Fiscal Policy for Recovery: The Case of Ireland

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Abstract

In this paper we first consider how the potential output of the Irish economy has been affected by the current recession and financial crisis. The capacity of the economy will clearly be seriously reduced as a result of a greatly enhanced risk premium attaching to borrowing and the consequential impact of the higher cost of capital on future investment. However, because of the flexibility of the labour market, we estimate that the effect on potential output through labour supply will be positive in the long run. This contrasts with the EU Commission methodology, which assumes a high rate of unemployment and consequently produces a lower estimate of the potential growth rate of the economy than we calculate in this paper.

Based on this analysis, and using the ESRI HERMES-Ireland macroeconomic model, we explore two scenarios for the development of the economy in the period to 2015. If the economy were to behave in the flexible manner that it did in the past, there could be a period of quite rapid growth between 2012 and 2015. When taken together with the government's plans for fiscal consolidation, this would largely eliminate the structural deficit. However, even with such an outcome the permanent loss of output as a result of the crisis could be at least 15% of GDP. In the case of a less benign scenario, the permanent loss of output would be significantly greater and the structural deficit would still be around 4% of GDP, albeit around half the estimate of the EU Commission.

The sensitivity of the risk premium to expectations concerning government borrowing meant that early action to tackle the crisis was vital. It also means that further fiscal tightening is necessary to return the economy to a stable growth path.

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Section 1: Introduction

In late 2008, when the full impact of the financial crisis hit Ireland, it took some time to assess what was happening and what were the full implications of the disaster. Economic forecasts were changing daily and the huge uncertainty about what was actually developing made policy-making exceptionally difficult. Because of a growing dependence of the public finances on the property sector in recent years, the severe economic shock had a catastrophic impact on the public finances. Having averaged a small surplus on the public finances over most of the period 2000-7, government borrowing shot up to just under 12% of GDP in 2009[2].

In Ireland the huge problems facing the economy only became clear in the immediate aftermath of the banking crisis of September 2008. The Budget for 2009 was brought forward two months to October 2008 in order to tackle the deterioration in revenues. However it was prepared before the full effects of the crisis on tax revenues had become fully apparent. In subsequent months it rapidly became clear that the deficit for 2009, even after cuts in the October Budget, would be very large. While a postponement of urgent fiscal action might have seemed possible before the events of September 2008, it was soon clear that major cutbacks were needed to prevent borrowing spiralling out of control. In early 2009 there was general agreement in Ireland that this was Ireland's own problem and that it was up to the Irish authorities to solve it. At no stage was any suggestion made that the French and German "cavalry" might ride to the rescue. This absence of perceived choices facilitated the painful process of reaching agreement on very tough fiscal action. With two further supplementary budgets for 2009 implemented in January and April of that year, the full-year discretionary fiscal tightening in 2009 was equivalent to a cumulative 4.5% of GDP.

In May 2009 we published a paper, *Recovery Scenarios for Ireland,* which considered the possible paths to recovery for the Irish economy. This analysis suggested that the Irish economy would suffer major permanent damage as a consequence of the recession. Nevertheless, the economy could return to a period of quite rapid growth once the world economy itself entered the recovery phase. At the time of publishing, the recovery in the world economy was only a gleam in the economists' eye. Since then there have been increasing signs of a return, if not to business as usual in the world economy, at least to significant growth.

This paper considers the role of fiscal policy in ensuring that recovery takes place in Ireland and that the economy is eventually returned to its potential level of output. In Section 2 of this paper we discuss some key features of the Irish economy, which will determine how it adjusts to the changed domestic and external circumstances. In the light of this analysis, in Section 3 we discuss how the potential output of the economy will be affected by the crisis. We also discuss how our model differs from that used by others, such as the EU Commission. Understanding the effects of the crisis on potential output is crucial in estimating the structural deficit that remains to be addressed by the Irish authorities over the period to 2014.

In Section 4 we set out our assumptions on the public finances and on the macro-economic implications of the action needed to resolve the banking crisis. We then spell out two scenarios for the economy for the period to 2015. The first of these scenarios is based on the analysis in Section 3 on the potential output of the economy. The second scenario considers an alternative growth path, which assumes that the growth potential of the economy has been permanently damaged by the crisis. Using the results from these simulations we present estimates of the size of

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[2] It was over 14% of GDP when the once off payments in relation to losses in the banking system are taken into account.

the structural deficit under alternative growth paths for the medium-term. Finally, in Section 5, conclusions are drawn.

Section 2: How the Economy Works

The Irish economy has been in a deep recession since the beginning of 2008. Within a two year period GDP has fallen by over 10 per cent. In money terms, GNP has shrunk by 14% between the end of 2007 and 2009. The unemployment rate in May 2010 was 13 ½ per cent, up from 4 ½ per cent at the end of 2007. The Irish economy has been faced with a collapse in the construction sector which has led to a surge in unemployment, a collapse in exchequer tax revenues and serious losses on the balance sheets of the major banks. The authorities are faced with tackling a major fiscal crisis (the General Government deficit is at 12 per cent of GDP) and a banking crisis (current estimates suggest that the net cost of government support to the banking system will be upwards of €25 billion see Box A).

The Government has agreed a stability programme with the European Commission, which involves a series of budgets out to 2014. To date, the authorities have introduced a series of austerity budgets since mid-2008 which cumulatively amount to €13 billion consisting of increased taxation (€5.5 billion), cuts in capital spending (€1.5 billion) and cuts in current expenditure (€6 billion). Alongside the fiscal crisis, the government has also introduced a series of measures to try and address difficulties in the banking system.

Box A: Measures adopted by the Government in Support of the Banking System

On 30 March 2010 the government announced the latest in a series of measures aimed at resolving the financial crisis and addressing the needs of individual banks. The latest announcement follows a number of important measures implemented by the government since September 2008 in response to the financial crisis. These measures began with the introduction of the deposit guarantee scheme and the two year blanket guarantee of all deposits, covered bonds, senior debt and dated subordinated debt for six Irish institutions. In early 2009, the government announced a programme of recapitalisation and nationalisation. Anglo Irish Bank was nationalised and €4 billion in State funding was provided for recapitalisation. In February 2009, the government announced that it would provide €3.5 billion in core tier 1 capital for both Allied Irish Banks and Bank of Ireland (Table 1A). This recapitalisation programme would be funded from the National Pensions Reserve Fund.

In the April Supplementary 2009 Budget, the government announced its plans for the establishment of the National Asset Management Agency which would buy loans of around €80 billion from the covered banks at an appropriate discount and pay for them by the issue of Irish government bonds. The legislation giving effect to the set up of NAMA was passed in early November 2009. In January this year, the NPRF acquired 180 million ordinary shares in Bank of Ireland, equivalent to the amount of the dividend owed to the State in respect of the preference shares it received under the recapitalisation agreement. This transaction left the State with a 16 per cent shareholding in the Bank of Ireland.

The process of transferring the first tranche of loans from the designated financial institutions to NAMA began in March 2010. These loans represent 20 per cent of the anticipated total assets to be transferred to NAMA. It was announced that NAMA would pay €8.5 billion for the first tranche of loans which have an estimated book value of €16 billion. New capital requirements have been imposed by the Regulator on the banks which stipulate that they must meet an 8 per cent core tier 1 capital requirement by the end of 2010.

Based on an assessment of capital requirements for each bank, the Regulator announced the additional capital requirements for each of the institutions participating in NAMA. Allied Irish Banks and Bank of Ireland are estimated to need additional capital of €7.4 billion and €2.4 billion respectively. If additional State funding is needed to enable these institutions to meet the capital requirement, it will be provided by the NPRF.

Table 1A: Overview of Existing and Estimated Government Support to Banks

	Total of Existing and Estimated State Investment in the Banks €billion	Source of Exchequer Funding
Anglo Irish Bank*	22.3	€4 billion already provided by Exchequer. €8.3 billion to be paid over 10-15 years via issue of promissory note.
Irish Nationwide	2.6	Exchequer via Issue of Special Investment Shares and promissory note.
Allied Irish Bank	3.5	NPRF
Bank of Ireland	3.5	NPRF
EBS	0.8	Exchequer via Issue of Special Investment Shares and promissory note.
Total of existing and Estimated State recapitalisation	32.7	
Payment Planned for Loans under NAMA	40 - 50	Issue of government guaranteed NAMA bonds.
* €12.3 billion in State funding has already been committed with a further €10 billion likely to be required.		

Regarding Anglo Irish Bank, the government announced that it would be providing €8.3 billion immediately to boost the bank's capital position. These funds will be provided in the form of a promissory note payable over 10-15 years. In addition, the government announced that the bank may need a further €10 billion to cover future losses. This would bring the total amount of funding provided by the State for the recapitalisation of Anglo Irish Bank to 22.3 billion, as shown in Table 1A

The Regulator determined that EBS and Irish Nationwide will need €0.8 billion and €2.6 billion to meet capital requirements. Since the NPRF cannot invest in non-listed institutions, this capital will be provided directly by the State.

Source: ESRI Quarterly Economic Commentary, Spring 2010.

Over the course of the last decade the Irish economy had steadily lost competitiveness. This loss of competitiveness was fuelled by a growing bubble in the domestic housing market. With housing reaching a peak of over 15% of GNP by 2006, the building and construction sector gradually crowded out the tradable sector of the economy. The huge increase in output in the building and construction sector required a major reallocation of resources within the economy. This was achieved by raising the rate of inflation in domestic costs, especially that of labour. This reduced the demand for labour and other factors of production in the tradable sector.

This loss of competitiveness saw a rapid deterioration in the balance of payments situation from 2003 onwards. From a surplus in 2003 the balance of payments was in deficit by almost 6 per

cent of GNP by 2006. Imports were sucked in as domestic demand grew rapidly and exporters found that they could no longer compete. While the public finances continued in surplus the growing balance of payments deficit was the clearest indicator that the economy was on an unsustainable trajectory.

To address this competitiveness problem the economy needs to undergo a real depreciation of the currency. Within a monetary union this can only be achieved through a fall in wage rates and other domestic costs relative to those in Ireland's competitors. With a very low rate of inflation in Ireland's Euro zone competitors this requires a fall in nominal wages or a very protracted adjustment period. Bergin *et al*, 2009, suggested that there was some uncertainty whether such a fall in nominal wage rates would actually occur as it has not been experienced in the recent past in Ireland or other EU countries. However, over the past year a 15 per cent fall in wage rates in the public sector has been implemented and there is growing evidence of falling nominal wage rates across a proportion of the private sector.

In this paper we use the HERMES-Ireland macroeconomic model of the Irish economy to examine two scenarios for the medium term. A key feature of this model is its treatment of the labour market. In particular, the very high level of migration means that the Irish labour market has a highly elastic supply of labour. Figure 1 shows net migration as a percentage of the labour force since 1950. For most of the period up to the 1970s there was sustained emigration out of Ireland. The 1970s saw some net immigration, including some return of emigrants. The very poor economic performance in the 1980s saw a return to very substantial net emigration towards the end of the decade. With the rapid growth in the economy since 1994 there was again a reversal in the flow of labour. Initially, there was a major return of emigrants, primarily those who had left in the 1980s. This resulted in substantial net immigration over the second-half of the 1990s. However, for the first time there was also significant immigration of non-Irish citizens. With the enlargement of the EU in 2004, creating a much larger pool of labour, there was a further step up in net immigration into Ireland, with the bulk of the net inflow being foreign citizens rather than returning emigrants.

**Figure 1: Net Immigration, % of Labour Force, 1951-2009**

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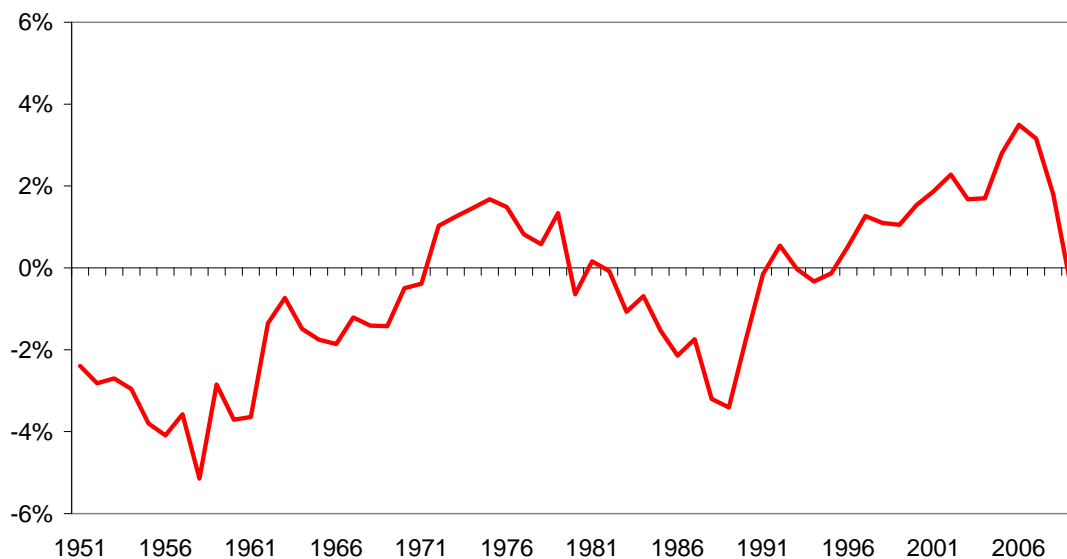
Since the 1960s, the behaviour of net migration in Ireland has been explained using a model where the flow of net emigration is driven by differences in the unemployment rates in the origin (Ireland) and destination (UK) labour markets (a specification based on Harris and Todaro, 1970)[3]. This openness of the labour market to migration means that the supply of labour is affected by wage rates and labour market conditions in Ireland and in the UK (as a proxy for the alternative "world" labour market). In addition, the openness of the Irish economy through trade means that many firms producing goods and services in Ireland are competing on a world market. Under these circumstances their choice of how much of their world demand to meet from production in Ireland is affected by the cost of production in Ireland relative to that in alternative similar locations.

