POLICY PAPER

Wages and Ireland's International Competitiveness

RORY O'FARRELL
OECD, Paris

Abstract: At the beginning of the crisis in 2008 it was a widely reported view that Ireland had become uncompetitive, leading to calls for wage cuts. Since then wage rates in the private sector have been largely stable. However, Ireland has shown a strong improvement in exports despite a difficult international trading situation. This presents a puzzle. If wages in Ireland were uncompetitive, how could Ireland improve its export position so rapidly, without a general fall in wages? Ireland can best be described as having moved from a position of "super-competitiveness" to "competitiveness". During the construction boom, exports remained an important driver of growth. Since 2008, the fall in nominal unit labour costs is entirely due to a move away from the labour intensive construction sector. However, while labour costs have been stagnant in Ireland, they have increased amongst our trading partners.

I INTRODUCTION

At the beginning of the crisis in 2008 it was a widely reported view that Ireland had become uncompetitive. Due to a domestic building boom Ireland had lost international competitiveness and, as currency devaluation was not an option, it was necessary to cut wages in order to restore competitiveness. Since then wages in the private sector have been largely

stable. However, Ireland has shown a strong improvement in exports and its current account quickly moved into surplus, despite a difficult international trading situation. This presents a puzzle. If wages in Ireland were uncompetitive, how could Ireland improve its export position so rapidly, without a general fall in wages? This paper asks, to what extent has wages affected international competitiveness?

Promotion of an "internal devaluation", whereby Ireland simulates currency devaluation by cutting prices and wages, no longer occupies a prominent place in public discourse. Previously, international institutions called for wage cuts. In 2010 an IMF staff position note (Allard and Everaert, 2010) called for a review of "… the level of minimum wage to make it consistent with the general fall in wages". Ireland's Memorandum of Understanding with the Troika of December 2010 included provisions to "Reduce by €1.00 per hour the nominal level of the current national minimum wage" and to "Enlarge the scope of the 'inability to pay clause' permitting firms to invoke this clause more than once;" and also to "… prevent distortions of wage conditions across sectors associated with the presence of sectoral minimum wages in addition to the national minimum wage" (European Commission, 2010). Also, it was that "Although price competitiveness has improved, a sustainable economic growth path from 2011 onwards requires further relative price and wage adjustment" (European Commission, 2011). Such a narrative informed the creation of the European Commission's "six-pack" rules and Macroeconomic Imbalances Procedure which monitors developments in indicators such as the current account and nominal unit labour costs. However, this narrative relies on the assumption that Ireland became uncompetitive, and was reliant upon a domestic boom. Part of the common narrative of Ireland's "Celtic Tiger" period is that an export led boom gave way to a domestic led boom from approximately 2002 onwards.

Despite the crisis average hourly wages remained stable. Although it is possible for wage declines to be masked by a simultaneous loss of relatively low paid jobs, this was not the case. It is a stylised fact that nominal wages do not tend to fall, with employers fearing a demoralising effect on workers (Du Caju, Kosma *et al.*, 2014). From 2009 to 2011, although some firms reduced their wage bill by means of redundancies, or a shorter working week, only about 30 per cent reduced average hourly earnings (Walsh, 2012). This was offset by a larger number of firms that increased wages, leading to an overall increase in wages when the composition of the workforce is controlled for.

It is true that from 2004 to 2008 Ireland had a current account deficit, reaching a trough of –5.7 per cent of GDP in 2008. However, during the same period exports increased by 18.7 per cent in real terms and by 2010 the current account deficit was closed, and a surplus of 1.6 was achieved in 2012 (and 6.2 per cent in 2014). Though there has been some discussion of the extent to which

the current account has been boosted by foreign firms reclassifying their home location as Ireland (FitzGerald, 2013a), it is generally agreed that Ireland has genuinely rebalanced its current account. If Ireland was indeed uncompetitive, such a turnaround of 7.3 per cent of GDP within four years is quite remarkable given that wages were stable.

This paper examines to what extent Ireland's export performance improved, and to what extent wage changes played a roll. Particular attention is paid to Nominal Unit Labour Costs (NULCs) which are the most policy relevant measures of wage competitiveness, due to their role in the European Commission's Macroeconomic Imbalances Procedure (MIP). Section II looks at how Ireland's external performance developed and how exports remained an important source of growth during the construction boom. Developments in measures of Ireland's competitiveness, with special regard to the MIP are presented in Section III, while changes in wages and NULCs are decomposed in Section IV. Section V concludes.

II HOW HAS IRELAND'S EXTERNAL PERFORMANCE DEVELOPED?

Despite a construction boom and high consumer inflation, and a growing current account deficit, the actual importance of exports to Irish economic growth in the 2000s has been somewhat neglected. It is therefore useful to decompose GDP growth into the contributions from domestic demand and exports; and also look at how Ireland's exports performed, adjusting for the economic fortunes of target markets.

A common method to decompose GDP is into domestic demand (consumption, investment, and government expenditure) and net exports (exports minus imports). This is based on the identity that GDP equals domestic demand plus net exports. Such decomposition is problematic, however, and underestimates the importance of exports to Irish GDP growth in the 2000s. For example, if a person imports Italian shoes into Ireland this will increase domestic demand (consumption). A decomposition of GDP into domestic demand and net exports suggests that the increase in domestic demand has boosted GDP, despite this demand being entirely satisfied by an import. It also gives an impression that the importance of exports has diminished, despite this not being the case. The aggregate supply of goods and services in an economy is given by GDP plus imports; and aggregate demand is given by exports plus domestic demand. Previously, due to data limitations it was not possible to show to what extent GDP grew to meet domestic demand, and to what extent such demand was met by imports.

However, data from the OECD/WTO TiVA database suggest that the importance of exports from 2002 onwards has been understated. This data shows more precisely how trade in value added (TiVA) contributed to GDP growth. Using this data Figure 1 shows that even during the construction boom exports continued to be an important driver of economic growth, contributing an average of 2.6 per cent from 2004 to 2008. As can be seen, the traditional decomposition underestimates the continued importance of exports during the construction boom, and suggests exports were a drag on GDP, despite their continued growth.

Figure 1: *Contribution of External and Domestic Demand to Ireland's GDP Growth*
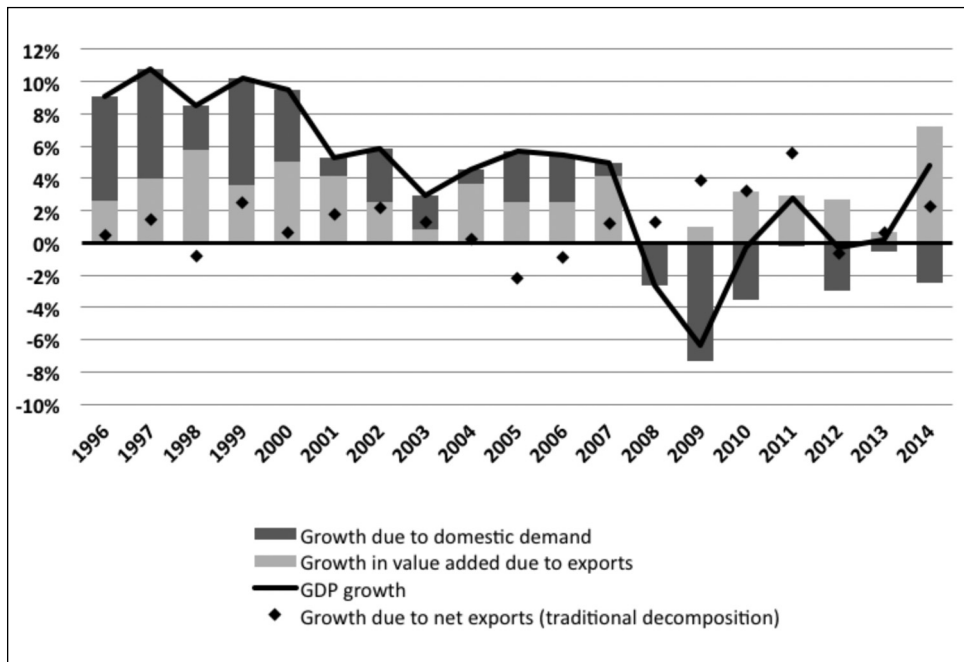

Source: TiVA database, Eurostat (nama_10_gdp), and author's calculations.
Note: The TiVA database covers the years 1995, 2000, 2005, 2008, and 2009. For other years the total domestic value added share of gross exports (OECD code EXGRDVA_EX) has been inferred by linear interpolation.

It should be noted that part of Ireland's respectable external performance during the construction boom can be attributed to a buoyant global economy, and underlying competitiveness problems may have been hidden by an economic high tide. Figure 2 shows Ireland's export performance (growth in

exports relative to the growth of the country's export market). Irish export performance declined from 2003 to 2006. However, this decline was relatively modest compared to previous gains (with Ireland keeping most of the Celtic Tiger era gains), and declines were quickly reversed. Interestingly, this improvement began in 2007, and accelerated strongly in 2009, a year characterised by falling consumer and property prices, but stable wages. The pattern of export performance is closely linked to the contribution of exports to GDP growth. In line with other advanced economies Ireland's share of world exports is in general decline as emerging market economies such as China increase their exports. As trade is not a zero sum game this should be considered a positive development for China, rather than a negative development for Ireland.

