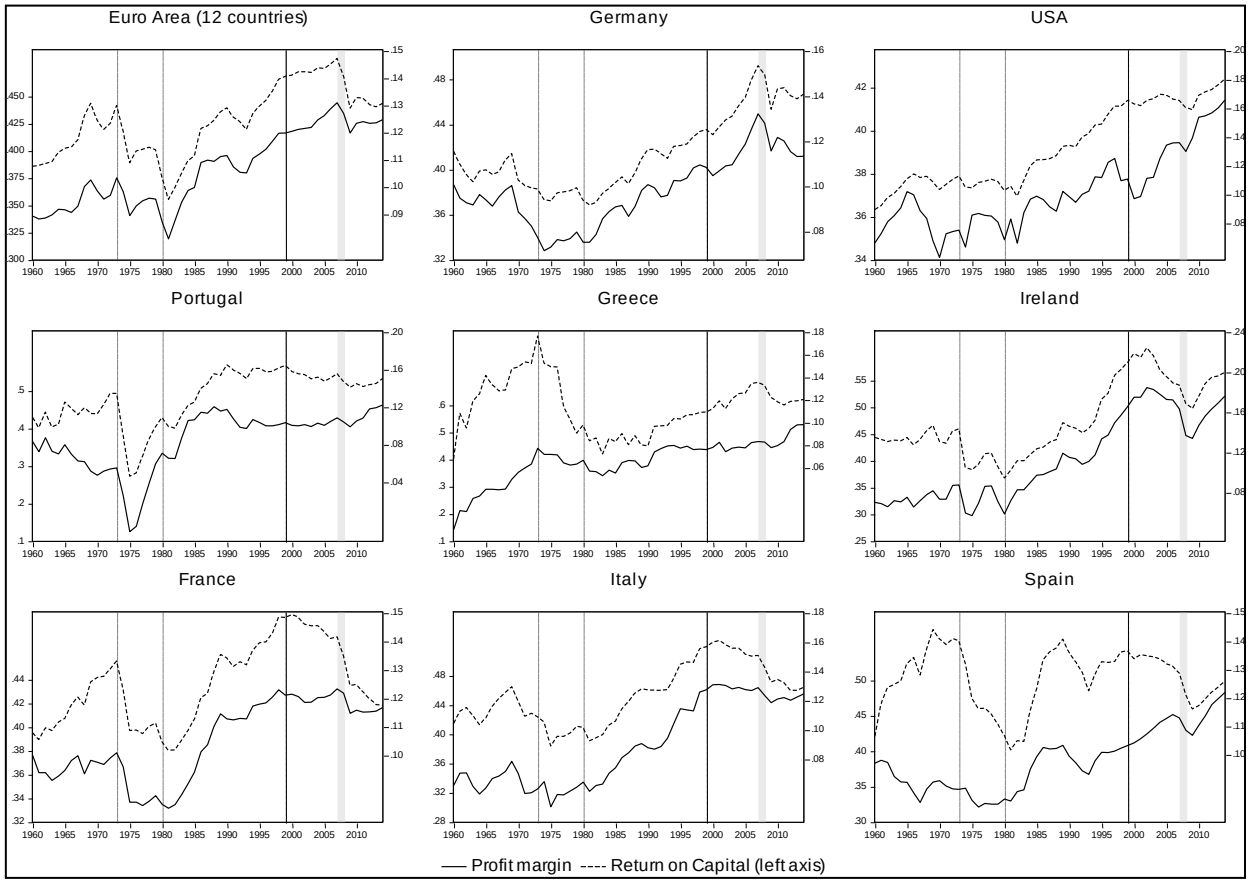
(1) $$RoC = \frac{PY - wL}{PY}\frac{PY}{P_kK}$$

Where PY is nominal GDP, wL is the nominal compensation of labour and P_kK is the nominal value of the capital stock. We call the second term on the RHS the average capital efficiency (ACE), which is equal to capital productivity when the price index for capital goods P_k evolves at the same rate as the GDP deflator P. The expression $wL/_{PY}$ is either called the wage share or real unit labour costs, because nominal unit labour costs are $wL/_{Y} = w/_{\lambda}$, i.e. the ratio between nominal wages and labour productivity (λ). The profit margin is the complement of the wage share. The return on capital will then increase when the profit margin increases, because unit labour costs are reduced and/or the capital efficiency is improved.

Figure 3 shows varied performances for profit margins and rates of return over half a century. Profit margins are shown on the left, returns to capital on the right-hand scale. When the gap between the two curves increases, capital productivity is rising; when it shrinks, the average efficiency of capital diminishes. Under the Bretton Woods regime, profit rates improved in many European countries or remained stable, as in the USA. However, with the collapse of Bretton Woods, profits also collapsed nearly everywhere. Flexible exchange rates were bad for European competitiveness.