The effect of the openness of the Irish labour market is that both the demand for labour and the supply of labour is affected, not just by circumstances and prices in the Irish economy, but also by prices in alternative locations, in particular in the UK. While local circumstances will continue to have an important impact, the result of this interdependence is that wage rates in Ireland are affected by wage rates abroad.[4] Because of the significant role of migration flows in total labour supply (Figure 1), Ireland has historically had an extremely elastic supply of labour.

This is not to suggest that the Irish labour market has not had periods of high unemployment. In the past the actual unemployment rate has, for substantial periods, been significantly higher than the "full employment" rate assumed here. While some of this difference has been due to the labour market and the wider economy being some distance from their long-term equilibrium, an additional important factor has been a mismatch between the skills of those unemployed and the skills needed in the economy, combined with the operation of the welfare system.

Figure 2: The Unskilled Unemployment Rate

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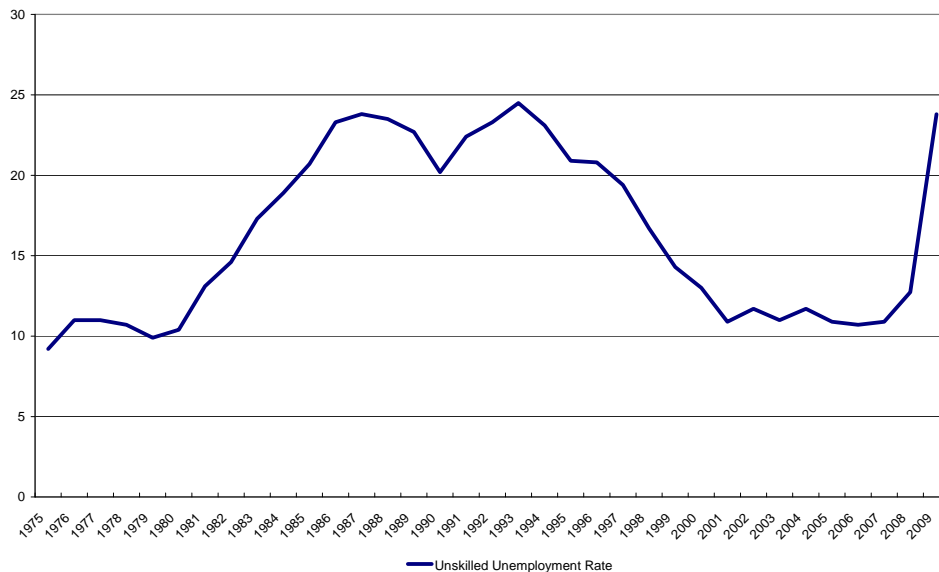
[3] This model explaining migration behaviour has been re-estimated on quite a number of occasions (Walsh, 1968, Keenan, 1981, Honohan, 1984 and 1992 and Bradley *et al.*, 1993). With each successive re-estimation it proved robust, continuing to explain migration behaviour over this long period.

[4] Curtis and Fitz Gerald (1996) and Fitz Gerald (1999) modelled the labour market using a wage equation which took account of the fact that UK labour costs affected both the demand and the supply of labour in Ireland.

Figure 2 shows the rate of "unskilled" unemployment. As can be seen from this graph unskilled unemployment was high and persistent from the mid-1980s until the late 1990s. The recent recession has led to another sharp rise in unskilled unemployment, primarily among young males due to the collapse in employment in the construction sector. There is a significant risk that this unemployment will persist for a number of years. Nevertheless, the rapid change in the educational profile of the Irish labour force since the mid-1980s means that while in 1985 55 per cent of the total labour force were unskilled, by 2009 that has fallen to 22 per cent.

Section 3: Potential Output

3.1 Labour Supply and Potential Output

In considering the appropriate medicine to prescribe for Ireland's current economic ills a key issue is what is the potential growth rate of the economy: how fast could it grow in a recovery? Economies can underperform and grow more slowly than their potential but they cannot exceed that potential on a sustained basis. The job of policy in the coming years is to ensure that the potential growth of the Irish economy is realised (and even enhanced).

There are many channels through which the negative consequences of the economic crisis is impacting on the output potential of the Irish (and other) economies. The combination of the bursting of the property market bubble and the world financial crisis has had a substantial impact on the endowment of labour and capital in Ireland. This has served to permanently reduce the potential output of the economy. This reduction in potential output has been driven by a number of factors:

- A significant part of the capital stock has been rendered obsolete through the closure of many businesses. While new investment will take place in the recovery phase, it will take much longer to put in place this new investment than it has taken to write off the investment due to the closure of existing businesses.

- Related to the shake-out of traditional businesses there are concerns that the dramatic reduction in employment could have a permanent effect on labour supply and, hence, on potential output. This could occur through hysteresis effects as those with limited skills lose their jobs and find themselves ill-equipped to find new jobs in the recovery phase. There are also likely to be effects through emigration on labour supply, which could impact on the future growth potential of the economy.

- The dramatic increase in government indebtedness will result in a major increase in the burden of taxes, especially of taxes on labour. The deadweight effects of the increased tax burden will adversely affect the economy's productive capacity.

- The rise in the risk premium on borrowing has not only raised the cost of borrowing for the government but it has also affected the cost of capital for all borrowers. In turn, this means that the optimal level of the capital stock has been reduced and, with it, the potential output of the economy.

- Finally, these factors are also affecting the wider world economy and, as a result, there has been a once-off reduction in the potential output of the world economy which must affect the demand for Irish output.

The potential output of the economy is very important in assessing the significance of the current level of government borrowing. Today the economy is operating well below its level of potential output – with the labour force and capital stock available it could produce much more. Depending on what that potential level of output is and when it is realised, increased economic activity will

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see some reduction in the government's borrowing, even in the absence of fiscal action. However, it is also clear that without policy intervention the level of borrowing would remain very high, even after a full economic recovery. The purpose of the analysis of the potential output of the economy is to estimate the current structural or "cyclically adjusted" deficit and, hence, the policy interventions that will be required over the next few years to eliminate that deficit by 2015.

There are a number of different ways of measuring the potential output of the economy. All of these methods aim to show what the maximum normal level of output would be, given the endowment of resources in the economy. Some of them take account of the specific structure and factor endowments of an economy while others are little more than a rule of thumb.

One popular measure of potential output is derived using a production function for an economy. Such a function describes how a given mix of inputs (physical and human capital, materials and technology) can be combined to produce national output. It is always possible for an economy to produce within the production frontier described by the production function. However, where that happens it means that the economy is producing less output than would be feasible with the available mix of inputs. It is not physically possible for an economy to produce more than the limit described by the production function for any sustained period of time.

This method is used by the EU Commission. However, they impose a specific type of production function – a Cobb Douglas – which assumes that the share of labour (and capital) in value added is constant. They also assume the same fixed factor shares for all EU-15 countries. While the use of the same methodology for all countries enhances transparency and simplicity in implementation, it does lead to difficulties for individual countries, especially in the context of a very sudden large widening in the budget deficit. This is particularly true in the case of Ireland where the share of labour has fallen over time and the EU average labour share is very far from the actual share. However, as discussed later, the most significant problem with their approach is their estimate of potential labour supply using a Non-Accelerating Inflation Rate of Unemployment (NAIRU). For the Irish economy, with a very elastic supply of labour and where wage rates adjust to clear the market in the long term, this approach has significant drawbacks.

Instead of using a production function to characterise the production technology of the economy we characterise it using a cost function. Theory shows that, under a range of maintained assumptions, for any production function there exists a cost function that represents the same technology (is dual to it). A cost function describes how the factors of production can be combined to produce a given level of output at minimum cost. Firms are then assumed to minimise their cost of producing output world-wide through choosing the appropriate level of output in Ireland. This measure of potential output is implemented in this paper, using the HERMES macroeconomic model of the Irish economy. Eight of the eleven productive sectors of the economy represented in the model are characterised by an individual cost function. For a given set of factor prices these cost functions describe the least cost combination of inputs to produce a given output. The optimal or potential output is that which maximises the profitability of the firms producing in each sector. In the short run the technology assumes that capital is fixed and firms optimise their mix of inputs to produce the desired level of output. In the long run firms adjust the capital stock to minimise the long-run cost of producing their optimal level of output.

In this Section we consider how the current economic crisis has impacted on the labour market and potential output using model of the labour market in HERMES. While the full HERMES model of the economy captures additional effects, the area where there is most difference of opinion concerns the operation of the labour market We concentrate first on the channels which affect the economy through the supply of labour. There will, of course, also be a significant impact on the long-run or equilibrium demand for labour as a result of the crisis. For example the rise in the risk premium on borrowing will impact on both the public and the private sector. In the

case of the public sector the necessary cut-backs in expenditure and increases in taxation will see an inward shift in the demand curve for labour. In the market sector of the economy the higher cost of capital will result in lower investment, lower output, lower productivity and lower demand for labour in the long-term. Labour demand will also be affected by any permanent loss of world output (Barrell et al., 2009), affecting the demand for exports from Ireland. In preparing our medium-term scenarios for the economy we have attempted to take these factors into account in Section 4.

The EU measure of the structural deficit, linked as it is to the underlying parameters of Stability and Growth Pact agreements, is highly influential in prescribing the scale of the fiscal correction faced by the Irish authorities in the wake of the recession. However we have argued (Bergin et al. 2009) that the European Commission methodology is not suitable for Ireland, because it does not allow for the very high elasticity of labour supply in Ireland. Because of this, the EU Commission estimates tend to over-estimate the size of the structural deficit. Their latest estimates (Spring 2010) suggest that in 2010 the structural deficit in Ireland is 9.3 per cent while the cyclical deficit is only 2.4 per cent. By contrast our estimates, discussed in Section 4, would suggest that roughly half of the current deficit is structural.

3.2 The HERMES-Ireland Model of the Labour Market

Output and Factor Input Determination in the Tradable sector

In the *HERMES-Ireland* macro-economic model of the Irish economy the demand for labour is determined within a factor demand system. For tradable sectors of the economy the approach is to model first the optimal or long run level of output in Ireland conditional on world output and costs in Ireland (including wage rates) relative to costs abroad and technical progress. In a second stage the optimal or equilibrium level of labour (and other domestic factors of production) is a function of the equilibrium level of output in Ireland and the prices of the domestic factors of production including the price of labour, and technical progress. In the non-tradable sectors, output is a function of domestic demand (which is not directly affected by wage rates) with the demand for labour being determined in the same way as in the tradable sector – as a function of domestic factor prices and technical progress.

This approach was originally set out in Bradley and FitzGerald, 1988. The model assumes that the production of goods relevant to Ireland on a worldwide scale can be characterised by a cost function (1) where the cost of world output of manufactured goods, C_w, is a function of the unit cost of production in Ireland c_I relative to the rest of the world, c_w, and technical progress, t. The unit cost of production includes the cost of all factor inputs – labour, capital and materials.

$$C_w = f(c_I, c_R, t) \qquad (1)$$

Then the share of world output that is located in Ireland is derived by differentiating the cost function with respect to the unit cost of production in Ireland (Shepard's lemma). The result (2) is also a function of the unit cost of production in Ireland c_I relative to the rest of the world, c_w, and technical progress, t. The output of each sector in Ireland is defined as Q_I and the relevant output in the rest of the world is Q_W.

$$\frac{Q_I}{Q_W} = f(\frac{c_I}{c_R}, t) \qquad (2)$$

The cost of production in Ireland is defined in Equation (3) as a quasi-fixed factor cost function where the arguments are the cost of labour, p_l, the price of inputs of goods and services, p_m and

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the capital stock K and technical progress, t. From this the share of each of the factors of production – labour and materials – in domestic output is determined by differentiating the cost function with respect to the relevant factor price

$$c_I = \frac{C_I}{Q_I} = f(p_l, p_m, K, t) \qquad (3)$$

Equation (4) shows the resulting equation determining demand for labour, L. As capital is treated as quasi-fixed, this cost function determines a temporary equilibrium.

$$\frac{L}{Q_I} = f(\frac{p_m}{p_l}, \frac{p_e}{p_l}, K, t) \qquad (4)$$

Equation (5) defines the optimal capital output ratio (optimal is denoted by "*"). This latter equation determines the optimal long run capital stock. When this optimal capital stock (from equation 5) is substituted back into the cost function (3) the true long run equilibrium demand for the factors of production, including labour is arrived at.

$$\frac{K^*}{Q^*} = f(\frac{p_l}{p_k}, \frac{p_m}{p_k}, \frac{p_e}{p_k}, t) \qquad (5)$$

The equations for long run or equilibrium output for the tradable sector are shown in Appendix 1. In the tradable sector changes in wage rates impact on the demand for labour firstly through changing the optimal output of the Irish tradable sector. In addition to this output or scale effect there is a substitution effect between factors of production as a result of changing relative factor prices in Ireland (see Appendix 2).

