

**THE IMPACT OF MACRO-ECONOMIC GROWTH ON THE INCOME DISTRIBUTION IN IRELAND  
1987-2004 \***

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## **1. INTRODUCTION**

The Republic of Ireland has been the fastest growing economy in the OECD over the latter half of the 1990's, an expansion known as the Celtic Tiger. Some commentators have commented on the gains from the boom being concentrated amongst the top of the income distribution. In this paper we shall try to understand what has happened to inequality over the period 1987-2004 and to understand the determinants of the changes in inequality. Jenkins (1995) in studying the impact of changes of inequality in the UK outlines a number of potential causes for the change in income inequality including in the following:

- Age Distribution
- Household Composition
- Employment Structure
- Industrial Structure
- Unemployment
- Business Cycle
- Tax-Benefit Changes
- Earnings Inequality
- Income from Capital

This paper attempts to quantify the impact of this economic transition on the income distribution, decomposing the growth into the mechanisms that drove this change in income distribution. In section 2 of this paper we describe some of the principle trends in the macro-economy and in the income distribution. The next section explains the methodology used in this paper. The data is described in section 4. Section 5 carries out an initial data analysis of the trend in inequality in Ireland, before decomposing the trend into impacts of income source in section 6 and population characteristics in section 7. Section 8 examines the impact of changes in policy and section 9 concludes.

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## 2. AN EXPLORATION OF TRENDS

### 2.1. *The Changing Economy 1987-2003*

We now try to summarize the main characteristics of the period of high growth experienced since the early 1990's and attempt to give some explanations.

We see in table 1 that over the period 1993-2000, Ireland had the highest growth record in the EU, with Real GDP growing by 87%, which is 40% higher than the country with the second highest growth rate, Luxembourg and 76% more than the country with the third best record, Finland. In the process it moved (see table 2) from 83% of EU average GDP pc to 117.7%.

Much literature has been devoted to the causes of this extraordinary growth. Honohan and Walsh (2002) point to a delayed convergence due to global shocks and subsequent policy mistakes. Krugman (1997) attributes the success to a "regional boom" with a cluster of well-educated people and a good IT infrastructure. Whelan (1991) explains that the serious costs of the fiscal contraction were offset by the stochastic effects of the acceleration in global economic growth.

The early recovery coincided with the British recession of the late eighties and early nineties which suppressed Irish wages as emigration to the UK became less fruitful. The devaluations of the Irish pound in 1986 and 1993 increased exports. The centralised wage bargaining system fostered stability in the workplace and influenced lower income tax rates. Lower tax rates helped motivate an increased labour supply (Walsh, 2002). The higher income tax rates of the mid 1980s had negative implications not just for official labour supply but also for the underground economy.

More recent developments include increased female labour force participation (Walsh, 2003) and higher house prices (Hogan and O'Sullivan, 2003). The unexpected house price inflation resulting in an arbitrary redistribution of wealth merits special examination. Globalisation has had a major impact on the Irish economy. The losers of globalisation have been low skilled individuals or agricultural workers vulnerable to foreign competition. The winners include those newly employed in the pharmaceuticals and financial services industries (Barry, 2005). Identifying the winners and losers of globalisation helps policy-makers assist these people to retrain and find appropriate jobs thereby enhancing the results of change.

The Irish labour force structure has changed drastically since independence. Honohan and Walsh (2002) suggest that Ireland experienced a delayed structural transformation whereby labour shifted out of the low-productivity agriculture sector into high-productivity industry and services. This was accompanied by (and contributed to) productivity increases in the agricultural and non-agricultural sectors.

There has been an enormous rise in employment outside of agriculture in recent years. There seems to be no major rise in this figure until the 1990s. This would indicate that the transformation in the structure of the Irish labour market did indeed co-incide with the Celtic tiger era. The previous diagram may not have illustrated this because overall employment was falling in the 1980s whilst there was an increase in the share of services employment.

Figure 1 reveals the spectacular growth performance of the Irish economy between 1991 and 2004 in comparison with other OECD countries. China is the only OECD country with higher real GDP growth than Ireland for this period. Walsh (2002) identifies several exogenous factors behind the high Irish economic growth of recent years.