After 1980 monetary policies became tight to bring inflation down, and neoliberal policies of liberalising financial and product markets drove up profit margins and the returns to capital all over the world. Since then, performances have diverged. In Germany, the improvement of rates of return is usually driven by increases in profit margins, while capital productivity does not seem to change much. The labour market reforms by the Schröder government have given a major boost to profit margins. In Ireland, the return to capital is also driven by wages and not by capital efficiency. Irish profit margins have increased in the booming 1980s and 90s, but then the advantage was lost after EMU began. Profits only finally picked up again during the crisis years. In Greece, profit margins have risen only marginally before the crisis, but there was a long run trend of improved capital efficiency. In Portugal, capital efficiency also did not change, at least not until the recent crisis started to diminish capital productivity, but profit margins have remained flat.

Figure 3 Profit margins and return on capital

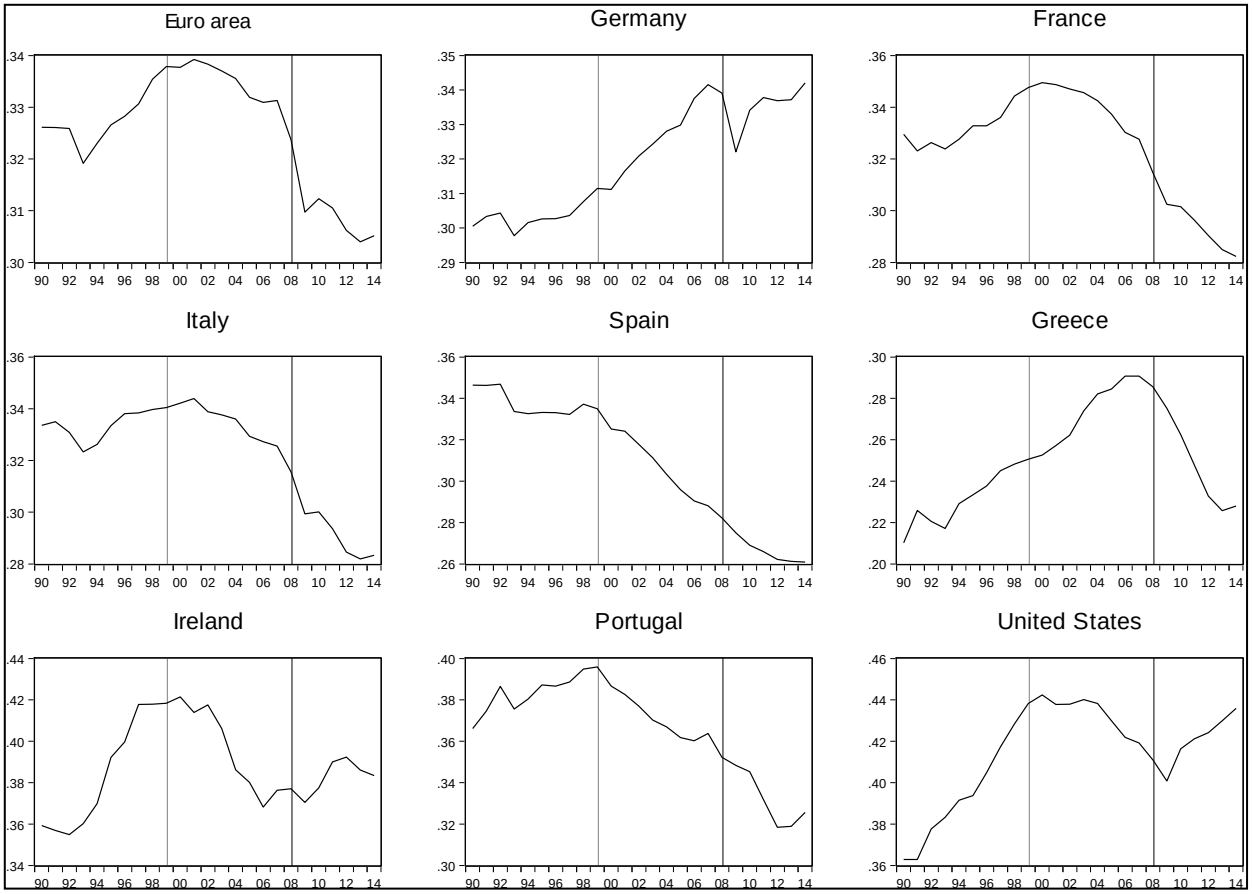


Source: own elaboration on AMECO

In all the other countries shown in Figure 3, the trends for profit margins and rates of return go in opposite directions because capital productivity has diminished. In France, Italy and Spain this loss of profitability is dramatic. Profit margins have remained stable in the first two economies, but in Spain even an increase in margins could not prevent diminishing returns, because capital productivity deteriorated so much. The general picture is that in countries where interest rates have come down after the start of the euro, rapid accumulation of capital has caused diminishing returns on capital, and variations in wage setting have not compensated this competitive deterioration. In the north, interest rates have not changed much, so that lower wages and higher profit margins have increased the return to capital. In the US, by comparison, wage reductions have pushed profit margins up so that by and large the diminishing capital productivity has been compensated and the return on capital has remained stable or even improved after the crisis.

FIGURE 4 ABOUT HERE

Figure 4. Average efficiency of capital



Source: own elaboration on AMECO

The distinction between profit margins and returns to capital throws a new light on competitiveness. Labour market reforms usually aim at reducing wages, either by increasing labour supply or by lowering social contributions. This has certainly been the effect of German Hartz IV reforms (see chapters 4 and 5). Margins also have gone up in the Southern crisis countries after the financial crisis. Yet, the main cause for the deteriorating competitiveness in the South during the first Euro-decade has been the rapid accumulation of capital. Diminishing returns on investment have lowered the average efficiency of capital. Figure 4 shows that before the financial crisis, the average efficiency of the capital stock has fallen in all southern member states, except Greece. With the exception of Ireland, this trend has continued even through the crisis, although the negative trend seems to have stopped in Italy, Spain, and Portugal; in Greece the adjustment