Table A1 in Appendix 1 reports the *HERMES* estimates of the elasticity of output from the tradable sectors of the Irish economy with respect to changes in world output. Within the HERMES model, both the equation for high tech manufacturing output and exports of tradable services include a post-1990 FDI dummy on world output. Effectively this raises the elasticity of output with respect to world demand in the post 1990 period,[5]

In the traded sectors of the HERMES-Ireland model substitution effects are relatively low in traditional industry, and relatively high in the high-tech, food and building industries. (As most material inputs are imported, substitution of materials for labour involves a reduction in domestic value added.) Scale effects are high in the traded sector because firms compete on world markets. Firms are price-takers and face highly elastic demand for their products. This effectively means there is no possibility for firms to pass on higher costs to the consumer in the form of higher prices. Instead an increase in marginal costs will cause a deterioration in competitiveness, and a consequent scaling back in production (Bradley, Fitz Gerald and Kearney, 1993).

In the non-traded sectors scale effects are much lower. Since firms are trading only on the domestic market, the demand for services' output is inelastic. There is scope for firms to pass on cost increases to the consumer in the form of higher output prices (Bradley, Fitz Gerald and Kearney, 1991). This price effect serves to offset the negative impact of higher wages on employment (see Appendix 2).

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[5] In the subsequent analysis these dummies are set to zero, resulting in a lower elasticity with respect to world output than that observed in recent years.

When a full simulation of all these effects is run, the result suggests a long-run own elasticity of labour demand of -0.4 per cent.

Labour Supply

In the HERMES-Ireland model the supply of labour is determined through a series of equations determining the population and the participation decision. The population is a function of the natural increase and net immigration. The participation decision is a function of real wages.

There is a natural increase in the labour force as a result of previous high births in the 1980s offset by a relatively smaller cohort of the labour force in the older age groups as a result of emigration in the 1960s. Thus new entrants greatly outweigh retirements. This element of the increase in labour supply is not directly affected by real wage rates.

The second important element affecting labour supply is migration. As discussed in the previous section Ireland is unusual in the importance of this channel for change. Because of this propensity of Irish people to migrate, Irish labour supply is very sensitive to changing economic conditions. The traditional model of migration is given below.

$$N = f(\frac{w_I}{w_U}, \frac{U_I}{U_U})$$ (6)

where:

N   =   net migration in thousands
w_i =   real after tax wage rates in Ireland
w_u =   real after tax wage rates in the UK in euros
U_i =   Unemployment rate for Ireland
U_u =   Unemployment rate for the UK

In this approach, taken in many previous studies, net migration is a function of Irish real after tax wage rates relative to those in the UK and of the difference in the unemployment rate for Ireland relative to that in the UK – equation 6. The decision to migrate will, *ceteris paribus,* be affected by relative employment prospects in the two economies and the relative return to employment in the two economies.

While this specification provided a good approximation to the underlying true labour market behaviour for many decades, it is no longer appropriate as it implies an infinite elasticity of labour supply. Instead in the most recent version of HERMES-Ireland, the long-term stock of net migrants, rather than the flow, is modelled as a function of the factors affecting the relative attractiveness of the Irish and UK labour markets.

$$N^* = a_1 + a_2 \frac{1 - U_i}{1 - U_u} + a_3 \frac{w_i}{w_u}$$ (7)

where:
N^* =   The stock of migrants (thousands)
w_i =   real after tax wage rates in Ireland
w_u =   real after tax wage rates in the UK in euros
U_i =   Unemployment rate for Ireland
U_u =   Unemployment rate for the UK

The estimated equation models the stock of migrants in Ireland (including returned emigrants) as a function of differences in the unemployment rate between Ireland and the UK and differences in the real after tax wage rates in the two labour markets.

When taken together these equations suggest an elasticity of labour supply of +0.6. This estimate is lower than previous estimates reflecting changes in the nature of the migration process.

Calibrating the Wage Equation

The basic model of wage determination used in HERMES-Ireland reflects the openness of the Irish economy. It is consistent with the modelling of the supply and demand for labour described above. Because long-run or "equilibrium" labour demand and labour supply is determined in separate equations in the model together these equations determine the long-run market clearing wage rate. In this section we calibrate a simple wage equation which captures some of the key characteristics of these separate equations. This is done by imposing the elasticites of labour demand and supply, described above, in a reduced-form wage equation and then estimating the remaining parameters.

The derivation of the wage rate equation is straightforward. We assume a log-linear form for the aggregate labour supply and aggregate labour demand equations for the economy. These can be solved for the "equilibrium" wage rate w*[6].

Approximating the system of equations for each sector in the HERMES-Ireland model, the demand for labour (8) is a function of world output, q_w, and the cost of labour in Ireland relative to the rest of the world, where w_i is the wage rate in Ireland, and w_u are the prices of wages in the UK.

$$l_i^d - q_w = d_0 + d_1(w_i - ew_u) \tag{8}$$

In the case of labour supply the set of equations describing the HERMES model of labour supply can be written in nested form as equation 9:

$$l_i^s = b_1 + b_2(w_i - z_i + t_i) + b_3(w_u - z_u + t_u) + b_4(U_i - U_u) + b_5 R_i \tag{9}$$

where:

l_i^s = labour supply in Ireland, (log of employment)

w_i = is the log of the wage rate in Ireland

z_i = is the log of the consumer price deflator for Ireland

t_i = is the tax rate in Ireland

U_i = is the unemployment rate in Ireland

R_i = is the log of the benefit level in Ireland

In this equation for labour supply the arguments include the real after tax wage rate in Ireland and in the alternative labour market (here assumed to be the UK indexed by "u"), the difference in the unemployment rates in the two labour markets (which affects migration) and the benefit rate in Ireland.

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[6] A formal derivation is given in Fitz Gerald (1999).

To derive the wage rate equation, which determines the level of labour supply and demand that will clear the market, equation (8) is set equal to equation (9) and the resulting equation is solved for the equilibrium wage rate w^*. To simplify, we drop the external variables from the equation as well as the domestic benefit level and the unemployment gap. As discussed above, the estimated elasticities derived by simulating *HERMES* are imposed prior to estimation by setting $b_2 = 0.6$ and $d_1 = -0.4$.

This results in an equation for estimation of the form:

$$w_i = q_w + (d_0 - b_1) + 0.6(z_i - t_i) \tag{10}$$

This equation is estimated for the period 1988 to 2005. The intercepts for the two equations are derived by assuming that desired labour supply and labour demand equalled actual employment in each year. This results in the following parameterised equations for labour demand (11) and labour supply (12) for 2010.[7]

$$l_i^d = 0.046 + q_o + 0.4w_i \tag{11}$$

$$l_i^s = 5.48 + 0.6(w_i - z_i + t_i) \tag{12}$$

3.3. Comparative Statics

In this section, we use comparative statics analysis to examine the labour market in 2010 and its equilibrium. In section 4, we solve for the full labour market equilibrium using the *HERMES* model. The labour demand equation determines the long run or equilibrium rate of employment. When taken together with assumptions on labour supply this, in turn, determines the long-run equilibrium rate of unemployment. In the years 1995-2005, this was in the range 4% to 5% of the labour force. In this section we present some graphical representations of the labour demand and labour supply curves estimated above. We use these to illustrate the very significant divergence between the HERMES-Ireland model of the labour market in the long-run relative to the European Commission characterisation of the Irish labour market. Furthermore, given that throughout 2009 and into 2010 house prices have been falling rapidly in Ireland, we argue that far from lowering potential labour supply, the long-run effects of the bursting of the housing bubble could be to increase labour supply as the costs of living in Ireland adjust downwards.

On the basis of the current forecasts for 2010, it is possible to estimate, *ceteris paribus*[8], the long-run or equilibrium wage rate and related level of employment, This partial equilibrium is defined as being the set of values for the model which would see the labour market clearing, returning the economy to full employment. Figure 4 shows the shapes of the labour supply and demand curves using the model calibrated for 2010 (equations 11 and 12). The intersection of the demand and supply curves determines the market clearing ("full employment") wage rate and level of employment. The dotted line, labelled "effective labour supply", reflects "frictionless" level of labour supply, where friction in the labour market leads to a long-run unemployment rate of 4.8%.

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[7] The numbers used to parameterise the equation for 2010 are drawn from the ESRI Spring 2010 *Quarterly Economic Commentary*.

[8] Conditional on the forecast value of key variables, such as the consumption deflator and OECD output.

Figure 4: Labour Market Equilibrium

Labour Market, 2010
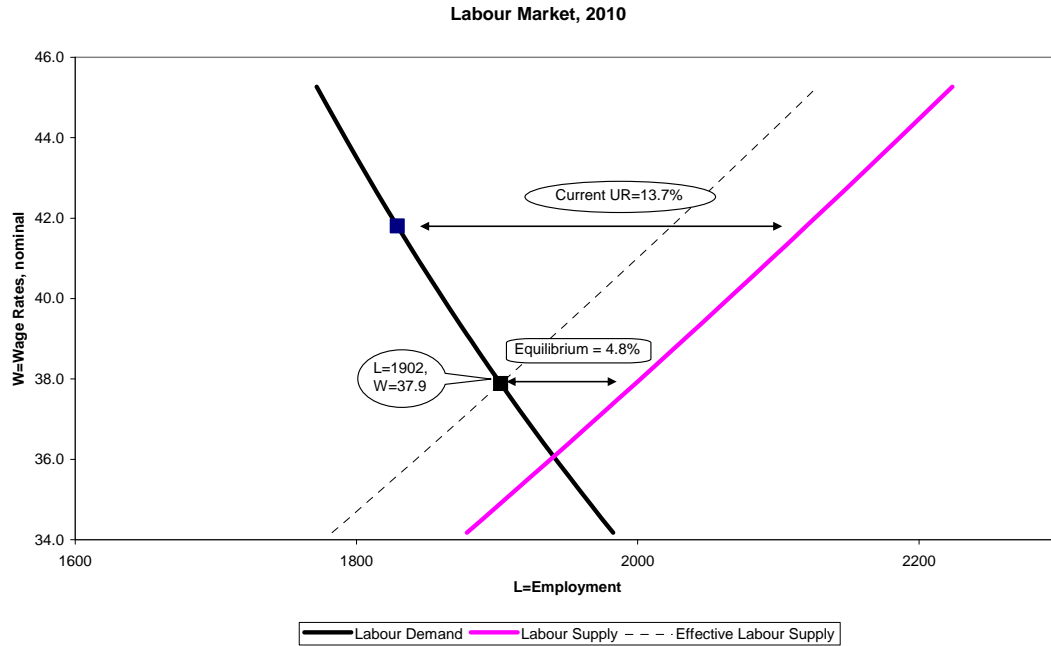

Table 3.1: Estimates of Full-Employment Equilibrium

	2010 forecast	Long-run Equilibrium
Wage Rate	41.8	37.9
% change relative to 2010 forecast		-9.4
Employment – Demand	1829	1902
% change relative to 2010 forecast		4.0
Labour Supply	2120	1998
% change relative to 2010 forecast		-5.7
Unemployment Rate	13.7	4.8

Table 3.1 shows the current forecast for key variables for 2010 and uses these numbers to calibrate the labour demand and supply curves for 2010. Given these numbers, the Table also shows the estimate of the wage rate and the related employment and unemployment rates that would clear the labour market returning the economy to close to full employment. At current wage rates the unemployment rate in 2010 is forecast to be 13.7%, with numbers unemployed (ILO) of around 300,000. With 4.8% defined as the full employment rate of unemployment, the market clearing wage rate would be around 9.4% below the forecast level for 2010. The increase in employment as a result of a move to the market clearing or equilibrium wage rate would be around 4.0% and the fall in labour supply would be around 5.7%. This would suggest that a significant part of the adjustment would be accomplished through a reduction in labour supply, in particular through significant emigration. This reflects the relative slopes of the labour supply and demand curves.

