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Exploring Older Male Worker Labour Force Participation Across OECD Countries in the Context of Ageing Populations: A Reserve Army of Labour?

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Abstract

The governments of many developed economies are confronting a number of policy issues associated with ageing populations. For example, pension reforms, increasing the labour force participation of older workers and increasing the standard retirement age are various policy reforms suggested by the OECD to cope with the fiscal strain associated with ageing populations. However, many of the same governments now embracing these reforms had until recent times allowed the early exit of older workers from the labour force by various means in periods of excess labour supply, leading to the allegation that these governments had treated older workers as a 'reserve army of labour'. In this paper panel models for the labour force participation of males aged 55-59 and 60-64 years in 12 OECD countries are estimated as a function of social security and labour market variables covering the time period 1967 to 2007. In contrast to previous OECD modelling, allowances are made for both country specific intercept and slope terms in various specifications, thereby allowing the incorporation of unique aspects of each country's social security system or labour market. In addition, both long run models and also short run models incorporating error correction terms are estimated. The findings suggest that the 'one size fits all' policy advocated by the OECD is inadequate to address country specific factors affecting older worker labour force participation. The recent pension reforms are now out of character with the reserve army of labour explanation and results also imply that governments in many OECD countries will struggle to increase older male labour force participation through pension policy reform alone, without addressing the important role of the aggregate labour market.

1. Introduction

A demographic shift toward an older age profile in many developed economies presents their governments with a number of policy challenges. Such ageing societies face issues associated with changing consumption patterns, labour force participation, healthcare and pension usage. As such, population ageing has inspired research and analysis of older workers' labour force participation and pension usage in both those countries affected by ageing populations as well as by international institutions. The primary consideration is that an increasing proportion of the older population, traditionally reliant upon publically funded pensions and healthcare, and a decreasing proportion of the population in the traditional workforce age group paying income tax, has been projected to place strain on future government budgets.

Three international institutions that advocate alternative ageing society policies to address labour force participation of older workers and pension reform are the World Bank, Organisation for Economic Co-operation and Development (OECD), and International Labour Organization (ILO). The World Bank recommends a gradual shift away from publicly managed pay-as-you-go schemes. Instead, a multiple pillar retirement income system is advocated, consisting of a mandatory publicly managed unfunded scheme supported by a privately managed funded scheme, and supplemented by voluntary savings schemes (World Bank 1994, Holzmann 1998).

The OECD recommends both welfare reform and increasing labour force participation of older workers (OECD 1995, 1998, Blöndal and Scarpetta 1998, Casey 1998, Burniaux *et al*. 2004, Duval 2003). The OECD research contends that older worker labour force participation had fallen over recent decades because of generous social security benefit levels and eligibility criteria, encouraging older workers to exit the labour force prematurely. Therefore, the removal of pensions that allow early exit from the labour force, reduced financial incentives for early exit, and increasing the standard age of retirement are their proposed policies to reduce fiscal exposure and increase older worker labour force participation rates.

In contrast, the ILO advocates a full employment strategy, anti age discrimination action, and flexible retirement age policies (ILO 1995, 2003, Auer and Fortuny 2000). Furthermore, the ILO largely rejects the rationale for the move from public to private

funded retirement income schemes suggested by other institutions (Gillion 1998). However, it is apparent that most countries have adhered to the OECD and World Bank strategies of trying to reduce government responsibility for pension financing, then attempting to increase older worker labour force participation through addressing social security availability and the financial incentives for early exit inherent in various social security schemes.

Government efforts to either encourage or discourage labour force participation of certain groups brings us the concept of the 'reserve army of labour', a phrase attributed to Marx (Power 1983). In contrast to 'orthodox' economists who would emphasise a microeconomic focus and financial incentives associated with non-wage forms of income such as pensions and private saving for older worker labour force participation, other labour market economists contend that the State plays an active role in manipulating the labour force status of marginalised groups or segments of labour such as older workers in response to aggregate labour market conditions (for example, Offe and Hinrichs 1985, Laczko and Phillipson 1991 and Peck 1996). They contend that older workers form a segment of the labour market that can be removed from the labour force in periods of labour supply surplus and mobilised into the labour force during periods of labour supply shortages through government policy mechanisms. At the heart of this rationale is that reserve army of labour mobilisation reduces constraints to increased production and reduces wage pressures for capitalists. This army is then deemed expendable in periods of production decline.

There are two main aspects to the research presented here. First, we present the background to recent policy reforms expected to affect older worker labour force participation. Then we look at the trends evident in labour participation of older workers in OECD countries and analyse various theoretical explanations for such. A clear divide is evident between orthodox theories that emphasis a microeconomic reaction to financial incentives for the work/leisure choice which are prevalent in the US literature versus more non-orthodox theories such as the reserve army of labour hypothesis which emphasise macroeconomic and institutional forces external to the individual which are more common in explaining older worker participation trends in European literature.

