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Understanding Irish Labour Force Participation

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Abstract: This paper explores developments in the labour force participation rate in Ireland. Given the important role of labour supply in explaining Irish economic growth, we aim to identify the relative influence of structural and cyclical factors in the recent dynamics of Irish labour force participation. Using a number of empirical approaches our results highlight the role of age, nationality and gender on the participation rate. We also find that the recent decline in female participation is entirely a response to the stage in the economic cycle given the weaker labour market, whereas the fall in male and overall participation also reflects the influence of some structural factors. Accordingly a rise in the participation rate is to be expected in the near term as the economic recovery continues, and current measures of slack in the economy should account for this. Combining our results and various population projection scenarios, we show that policy actions to increase female participation may not in and of themselves yield significant changes in the aggregate trend participation rate over the medium term owing to the stronger influence of the falling male trend. Higher immigration is the most effective way of offsetting the expected decline in trend participation out to 2025.

JEL classification: J11, J21.

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The views expressed in this paper are our own, and do not necessarily reflect the views of the Central Bank of Ireland or the ESCB.

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I INTRODUCTION

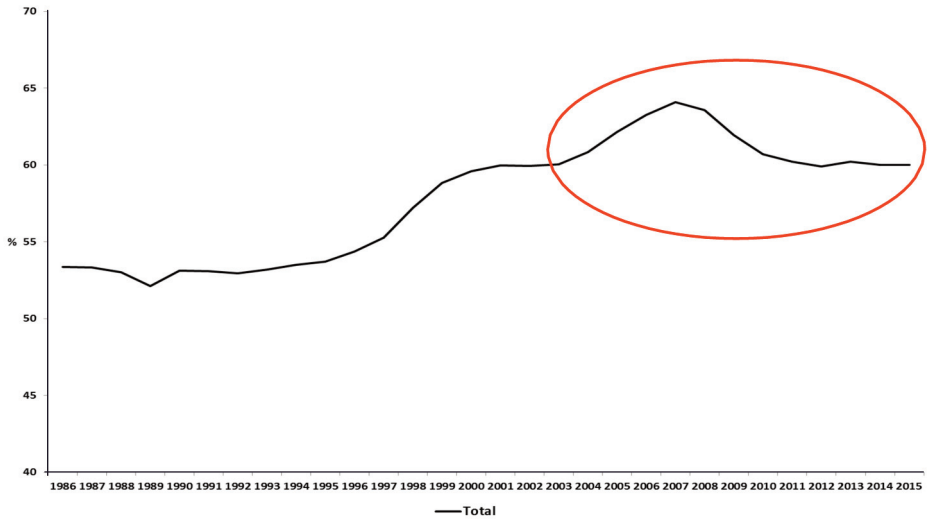
There has been a continued interest in the development of labour force participation in advanced economies given generally ageing populations and the relative attachment of various age/gender cohorts to the labour force.[1] It has been noted as a potential indicator of "secular stagnation" in both the United States and the European Union. Since the Great Recession of the late 2000s labour force participation rates (LFPRs) in many countries have typically fallen, including in Ireland which has one of the more favourable demographic profiles of advanced economies. From a policymaking perspective it is important to understand how much of these changes in the LFPR reflect an underlying trend given the population structure, demographic factors such as ageing and migration, and the fundamental attachment of various cohorts to the labour market, versus how much reflects cyclical responses to the changing economic environment. If the decline in the LFPR is cyclical, then a cyclical recovery of the economy will in and of itself bring the LFPR back up to pre-recession levels. However, if the decline is more structural in nature then one might anticipate that the LFPR may be lower than it was prior to the Great Recession for an extended period of time. In the medium term, both actual and potential output could be negatively affected by fundamentally lower levels of labour force participation, which should at least be taken into account when designing counter-cyclical policy and may require a number of alternative policy responses in and of itself.

Increases in the labour force participation rate (LFPR), particularly for females, was a notable part of the Irish growth story during the Celtic Tiger period up to 2001. Following this, participation rates from the mid-2000s up to 2008 reached historic highs, assisted by robust inward migration in the wake of the enlargement of the European Union in 2004. From the onset of the domestic financial crisis and recession however, participation rates have fallen back to levels seen at the early part of the century (Figure 1). It is this decline that is the main focus of this paper.

In this paper, we exploit a number of descriptive and empirical approaches to understand the trend and cycle component of the LFPR in Ireland. We first describe the development of the LFPR from the early 2000s to the present, highlighting the key demographic and cohort specific drivers of the aggregate developments over the period. The first empirical approach uses microdata from the Quarterly National Household Survey (QNHS) and examines the determinants of transition probabilities in and out of the labour force, and how the impact of these fundamental determinants change through the economic cycle. In the second empirical approach we estimate a cohort-based model of the LFPR for both males and females. We

[1] Throughout the paper the standard International Labour Office (ILO) definition of labour force participation is used unless otherwise specified, that is the proportion of all individuals over age 15 either in employment or seeking work.

Figure 1: Labour Force Participation Rate



incorporate data on the unemployment rate, employee compensation and unemployment benefits to identify the cyclical component in the LFPR, while age and birth-year cohort effects identify the trend LFPR. Taking these two empirical approaches we show the relative importance of trend and cycle effects on explaining the development of the LFPR in recent years. We also provide estimates for the trend LFPR over the medium term to 2025 and discuss the resulting implications for actual and potential output growth, as well as relevant policy initiatives.

In the theoretical literature, both supply-side real business cycle (RBC) models and demand-led new Keynesian models have framed the decision to participate in the labour market in the returns relative to home production (non-participation), following the incorporation of such a mechanism in Benhabib *et al.* (1991).[2] Erceg and Levin (2014) highlight the role of adjustment costs to moving in or out of the labour force and showed how these cause the participation rate to lag and react sluggishly to the unemployment rate given a demand side shock. Search and matching models of the labour market, typical in the RBC literature, build on the Diamond-Mortenson-Pissarides model (Pissarides, 2000) by endogenising the participation decision. Haefke and Reiter (2006) and Veracierto (2008) are early examples of this approach, but in the absence of very restrictive assumptions on wage adjustment their models exhibit a pro-cyclical unemployment rate. This would only be consistent with an implausibly strong discouraged worker effect, where

[2] The standard approach up to then, and in much work since, has been to consider only two states of employment or unemployment and not to consider the third state of non-participation/inactivity/home production.

people decide to become inactive almost immediately when faced with a weakening labour market. In an alternative approach, Shimer (2013) allows for a sticky-wage mechanism consistent with search/matching frictions following Hall (2005). He shows that where the relative dis-utility of employment and unemployment are equal, his model can generate a plausible counter-cyclical unemployment, slightly pro-cyclical LFPR and strongly pro-cyclical employment. Krussel *et al.* (2012) highlight the role of individual and household characteristics in the relative returns to participation and how it is that the relative impact of these characteristics at different stages of the cycle is what determines the transition in or out of the labour force. They show that groups that are relatively indifferent between participation and inactivity given their characteristics are most responsive to various types of shocks and typically drive the flows into and out of the labour force as well as the development of stocks of employed, unemployed and inactive over the business cycle. In essence this points to a dual channel for how the cycle affects the LFPR, a direct impact and an indirect impact through the relative role of individual or household characteristics on the probability of moving in/out of the labour force. Our first empirical approach aims to see whether this second indirect channel is identifiable in the Irish context.

Empirically the flows into and out of various labour market states have been studied extensively, with most attention being paid to the transition into and out of unemployment. In terms of methodology, discrete choice models have been used by Poterba and Summers (1995) and Alba-Ramirez (1999) to examine the effect of unemployment insurance on the duration of unemployment in the US and Spain respectively. Fabrizi and Mussida (2009) use a similar approach to this paper to analyse the impact of various individual characteristics on transition probabilities into and out of the labour force in Italy over two time periods, 1993-94 and 2003-04. They find differing effects of the gender and age variables between the two time periods, however they do not attempt to explain whether these are the result of cyclical factors or structural changes that occurred over the period. In related work for Australia, Rotaru (2014) finds that older workers have a higher probability of exiting the labour force when unemployed.

In the Irish context both Bergin *et al.* (2015) and Conefrey *et al.* (2015) explore the changes in the probabilities of transitioning into and out of unemployment over the 2006 to 2011 period. They note that the rate of transition from unemployment to employment declined, while the rate of transition from employment to unemployment increased. Similar to findings from other jurisdictions, young people became less likely to exit unemployment while education played the largest role in determining the probability of exiting unemployment. Conefrey *et al.* make the point that a potential re-entry of a large pool of labour supply back into the labour force may slow the fall of unemployment over the coming years.

This paper also feeds into an older literature on labour force participation in Ireland taking a more macro perspective on labour market states, but again rooted in explaining the developments in unemployment (Newell and Symons, 1990; Barry and Bradley, 1991). Walsh (1993) explored the large increases in female labour force participation in Ireland in the 1970s and 1980s in the context of the persistence of the unemployment problem over the period. He found that the rising female LFPR was largely attributable to a fall in the birth rate and a rise in the relative returns to labour force participation due to increased educational attainment and institutional changes such as equal pay legislation. Of particular relevance to the current paper is his finding that the female LFPR is more sensitive to changes in the relative returns to participation than that of males. These results are echoed by Russell and O'Connell (2004), who also highlight the importance of educational attainment and care of dependants in explaining female transitions into the labour force.