policies imposed have destroyed and reversed the earlier positive trends of capital productivity, but here, too, the downward trend may finally have come to an end in 2013.

3.2 Theoretical foundation of the CER Competitiveness Index

If our benchmark for measuring competitiveness is the rate of return to capital, we can derive the equilibrium *level* of unit labour costs (see Collignon, 2012) as the level where, given productivity conditions, wages are just equalising the regional return to capital with the aggregate of the currency area. This does not mean that market dynamics will necessarily and always equalize the returns on capital, but that the equilibrium defines the standard of measurement against which deviations from efficiency can be assessed. Taking the Euro Area as our reference, the relative return on capital in different member states would indicate whether unit labour costs are overvalued when actual costs are above the equilibrium level or undervalued in the opposite case. What follows is a theoretical derivation of the competitiveness index based on these assumptions.

Referring back to equation (1), we get the rate of return as the product of the profit share and ACE

$$R = k\sigma_k = k(1-\sigma_w) = \frac{Py - wL}{Py}\frac{Py}{P_k K} = \left(1 - \frac{w}{P}\frac{1}{\lambda}\right)k = \left(1 - \frac{ULC}{P}\right)k \tag{2}$$

where λ= y/L is labour productivity and the profit share σ_k is the complement of the wage share σ_w

$$\sigma_k = \frac{Py - wL}{Py} = 1 - \sigma_w \tag{3}$$

k is the average capital efficiency.

Because of (2), the return on capital *R* improves when the average capital efficiency and/or the profit share improve. The average efficiency of capital rises with the technological productivity of capital (*y/K*) or when prices for capital goods are less than the GDP deflator (P/P_K<1). The profit share rises when the wage share falls, which implies that real wages rise less than labour productivity.

Assuming efficient markets, *R* should converge to the Euro Area average. Thus, for country A and Euroland B we have the two equilibrium returns

$$R_A^* = R_B^* \Leftrightarrow \left(1 - \frac{ULC_A^*}{P_A}\right) k_A = \left(1 - \frac{ULC_B^*}{P_B}\right) k_B \tag{4}$$

or:

$$\sigma_{KA}^* = \sigma_{KB}^* \frac{k_B}{k_A}$$

Hence, in equilibrium the differences in wage shares must reflect the relative productivities of capital and the equilibrium for relative ULC is

$$ULC_A^* = \frac{k_B}{k_A} \frac{P_A}{P_B} ULC_B^* - \left(\frac{k_B}{k_A} - 1\right) P_A \tag{5}$$

If actual unit labour costs are higher or lower than this theoretical equilibrium level, we will say that a country is over or undervalued relative to the so-defined competitiveness standard, where the Euro Area is our reference country. The CER competitive index (CCI) for country A is then simply defined as the ratio of actual to equilibrium unit labour costs:

$$CCI_A = \frac{ULC_A}{ULC_A^*} \tag{6}$$

Combining equations (5) and (6) we can now define the CCI as function of ACEs, prices and ULCs for a given country and Euro Area as whole:

$$CCI_A = \frac{ULC_A}{\frac{k_{EA}}{k_A} \frac{P_A}{P_{EA}} ULC_{EA} - \left(\frac{k_{EA}}{k_A} - 1\right) P_A} \tag{7}$$

