Quantifying and Correcting Eurozone Imbalances Fighting the Debt Snowball

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Fighting the Debt Snowball

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Data and estimations can be provided by request

Abstract

This paper quantifies and discusses the concept of current account imbalances in the Eurozone. Using panel data estimations, the analysis shows how the external positions of the Eurozone economies can be modelled as a function of divergences in unit labour costs. Specifically, the results indicate that the formation of EMU has exacerbated the extent to which even relatively small divergences in unit labour costs may materialize in large current account imbalances. These results are framed in the context of the idea of a debt snowball effect and why the idea of an internal devaluation as a tool to correct external imbalances is inconsistent with the current setup of the Eurozone.

1.0 Introduction

The Eurozone is currently undergoing its largest test since its inception a decade ago. Greece is on the brink of default and other economies are standing in line and old questions about the benefits and viability of the Eurozone have resurfaced to become not merely academic issues, but real political and economic issues that, if left unanswered, could lead to the end of the Eurozone as we know it. Specifically, the inflection point presented by the need to regain lost competitiveness through wage and price deflation (internal devaluation) at the same time as having to deal with structural reforms to rein in an excessive debt to GDP ratio now linger as a serious yoke for many Eurozone countries and thus for the European Monetary Union (EMU) as a whole.

This paper initially takes a step back from the immediate economic crisis and discusses and analyzes the notion of Eurozone imbalances which are characterised by divergence in intra-Eurozone current account positions as well as inflation and unit labour costs. Thus, and while at the onset, EMU was expected to foster convergence between the participating economies this has not materialised. In an influential policy brief from 2006[1] economists Alan Ahearne and Jean Pisani Ferry point out that while EMU membership certainly had its clear benefits it also came with costs. Concretely, the loss of monetary policy and in particular the loss of the nominal exchange rate as a shock absorber means that imbalances e.g. as a result of persistent price and wage differentials and difference in market structures, differing demographics may build exactly because the correction mechanism is rigid or nonexistent. In the context of monetary policy the obvious question that arises is whether the single interest rate set by the ECB may be appropriate for all Eurozone economies at one at the same time. Further, in terms of the nominal exchange rate the issue is that there is no immediate mechanism through which a loss of external competitiveness can be regained except through the road of internal price and wage deflation which is very difficult to pull off in practice. Especially, the notion of intra-Eurozone divergence of real-exchange rates Ahearne and Pisani-Ferry (2006), and thus wage and inflation differences, believed to have led to a large and growing divergence in current account positions have been at the core of the idea of Eurozone imbalances.

The paper proceeds as follows. Section 2 provides a brief theoretical perspective on Eurozone imbalances and gives a descriptive account of their magnitude. Section 3 presents the empirical model and the estimation results. Section 4 provides a perspective and discussion of the results in relation to the idea of a debt snowball. Section 5 concludes.

2.0 Eurozone Imbalances at a Glance

In the general market discourse, the notion of Eurozone imbalances has received due attention from private market analysts and academics alike as a potential source of disruption and problems, but until recently this discourse had not taken hold within official EU and EMU policy circles. Here, it has been widely held that the extent to which imbalances existed, the institutional setup of the Eurozone with the growth and stability pact on the fiscal side and the single interest rate policy on the monetary side was expected to slowly but surely smooth out any internal imbalances. However, the ongoing economic crisis and the fact that the market focus has now turned to the shores of the Eurozone periphery seem to have changed this.

As such, the German newsmagazine Der Spiegel[2] recently published an article detailing a report from the EU commission which specifically casts its argument in relation to the growing divergence of Eurozone economies and argued how a correction *was vital for the long-term functioning of monetary union*. This is significant because it presents a slight but distinct change in discourse by part of the EU in terms of recognizing some of the underlying deficiencies in the Eurozone setup, deficiencies that have raced to the

[1] Alan Ahearne and Jean Pisani-Ferry (2006) – *The Euro: Only for the Agile*, Bruegel Policy Brief
[2] http://www.spiegel.de/spiegel/vorab/0,1518,673576,00.html

foreground recently in the context of Eurozone finance ministers and officials scrambling to agree on a common path out of an economic crisis in Greece and Spain, but which essentially mirrors a fundamental issue with how the Eurozone should look in the future and what the sources of sustainable economic growth should be.

In this sense, it would be timely to have a closer look at what these imbalances are and what they mean.

Any discussion on the build-up and subsequent correction of macroeconomic imbalances within the confines of a fixed exchange system has to begin with Mundell (1961) which argues that for a fixed exchange system to be optimal, international factors, and in particular labour, must be mobile across borders within the currency union. On this, Puhani (1999) demonstrate how it is very unlikely that labour will be sufficiently mobile to act as a valve for adjustment except as a long run mechanism which provide counter evidence to the merits of the Eurozone as an optimal currency area.

However, the main discussion on the Eurozone as an optimal currency union has not traditionally been centered on the issue of labour mobility. Rather, the focus has been on the ability of Eurozone economies to adjust to sudden asymmetric shocks as well as how to avoid the creation of imbalances over time Zemanek et al. (2009) and Blanchard (2007). Specifically, the marriage between a common monetary policy and continuing sovereign control over fiscal policy with no real supra-national coordination Calmfors (2003) and Bibow (2009) as well as downward nominal wage rigidity (DNWR) to correct potential divergences in real exchange rates Calmfors (1998 and 2002) have been highlighted as the main structural deficiencies that may lead to intra-Eurozone imbalances.