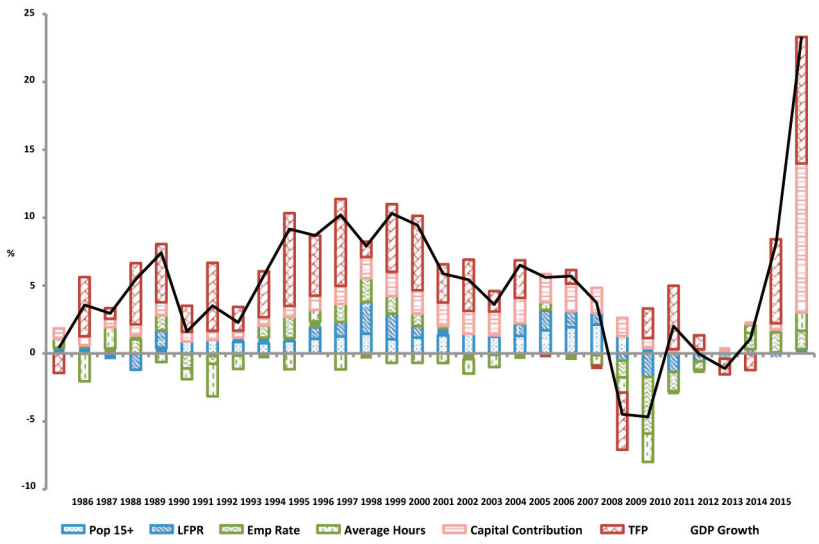
The extent to which the recent decline in participation reflects structural issues consistent with population ageing and changes in the fundamental attachment of particular cohorts to the labour market, as opposed to cyclical factors stemming from the Great Recession, has been examined empirically for a number of countries. Using approaches similar to those in this paper, Aaronson *et al.* (2014) and Kudlyak (2013) find that most of the decline in the LFPR in the United States in recent years reflects structural or trend factors that would have arisen irrespective of the weakness of the economy during the Great Recession. The ageing of the population, alongside lower levels of participation by younger age groups due to a greater tendency to pursue further education, is noted as putting pressure on the LFPR in the United States from both ends of the demographic spectrum. Aaronson *et al.* highlight the importance of knowing this when analysing measures of slack in the labour market, as a low LFPR driven by structural factors would not increase in line with economic activity to the same extent as one which is dominated by cyclical factors. Focussing on the impact of changes in structural norms, particularly for female participation, Balleer *et al.* (2014) estimate a cohort-based model for a number of European economies. They find that positive birth-year cohort effects, consistent with changes in social norms and institutions, alongside changes in the age composition of the population, can explain the bulk of the increase in the female LFPR and the decrease in the male LFPR evident in their sample of countries. Projecting forward, they estimate that the positive influence of cohort effects will, for the most part, offset the impact of population ageing on the LFPR. In a recent contribution for Ireland, Bercholz and FitzGerald (2016) note the increased rates of participation in education for females in their twenties since 2007 as a corollary for the decline in labour force participation for that cohort over the period. They contend that this should lead to higher labour force participation for this cohort in future years driven by their higher level of educational attainment.

The paper proceeds as follows: Section II considers the wider economic impact of changes in the LFPR and decomposes the drivers of LFPR developments. Section III presents an empirical model of transition probabilities into and out of the Irish labour force and whether there are differences in these at different stages of the economic cycle. In Section IV we outline a cohort based model of the Irish LFPR. Section V discusses the results of the cohort model in the context of actual and potential output growth and relevant policy developments, while Section VI concludes.

II EXAMINING THE ROLE AND DRIVERS OF LABOUR FORCE PARTICIPATION RATE DEVELOPMENTS

An appreciation of the contribution of labour supply and in particular the tendency of the working age population to participate in the labour force is an important motivating factor in this paper. In Figure 2, we apply a simple growth accounting approach to assess the relative labour, capital and total factor productivity contributions to Irish GDP growth over recent decades. The labour component is in turn decomposed into factors that can be considered more demand-driven, such as the employment rate and average hours worked, and factors more supply driven such as the working age population and the LFPR.

Figure 2: A Decomposition of GDP Growth



Source: Own estimates based on data from the CSO, Eurostat and AMECO. 2014 and 2015 figures are preliminary estimates given data available at the time of writing.

As can be seen, labour supply played a non-trivial role in explaining the Irish growth story during the Celtic Tiger period of the mid-1990s to early 2000s. This was reflected in demographic factors, with a rise in the working age population, and also in a higher tendency to participate in the labour force. In the mid-2000s, much of the growth in GDP was attributable to labour supply, reflecting the role of inward migration from those EU Member States which joined in 2004 and further increases in the LFPR.

During the financial crisis and recession, both labour supply and labour demand factors contributed to the fall in GDP. However considering the labour supply issues, falls in the LFPR contributed to negative GDP growth while there has been no contribution from population changes as net emigration has been offset by higher numbers of people reaching or remaining in working age. A notable feature of the recovery in GDP growth in more recent years has been the relative absence of labour supply drivers, and in particular the weak LFPR in contrast to the experience of most years since the mid-1980s. While theory would suggest some lag in the reaction of participation rates to changes in the economic cycle, it is an empirical matter to determine how much of the weak LFPR contribution reflects cyclical factors and how much reflects structural or trend factors. Our descriptive and econometric analysis below aims to identify these factors.

2.1 Decomposing LFPR by Gender, Nationality, and Age Group

Aggregate LFPR at time is the population (*Pop*) weighted sum of LFPR by the various active age demographic groups of interest (*i*):

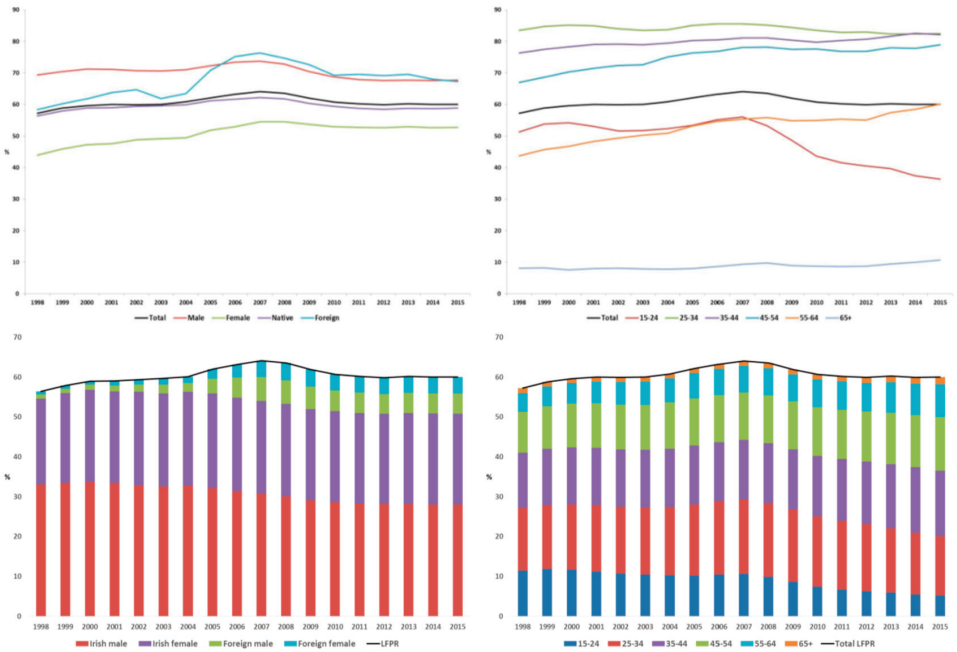
$$LFPR_t = \sum_i s_t^i LFPR_t^i \tag{1}$$

$$s_t^i = \frac{Pop_t^i}{Pop_t} \tag{2}$$

where s_t^i is the share of demographic group *i* in the total population in a given time period *t*. Figure 3 shows the developments of the LFPR for certain age, gender and nationality groups, and the contribution of those groups to the aggregate LFPR. Moving clockwise from top left, the first chart shows that the rise in the aggregate LFPR in the mid-2000s mostly coincided with a strong rise in the participation rate of immigrants and, to some extent, females. The second chart suggests the fall in the LFPR in the aftermath of the financial crisis was primarily reflected in a lower tendency of 15-24 year olds to participate in the labour force. This is corroborated by the chart in the bottom right, where the contribution of the 15-24 year old LFPR to the aggregate LFPR can be seen to be falling from 2007 onwards, as has that of the 25-34 year old age group. The chart on the bottom left of Figure 3 shows the

increasing importance over recent years of the role of immigrants in the aggregate LFPR. This stands in contrast to the contribution of native Irish, which has been declining since 2000.

Figure 3: Contributions of Gender, Nationality and Age Group to Aggregate LFPR



Source: CSO and Eurostat.

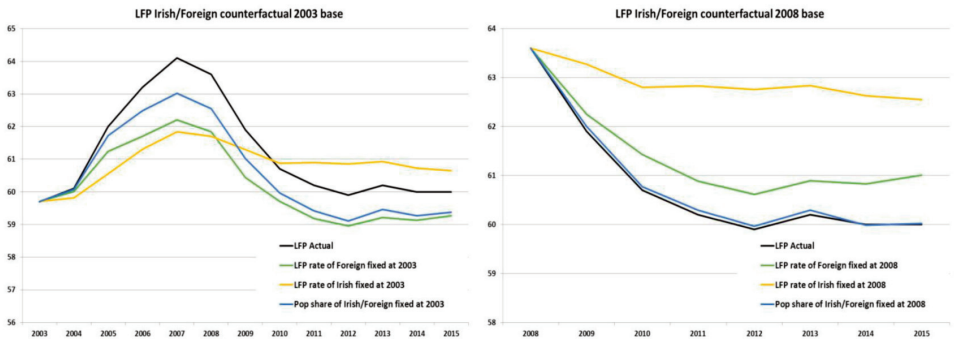
2.2 Drivers of LFPR Change – Counterfactual Analysis

To understand the relative importance of the compositional changes in the labour force, this section presents counterfactual exercises in a similar vein to Kudlyak (2013), in order to quantify the impact of the changes in population structure and in the tendency of certain demographic groups to participate on the aggregate LFPR. We examine a number of counterfactuals by fixing, respectively, the *LFPR* and S_i of certain groups at their 2003 and 2008 levels to examine the effect of their changes on the aggregate participation rate. The outcomes of these counterfactual exercises are shown in Figures 4, 5 and 6.