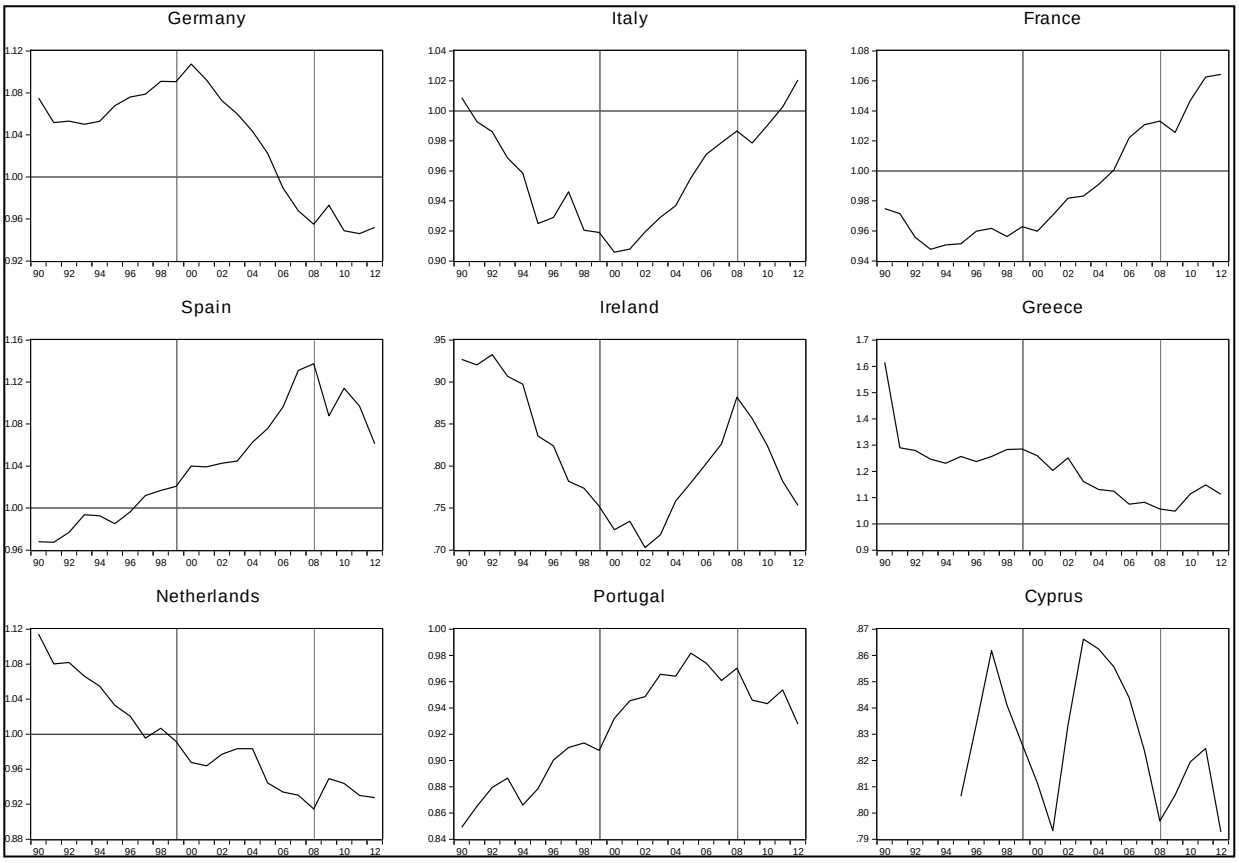
The index is equal to one plus the percentage of overvaluation/undervaluation relatively to the Euro Area average, and an increase indicates deteriorating competitiveness. The CCI for a given country depends positively on its ULC and negatively on the Euro Area cost levels (see the appendix for a detailed proof).

The additional feature is its negative relation with the domestic ACE while an increase in the Euro Area ACE diminishes the index as the latter causes the equilibrium ULC to fall.