Figure 2: *Ireland's Export Performance and Share of Exports in World's Exports*
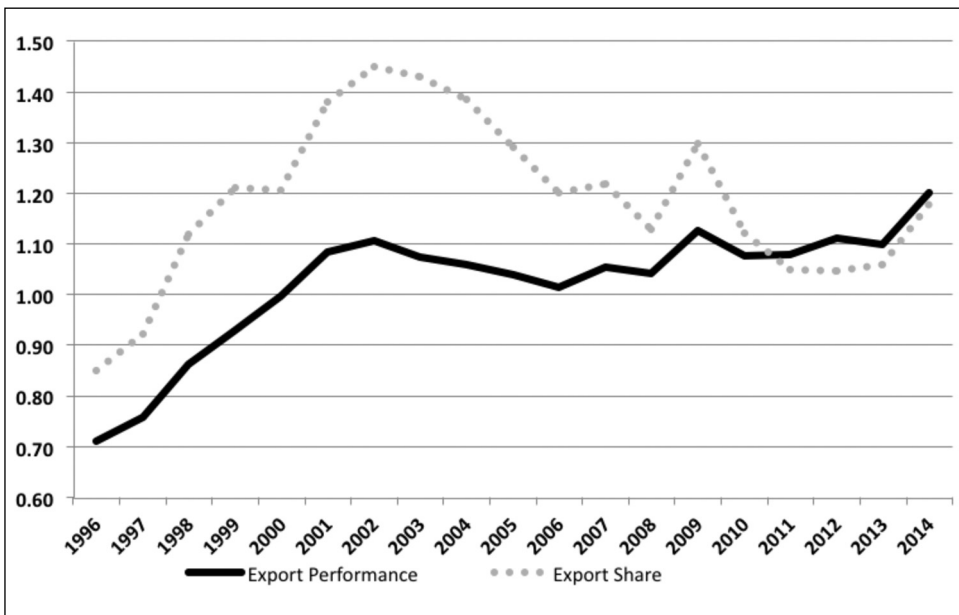
Source: OECD *Economic Outlook*, No.97 database and author's calculations.

This raises questions as to what extent competitiveness was actually lost. Did a change in Irish wages affect Irish competitiveness during the boom period, and if so do they explain Ireland's improved export position? This will be examined by focusing on the most policy relevant measure of wage competitiveness, nominal unit labour costs.

III MEASURES OF COMPETITIVENESS

International competitiveness is not a clearly defined concept. The World Economic Forum produces estimates of international competitiveness based on 12 "pillars" (and over 100 sub-indices). Most of these are qualitative measures and not direct measures of price or costs. A discussion of some of the issues are given by Neary (2006) and O'Brien (2010).

Nevertheless, price or cost competitiveness is relevant. For countries (such as the UK) with a free floating currency cost competitiveness can be quickly achieved by devaluing the currency. However, this option is not available to countries in the Eurozone, and so has led to interest in measuring "macroeconomic imbalances". The European Union's Macroeconomic Imbalances Procedure (MIP) forms part of the "Six-Pack" which entered into force in December 2011. The European Commission can issue fines when countries are not compliant (European Union, 2011).[1] A total of eleven indicators are included in the MIP scorecard. Those related to external balances and international competitiveness are:[2]

● *External Imbalances*
    1. Current account balance (3 year average).
    2. Net International Investment Position (as per cent GDP).

● *Competitiveness*
    3. Real Effective Exchange Rates (with harmonised index of consumer prices deflators) (3 year average).
    4. Export Market Shares (5 year average).
    5. Nominal Unit Labour Costs (3 year average).

The MIP scorecard measures of most interest when examining cost competitiveness are real effective exchange rates and nominal unit labour costs (NULCs). Indicators 1 to 5 are shown in Figure 3 (the data series begins in 2004), along with thresholds which countries should not exceed; as is an auxiliary indicator of 10-year changes in NULCs relative to Eurozone. The EU uses averages over several years as annual changes can be volatile. The current account (indicator 1) and export market shares (indicator 4) can be viewed as the outcome of whether or not a country is competitive, and an aim of increasing competitiveness is to improve these measures. If a country increases its imports the current account can worsen, without necessarily harming competitiveness,

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[1] At present the implementation of the Macroeconomic Imbalance Procedure has been suspended for Ireland (European Commission, 2013).
[2] The six measures of internal imbalances are house prices, private sector credit flows, private sector debt, general government debt, unemployment rate, and total financial sector liabilities.

such as by importing machinery which ultimately improves a country's competitiveness. Similarly, the change in share of world exports is more an outcome of a country's competitiveness rather than something that can be directly managed. The export market share differs from export performance as measured by the OECD (Figure 2) in that the EU looks at growth in exports throughout the world, while export performance emphasises growth in markets into which a country exports. Due to the greater importance of emerging markets, most EU countries report a declining share of world exports. A poor net international investment position (indicator 2) may not be due to a current lack of competitiveness, but due to deleveraging following excessive borrowing in the past (such as during the housing boom).

The real effective exchange rate (indicator 3) is a measure that can be directly influenced by domestic policymakers. It depends on the level of consumer prices in Ireland relative to our trading partners and the exchange rate. When comparing the real effective exchange rate with a country that uses the same currency, one is simply comparing differences in prices. However, when making a comparison with a country that uses a different currency (such as the US) changes in the exchange rate must also be accounted for. For Eurozone members, exchange rate movements are beyond the control of national institutions. If an economy such as Germany's performs well this tends to cause the value of the Euro to increase. This can lead to a country such as Ireland losing competitiveness, despite having no influence over Germany's performance. The real effective exchange rate is measured relative to a weighted average of 42 trading partners. Changes in this indicator are less dramatic than changes in nominal unit labour costs, which can be explained by NULCs rising faster than prices. Also from 2004 to 2008 Irish price increases were in line with the Eurozone average (with the Irish harmonised index of consumer prices increasing by 11.2 per cent compared to 10.2 per cent for the EA-17).

3.1 Nominal Unit Labour Costs

Although nominal unit labour costs (indicator 5) are just one measure of cost competitiveness, of the measures monitored by the European Commission they are the most relevant to wages. The European Commission aims that nominal unit labour costs do not increase by more than 9 per cent over a three year period. Nominal unit labour costs are defined as nominal compensation per employee (the average wage plus social security contributions per worker in cash terms), divided by real output per person in employment (labour productivity). By allowing for productivity one can account for why workers in more developed countries earn higher wages, without losing competitiveness. The headline indicator included in the scorecard is simply the change in

Figure 3: *Ireland's Macroeconomic Imbalances Procedure Scoreboard*
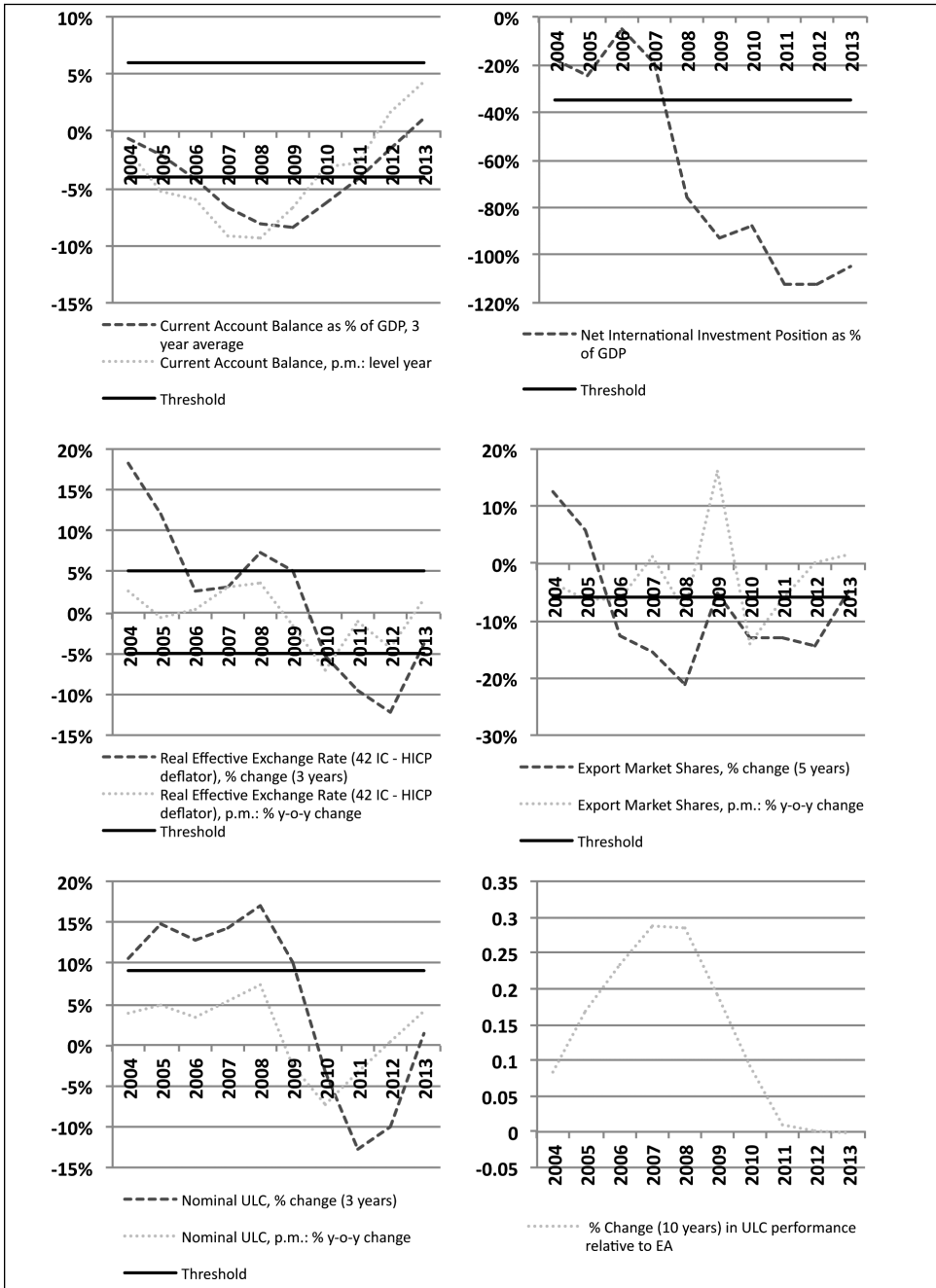
nominal unit labour costs over time. This is of limited usefulness as it takes no account of developments in other countries, but it is a measure that can be influenced by domestic policymakers.