The EU Commission determine the potential output of an economy using a Cobb-Douglas production function with similar parameter values for each country. In measuring the potential labour input in this production function, they use a trend measure of the Non-Accelerating

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Inflation Rate of Unemployment (NAIRU).[9] The NAIRU for Ireland (and other countries) is derived using a moving average process, which accords significant weight to the most recent observations. As a result, they estimate that the NAIRU for Ireland for 2010 is 10.9% of the labour force with the actual unemployment rate estimated to be 13.8%.

Because of the openness of the Irish economy and the fact that, over time, the labour market tends to clear this is not a suitable method for determining the potential output of the Irish economy. A wide range of research into the Irish labour market, for example, Walsh, 1967, Honohan, 1992, and FitzGerald *et al.*, 2008 have all found the supply of labour in Ireland to be very elastic through migration. While changes in recent years have reduced the elasticity of labour supply (Duffy, FitzGerald and Kearney, 2006, Bergin and Kearney 2007), nonetheless it is still very elastic by the standards of other EU countries.

Table 3.2: Estimates of Labour Market Equilibrium under different Scenarios

	Standard equilibrium	EU - NAIRU
Wage Rate	37.9	42.6
% change relative to equilibrium		12.6
Employment – Demand	1902	1814
% change relative to equilibrium		-4.6
Labour Force	1998	2036
% change relative to equilibrium		1.9
Unemployment Rate	4.8	10.9

In Table 3.2 we show the impact of the EU Commission assumptions on the "equilibrium" rate of unemployment (NAIRU) for Ireland. We have implemented this by an inward shift in the labour supply curve driven by higher consumer prices[10]. Since the labour market fails to clear, leaving structural unemployment, this will lead to higher wages, and hence higher prices, and will shift inwards the supply curve of labour. The result is a "partial equilibrium" rate of unemployment of 10.9% of the labour force. This is illustrated in Figure 5 as an inward shift in the labour supply curve. With an assumed fixed demand curve for labour the new equilibrium wage rate would settle over 12% above the equilibrium rate implied by the standard model (Table 3.1) and some 2% above the current wage rate in 2010.

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[9] The determination of labour input in the EC methodology involves several steps. They begin with estimates of the population of working age, then move on to estimating the trend participation rate and the trend NAIRU. The final potential labour input is expressed in hours using an estimate of the trend of average hours worked.

[10] Consumer prices in Ireland fell very rapidly in 2009, partly driven by the fall in nominal wages in both the private and public sector. To implement the inward shift in the labour supply curve we have assumed that consumer prices remain static in 2009 and 2010.

Figure 5: Alternative Labour Market Equilibrium
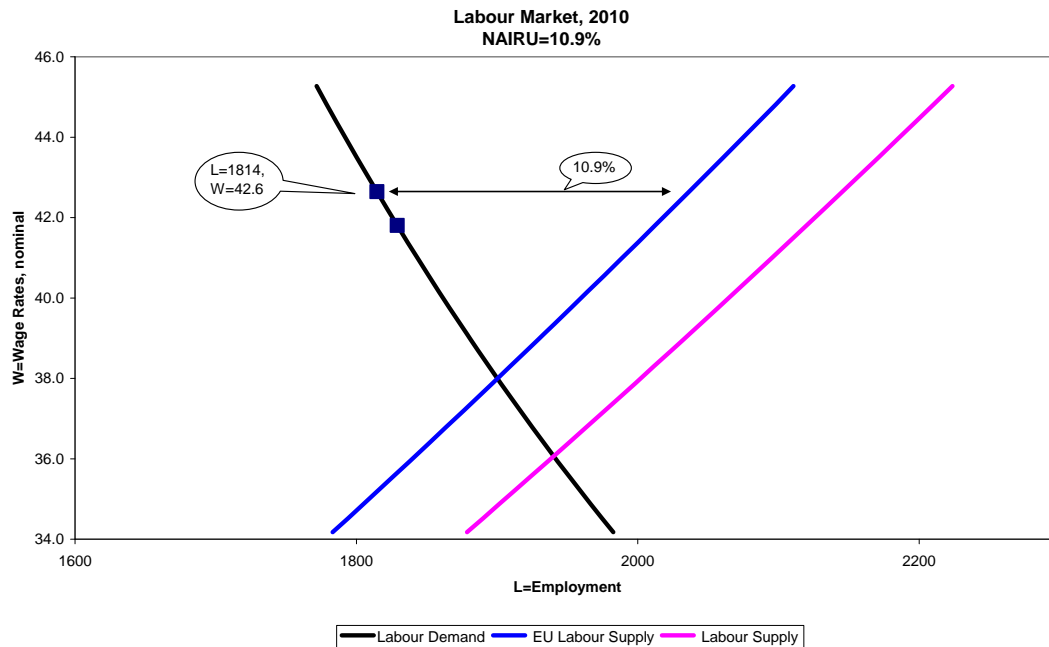
The effect of consumer prices on the labour supply curve does suggest an alternative scenario. The recession in Ireland has led to a dramatic fall in the cost of living and working in Ireland as a result of the collapse in housing costs.[11] The housing bubble of the 2003-2008 period saw the price of housing in Ireland rise far above its long-term equilibrium level (Barrett and Kearney, 2009). While the new "equilibrium" price remains unclear, recent forecasts suggest the cumulative peak-to-trough change could be close to 50%(Barrett and Kearney, 2010). The nature of a housing bubble is that the bulk of those involved believe it is not a bubble but rather a real phenomenon. Thus in making their labour supply decisions, up to 2008 these decisions assumed a very high cost of accommodation in Ireland. However, with the collapse in property prices labour supply decisions by potential new labour market entrants will assume a much lower cost of living, and hence expect a lower wage rate.

Table 3.3: Model Estimates of Labour Market Equilibrium under different Scenarios

	Standard equilibrium	EU - NAIRU
Wage Rate	37.9	35.9
% change relative to equilibrium		-5.1
Employment – Demand	1902	1943
% change relative to equilibrium		2.1
Labour Force	1998	2040
% change relative to equilibrium		2.1
Unemployment Rate	4.8	4.8

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[11] Duffy, FitzGerald and Kearney, 2006, show how the supply of labour is affected by the cost of housing in Ireland.

In this scenario we assume that housing prices fall 50% relative to their peak and we consider how this would affect labour supply. Using the weighting of rent (and imputed rent) in the national accounts figure for total personal consumers' expenditure we adjust the consumer price deflator in the standard labour market model described above. In turn, this shifts the intercept of the labour supply curve so that the curve shifts outwards (See Figure 6). The effect of this outward shift in the labour supply curve is to reduce the equilibrium wage and to increase the level of employment at which the labour market will clear (Table 3.3).

Figure 6 shows that this outwards shift in the labour supply curve would result in a fall in the equilibrium wage of 5% relative to the standard equilibrium. The result of this would be a 2% increase in employment relative to that equilibrium while still maintaining full employment at 4.8% of the labour force.

Figure 6: Labour Market Equilibrium, Lower House Prices
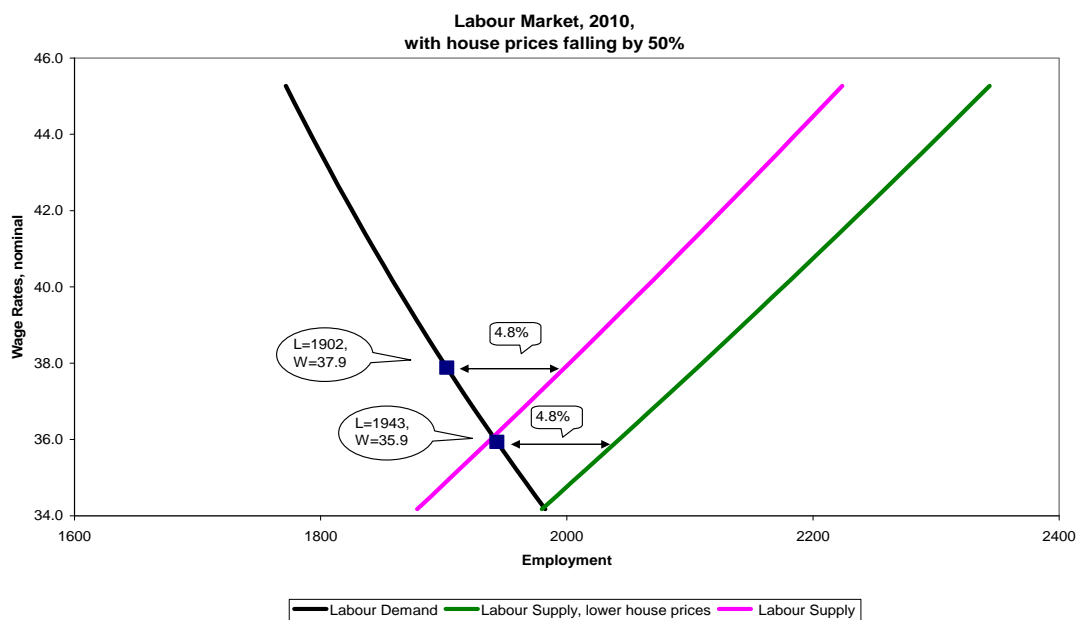
In practise, in using data for 2010 some of this effect is already probably built into the basic equilibrium as a result of the fall in prices that has already occurred. However, what is important is that the model suggests that the economy can benefit from a lower cost base arising from the collapse in the cost of housing. While all the short-term effects of housing bust are negative, lower living costs, for whatever reason, do improve competitiveness and, hence potential output.

What this analysis illustrates is that differing views about how labour supply is determined in Ireland can make a significant difference to estimates of the potential output of the economy. This is presented as a comparative static analysis, focussing on the impact of the recession on labour supply. However, as well as affecting labour supply, the permanent costs of the recession have adversely affected the demand for labour. There is less disagreement on this issue. Section 4 below models the effects using the HERMES-Ireland model.

Section 4: Medium-Term Simulations - Scenarios for Recovery

4.1 Introduction

This section examines exit strategies for the economy from the current recession. We explore two scenarios for the Irish economy over the period 2010-2015. We refer to these as the *High Growth Scenario* and the *Low Growth Scenario.* We begin by outlining the assumptions underpinning these scenarios. In both scenarios we assume that the world economy recovers in 2010 and returns to growth in 2011 and that the government implements a package of fiscal cuts equivalent to €6 billion as outlined in Section 4.2. The scenarios differ in relation to the assumed response of the Irish economy to a recovery in the world economy. We use these two scenarios to examine various exit strategies from the current public finance problems, assessing the extent to which the deficit in the public finances is structural, as well as considering how an economic recovery will affect the future path of unemployment.

The *HERMES* macroeconomic model of the Irish economy has been used to develop these scenarios. The behaviour of this model is discussed in Bergin, Conefrey, Fitz Gerald and Kearney, 2009. The two scenarios are calibrated to the Spring *Quarterly Economic Commentary* numbers for 2010 and 2011, published in April 2010[12].

The *High Growth Scenario* presented in this paper shows how the Irish economy would develop assuming the full implementation of the budgetary package for 2011-14 amounting to almost €6 billion outlined in section 4.2. In considering how the Irish economy is likely to exit from the current recession, a crucial factor is the timing and nature of a world recovery. In the scenarios which we develop in this paper, the forecasts for the world economy for 2010-2015 are taken from the *National Institute Economic Review* of April 2010. Following the sharp contraction in economic activity in all of the world's major economies, a tentative recovery is expected in 2010. Most of the world's economies are forecast to grow at rates close to potential over the period 2011-2015.

The *High Growth Scenario* assumes that the financial system is rehabilitated and restructured so that it responds to the recovery in the economy in 2011½012 by providing adequate credit. The analysis in Bergin, Conefrey, Fitz Gerald and Kearney (2010) highlights the sensitivity of Irish output with respect to changes in world demand. The *High Growth Scenario* assumes that the structural behaviour of the Irish economy is not fundamentally altered as a result of the current crisis. In particular, the scenario is based on the assumption that the key drivers of output in the tradable sector of the economy do not change as a result of the current recession.

In the light of the severity of the current recession as well as the uncertainty surrounding the nature of the international recovery, the concern exists that the Irish economy may not respond in a similar manner as in the past to an upturn in world demand. In the *Low Growth Scenario*, we consider what the implications would be if there was a lower response by the Irish economy to growth in the world economy than has been the case over the past twenty years.

Finally, section 4.5 summarises our estimates of the structural deficit under the *High Growth* and *Low Growth* scenarios.

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[12] Some of the numbers differ from the April QEC to reflect changes in key data indicators since then, in particular in relation to the treatment of monies transferred to Anglo Irish bank in 2009 and 2010.

4.2. Assumptions

In our *High Growth* scenario we assume that the government adopts policies to ensure that general government borrowing (as defined in the General Government Balance – GGB) is brought to 3% of GDP by 2014 as agreed under the Stability and Growth Pact. While our estimate of the structural deficit, discussed below in Section 4.5, suggests that the bulk of the current GGB for this year (2010) of 12%[13] is due to either the direct fiscal costs of the banking crisis or due to the cyclical downturn, serious fiscal retrenchment will still be needed to reduce borrowing in 2014 to the government target and to eliminate borrowing altogether by 2015 or 2016.