3.3 Descriptive evidence

Figure 5 describes the evolution of the CER Competitiveness Index. The horizontal line at value 1 indicates that the unit labour cost levels of a given country are at a level where the return to capital is equal to the Euro Area. The position of the index above the horizontal line indicates an overvalued position, below this line is an undervalued indication. Based on these data, not all of which are shown, northern member states are generally undervalued. In Finland this undervaluation goes back to the crisis years in the early 1990s, in the Netherlands it started around the time of monetary union in 1999, and in Germany it occurred with the Schröder labour market reforms. France has moved from undervaluation to overvaluation, Italy has persistently lost competitive advantages over the last two decades, but having started from a much undervalued position it is now close to equilibrium. In the crisis countries, Spain has become more and more overvalued during its property boom; Portugal and Ireland have also lost competitiveness, but they are still undervalued. Cyprus has oscillated in a range below equilibrium. Most surprising, Greece has reduced its overvaluation disadvantage before the crisis, but had not yet reached equilibrium. Despite a draconian austerity regime, the country has experienced a slight deterioration in competitiveness since the crisis erupted. The movements reveal very different behaviour in unit labour costs among member states. Although the crisis in 2008 has had an impact on cost levels in most countries, a durable adjustment toward equilibrium levels can hardly be observed anywhere.

Figure 5. The CER Competitiveness index for selected Euro area countries



Source: CER elaborations on AMECO data

4. Testing the performance of the CER Competitiveness Index

4.1 Econometric strategy

In this section we test the performance of the CCI against alternative measures of competitiveness. We wish to know how well "input" variables of competitiveness, i.e. relative cost indicators, are able to explain the "output" of changes in the international position of Euro Area countries in terms of net exports and market penetration. The latter is usually measured in terms of market shares (*MKTsh*), although in order to get a clearer measure of competitiveness we use also variables derived from constant market share analysis (CMS). This analysis has the advantage of distinguishing between demand effects due to trade specialisation in products or markets that expand rapidly and supply effects due to improvements in productivity and cost competitiveness. We apply the CMS methodology as developed by the ECB (2008) and calculate demand

and supply effects for total export and for intra-European exports only. We then test the ability of competitiveness indicators to explain these components. The details of the CMS are described in Appendix 1.

Another "output" indicator of a country's international competitiveness position is given by the trade balance (*TB*), which is the main component of the current account balance, a measure used by the European Commission in the scoreboard for identifying macroeconomic imbalances (EC 2011). However in our view, the use of current accounts can be misleading as they reflect also other components not necessarily related to the competitiveness of a country's industry (see chapter 1). We use, therefore, data for net exports and distinguish again for total trade and intra-EU trade.

Hence, we estimate a model with three output or "revealed" competitiveness indicators, calculated for total and intra EU trade: the market share (*MKTshT, MKTshEU*), the competitiveness effect calculated from the CMS analysis (*CT, CEU*) and the trade balance (*TBT, TBEU*). The indicators which will be tested against the CCI are conventional nominal and real unit labour costs (*ULCrel* and *RULCrel*) as well as the Real Effective Exchange Rate (*REERrel*). All these indicators are expressed in relative terms with the Euro Area level as the common denominator.

The econometric specification includes domestic as well as world GDP in order to account for internal and external demand and a set of country specific fixed effects as in equation (11):

$$Y_{i,t} = \alpha + \beta_1 \log GDPw_{i,t} + \beta_2 \log GDP_{i,t} + \beta_3 COMP_{i,t} + U_i + \varepsilon_{i,t} \quad (11)$$

where *Y=MKTshT, ,MKTshEU, CT, CEU, TBT, TBEU* and *COMP=log(CCIb), log(ULCrel), log(RULCrel), log(REERrel).*The sample includes the original 12 Euro Area countries over the period 1999-2010.

As to the estimation technique, we first have to test for the stationarity of data as well as for the presence of cross sectional dependency (CSD). Table A1 in the appendix shows the Pesaran (2004) test for CSD as well as the unit root test developed by Pesaran (2007), which is robust to the presence of CSD. The results indicate that all variables are non stationary at 10% while CSD is present in all time series except for the two trade balances and *CT*, and is particularly high for *MKTshT* and *REERrel* as well as GDP. This is because global market shares and GDP are affected by common shocks such as the global crisis or the competition of

extra Euro Area countries, while real exchange rates reflect, as we argued in section 2, the exchange rate dynamics between the euro and the other main currencies, especially the dollar.

Given the non stationarity and the presence of CSD the Common Correlated Coefficients (CCE) estimator developed by Pesaran (2006) is the most suitable tool. This estimator builds upon the Mean Group estimator proposed by Pesaran et. al. (1999), which returns consistent estimates of a long run relation even in presence of non stationary variables and endogenous regressors. Endogeneity is addressed by using an Auto Regressive Distributed Lags (ARDL) model while the improvement of the CCE is the addition of cross sectional averages of all variables in order to control for CSD. As shown by Kapetanios et al. (2011), this estimator controls for a variety of structures of the common factor causing CSD, from a simple symmetric one to more complicate multifactor error structures.