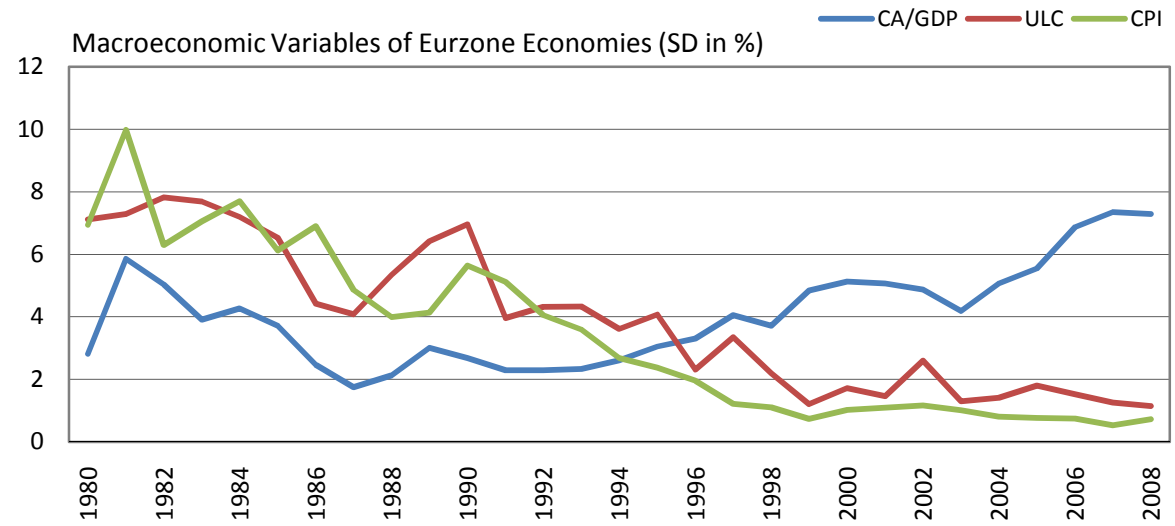
Calmfors (2003) argues that DNWR in particular would be a problem in economies in need of correction as well as it is argued how ultimately a better cushion against asymmetric shocks would come through increasing cooperation on the fiscal level. Bibow (2009) levies an altogether more devastating critique against the Maastricht criteria and EMU setup pointing towards the fact that the very system not only prevents adjustment, but essentially fosters and furthers the imbalances themselves.

The concrete manifestation of imbalances essentially takes two forms Bibow (2009). One is the diverging trend in inflation and unit labour costs which is connected to a divergence in real exchange rates and thus, it is argued, divergence in competitiveness to foster real imbalances in the form of current account and growth imbalances. The second manifests itself in the growing trend of divergence between the yield of sovereign bonds Bibow (2009) which tend to be narrated as the growing spread between e.g. Spanish and Greek bonds to German benchmark bunds. This paper mainly focuses on the former and essentially attempts to quantify the link between diverging trends in inflation and unit labour costs (real exchange rates) and Eurozone imbalances. However, it also seeks to articulate the latter point in relation to the economic crisis and the idea of a correcting through an internal devaluation.

Looking at the evolution of unit labour costs (ULC), inflation (CPI)[3], as well the CA/GDP the first thing to notice is actually convergence rather than divergence in the context of prices whereas current account imbalances have indeed diverged.

[3] See graphs in Annex.

Figure 1 – Standard Deviation of Macroeconomic Variables in Eurozone Economies



Source: IMF WEO Database, own calculations [4]

Consequently, in the period 1980 to 2008 the main trend remains one of steady convergence of inflation rates and ULC. In 1980 the standard deviation of the inflation rates and ULC of the, then, future Eurozone economies was 6.95% and 7.12% respectively, a number which had declined to 0.72% and 1.14% in 2008. This is an interesting observation which reflects the general tendency of economic integration in Europe as well as the idea of a great moderation which, despite its recent fall from grace, has been the catch-all phrase for the general decline in volatility in macroeconomic variables. Turning to the evolution of the external positions of the Eurozone economies the opposite picture reveals itself with the standard deviation increasing 2-3% since the inception of EMU.

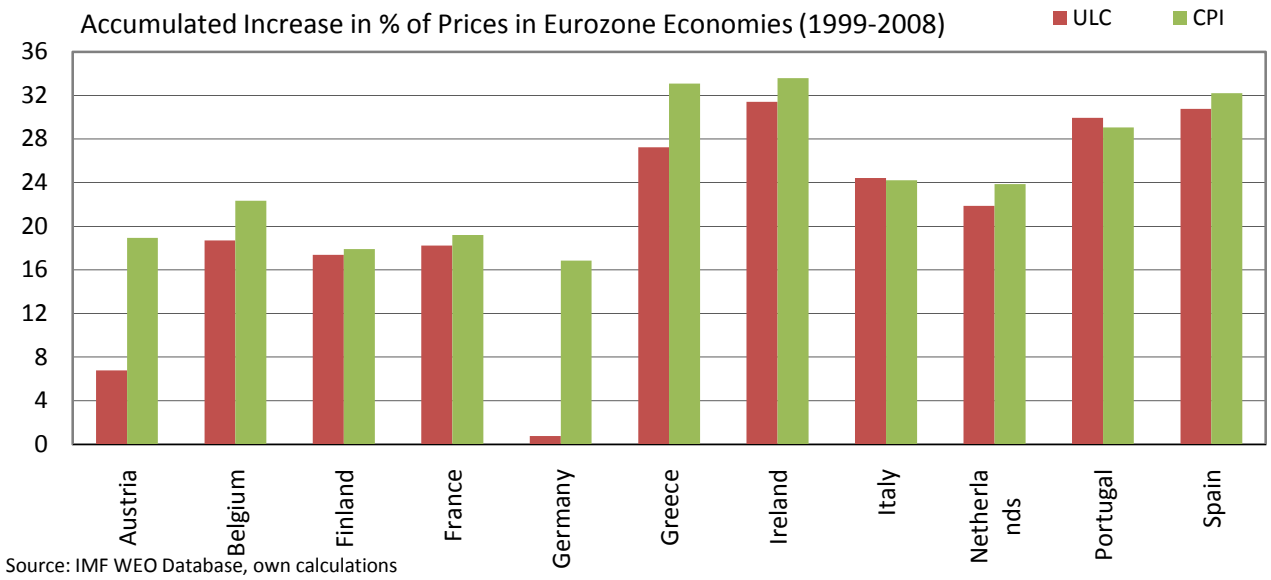
This would then merit two possible conclusions. One is that that the growing divergence in the Eurozone economies' current account positions are not related to inflation and labour cost differentials and another would be that the lack of currency adjustments mean that even relatively small divergences in inflation and unit labour costs may accumulate over time to result in large real economic imbalances.

This paper firmly leans towards the latter view.

Especially the idea that small, but persistent, price differentials may accumulate over times is a key intuition. Consider then the point that the standard deviation in % of the accumulated increase in the CPI and ULC of the Eurozone economies since 1999 are 6.35% and 9.87% respectively.