Considering first the left panel of Figure 4, the impact of the rising working age population can be seen for the counterfactuals which fix the LFPR of the Irish and non-Irish population at their 2003 levels. Most of the rise in the aggregate LFPR over the 2003 to 2007 period can be explained by the rise in the population.

However, when we fix the population share of immigrants at the 2003 level it is also evident that the rise in the aggregate LFPR up to 2007 was also driven by a higher tendency of immigrants to participate in the labour force. This is consistent with the immigration of young people from the 2004 EU Accession Member States which was a key feature of the Irish labour market at the time. It is also evident from Figure 4, considering both the 2003 and 2008 based counterfactuals, that the decline in the aggregate LFPR in recent years is dominated by a lower tendency to participate on the part of native Irish, as opposed to major changes in the population shares of native and immigrant groups.

Figure 4: The Impact of Nationality

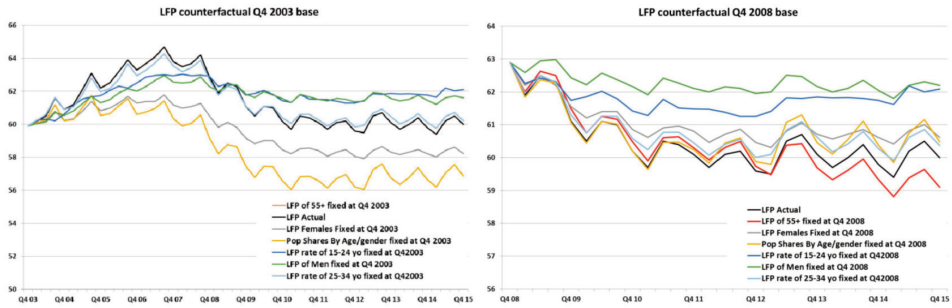


Source: Authors' calculations.

A similar exercise is conducted for age and gender groups in Figure 5. Again the role of the rising share of key working age population groups, particularly in the younger age groups, features in explaining the rise in the aggregate LFPR from 2003-2007. However the impact of the higher tendency to participate is stronger in this counterfactual in explaining the increases in the LFPR over the period. In contrast, the suggestion in the right panel of Figure 5 is that a decline in the relative share of males and 15-24 year olds in the working age population drives most of the aggregate LFPR decline since 2008.

The counterfactual analysis so far has pointed to a key role for the developments in both the population share and the LFPR of younger age groups in driving the aggregate LFPR decline since the onset of the domestic financial crisis and recession. Figure 6 examines more closely the effect of changes in the LFPR of the young age cohorts, 15-24 and 25-34. For 15-24 year olds, the reduction in both the LFPR and the population share of this age group has played a significant role in aggregate LFPR developments, as demonstrated by gap between the actual LFPR and that derived from the counterfactual analyses. Turning to the 25 to 34 year old

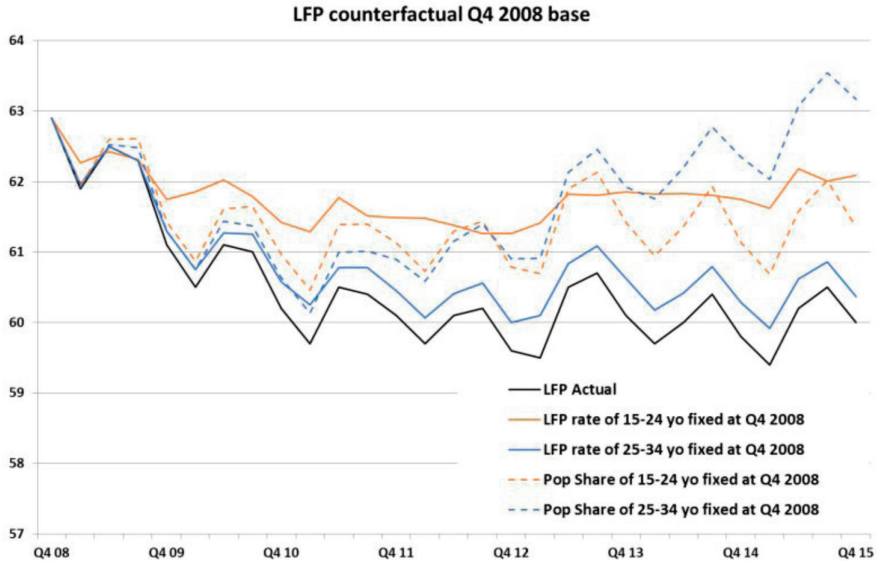
Figure 5: The Impact of Age and Gender Groups



Source: CSO and authors' calculations.

age groups, the gap between the actual and the counterfactual aggregate LFPR is greatest when we keep their population share fixed at 2008 levels, while the differences arising from fixing their LFPR as at 2008 are not very large. The impact of a falling share of 25-34 year olds in the working-age population on the aggregate LFPR is quite fundamental and was for the most part bound to happen irrespective of the economic climate. This is mostly a result of the fall-off in the birth rate that occurred in the mid-1980s and as such reflects structural changes that are not as

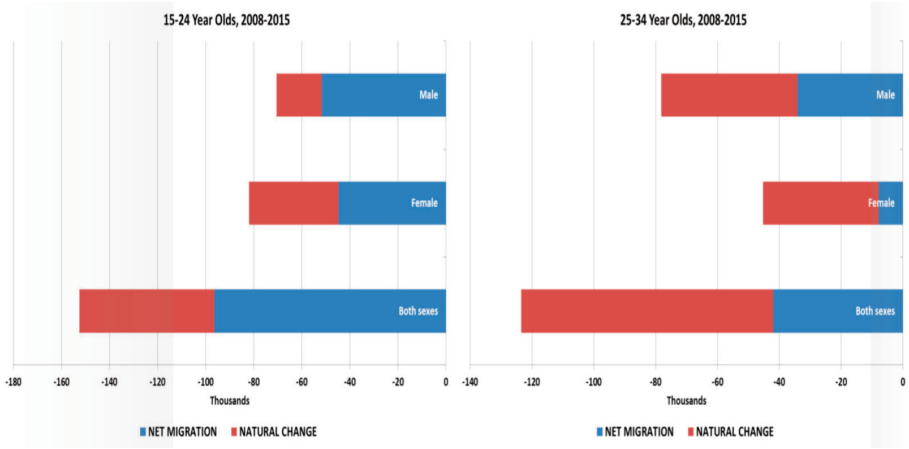
Figure 6: The Impact of Young Age Groups



Source: CSO and authors' calculations.

easily remedied by policy action. This is illustrated more clearly in Figure 7, where the majority of the falls in the size of 25-34 age group from 2008-2015 is shown to result from natural change, whereas the larger proportion of the fall in the 15-24 year old age group reflected net migration.[3]

Figure 7: The Drivers of Population Change in Young Age Groups



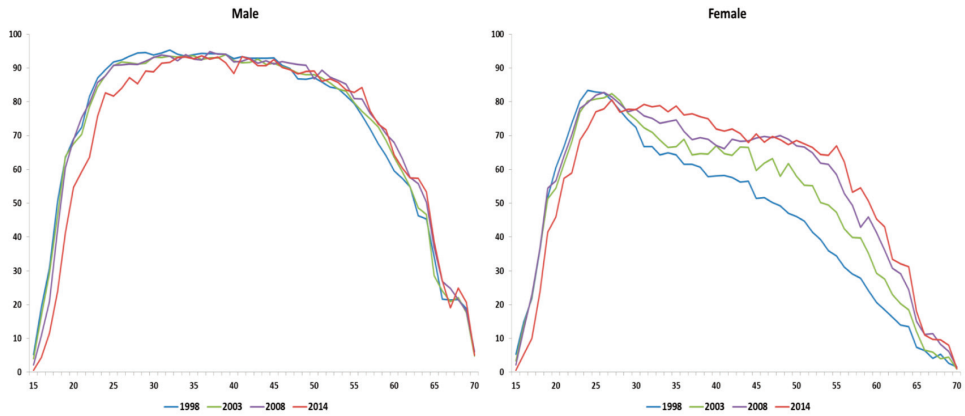
2.3 Age and Birth-Year Cohort Effects

In this section we consider an alternative way of measuring how much of the change in the LFPR was driven by movements in the population shares of different demographic groups. Age and birth-year cohort effects can be considered fundamental determinants of attachment to the labour force.

Age effects reflect the tendency of certain age groups to participate given their stage in the life-cycle: younger people engaged in secondary/tertiary education will have a lower tendency to participate; females would tend to have a lower participation rate during those years where they have young children; older persons move into retirement and participate less in the labour force. These age effects can be seen graphically by plotting the LFPR by single-year age derived from the Quarterly National Household Survey (Figure 8). Changes in these age effects through time are also considered by plotting them based on survey responses in different years (1998, 2003, 2008, 2014) and for males and females separately. For males the age effects are shown to conform to standard inverted U shape common in many countries; low participation at either end of the age distribution, with a

[3] An important consideration in the coming years will be the tendency of this 15-24 year age group that emigrated to participate in the labour force if and when they return to Ireland. A cursory glance at Census 2011 data suggests no difference in participation between Irish natives who emigrated and returned and Irish natives who stayed in Ireland.