Our estimates suggest that to achieve this objective of reducing the deficit to 3% of GDP by 2014, the government will have to undertake fiscal policy action to reduce expenditure or increase taxation by around €6 billion. This is the basis on which we have prepared the *High Growth* scenario. Set out below in Table 4.1 are details of a stylised package of fiscal measures spread over the years 2011-14. It is assumed that in 2011 the government will reduce the borrowing requirement by close to the €3 billion announced at the time of the 2010 budget. For 2012 we have assumed a further package of fiscal measures of around €2.5 billion. Further measures to save a total of just under €0.4 billion are assumed to be implemented in 2013-15.

Table 4.1: Assumed Fiscal Policy Action 2011-15, €billions

	2011	2012	2013	2014	2015	Total 2011-15
Tax Revenues	0.79	0.94	0.05	0.05	0.05	1.9
Property tax etc.	0.40	0.90	0.00	0.00	0.00	1.3
Carbon Tax	0.16	0.05	0.05	0.05	0.05	0.3
Tax on income	0.23	0.00	0.00	0.00	0.00	0.2
Capital expenditure	0.96	0.53	0.00	0.00	0.00	1.5
Current expenditure	1.14	1.02	0.00	0.30	0.00	2.5
Current expenditure on goods and services	1.14	1.02	0.00	0.00	0.00	2.2
Transfers (Pension age)	0.00	0.00	0.00	0.30	0.00	0.3
Total	2.9	2.5	0.0	0.3	0.0	5.8

It should be stressed that the composition of the fiscal package assumed here is not normative. In the absence of a fully spelt out government programme we have included a range of measures which might be considered as being consistent with the broad parameters of government policy. They should not be seen as a "desirable" or "optimal" package.

The cuts assumed in capital expenditure would still leave government capital expenditure, excluding special items, at around 4.5% of GNP in 2015. The cuts in current expenditure on goods and services would involve a cut in public service employment in 2011 and 2012 of on average 2.8% each year. A fall in employment of this magnitude is consistent with what might be expected to occur through natural wastage. No further cuts in public service wage rates are assumed for 2011 and subsequent years.

The cut in expenditure on pensions in 2014 arises from the government decision to extend the retirement age for public old age pensions from 65 to 66. This saving in expenditure takes no account of the additional savings that might be expected through higher labour force participation

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[13] If the €11 billion transfer to Anglo-Irish bank and Irish Nationwide were classified as part of the GGB. that would raise the deficit for 2010 to 19% of GDP.

by this cohort. By working a year longer the tax revenue accruing to the state would also be significant, as would the effect on output. Barrell et al. (2010)[14] have estimated the effects of an extension in the pension age in the UK in 2015 which would suggest a bigger long-term economic impact than we have assumed here.

We have assumed that over the course of 2011 and 2012 tax revenue of around €1.3 billion would be raised from a tax on property. In addition, some limited changes in taxes on income in 2011 would raise just under €230 million and a gradual increase in the carbon tax would raise revenue from this source by just under €350 million by 2015.

In the numbers for the public finances we have taken account of an exceptional payment to Anglo-Irish Bank and Irish Nationwide in 2009 of €4 billion in cash and a further payment of €11 billion in 2010 by way of a promissory note. We have also assumed that this promissory note will attract a market interest rate with the resulting interest payments being added to national debt interest. Furthermore, we have assumed that this payment will be included in the GGB for 2011. Over the life of the promissory note the cumulative interest payments will amount to over €2 billion. The risk premium assumed for Irish borrowing is as set out in the attached Table 4.2.

Table 4.2: Risk Premium Relative to Germany Assumed for Irish Borrowing

2010	2011	2012	2013	2014	2015
2	1.5	1.25	1	1	0.75

We have also assumed that there will be a further exceptional capital payment to these two institutions of €0.8 billion a year for ten years beginning in 2011. Together these payments will amount to €25 billion – the suggested possible cumulative losses outlined by the Minister for Finance in March 2010. These exceptional items are excluded from the numbers on fiscal policy action in Table 4.1.

Implementation of the fiscal programme outlined by the government at the time of the 2010 budget would involve a reduction in the deficit (ex ante) of €7.5 billion over the years 2011-14, compared to the €6 billion we have assumed. Our *High Growth* scenario suggests that €6 billion in cuts should be sufficient to reach the target of a 3 per cent deficit by 2014. However, as outlined below in our *Low Growth* scenario, were the Irish economy to under-perform during the next five years, then further cuts will be needed to achieve the 3 per cent target.

4.3 High Growth Scenario

This scenario assumes that the Irish economy's relationship with the outside world is maintained after the current crisis, assuming that the past behaviour of the Irish economy provides a valid basis on which to formulate forecasts of the likely future path of the economy. Following three years of contraction in economic activity in 2008, 2009 and 2010, we expect economic growth to resume from 2011 onwards (Figure 7). Our forecasts for economic growth in this scenario are lower than those contained in the *World Recovery* scenario of *Recovery Scenarios for Ireland* publication of May 2009. The reasons for the differences between our latest projections and those of May 2009 are discussed in Box B. Initially the recovery will be driven by exports. The combined effect of a return to growth in Ireland's external markets and the significant

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[14] Barrell, R., Hurst, I., and Kirby, S. 2010. How to Pay for the Crisis or Macroeconomic implications of pension reform, NIESR Dp no. 333

improvement in competitiveness which is under way should see Irish exporters gaining an increased share of a growing export market.

Figure 7: GDP, % Change
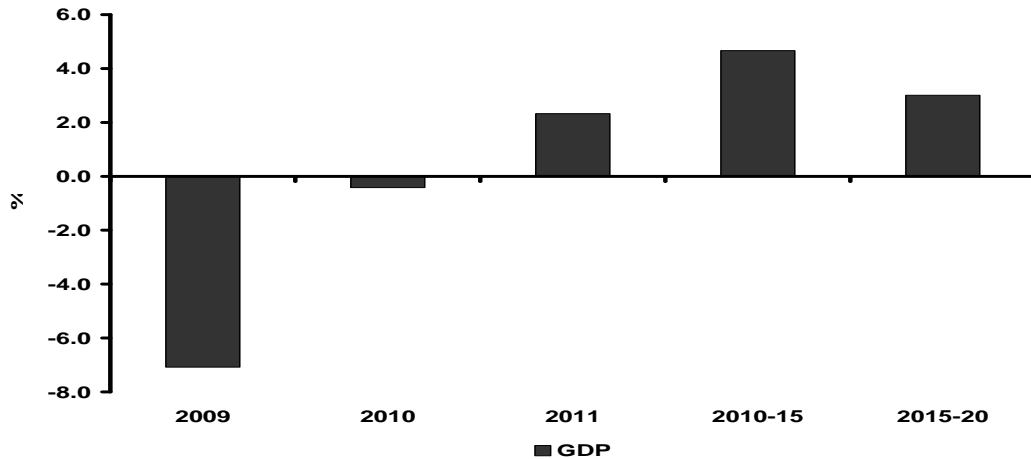
The strong recovery in the Irish economy after 2011 envisaged in this scenario can be explained by two factors. First, the openness of the Irish economy, with over 80 per cent of manufacturing output being exported, means that an increase in world demand has a substantial effect on Irish output. Our estimates suggest that an increase in world output of 1 per cent in the long run increases the demand for Irish output by around 1.3 per cent (Bergin, Conefrey, Fitz Gerald and Kearney, 2010). Growth in world trade directly affects the Irish economy through the manufacturing, business and financial services and tourism sectors. A growing share of the output of the business and financial services sector is internationally traded which increases substantially the combined effect of growth in world demand on the Irish economy. This high degree of responsiveness to changes in world activity contributed to the depth and severity of the downturn in the Irish economy since 2008. In the same way this high sensitivity with respect to world activity gives rise to the strong recovery in the Irish economy from 2011 as reflected in this scenario.

The second factor which explains the growth in the Irish economy after 2011 in this scenario is the expected improvement in competitiveness in Ireland relative to the rest of the world. Ireland's competitiveness relative to the rest of the world drives the output of the tradable sector in the domestic economy. The combination of a fall in the cost of living in Ireland (including the cost of accommodation) and the increase in unemployment associated with the contraction in the economy over the period 2008-2010 is expected to lead to significant wage moderation in the private sector. A substantial reduction in wage rates in the public sector has occurred as a result of the combined effect of a pensions levy introduced in January 2009, as well as the direct reduction in public sector wage rates implemented from the beginning of 2010. Together these have reduced wage rates in the public sector by around 15%. These factors combined would lead to a fall in average annual earnings in the economy of around 6% over the period 2009-11.

Figure 8: Economy wide Unit Labour Costs, Annual Percentage Change
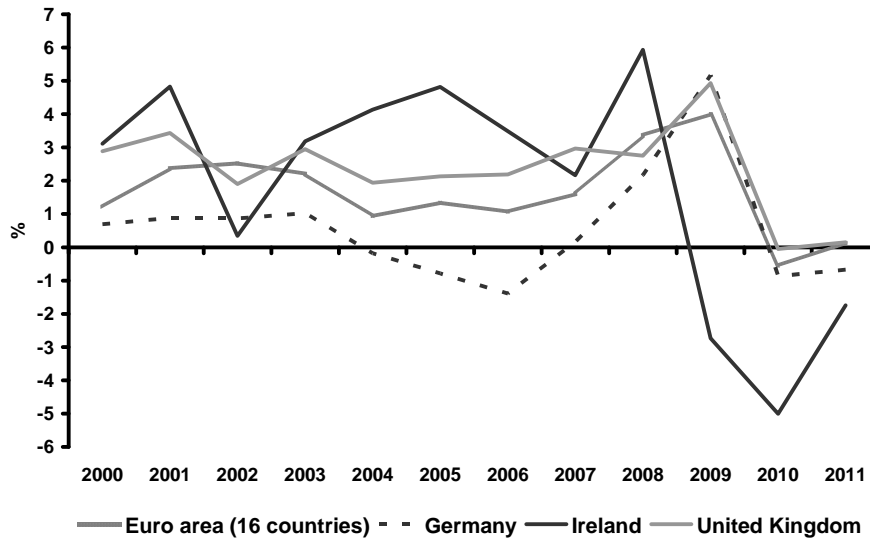
Source: European Commission *Ameco Database*

Latest data suggest that the economy is on course to record such a reduction. Other costs, especially the cost of accommodation, both for households and for business, are also greatly reduced. Data on unit labour costs from the European Commission suggests that the Irish economy has already experienced a significant improvement in competitiveness relative to other euro area countries (Figure 8). This improvement in competitiveness is expected to drive the growth in GDP over the period 2011-2015. Bergin, Conefrey, Fitz Gerald and Kearney (2010) estimate that Irish manufacturing output has an elasticity of unity when faced with a 1 percentage point improvement in competitiveness.

Table 4.3: High Growth Scenario, Major Aggregates

	2010	2011	2010-15	2015-20
	Annual % Growth Rate		**Average Annual % Growth**	
GDP	- ½	2 ¼	4 ¾	3
GNP	0	2 ½	4 ½	3
Total Employment	-4 ¼	½	2 ¼	1 ¼
Output, industry	-3 ¾	2 ½	8 ½	3 ¼
Output, market services	2	4 ¼	4 ½	3 ¼
Consumer Prices	-2	0	2	2 ¾
Non-agricultural Wage Rates	-3	-1 ½	2 ½	4 ¼
Year End:	**2010**	**2011**	**2015**	**2020**
Personal Savings Ratio	10 ¼	10	7	6 ¾
General Government Balance, % GDP	12[15]	-10 ½	-1 ¾	- ¼
Net Government Debt, % of GDP	32	52	60	47
General Government Debt, % GDP	84	93 ¼	88	72
Balance of Payments, % GNP	1	2 ½	2 ¼	1 ½
Unemployment Rate, % of labour force	14	13	4 ¾	4
Net Migration, 000s	60	40	-24	-22

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[15] See footnote 13.

For 2010, we expect a further small contraction in the economy followed by a modest recovery in output in 2011. The growth in 2011 will all come from the external sector. Overall GNP is projected to decline by ¼ per cent in 2010 before expanding by 2 ½ per cent in 2011. Assuming that the elasticity of Irish output with respect to output in the outside world is maintained as it was in the past, and also assuming that competitiveness improves as the model would suggest, the recovery in the international economy is expected to give rise to a strong recovery in output in the manufacturing and market services sectors over the period 2011-2015, as illustrated in Table 4.3.

Because of fears for their future many households are saving at an exceptional rate. In addition, investment in housing by the household sector has been dramatically reduced. However, once an export driven recovery becomes established in 2012 it is likely that the savings rate will fall gradually towards its long run equilibrium level. In addition, once the excess of dwellings in the major urban areas are occupied through sale or rental in 2012 or 2013, rents will begin to rise and investment in housing will show a limited recovery. This delayed recovery in domestic demand will be particularly important for employment growth in later years.