[4] Austria, Belgium, Finland, France Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain

Figure 2 – Accumulated Increase in Prices (1999-2008)



Source: IMF WEO Database, own calculations

This suggests a much stronger degree of divergence than the graph above. Of the economies in question here the three economies with the largest accumulated increase in the CPI and ULC since 1999 has been Greece, Ireland and Spain (with Portugal very close) who have seen accumulative increases prices in the range of 25-37%.[5] The flipside to these is represented by France, Germany and Finland who have observed the smallest accumulated increase in the CPI and Austria, Germany, and Finland who have observed the smallest accumulated increase in ULC. The divergence is especially noteworthy in relation to ULC where the spread between the lowest accumulated increase (0.75% in Germany) and highest accumulated increase (31.4% in Ireland) is indicative of a large and persistent divergence in price levels.

This restores the idea that Eurozone imbalances may indeed be a function of divergences in price levels.

Between 1999 and 2008 there has been 5 economies running current account deficits on an average basis. These are Greece, Ireland, Italy, Spain and Portugal with an average CA/GDP ratio of -8.60%, -2.0%, -1.30%, -9.14%, and -5.88% respectively. They are complemented by the surplus economies in the form of Austria, Belgium, Finland, Germany, the Netherlands, and France with CA/GDP ratios of 1.47%, 3.20%, 5.78%, 3.08%, 5.53%, and 0.5% respectively where the number from Germany misleads in the sense that measured solely on the period 2004 to 2008 Germany's external surplus totalled almost 6% of GDP on average. Although these figures are not, in themselves, evidence of Intra-Eurozone imbalances popular discourse has it that especially the surplus of Germany has come to be flip side of the deficits of Greece, Spain, and Portugal in particular but also Italy and Ireland. The extent to which the divergence reflects intra-Eurozone imbalances as well as the extent to which individual Eurozone economies have reacted differently to a one size fits all monetary policy vis-à-vis ex-Eurozone economies would exactly be measured through divergence in prices.

In the following section, the investigation turns to a more rigorous empirical test of the hypothesis that the growing divergence in Eurozone current account positions can be attributed to persistent and accumulated divergences in inflation and unit labour costs.

[5] For the CPI the numbers are 33.1, 36.6, and 32.2 percent for Greece, Ireland and Spain and for the ULC the numbers are 27.3, 31.4 and 30.8 percent respectively.

3.0 Estimation and Results

Annual data on inflation (CPI), GDP growth, and output gap as a percentage of GDP has been taken from the IMF data base whereas annual data on growth in unit labour cost is taken from the OECD. Finally, Eurostat was used to get data on the annual nominal value of GDP in order to construct weights used in part of the estimations. As a qualifier in relation to the OECD data on unit labour cost, the OECD database did not return values for Ireland (2008) as well as Greece and Portugal (2007 and 2008). In order to retain these countries in the sample, the missing values have been extrapolated as the average annual growth in unit labour cost of the past 10 years. The data spans the years 1980 to 2008 and covers 11 Eurozone economies[6] whose combined GDP covers 99.3% of the entire Eurozone GDP measured as the average country weight of Eurozone GDP from 2000 to 2011 (where 2009-2011 are Eurostat forecasts).

Following the descriptive analysis above, the empirical estimation will take its point of departure in the following main proposition;

Eq. 1

$$G = F(CPI_i, ULC_i)$$

$$f_{CPI} > 0$$

$$f_{ULC} > 0$$

where "G" is a measure of imbalances and "CPI" and "ULC" are the annual growth rate of inflation and unit labour costs respectively. Intuition here suggests that Eurozone imbalances (G) should increase in inflation and labour costs respectively. This paper thus proposes that Eurozone imbalances measured as the growing divergence in current account positions among Eurozone economies can be quantified as a function of inflation and unit labour cost differentials In the empirical analysis that follows "G" will be operationalized as the current account as a share of GDP (in percentages)

One analytical challenge here is how to introduce the aspect of imbalance and thus the difference between Eurozone economies. Following Schmitz and von Hägen (2009) one possible focus would be to focus on the extent to which current account imbalances mainly reflect intra-Eurozone imbalances or whether there is no meaningful distinction between the sources of funds for the external deficits. This requires a more detailed a dataset than the one from IMF WEO and thus I follow a different approach. Consequently, I define the dependent variable as the excess current account over the Eurozone average for each country. Specifically, I calculate the Eurozone average current account position as a weighted average of the sample countries' current account position. As weight, I use the sum of current prices GDP from 2000 to 2011 where 2009 to 2011 constitute Eurostat forecasts.[7]

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[6] Austria, Belgium, Finland, France Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. Due to the inclusion of the lagged dependent variable the actual sample period is naturally 1981-2008.

[7] This leads to the following weights; Austria (3%), Belgium(3.7%), Finland(2%), France(21.4%), Germany (24.4%), Greece(2.4%), Ireland(1.8%), Italy(17.5%), Netherlands(6.3%), Portugal(1.8%) and Spain(11%).

With these points in mind, consider the following least squares dummy variable framework which is essentially equal to a fixed effect representation Greene (2003, p. 287);

Eq. 2

$$a) \rightarrow CA_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 CPI_{it} + \beta_3 CA_{it-1} + \beta_4 \mathbf{D_i} + \beta_5 D_t GDP_{it} + \beta_6 D_t CPI_{it} + \beta_7 D_t + u_{it}$$

$$b) \rightarrow CA_{it} = \alpha_0 + \alpha_1 GDP_{it} + \alpha_2 ULC_{it} + \alpha_3 CA_{it-1} + \alpha_4 \mathbf{D_i} + \alpha_5 D_t GDP_{it} + \alpha_6 D_t ULC_{it} + \alpha_7 D_t + v_{it}$$

where "CA" is operationalized as noted above. GDP is a control variable and so is the lagged dependent variable which is expected to correct for autocorrelation. The matrix of dummy variables "**D**" corrects for country specific effects and uses France as the benchmark category. In this sense France is regarded as the closest compromise between a big Eurozone economy close to the average value for the Eurozone itself. Another aspect of France's economy is that, on average, it has been the closest to a balanced current account since 1999.[8] The two dummy variables for CPI and ULC are the important variables to gauge in this estimation. They take the value of 0 in the years 1980-1998 and 1 in the years 1999-2008 and thus implicitly tests for a structural break around the formal initiation of EMU. The interpretation of these dummy variables is simple. A significant dummy variable would indicate the estimated coefficient for either GDP or CPI/ULC is likely to have changed at the onset of the Eurozone. This method follows Gujarati (2003) and as a function of the model setup the new coefficient can then be derived by the sum of the estimated coefficient for e.g. "CPI" and "DtCPI" Gujarati (2003). However, this is *not* likely to be the case in a panel data setting which includes a cross section. In this way and as a robustness test, the estimations above will also be reported exclusively for the period 1999-2008 in order to gauge exactly whether any significant indication of a structural break can be carried over into an actual estimation in the given period. Moreover, the check for robustness will also report results from a random effects model to further qualify the results.