- The strongest expansion in the US economy since the Second World War.
- Lower corporation tax
- Fall in real Irish interest rates

Walsh (2002) rejects the view that a well thought out strategy to attract Foreign Direct Investment was behind the economic success. He explains that such inducements were actually cut back in the 1990s, although they may have been better targeted. Labour supply was highly elastic in the 1990's. It was always elastic but use was now made of it. Walsh found a correlation of 0.7 between GDP growth and the fall in unemployment. The high elasticity of Labour supply is due to the following:

- Baby boom 60s and 70s.
- Education expenditure in earlier years.
- Low initial participation among married women

Employment growth significantly outpaced population growth, so that GNP per person rose much faster than GNP per person at work or productivity. Ireland is one of the few OECD countries – Austria, the Netherlands, Norway, Switzerland and the U.S. are the others whose unemployment level is at or below the level recorded in the 1960s (Walsh, 2004).

The pattern of growth in real GDP per capita is very interesting. The high growth rates of the late seventies proved to be a false dawn. Fitzgerald (2000) refers to the governments 'dash for growth' policy at that time involving a huge fiscal injection. This caused hardship in future years because the economy was ill-equipped to deal with the world recession of the early 1980s. In the late 1980's there followed a period of fiscal contraction as the current budget deficit declined from 6.2 per cent of GNP in 1987 to 1.6 per cent in 1988. Fiscal contraction restored confidence in the governments handling of the public finances. Real GDP per capita growth reached 7.2 per cent in 1990. This was followed by more modest growth rates as the world economy again went into recession. Growth declined to 1.8 per cent in 1991, a sharp fall from the previous year. This was followed by growth rates of 2.5 per cent in 1992 and 2 per cent the following year. These were reasonable figures given the global economic climate of the time. However male unemployment increased from 12.5 per cent in 1990 to 15.6 per cent in 1993.

The current budget balanced in 1994, the first time in many years. This coincided with a return to the high growth rates of the late eighties as global economic conditions improved. Real GDP per capita grew between 7-10 per cent per annum from 1995-2000, a period often referred to as the Celtic tiger era. The current budget balance achieved a surplus in 1996 and this trend of surpluses continued for the rest of the period examined. Male unemployment appears to be highly pro-cyclical and it fell dramatically from 14.7 per cent in 1994 to 10.4 per cent in 1997. This pattern of rising growth and falling male unemployment continued until 2001/02. Male unemployment fell to 3.8 per cent in 2001 but increased to 4.7 per cent in 2003. The decline of growth rates in subsequent years appears quite dramatic. Real GDP Growth per capita fell from 8.5 per cent in 2000 to 4.4 per cent in 2001 and 2.1 per cent in 2003. This growth decline has been accompanied by higher inflation exceeding 3 per cent from 1999 to 2003. This period was preceded by a low inflation era between 1993 and 1999 when inflation was well below 3 per cent. However expansionary monetary policy (see figure 7) and to a lesser extent fiscal policy helped the economy recover since 2003. Female Labour force participation increased at a steady rate throughout the period from 34.4 per cent in 1988 to 49.1 per cent in 2003. The rate of increase appeared to be independent of the GDP growth rate.

Many identify the current demographic composition of the Irish population as a driving force behind high economic growth. The 1960s and 1970s produced a marriage boom (the highest number of marriages of the 20<sup>th</sup> century took place in 1974, with almost 23,000 marriages in that year). The marriage boom led to a fertility increase, with a peak in birth numbers for the century occurring in 1980 at 74,000. By 1994 births had fallen to just below 50,000 (a decline of one-third from the 1980 peak). The baby boom of the 1970s is now being felt as the large cohort of children from that generation are most valuable to the economy because of their high productivity and consumerism.

This generation has achieved higher education levels than previous generations and provides a cluster of well-educated young people thereby increasing the returns to education. Those born in the 1970s are now of house buying age thus increasing the demand for housing, increasing, at least at present, the returns from property investment. Many of the gainers and losers from this demographic change can be found by investigating changes for property income recipients.

The fertility rate of mothers seems to be partly influenced by their education level. The fertility rate of 2.6 for women with primary education is higher than for those with higher levels of education. However it is not much greater than the replacement rate of 2.1. Given the high correlation between education and income, one can assume that the higher fertility rate for lower educated women increases inequality in the income distribution allowing for equivalence scales.

