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Estimating the Impact of Immigration in Ireland

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Abstract

The core objective of this paper is to review the research which has been undertaken on estimating the economic impacts of immigration in Ireland. By way of providing context, the paper begins with an overview of Ireland's recent experience of immigration and of the research which has been conducted on the associated issues such as the characteristics and experiences of immigrants. As the approach taken to estimating the impacts of immigration is based on simulations using a model of Ireland's labour market, details of the model are provided. Results from two studies are then presented. One study tended to show unambiguously positive outcomes, such as increased national output and reduced earnings inequality. However, a second study called into question the earlier findings on earnings inequality. While immigrants in Ireland are generally high-skilled, many were found to be working in occupations below their skill levels. Hence, high-skilled immigrants may be competing in the labour market with low-skilled natives. Accounting for this in the simulation exercises showed how immigration may have negatively impacted upon the earnings of low-skilled workers in Ireland.

JEL classification: J61

Keywords: immigration, Ireland, wages

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1. Introduction

Ireland's economic boom, which lasted from the mid-1990s until 2007 and which became known as the Celtic Tiger, had numerous impacts. One of these impacts has been a turnaround in Ireland's experience of migration. Having experienced substantial population outflows for most of the twentieth century, Ireland began to experience positive net inflows in the mid 1990s. After that, the inflows accelerated. Between 2004 and 2007 inclusive, net inward migration amounted to over 225,000 or over 5 percent of the resident population.

Given this transformation, a host of research questions have come onto the agenda for Ireland's economists and other social scientists. In general, these questions have been explored in other economies with long-established histories of inward migration. Among the questions is how immigration has impacted upon the Irish economy. In this paper, we will set out how this issue has been tackled in the Irish context.

The paper is structured as follows. In the next section, we will present some further details of Ireland's recent experience of immigration. We will also outline the research that has been done on questions such as immigrants' earnings and occupational attainment. In Section 3 we turn to the issue of estimating the impact of immigration. We begin by explaining why we have used a modelling/simulation approach. We then set out the details of the model used. In Section 4, we present some of the results that have emerged from our simulation exercises. In Section 5 we conclude with some references to our own concerns over how successfully we are capturing the impacts of immigration in Ireland.

2. Ireland's recent immigration experience

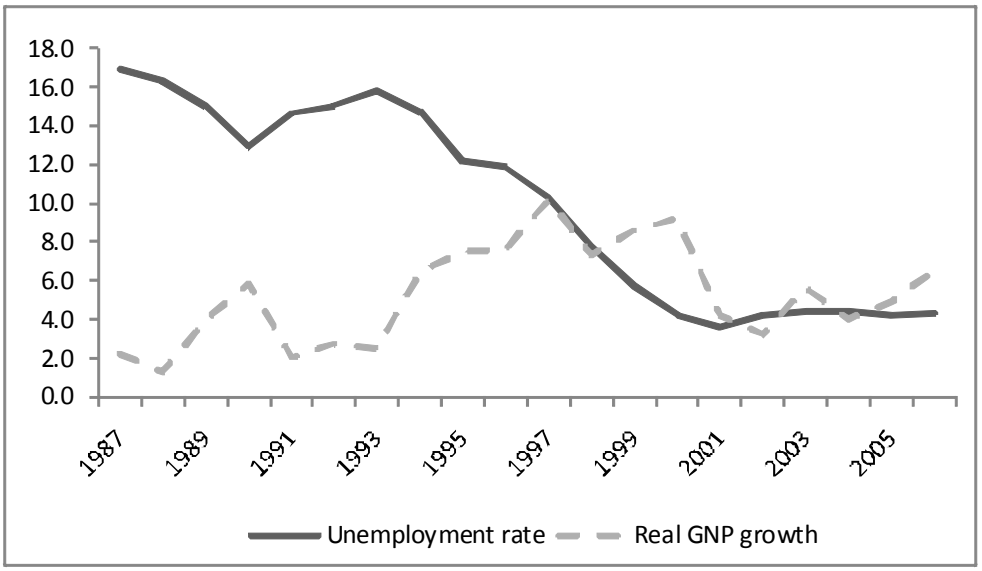
Broad figures

In general, discussions of any dimension of Ireland's economy over the so-called Celtic Tiger period should begin with an overview of indicators of economic performance such as real GNP growth and the rate of unemployment. In Figure 1, we show these indicators for the years 1987 to 2006. Looking firstly at economic growth, the particularly strong pace of growth from 1994 onwards can be seen in the figure. In the ten year period after 1994, real GNP growth averaged 6.7 percent. This strong growth performance was reflected in the labour market where the rate of unemployment fell from 17 percent in 1987 to 3.6 percent in 2001, before levelling of at around 4.5 percent in the first half of this decade. It would be expected that such a turnaround in the labour market of a small open economy would have implications for the patterns of migration and this, of course, was the case[2].