This estimation setup leads to four regressions to be estimated of which two are variations on the main estimations and serve as indicators of robustness. With regards to ex ante expectations one would expect that inflation (CPI) and ULC to have a negative effect on the excess current account as percentage of GDP over the Eurozone average. This is to say that when the imbalances are implicitly defined in the dependent variables one would expect country specific inflation rates to influence the extent to which economies have had exhibited imbalances relative to the Eurozone average.

All the results are shown in the appendix. The tables below show the results from the main estimation of eq 2a and eq 2b. Standard errors are robust.

[8] 0.5% of GDP from 1999 to 2008.

Table 1 – CPI on CA/GDP

Dependent Var	eca			
R-Sq	0.87			
F	121.5***			
No. Of obs	308			
Variable	Estimate	SE (robust)	T	P-Val
Cons	0.02	0.30	0.06	0.96
eca(t-1)	0.88	0.04	23.56	0.00
GDP	-0.11	0.05	-2.00	0.05
CPI	0.03	0.04	0.68	0.50
Aus	0.33	0.30	1.10	0.27
Bel	0.44	0.27	1.65	0.10
Fin	0.40	0.34	1.17	0.24
Ger	0.48	0.25	1.91	0.06
Gre	-0.99	0.47	-2.13	0.03
Ire	0.33	0.36	0.92	0.36
Ita	-0.09	0.22	-0.39	0.70
Neth	1.00	0.42	2.36	0.02
Por	-0.83	0.56	-1.48	0.14
Spa	-0.40	0.27	-1.53	0.13
D.CPI	-0.28	0.15	-1.85	0.07
D.GDP	0.05	0.08	0.65	0.52
D.Cons	0.40	0.45	0.88	0.38[9]

[9] Where ”eca” is the excess current account position over the Eurozone average. *** indicates significance of the F value at 1%

Table 2 – ULC on CA/GDP

Dependent Var	eca			
R-Sq	0.88			
F	111***			
No. Of obs	308			
Variable	Estimate	SE (robust)	T	P-Val
Cons	0.32	0.25	1.28	0.20
eca(t-1)	0.88	0.04	24.76	0.00
GDP	-0.14	0.05	-2.66	0.01
ULC	-0.02	0.04	-0.47	0.64
Aus	0.17	0.29	0.57	0.57
Bel	0.38	0.27	1.43	0.15
Fin	0.44	0.32	1.37	0.17
Ger	0.25	0.23	1.09	0.28
Gre	-0.65	0.49	-1.32	0.19
Ire	0.50	0.33	1.52	0.13
Ita	0.02	0.21	0.08	0.93
Neth	0.96	0.41	2.31	0.02
Por	-0.52	0.56	-0.93	0.35
Spa	-0.25	0.26	-0.96	0.34
D.ULC	-0.30	0.10	-2.88	0.00
D.GDP	0.04	0.08	0.50	0.62
D.Cons	0.21	0.35	0.60	0.55 [10]

The explanatory power of these models is difficult to interpret as the coefficient of determination is significantly biased by the inclusion of the lagged dependent variable to correct for autocorrelation. Rather, it is interesting to gauge the significance of the dummy variable included to test for a structural break. On this account the estimations return the expected results. Over the whole sample period 1981 to 2008 neither the CPI nor the ULC represent significant predictors of the current account and output gap measured as percentage of GDP. However, in both estimations do we observe a significant structural break with the expected sign with the important qualifier that the estimation including the CPI as a regressor do not suggest a strong degree of statistical significance with the p-value for the structural break at 0.07.

In the estimation with CA/GDP regressed on CPI the results indicate that a 1% increase in the CPI has been associated with a deterioration of the current account to the magnitude of 0.25%[11] in a post 1999 context. This result is mirrored in the estimation where the CA/GDP is regressed on the ULC. Here the results show how a 1% increase in the ULC has been associated with a decline in the CA/GDP of 0.32%[12] in a post 1999 context. These results thus give a concrete quantitative perspective on the notion of the build-up of

[10] *** indicates significance of the F value at 1%
[11] 0.03 + (-1)(0.28)
[12] -0.02+ (-1)(0.3)

Eurozone imbalances as a function of diverging inflation and labour costs often proxied by the growing difference in real exchange rates.

Turning the attention to the fixed effect estimates, a number of interesting results are revealed. Focusing first on the full period the model seems to capture a notable difference in external positions across the Eurozone economies. In this way and remembering that France is the base case; the fixed effects in the model with CPI as the main explanatory variable are significant for the following countries: Belgium, the Netherlands, Germany and Greece with a positive sign for the first three and a negative sign for Greece. [13] In the model with ULC as the main explanatory variable, only the fixed effect for the Netherlands is significant with a positive sign.

Regarding the checks for robustness which estimate eq 2a and 2b exclusively for period 2 (naturally excluding the structural break dummies) as well as present results from using a standard random effects GLS estimator the results above are qualified somewhat (see appendix).

On the first check, the estimations which only include data from 1999 and onwards suggest that while it appears that a structural break indeed may be present, the alleged strength of the relationship between a build-up of imbalances and increases in inflation and unit labour costs is difficult to capture in this estimation framework. In the context of the CPI, the estimation for the period 1999-2008 reveals no significant relationship between the excess current account over the Eurozone average and the CPI. This result is not materially different for the estimation including ULC although the relationship appears stronger. In this way, the estimated coefficient has the expected sign (negative) whereas the returned p-value at 0.13 does not pass traditional measures of statistical significance. It is important to note though, this p-value is a function of a standard correction of heteroscedasticity[14] with the uncorrected p-value coming in at a more respectable level of 0.05. This does not make the result more robust per se, but it highlights the fact that when it comes to the statistical significance of the result, it is likely to be very sensitive to the choice of covariance matrix and correction strategy.