The second part of the research involves quantitative modelling of the influences of social security and labour market variables upon the labour force participation rates of older male workers (aged 55 to 64 years) for selected OECD countries. In contrast to previous OECD modelling, allowances are made for both country specific intercepts and slope terms in various model specifications. In addition, we analyse stationarity and cointegration issues which were also neglected in the previous OECD modelling of Blöndal and Scarpetta (1998) and Duval (2003), allowing the estimation of both long run models, and short run dynamic models incorporating error correction mechanisms.

Recent pension reforms to increase labour force participation of older workers primarily in response to ageing population concerns rather than labour market conditions do not neatly fit the reserve army of labour concept. Furthermore, model results show that some pension reforms suggested by the OECD would appear to be ineffective policy tools to stimulate older worker labour force participation in many countries. This implies that some OECD governments will struggle to mobilise older in response to ageing society policy pressures through pension reform alone without addressing the role of the aggregate labour market. Thus, the findings suggest that many countries may benefit from accepting ILO policy recommendations to stimulate aggregate labour demand rather than rely solely on OECD recommendations addressing the supply side only.

The research is presented as follows: Section 2 presents the background to the demographic ageing of OECD populations and associated policy considerations. Section 3 presents the trends for older male labour force participation rates in OECD countries while also introducing competing explanatory theories. Section 4 presents the methodology employed in this study with Section 5 presenting the estimation results of a number of econometric models. Section 6 concludes with a summary of findings and policy implications.

2. Population Ageing and the Policy Platforms of the World Bank, OECD and ILO

An ageing society is observed when there is a relative increase in older age groups' population (generally aged 65 years and over) amongst the general population leading to an increase in average age. The populations of many developed economies are experiencing such a demographic phenomenon as a result of both declining fertility rates and increased life expectancy. For example, the average fertility rate in OECD countries has declined from above 3.23 children per woman aged 15-49 years in 1960 to below 1.65 in 2006. C*eteris paribus*, a fertility rate of 2.1 is required to maintain population stability. Turkey and Mexico are the only two OECD countries to have fertility rates above 2.1. The ageing population is exacerbated by increasing life expectancy, with the OECD average life expectancy increasing from 65.8 and 70.8 years in 1960 to 76 and 81.7 years in 2006 for males and females respectively (OECD 2009a). Apart from the declining fertility rates and increasing life expectancy, ageing of OECD country populations is intensifying as a large proportion of the population, comprising the baby boomer generation (born between 1946 and 1960) gradually age, and reach the mandatory retirement age (generally 65 years) between 2011 and 2025.

The main policy concern anticipated for the governments of countries experiencing ageing populations was of supporting a growing proportion of older citizens traditionally reliant on the public purse for social security pensions and health expenditures. Coexisting with this situation, of course, is a smaller proportion of the population in the traditional working ages of between 15 and 64 years of age. Therefore, while the proportion of the population traditionally 'dependent' on social expenditure spending was expected to increase, the proportion of persons 'active' and working, and thereby forming the traditional income tax base to fund such expenditure, was expected to shrink. At the very least, this situation was expected to put strain on governments' budgets to finance its social security and health obligations. At the extreme, this situation was speculated to lead to intergenerational conflict from a younger minority financially supporting an ageing majority (Johnson *et al*. 1989). This situation became further complicated by early retirement or exit trends of older workers (aged 55-64 years) that emerged from the 1970's onward.

A simple measure of the relative size of the older population traditionally reliant on social security pensions and healthcare relative to the size of the labour force aged tax base is the old age dependency ratio. It is calculated as the percentage of so called 'inactives' aged 65 and over, to the labour force aged population (generally 15 to 64 years). Burniaux *et al*. (2004) projected the average OECD dependency ratio to increase from 26.5% in 2000 to 41.9% in 2025. There is quite a large amount of variation in these old age dependency ratios between OECD countries, however, all are projected to increase substantially over this time period. Some countries such as Belgium, Finland, France, Poland and Sweden are projected to have dependency ratios in excess of 50% in 2025. Of note is that these projections do not take into account the aforementioned early exit trends of those prior to the age of 65 prevalent in many OECD countries.

Because of population ageing, older worker labour force participation rates and social security pension reliance have emerged as important policy issues. As such, a number of international institutions have suggested, and national governments implemented, various social security pension reforms aimed at restricting pension eligibility and increasing the labour force participation rates for older workers. Three international institutions have contributed to policy platforms to address ageing populations, namely, the World Bank, the OECD, and the ILO. Each has a different political agenda and policy recommendations, and thus different implications for older male labour force participation rates and social security pension use.

The World Bank's role in pension policy reform comes from its direct role as a lender to countries with dysfunctional pension systems, such as those in Latin America, and Central and Eastern Europe. The World Bank recommends a gradual shift away from publicly managed pay-as-you-go schemes that are unfunded and the norm in these countries. Instead, a multiple pillar retirement income system is advocated, consisting of a mandatory publicly managed unfunded scheme supported by a privately managed funded scheme, and supplemented by voluntary savings schemes (World Bank 1994, Holzmann 1998). The World Bank has the power to influence this outcome of a multiple pillar retirement income system by making it a condition of a borrowing country's reform proposals. However, because they are primarily lenders to governments in dire circumstances, their power only spreads to a relative few

countries. Therefore, many of the advanced OECD economies facing ageing population profiles will not be directly affected by the World Bank's policy position.