Figure 8: LFPR by Single Year Age and Time



Source: CSO.

rapid increase in the early 20s and persistently high participation through to the late 50s. Differences between males surveyed in the different years are negligible, an exception being young men surveyed in 2014, who had a lower participation than young men surveyed in the other years.

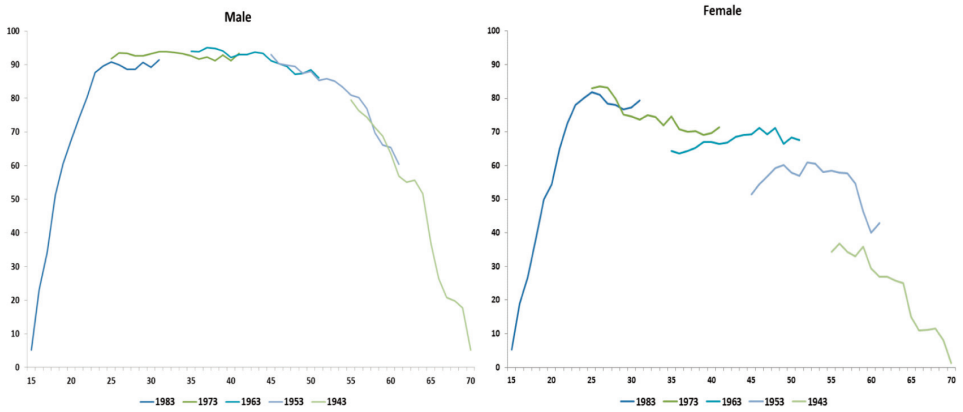
The differences for females are far more pronounced. The rapid decline in the age effect for females surveyed in 1998 from the age of 25 has for the most part been offset by 2014, as both the tendency to return to the labour force after giving birth and the average age of first giving birth has increased. As a result, a female in her 30s and older in 2014 has a much higher tendency to participate than a female in her 30s and beyond had in 1998. In comparison to males, however, females at all ages beyond 25 still have a lower LFPR.

In contrast to age effects, birth-year cohort effects reflect the fundamental attachment of a given cohort to the labour force depending on the social norms and institutions prevailing as people in that cohort progress through their lives. Figure 9 looks at the gender differences in participation by birth cohort. Looking at the periods of overlap in the series gives indications of the presence of changes in these cohort effects. Birth year effects are relatively stable for males, but have changed significantly for females, corresponding with the boost to labour force participation noted by Walsh (1993). In particular, the differences in the participation rates of women born in 1943 and 1953 are large, as are those of women born in 1953 and 1963. These differences in part reflect changing social norms regarding female labour force participation and the removal of institutional barriers to such participation.[4] The introduction of free secondary school education in 1966, which

[4] Legislative changes such as the *Civil Service (Employment of Married Women) Act 1973*, the *Anti-Discrimination (Pay) Act 1975* and *Employment Equality Act 1977* are often cited as factors supporting higher female participation from the mid-1970s.

improved the levels of educational attainment in the population as a whole, also had a disproportionately positive effect on future female labour force participation. However the differences across birth-year cohorts in Figure 9 also partially reflect cyclical factors that affect the condition of the labour market. The condition of the labour market when the particular cohort reached working-age or typically became active is likely to have some permanent impact on the labour market experience of that cohort.

Figure 9: LFPR by Birth Year Cohort



Source: CSO.

III AN EMPIRICAL MODEL OF TRANSITIONS IN/OUT OF THE LABOUR FORCE

This section uses microdata from the Quarterly National Household Survey (QNHS) to examine transitions into and out of the labour force over the period 1998 to 2014 and to examine whether the impact of these determinants has changed over time. Specifically, we estimate the impact of various individual and economy level factors on the probability that an individual i in labour force state j in time t will transition to labour force state k, or remain in state j in $t + 4$. The theoretical work of Krussel *et al.* (2012) suggests that the position in the economic cycle should in part determine the magnitude of the impact of these characteristics in explaining transition probabilities into/out of the labour force. Our empirical approach allows us to identify whether this is evident in the Irish experience.

3.1 Quarterly National Household Survey

The Quarterly National Household Survey (QNHS) is a large scale, nationwide survey of households in Ireland conducted by the Central Statistics Office. The

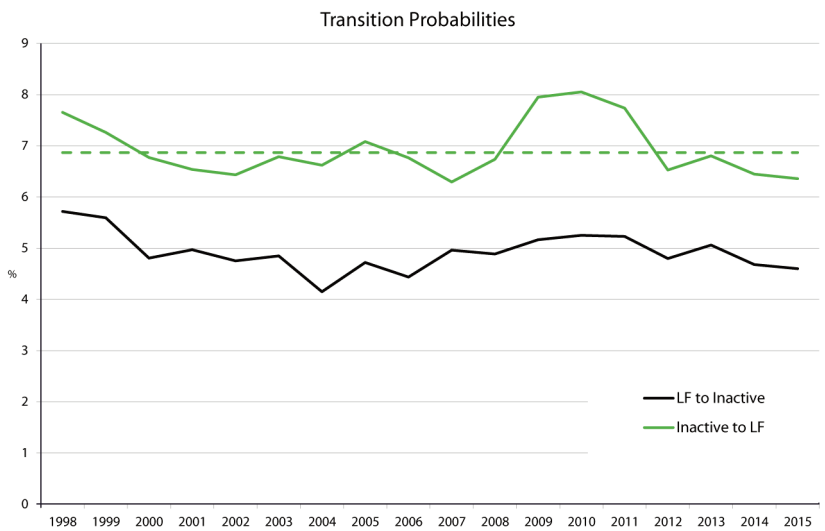
QNHS offers the most comprehensive source of data on the Irish labour market. The survey sample is designed to be 26,000 households per quarter but the actual number varies depending on response rates. Households are surveyed for five successive quarters and one-fifth of the households in the survey are replaced each quarter.

An individual is defined as active if they are either in employment or unemployed and seeking work. By way of definition, a person is in employment if they worked at least one hour or more for pay or profit in the week before the survey, including work on the family farm or business and all persons who had a job but were not at work because of illness, holidays etc. in the week. An unemployed person is defined as someone who "in the week before the survey, was without work and available for work within the next two weeks, and had taken specific steps in the preceding four weeks to find work" (CSO, 2015).

A person is classified as "outside the labour force" (or inactive) if they are neither working nor looking for work.

Using the repeated observations on survey respondents during their time in the QNHS sample it is possible to derive aggregate measures of transition probabilities in and out of the labour force. In Figure 10, the solid lines illustrate the overall transition probabilities estimated in each year over the period being investigated, while the dashed lines show the overall probability of transitioning in/out of the labour force over four quarters for the entire 1998-2014 timeframe. The probability of exiting the labour force dipped in the early 2000s before rising after the onset of

Figure 10: Transition Probabilities



Source: Authors' calculations

the financial crisis. At the onset of the financial crisis in 2008, the probability of moving from inactivity to the labour force increased by almost 1 percentage point to 8 per cent. This did not fall again until 2013. The transition probability for moving from the labour force to inactivity increased to 5.5 per cent between 2010 and 2012 before falling to just over 4 per cent in late 2013/early 2014.

3.2 Methodology

The focus of this section is to estimate an equation to identify the determinants of the transition probabilities in/out of the labour force and whether the relative importance of these determinants changes through the economic cycle as suggested by theory. The dependent variable in such an equation is binary, either an individual transitions from their current state or they do not. In such a framework, estimation by OLS (using the linear probability model) produces heteroscedastic estimates and may also yield estimates outside of the binary [0, 1] interval. With this in mind, we employ a nonlinear framework which is bounded within the [0, 1] interval to combat this problem.

As such, we estimate a logit model with standard errors clustered at the individual level. More formally, let π_i denote a binary random variable representing whether or not the individual has transitioned from their initial labour force state. We assume that the outcome of interest (whether or not the individual transitions from their current labour force state) depends on a vector of covariates X, which contains information on age; gender; level of education attained; the region in which an individual lives defined at the NUTS3 level; the number of children in the household of the respondent (expressed in natural logs); marital status; and a dummy for being a foreign national. In the model that looks at transitioning from the labour force into inactivity, we include a dummy for whether or not the individual is unemployed at time t. We also include a common time dummy in X which accounts for the impact of the wider state of the economy and the economic cycle facing respondents over the time they are surveyed. As such the impact of the individual characteristics on transition probabilities reported here are those independent of the economic cycle. π_i then denotes the probability that an individual in labour force state j at time t is in state k at time $t + 4$, where j and k are "in the labour force" and "inactive" respectively and $t = 1, 2 \ldots 5$ where 5 is equal to the number of quarters for which an individual is in the survey.[5]

The model can be expressed in the form

$$\pi_i = \frac{exp(X_i'\beta)}{1 + exp(X_i'\beta)} \tag{3}$$

and

[5] Individuals who remained in the survey longer than five quarters were dropped.

$$1 - \pi_i = \frac{1}{1 + exp(X_i'\beta)} \tag{4}$$

Using these expressions one creates the following ratio:

$$\frac{prob[\pi_i = 1]}{1 - prob[\pi_i = 1]} = exp(x_i'\beta) \tag{5}$$

which, taking logs and differentiating with respect to the X variables yields B_k, the effect of a small change in the X variable on the log odds of the event occurring. In order to interpret the results from the logit in terms of probability rather than log odds ratios we compute the marginal effects, which for the continuous variables can be expressed as:

$$\frac{\delta\ Prob(y_i = 1)}{\delta X_k} = \beta_k * \left[\frac{exp(X_i'\beta)}{1 + exp(X_i'\beta)} - \frac{1}{1 + exp(X_i'\beta)}\right] \tag{6}$$

The marginal effect is the gradient of the standard normal cumulative distribution function (CDF) at the mean value of the explanatory variable multiplied by the relevant coefficient. For marginal effects relating to the dummy variables, the effect is given by the difference between the two logistic CDF values where the dummy is equal to one and where it is equal to 0, again computed at the mean values of the explanatory variables.[6] This can be interpreted as the average marginal effect of the characteristic in X on the probability of transitioning from state j and k.