Moreover, the importance of the fixed effect increases across the board in the estimations for the period 1999 to 2008. In the estimation including CPI as the main explanatory variable, fixed effects estimates for Austria, Germany, the Netherlands, Spain, and Greece are all significant with positive signs for the first three and negative signs for the last two. This result is mirrored exactly, albeit with somewhat higher p-values, in the estimation with the ULC as the main explanatory variable.

The main message to take away from the fixed effect estimates and the fact that their significance increase in the second period estimation is essentially a quantitative proof the existence of intra Eurozone imbalances with Germany, Austria, and the Netherlands as the main surplus economies with Greece, Spain and Portugal as the main deficit economies (Ireland should be included here too, but the model does not capture a significant fixed effect in this case).

Finally as a last check for robustness, the appendix also reports the results from a random effects GLS estimation with exclusively focus on an estimation with ULC as the main explanatory variable as using the CPI does not seem to yield good results. The random effects model return a very promising results with the coefficient estimated for ULC having the correct sign and being significant for the whole period (1981 to 2008) as well as it exhibits a strong and significant structural break around 1999. However, the Hausmann

[13] This then indicates that Germany, Belgium (p-val, 0.09), and the Netherlands have been running statistically signficant external surpluses measured against France and in Greece's case an external deficit. Portugal and Spain are borderline cases (passing only a 15% test of statistical significance) both also with negative signs as expected.
[14] Following STATAs standard correction measure using robust standard errors.

specification test do not come out in favour of allowing a random effect estimation returning a p-value of 0.03 and thus a rejecting of the null hypothesis that the fixed and random effect estimates are different[15].

4.0 Discussion

How does the analysis above relate to the current turmoil in the Eurozone economies?

There are two ways to approach this question; one is to discuss the overall evidence in favour or against the ability of prices to correct downwards and the second would be to a more general discussion on how to restore external competitiveness with a fixed exchange rate at the same time as managaing public debt faced with future liabilities due to population ageing.

Beginning with the first it is a discussion that takes us into the mainland of a classic debate among macroeconomists on price flexibility and more specifically in the present context, the extent and pervasiveness of DNWR.

Across a wide range of studies DNWR has been found to be pervasive both in a US context (Altonji and Devereux (1999), Lebow et al. (2003) and Holden and Wulfsberg (2007)) and in a European context (Dessy (2005), Holden and Wulfsberg (2007) and Knoppik and Beissinger (2009)). Consequently, the main macroeconomic debate has not been on the existence of DNWR as such but more so whether it is associated with higher unemployment. Here, we can safely bypass this issue and focus on the actual extent of DNWR in a Eurozone context. Initially, it is thus important to remember that the persistence of DNWR was one of the main reasons that many raised the risk that imbalances would be allowed to grow within the EMU absent any joint effort to police the individual members in terms of fiscal policy Calmfors (2003). On this account, the prospects of imposing an internal devaluation in key Eurozone member countries look difficult, not because it cannot (and will not) be done, but because of the speed with which such a process can be implemented as well as the pressure on politicians from the public during such a process; pressure which might ultimately make the process non-viable.

Holden and Wulfsberg (2007) for example finds evidence of DNWR on the industry level and thus manages to pin down DNWR as an aggregate, and not purely microeconomic, phenomenon. Specifically, the paper finds that in economies with tight employment protection legislation (epl) and higher union density DNWR is more pronounced. This characterization consequently puts countries such as Italy, Greece, Portugal, and Spain in the group where DNWR is found to be strongest while in Ireland, as part of the Anglo-Saxon countries, DNWR is found to be less pervasive. Initially, this provides a cautional tale to the idea of an internal devaluation as the sole mechanism of adjustment of Eurozone imbalances with the qualifier that the period covered by Holden and Wulfsberg (2007) runs from 1973-1999 and thus, strictu sensu, cannot be applied directly to our case here as we are particularly interested in a post 1999 context. However, as the economic turmoil is strengthening rather than loosening its grip on the Eurozone economy the stakes are being raised to cover far more than the technical question of whether and how long DNWR will delay external adjustment. Thus and beyond the crucial question of how the adjustment process will pan out, the travails of Southern Europe has given birth to fundamental discussion of the future state and architecture of Europe's common monetary union.

At the time of writing, policy makers and economists are consequently wrestling with different scenarios on how to deal with an imminent risk of default in Greece as well as how prevent similar issues to surface in Spain, Portugal, Ireland and perhaps even on to France and Germany. With Greece having activated the promised EU-IMF loan[16] that insures aid to the tune of 45 billion Euros ($60 billion), it is the hope that calm

[15] This is the way the test is specified in STATA.

[16] *Greece Requests EU-IMF Rescue in Euro's Biggest Test*, Bloomberg News article Apr 23rd

will be restored. Yet, this is far from certain and in truth no real solution has been put on the table. Everything from a common Eurozone fund over to the issuance of Euro bonds backed by all governments over to unilaterally allowing IMF to directly assist ailing Eurozone members have been brought to the table in terms of bringing the Eurozone economies through the crisis in one piece. Talks of the demise of the Eurozone may seem overblown, but it would be foolish not to consider carefully the future of the Eurozone in its present state.

In this sense and beyond the extent of potential DNWR, the way out for Greece, Spain, and Ireland is simple. As growth in domestic demand has been too high for too long and as the continuing expansion of fiscal policy cannot be defended, these countries needs to restore external competitiveness not only to achieve economic growth but also, structurally, to rebalance their economies. With a fixed exchange rate and no independent central bank, the only way to correct is through a process of internal devaluation which involves a persistent and prolonged downward pressure on domestic price and wage levels. In a recent research article at VOX.EU Ricardo Cabral from University of Madeira[17] provides a further important spin of the issues of Southern Europe. In essence, the argument approaches the issue of correcting external competitiveness from a different angle and highlights the problems excessive external debt and how economies are extra vulnerable when interest payments primarily go to foreign as oppose to domestic creditors. Structurally, this translates into a negative net external position which feeds into a negative income balance. In short; foreigners own more assets in Southern Europe than their domestic citizens own abroad and this translates into a negative income balance which acts as a ball and chain on these economies' efforts to lift themselves out of the mire.