Examining the absolute level of NULCs can also be useful. As can be seen from Figure 4, due to the Balassa–Samuelson effect there is a strong link between high NULCs and economic development. This highlights the limitations of using nominal unit labour costs of the whole economy as an indicator of competitiveness. It is well known that non-traded services (such as dentists or restaurants) tend to be cheaper in Eastern European countries than in Ireland and other Western European countries. This is as in richer countries the traded sector tends to have higher productivity than poorer countries, leading to higher wages in the traded sector of the rich country. Within the rich country, higher wages in the traded sector put upward pressure on wages in the non-traded sector, leading to the rich country having higher wages in the non-traded sector than the poorer country does, even if productivity for both countries in the non-traded sector is equal. Therefore, NULCs for the traded sector could be equal for both countries (with the higher wages in the rich country being offset by higher productivity), but NULCs for the non-traded sector will be higher in the rich country. This will lead to higher *average* NULCs in the rich country despite the rich country remaining competitive. It would be a more accurate measure of competitiveness if nominal unit labour costs could be measured for the traded sector alone (and perhaps the labour output for which the final use is in the internationally traded sector). This is not possible, and sometimes the manufacturing sector is used as a proxy, as most of the output of the manufacturing sector is traded. However, it is nominal unit labour costs for the whole economy that is monitored by the European Commission.

High costs in the non-traded sector (such as high legal fees) can affect the competitiveness of the traded sector through channels other than wages. There are significant hurdles to the comparison of cross-country prices and costs over time. There are various established ways of measuring changes in prices (such as the harmonised index of consumer prices) within countries over time. These typically include a "basket" of goods (or collection of occupation groups for labour costs) which is fixed from one period to the next. However, these do not account for the different compositions of "baskets" across countries. This means cross-country comparisons are limited, and the interpretation of results can be heavily influenced by the choice of base year. For example, Ireland was frequently described as unsustainably super-competitive in the year 2000 (Lane, 2004; Cassidy and O'Brien, 2007 and O'Brien, 2010), so choosing the year 2000 as reference year will show Ireland's competitiveness to have declined (which is accurate) but ignore that this was in part simple rebalancing. Similarly when comparing prices across countries (such as with purchasing

Figure 4: *Nominal Unit Labour Costs, 2013*
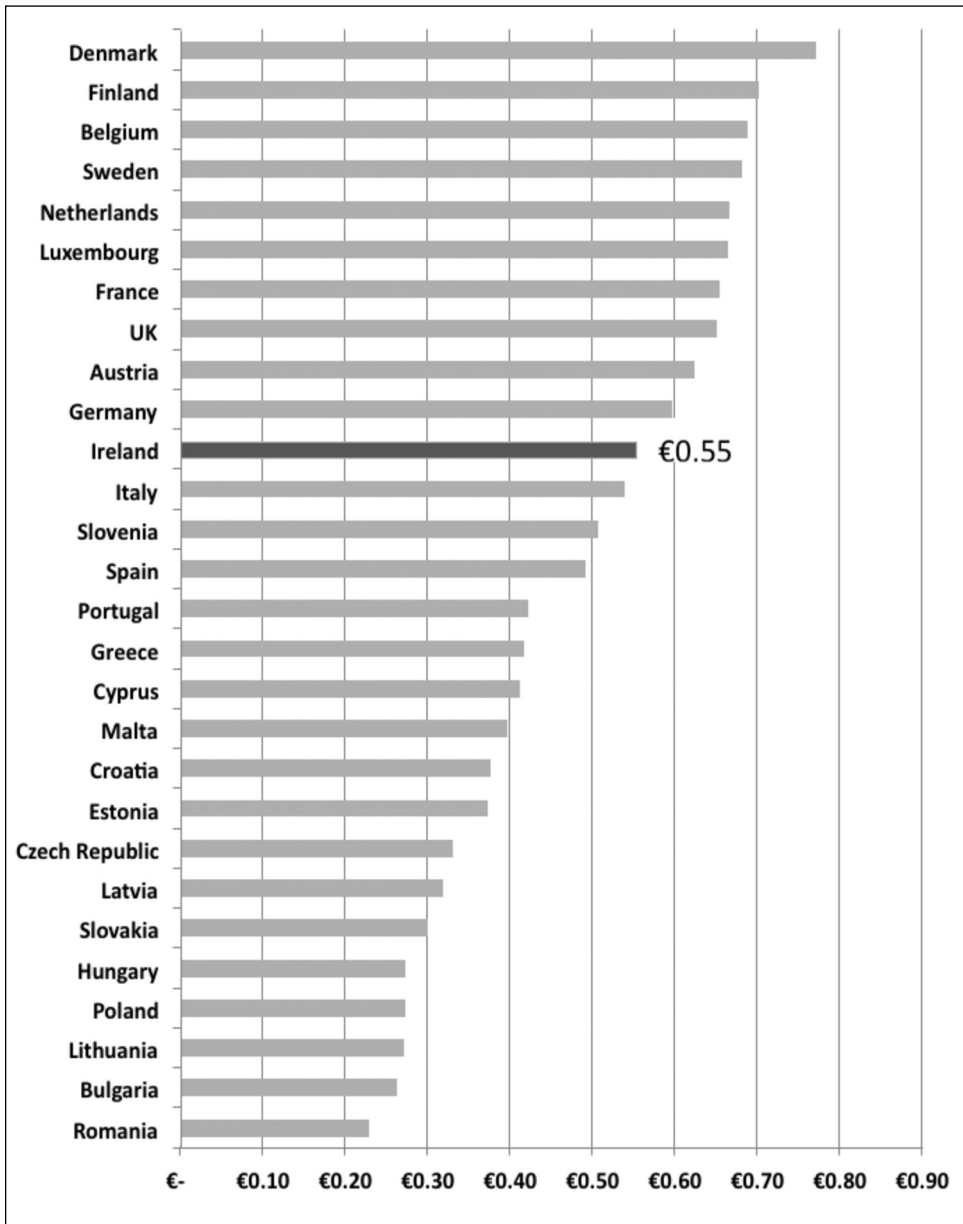
Notes: Price level indices are used as the GDP deflator. In 2013 it would be necessary to pay someone in Ireland €0.55 to produce €1 worth of average EU output.
Source: Eurostat National Accounts, Eurostat price level indices for GDP, and own calculations.

power parities) a representative "basket" of goods is used across countries for a given point in time. However, the basket of goods used across countries may change over time, limiting comparisons across countries. As stated by Eurostat (2011) "The 'perfect', multi-purpose indicator that simultaneously captures both spatial and temporal aspects adequately simply does not exist."

3.2 *Auxiliary Indicators to Macroeconomic Imbalances Procedure Scoreboard*

In response to limitations of the MIP, the European Commission also produces auxiliary indicators to inform analysis. These include inward FDI flows as per cent of GDP, inward FDI stocks as per cent of GDP, and percentage change (5 years) in terms of trade, amongst others. The most relevant auxiliary indicator in terms of wage competitiveness is the change in unit labour costs compared to the Eurozone average (over the past 10 years, Figure 3). Effective unit labour costs compare developments in Ireland's nominal unit labour costs with developments in other countries and also movements in currency exchange rates (for comparisons with the Eurozone exchange rate changes are irrelevant). While developments in Irish nominal unit labour costs can be influenced by policymakers in Ireland, Irish policymakers cannot influence changes in exchange rates or changes in unit labour costs in other countries. Between 2008 and 2012 changes in the value of the Euro made Irish goods 12.6 per cent cheaper in the US, but 1.8 per cent more expensive for the UK (however, this is offset by lower inflation in Ireland). At the same time UK nominal unit labour costs (as measured by the European Union) increased by 9.1 per cent but fell by 12.4 per cent in Ireland. So relative to the UK; Irish effective unit labour costs declined by 20.2 per cent with currency changes playing a relatively minor role. Indigenous firms, which tend to be labour intensive are more exposed to the UK market and were badly affected by the deterioration of Sterling at the start of the crisis (O'Brien and Scally, 2012). Only changes relative to the Euro Area are measured in the MIP. Despite the importance of the non-Eurozone export market for Ireland (the Eurozone accounts for roughly one-third of Ireland's trade in value added), this is logical as though domestic policy can affect changes in prices and wages relative to the Eurozone average, Ireland is too small to affect the exchange rate with Sterling or the US Dollar. Overall, between 2008 and 2012 Irish real effective exchange rates based on NULC fell by 18.7 per cent compared to the Eurozone, and 22.0 per cent compared to 37 other trade partners, reflective of currency movements having played a relatively minor role.