Similarly, in the company sector, companies are currently concentrating on reducing their balance sheets with the result that investment has fallen to a low level. Once a recovery becomes well established a recovery in private sector non-housing investment is anticipated.

As shown in Table 4.3, the increase in output from the tradable sectors of the economy is expected to drive annual average GNP growth of 4½ per cent over the period 2010 to 2015. Beyond 2015, growth is expected to moderate to an annual average rate of 3 per cent, close to the economy's long run potential rate of growth (see Bergin et al, 2009 for details).

The sharp contraction in the economy over the period 2008 to 2010 has resulted in a dramatic rise in the unemployment rate, as illustrated in Figure 9. As a result of lower levels of activity in the building, manufacturing and market services sectors, total employment fell by almost 9 per cent in 2009 and it is expected to contract by a further 4 per cent in 2010. The unemployment rate rose to almost 12 per cent in 2009 and is projected to peak at almost 14 per cent in 2010. In line with the anticipated recovery in economic activity from 2011 onwards in this scenario, employment growth is expected to resume and average 2.3 per cent over the period 2010 to 2015. As a result, the unemployment rate is expected to fall to 4.7 per cent by 2015, a rate consistent with full employment.

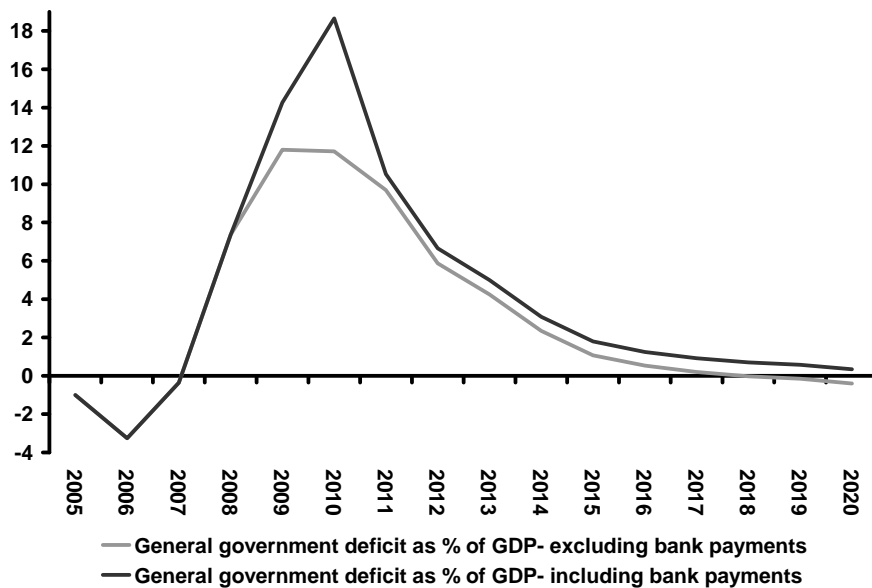**Figure 9: Unemployment Rate, Per Cent of the Labour Force**
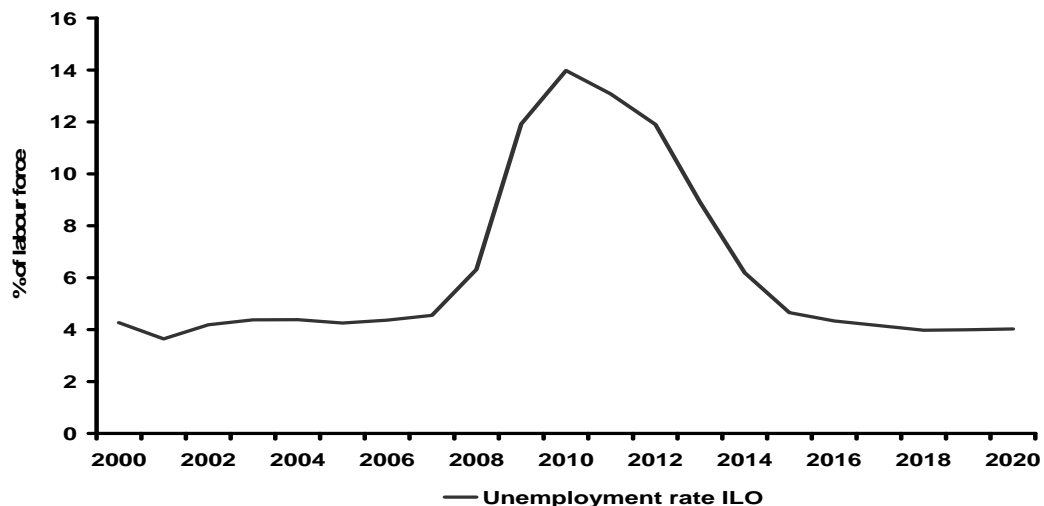
The fall in the unemployment rate to below 5 per cent by 2015 would reflect the rapid adjustment of the labour market which occurs in this scenario. This rapid clearing of the labour market contrasts with the experience of the Finnish economy in the 1990s where the unemployment rate still stood at 11 per cent in 1999, five years after economic growth had resumed. The difference reflects the observed flexibility of the Irish labour market. Throughout these simulations migration is assumed to be driven by movements in after-tax wage rates and the unemployment rate in Ireland relative to other labour markets. As a result, the rise in unemployment leads to substantial outward migration in this scenario. There is cumulative net emigration of 144,000 over the period 2009 to 2013, this is crucial to the rapid decline in the unemployment rate which takes place in this scenario. If migration were not to resume to this extent, this would lead to a higher unemployment rate and a slower decline in the unemployment rate in the recovery period than we have assumed here. This adjustment to the labour force through net emigration is likely to be completed by the end of 2013. In later years of the decade some return to limited net immigration might be expected.

As discussed, households have reacted to the current economic crisis by increasing their personal savings rate. As shown in Table 4.3, the savings rate reached 11 per cent in 2009, significantly above its long run average of around 8 per cent. As the economy recovers, the savings rate is expected to fall back gradually to reach 7.1 per cent in 2015. The fall in the savings ratio and the associated rise in consumption in this scenario adds further impetus to the recovery in the economy after 2011.

As shown in Bergin et al. (2009), for every 1 percentage point reduction in government borrowing through discretionary fiscal action the balance of payments current account deficit (surplus) also tends to fall (rise) by around 1 percentage point. The package of fiscal policy measures implemented in this scenario will tend to move the current account of the balance of payments into surplus in 2010. In addition, the recovery in world demand and the increase in Irish exports after 2011 envisaged in this scenario are together also likely to result in a substantial continuing surplus on the balance of payments current account over the medium term. The delayed recovery in domestic demand will contribute to this process.

Figure 10: General Government Balance, Per Cent of GDP

General government deficit as % of GDP- excluding bank payments
General government deficit as % of GDP- including bank payments

The emerging surplus on the current account of the balance of payments is, in turn, matched by developments in the flow of funds. As discussed later this has significant implications for the banking system. While the government sector will continue to borrow abroad till 2015, albeit at a diminishing rate, the private sector will be making net repayments on its foreign borrowing. This will see a very substantial reduction in the current foreign exposure of the Irish banking system as its net foreign borrowing is largely eliminated.

Turning to the public finances, the decline in economic activity has led to a collapse in government receipts from a range of taxes. At the same time government expenditure is expected to rise due to higher welfare payments as a result of higher unemployment and a major increase in debt interest payments related to the borrowing undertaken to fund the resolution of the banking crisis. Based on the assumptions on the public finances discussed in section 4.2, the general government deficit, excluding payments to the banks, is expected to peak at close to 12 per cent of GDP in 2010. Taking into account the fiscal measures implemented over the period 2011 to 2015, as well as the return to strong growth and the associated fall in unemployment envisaged in this scenario, the general government deficit, excluding payments to the banks, is expected to improve significantly over the medium term, falling to 1^{16} per cent of GDP by 2015 as shown in Figure 10. This is the deficit which would remain assuming a normal world recovery and the full implementation of the package of fiscal measures outlined in section 4.2.

As a consequence of the sharp rise in government borrowing, the gross government debt to GDP ratio would rise to over 95 per cent of GDP before falling back to 88 per cent of GDP in 2015. Deducting the government liquid assets deposited with the Central Bank together with the National Pension Reserve Fund , the net government debt to GDP ratio would stand at 60 per cent of GDP in 2015.

Figure 11: GNP per head , 2007=100. Before and after the Recession

Pre-recession   2010 forecast

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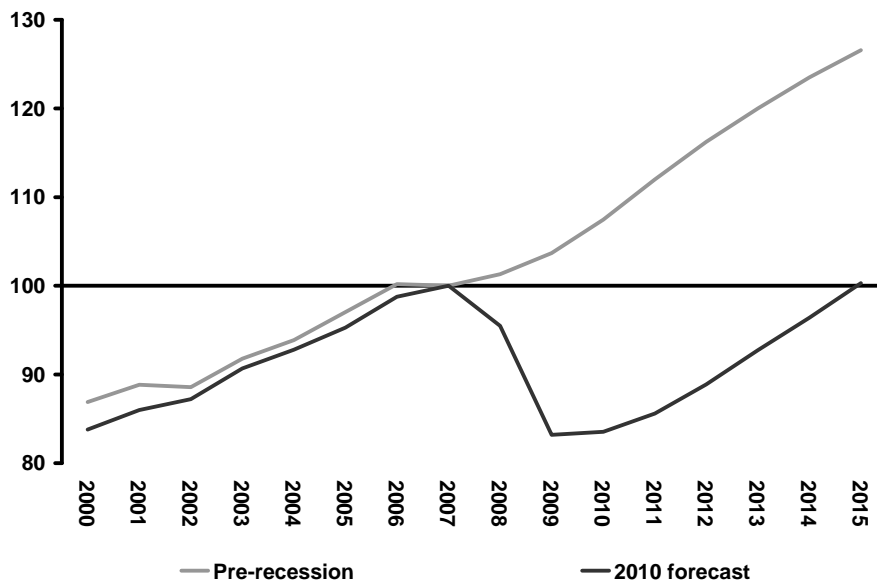
[16] When a special payment to cover the losses of the banking system is taken into account the figure would be around 1.7%. These special payments to cover banking losses are unrelated to day to day expenditure and revenue. They are assumed to be completed by 2020.

This scenario suggests that once the world recovery gathers momentum, which according to current forecasts could happen in 2011, growth rates in the recovery phase of 4 to 5 per cent would be likely. While this would represent a return to strong rates of growth, it should be noted that growth rates of this magnitude would be sufficient to restore only some of the losses sustained over the period 2008-2010. Set out in Figure 11 is a comparison of the path of GNP per head in this scenario with the forecasts before the advent of the crisis. In this case we use the housing shock scenario from the 2005 *Medium-Term* Review to represent the pre-recession base. We estimate that by the end of 2010, as a consequence of the severe contraction in the Irish economy over the period 2008 to 2010 and the associated rise in unemployment, output per head will have fallen back to its 2001 level. On the basis of the growth rates envisaged in this scenario, output per head would not be restored to its 2007 level until 2015. The pattern shown in Figure 11 implies a permanent loss of output of over 15% in 2015 relative to the pre recession base, a very painful permanent scar on the economy arising from the current recession.

Box B: Comparison with *World Recovery* Scenario from May 2009

In May 2009, the ESRI published a paper (Bergin et al., 2009) which set out possible paths to recovery for the Irish economy. In the paper we argued that if the world economy recovered significant momentum by 2011, the Irish economy, as long as it regained competitiveness, could grow quite rapidly in the period 2011-2015 and recover some of the lost ground of the current severe recession. We remain of the view that this outcome is still possible. Nevertheless, the current scale of the structural deficit in the public finances, combined with the deadweight costs of the banking bailout, currently estimated at 15 per cent of GDP, means that further fiscal consolidation will be necessary in the period out to 2014. This in turn will reduce the growth path of the economy out to 2015.

Since the publication of *Recovery Scenarios for Ireland,* more detail has emerged on the likely scale of government funding required to resolve the banking crisis (see Box A). In particular, it has now become clear that the State is likely to have to transfer an estimated €25 billion to the banking system. As a result, in developing the scenarios in this paper we have included an additional funding cost of €25 billion. These exceptional payments to the banks involve a medium-term cost to the economy in terms of output, income and employment.