## *2.2 Income Distribution Studies in Ireland*

Although the first study of income distribution in Ireland, Nolan (1978) came relatively late due to the limited availability of micro data. Early studies such as Nolan (1978, 1981) and O'Connell (1982) based their analyses on published distributional information from the 1973 Household Budget Survey (HBS). Without access to micro data, it made it difficult to incorporate concepts such as equivalence scales. Murphy (1985) using actual HBS data for 1973 and 1980, however found that studies using published interval information such as Nolan (1981) and O'Connell (1982) slightly underestimated inequality because of the existence of within group inequality. Callan and Nolan (1993) examined the trend in inequality over the period 1973-1987, finding that the Gini coefficient of gross incomes rose over this period. Callan and Nolan (1997) utilising new data from the 1987 ESRI Survey as well as the HBS's since 1973, looked at the distribution of income over the 1970's and 1980's while Callan and Nolan (1999) extended the analysis to 1994 using the Living in Ireland Survey. Meanwhile O'Neill and Sweetman (1999) utilised the HBS comparing inequality between 1987 and 1994 considering both consumption and income. Collins and Kavanagh (1998) using the HBS examined the trend in inequality from 1973 to 1994. Nolan et al. (2000) carried out a detailed study of the income distribution in Ireland extending the analysis to 1997. Nolan and Maitre (2000) placed trends in income inequality in an international context. The most recent studies such as Clancy and Madden (2005) and Cussen (2005), using the HBS and Nolan and Smeeding (2005) using a range of surveys bring the analysis up to recent times to respectively 2000 and 2001.

### 3. METHODOLOGY

In this section we describe the methodology used in this paper. We consider initially the measure of inequality used, before introducing a regression based decomposition.

#### 3.1 Cross Sectional measures of Inequality

The measures employed in this paper to measure income inequality are the Mean Logarithmic of Deviation, the Income Weighted Theil and the Half Squared Coefficient of Variation Index (commonly referred to as the Generalised Entropy Class of inequality measures,  $I_0$ ,  $I_1$  and  $I_2$ ). The general formula of the Generalised Entropy Class of inequality measures is given by

$$GE(\alpha) = \frac{1}{\alpha^2 - \alpha} \left[ \frac{1}{n} \sum_{i=1}^n \left( \frac{y_i}{\bar{y}} \right)^\alpha - 1 \right] \quad (1)$$

where the  $y$ 's are the individual incomes and  $\bar{y}$  is the arithmetic average in a population of  $n$  individuals. If everyone has the mean income, then the value is zero. The mean income divides the population into an upper tail and a lower tail. In the upper tail the ratio is above unity and it is below unity in the lower tail. If  $\alpha$  is equal to unity, then we have equal weighting of the ratios. When  $\alpha$  is larger than unity, the high incomes have even higher income in the sum and the low-income ratios become even smaller in the measure of inequality. When  $\alpha$  is smaller than unity, the lower tail ratios get closer to unity (become more important in the sum) and the higher value incomes get pulled back to the mean.

The three typical values of  $\alpha$  frequently used in empirical research are zero, one and two, and these values result in the following three measures of inequality.

$$\text{Mean log deviation } GE(0) = \frac{1}{n} \sum_{i=1}^n \ln \left( \frac{\bar{y}}{y_i} \right) \quad (2)$$

$$\text{Theil index } GE(1) = \frac{1}{n} \sum_{i=1}^n \left( \frac{y_i}{\bar{y}} \right) \cdot \ln \left( \frac{y_i}{\bar{y}} \right) \quad (3)$$

$$GE(2) \text{ is half of the square of the Coefficient of Variation} = \frac{1}{\bar{y}} \left[ \frac{1}{n} \sum_{i=1}^n (y_i - \bar{y})^2 \right]^{1/2} .$$

One other measure that is widely used in looking at inequality is the Lorenz curve based measure, the Gini coefficient (fails decomposability generally)

$$\text{Gini} = \frac{1}{2n(n-1)\bar{y}} \sum_{i=1}^n \sum_{j=1}^n |y_i - y_j| \quad (4)$$

One of the main axioms which we usually require inequality measures to meet is that of decomposability. This requires overall inequality to be related consistently to constituent parts of the distribution, such as population sub-groups. For example if inequality is seen to rise amongst

each sub-group of the population then we would expect inequality overall to also increase. Some measures, such as the Generalised Entropy class of measures, are easily decomposed and into intuitively appealingly components of within-group inequality and between-group inequality. The Gini coefficient fails decomposability generally.