Though wages and unit labour costs are relevant to discussions of international competitiveness, they form just one element. As is generally agreed by economists working in the area, nominal unit labour costs should be evaluated in the context of other indicators.

IV TRENDS IN IRISH WAGE COMPETITIVENESS

In the early part of the 2000s the Irish economy has been described as unsustainably "super-competitive" (O'Brien, 2010) but according to Bergin, Conefrey *et al.* (2013) wages moved above their long-run equilibrium value from 2003. In 2007 Ireland's labour costs were described as "on par" with the European average, though with some relatively high non-labour costs (Cassidy and O'Brien, 2007). As can be seen in Figure 5, Irish labour costs (labour costs include wages, benefits in kind, and also employer social contributions) did rise when compared to other countries, however, during the height of the boom between 2004 and 2008, developments were broadly in line with Finland and

Figure 5: *Labour Cost Index (Wages and Salaries) 2000 to 2014*
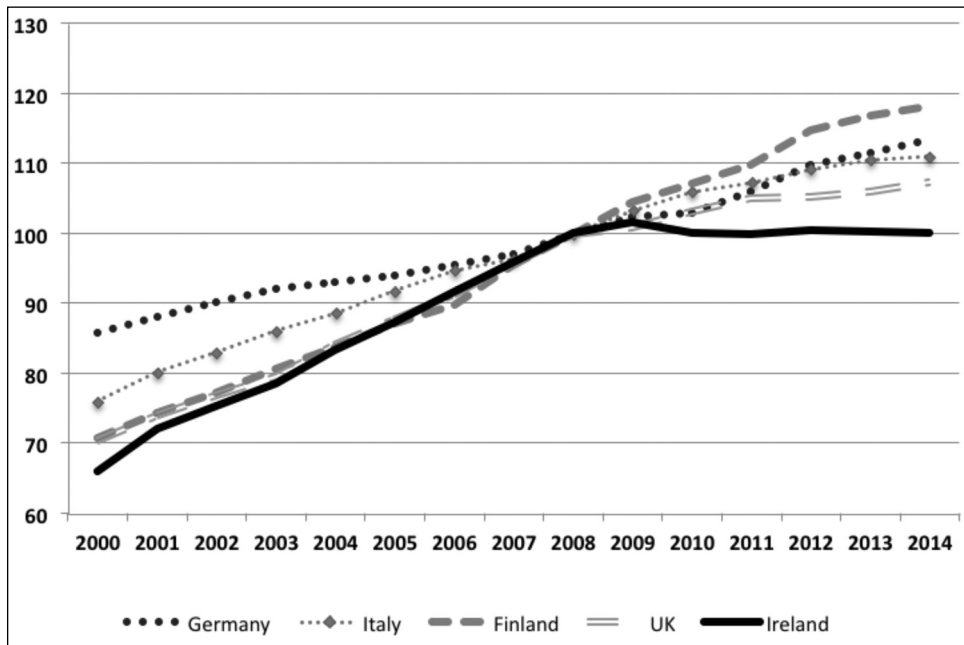
Note: Data refer to industry, construction and services (except activities of households as employers and extra-territorial organisations and bodies). Indices are chain-linked Laspeyres indices, so help to account for changes in the composition of the workforce. Base year 2008. As this is an index rather than absolute levels, the choice of base year can influence the perception gained by the graph. For example, a base year of 2000 gives the impression of labour costs diverging, while a base year of 2013 gives the impression of convergence. The base year of 2008 was chosen by Eurostat.
Source: Eurostat Labour cost index, nominal value – annual data (NACE R2) [lc_lci_r2_a].

the UK. Germany serves as an outlier, and all countries lost competitiveness relative to Germany.

A more dramatic story is told by Figure 6, which focuses on nominal unit labour costs[3] (NULCs). As can be seen changes for Ireland have been dramatic. Part of the difference is that whereas the labour cost index takes account of changes in the labour force, the data for NULCs do not. It has been suggested that changes in the composition of the economy following the end of the construction bubble (such as the loss of less productive construction and retail jobs) gives an exaggerated sense of the improvement in NULCs. Though there are issues with measuring price changes over time, Figure 6 gives an indication to the extent that Irish NULCs were converging from a "super-competitive" position. As can be seen, relative to Germany, Ireland converged and then exceeded Germany's NULCs. Part of this is due to Germany's adoption of

Figure 6: *Nominal Unit Labour Cost Index, Rebased With 2013 Absolute Values*
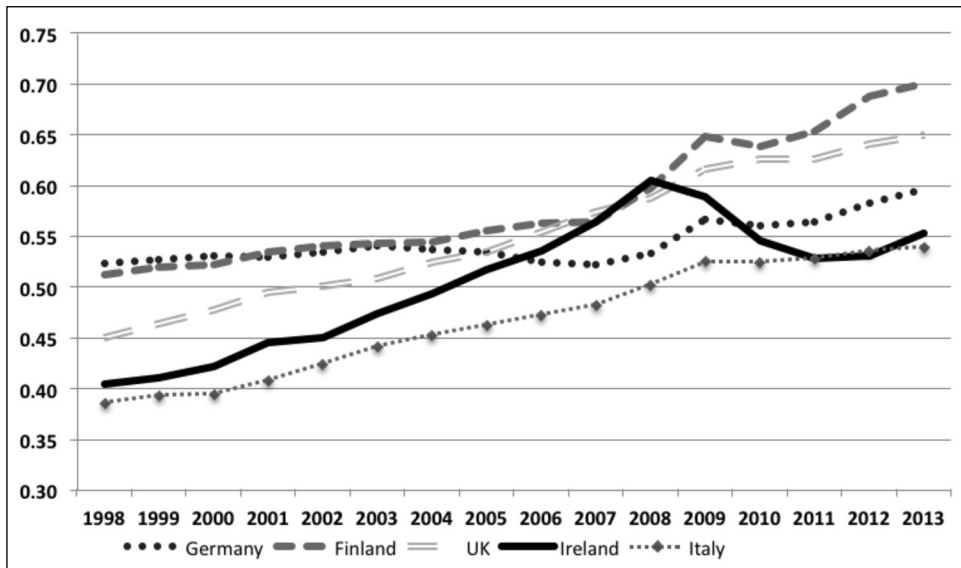
Note: The index is rebased to reflect the absolute values shown in Figure 2.
Source: Eurostat national accounts, Eurostat price level indices for GDP, and own calculations.

[3] Cross country comparisons over time of nominal unit labour costs must be treated with some caution. Two options for price indexes (which are necessary to calculate productivity) are available. Data taken from Purchasing Power Parities allow comparisons across countries at one point in time. GDP deflators allow comparisons of a single country over time. These are distinct concepts. There is no ideal index available that allows reliable cross-country comparisons over time.

policies which encouraged wage moderation. By 2012 Ireland's NULCs relative
to Germany's had gone back to the position held in 2004. Due to a lack of data
the Eurozone is not included, but from 2008 to 2012 NULCs for the Eurozone
(EA-18) increased by 6.4 per cent, indicating a relative improvement for Ireland.

4.1 *Data Problems and Nominal Unit Labour Costs*

   Some sectors of the economy are more labour intensive than others, and so
have higher nominal unit labour costs. Even if nominal unit labour costs in
each sector are constant, the *average* for the whole economy can change if the
more labour intensive sectors of the economy contract. In a recent report Forfás
(2013) stated "This means the composition mix is overstating our real
productivity performance rather than any inherent structural improvements
in labour costs."

   There are a number of data issues which serve to distort Ireland's
productivity and NULC statistics. For ease of decomposition numbers in tables
are presented as log-differences. These issues are highlighted in Figure 7. There
are several, complementary, approaches to measuring economic output and
NULCs. This is as GDP can be measured in terms of the price at which goods
are sold (market prices); or in terms of the value added by producers (basic
prices or Gross Value Added). By adding taxes and subtracting subsidies from
basic prices one arrives at the figure for market price. As output at the sectoral
level is measured in terms of basic prices, it is necessary to decompose the figure
for NULCs in terms of basic prices. Also, there are issues with regard to the
presence of a statistical discrepancy and the fact that the price deflator for the
whole economy is not simply the sum of the price deflator for individual sectors.
Also, given the high level of self-employment in the agricultural sector, data for
that sector should be treated with a degree of caution. Figure 7 shows that all
three approaches result in the same pattern. Though Figure 7 shows the same
pattern as Figure 6, the scale is different. This is as Figure 6 is an index (which
only reflects changes over time). In contrast, Figure 7 shows how much a worker
has to be paid to produce a unit of output that is worth €1 in 2013.