Thus, Greece et al are effectively caught in a catch 22. Specifically, the need to simultaneously rein in fiscal stimulus in order to preserve long term debt sustainability as well as to correct an external deficit proves a decisively unattractive macroeconomic medicine which may not only prove difficult to administer, but also effectively impossible to pull through in the current Eurozone setup. The vice which then locks in uncompetitive economies in the Eurozone is twofold.

Firstly, the deflation in prices and wages needed to restore external competitiveness and thus growth must be relative in excess of other economies' correction. In this sense, Greece et al are fighting a moving target in the form of relative deflation compared to other member economies and indeed other global economies facing similar pressures to deleverage. In short, the battle for relative market share on export markets will increase in conjunction with the amount of economies pursuing a deliberate export oriented growth strategy. Secondly, deflation increase the real value of overall government debt thus requires even more in the way of austerity measures to keep the debt level sustainable. Moreover and as a complicating factor; Greece, Spain, and Portugal are currently paying a large premium over the base rate (German Bunds) for lending money.

This means that as nominal growth in GDP is likely to fall with the corrective measures and as interest rates, for now, remain elevated the ability to reach the designated goals of e.g. complying with rules of the growth and stability pact in 2013-2015 is gravely impaired. In fact, even if we assume that Eurozone policy makers manage to come up with a deal that provides the sufficient credibility so as to persuade the market to allow interest rates paid on government debt in Southern Europe to come down, the fall in nominal GDP itself means that the debt to GDP ratio is likely to be very difficult to stabilize.

[17] Cabral (2010)

The situation above is also known as the *debt snowball effect* [18] and can be given an analytical treatment by considering the following dynamic path of government debt to GDP[19];

eq. 3

$$d_t - d_{t-1} = pdef_{t-1} + \left(d_{t-1} \frac{i_t - y_t}{1 + y_t} \right) + \frac{SF_t}{Y_t}$$

Where lower capital d is the debt level to gdp, i is the interest raid paid on government debt, y is growth rate of nominal GDP, pdef is the primary deficit over GDP[20], and SF is a stock flow adjustment. Assuming for a minute for that the stock flow mechanism is zero, this can be rearranged as a simple first order differential equation;

eq. 4

$$d_t = \left(1 + \frac{i_t - y_t}{1 + y_t} \right) d_{t-1} + pdef$$

Which has the following general solution;

eq. 5

$$d_t = +A\left(1 + \frac{i_t - y_t}{1 + y_t} \right)^t + \frac{pdef}{1 - \left(1 + \frac{i_t - y_t}{1 + y_t} \right)}$$

$$\Leftrightarrow \quad [21]$$

$$d_t = +A\left(1 + \frac{i_t - y_t}{1 + y_t} \right)^t + \frac{pdef}{-\frac{i_t - y_t}{1 + y_t}}$$

[18] See Edward Hugh (2010) – The Debt Snowball Problem, afistfulofeuros Jan 15th, 2010

[19] Taken from Danske Bank Investment Research; *Research Euroland Debt on a dangerous path*, Jan 4th 2010 by Gustav Smidth and Frank Øland Hansen.

[20] Note that the higher the value of pdef, the ***more negative*** the primary deficit.

[21] The constant "A" is assumed positive throughout which is simply akin to assuming that the initial level of debt will be higher than the primary deficit divided by the discounted spread between the interest rate and the nominal growth rate of GDP.

Simplifying the setup as a first step we can assume the constant away by setting the primary deficit equal to 0. This gives us;

eq. 6

$$d_t = A\left(1+\frac{i_t - y_t}{1+y_t}\right)^t$$

From this result the debt snowball follows from the dynamics of a first order difference equation. Consequently, in order for the debt to GDP ratio to remain constant the value of the term inside the bracket must be less than 1[22]. In this case it means that the fraction of the difference between the interest rate paid on the debt and nominal GDP discounted by the nominal GDP must be negative. In other words, nominal GDP growth must be *higher* than the level of interest rate paid on the debt. If this is not the case and if we assume for e.g. that the primary deficit is simply 0 at all points in time, it will still lead to an explosive evolution in debt to GDP.

However, introducing the primary deficit leads to an overall rule of thumb which states that the extent to which an economy may maintain a constant debt to GDP is a function of its initial level of debt to GDP level as well as whether the primary *surplus*[23] matches the excess interest rate paid over nominal GDP growth discounted by the nominal growth rate (see appendix for a simple example). It is important to note that the initial level of debt has a significant impact on the level of the primary surplus needed in order to keep the overall level of stable. Consequently, the higher the initial level of debt, the larger the primary surplus has to be in order to maintain a stable level of debt to GDP. But this is less important in the current context since the debt snowball will, for all practical reasons, roll in the event of negative nominal growth in GDP at the same time as (foreign) creditors are pushing up yields on government bonds.

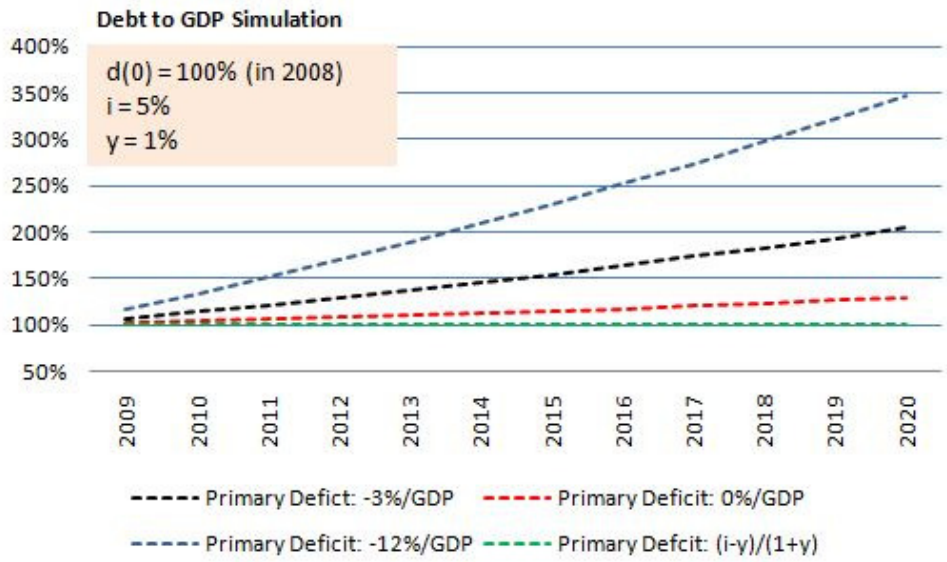
So, why is this important in the present context?