In Figure 2, we show net migration and population change in Ireland from 1987 to 2006. A number of points are readily seen. As recently as the late 1980s, Ireland was experiencing significant outflows. In 1989 alone, the net outflow figure was almost 44,000. As the total population at the time was approximately 3.5 million, this meant that the net outflow in that year alone amounted to 1.25 percent of the population. For the early 1990s, gross outflows and inflows were largely balanced. However, from around 1996 onwards, gross inflows began to exceed gross outflows whereby the net inflow became positive and then grew. The acceleration in the net inflows became particularly strong around 2004 as a result of EU enlargement. As Ireland was one of only three countries at the time to allow full access to its labour market to all citizens, this contributed in part to the acceleration.

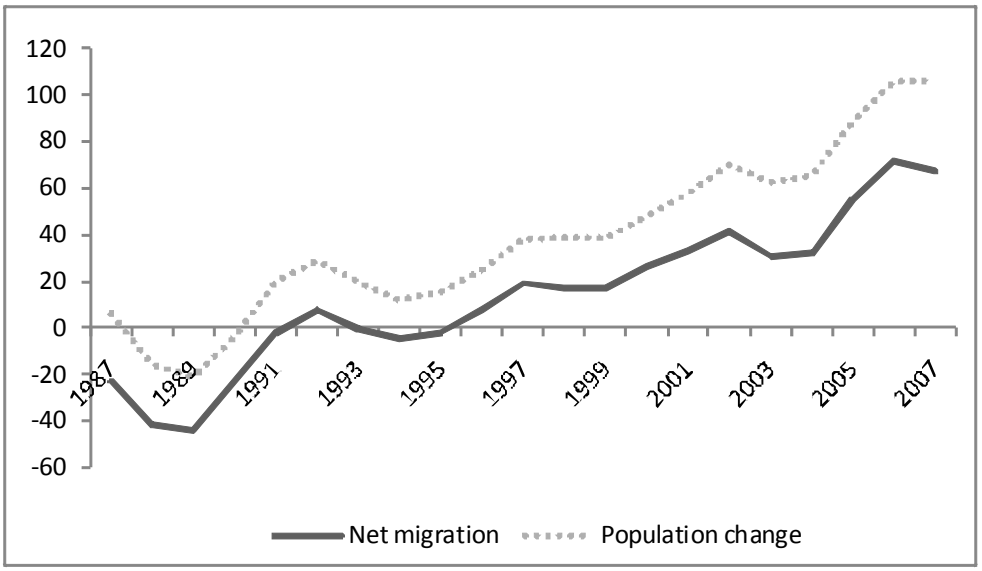
[2] Growth in GNP remained strong in 2007 at 4 percent but in 2008 the global downturn and a collapse in the building sector led to GNP contracting by 2.8 percent. The downturn has intensified into 2009, with the rate of unemployment reaching 12.7 percent in the third quarter.

Figure 1: Real GNP growth and the rate of unemployment, 1987-2006



In addition to the net inflow, Figure 2 also shows population change in Ireland for the last twenty years. The close relationship between net migration and population change is clear. For the most recent period, Ireland has been experiencing significant population growth. In the year ended April 2007, Ireland's population grew by over 100,000 or approximately 2.3 percent. Two-thirds of the increase was due to net migration with the remaining one-third being due to the natural increase.

Figure 2: Net Migration and Population Change, 1987-2007 (in thousands)



While net migration was 67,300 in the year that ended April 2007, it should be noted that this net figure disguises large gross flows. Over the same period, the gross inflow amounted to 109,500 while the gross outflow was 42,200. Of the gross inflow, 20,000 were returning Irish nationals; a further 52,700 were nationals of the EU's Accession States. The Central Statistics Office does not provide a breakdown of emigrants by nationality so it is difficult to get a precise sense of the amount of return migration out of Ireland. A breakdown by destination of emigrants is provided and in the year ending April 2007, 7,000 people left for the Accession States. On the assumption that this group comprised mainly of nationals of these countries, we can use this as an indicator

of the amount of outward migration. Almost half of those leaving Ireland go to destinations other than the EU (including the UK) or the US. As the vast majority of immigrants in Ireland come from the EU, this looks somewhat surprising but part of the explanation is likely to involve younger Irish people travelling in Australia and elsewhere immediately after completing second level and third level education.

According to the Census of 2006, about 10 percent of the Ireland's population is now made up of non-nationals – about 400,000 non-nationals out of a total population of 4 million[3]. This means that Ireland is similar to other countries in terms of the proportion of its population that are non-nationals. However, what makes Ireland somewhat unique is the speed with which this proportion grew. The Census of 2002 recorded the proportion of non-nationals as being 6 percent, so the four year period up to 2006 saw a rise in the non-national proportion of 4 percentage points.