Table 1B compares our projections for GDP and the public finances based on the *World Recovery* scenario (May 2009) with our revised projections based on the *High Growth* scenario. The principle reason for the differences between these numbers relates to our assumptions on fiscal policy over the medium-term. Underpinning the scenarios presented in this paper is the assumption that the government will implement fiscal policy action to reduce expenditure or increase taxation by around €6 billion between 2011 and 2015. In *Recovery Scenarios for Ireland,* we assumed that no further fiscal policy interventions would occur beyond 2010. The implementation of the €6 billion programme of spending cuts and tax increases (equivalent to around 3.6 per cent of 2009 GDP) contributes to a significant reduction in our forecasts for economic growth compared to *Recovery Scenarios.*

Table 1B: Comparison of *High Growth* Scenario with *World Recovery* Scenario Projections Prepared in May 2009

	2010	2011	2010-15	2015-2020
GDP Growth Rates			**Average Annual % Growth**	
World Recovery, May 2009	-1	3½	5 ½	3 ¼
High Growth, June 2010	-½	2 ¼	4 ¾	3
General Government Balance, % of GDP, year end	**2010**	**2011**	**2015**	**2020**
World Recovery, May 2009	11 ¼	9 ¼	3 ¼	2 ½
High Growth, June 2010	12	10 ½	1 ¾	¼

The fiscal consolidation package reduces our forecasts for average annual GDP growth over the period 2010 to 2015 by ¾ of a percentage point. Total employment is 25,000 lower by 2015, and the gross debt to GDP ratio is 17 percentage points higher. Income per head in 2015 is 6 per cent lower, see Figure 1B. Our analysis here indicates that the full implementation of the budgetary package outlined in section 4.1 would ensure compliance with the 3 per cent SGP target by 2014, even allowing for the additional fiscal costs of the banking crisis. Nevertheless, these figures confirm that implementation of this package of fiscal consolidation imposes real costs on the economy.

Figure 1B: GNP per head, constant prices, 2007=100. Comparison of forecasts
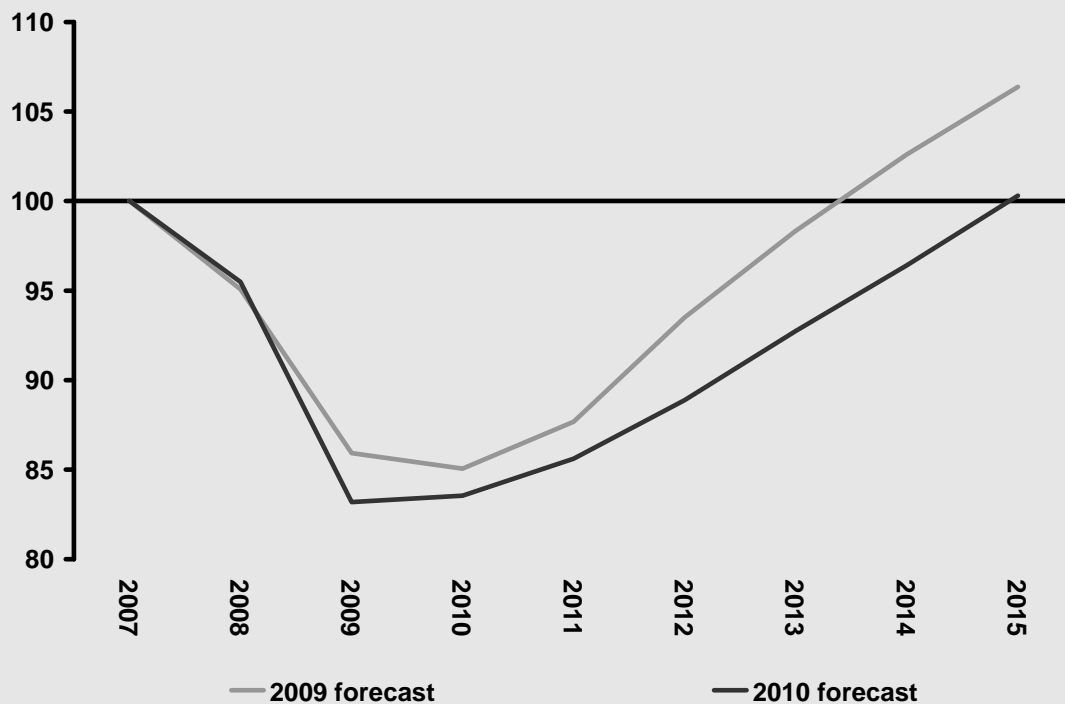
4.4 Low Growth Scenario

The *High Growth* scenario assumes that the Irish economy will react to the international recovery in the same way as in the past. In particular, it assumes that output in high-tech manufacturing and business and financial services, which is largely driven by world demand, will grow strongly. In this Scenario we consider the medium-term trajectory for the Irish economy if the relationship between output in the traded sectors and world growth is weaker than in the past. The fiscal assumptions, outlined in Section 4.2, are the same as the *High Growth* scenario. The scenario is generated by permanently reducing the elasticity of output in these sectors to world growth by around one percentage point. Since 1990, the elasticity of both high-tech output and business and financial services exports with respect to world demand has increased in Ireland, reflecting the acceleration of FDI flows into Ireland in the 1990s (Barry and Bradley, 1997). This enhanced FDI effect is captured in the output and exports equations for these two sectors using a dummy variable which is zero prior to 1990 (see Bergin and Kearney, 2007 for details). In this scenario we assume that this additional post-1990 effect ends, knocking roughly one percentage point of the elasticity with respect to output in both of these key sectors.

Table 4.4 summarises the impact of this change in behaviour scenario on the key economic aggregates. The overall impact of this change is to significantly stifle the recovery in economic activity. As a result of the lower response to world output, external demand for Irish exports is lower than in the *High Growth* scenario resulting in lower output and employment. In this scenario output in the industrial sector would grow by 5 ¾ per cent per annum over the period 2010 to 2015, compared to 8 ½ per cent in the *High Growth* scenario. Output in the market services sector would be 3 per cent compared to 4½ per cent in the *High Growth* scenario. Average GNP growth over the period 2010 to 2015 is more moderate at 3¼ per cent, while the comparable GDP growth rate is 3 per cent.

Table 4.4: Low Growth Scenario, Major Aggregates

	2011-2015	2016-2020
	Average Annual % Growth	
GDP	3 ¼	2 ¼
GNP	3 ¼	2 ¼
Total Employment	1 ½	1
Output, industry	5 ¾	2 ¼
Output, market services	3	2 ½
Consumer Prices	2	2 ½
Non-agricultural Wage Rates	2	4
Year End:	**2015**	**2020**
Personal Savings Ratio	6 ¾	6 ¾
General Government Balance, % GDP	-4 ½	-4 ½
Net Government Debt, % of GDP	72¾	75¼
General Government Debt, % GDP	102	101 ¼
Balance of Payments, % GNP	-1 ¼	-4
Unemployment Rate, % of labour force	7 ½	7
Net Migration, 000s	-23	-20

In this case the permanent loss of output per head relative to the pre recession base is more severe than in the *High Growth* scenario. By 2015 GNP per head is still 6 per cent below the 2007 level. In this scenario the permanent loss of output amounts to 22 per cent by 2015 relative to the pre recession base.

Figure 12: GNP per head – Before and after the Recession
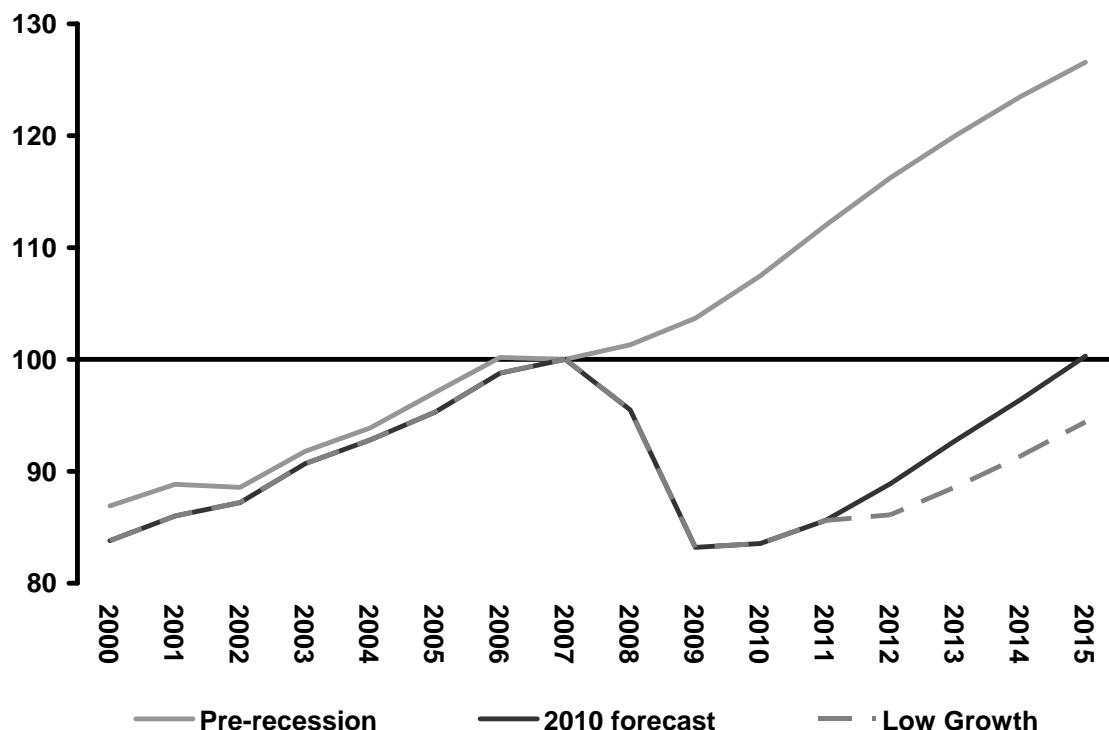
Such a permanent reduction in output would have a significant impact on the public finances. The lower level of economic activity would reduce government revenue from taxation while the higher unemployment rate and borrowing would increase government expenditure on welfare payments and interest payments. This would result in a significant deterioration in the general government balance compared to the *High Growth* scenario as shown in Figure 13. By 2015, the general government deficit as a percentage of GDP under the *Low Growth* scenario would stand at 4 ½ per cent compared to 1 ¾ per cent in the *High Growth* scenario. The deficit in the *High Growth* scenario would meet the 3 per cent Stability and Growth Pact (SGP) limit by 2014. However, with a lower response to world activity there would be a substantially higher deficit by the end of the period. By 2015 the net debt to GDP ratio would be 14 percentage points higher under the *Low Growth* scenario compared with the *High Growth* scenario.

In this scenario the economy would under perform relative to its potential and this would mean that the unemployment rate would remain persistently high. In fact, these average growth rates for the period 2011-2015 are of a similar order of magnitude to those attained in second half of the 1980s. As discussed in Section 4.5 below, were the economy to record such sluggish growth levels, then the resultant deficit and debt levels would require further fiscal consolidation to achieve the Stability and Growth Pact 2014 target.

Figure 13: General Government Deficit as a Per Cent of GDP
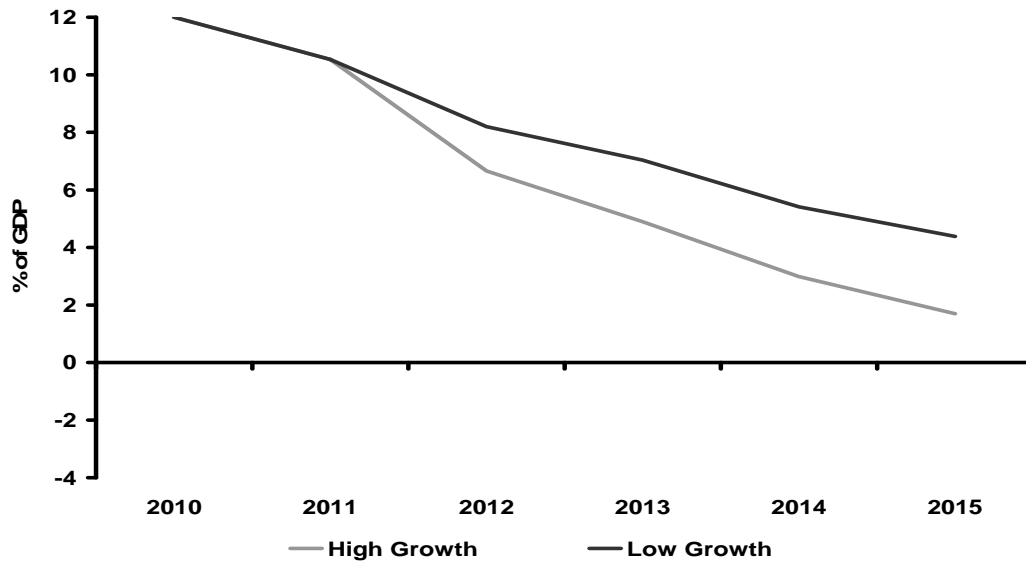
4.5 Estimates of the Structural Deficit

In Section 3 we discussed the differences between the HERMES model of the labour market and that implicit in the EU Commission methodology for estimating the structural deficit. To assess these differences, we present here an overview of the implied structural deficit from the *High Growth* scenario and the *Low Growth* scenario.

In its most recent forecasts, the EU Commission estimate that the Irish structural deficit in 2010 is 9.3 per cent of GDP. This is based, as discussed in Section 3.3, on a NAIRU of 10.9 per cent. With a total deficit (excluding the cost of the bank bailout) of 11.7 per cent, this implies that notwithstanding the significant fiscal consolidation measures undertaken in 2009 and 2010, they consider that almost 80 per cent of the deficit is not related to the cyclical downturn. We consider this estimate to be too high. Table 4.5 summarises our estimates of the structural deficit under the two scenarios considered in this paper.