Jenkins (1995) used a decomposition rule to treat total inequality in a given year as the sum of factor contributions, where each contribution depends on the incomes from a given factor source. Shorrocks (1982a, b) proves that the choice of decomposition rule is totally independent of the choice of inequality index and that there are, in principle, an infinite number of possible decomposition rules for each index. Jenkins uses an index that can handle the regular incidence of zero incomes. The results show that the within group inequality component dominates the between group inequality for each year. The between group component is largest for the earnings status decompositions, but even then is never more than one-fifth of total inequality.

### 3.2 Regression-based Decomposition of Inequality

Morduch and Sicular (2002) argue that decomposition by population groups is dependent on sample size, so that the use of many sub-categories often is not feasible given data constraints. The method also makes it difficult to examine the influence of variables such as age, which might be more properly regarded as continuous variables. Use of large numbers of categories, also make the calculations quite difficult.

Because of these methodological problems, a regression-based method, has been developed by Gary Fields and utilised by Fields and Yoo (2000), Redmond and Kattuman (2001) and Morduch and Sicular (2002), to investigate the contribution made by such factors such as unemployment, labour force participation, family status, age distribution, education distribution etc to inequality.

The method starts with a decomposition of total income  $Y$ , into a regression equation as detailed in formula (5).

$$Y = X\beta + \varepsilon \quad (5)$$

Where  $X$  is an  $n \times M$  vector of attributes and  $\varepsilon$ , an  $n \times 1$  vector of residuals. The next step involves splitting for each unit,  $i$ , total income into the component  $Y_i^m$ , accounted for by each independent variable  $\beta_i$  as defined in formula (6).

$$Y_i = \sum_{m=1}^{M+1} Y_i^m \quad \begin{array}{l} \text{For } m = 1, \dots, M \\ \text{For } m = M + 1 \end{array} \quad (6)$$

where  $Y_i^m = X_i^m \beta^m$ ,  $Y_i^m = \varepsilon_i$ ,

Instead of using a decomposition method for population groups, we can therefore use a decomposition method for income characteristics. Inequality is broken up into the “absolute factor contribution”.  $S_f$  is defined in equation (7).

$$I = \sum_f S_f = \sum_f \rho_f \chi_f \sqrt{H_f} \quad (7)$$

where  $\rho_f$  is the correlation between component  $f$  and total income and  $\chi_f = \frac{\mu_f}{\mu}$  is factor  $f$ 's factor share.

In this way, from (7) above, total income variability can be decomposed into its components accounted for by these independent attributes as described in (8).

$$I = \sum_{m=1}^{M+1} \rho_m \chi_m \sqrt{I \cdot I_m} \quad (8)$$

$$\text{where } I_m = \frac{\sum_{i=1}^n (\beta^m \cdot X_i^m - \beta^m \cdot \bar{X}^m)^2}{2 \cdot \left( \sum_{i=1}^n (\beta^m \cdot X_i^m) \right)^2}$$

In addition to capturing the impact of the economic structure on *levels* of inequality at a particular point in time, we utilise the method of Fields and Yoo (2000) to assess the impact of the *change* in the structure of the economy on the change in the income distribution so as to identify the impact of the economic transition.