   Additional problems relate to measuring productivity in the manufacturing
sector. Conroy, Honohan *et al.* (1998) noted the unusually high productivity in
the manufacturing sector in the late 1990s. As Ireland has a disproportionately
foreign owned manufacturing sector there is potential for transfer pricing,
which can exaggerate the output of Irish manufacturing. In 2013, 24.6 per cent
of Irish GVA was in foreign MNE dominated sectors (Central Statistics Office,
2014a) with chemicals and pharmaceuticals accounting for 11.2 per cent and
software and communications 9.6 per cent. In 2012, 41.7 per cent of gross value
added in manufacturing was accounted for by "basic pharmaceutical products

Figure 7: *Nominal Unit Labour Costs Using Alternative Measures of Gross Domestic Product*
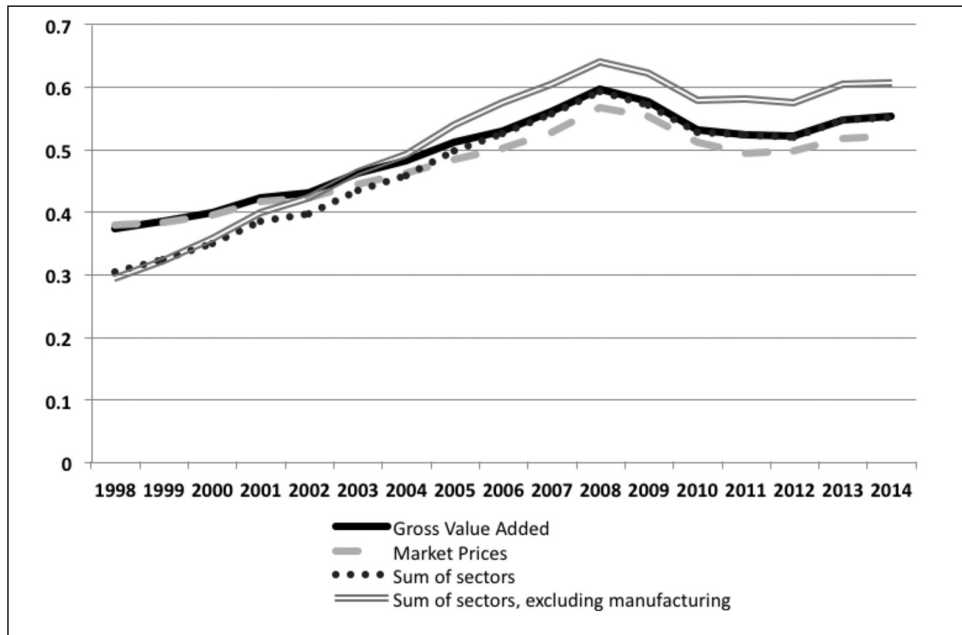
Note: Real values based on 2013 prices.
Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and author's own calculations.

and pharmaceutical preparations", and 8 per cent by "computer, electronic and optical products" (Central Statistics Office, 2014b). Conroy, Honohan *et al.* (1998) also point out the low labour share in manufacturing, something which has not changed since 1998. This can be attributed to high capital intensity in manufacturing and also, potentially, transfer pricing. Cassidy (2004) stated that "it is now generally accepted" that the activities of MNEs inflate Irish productivity. This is as part of the output attributed to Ireland is actually due to intangible inputs, such as research conducted abroad (Cassidy and O'Brien, 2007). Using US rates of value added per hour, Forfás (2012) find that for 2007 labour productivity in the modern manufacturing sector falls from €103 to €57 per hour, and average labour productivity in the manufacturing sector as a whole falls from €70 to €45 an hour. Since 2009 a divergence in trend in Gross Value Added and Gross Output has also been observed (Darvas, 2012), which raises further questions over the manufacturing sectors output data.

Though these data problems have been well recognised, they have been compounded since 2008 by the "patent cliff", re-domiciling of firms as Irish

firms, and "contract manufacturing". In the early part of the 2010s several pharmaceuticals produced in Ireland came off patent. When the CSO calculates real output, drugs which have come off patent are considered to be new drugs, rather than the production of an existing drug at a lower price (FitzGerald, 2013b). Therefore output of cheaper off-patent drugs is measured as lower output. Reduced profitability of MNEs would be recorded as a fall in GDP, but with no impact on GNP. Enright and Dalton (2014) estimate that the patent cliff leads to a 4 per cent fall in GDP over four years. Overall, reported output in MNE dominated sectors fell by 8.5 per cent in 2013 (compared to 2012) due to higher royalty payments by software and communication companies and the patent cliff (Central Statistics Office, 2014a). This has the effect of lowering output and productivity, and increasing reported NULCs in 2013.

GNP has been used previously as an alternative measure as the repatriated profits of MNCs are excluded from this measure. However, in recent years there has been a pattern of foreign firms "re-domiciling" themselves as Irish firms with the undistributed profits of such firms increasing from 1 per cent to 4.5 per cent of GDP between 2009 and 2012 (FitzGerald, 2013a). As such firms only distribute a portion of their profits as dividends, the retained earnings boost Irish GNP even though the benefit of these remain with the largely foreign owners. This should not have an effect on GDP (and so no effect on NULCs) but it does reduce the usefulness of GNP as an indicator of Irish economic performance.

Contract manufacturing has the potential to distort NULC estimates. This is an issue where a firm outsources production of a good to a foreign plant, but maintains ownership of the inputs. Previously (under the data classification ESA95) when such imports were sent abroad they were recorded as an export, despite no change in ownership. Using the new classification (ESA2010) an import is only recorded if there is a change of ownership. The result is some of the management of a production chain is now recorded as manufacturing output. To the extent that transactions are recorded accurately this does not affect overall GDP figures, but may affect how value added is attributed to different sectors. As such data has been retrospectively revised it is unlikely to have a major effect on the trends in NULCs.

There is the potential for inflated productivity in service sectors (such as due to the location of company headquarters in Ireland), though these sectors are relatively small compared to manufacturing and software. Using a similar adjustment as for manufacturing, Forfás (2012) suggests an alternative estimate of €40 per hour (as opposed to €55 per hour found in official statistics) for labour productivity in internationally tradable services. Applying these adjustments to economy wide productivity, Forfás (2012) calculate an alternative figure of €37.40 per hour (compared to €43.50 per hour) up to the

year 2007. However, as the differential between adjusted and unadjusted productivity was stable from the year 2000 at €3 to €4 per hour, trends presented are likely to be reflective of actual developments.

Finally, output figures for real estate activities include imputed rent, and as the market output of the public sector cannot be assessed it is measured as the payments to public sector employees, however, this is in line with international national account conventions.

These issues are highlighted in Figure 7 which also shows trends in NULC when the manufacturing sector is excluded. In 1998 excluding the manufacturing sector has almost no impact on NULCs, but in 2012 excluding manufacturing leads to NULCs approximately 15 per cent higher. This suggests that in 1998 the manufacturing sector had NULCs the same as the average for the economy as a whole, but over time NULCs in manufacturing were below the average for the economy as a whole. This is a common experience across economies, and by 2002 the process was complete (though the gap began to widen in 2010). This suggests that although measurement error in the manufacturing sector may affect the level of NULCs, it is unlikely to have affected the trend between 2002 and 2010. Changes since 2010 can be attributed to a productivity spurt, or an increase in measurement error. However, the patent cliff does work in the opposite direction.

4.2 Compositional Shift and Nominal Unit Labour Costs

Between 2000 and 2012 there were dramatic changes in the composition of the Irish economy, with manufacturing employment showing a secular decline and construction employment increasing from 9.6 per cent of employment in 2000 to 11.3 per cent in 2008, before crashing to 5.6 per cent in 2012. These shifts in composition are important in explaining changes in average NULCs. Changes in the composition of employment and gross value added are outlined in the Appendix.

As can be seen from Figure 7, from 2008 to 2012 NULCs declined somewhere in the range 10.6 per cent to 13.5 per cent depending on the method of measurement. However, Figure 8 and Table 1 show that this is almost entirely due to a change in the sectoral composition of the economy. Total NULCs can be treated as the weighted average of individual sectors. Using the weights of a given year it is possible to control for changes in the composition of the workforce. The results are shown in Table 1. Using 2008 sector weightings, NULCs have actually increased by 0.9 per cent. Alternatively, keeping sectoral NULCs constant, but just altering the weights leads to a fall in NULCs of 11.0 per cent. Clearly, the change in composition is the main cause for the improvement in NULCs. Qualitatively similar results are gained by using 2012 as the reference year. A changing composition did play a role

Figure 8: *Nominal Unit Labour Costs Using 2008 Sectoral Composition*
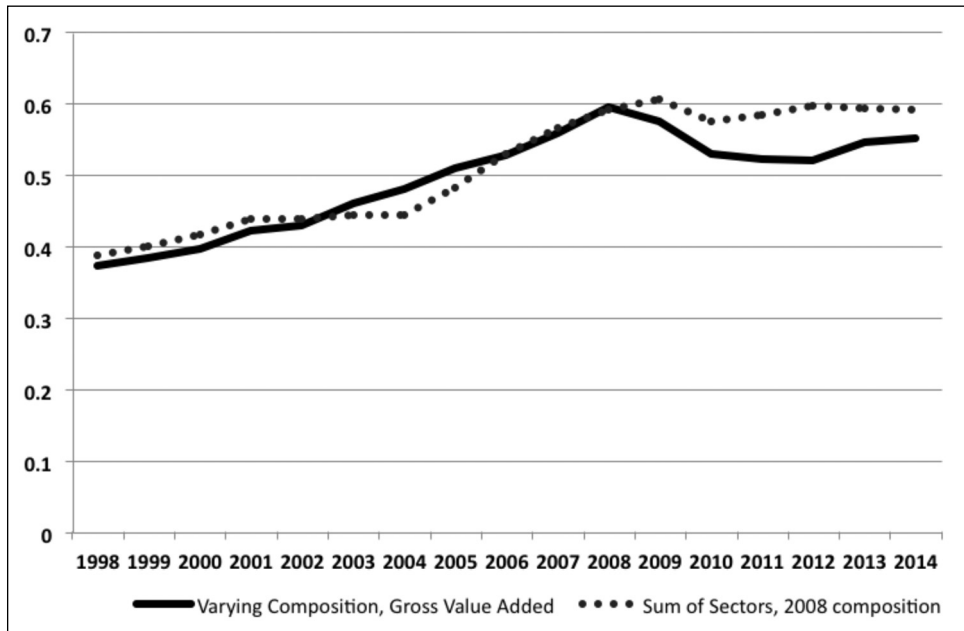
Note: Real values based on 2013 prices.
Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and authors own calculations.

between 2000 and 2004 in increasing NULCs, but the role of composition shifts between 2004 and 2008 was relatively minor.