Quite simply, the path which Greece, Spain, Portugal et al must now take of deflation almost certainly means that the level of nominal growth in GDP will be lower than the interest rate they pay on their debt. In fact, the whole market dynamic assures this as sluggish growth itself will prompt international investors to demand more for holding debt from these economies. At the end of April as Greece was finally taken steps to call in aid from the IMF and EU yields on Greek 2 year and 10 year notes rose to 7.76% and 10% respectively. In the context of the framework above, this is dramatically higher than the nominal growth rate Greece can expect in the coming years. More worryingly, the 5% interest rate which has been floated as the fixed rate which Greece will pay on the loans that will be extended from its fellow member EMU economies is also surely going to above the growth level of the Greek economy. In fact, the whole issue boils down to the point that these economies cannot correct their external imbalances without one or two years of negative nominal GDP growth which, in the light of e.g. Greek public finances, will be very difficult to sustain without bilateral aid of an almost unthinkable scale or outright debt restructuring (see also Cabral (2010) here).

[22] If it is exactly 1 the debt level will be constant at its intial level.
[23] i.e. pdef entering with a negative sign in this model.

Consider for example a simulation based on the following assumptions; initial debt to GDP: 100%, nominal growth rate: 1%, interest rate paid on loan: 5%[24], primary deficit to GDP: -3%[25] 0%, -12% or –3.9%[26]:

Figure 1 – Debt to GDP Simulation



Naturally, the interest rate charged on the government debt will itself be a function of the primary balance, but as the level of nominal growth in GDP will also tend to fall if we assume a lower budget deficit (to reflect a higher degree of belt tightening and cuts in public spending), this will work in the other direction. In this sense the trajectory of debt accumulation above may not be entirely outlandish in the context of key Eurozone economies at the present juncture and thus, a debt restructuring of some form seems to be moving ominously closer by the day.

[24] C.f. the most recent terms of the aid package to Greece.
[25] Official target for 2012 Greek budget deficit
[26] Which is equal to (i-y)/(1+y) and thus consistent with the level needed to maintain the debt/GDP ratio at 100%

Conclusion

After 10 years of smooth sailing the Eurozone is now at a crossroads. Not only has the risk of an outright default of one or more member countries increased significantly (see e.g. Feldstein (2010)), but the whole operational setup of EMU and thus the benefits of staying as oppose to staying out have been seriously questioned. With this as a backdrop, the analysis above has attempted to quantify and operationalize the concept of Eurozone imbalances. Specifically, empirical evidence has been provided to suggest how the build-up of current account imbalances in the Eurozone is a positive function of even small divergences in unit labour costs. This in itself is not a novel result, but in the absence of effective supranational fiscal coordination to police overspending economies as well as DNWR it also means that there has been no natural correction mechanism at work.

The main contribution of this paper is to give a quantitative spin on the idea that as EMU countries surrendered monetary policy and a flexible exchange rate, the relationship between divergences in unit labour costs and divergences in current account positions increased significantly. Concretely, and focusing on the results for ULC[27], the empirical results indicate that a 1% increase in the ULC has been associated with a decline in the CA/GDP of 0.32%[28] in a post 1999 context. To the extent that the accumulated change in ULC has diverged notably between Eurozone economies from 1999 to 2008, this suggests that current account imbalances are indeed a positive function of divergences in labour costs.

Finally and more worryingly from the point of view the Eurozone as we know it today, the operational setup which essentially requires countries such as Ireland, Spain, Greece, and Portugal to correct the loss of external competitive through internal devaluations also means that these economies are now caught in a vice. This is most easily seen in the context of the debt snowball effect which essentially shows how it is impossible to maintain public debt sustainability at the same as correcting external competitiveness through an internal devaluation since the latter will entail price deflation and thus a fall in nominal GDP growth. Much more problematic however is the fact that the interest rate which e.g. Greece is currently paying to rollover its current financing not to mention its longer term obligations makes a long process of internal price deflation almost impossible without a debt restructuring. Should this ultimately happen, it is difficult to say what would follow next in relation to the Eurozone's other ailing economies as well as the willingness and ability of the core to assist them.

Further studies on this topic should focus on two things in my opinion. Firstly, the verification of the notion of Eurozone imbalances as a function of divergences in unit labour costs from an empirical perspective and secondly, the formulation of policy tools in a Eurozone context that can address the contradiction between public debt sustainability and internal devaluation as means of correcting divergences between member economies.

[27] Which are most robust.
[28] -0.02+ (-1)(0.3)

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Appendix

Regression Results

The two tables below show the results from the main estimations and are equivalent to the results shown in the text;

Dependent Var	**eca**
R-Sq	0.87
F	121.5***
No. Of obs	308

Variable	Estimate	SE (robust)	T	P-Val
Cons	0.02	0.30	0.06	0.96
eca(t-1)	0.88	0.04	23.56	0.00
GDP	-0.11	0.05	-2.00	0.05
CPI	0.03	0.04	0.68	0.50
Aus	0.33	0.30	1.10	0.27
Bel	0.44	0.27	1.65	0.10
Fin	0.40	0.34	1.17	0.24
Ger	0.48	0.25	1.91	0.06
Gre	-0.99	0.47	-2.13	0.03
Ire	0.33	0.36	0.92	0.36
Ita	-0.09	0.22	-0.39	0.70
Neth	1.00	0.42	2.36	0.02
Por	-0.83	0.56	-1.48	0.14
Spa	-0.40	0.27	-1.53	0.13
D.CPI	-0.28	0.15	-1.85	0.07
D.GDP	0.05	0.08	0.65	0.52
D.Cons	0.40	0.45	0.88	0.38