4.2 Results

Estimation results of equation (1) for the competitiveness effect, the total market share change and the trade balance are reported respectively in tables 2 to 4. At the bottom of each table we report the root mean square error (RMSE) as measure of model fitting and the Pesaran (2007) test for CSD on the estimation residuals. As to the latter, in the market share estimates some specifications still suffer from a weak CSD, but they are acceptable as the 5% threshold for the CSD is never reached. The RMSE indicates that estimates in tables 2 and 4 fit the data better. This is an interesting result as it confirms the above-mentioned problems with the use of market shares *tout court*, which amalgamate foreign demand and domestic supply factors. By contrast, our estimates for trade balances measure how much net exports improve in response to our input variables, given the importance of external and domestic demand components.

Our results confirm the better performance of the CCI compared with ULC and REER indices. As we can see in table 2, the CCI is the only significant competitiveness indicator in explaining competitive changes of market shares. In addition, its coefficient is higher when considering intra-European export only (column 5), proving its better ability to reflect the dynamics of intra-European competitiveness. In the latter case, other things equal, a 10% reduction of the CCI (i.e. a competitive gain due to lower ULCs relative to equilibrium) increases the competitiveness effect from the CMS by 8.3%. Although the explanatory power for total market share changes is lower, the results in table 3confirm the ability of the CCI to explain the intra-

European dynamics. According to column 5, a 1% increase in the CCI decreases the intra-European market share by 1.2%. Finally, trade balance estimates (table 4) also indicate that the CCI explains intra-European flows better. Yet, while the CCI is statistically significant for the world trade balance, the REER is statistically more significant in spite of its lower coefficient. This is an expected result as REER incorporate also exchange rate dynamics between the Euro Area and the Rest of the World.

Summing up, we found a clear confirmation that the CCI is better suited to explain changes in the competitive position of European countries. The comparison has shown that standard ULC and REER indices are not able to explain external competitiveness among European countries and the latter in particular tends to capture changes in the nominal exchange rate between the euro and the USD.

Table 2 Dependent variable supply-side competitiveness effect from CMS

	Total				Intra-EU			
	1	2	3	4	5	6	7	8
Log(GDPw)	-0.224	0.039	-0.753	-0.123	0.183	-0.32	-0.397	1.627*
	[0.471]	[0.611]	[1.000]	[1.504]	[0.354]	[0.441]	[0.352]	[0.951]
Log(GDP)	0.262	0.198	0.425	0.422**	-0.113	0.292	0.27	0.238
	[0.423]	[0.487]	[0.415]	[0.178]	[0.419]	[0.499]	[0.416]	[0.502]
Log(CCI)	-0.659**				-0.832**			
	[0.215]				[0.354]			
Log(ULCrel)		-0.103				-0.492		
		[0.324]				[0.437]		
Log(RULCrel)			-0.263				-0.557	
			[0.263]				[0.541]	
Log(REERrel)				0.130				-0.217
				[0.157]				[0.280]
N	203	203	203	192	203	203	203	192
rmse	0.023	0.022	0.025	0.019	0.027	0.027	0.029	0.026
CSD	-1.80*	-1.41	-1.94*	-1.73*	-1.66*	-1.15	-0.44	-1.96*

Standard errors in brackets; *significant at 10% level, **significant at 5% level; ***significant at 1% level.

Table 3 Dependent variable: market share change

	Total				Intra-EU			
	1	2	3	4	5	6	7	8
Log(GDPw)	-1.664	0.943	1.361	0.000	0.161	-0.963	-0.868	0.278
	[1.475]	[0.749]	[0.853]	[0.001.]	[0.391]	[0.644]	[0.565]	[0.261]
Log(GDP)	0.686	1.68	2.159	2.067	-0.058	0.799	0.619	0.829
	[0.836]	[1.878]	[1.967]	[2.134]	[0.493]	[0.604]	[0.533]	[0.679]
Log(CCI)	-0.539				-1.129**			
	[1.375]				[0.397]			
Log(ULCrel)		-0.802				-0.383		
		[0.869]				[0.571]		
Log(RULCrel)			-0.024				-0.562	
			[1.044]				[0.673]	
Log(REERrel)				-0.888				-0.183
				[0.774]				[0.299]
N	204	203	203	192	203	203	203	192
rmse	0.54	0.48	0.5	0.43	0.29	0.31	0.33	0.27
CSD	-1.95*	-1.97*	-1.88*	-0.96	-1.92*	-1.95*	-1.55	-1.94*

Standard errors in brackets; *significant at 10% level, **significant at 5% level; ***significant at 1% level.