To examine whether the actual impact of the characteristic differs given the position in the economic cycle, we estimate the average marginal effects across the entire time period and at each value for the common time dummy (i.e. each separate year) in the sample; these results are presented in chart form.

3.3 Logit Results

Table 1 shows the average marginal effects from the logit model outlined above. For the age category dummies, 35-44 is chosen as the base category and all other variables should be interpreted relative to this cohort. The most economically significant result for the age groups is that 15-24 year olds are 8.9 percentage points more likely to transition from the labour force to inactive than the base category, but only 1 percentage point more likely to move from inactivity to the labour force.[7] Not surprisingly, those in the 65+ age group are 7.9 percentage points more likely than the base category to move from the labour force to inactivity, but 10.1

[6] This is the method employed by Stata using the "margins" command.
[7] Splitting the results for the 15-19 and 20-24 age groups does not alter the results.

Table 1: Average Marginal Effects for Transitions

State @ Quarter t *State @ Quarter t+4* *Average Transition Probability*	*Labour Force* *Inactive* *0.049*	*Inactive* *Labour Force* *0.069*
Age Category		
15-24 Year Olds	0.089***	0.010***
25-34 Year Olds	0.003***	0.021***
55-64 Year Olds	0.020***	–0.062***
65+ Year Olds	0.079***	–0.101***
Male	–0.036***	0.038***
Educational Attainment		
Second Level Education	0.010***	–0.053*
Third Level Education	–0.001	0.017***
Region		
Border	–0.007***	–0.008***
Midlands	–0.006***	–0.008***
West	–0.005**	–0.008***
Mid East	–0.000	– 0.009***
Mid West	–0.000	–0.003
South East	–0.006***	–0.003
South West	0.002*	–0.004**
Number of Children	0.003***	–0.004***
Marital Status		
Single	0.001	–0.014***
Widowed	0.005	–0.007***
Divorced	0.005**	0.012***
Unemployed	0.177***	–
Foreign National	0.003**	0.008

Source: Authors' calculations. Reference for age categories are 35-44 year olds. Reference for educational attained categories is post-secondary/non-tertiary (these are post-Leaving Certificate courses, level 5/6 on the National Framework for Qualifications). Year dummy included.
***, **, *, indicate statistical significance at the 1, 5 and 10 per cent levels.

percentage points less likely to move out of inactivity to the labour force. Being male reduces an individual's probability of transitioning from the labour force to inactivity by 3.6 percentage points compared with females.

The base category for the highest level of education attained is "post-secondary/non-tertiary". It appears that there are no economically significant effects for the education variables on transitioning from the labour force to inactivity, however having a third-level degree does imply that an individual is 1.7 percentage points more likely to move out of inactivity than the reference category.

Though statistically significant, there are negligible effects of the number of children or the region in which an individual lives, compared with those who live in Dublin. Relative to married individuals, being divorced implied a 1.2 percentage point increase in the probability of transitioning out of inactivity. The effect of being "foreign" is negligible, and for transitioning out of inactivity it is statistically insignificant.[8]

Being unemployed increases the probability that an individual moves out of the labour force by 16.5 per cent, on average and ceteris paribus, consistent with other findings in the literature and for Ireland.

We now examine the effect of certain key variables of interest at different stages of the economic cycle and whether these are significantly different from the fundamental marginal effects over the entire sample period.

The results of these calculations are presented in Figures 11, 12, and 13. In Figure 11, the first row shows the average marginal effects over time of transitioning from inactivity to the labour force for the different age cohorts relative to the base category (35-44). For those aged 55 to 64 and 65 and above the effect became less negative over time, though not significantly different from the fundamental effect. We find no evidence of cyclical impacts on the other age groups.

For moving from the labour force into inactivity, the probability falls marginally for 15-24 year olds and both 55-64 and 65+ age groups, though again there is no statistically significant difference through time.

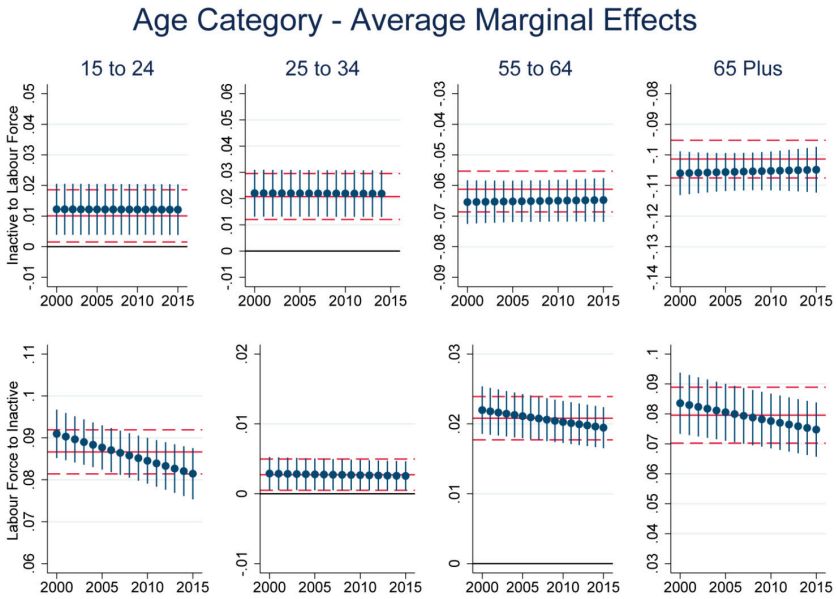
Figure 12 examines the effect over time of gender and nationality. The marginal effect of being male or a foreign national does not appear to change over the economic cycle when considering the transition probability into and out of the labour force. There is some evidence for changes in the marginal effect of being male in explaining transition probabilities into inactivity from the labour force, but these are not significantly different from the fundamental effect over the entire sample period.

The marginal effects over time of the unemployment variable on the probability of transitioning out of the labour force are shown in Figure 13. Again there is no statistically significant effect of the cycle on the marginal effect of being unemployed, although the coefficient does decrease over the period from just over 18 per cent to 16 per cent.

Overall there is little evidence of differences in the relative importance of individual characteristics on transition probabilities in/out of the labour force at different stages of the economic cycle. This suggests that the indirect impact of the cycle as suggested by theory is not identifiable in the Irish context.

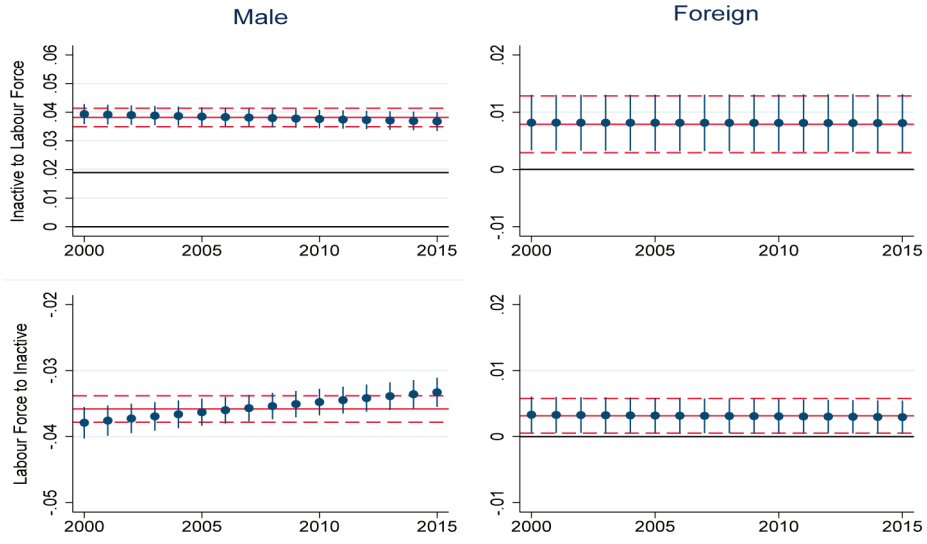
[8] In this analysis we define foreign as those individuals born outside of Ireland. When we examined a wider definition, including all those who identified as Irish in the QNHS, the effect of being foreign on exiting the labour force was greater.

Figure 11: Average Marginal Effects – Age Categories



Source: Authors' calculations.

Figure 12: Average Marginal Effects – Gender and Nationality



Source: Authors' calculations.

Figure 13: Average Marginal Effects – Unemployment

Source: Authors' calculations.