Where  $I_1$  and  $S_{f,1}$  represents respectively the level of inequality and contribution of factor  $f$  at time 1 and  $I_2$  and  $S_{f,2}$ , the corresponding values for time 2, then equation 9 represents the contribution of the  $f^{\text{th}}$  factor to the change in inequality.

$$\Pi_f(I) = \frac{[S_{f,2} * I_2 - S_{f,1} * I_1]}{(I_2 - I_1)} \quad (9)$$

#### 4. DATA

In this paper, in our empirical analysis we use a number of different data sources made available by the Economic and Social Research Institute, Eurostat and the Central Statistics Office via the Irish Social Science Data Archive:

- The Study of Income Distribution and Use of State Services (SIDUSS), 1987
- The Living in Ireland Survey (LII), 1994-2001
- European Commission Household Panel Survey (ECHP), 1994-2001
- The Household Budget Survey (HBS), 1994-2000
- Survey of Income and Living Conditions (EU-SILC), 2003 - 2004

The SIDUSS was a survey collected by the ESRI in 1987, containing 8549 individuals. The Living in Ireland (LII) survey is essentially the Irish component of the European Community Household Panel (ECHP). These surveys track all individuals living in private households between 1994 and 2001. The first wave of data was collected in 1994, and the same respondents have been interviewed every year since then. Individuals are surveyed about their age, income, employment status, education, health, social relations, migration and satisfaction. One distinction however is that the LII contains a booster sample to account for the non-random attrition that occurs in the panel in the years 2000 and 2001.

The main income concept used in the ECHP refers to income received by all household members from all sources in the previous calendar year. The ECHP survey tends to take place at the end of the calendar year. Therefore respondents are often reporting their income levels from 9-12 months previous. The Living in Ireland (LII) survey uses a different approach towards income measurement. It measures income received in the previous week or month depending on the pay period-with only capital and self-employment income assessed over a year.

The LII unlike the ECHP was significantly boosted in 2000 and 2001 to counteract the high attrition rate. Data is collected from responding households but the unit of analysis is the individual unlike the Household Budget survey which analyses the household. The HBS is a cross section survey (See Murphy (1984) for further information) obtaining results from a different set of households in 1994-95 and 1999-2001, whereas the ECHP and LII are longitudinal seeking to refer to the same people every year. Because, the HBS is collected over 6 quarters from quarter 2 in the first year to quarter 3 in the second year, we split the sample to attempt to identify income inequality separately for the two years, acknowledging some bias in relation to seasonality and some components of non-randomness, for example in the collection of incomes by farmers.

The HBS income is top coded at £800 per week (Madden, 2002). Clancy and Madden (2005) accounted for this by trimming the top and bottom three per cent of the distribution. The CSO provided Nolan and Smeeding (2004) with person weighted and equivalised figures from the Household budget survey. The HBS has approximately twice the sample size of the LII.

The ECHP and LII were discontinued in 2001 and have been replaced by Survey of Income and Living Conditions (EU-SILC). The EU-SILC data has approximately 5000 households. There are a number of data collection differences however. Firstly the income questions relate to the 12 months before the interview, compared with income from the last week or month in the LII and from the previous calendar year in the ECHP. The EU-SILC in 2003 also has a potential seasonality problem in that interviews were only carried out over the last 6 months of the year. The 2004 and subsequent surveys contain data for 12 months. Lastly while there is a small longitudinal component of approximately 30% of households from 2004, the 2003 wave contains individuals sampled for the first time in 2003. The welfare measure used in this paper is Equivalised Household Disposable Income.<sup>1</sup> The equivalence scale, which is used to account for economies of scale of multi-person household, that is used is the modified OECD scale, weighting

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<sup>1</sup> While most of the analyses have utilised the concept of disposable income, a measure of income after direct taxes, social insurance contributions and state, benefits O'Connell (1982), using additional tabulations provided by CSO, Ireland, was able to extend earlier analyses such as Nolan's (1981) analysis to include the income concept, final income. This measure includes both indirect taxes and non-cash benefits such as medical services, education, housing and non-cash social welfare benefits, postal and transport services. The impact of adding these instruments was to increase income inequality as measured by the Gini coefficient. O'Connell also examined the effect of tax and expenditure categories on overall inequality individually and found that social welfare pensions, health expenditure had the largest impact, with all benefits (cash and non-cash) benefits reducing inequality with the exception of education expenditures.

the head of household 1 and additional adults at 0.5 and children aged 13 or younger at 0.3. The definition of disposable income in term of sub-components is defined as follows:

- Male Gross Earnings
- *plus* Female Gross Earnings
- *plus* Self-Employment Earnings
- *plus* Farm Earnings
- *plus* Capital Income
- *plus* Social Welfare Income
- *plus* Other Income
- *minus* Tax and Social Insurance Contributions

## 5 INITIAL DATA ANALYSIS

In this section we describe the aggregate trends in income inequality in Ireland over the period of this study 1987-2004. While other series are available such as the HBS series 1973-1987, we report only those datasets with which we could use a standard methodology based upon access to micro-data.