The biggest group within this total are immigrants from the EU's New Member States (as of May 2004); a total of 121,000 people from these countries were counted in the Census 2006. The U.K. accounts for the next biggest group with 113,000 U.K. nationals living in Ireland. There were 47,000 Asians counted in the 2006 Census, along with 43,000 from the "old EU" and 35,000 Africans.

Research

We turn now to the research that has been conducted looking at this inflow. Starting with Barrett and Trace (1998), a number of papers have looked at the characteristics of immigrants in Ireland (Barrett et al 2006; Minns 2005). Barrett and Trace showed that immigrants in the mid-1990s were a highly educated group, with levels of education that significantly exceeded those of the native population. One of the hypotheses used to explain this observation was that the immigrants of the 1990s were "early movers" and may have had access to more information on Ireland. This gave rise to an expectation that the level of education among immigrants would fall as inward migration continued and increased.

Later analyses of immigrant characteristics continued to show immigrants as being a highly educated group, based on both the Quarterly National Household Surveys[4] (Barrett et al, 2006 and Barrett and Duffy, 2008) and the Census 2002 (Minns, 2005). Table 1 is taken from Barrett and Duffy (2008) and shows the high level of education among Ireland's immigrants, based on data from 2005. While the level of education among immigrants was lower among the more recent arrivals, the most recently arrived cohort (as of 2005) still had higher levels of education than the native population.

On the issue of how migrants are performing in the Irish labour market, the evidence suggests that they do less well than the native population. Ruhs (2005) provided the first study on earnings but his data was limited to work permit holders and so omitted the many EU nationals who were living in Ireland at the time of his analysis[5]. Barrett and McCarthy (2007) use data from the Irish component of the European Union Survey on Income and Living Conditions (EU-SILC) for 2004 to show that immigrants on average earned 18 percent less relative to native workers, controlling for factors such as education and length of labour market experience. For immigrants from non-English speaking countries, this wage gap is 31 percent. Barrett and McCarthy also show that the wage gap is biggest for the more highly educated immigrants, relative to comparable native employees.

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[3] If people who failed to report a nationality in the Census are assumed to be non-Irish-nationals, the number of non-nationals is 444,000 and hence 11 percent of the population.

[4] This is the official labour force survey, conducted by the Central Statistics Office.

[5] All EU nationals can work in Ireland, with the exception of citizens from Bulgaria and Romania. Until recently all others must obtain work permits which were issued annually and which were tied to a given employer. This system has now been expanded through the issuing of greencards for specific occupations. Such greencards are not linked to specific employers.

Table 1: Educational Distributions of Immigrants and Natives

	Native	All immigrants	Arrived 04-05	Arrived 02-03	Arrived 00-01	Arrived 95-99
	%	%	%	%	%	%
No formal/ primary education	10.5	4	6.1	2	4.5	2
Lower secondary	16.7	8.4	5	9.6	8.3	12.9
Upper secondary	29	26.8	36.3	26.6	21	18.6
Post Leaving	12	10.4	11.6	10.6	9.5	9.2
Third level	11.8	13.6	13	13.2	13.1	15.9
Third level - degree or above	19.9	36.8	28.1	38	43.6	41.4
% third level	31.7	50.2	41.1	51.2	56.7	57.3
N	32536	1634	524	395	420	295

Note: Taken from Barrett and Duffy (2008).
The term "post-leaving" refers to educational qualifications which are acquired after second level schooling but which are not granted by recognised third-level institutions. The term "third level" refers to qualifications that are awarded by third level institutions but which are not degrees – diplomas would be an example.

The issue of labour market performance is also addressed in Barrett et al (2006) and Barrett and Duffy (2008). As these papers use the CSO's Quarterly National Household Survey, the sample sizes are larger than that used by Barrett and McCarthy. However, as the QNHS does not include information on earnings, the analyses in these papers use occupational attainment rather than wages as a measure of labour market outcomes. Both papers show how immigrants are less likely to be in higher-level occupations, controlling for factors such as age and education, and label this as an "occupational gap". Barrett and Duffy (2008) also show how this "occupational gap" is largest for immigrants from the EU's New Member States and how the gap does not seem to decline for this group as they spend longer in Ireland. Based on this finding, Barrett and Duffy conclude that there is an absence of evidence of increased labour market integration of immigrants over time.