IV A COHORT BASED MODEL OF THE LFPR

The results in Section II suggest that the structural factors in the labour market, particularly demographics, shifting social norms and institutions and advances in the levels of educational attainment, as reflected in age and cohort effects, have played an important role the development of the LFPR in Ireland over the last few decades. In this section, we outline a model for the trend LFPR based on these age and cohort effects. We then complement the trend model with factors that reflect the cyclical factors which determine the relative returns of participation through time. In doing so we are able to identify whether the recent developments of the LFPR are dominated by trend or cyclical factors.

4.1 Model

We follow inter alia Kudlyak (2013) and Aaronson *et al*. (2014) in modelling the age and cohort effects in the labour force participation rates of single-year age and gender groups. To estimate the trend labour force participation for each age-gender group we use the following model:

$$ln\ LFPR_t^i = \alpha + ln\ \alpha_i + \sum_{b=1928}^{1998} C_{b,i,t}\, ln\, \beta_b + \varepsilon_{i,t} \tag{7}$$

where $LFPR_t^i$ is the labour force participation rate of single year age-gender group i, α_i is the fixed effect of age-gender group i, $C_{b,i,t}$ is a dummy variable that takes

the value one if the age gender group i in period t includes individuals born in year b, where b includes each birth year from 1928 to 1998, which covers all birth years covered by the QNHS microdata files. We estimate the model using pooled quarterly data for each single year age from the QNHS microdata.[9]

Using estimates from this equation, we can derive a time series for the trend participation rate of each age and gender group:

$$\widehat{LFPR_t^i} = exp\left(ln\ \widehat{LFPR_t^i} + \frac{\sigma_\varepsilon^2}{2}\right) \tag{8}$$

where $\frac{\sigma_\varepsilon^2}{2}$ is the variance of $\widehat{\varepsilon_{i,t}}$.

We then construct the estimate of the aggregate trend LFP:

$$LFPR_t^i = \sum_i s_t^i LFPR_t^i \tag{9}$$

where s_t^i denotes the population share of age-gender group i in period t.[10]

Aside from the fundamental age and cohort effects, cyclical factors are also likely to determine the dynamics of the LFPR. In particular the state of the economy and labour market at a given point in time will determine the relative returns to participation. The responsiveness of the various age and gender groups to these changing relative returns is also likely to be different, given the fundamental degree of attachment to the labour force of those groups. We model this using an equation similar to the one above but including a number of variables to reflect cyclical factors in the vector. This includes the unemployment rate, average weekly compensation per employee,[11] and average weekly unemployment benefit expressed in logs. Two lags of each variable are also included.[12] The financial returns to participation (employee compensation and unemployment benefit) are deflated by the personal consumption deflator from the Quarterly National Accounts. This is denoted by:

$$ln\ LFPR_t^i = \alpha + ln\ \alpha_i + \sum_{b=1928}^{1998} C_{b,i,t}\, ln\, \beta_b + \lambda_i X_{i,t} + \varepsilon_{i,t} \tag{10}$$

[9] Ages are single-year ages from 16-70, while respondents aged 70 and above are classified as a single group.

[10] The population shares in each quarter are derived by scaling the individual quarter shares from the QNHS by the detailed annual population estimates published with reference to April each year by the CSO.

[11] Derived from the CSO Non-Financial Institutional Sector Accounts from 1999 onwards and AMECO for 1998.

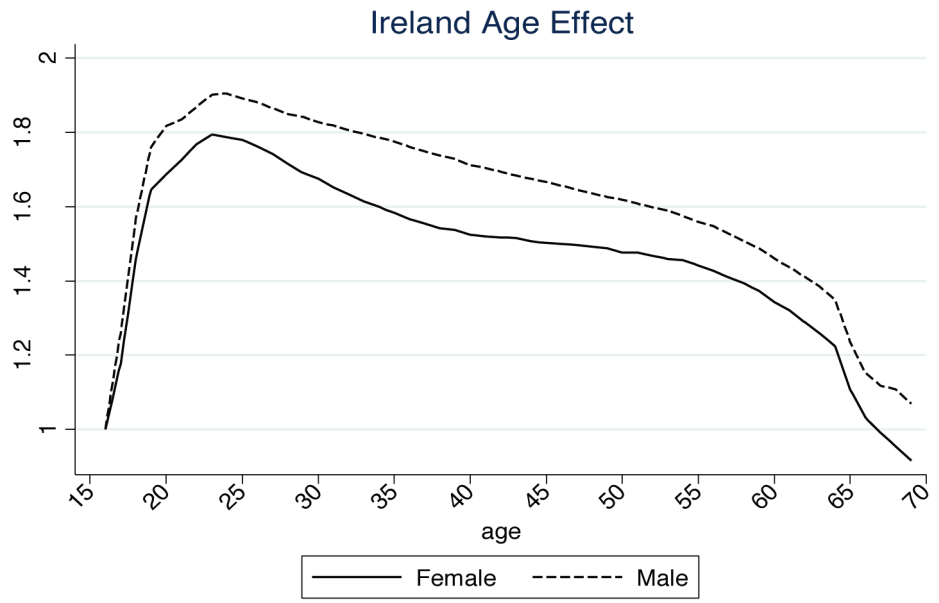
[12] This is the unemployment benefit paid divided by the number unemployed.

It is worth noting that cohort models can suffer from an end of sample issue. This comes from the fact that young cohorts (in our case those born between 1991 and 1998) are subject to various biases resulting from the fact that they are only observed when they are very young, but also in the Irish case entered a very weak labour market when they reached working age. We account for this by restricting the cohort effects for these years to equal the previous twenty-year average.

4.2 Cohort Model Results

We begin our discussion of the cohort model results by highlighting the age effect α_i from Equation 7 (Figure 14). Owing to the parameterisation of the model it must be presented relative to a particular age and we follow Kudlyak (2013) in choosing 16-year-olds as the base. For males, the shape of the curve is in line with the literature and the descriptive analysis in Section II, rising quickly up to 25 before declining slowly to age 70. For females the story is slightly different, they experience the same jump in their participation rates early in their life cycle. However, there is a significant dip in their participation rate from age 30 onwards, owing to some of the factors outlined in Walsh (1993) and Russell and O'Connell (2004) mainly around family formation.

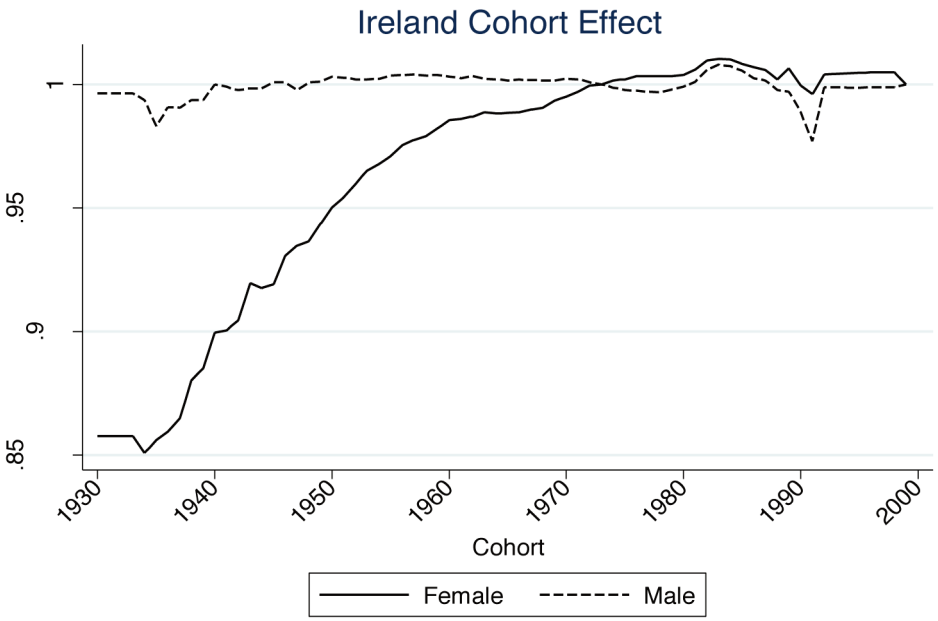
Figure 14: Cohort Model – Age Effect (Relative to 16 Year Olds)



Source: Authors' calculations.

Figure 15 shows the estimates of the cohort effect from Equation 7 relative to individuals born in 1973. The effect of the change in social norms and institutions and higher levels of educational attainment that took place over the twentieth century is clear as the participation rates of women born in the 1940s and beyond grew strongly. From the 1980 cohort onwards however the overall female cohort effect was broadly unchanged and followed a similar profile to the male cohort effects. This suggests that there may be little scope for further increases in the female cohort effect without significant structural change in the labour market.

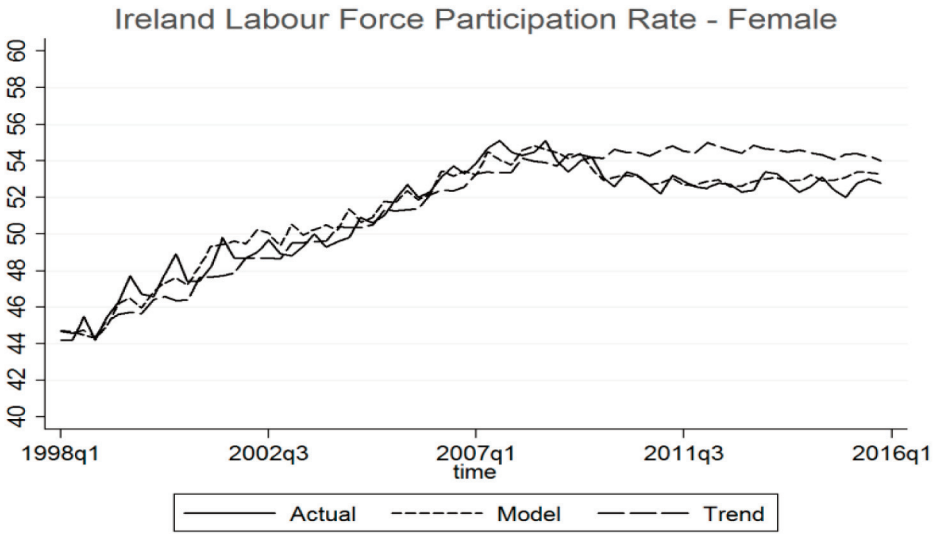
Figure 15: Cohort Model – Cohort Effect (Relative to 1973)



Source: Authors' calculations.