Table 1: *Percentage Change in Nominal Unit Labour Costs Relative to 2008*

	2000	2004	2008	2012
Total change	−40.5	−21.4	0.0	−13.5
Total change (sum of sectors)	−52.8	−25.6	0.0	−13.1
Change holding sectoral composition constant	−35.0	−29.0	0.0	0.9
Changing composition, fixed nominal unit labour costs	6.4	13.7	0.0	−11.0

Note: Total change in NULCs is based on Gross Value Added. As the overall price index is not the sum of sectoral price indices, using the sum of sectors gives a different figure to using the headline figure. The fixed composition uses 2008 sectoral weights. Percentage change is measured by log-difference.
Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and authors own calculations.

4.3 *What Drove the Increase in Nominal Unit Labour Costs?*

It is clear that, as in other countries, NULCs did increase during the 2000s. Though NULCs are used as a measure of labour market competitiveness, the driving force behind an increase in NULCs may be from a source other than the labour market. Also, an increase in NULCs does not necessarily mean that workers benefited from an increase in living standards. NULCs are calculated by the formula

$$\frac{Nominal\ Compensation}{Number\ of\ Employees} \div \frac{Real\ Output}{Employment} \text{ which is simply}$$

Average compensation per worker ÷ Productivity

Therefore, it is possible to decompose changes in NULCs into changes in wages per worker and changes in productivity. An increase in compensation per worker will increase NULCs, while an improvement in productivity will decrease NULCs. Employment is simply the number of employees plus self-employed.

Table 2 shows the contribution to changes in NULCs of nominal compensation versus productivity for 2000 to 2008 and 2008 to 2012 (a discussion covering the 1980s onward is given in Forfás (2012)). As an increase in productivity reduces NULCs, productivity growth is presented with a minus sign. Given the limitations in measuring sectoral level real GDP, the data is best treated as indicative of trends.

As can be seen, between 2000 and 2008 there was a general increase in both nominal compensation per worker (averaging 4.7 per cent per year) and productivity (averaging 0.5 per cent per year in terms of gross value added, though double that in terms of market prices). Overall nominal pay increases outstripped productivity increases. Despite the overall increase in productivity there were declines in sectors such as utilities and mining; construction; and wholesale and retail; transport accommodation and food. This can be explained by overheating and diminishing returns to scale. These sectors also had below average increases in nominal compensation.

From 2008 to 2012 there has been an increase in productivity in the manufacturing sector of 23.4 per cent (compared to 6.3 per cent in the EU-15), an annual average of 5.4 per cent (compared to 1.5 per cent in the EU-15). This represents an increase over the previous period (from 29.1 per cent from 2000 to 2008, an annual average of 3.2 per cent compared to an EU-15 annual average of 2.7 per cent). Though it is not unprecedented, it is unclear to what extent this represents a genuine productivity increase or a change in composition within the manufacturing sector. Jobs were more likely to be lost

Table 2: *Percentage Change in Nominal Unit Labour Costs Decomposed into Movements in Compensation and Productivity Per Worker*

	2000 to 2008			2008 to 2012		
	Nominal Compensation	Productivity	Total	Nominal Compensation	Productivity	Total
Total	44.6	–4.1	40.5	–2.9	–10.6	–13.5
Agriculture, forestry and fishing	28.7	58.2	86.8	26.6	–2.3	24.2
Utilities, Mining and quarrying	11.6	53.9	65.5	28.6	4.7	33.3
Manufacturing	46.7	–29.1	17.6	–2.4	–23.4	–25.8
Construction	39.9	8.8	48.7	–1.6	–2.2	–3.8
Wholesale and retail trade, transport, accommodation and food service activities	40.4	45.9	86.2	–5.3	20.2	14.9
Information and communication	39.7	–107.6	–67.8	15.9	–24.1	–8.3
Financial and insurance activities	59.2	–21.8	37.4	–4.2	–4.7	–8.9
Real estate activities	27.6	7.8	35.4	–1.9	–12.6	–14.5
Professional, scientific and technical activities; administrative and support service activities	44.7	–17.2	27.6	10.0	–30.5	–20.4
Public administration, defence, education, human health and social work activities	44.7	13.7	58.4	–10.1	8.8	–1.3
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies	42.7	92.9	135.5	–8.7	11.7	3.0

Note: Calculations based on log differences. As an increase in productivity serves to reduce NULCs, therefore an increase in productivity has a minus sign. Total based on factor costs.
Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and authors own calculations.

in smaller, and Irish owned firms (Lawless, 2012), which tend to be less productive. Since 2006 seasonally adjusted falls in manufacturing NULCs are largely due to the "modern sector" (which includes computers and pharmaceuticals) while NULCs in the "traditional" sector (which includes predominantly indiginous firms engaged in activites such as food and beverage processing) began to fall at the end of 2008, and gains for the modern sector have largely been due to reported productivity improvements (Casey, 2012). Also, changes within sectors are relevant; as shown by O'Brien (2011) roughly half the change Irish manufacturing relative unit labour costs was due to compositional shift within manufacturing. The *Census of Industrial Production 2012* showed that the share of industrial turnover in 2008 for the computer, electronic, and optical and electronic equipment sector was 18.7 per cent, and 30.0 per cent for the chemical and pharmaceutical sector (10.4 per cent and 10.9 per cent of persons engaged respectively). By 2012 the share of industrial turnover was 9.3 per cent and 37.4 per cent respectively (7.8 per cent and 12.0 per cent of persons engaged, respectively). Other subsectors showed more modest changes in shares. Though turnover should not be confused with value added, this does indicate a shift in composition towards the relatively more productive (or alternatively, less accurately measured) chemical and pharmaceutical sector. As previously mentioned the recent "patents cliff", however, would tend to show a fall in productivity rather than exaggerate an increase.

Changes in productivity per worker can be due to changes in the number of hours worked. This may be particularly relevant for the construction sector given the choice of 2008 as a reference year. The construction sector had already shown signs of slowdown by 2008, but employers were reluctant to fire construction workers in the initial stages of the slowdown due to past staff shortages. Table 3 shows some complementary information using data based on hours worked rather than numbers employed.

A broadly similar set of figures to those in Table 3 is seen if compensation and productivity are measured on an hourly, rather than a per person basis. It should be noted, however, that hourly data are considered less reliable than data based on per worker basis. Hourly pay in the construction sector increased by 4.7 per cent from 2008 to 2012, but Table 2 shows pay per worker fell 1.6 per cent. This would indicate a decrease in the average length of the working week in the construction sector. Overall hourly nominal compensation decreased by 1.5 per cent after the crisis (though compensation increased when the composition is held constant). This is in line with other research (Bergin, Kelly *et al.*, 2012 and Walsh, 2012). Unsurprisingly, the largest hourly compensation falls were in the public sector, and finance and insurance.

Table 3: *Change in Nominal Unit Labour Costs Decomposed into Movements in Compensation and Productivity Per Hour Worked*

	2000 to 2008			2008 to 2012		
	Nominal Compensa-tion	*Produc-tivity*	*Total*	*Nominal Compensa-tion*	*Produc-tivity*	*Total*
Total	49.0	–8.8	40.1	–1.5	–12.7	–14.2
Agriculture, forestry and fishing	35.4	54.4	89.8	29.5	–3.7	25.8
Utilities, Mining and quarrying	10.2	55.1	65.3	33.2	2.0	35.2
Manufacturing	49.6	–31.7	17.9	–1.7	–24.4	–26.1
Construction	45.9	3.0	48.9	4.7	–9.6	–4.9
Wholesale and retail trade, transport, accommodation and food service activities	44.1	41.3	85.5	–2.1	17.5	15.3
Information and communication	42.0	–110.0	–67.9	13.9	–22.3	–8.4
Financial and insurance activities	62.1	–24.8	37.3	–5.5	–3.1	–8.7
Real estate activities	31.1	6.7	37.8	–2.0	–14.2	–16.2
Professional, scientific and technical activities; administrative and support service activities	50.8	–22.9	27.9	6.2	–29.1	–22.9
Public administration, defence, education, human health and social work activities	47.4	10.8	58.1	–10.4	9.0	–1.4
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies	45.7	89.4	135.0	–5.5	8.7	3.1

Note: Calculations based on log differences. An increase in productivity serves to reduce NULCs. Therefore, an increase in productivity has a minus sign in this table. The total change in compensation does not account for the change in composition of the workforce. *Source:* Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and authors own calculations.