3. Estimating impacts

Barrett et al (2002), Barrett et al (2006) and Bergin and Kearney (2007) all estimate the impact of immigration on the labour market and the wider macro economy using a small structural model of the Irish labour market that separately distinguishes between high-skilled and low-skilled labour.[6] This section outlines the key mechanisms and features of the model. The model is described in full in Bergin and Kearney (2007) and was first developed in Fitz Gerald and Kearney (2000). The model includes behavioural equations for output determination, labour demand, the relative demand for high-skilled labour, the high-skilled population, the high-skilled participation rate and the low-skilled participation rate. The model is estimated using annual data from 1966 to 2002.

Before getting to the details of the model, it is important to point out why another approach to estimating the impacts of immigration was not used. One standard approach in the literature, often referred to as the area-based approach, is to use regional variations in immigrant proportions and the wages of natives to estimate the impacts of immigration. Two examples of this approach for the US are Altonji and Card (1991) and LaLonde and Topel (1991). In the case of both, the *change* in the labour market outcomes of natives across cities are related to the *change* in the number of immigrants in those cities, thereby attempting to avoid any spurious cross-sectional spatial correlation. Apart from criticisms made of this approach by Borjas et al (1997), the approach is unworkable in the Irish case due to the small size of the area in question. As

[6] We define high-skilled as those who have at least a higher secondary qualification and low-skilled as those with at most a lower secondary qualification.

Ireland is a small country (just over 70,000 square kilometres), it is not possible to think in terms of separate labour markets based on area and so the use of the area-based approach is inappropriate. Hence, the model/simulation approach is used as an alternative.

The broad theoretical framework is a model with one good and two kinds of labour, high-skilled and low-skilled. The determination of output and factor inputs is based on the work of Bradley and Fitz Gerald (1988) where output and factor inputs in a small open economy are determined in a two-stage optimisation procedure. In the first stage factor demand equations for labour and capital are derived under the assumption of cost minimisation and in the second stage the demand for Irish output is driven by world demand and Ireland's relative cost competitiveness:

$$Q = f(Q_w, C_i) \tag{1}$$

where Q is Irish output, Q_w is world output and C_i is unit labour costs in country i. In the empirical specification world demand is proxied by US GDP, given the influence of US multinationals in the Irish traded sector. Competitiveness is measured using two terms: Irish relative unit labour costs vis-à-vis the UK and Germany. These countries are chosen because they are representative of Ireland's main trading partners. Any gain in relative cost competitiveness results in Ireland capturing an increased share of world output and hence faster growth than the world economy. Any loss in competitiveness reverses this process.

Labour demand for the composite labour input is a function of output and the real wage (W/PC)[7]:

$$L = f\left(Q, \frac{W}{PC}\right) \tag{2}$$

The relative demand for high-skilled labour is modelled separately from total labour demand. Within the total labour input bundle the relative demand for high-skilled labour is determined as a function of the relative wage and technical progress (time).[8]

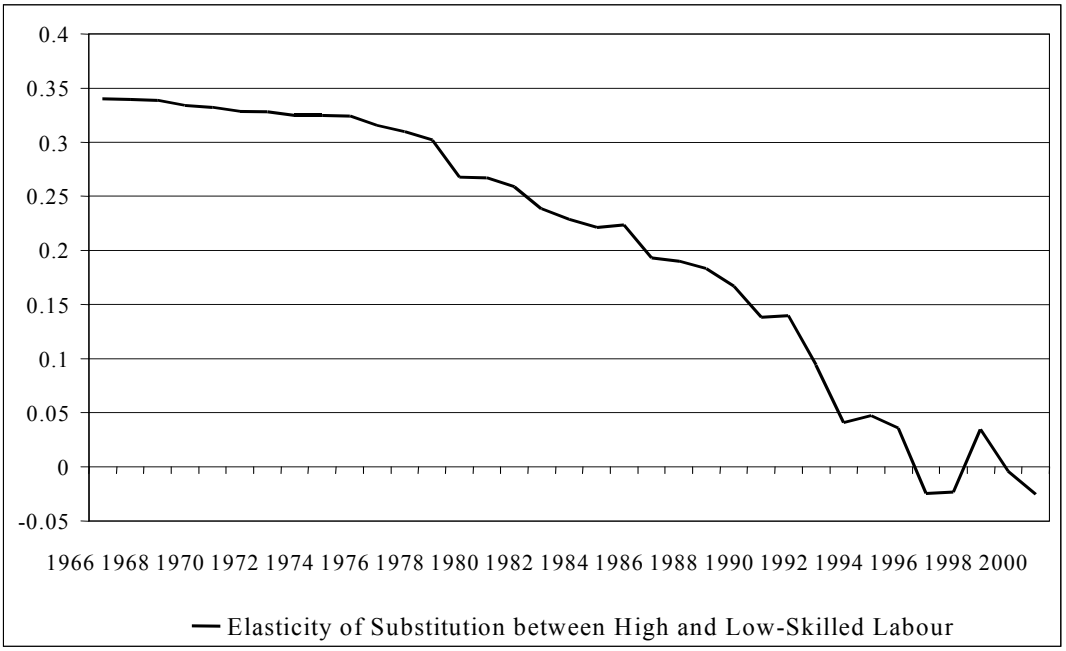
$$LH = f\left(\frac{WH}{WL}, time\right) \tag{3}$$