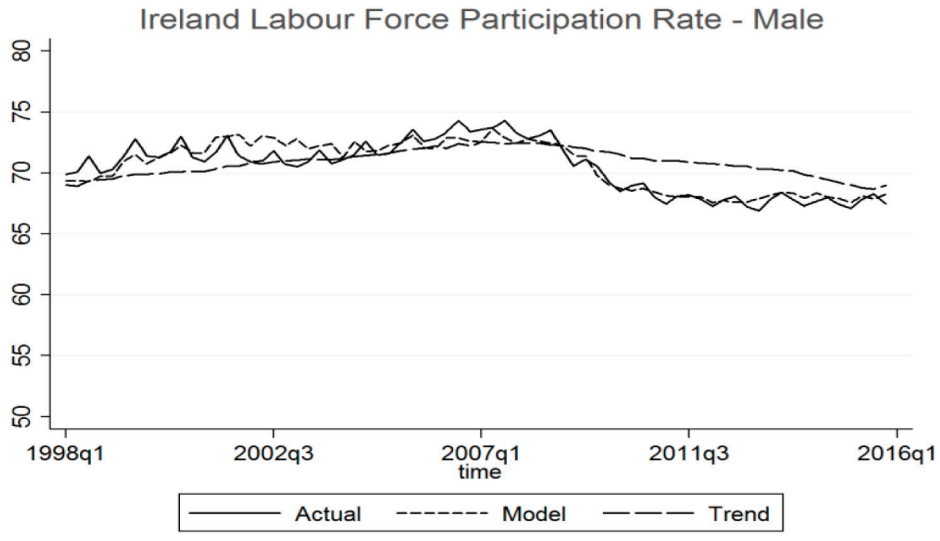
In order to compare the relative importance of trend and cyclical factors on overall LFPR developments since the financial crisis, we compare the fitted estimates from Equations 7 and 10 with the actual LFPR for females (Figure 16), males (Figure 17) and for both genders combined (Figure 18). The trend for females has been broadly flat at approximately 55 per cent since early 2007. The results indicate that the decline in the actual female LFPR since 2007 has been entirely due to cyclical factors. Indeed, the fitted estimates of the model with cyclical effects explain quite well the falls in the female LFPR in the intervening period. This tallies with the findings of Walsh (1993) that females tend to be more responsive to the

Figure 16: Cohort Model with Cyclical Effects – Female



Source: Author's calculations.

Figure 17: Cohort Model with Cyclical Effects – Male



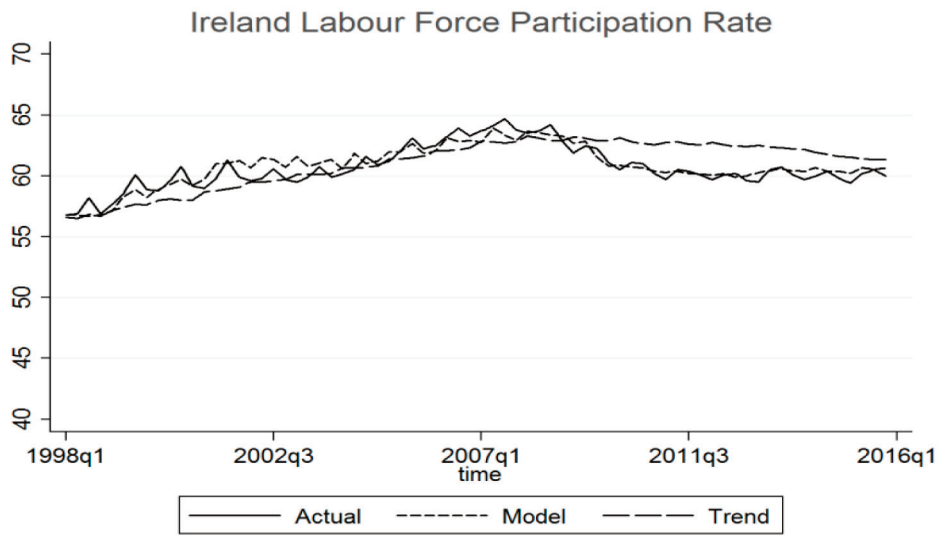
Source: Author's calculations.

relative returns of participation, and it is interesting that this feature of female participation remains prominent almost 25 years after Walsh's work.[13]

The story is somewhat different for males (Figure 17). While most of the decline in the male LFPR from 2007 is found to have been driven by cyclical factors, the trend rate is also declining. This implies that some of the falls in the male LFPR over the past number of years are due to structural factors related to age and cohort effects, which cannot be mitigated quickly or easily by policy action.

In aggregate taking account of the relative population share of the various age and gender groups, the female and male results indicate that the fall in the total LFPR over the period 2007 to 2014 has been driven in the main by the cyclical effects (Figure 18). The actual LFPR is below the estimated trend level at the end of our sample period (Q4, 2014). The trend total LFPR has also been falling however, driven by the falls in the male trend. As such, we can conclude that there is scope for higher participation rates as the cyclical improvement in the economy continues, but this will be constrained by the fall in the underlying trend LFPR.

Figure 18: Cohort Model with Cyclical Effects – Total



Source: Author's calculations.

[13] Bercholz and FitzGerald (2016) note the rise in education participation for young females since 2007 being relevant in the LFPR developments over the period and hypothesise that this may be a structural feature. This may be the case to the extent that the higher education participation is not due to the lack of employment opportunities or a change in the short-term relative returns to participation. Indeed Bercholz and FitzGerald cite recent experience in the UK which suggests the state of local labour markets are important determinants in the decision of certain cohorts to pursue further education as opposed to entering the labour force.

V THE OUTLOOK FOR TREND PARTICIPATION AND ITS IMPLICATIONS

Given the factors noted above, it is instructive to examine some potential future paths for the Irish LFPR over the medium term. To do this, we use population projections from the Central Statistics Office (2011) and from Eurostat (2013) and combine these with the age and cohort effects prevailing at the end of our sample period from the previous section as estimated in Equation 7.

Table 2 outlines the results of these projection exercises.[14] In all cases the trend LFPR is projected to fall over the period to 2025, with the average outcome of the various scenarios indicating a drop of the female trend LFPR to 52.1 per cent and the male equivalent to 61.7 per cent. The average outcome for the aggregate trend LFPR sees it falling to 56.7 per cent from the current estimate of 61.4 per cent, mostly due to the decline in the male trend. Looking across the different scenarios the decline in the trend LFPR is not as large where higher levels of net immigration are assumed.

The main lesson that can be drawn from these projections is that structural factors, given the demographic profile and the lower attachment of young males in particular to the labour force, mean that aside from a near-term cyclical boost, the trend LFPR in Ireland is likely to fall in the coming ten years.[15]

One potential area for structural reform to offset this is to increase the participation of females in the labour force through, for example, changes to maternity or paternity leave and benefits or provision of more supports for childcare services. In our framework, this would most likely be reflected in a change in the profile of the female age effect shown in Figure 14, in essence eliminating the dip in that profile from the late 20s to the mid-50s. To simulate the potential impact of such reforms we set the female age effect from age 20 to 55 to be proportionate to the male effect for these age groups and smooth out the drop in female participation around the family formation ages as seen in Figure 14.[16] We find that the boost to female participation by 2025 from this exercise would only be 0.5 percentage points. Moreover, the boost to the total LFPR would be 0.3 percentage points. With this in mind, aside from any wider benefits to such a policy, it may not be as effective in boosting overall LFPR as one might have expected a priori. This is because the

[14] The CSO and Eurostat population projections are based on different assumptions regarding migration, fertility and mortality rates, which are outlined in detail in the note to Table 2.

[15] It might be argued that in comparison to some northern European countries the Irish LFPR is still relatively low and that further convergence to those levels could emerge. However our results suggest that the pace of structural change through cohort and age effects has eased to such an extent that further convergence to those currently higher northern European LFPR levels may not arise absent any significant structural reform or currently unexpected population changes.