Dependent Var eca

R-Sq	0.88
F	111***
No. Of obs	308

Variable	Estimate	SE (robust)	T	P-Val
Cons	0.32	0.25	1.28	0.20
eca(t-1)	0.88	0.04	24.76	0.00
GDP	-0.14	0.05	-2.66	0.01
ULC	-0.02	0.04	-0.47	0.64
Aus	0.17	0.29	0.57	0.57
Bel	0.38	0.27	1.43	0.15
Fin	0.44	0.32	1.37	0.17
Ger	0.25	0.23	1.09	0.28
Gre	-0.65	0.49	-1.32	0.19
Ire	0.50	0.33	1.52	0.13
Ita	0.02	0.21	0.08	0.93
Neth	0.96	0.41	2.31	0.02
Por	-0.52	0.56	-0.93	0.35
Spa	-0.25	0.26	-0.96	0.34
D.ULC	-0.30	0.10	-2.88	0.00
D.GDP	0.04	0.08	0.50	0.62
D.Cons	0.21	0.35	0.60	0.55

The table below shows the result from the second period regressions (1999 to 2008);

Dep Var	eca			Dep Var	eca		
Obs	110			Obs	110		
R-Sq	0.9541			R-Sq	0.9555		
F	141			F	143		
Variable	Coef.	Std.	t	Variable	Coef.	Std.	t
cons	-0.4791	0.483329	-0.99	_cons	0.876986	0.330964	0.05
ecalag	0.884709	0.056129	15.76	ecalag	0.876986	0.055992	15.66
gdp	0.032765	0.088174	0.37	gdp	-0.01388	0.080962	-0.17
cpi	**0.057067**	**0.19093**	**0.3**	**ulc**	**-0.1575**	**0.103841**	**-1.52**
aus	0.990227	0.405334	2.44	aus	0.825032	0.422897	1.95
bel	0.043161	0.630268	0.07	bel	0.098649	0.606922	0.16
fin	0.733445	0.625262	1.17	fin	0.804802	0.595329	1.35
ger	1.400569	0.342997	4.08	ger	1.096788	0.372206	2.95
gre	-1.78823	0.735032	-2.43	gre	-1.53876	0.653426	-2.35
ire	-0.57634	0.677834	-0.85	ire	-0.14009	0.543073	-0.26
ita	-0.21499	0.255091	-0.84	ita	-0.14124	0.236348	-0.6
neth	1.358647	0.550172	2.47	neth	1.492204	0.495631	3.01
por	-1.16187	0.759558	-1.53	por	-1.0189	0.748177	-1.36
spa	-1.16151	0.591297	-1.96	spa	-0.87054	0.542491	-1.6

The table below shows the results from the GLS random effects model on the full sample with the ULC as the main explanatory variable. The output below also shows the results from a Hausmann specification test to check for the validity of the random effects model relative to the fixed effects specification

Dep Var	eca
Obs	308
No of Groups	11
Obs per group	28
Wald chi-sq	7238.87
R-Sq (overall)	0.87

Variable	Coef.	Std.	z
cons	0.696844	0.177854	3.92
ecalag	0.940838	0.016201	58.07
gdp	-0.16529	0.039429	-4.19
ulc	**-0.04983**	**0.016073**	**-3.1**
dulc	**-0.25067**	**0.084218**	**-2.98**
dgdp	0.070125	0.055347	1.27
dintercept	-0.06018	0.370094	-0.16

Hausmann Specification Test	
(b-B)'[(V_b-V_B)^(-1)](b-B)	
Ho	difference in coefficients not systematic
chi2(5)	12.19
Prob>chi2	0.0322

The Debt Snowball

The dynamics of the simple framework described in the text relative to the idea of a debt snowball is a function of the initial condition for the debt to GDP ratio as well as a the relationship between the primary deficit and the spread on the interest rate and nominal GDP growth. In this sense and given an arbitrary value for a country's debt/GDP ratio in year 0 it follows that we must solve for the constant "A" accordingly;

$$A = d_0 - \frac{pdef}{-\frac{i_t - y_t}{1 + y_t}}$$

Specifically and following directly from eq 5 in the text, the snowball will be in effect for all values of A other than 0 (assuming that A must be positive at all times in the context of an internal devaluation[31]). If A is between 0 and 1 it will dampen the snowball effect and if it is above 1 the debt snowball will become explosive.

In order to proceed we need to make some assumptions on variables which are exogenous and which are endogenous to economic policy makers. Clearly, in a situation of debt distress the nominal interest rate is going to be exogenously dictated by the market[32] and it is reasonable to assume as well that given the path of internal adjustment through an internal devaluation the growth rate of nominal GDP will also be given. This is to say, the only parameter which remains within control of policy makers is the original policy lever of policing the government budget[33]. This is best shown with a concrete example using the values for "i", "y", and d(0) in the text;

$$A = 1 - \frac{pdef}{-\frac{0.05_t - 0.01_t}{1 + 0.01_t}} \Leftrightarrow A = 1 - \frac{pdef}{-0.039}$$

Clearly, for A to be 0 in this case and thus for the debt snowball to be cancelled out, the primary deficit must be equal to the spread between the interest rate and the nominal growth rate of GDP (in this case -

[31] I.e. the interest rate paid on the debt is higher than the nominal growth rate.
[32] In fact, for anyone but very large economies the interest rate will always be exogenous.
[33] Of course, in the current situation in the Eurozone where e.g. Greece has called on de-facto aid even the primary deficit is outside the control of domestic policy makers as it will be dictated by the creditors.

0.039 which signifies a surplus[34]). The crucial thing to consider here is that there are two things which affect the snowball effect.

One is the difference between the interest rate and the nominal growth rate. The higher the interest rate relative to the nominal growth rate the stronger the snowball effect. However, the initial condition matters too since a low initial debt to GDP means that the economy will have to run a lower primary deficit in order to keep its deficit level stable. Take for example the case above and assume that the initial debt/GDP ratio is instead 80%;

$$A = 0.8 - \frac{pdef}{-\frac{0.05_t - 0.01_t}{1 + 0.01_t}} \Leftrightarrow A = 0.8 - \frac{pdef}{-0.0396} \Leftrightarrow 0 = 0.8 - \frac{pdef}{-0.0396} \Leftrightarrow pdef = -0.03168$$

This may be a small difference at a first glance, but clearly the difference between e.g. an initial debt position of 50% and one of 100% makes a big difference. More generally and as an overall rule of thumb for policy makers the longer an unsustainable trajectory in public finances are allowed to run, the higher the primary deficit needed to correct it. This is especially the case if we assume that the interest rate the government pays on its debt rises with the debt/GDP ratio.

[34] i.e. a *negative* deficit.