Figure 3 describes the initial analysis carried out for this paper utilising the 1987 SIDUSS, the 1994-2001 ECHP and 2003 EU-SILC datasets using the original imputations and weights. The plot describes the Gini measure of inequality for each of the years, indicating a decline in income inequality over the period, particularly in the period post 1994, with slight rises in 1995 and 1999. This result is consistent with the ECHP based analysis by the *Joint Report by the Commission and the Council on Social Inclusion* (2004).

On the face of it, it would seem that the period, marked by strong growth in the post 1994 era, as indicated by the graph on the secondary axis of real GDP per capita (baseline 1987 = 1) coincides with a period of falling income inequality. However as identified by Nolan and Smeeding (2005), there are a number of measurement issues associated with the ECHP. While most inequality analyses in Ireland, use current income definitions which relate to incomes in the previous week or month, the ECHP income definition, for comparability reasons is the income from the previous calendar year. Thus the accounting period used in the 3 surveys is different. However of greater concern is the degree of attrition within the ECHP, which we see in Table 5 that only 38% of the original sample remains by wave 8. As it is likely that individuals leave the sample in a non-random fashion, this may affect our results. Nolan and Smeeding (2005) also highlight the impact of different weighting mechanisms being used.

In a similar way to Nolan and Smeeding (2005), we contrast the results produced in the ECHP with that produced by other surveys. In Figure 4 we include the Living in Ireland Survey (LII). Note however that the definition of disposable income used in the LII here is before imputations have been included. While results are similar in the years 1994-1999, the direction changes 1999-2001, due primarily to the booster sample collected.

However the LII data excludes imputed values of incomes of individuals who either ignored some income questions or who did not respond to particular waves. Similarly, the CSO released a revised set of SILC data in 2003 with new imputations and weights and used a similar

methodology in 2004. In Figure 5, we compare the trend in the Gini, including imputed data in the LII and SILC, giving us a very different trend. Here we see the Gini oscillating around 0.32 over the period 1994-2004, without any obvious trend

As a comparison to LII and ECHP over the period 1994-2001 we can use another dataset, the Household Budget Survey for 1994-2000. We must note however that the top-coding contained within the HBS is likely to result in a lower level of income inequality than without this effect. In figure 6, we see that the trends observed in the HBS lend support to the use of the LII containing imputations. Table 6, compares the Gini measure with the Generalised Entropy measures of inequality, not finding any obvious trend.

To conclude there is a mixed message coming from the data. There is little evidence of a significant trend in the gini. In the remaining analyses in the paper, we chose to use the Living in Ireland Survey for the years 1994-2001 as the basis for our analysis, avoiding the issue of top coding in the HBS and attrition contained in the ECHP.

## **6. EMPIRICAL ANALYSIS 1 – INCOME DISTRIBUTION**

In this section, we try to decompose disposable income into the income components that influence the variability of income. Table 7 reports the decomposition of inequality using the  $I_2$  measure of inequality, into the impact of its factor components.

Over the period 1987-1994, the biggest drivers of change in the fall in inequality were Non-agricultural self-employment income, due in large part to the decrease in inequality of this factor income and due to the decline in the correlation with total income. This was followed by farm income, while the change in capital, social welfare and other incomes were relatively minor. Female employment income together with taxes worked in the opposite direction.

Between 1994 and 2000, all earned income sources except for male income made a downward contribution to the fall in inequality, with the decline in female employment income and both self-employment incomes being due particularly large falls in the level of inequality of these incomes. The decline in inequality for male incomes was lower. The biggest impact on declining inequality however was the contribution made by the tax and social contribution system.

Between 2000 and 2004, employment income had the largest downward pressure impact on inequality. We cannot distinguish between male and female employment income in the EU-SILC and so we report the combined figure. Self-employment and social welfare income however dominate, pushing total inequality in the other direction. We see that the decline in the inequality of self-employment income is one of the prime determinants of this. For farm income, a decline in the factor share together with a decline in the factor correlation is the prime cause of the impact. In relation to capital income, it is hard to see how a period of economic growth could result in such a large decline in the share of this income and so the difference may due more to statistical collection issues.