4.4 *Drivers of Changes to NULCs*

As shown, *nominal* compensation is not the only factor to affect NULCs. If workers' compensation increases in real terms at the same rate as productivity (which by definition is measured in real terms); then NULCs will increase at the rate of inflation. Therefore, NULC increases can be due to labour market pressures, or other inflationary pressures such as loose monetary or fiscal policy, or a combination of the three.

In a period of inflation the real value of wages could potentially be eroded, while NULCs increase. In such a case, the driving force behind the increase in NULCs could be due to an increase in non-wage costs, such as property prices, or a general increase in inflation. For this reason a measure that is sometimes examined to look at labour market pressures is "real unit labour costs". Using the above, NULCs can be written as

$$NULC = \frac{Nominal\ Compensation}{Number\ Employees} \div \left(\frac{\dfrac{Nominal\ Output}{Output\ Price\ Deflator}}{Employment} \right)$$

By deflating nominal compensation by a price index we can calculate the real value of workers compensation. The choice of price deflator is not clear cut. Typically wages are deflated by a consumer price index to arrive at the real value of wages. However, the standard way of calculating real unit labour costs is to use the output price deflator. Real unit labour costs (RULC) can be written as

$$RULC = \frac{\dfrac{Nominal\ Compensation}{Output\ Price\ Deflator}}{Number\ Employees} \div \left(\frac{\dfrac{Nominal\ Output}{Output\ Price\ Deflator}}{Employment} \right)$$

which can be further simplified as

$$RULC = \left(\frac{Nominal\ Compensation}{Number\ Employees} \right) \div \left(\frac{Nominal\ Output}{Employment} \right) = Labour\ share$$

Though this is the standard measure of real unit labour costs, this is not satisfactory as what is produced by workers need not necessarily match what is consumed. For example, Ireland produces far more pharmaceuticals than could be safely consumed by the population of Ireland, and imports many consumer items. This issue is even starker when real unit labour costs are examined at a sectoral level. For example, during the 2000s the price of services output rose more than consumer prices. For a given level of productivity nominal compensation can rise more than consumer prices, with real unit

labour costs remaining constant. Using the above formula it is seen that real unit labour costs are identical to the wage share. NULCs can be decomposed as

$$NULC = Labour\ Share \times Output\ Price\ Deflator$$

Table 4: *Change in Nominal Unit Labour Costs Decomposed into Movements In Wage Share and Price Movements*

2000 to 2008			2008 to 2012		
Wage Share	Output Price Movements	Total	Wage Share	Output Price Movements	Total
11.8	28.7	40.5	−12.4	−1.1	−13.5

Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); and authors own calculations.
Note: calculations based on log differences. Changes in wage share are relative percentage increases rather than absolute increases (e.g., a move from 50 to 55 is reported as the relative increase of 10 rather than the absolute difference of 5).

Table 4 shows the contribution of the labour share and changes in output prices to changes in sectoral NULCs. It is important to note that such a decomposition should not be interpreted as a causal relationship, but is indicative. In the period 2000 to 2008, the labour share did increase which can be explained as due to labour market tightness leading to workers gaining higher wages. A higher labour share can also potentially be due to greater relative labour input (such as due to high rates of inward migration), but as labour productivity increased this is unlikely to be the case. The construction sector had a particularly large relative increase in the wage share (up by 28.6 per cent), which can be explained by a particularly tight construction labour market. Following the crisis the wage share declined, reflective of a weak labour market and productivity growth outstripping real wage growth.

A final decomposition is shown in Table 5 showing the contribution of real compensation, consumer prices, and productivity. Although real unit labour costs are deflated by output prices, a far more useful index is the consumer prices index (CPI) which is a standard measure of changes in the cost of living. Table 5 shows the change in nominal compensation per worker deflated by the consumer price index. Overall from 2000 to 2008 real compensation growth exceeded productivity growth by 10.5 per cent (1.3 per cent annually), while the CPI increased 30.0 per cent. CPI trends were broadly in line with trends of the output deflator.

Table 5: *Change in Nominal Unit Labour Costs Decomposed into Movements in Real Compensation, Price Movements and Productivity*

| 2000 to 2008 | | | 2008 to 2012 | | |
Real Compensation	CPI	Productivity	Real Compensation	CPI	Productivity
14.6	30.0	−4.1	−1.5	−1.4	−10.6

Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e); CSO Consumer Price Index; and authors own calculations.
Note: An increase in productivity serves to reduce nominal unit labour costs. Therefore an increase in productivity has a minus sign in this table.

The direction of causality between wages and output or consumer prices is complex and a lack of data means it is not possible to test the direction of causality during the period 2000 to 2008. Despite Ireland being a global price taker, domestic pressures do influence Ireland's inflation rate (Bermingham, Coates *et al.*, 2012), and after adjusting for inputs bought on a world market, labour costs are often the most important element of labour sensitive costs (O'Brien and Scally, 2012). Output price movements can be due to cost push factors (such as higher wages or other input costs such as rents leading to higher prices). Demand pull factors can lead to firms in non-traded sector increasing mark-ups (boosting profitability), which can then in turn lead to higher bargained wages. In the early 2000s, a buoyant domestic economy allowed some firms increase mark-ups (Cassidy and O'Brien, 2007). Firms' perceptions of the intensity of competition is one of the most important determinants of price-setting by Irish firms (Keeney, Lawless *et al.*, 2010). This is supported by data which shows the relatively open information and communication sector showed output price falls and manufacturing showed a relatively small increase while above average increases were found in non-traded sectors such as wholesale and retail and utilities mining and quarrying. Counterintuitively, construction showed below average output price movements.

Several factors can explain Ireland's increase in NULCs during the 2000s. (1) There was a process of catch-up in prices and wages, with price levels exceeding Euro Area averages (though as labour cost indices adjusted for cross country differences in composition are unavailable it is unclear if this is the case for Ireland. (2) Between 2000 and 2004 there was a shift in composition towards sectors focused on the domestic economy (such as retail, construction, and public services). (3) A generally lax fiscal policy contributed to a general inflationary environment. Though it can be argued that policies such as increases in unemployment benefit (which increases the reservation wage) or

public sector pay increases followed rather than led labour market develop-
ments; fiscal policy did not act as a restraining force. Fiscal policy is important
in keeping inflation low (Cassidy and O'Brien, 2007). (4) A strong demand for
labour led to continued low unemployment, leading to wage pressures and
inward migration. (5) Increases in the cost of living, and housing costs in
particular led to follow up wage increases as workers tried to maintain (and
increase) the real value of wages. (6) Monetary policy was inappropriately lax
given Ireland's economic conditions. (7) An industrial policy which attracted
industries such as ICT with strong productivity growth world-wide served to
mitigate NULC increases.

    The fact that the wage share and real compensation did increase show that
labour market pressures did play a role in Ireland's decline in wage
competitiveness as measured by NULCs. However, it is essential that the role
of competition policy and fiscal policy in ensuring a low inflation environment
be considered when looking at trends in wage competitiveness. Unfortunately,
the main lever for tackling inflation, monetary policy, is not available to tackle
inflation. Though macro-prudential banking policies may have the effect
preventing price bubbles, they are not suited to controlling inflation. In the
absence of centralised wage bargaining, this leaves Irish fiscal policy as a tool
to prevent the Irish economy from overheating.

V CONCLUSION

    Ireland's competitiveness at the dawn of the century had been described as
unsustainably super-competitive. It is true that Ireland's competitiveness has
declined, but it would be inaccurate to describe Ireland as having become
uncompetitive. During the peak of the construction boom exports continued to
grow and contribute significantly to growth. Had the domestic economy
remained largely stagnant, GDP would have continued to grow at a respectable
2.7 per cent between 2003 and 2007. Also, the current account returned to
balance far faster than if due to a fundamental restructuring of the export base
of the economy. It would be more accurate to describe Ireland as having
transitioned from a state of unsustainable super-competitiveness to a state of
sustainable competitiveness; with an unsustainable construction boom also
occurring in the meantime.

    There is a strong consensus amongst economists that no single measure of
competitiveness should be relied upon. However, media debates regarding
competitiveness frequently degenerate into simplistic comparisons of NULCs
in one country versus another. As NULCs are the only labour market element
of the European Commission's Macroeconomic Imbalances Procedure, they are

the focus of this paper. As with most other countries, NULCs increased in the period up to 2008 and then along with the Baltic countries, Spain and Portugal, rapidly decreased. During this period labour costs did increase somewhat faster than most of the Eurozone, but at approximately the same rate as in the UK.