[16] We use the CSO M2 population projections for the exercise.

other demographic and structural effects are dominating, with the lower participation of younger men being particularly relevant.[17]

Table 2: Trend Participation Rate With Alternative Population Assumptions

	Female			*Male*			*Total*		
	2015	*2020*	*2025*	*2015*	*2020*	*2025*	*2015*	*2020*	*2025*
Eurostat 2013 Main	54.8	53.3	51.6	68.8	64.8	61.1	61.4	58.7	56.1
Eurostat 2013 No Migration	54.8	53.8	52.5	68.9	65.6	62.6	61.5	59.4	57.2
Eurostat 2013 Higher Life Expectancy	54.8	53.3	51.5	68.8	64.7	61.0	61.4	58.7	56.0
Eurostat 2013 Reduced Migration	54.8	53.4	51.8	68.8	64.9	61.4	61.4	58.9	56.3
CSO 2011 No Net Migration (M0)	54.9	53.8	52.3	68.9	65.4	61.9	61.5	59.2	56.8
CSO 2011 High Net Immigration (M1)	54.8	54.0	53.3	68.8	65.5	63.0	61.5	59.4	57.8
CSO 2011 Low Net Immigration (M2)	54.8	53.7	52.5	68.8	65.2	62.0	61.4	59.1	56.9
CSO 2011 Low Net Emigration (M3)	54.8	53.3	51.7	68.8	64.8	61.0	61.4	58.7	56.1
Average	54.8	53.6	52.1	68.8	65.1	61.7	61.4	59.0	56.7
Female Age Effect Counterfactual	55.2	54.0	52.6	68.8	65.2	62.0	61.6	59.3	57.0

Source: Authors' calculations, CSO 2016-2046 Population Projections (2011) and Eurostat Population Projections (2013). Projections used from the CSO have a common total fertility rate assumption of 2.1 alongside a gradual reduction in mortality rates. See the CSO publication for more details on these and the M0, M1, M2 and M3 migration assumptions. Projections from Eurostat have a common total fertility rate assumption of 2.01. The Main Eurostat projection also assumes a mortality rate of 0.0054 by 2025 and net migration remaining negative out to 2025. The Eurostat Higher Life Expectancy scenario assumes a mortality rate of 0.0052 by 2025, whereas the Reduced Net Migration scenario assumes net emigration being 20 per cent lower than the Main scenario. The Female Age Effect Counterfactual sets the age effect for females from 25-55 years of age to be proportionate to the male effect for these age groups (see Figure 14) and uses the M2 CSO scenario for the population projections.

[17] The results are dependent on the mechanical assumption of the impact of policies on the female age effect, which may be higher or lower than the impact assumed here, nor do we account for any dynamic impacts that may be reflected in the male age effect.

This outlook for the trend LFPR has implications for actual and potential GDP growth in the medium term, as well as near-term considerations for measures of slack in the labour market. The contribution of labour supply to actual and potential GDP growth will most likely be lower than that experienced over the three decades up to the Great Recession. Given that this in part reflects higher tendencies to participate in higher education by young males, there may be positive boosts to productivity in the future which could partially offset the relative drag from labour supply on actual and potential GDP growth.[18] However the most direct mitigation of the falling trend LFPR on GDP growth is likely to be found in higher levels of net immigration. The Irish labour market has typically been characterised by a relatively high degree of flexibility through migration, which is reflected in the population projections compiled by the CSO underlying our analysis in Table 2. It may have to become even more so in the coming years, particularly in attracting non-Irish immigrants who typically have a higher tendency to participate in the labour force in order to encourage a positive contribution from labour supply to overall GDP growth.[19]

Regarding some near-term considerations, we have found that the trend LFPR is currently still above the actual LFPR for both males and females. This would suggest that as the cyclical recovery in the economy continues participation rates will rise. As a result, the constraint of an excessively tight labour market which could result in unsustainable increases in wage rates and over-heating in the economy is unlikely to become binding in the near-term. It is important to consider this with regard to current measures of slack in the economy, policy responses in terms of pay and other labour market issues, and wider economic policy evaluation.

VI CONCLUSION

Labour supply, and in particular increases in labour force participation, has been a significant feature of Irish economic growth in recent decades. Understanding the drivers of the decline in the LFPR since its peak before the onset

[18] Bergin and Kearney (2007) present evidence of the positive role educational attainment had on Irish productivity growth in the 1990s. On top of this higher educational attainment is also related to higher LFPR, which Bercholz and FitzGerald (2016) note as being of potential relevance for the pattern of young female participation since 2007. However there may be some offsetting impacts in terms of the labour supply contribution to actual and potential output growth should this higher LFPR come at the expense of lower fertility.

[19] Per footnote 3, an important consideration in the coming years will be the tendency of this 15-24 year age group that emigrated to participate in the labour force if and when they return to Ireland. A cursory glance at Census 2011 data suggests no difference in participation between Irish natives who emigrated and returned and Irish natives who stayed in Ireland.

of the domestic financial crisis is an important input to policy evaluation and design, as well as the outlook for the contribution of labour supply to actual and potential GDP growth. Using a number of descriptive and econometric approaches arising from the theoretical and empirical literature we have shown that:

- The rise in the LFPR in the mid-2000s was almost entirely due to the enlargement of the labour force through immigration from the new EU Member States and masked an underlying decline in the participation rate of native Irish;
- The fundamental impact of key individual and household characteristics on the probability of moving in/out of the labour force does not appear to differ given the state of the economic cycle, in contrast to some of the theoretical work in the area;
- There are significant differences in how male and female participation has evolved over time, with increases in the female LFPR trend driven by positive birth-year cohort effects up to 2007 while the male trend remained relatively static;
- Since the onset of the domestic financial crisis and recession, the evidence suggests that the decline in the female LFPR is entirely due to cyclical responses to the weaker labour market, whereas the decline in the male and the total LFPR also reflects a fall in the trend LFPR arising from age and birth-year cohort effects;
- Combining existing population projections and our results on age and birth-year cohort effects suggests a further decline in trend LFPR is to be expected over the next decade, whereas in the near-term, measures of slack in the economy should take account of the likelihood for a cyclical recovery in labour force participation as the actual LFPR is currently below trend;
- Policy options to offset the decline in trend LFPR such as encouraging higher levels of female participation may not be sufficient in and of themselves to achieve that objective, especially in the absence of higher than currently expected immigration;
- To the extent that lower levels of participation by younger people in the labour force corresponds to overall higher levels of educational attainment, there can be expected to be some positive benefit to future levels of economic growth through higher productivity. The benefits of higher educational attainment on labour force participation itself may also feed through for those cohorts where scope for higher LFPRs exist, although it is difficult to see this happening to the same extent as previous generations. While it is beyond the scope of the current paper, further research could re-examine this issue in the context of the age and cohort effects presented here and under various demographic scenarios.

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APPENDIX

Table A1: Age Category – Inactive to Labour Force

	15 to 24	*25 to 34*	*55 to 64*	*65 Plus*
2000	0.091	0.003	0.022	0.084
2001	0.090	0.003	0.022	0.083
2002	0.090	0.003	0.022	0.082
2003	0.089	0.003	0.021	0.082
2004	0.088	0.003	0.021	0.081
2005	0.088	0.003	0.021	0.081
2006	0.087	0.003	0.021	0.080
2007	0.086	0.003	0.021	0.079
2008	0.086	0.003	0.021	0.079
2009	0.085	0.003	0.020	0.078
2010	0.085	0.003	0.020	0.078
2011	0.084	0.003	0.020	0.077
2012	0.083	0.003	0.020	0.076
2013	0.083	0.003	0.020	0.076
2014	0.082	0.003	0.020	0.075
2015	0.081	0.003	0.019	0.075

Table A2: Age Category – Labour Force to Inactive

	15 to 24	*25 to 34*	*55 to 64*	*65 Plus*
2000	0.0122	0.0221	–0.0654	–0.1060
2001	0.0122	0.0221	–0.0654	–0.1059
2002	0.0122	0.0221	–0.0653	–0.1058
2003	0.0122	0.0220	–0.0653	–0.1058
2004	0.0122	0.0220	–0.0652	–0.1057
2005	0.0122	0.0220	–0.0652	–0.1056
2006	0.0122	0.0220	–0.0651	–0.1055
2007	0.0122	0.0220	–0.0651	–0.1055
2008	0.0122	0.0220	–0.0651	–0.1054
2009	0.0122	0.0220	–0.0650	–0.1053
2010	0.0122	0.0219	–0.0650	–0.1052
2011	0.0121	0.0219	–0.0649	–0.1052
2012	0.0121	0.0219	–0.0649	–0.1051
2013	0.0121	0.0219	–0.0648	–0.1050
2014	0.0121	0.0219	–0.0648	–0.1049
2015	0.0121	0.0219	–0.0647	–0.1049

Table A3: Unemployed

	Labour Force to Inactive
2000	0.183712
2001	0.1825496
2002	0.1813913
2003	0.180237
2004	0.1790869
2005	0.1779409
2006	0.1767991
2007	0.1756614
2008	0.174528
2009	0.1733988
2010	0.1722739
2011	0.1711532
2012	0.1700368
2013	0.1689248
2014	0.167817
2015	0.1667136

Table A4: Foreign

	Labour Force to Inactive	*Inactive to Labour Force*
2000	0.003	0.008
2001	0.003	0.008
2002	0.003	0.008
2003	0.003	0.008
2004	0.003	0.008
2005	0.003	0.008
2006	0.003	0.008
2007	0.003	0.008
2008	0.003	0.008
2009	0.003	0.008
2010	0.003	0.008
2011	0.003	0.008
2012	0.003	0.008
2013	0.003	0.008
2014	0.003	0.008
2015	0.003	0.008

Table A5: Gender

	Labour Force to Inactive	*Inactive to Labour Force*
2000	–0.0376222	0.038319
2001	–0.0373502	0.038294
2002	–0.0370798	0.03827
2003	–0.036811	0.038245
2004	–0.0365437	0.038221
2005	–0.036278	0.038197
2006	–0.036014	0.038172
2007	–0.0357514	0.038148
2008	–0.0354905	0.038124
2009	–0.0352311	0.038099
2010	–0.0349732	0.038075
2011	–0.0347169	0.038051
2012	–0.0344622	0.038027
2013	–0.0342089	0.038002
2014	–0.0339572	0.037978
2015	–0.0337071	0.037954