We define the structural deficit to be that which would persist when the labour market clears. In the *High Growth* scenario, the unemployment rate returns to 4 ¾ per cent in 2015. This means that under this scenario our estimate of the structural deficit would be 1 ¾ per cent of GDP. Excluding the cost of special payments to the banks it would be 1 per cent. In the *Low Growth* scenario the under-performance of the economy would mean that the labour market would stabilise at an unemployment rate of 7 ½ per cent, again achieved in 2015. In this case the structural deficit, even excluding the banks, would be 3 ½ per cent of GDP, above the SGP guideline.

These measures include further fiscal consolidation packages in the years 2011-2014, as discussed in Section 4.2. They are therefore not a correct comparator with the 9.3 estimate of the structural deficit from the EU Commission. This number assumes no further fiscal correction from 2011 onwards. We have implemented this assumption in both of the scenarios shown here by assuming that the government pursues a neutral fiscal policy from 2011 onwards. The results are instructive. Under the *High Growth* scenario, the structural deficit is estimated at 2 per cent of GDP and under the *Low Growth* scenario it is estimated at 4 ¾. This latter figure is significantly below the estimate from the EU Commission.

These estimates of the structural deficit suggest that most of the heavy lifting in relation to fiscal consolidation has already been undertaken. To assess this, we have also estimated the deficit assuming that the government pursues a neutral fiscal policy since 2009. In this case our estimate of the structural deficit ranges from 7 to 10 per cent, depending on the growth performance of the economy. These estimates suggest that the fiscal correction in 2009 and 2010 have reduced the structural deficit by 5 percentage points.

Table 4.5: Estimates of the Structural Deficit

	2008	2009	2010	2011	2012	2013	2014	2015
High Growth Scenario								
Unemployment Rate	6 ¼	12	14	13	12	9	6 ¼	4 ½
			Deficit as % GDP					
Baseline	7 ½	14 ¼	18 ¾	10 ½	6 ¾	5	3	1 ¾
excluding bank payments	7 ½	11 ¾	11 ¾	9 ¾	6	4 ¼	2 ¼	1
No fiscal tightening 2011 onwards , excluding banks	7 ½	12	11 ¾	10 ¼	7 ¼	5 ½	3 ½	2
No fiscal tightening	7 ½	15 ¾	22	14 ¾	12	10 ¼	8 ½	7
Low Growth Scenario								
Unemployment Rate	6 ¼	12	14	13	13 ¾	11 ½	9	7 ½
Baseline	7 ½	14 ¼	18 ¾	10 ½	8 ¼	7	5 ½	4 ½
excluding bank payments	7 ½	11 ¾	11 ¾	9 ¾	7 ½	6 ¼	4 ½	3 ½
No fiscal tightening 2011 onwards	7 ½	12	11 ¾	10 ¼	8 ¾	7 ½	5 ¾	4 ¾
No fiscal tightening	7 ½	15 ¾	22	14 ¾	13 ¾	12 ½	11	10

Section 5: Conclusions

- The world recession and related financial crisis has affected economies in different ways. Hence it is important in assessing the sustainability of the public finances to use appropriate models for individual economies. The application by the EU Commission of the same basic model to individual economies contributed to an underestimation of the risks to economies such as Ireland and Spain in the years before the crisis. Similarly, this paper suggests that the EU model is likely to underestimate the potential growth rate of the Irish economy in the medium term and, hence, the current size of the structural deficit.

- The effect of the financial crisis has been to greatly increase the risk premium on Irish borrowing and it is expected to remain substantial for some considerable time. The fact that the risk premium responds to expectations about future borrowing changes the likely response of the economy to a tightening of fiscal policy. The presence of a large risk premium for Irish borrowing greatly increased the urgency of taking fiscal action last year. Had Ireland not acted to stem the massive increase in the deficit in 2009, the consequences would have been an even higher risk premium. In turn, this would have greatly increased the costs of returning the economy to a sustainable growth path.

- The depth of the recession in Ireland, and the massive funding crisis in the Irish banking system, necessitated swingeing interventions on the part of the authorities to stabilise the government deficit. We estimate that the austerity measures undertaken in the 2009 and 2010 budgets have already achieved much of the heavy lifting in relation to reducing the structural deficit. Indeed, even if the economy were to record sluggish growth rates out to

2015, with persistent unemployment, we estimate that the structural deficit would be half that estimated by the EU Commission. Nevertheless, further measures will be necessary to bring the deficit within the SGP target by 2014. The deadweight cost of the banking crisis has significantly added to the burden of fiscal adjustment in this regard.

- We echo the findings of Bergin *et al.,* (2009) in arguing that, if the world economy recovers significant momentum by 2011, the Irish economy, as long as it regains competitiveness, could grow quite rapidly in the period 2011-2015. If the economy proves as flexible as it did in the past, there will be a major adjustment in the cost base driven by market forces. Already there is some evidence that this is happening in terms of wages. It is clearly happening in the case of other costs, such as rent and the cost of accommodation. This repricing will be an important factor in returning the economy to growth. This would see some recovery of lost ground, while still leaving the level of output in 2015 15% or more below what it would have been without the recession and the related financial crisis. This assumption that the economy will behave as it did before the recession underpins the *High Growth* scenario.

- If the tradable sector were to prove much less responsive to world demand than it did in the past, the permanent loss of output would be significantly greater and the restoration of full employment would take much longer. Such an outcome would severely hamper the recovery in the Irish economy and it would require more painful fiscal action than currently planned by the authorities. Because of the uncertainty about the future and because of the asymmetric nature of the costs of being too optimistic relative to those arising from excessive prudence, the current situation calls for the full implementation of the programme of substantial further fiscal consolidation.

- The very high contingent liabilities that the state assumed as part of the banking bail out have greatly exacerbated the difficulties facing the Irish economy over the medium-term. The subsequent approach taken by the Irish government has been to try and crystallise the losses in the financial system reasonably quickly. The objective in bringing up front the losses is to increase the certainty about the future. It now looks likely that the state will end up paying around €25 billion to cover the losses for which it has become directly responsible. The deadweight cost of this payment, while manageable under the scenarios presented here, represents an enormous cost to the Irish public in a time of unprecedented fiscal difficulties. In addition, the government is likely to end up with over €50 billion invested in the rest of the banking system, through recapitalisation and the purchase by the state of non-performing property loans[17]. While it is possible that these latter investments could cover their costs in the long run , the size of the implicit balance sheet of the Irish government leaves open the possibility that limited under-performance (over-performance) could translate into further significant costs (benefits).

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[17] These loans are being acquired at a heavily discounted price, which aims to ensure that there is no net cost to the state in the long term.

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Appendix 1: Output Equations in the Traded Sector

In the *HERMES* macro-economic model manufacturing is divided into three sectors, high-tech, traditional and food processing. High-tech covers chemicals and pharmaceuticals with the traditional sector covering the rest of the manufacturing sector.

Manufacturing - High Tech Sector

$$q^* = a_1 + a_2 q_w + a_3 q_w d + a_4 \frac{c_i}{c_w} + a_5 \frac{w_i}{w_u} \quad [18] \qquad \text{(A.1)}$$

where:

q_w	=	US GDP
d	=	dummy between 1990 and 1998 is one, zero otherwise
c_i	=	unit cost of production in Ireland
c_w	=	unit cost of production abroad (proxied by OECD manufacturing prices)
w_i	=	wage rates in Ireland
w_u	=	wage rates in the UK in euros

Manufacturing - Food Processing.

$$q^* = a_1 + a_2 q_w + a_4 \frac{c_i}{w_g} \qquad \text{(A.2)}$$

where:

q_w	=	UK GDP
c_i	=	unit cost of production in Ireland
w_g	=	wage rates in Germany in euros

Manufacturing – Traditional Sector.

$$q^* = a_1 + a_2 q_w + a_4 \frac{c_i}{c_w} + a_5 \frac{w_i}{w_g} \qquad \text{(A.3)}$$

where:

q_w	=	OECD GDP
c_i	=	unit cost of production in Ireland
c_w	=	unit cost of production abroad (proxied by EU manufacturing prices)
w_i	=	wage rates in Ireland
w_g	=	wage rates in Germany in euros

Traded services Exports

In the case of the professional and financial services sector exports of non-tourism services are a function of world activity and Irish competitiveness (equation A.4) and the output of that sector is function of both exports and domestic demand. The effect of changes in wage rates on output occurs through its effect on the volume of relevant exports.

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[18] Lowercase letters in equations denote logarithms.

$$x_s^* = a_1 + a_2 q_w + a_3 q_w d + a_5 \frac{w_i}{w_u} + a_6 t_x \qquad (A.4)$$

where:

x_s	=	Services (non-tourism) Exports

q_w	=	US GDP
t_x	=	corporation tax rate in Ireland
w_i	=	wage rates in Ireland
w_u	=	wage rates in UK in euros
d	=	dummy from 1990 onwards is one, zero otherwise

Table A1: Estimation of Output Equations in the Tradable Sector[19]

Variable	Equation:	(A.1)	(A.2)	(A.3)	(A.4)
Constant	a_1	12.88	9.91	-5.18	14.64
		(19.0)	(161.8)	(-11.2)	(21.8)
World Output	a_2	3.40	1.52	1.74	3.80
		(0.2)	(9.9)	(43.8)	(15.3)
World Output from 1990 onwards	a_3	0.40			0.92
		(0.1)			(4.9)
Unit Costs	a_4	-0.61	-0.30	-1.23	-1.29
		(0.2)	(-4.2)	(-11.1)	(-5.7)
Relative Wages	a_5	-0.67		-0.14	
		(0.2)		(-2.5)	
Corporation Tax	A_6				-2.21
					(-4.9)
	Rho(1)				
	R^2	0.99	0.99	0.99	0.99
	std.err.	0.08	0.04	0.03	0.11
	D.W.	1.05	0.57	1.76	1.68
	from	1975	1975	1980	1970
	to	2005	2005	2005	2005

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[19] t-statistics in parentheses, estimation by least-squares, Rho(1) denotes estimated first-order autocorrelation coefficient using Cochrane-Orcutt techniques.

Appendix 2: The Elasticity Demand for Labour

The elasticity of demand for labour combines substitution, scale and price effects:

- *Substitution effects* look at the impact on employment of a change in the wage level if the total output level remains unchanged. An increase in wages makes labour relatively more expensive than other inputs of production (capital, intermediate inputs) and this encourages substitution away from labour toward relatively cheaper inputs in the production process. The higher the substitution effect, the bigger the reduction in employment for a given wage increase and a given level of output. In the short-run, when the capital stock is fixed, the possibilities for substitution are limited so that the substitution effect is relatively low. In the long-run, when all factors of production can be re-adjusted to their optimum level in the face of changed relative factor prices, the substitution effect is higher.

- The *scale effect* looks at the impact of the decline in output (scale of production) on employment. Higher wages will increase the marginal cost of production. This raises prices and reduces output. This reduction in output will in turn reduce the demand for all factors of production, including labour. Hence the strength of the scale effect depends on both the elasticity of demand for output and the importance of labour as a factor of production. The greater the responsiveness of output to a change in prices (the more elastic the demand for output) the higher will be the fall in output and hence, employment. The fall in employment will also be higher in sectors where labour's share of total costs is high. This is because a high labour share means that labour is a relatively important factor in production so that any increase in wages will have a significant impact on marginal costs.

- The *price effect* measures the elasticity of prices with respect to wages. In the non-traded sector prices are modelled as a mark-up on costs. Extensive empirical testing has suggested that there is full pass-through of wage increases to output prices in Irish services sectors in the long run. This implies an elasticity of prices with respect to wages of one. With full pass-through of wages to prices the long-run effect of a wage increase on employment is very small.

In HERMES-Ireland the factor demand equations for the manufacturing sectors and for the building sector are estimated as a system using FIML. The resulting own elasticities of demand for labour are shown in Table 1 below together with the elasticities for the non-tradable sectors where employment is endogenous. These elasticities capture the substitution effect as other factors of production are substituted for labour when the price of labour rises. They do not reflect the effect of higher labour costs on output through changing the competitiveness of the Irish tradable sector. Given the nature of the economy the substitution elasticities are quite low and the major impact of changes in wage rates on the demand for labour comes through the effect on changing the demand for Irish output.

Table A2.1: Own Elasticity of Demand for Labour (substitution effects)

	Elasticity
Manufacturing: High Tech	-1.0
Manufacturing: Food Processing	-0.9
Manufacturing: Traditional	-0.3
Building and Construction	-0.7
Market Services: Professional and Financial	-0.5
Market Services: Distribution	-0.1

When the model is simulated for a change in wage rates the result gives an estimate of the elasticity of labour demand for the economy as a whole. This simulation suggested that the own elasticity of demand for labour was around -0.4[20].

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[20] While this may look small relative to some of the elasticities in Table A2.1 it must be remembered that for the public sector, and the non-traded private sector, employment is not very sensitive to changes in wage rates.