The increase in inward investment is likely to have been spurred by falls in other costs (such as the cost of property) rather than relative changes in labour costs. In Ireland labour costs have not declined since 2008 to any significant extent. However, as they have increased in the Euro Area as a whole, in 2014 they were 11.4 per cent lower relative to the rest of the Euro Area than in 2008. In terms of exchange rates, by 2012 Euro-Sterling exchange rates were back where they were in 2008, leading to no change in competitiveness with the UK due to exchange rate movements, but exchange rate movements did make the Eurozone as a whole (and therefore Ireland) more competitive relative to the dollar. Indigenous firms, which tend to be labour intensive, are more exposed to the UK market and were badly affected by the deterioration of Sterling at the start of the crisis (O'Brien and Scally, 2012). The fall in NULCs since 2008 (of 10.6 to 13.5 per cent depending on method of measurement) has received much attention. However, this decrease is due to a shift away from the relatively labour intensive construction sector. Holding the composition of the economy constant, NULCs actually increased by 0.9 per cent from 2008 to 2012. There has been an increase in productivity within the manufacturing sector, but it is unclear to what extent this is due to a shift towards the more highly productive pharmaceutical sector, and to what extent it is a genuine increase in productivity.

The evidence from this paper shows a number of problems with using NULCs as a measure of competitiveness. First, it is a measure of developments within a country. However, as competitiveness is a relative concept, changes in NULCs must be seen relative to developments in other countries. Though there is no perfect measure across countries and across time, an (admittedly imperfect) index could be created which aims to capture price developments in the traded sector across countries. Second, it is an aggregate measure for the whole economy. Large changes can occur in the aggregate figure with no change at the sectoral level, if there is a shift in the composition of the economy. This could be overcome by the use of "chain-linking" as is done with the labour cost index. Third, as it is a measure of the aggregate economy no focus is given to the traded sector. Though developments in the non-traded sector can possibly ultimately affect international competitiveness, these are best dealt with as internal imbalances. Finally, though measures of NULCs are useful, they give no indication as to what is driving the change. It is sometimes believed by policymakers that changes in NULCs are solely driven by the labour market. However, factors other than the labour market contributed to the increase

in NULCs. Even where real compensation (as deflated by consumer prices) simply keeps pace with real productivity growth, NULCs will still increase at the same rate as inflation. Such a scenario is not just a labour market phenomenon.

REFERENCES

ALLARD, C. and L. EVERAERT, 2010. "Lifting Euro Area Growth: Priorities for Structural Reforms and Governance", *IMF Staff Position Note,* (SPN/10/19).

BERGIN, A., T. CONEFREY, D. DUFFY, J. FITZGERALD, I. KEARNEY, K. TIMONEY and N. ŽNUDERL, 2013. *Medium-Term Review 2013-2020*, No. 12, Dublin: The Economic and Social Research Institute.

BERGIN, A., E. KELLY, and S. McGUINNESS, 2012. *Explaining Changes in Earnings and Labour Costs During the Recession*, Dublin: The Economic and Social Research Institute.

BERMINGHAM, C., D. COATES, J. LARKIN, D. O'BRIEN, and G. O'REILLY, 2012. "Explaining Irish Inflation During the Financial Crisis", *Central Bank of Ireland Technical Paper,* 2012, (9).

CASEY, E., 2012. "Unit Labour Costs in Irish Manufacturing", *Quarterly Economic Commentary,* pp. 39-44, Dublin: The Economic and Social Research Institute.

CASSIDY, M., 2004. "Productivity in Ireland: Trends And Issues", *Central Bank of Ireland Quarterly Bulletin*, Spring, pp. 83-106.

CASSIDY, M. and D. O'BRIEN, 2007. "Ireland's Competitiveness Performance", *Central Bank of Ireland, Quarterly Bulletin*, 2.

CONROY, C., P. HONOHAN, and B. MAÎTRE, 1998. "Invisible Entrepot Activity in Irish Manufacturing", *Irish Banking Review,* pp. 22-38.

CENTRAL STATISTICS OFFICE, IRELAND, 2014a. "Gross Value Added for Foreign owned Multinational Enterprises and Other Sectors Annual Results 2013", *CSO Statistical Release*, Cork: Central Statistics Office.

CENTRAL STATISTICS OFFICE, IRELAND, 2014b. *National Income and Expenditure 2013*, Dublin: Stationery Office.

DARVAS, Z., 2012. "Compositional Effects on Productivity, Labour Cost and Export Adjustments", Bruegel Policy Contribution.

DU CAJU, P., T. KOSMA, M. LAWLESS, J. MESSINA and T. ROOM, 2014. "Why Firms Avoid Cutting Wages: Survey Evidence from European Firms", *World Bank Policy Research Working Paper,* (6976).

ENRIGHT, S. and M. V. DALTON, 2014. "The Impact of the Patent Cliff on Pharma-Chem Output in Ireland", *Journal of the Statistical and Social Inquiry Society of Ireland*, Vol. 43, pp. 91-113.

EUROPEAN COMMISSION, 2010. "Ireland: Memorandum of Understanding on Specific Economic Policy Conditionality." Retrieved 31 August 2015, from http://ec.europa.eu/economy_finance/articles/eu_economic_situation/pdf/2010-12-07-mou_en.pdf

EUROPEAN COMMISSION, 2011. "Economic Adjustment Programme for Ireland." *European Economy. Occasional Papers*, No. 76.

EUROPEAN COMMISSION, 2013. "Results of In-depth Reviews under Regulation (EU) No 1176/2011 on the Prevention and Correction of Macroeconomic Imbalances "*Communication from the Commission to the European Parliament and the Council and to the Eurogroup*, No. 199.

EUROPEAN UNION, 2011. "Regulation (EU) No 1174/2011 of the European Parliament and of the Council of 16 November 2011 on Enforcement Measures to Correct Excessive Macroeconomic Imbalances in the Euro Area." *Official Journal of the European Union,* 306/8.

EUROSTAT, 2011. "Purchasing Power Parities: Reference Metadata in Euro SDMX Metadata Structure (ESMS)." Retrieved 25 October 2013, from, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/prc_ppp_esms.htm#unit_measure

FITZGERALD, J., 2013a. "The Effect of Re-domiciled Plcs on Irish Output Measures and the Balance of Payments"m *Quarterly Economic Commentary Research Notes* 2013(1/2), Dublin: The Economic and Social Research Institute.

FITZGERALD, J., 2013b. "The Effect on Major National Accounting Aggregates of the Ending of Pharmaceutical Patents", *Quarterly Economic Commentary Research Notes,* (2013/2/1), Dublin: The Economic and Social Research Institute.

FORFÁS, 2012. *Ireland's Productivity Performance, 1980-2011*, Dublin: Forfás.

FORFÁS, 2013. *Forfás Annual Report 2012*, Dublin: Forfás.

KEENEY, M., M. LAWLESS and A. MURPHY, 2010. "How Do Firms Set Prices? Survey Evidence from Ireland", *Central Bank and Financial Services Authority of Ireland Research Technical Paper*, Vol. 10, No. 7.

LANE, P. R., 2004. "Assessing Ireland's Price and Wage Competitiveness", *National Competitiveness Council Discussion Paper*.

LAWLESS, M., 2012. "Job Creation and Destruction in Recession", *Economic Letter Series,* 2012, No. 1.

NEARY, J. P., 2006. "Measuring Competitiveness", *The Economic and Social Review*, Vol. 37, No. 2, p. 197.

O'BRIEN, D., 2010. "Measuring Ireland's Price and Labour Cost Competitiveness", *Central Bank Quarterly Bulletin*, No 1, pp. 99-113.

O'BRIEN, D., 2011. "Compositional Effects in Recent Trends in Irish Unit Labour Costs", *Central Bank of Ireland Quarterly Bulletin*, No. 1, pp. 22-24.

O'BRIEN, D. and J. SCALLY, 2012. "Cost Competitiveness and Export Performance of the Irish Economy", *Central Bank of Ireland*, 86.

WALSH, K., 2012. "Wage Bill Change in Ireland During Recession – How Have Employers Reacted to the Downturn", *Statistical and Social Inquiry Society of Ireland*, Vol. 41, pp. 39-70.

APPENDIX

Employment and Value Added by Sector, Selected Years

	Employment			GVA (2010 prices)		
	2000	2008	2012	2000	2008	2012
Total	1,695.8	2,129.25	1,838.5	122,418.4	160,149.1	153,697.4
Agriculture, forestry and fishing	127.11	115.8	85.9	4,838.3	2,464	1,871.9
Utilities, Mining and quarrying	22.43	36.08	25.4	5,308.6	4,979.7	3,343.9
Manufacturing	294.78	254.55	210.4	28,633.5	33,062.2	34,543.8
Construction	163.24	240.93	102.3	3617.1	4,887.8	2,120.5
Wholesale and retail trade, transport, accomodation and food service activities	429.78	537.62	484.2	37,924.8	29,988.8	22,063.1
Information and communication	62.24	72.02	80.7	3,714.1	12,599.5	17,980.1
Financial and insurance activities	69.11	96.81	91.6	9,719.0	16,932.6	16,798.4
Real estate activities	6.46	11.02	10.4	5,786.8	9,132.4	9,731.5
Professional, scientific and technical activities; administrative and support service activities	128.66	192.07	165.6	7,527.5	13,345.3	1,5603
Public administration, defence, education, human health and social work activities	317.07	470.73	482.3	21,870.4	283,03.7	26,561.6
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organisations and bodies	74.9	101.6	99.8	6,880.4	3,654.6	3,187.9

Source: Eurostat National Accounts (nama_10_gdp, nama_10_a10, nama_10_a10_e)