The model captures the fact that as domestic production has become more technologically advanced and has shifted towards more skill-intensive sectors that the relative demand for high-skilled workers has increased. This is reflected in the very large increase in the share of high-skilled labour in total employment which rose from 65% in 1980 to 80% in 2000. The estimation results imply that high-skilled and low-skilled workers have become less substitutable over time so that by the mid to late 1990s there is essentially a zero elasticity of substitution between the two (see Figure 3).

[7] A CES production function that allows for nonconstant returns to scale is used to derive factor demand equations. The demand for labour is estimated indirectly using a marginal productivity condition. The demand for capital is not separately estimated. An estimate of the share of capital in the production of output is imposed from the (2004) HERMIN-Ireland model specification, see Bradley et al. (1995). In the model labour is augmented using an index of human capital. Human capital is endogenised in the model as a simple weighted average of high-skilled (*LH*) and low-skilled (*LL*) labour, with the weights being the respective wage rates.

[8] A translog cost function is used in estimation. This relaxes the assumption of a constant elasticity of substitution that underlies the CES function.

Figure 3: Elasticity of Substitution between High and Low-Skilled Labour



Labour supply is modelled differently depending on the educational qualifications of workers. Those with high levels of education are typically more mobile and will emigrate (immigrate) in periods of low (high) labour demand, so that participation rates and unemployment rates among these workers are relatively stable. Those with lower levels of education have more volatile participation rates, so that in periods of low labour demand they either withdraw from the workforce or are unemployed. Because of these important distinctions, we model the participation decision for high-skilled and low-skilled workers separately. Estimates of the elasticity of the labour supply decision with respect to the wage are taken from Doris (2001) based on detailed microsimulation analysis of the participation decision.

High-skilled labour supply is determined in the model by the participation decision and the population, which in turn is driven by migration. The high-skilled participation (*NH/POPH*) decision is modelled as a function of the high-skilled consumption wage and a time trend:

$$\frac{NH}{POPH} = f\left(\frac{WH}{PC}, time\right) \tag{4}$$

The high skilled population is a function of the natural increase and net immigration. Migration is modelled as a function of the expected real after tax earnings in Ireland relative to the UK. While in the 1960s and 1970s most emigrants were unskilled, since 1980 most migration both into and out of the country has been skilled.[9] As a result, all migration is assumed to be high-skilled. High-skilled labour supply is very elastic because of the ready availability of migration flows. We assume that there is a fixed frictional high-skilled unemployment rate. These equations together determine the change in the wage necessary to clear the market.

The low-skilled participation decision is also modelled as a function of the real low-skilled consumption wage and a time trend. However, there is no migration in the low-skilled labour market. The model incorporates two mechanisms for adjustment within the low-skilled labour market. In the first case, there is no market clearing and adjustment is through changes in unemployment. In the low-skilled labour market, low wage rates until recent years meant there has been a high effective replacement rate which acted as a floor on the wage rate. With no

[9] See Barrett et al. (2006), Barrett and Trace (1998) and Fahey et al. (1998).

adjustment in wages, equilibrium in the low-skilled labour market was reached through adjustments in the unemployment rate.[10] While such an assumption is reasonable for the 1980s and much of the 1990s, in the last few years with significant reductions in low-skilled unemployment and the general tightening of the labour market wage bargaining has become a feature of the low-skilled labour market. Therefore we include a second option where market clearing operates and adjustment is through wages. We capture this process using a threshold replacement rate - moving across the threshold involves an abrupt switch from a high to a low unemployment regime. When the replacement rate falls below this threshold the low-skilled labour market clears using the same mechanism as in the high-skilled labour market, with the participation equation determining the wage rate and a fixed unemployment rate.[11]

4. Simulation Results

The model described in Section 3 has been used to estimate the impact of immigration in Ireland in Barrett et al (2002), Barrett et al (2006) and Bergin and Kearney (2007). Here, we will present and discuss the results from the first two of these papers[12].