Table 4 Dependent variable: trade balance

	Total				Intra-EU			
	1	2	3	4	1	2	3	4
Log(GDPw)	0.083	0.029	-0.019	0.059	0.08	0.015	0.07	0.034
	[0.121]	[0.113]	[0.093]	[0.108]	[0.085]	[0.085]	[0.088]	[0.103]
Log(GDP)	-0.103*	-0.029	-0.073**	-0.072	-0.143**	-0.063	-0.115*	-0.038
	[0.062]	[0.043]	[0.034]	[0.081]	[0.063]	[0.064]	[0.066]	[0.081]
Log(CCI)	-0.093*				-0.144**			
	[0.054]				[0.060]			
Log(ULCrel)		-0.068				-0.153		
		[0.053]				[0.099]		
Log(RULCrel)			-0.065				-0.153	
			[0.055]				[0.111]	
Log(REERrel)				-0.056**				-0.077
				[0.012]				[0.062]
N	204	203	203	192	200	199	199	188
rmse	0.003	0.004	0.003	0.002	0.02	0.04	0.03	0.03
CSD	-0.2	0.02	0.33	-0.07	0.64	0.42	-1.04	-0.11

Standard errors in brackets; *significant at 10% level, **significant at 5% level; ***significant at 1% level.

6. Conclusions

This chapter has defined competitiveness as the relative profitability of a country's capital stock relative to the average of the Euro Area. It has derived unit labour cost level indicators, which indicate how much individual member states are over- or under-valued relatively to the average benchmark. We have then confirmed that this measure yields better results for explaining how input

variables into the competitiveness process, such as unit labour costs, generate the outcome of traditional competitiveness dynamics, which are reflected in exports or market shares. Using the CER Competitive Index would therefore be a superior tool for policy assessments than the conventional indices used by European and international organizations. It could become particularly useful as a guide for wage-bargaining in the Euro Area.

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Appendix 1. Methodological note on the CMS

In calculating the competitiveness effect used in section 4 we use the CMS methodology developed by the ECB (2005). The basic idea of the CMS is to decompose the growth rate of exports (g) of a country in a given destination market (or in a given region) in a component obtained by applying the growth rate of world exports (g^*) to the initial export flows and a residual component. The residual component represents what causes the market share change and we call it total effect (TE):

$$TE = g - g^* \qquad \text{(A1)}$$

The total effect is than broken down into two components: a combined structural effect (CSE) and a competitiveness effect (COMP). The CSE is obtained by applying to each export flow the difference between the world export growth rate and that of the specific market:

$$CSE = \sum_i \left[\sum_j \left[\left(\theta_{ij} - \theta_{ij}^* \right] \right] \left(g_{ij}^* - \right] g^* \right) \qquad \text{(A2)}$$

where $g_{i,j}^{\bullet}$ is the growth rate of total imports of product *i* in country *j*; $\theta_{i,j}$ and $\theta_{i,j}^{\bullet}$ represent the shares of product *i* in country *j* for the exporting country and world respectively. Further refinements of the analysis (Leamer and Stern 1970, Richardson 1971a/b) decompose the structural effect into three terms which account for the geographical (market effect *ME*) and sectoral (commodity effect *CE*) composition of exports as well as for their interaction (*MIX*):

$$CSE = ME + CE + MIX \qquad \text{(A3)}$$

the latter term is included because the geographical and sectoral distributions are not independent so that the sum of the first two effects does not equal the CSE if either Laspeyres or Paasche weights are used.

The market effect represent the export growth obtained as weighted average of the growth rates of specific markets (net of world growth) with weights given by the initial export distribution by partner:

$$ME = \sum_j \left(\theta_j - \theta_j^{\bullet} \right) \left(g_j^{\bullet} - g^{\bullet} \right) \qquad \text{(A4)}$$

Where $g_j^{\bullet}$ is the growth rate of total imports of country *j*, θ_j and $\theta_j^{\bullet}$ represent the geographical distribution of exports for the reference country and the world. By the same token, the commodity effect is the effect of total growth of each commodity (net of world growth) weighted by the commodity distribution:

$$CE = \sum_j \left(\theta_i - \theta_i^{\bullet} \right) \left(g_i^{\bullet} - g^{\bullet} \right) \qquad \text{(A5)}$$