## **7. EMPIRICAL ANALYSIS II – POPULATION DISTRIBUTION**

In this section, we focus on the impact of changing population composition on inequality. Population characteristics may impact upon income inequality because incomes may be related to these characteristics. For example higher income may be associated with higher human capital characteristics, while older people in a household may be associated with lower incomes due the existence of lower incomes in retirement. Other studies such as Collins and Kavanagh (1999) utilise single category decomposition methods such as the Shorrocks decomposition, however in

this paper we prefer to use the regression based method described above that allows us to consider different categories simultaneously.

As part of this analysis, we regressed equivalised disposable income separately for each of the three datasets on the following explanatory variable groups:<sup>2</sup>

- Age: Number of people in household
- Family Type: Head of Household (Single, Single with Children, Married, Married with children).
- Employment Status: Number of people in household (Male Employee, Female Employee, Self-Employed, Farmer, Relative Assisting, Unemployed, Student, Retired, Other Inactive).
- Region: (South and East, Border Midland –Western)
- Education Level of Head of Household: (Compulsory, Upper Secondary, Tertiary).

In table 8, we illustrate the results that have been grouped across the individual categories into these broad headings. The numbers in the table refer to the proportion of overall inequality accounted for by the individual characteristic groups, while the numbers in brackets refer to the proportion of explained variability accounted for.

Overall we see that employment status is the main driver of inequality, accounting for about 40-75% of explained variability, declining from 1987 to 2000 and increasing from 2000 to 2004. Within this heading, the main change has been an increase in the contribution male employees make, while the contribution of self-employed declines. Because of multicollinearity, we cannot identify industrial category separately in the regression equation and thus within this framework cannot address industrial change. However it should be noted that the position of industrial workers improved over the period of the study, moving up the distribution, being accompanied their share

The next most important heading is education, rising as percentage of the explained variation from 1987 to 2000, before declining substantially in 2003, being driven by the increasing impact of higher education on inequality over the period. There are a couple of factors that influence this. Firstly the increase in the proportion of the university educated has led to a widening of the earnings distribution. Also there has been a shift up the distribution of highly educated, especially in the period 1987-1994 and conversely a slip down the distribution, especially of those with lower qualifications which corresponds to the conclusion of the next most important category, Age.

Age has a relatively small impact on inequality, with the overall trend disguising the fact that the impact of young children on inequality declines over the period as the proportion of children falls and as families with children move to the centre of the distribution, while the impact of elderly rises for the opposite reasons, with an increase in the numbers of those aged 65 or higher and a decline of their position in the income distribution.

Region has a very small impact as well, with individuals in the Border, Midland and Western region being slightly more likely to be at the bottom of the distribution, a situation that improved

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<sup>2</sup> The results are available on request from the authors.

slightly between 1987 and 1994, but declined subsequently.

## 8. IMPACT OF PUBLIC POLICY

We turn to the impact of policy instruments, where instead of using data based variables we consider the impact of simulated variables using the EUROMOD tax-benefit model for the EU15, see (O'Donoghue et al., 2001).

In table 9 we look at the impact of different tax-benefit instruments on income inequality. In the first part we look at the impact of different groups on income inequality as measured by the Gini coefficient.<sup>3</sup> The first measure describes the inequality of market income (as measured by incomes before social contributions, income taxes and benefits have been included.) Because we use a simulation model that can identify employer social insurance contributions, our measure of market income is defined as incomes before employer contributions have been paid. We assume that employer contributions are incident on the employee. Ireland has amongst the highest level of market income inequality. The country with the lowest level of market income inequality is the Netherlands, with a Gini of less than 50. The other countries have Gini coefficients in the range 50-60. Amongst the other highest inequality levels are the countries with the highest levels of inequality for each of the income measures, Greece, Spain and Portugal reflecting wider levels of inequality in these countries. Belgium however has the highest level of market income inequality.