Barrett, FitzGerald and Nolan (2002)
Barrett et al (2002) begin with an analysis of trends in earnings inequality in Ireland between 1987 and 1997 and eventually arrive at a migration-related explanation for the observed trends. The path which brings them to that point is as follows. They observe how Ireland had experienced a rapid increase in inequality between 1987 and 1994. For example, the ratio of weekly earnings of the top decile relative to the bottom decile increased from 3.68 to 4.06. This was the largest increase in this measure across fifteen OECD countries and left Ireland substantially ahead of the UK, where the corresponding ratio was 3.39 in 1994. Between 1994 and 1997, the trend towards increased earnings inequality seemed to come to a halt. The top decile/bottom decile ratio for weekly earnings actually fell from 4.06 in 1994 to 3.93 in 1997. Other measures of inequality also fell or showed only minor increases.

Having observed this changing trend in earnings inequality, Barrett et al went on to assess whether changing returns to education could explain the trend. They did find evidence of increasing returns to education in the period 1987-1994 and of stable or falling returns in the period 1994-1997. However, what was more interesting was the trend in the returns to education *within age categories*. For the youngest age group (15-32), the returns to education were constant throughout the ten- year period. For the age group 33-49, returns to education increased between 1987 and 1994 but then decreased in the subsequent three years

These divergent patterns required an explanation and the hypothesis advanced by Barrett et al ran along the following lines. Ireland was receiving much foreign direct investment during the period 1987 to 1994 and much of this FDI was in high-technology manufacturing. For this reason, it was likely that Ireland was experiencing an increase in the demand for skilled labour, in much the same way as other parts of the developed world in that period. The terms used in the literature to describe this phenomenon was "skilled-biased technical change" and it was central to many explanations of increasing earnings inequality in the US (see for example Katz and Murphy, 1992, and Autor et al, 1998).

This increase in the demand for skilled labour in Ireland probably explains the increase in the returns to education in the age group 33-49 between 1987 and 1994. For the younger age

[10] Scarpetta (1996) argues that 4.9 percentage points of the 9.7 percentage points increase in Irish structural unemployment over the period 1971-93 was due to the increased generosity of the Irish unemployment benefit system.
[11] Appendix 1 outlines the remaining equations which close the model.
[12] Although Bergin and Kearney (2007) contains estimates of immigration impacts, such estimates were not the focus of the paper.

group, although an increase in the demand for skilled labour was also present, the expansion of Ireland's third-level education sectors in the 1980s and 1990s meant that there was a ready supply of younger skilled workers. In this way, the increased demand was met by an increased supply and so the returns to education did not increase for skilled workers within the younger age group.

As regards the period 1994-1997, FDI and the increased outflow from the third level sector continued, and so the same explanation for stable returns to education for the younger age group was thought to hold. However, in the case of the age group 33-49, an explanation was needed for the fall in the returns to education between 1994 and 1997. The explanation given was inward migration.

Referring back to Figure 1, the mid 1990s saw the beginning of positive net inflows but the figure hides important difference across age groups. For those aged 15-25, the mid 1990s continued to be years of net outward migration. However, for those aged 25-44, there was a net inflow equal to 3% of the population of that age in the years 1994 to 1997. Many of these people would have been returning emigrants who left in the 1980s. They were typically high-skilled, as were many of the immigrants at this time, and so would have competed in the labour market on their return with other well-educated people.

In order to assess if this inflow in the mid 1990s was of sufficient size to produce a decline in the wages of skilled people, a simulation was conducted using the model described in Section 3. The results suggested that the inflow between 1994 and 1997 led to a fall in skilled wages of 4.7 percent. As unemployment in Ireland at the time was high, the complementarity between skilled and unskilled labour was shown to lead to a fall in the rate of unemployment (by 0.7 percentage points) as opposed to leading to an increase in the wages of the unskilled. Hence, this period of immigration was seen to have reduced earnings inequality and to have increased national output. Barrett et al noted that this was in contrast to Borjas et al (1997) who showed how unskilled immigration into the U.S. was contributing to increased earnings inequality.

Barrett, Bergin and Duffy (2006)

Barrett et al (2006) had two, related, objectives. First, they wanted to provide an updated profile of immigrants in Ireland as of 2003. This was needed in order to contribute to addressing their second objective, i.e. estimating the impact on immigration on a range of economic variables such as wages and national output. While the inward migration of the mid 1990s had been highly skilled, in part as a result of the presence of returning emigrants in the inflow, the nature of the inflow around 2003 had to be determined before the impacts could be estimated.

The profiling exercise produced two important results. Firstly, non-national immigrants in Ireland continued to exhibit a high level of education attainment as of 2003 relative to the native population. While almost 30 percent of the native population had some form of third level education, the corresponding figure for the immigrant population was 54 percent. At first glance, this suggested that the impact of immigration in Ireland into the 2000s might still have been positive for both national output and inequality (on the assumption that reduced inequality is considered to be a positive development).