The interaction effect is given by:

$$\sum_i \sum_j \left[\left(\theta_{ij} - \theta_{ij}^{\bullet}\right) - \left(\theta_i - \theta_i^{\bullet}\right)\frac{\theta_{ij}^{\bullet}}{\theta_i^{\bullet}} - \frac{\left(\theta_j - \theta_j^{\bullet}\right)\left(\theta_{ij}^{\bullet}\right)}{\theta_j^{*}} \right] g_{ij}^{*} \qquad \text{(A6)}$$

in simple worlds this effect represents the impact of the change in both geographical and sectoral weights. Some authors find no economic meaning for the interaction effect (Reimert and Schultz 1985) while Richardson (1971) called this effect "Second Competitiveness Effect". For each exporting country, the standard competitiveness effect is given by the difference between the growth rate of exports of commodity *i* in country *j* and world exports of *i* in country *j*, weighted by the initial structure:

$$COMP = \sum_i \sum_j \theta_{ij}\left(g_{ij} - g_{ij}^{\bullet}\right) \qquad \text{(A7)}$$

this competitiveness effect represent the difference between the growth of exports for a given country and world exports net of differences in relative specialisation.

Appendix 2. Derivatives of the CER Competitiveness Index

By manipulating equation (7) the derivates with respect to the different variables can be expressed as follows:

(A1) $$\frac{\partial CCI}{\partial ULC_A} = \frac{k_A P_{EA}}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} > 0 \text{ if } \frac{ULC_A}{P_A} > k_{EA} - k_A;$$

the condition for a positive sign is always satisfied as the term on the LHS is always positive and well above realistic differences in capital efficiency. The sign of derivatives with respect to ULC_{EA}, k_A and k_{EA} are determined as shown in equations (A2) to (A4):

(A2) $$\frac{\partial CCI}{\partial ULC_{EA}} = -\frac{k_{EA} k_A P_A P_{EA} ULC_{EA}}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} < 0;$$

(A3) $$\frac{\partial CCI}{\partial k_A} = \frac{k_{EA}\left(ULC_{EA} - P_{EA}\right)}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} < 0;$$

(A4) $$\frac{\partial CCI}{\partial k_{EA}} = -\frac{k_A P_A P_{EA} ULC_A (ULC_{EA} - P_{EA})}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} > 0;$$

Which states that competitiveness always increases when the own capital efficiency of average ULCs increases, but deteriorates when average ACE increases more than the domestic one. The effect of domestic inflation is show in equation (A5):

(A5) $$\frac{\partial CCI}{\partial P_A} = -\frac{k_A P_{EA} ULC_A \left[k_{EA} (ULC_{EA} - P_{EA}) + P_{EA} k_A\right]}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} < 0; \text{ if } k_A > k_{EA}(1 - \frac{ULC_{EA}}{P_{EA}});$$

Its effect on competitiveness is positive unless a country's ACE is above the average profit rate. As the latter has been basically stable at 0.13 and ACE is always above 0.2 this condition, which underlines the importance of a certain degree of similarity between countries, is always fulfilled. Conversely, the effect of average inflation is always negative:

(A6) $$\frac{\partial CCI}{\partial P_{EA}} = \frac{P_A \left[k_{EA} (ULC_{EA} - P_{EA} + 1) + P_{EA} k_A\right]}{\left(k_{EA} P_A ULC_{EA} - P_{EA} P_A k_{EA} + P_{EA} P_A k_A\right)^2} > 0;$$

The explanation for these effects lies in the nominal nature of the CCE and in the additional effect on ACE. In standard ULCs a domestic price increase raises both nominal labour productivity and nominal wages, with the overall effect uncertain but positive, if wage inflation is higher than overall inflation. In the CCI we have to take into account the positive effect of prices on nominal ACE, which reduces the CCI, if is strong enough to counterbalance for effect of higher wage inflation. The overall effect will always be negative if wage inflation is not higher than actual inflation.

Appendix 3. Unit root and cross sectional dependence tests

Table A1. Results of the Pesaran (2007) unit root test and

	unit root	cross sectional dependence	cross correlation

CT	2.8	0.6	0.02
CEU	0.1	-1.8*	-0.06
MKTshT	-1.4	26.8***	0.86
MKTshEU	-1.6*	-2.6**	-0.08
TBT	-1.0	1.3	0.04
TBEU	0.6	-1.0	-0.03
log(CCI)	-0.3	-2.3**	-0.07
log(ULCrel)	1.6	3.0***	0.09
log(RULCrel)	-0.4	-0.4	-0.01
log(REERrel)	-2.2*	18.4***	0.57
log(GDP)	-1.0	32.7***	0.98

*significant at 10% level, **significant at 5% level; ***significant at 1% level.