Adding benefits and pensions to market income we have what we define as gross income. The ranking of countries is largely the same. Ireland's ranking falls slightly from 12<sup>th</sup> to 13<sup>th</sup> under this measure, highlighting the relatively less distribution accounted for by the state benefit and pension system, which is partly accounted for by the reliance on private pensions in retirement in Ireland. However the more means tested nature of the Irish benefit system results in the 6<sup>th</sup> largest decline in the Gini. The importance of redistribution due to benefits and pensions in Belgium and Finland, result in their ranking improving, with Belgium, moving to 10<sup>th</sup> from 15<sup>th</sup> and Finland moving to 2<sup>nd</sup> from 9<sup>th</sup> and Sweden moving to 5<sup>th</sup> from 11<sup>th</sup>. The lack of redistribution due to these instruments in Greece and Italy, reflecting the low coverage and small value of benefits and pensions, results in these countries moving from 10<sup>th</sup> to 14<sup>th</sup> and from 7<sup>th</sup> to 12<sup>th</sup> respectively. In the Netherlands, due to high employment rates that result in a low market income inequality and also the high degree of private provision in pensions benefits and pensions reduce inequality by a relatively small amount.

Subtracting direct taxes, employer social insurance contributions and employee contributions, we have disposable income. Ireland's ranking increases slightly to 11

The most redistributive direct taxation occurs in Germany, Austria, Denmark, Belgium, Luxembourg, Sweden, Finland and the Netherlands, resulting in these countries being the countries with the lowest disposable income inequality. Greece, Italy and France have the lowest change in the Gini due to direct taxes.

Subtracting indirect taxes from disposable income, results in what we define as final income. We only report final income inequality for 12 countries, due to data restrictions. Here, the low level of negative redistribution due to indirect taxes observed in Belgium, results in Belgium now have the lowest level of inequality followed by Luxembourg and the Netherlands. Relatively regressive

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<sup>3</sup> Note that the definition of income differs somewhat from the data used in the previous analysis. In the EUROMOD model, taxes and benefits are simulated rather than taken from the data and do not account for evasion or benefit take-up issues. Similarly the data in some cases has been adjusted to account for data being older than the 1998 simulation year.

indirect taxes see Finland moving from the lowest disposable income inequality level to 4<sup>th</sup> in final income inequality, even with the relatively low inequality countries of Austria, Denmark and Germany being excluded. As in the case of disposable income Portugal, Greece and Italy occupy the 3 worst rankings, with regressive indirect taxation in Ireland, swapping places with Spain to go 8<sup>th</sup>. France and the UK consistently have stayed upper-middle ranked in terms of inequality.

## 9. CONCLUSIONS

In this paper we have described a preliminary analysis into the impact of the changes in Irish society during the period of the economic expansion of the 1990's. We highlighted the trend of slight decline in inequality over the period, although this is couched in terms of uncertainty relating to the data. We decomposed the change in inequality in a number of dimensions, considering first the impact of income sources and then the impact of population characteristics. We completed the analysis looking at the comparative position of Ireland and the impact of the tax benefit system.

To conclude we must highlight that this paper perhaps has thrown up more questions than answers. Firstly we need to address issues relating to the imputation and reweighting methods that the ESRI and the CSO apply to their data, which as Nolan and Smeeding (2005) highlight even variants of data based upon the same questionnaires can result in different conclusions. Secondly more work is required in harmonising the definitions used in the different surveys, where again seemingly similar variable and category definitions seem to imply rather different patterns. It may be partially related to sample variability and the weighting mechanism used. Thirdly, to make the household budget survey compatible, we need to understand the effect of top-coding of incomes on the distribution of income.

Because of the comparability issues relating to the definition of some of the variables such as industry and occupation, we have delayed further analysis into the impact of the change in industrial and occupational structures that have occurred during the expansion. This is planned as the next step in our analysis. Future work will extend these analyses to assess the impact not only on the cross-sectional income distribution, but exploiting the panel data nature of the Living in Ireland Survey, assess the impact on income mobility. Also while the work thus far as focused on real variables, differential inflation can have a particular impact on welfare, especially for those on fixed incomes such as pensioners. We will exploit the work of Garvey and Murphy (2005) on differential price inflation to achieve this. Lastly we have just touched on the impact of the tax-transfer system on income inequality over the 1990's, further is necessary to disentangle these impacts in more detail.

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