The second results from the profiling exercise altered this view. Although immigrants were more highly educated than the native labour force, their distribution across occupations was very similar to that of natives. This mismatch between immigrants' education levels and occupations was confirmed in a probit analysis of occupational attainment. Immigrants were found to be 7 percent less likely to be in higher skilled jobs, controlling for a range of socio-economic factors. For immigrants from countries other than the U.S. and the U.K., this percentage ranged between 10 and 17 percent.

Given this education/occupation mismatch for immigrants, the question arose as to how to take account of immigrant skill levels when estimating the impact of immigration. The approach taken was to look firstly at the impact based purely on reported education and then to assume that immigrants and natives had the same educational distributions (as a simple way of

capturing the similarity in occupational distributions, in spite of higher educational attainment on the part of immigrants).

The results of the first approach (i.e. taking immigrants' education as if it is deployed in the same way of the education of natives) are shown in Table 2. The simulation results are based on immigration adding 72,000[13] to labour supply, with 61,000 added to the high-skilled labour force (~72,000*.85) and 11,000 added to the low-skilled group. Focussing on the column with the low-skilled labour market clearing (third column), GNP is shown to increase by 3.5 percent with GNP per head and per worker growing by less than 1 percent. What is perhaps more interesting is the impact on high-skilled and low-skilled wages. High-skilled wages fall by almost 6 percent while low-skilled wages rise by 1 percent. This is essentially a repeat of the Barrett et al (2002) findings of immigration into Ireland having this "double-positive" effect for both GNP and earnings inequality.

As noted already, the results are based on full utilisation of immigrant skills but Barrett et al showed that this was not necessarily the case. In order to account for this, Barrett et al re-ran the simulation exercise but assumed that the immigrant and native populations had the same educational distributions. This was a somewhat arbitrary assumption but was based on the observation that immigrants and natives had similar occupational distributions. The results from this simulation are presented in Table 3.

Table 2: Effects of Immigration into Ireland (1993-2003) with Full Utilisation of Immigrant Skills

	No market clearing in low-skilled labour market	Market clearing in low-skilled labour market
	% change	
GNP per head	1.1	0.9
GNP per worker	1.0	0.9
GNP	3.7	3.5
Total employment	2.6	2.5
High skilled	2.8	2.6
Low skilled	2.4	2.3
Labour supply	2.1	2.5
High skilled	2.8	2.6
Low skilled	1.0	2.3
Average	-4.8	-4.5
High skilled	-6.1	-5.9
Low skilled	0.0	1.0
As % of labour force		
Unemployment rate	-0.5	0.0
Low-skilled unemployment rate	-1.2	0.0

Source: Barrett et al (2006)

Table 3: Effects of Immigration into Ireland (1993-2003) Accounting for Occupational Gap

	No market clearing in low-skilled labour market	Market clearing in low-skilled labour market
	% change	
GNP per head	0.5	0.4
GNP per worker	0.8	0.8

[13] 72,000 was estimated to be the net inflow of non-nationals between 1993 and 2003; the actual net inflow was about double this, due to return migration.

GNP	3.0	2.8
Total employment	2.1	2.1
High skilled	2.2	2.1
Low skilled	1.9	1.9
Labour supply	2.2	2.0
High skilled	2.2	2.1
Low skilled	2.1	1.9
Average	-3.9	-3.7
High skilled	-4.9	-4.6
Low skilled	0.0	-0.2
As % of labour force		
Unemployment rate	0.1	0.0
Low-skilled unemployment rate	0.2	0.0

Source: Barrett et al (2006)

As can be seen from Table 3, this second simulation also shows GNP, GNP per head and GNP per worker all increasing. In addition, earnings inequality is still reduced. However, low-skilled wages do fall under this simulation (with market clearing) so there is now a loss to low-skilled native workers. Hence, even with this somewhat modest adjustment for lower immigrant occupational attainment relative to education, a wage penalty for low-skilled native workers arises.

While the work of Barrett, FitzGerald and Nolan (2002) included measures of earnings inequality and reported trends in these measures (see discussion above), such measures were not included in Barrett et al (2006) and are not readily available. McGuinness et al (2009) have shown that the ratio of hourly earnings in the top decile relative to the bottom decile declined between 1997 and 2001, from 4.51[14] to 3.46. If the results in Barrett et al are correct, the trend toward lower earnings inequality should have persisted beyond 2001, although with low skill wages falling more slowly relative to high skill earnings.

5. Conclusions

Our main purpose in this paper has been to discuss how the issue of immigrant impacts has been addressed for Ireland and to review the results. The approach taken involves the estimation of a model of the labour market, taking account of the specific features of the Irish economy such as its openness and the crucial role played by competitiveness in determining national output. Having estimated the model, simulations have been run whereby an amount of immigrants are essentially added to the labour force, with account being taken of the skill distribution of the immigrants.

The earlier results (i.e. Barrett et al, 2002) from this exercise seemed to show that immigration had been positive for Ireland in terms of both national output and earnings inequality. However, the later exercise (Barrett et al, 2006) produced a question mark over this "win-win" result, at least in terms of the impact on the wages of low-skilled native workers. While immigrants were generally found to be high skilled, additional analysis in Barrett et al (2006) showed how immigrants were also less likely to be working in high-skilled occupations. This meant that immigrants were competing with lower-skilled native to a greater extent than had previously been thought.

[14] This figures differs slightly from the figure reported above on the ratio for 1997. The figure reported earlier is as reported in Barrett et al (2002); this figure is as reported in McGuinness et al (2009).

These results for Ireland are in line with those for the US in Borjas (2003) and Borjas et al (1997) but it should be noted that they are somewhat at odds with results from many other studies where the impact of immigration on labour market variables such as native wages and employment are typically shown to be minor or non-existent. Friedberg and Hunt (1995) review such studies and conclude that "the effect of immigration on the labor market outcomes of natives is small".[15] More recently, Dustmann et al (2008) have produced at up-to-date review of studies looking at the impact of immigrants on the labour market outcomes of natives. They note that "many recent empirical papers, adopting different identification strategies, fail to find a negative impact of immigration on natives' wages". By contrast, they refer to papers such as Friedberg (2001) and Ottaviano and Peri (2006) where *positive* impacts of immigration on native wages have been found. In comparing the results for Ireland and elsewhere, it should be stressed that different methodologies have been used. The approach used for Ireland, as discussed above, is based on model simulation whereas the other studies typically try to capture the impact of immigration by comparing actual outcomes with some form of constructed counterfactual.

While this model-based approach has yielded interesting results, there remain doubts as to whether the full impacts of immigration are being captured. For example, capital is absent from the model, both public and private. In the case of private capital, it could be argued that an increased capital inflow is likely to have resulted from the increased labour inflow. For this reason, we could be overstating downward wage effects. However, to the extent that public infrastructure is relatively fixed, the congestion dimension of inward migration is also being omitted and such an effect would be negative for GNP growth and hence for wage developments. On a similar point, Duffy et al (2005) have shown how immigration contributed to house price increases in Ireland as a demand increase interacted with a relatively fixed supply of housing.

While improving the model used to estimate the impacts of immigration will be of value, we will still be left without any direct evidence on the impact of immigration in Ireland. While the area-based approach is not workable in the Irish situation, as discussed above, the approach in Borjas (2003)[16] offers an opportunity to provide direct evidence. For this reason, this is likely to be the next avenue for research on this topic within Ireland.

[15] Borjas (2003) also includes this direct quote.

[16] This approach looks at wage changes for natives in experience-education cells and relates them to changes in the number of immigrants in the corresponding cells.

Appendix 1: Other Equations which close the Labour Market Model

$$W = \frac{WH * LH + WL * LL}{L}$$

$$L = LH + LL$$

$$N = NH + NL$$

$$M_t = (POPH_t - POPH_{t-1} - NIPOPH_t)$$

$$POPL_t = POPL_{t-1} + NIPOPL_t$$

$$POP = POPL + POPH$$

$$ULC = \frac{YWNA}{GNP}$$

$$YWNA = WH * LH + WL * LL$$

Variable definitions and Data Sources

All data from ESRI databank (Bergin and Fitz Gerald, 2003) unless otherwise stated.

GNP:	Constant price GNP.
L:	Non-agricultural employment, total.
PC:	Personal consumption deflator.
WL:	Low-skilled wage, measured as average wage in clothing sector.
WH:	High-skilled wage, measured as average wage in non-agricultural sector excluding clothing.
ULC_{UK}:	Wage bill as share of constant price GDP, UK.
e_{UK}:	Exchange rate Irish pounds per £ sterling.
ULC_{GER}:	Wage bill as share of constant price GDP, Germany.
e_{GER}:	Exchange rate Irish pounds per DM.
NH:	High-skilled labour supply.
RELW	Relative after-tax wage between Ireland and the UK.
POPH:	High-skilled population of working age, where high-skilled is defined as those aged 15-64 with at least higher secondary education.
T:	Annual time trend, measured as actual calendar year.
NL :	Low-skilled labour supply.
POPL:	Low-skilled population of working age, where low-skilled is defined as those aged 15-64 with education below higher secondary level.
W_{UK}:	Wage rate in business sector, UK.
PC_{UK}:	Consumer price index, UK.
WS:	Average rate of unemployment benefit for 1 adult and 3 dependents.
WL_MIN:	threshold replacement ratio, = 0.65.
M:	Net immigration.
NIPOPH:	Natural increase in high-skilled population.
NIPOPL:	Natural increase in low-skilled population.

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