In contrast, the OECD policy reforms directly address more affluent or developed nations. Their policy reform research focuses predominantly on supply side issues and its evolution can be described as a three part process. First, the identification of the future budget exposure posed by an ageing society, especially from publicly funded pensions. Second, the role of the availability and financial value of pensions available to those aged 55-64 for explaining the decline in older labour force participation was established. Finally, this research was used to justify the primary role of pension reform for reversing early retirement trends via restrictions to eligibility and lower social security pension value, thereby justifying a diminishing role for public pension financing.

Government budget exposure to an ageing society through the provision of publicly funded pensions and health care to its citizens was established by the OECD via simulation results in Leibfritz *et al*. (1995). Similarly, Rosevare *et al*. (1996) projected pension and health outlays to 2030 for OECD countries under various assumptions. The disincentives for continued work in social security systems theme was established in OECD (1995). They gave emphasis to the availability and financial value of State provided pensions prior to standard retirement age, such as from unemployment or disability related pensions, as incentives to leave employment. Blöndal and Scarpetta (1998) provided econometric evidence of the magnitude of financial disincentives for labour force participation of inherent within social security pensions and the scope for an increase in older male labour force participation rates from the removal of such. More recently, Duval (2003) continued this line of research by estimating the financial disincentives for longer labour force participation of older workers via the 'implicit tax rate' on labour force participation in social security pensions for those aged greater than 55. As such, pension reforms suggested by the OECD consist of three main avenues: i) removal of pensions that allow early retirement; ii) a move toward actuarial neutrality of pension systems; iii) convergence of retirement ages to 67 years (Burniaux *et al*. 2004).

Of note is that OECD (1995) discussed employment disadvantages of older workers

such as the greater likelihood of becoming separated from employment involuntarily, and remaining so. Furthermore, it was acknowledged that this situation was often addressed by government policy intervention to remove the older unemployed from the labour market in the face of high aggregate unemployment levels. Therefore, these findings seem to recognise the role of labour demand and aggregate labour market conditions for declining older worker labour force participation rates, however, apart from Casey (1998) no policy recommendations have been suggested by the OECD to address such.

The ILO has had a longer association with older worker interests than the other international institutions. The ILO was instrumental in improving invalid pensions for older workers in the 1930's, in promoting policies for early retirement, training and placement of older workers in the 1960's, and supporting job protection for older workers in the 1970's. The ILO Older Worker Policy Recommendations established in 1980 included older workers being placed within a strategy of full employment and ensuring unemployment is not shifted from one group to another; anti age discrimination legislation and access to employment that takes into account their skills, experience and qualifications; measures to enable older workers to continue in employment under satisfactory conditions; and a gradual transition to retirement and flexible age of old age pension receipt (ILO 1995, 2003, Auer and Fortuny 2000).

A central part of the ILO mandate is social security systems in general, and pensions in particular. In this respect, the ILO recommendations are out of step with the OECD and World Bank, with the ILO questioning the shift from public to privately managed schemes, where benefits levels are not guaranteed and may be based on interest rates or other financial market returns (Gillion 1998). Furthermore, the emphasis on a full employment policy and anti-age discrimination legislation sets the ILO apart from the World Bank and the OECD. However, it is apparent in Table 1 that governments have largely adhered to OECD recommendations of pension reforms, with aggregate demand stimulus policies only utilised by many governments recently to combat the global financial crisis, not to address ageing society considerations.

Table 1. Recent Pension Reform Policies in Selected OECD Countries

Country	Pension Reform
Australia	Superannuation Guarantee Scheme became mandatory in 1992. Removal of Mature Age Allowance. Restrictions to Disability Support Pension eligibility. Increase in standard age of retirement for women from 60 to 65. Proposed increase in standard age of retirement to 67 years.
Austria	Decline in accrual rate of pension and increase in number of contribution years to reach maximum replacement rate.
Belgium	Standard age of retirement for women increased from 60 to 65.
Finland	Reforms to old age and early retirement schemes to reduce implicit taxes on continued work.
France	Lower implicit taxes on continued work beyond the age of 60. Increase in contribution period to receive full pension.
Germany	Actuarial reduction adjustment for early retirement at 63, and actuarial increases for deferred retirement effective by 2004. Actuarial reduction to unemployment pension available at age 60. Increase in retirement age to 67.
Italy	Lower implicit taxes on continued work up to the age of 65.
Japan	Rise in minimum retirement age from 60 to 65 by 2025. Contribution rates increased.
Switzerland	Standard age of retirement for women to increase from 62 to 64.
UK	Reduction in annual accrual rate in State Earnings Related Pension Scheme.
US	Standard retirement age to rise from 65 to 67 from 2000-2022.

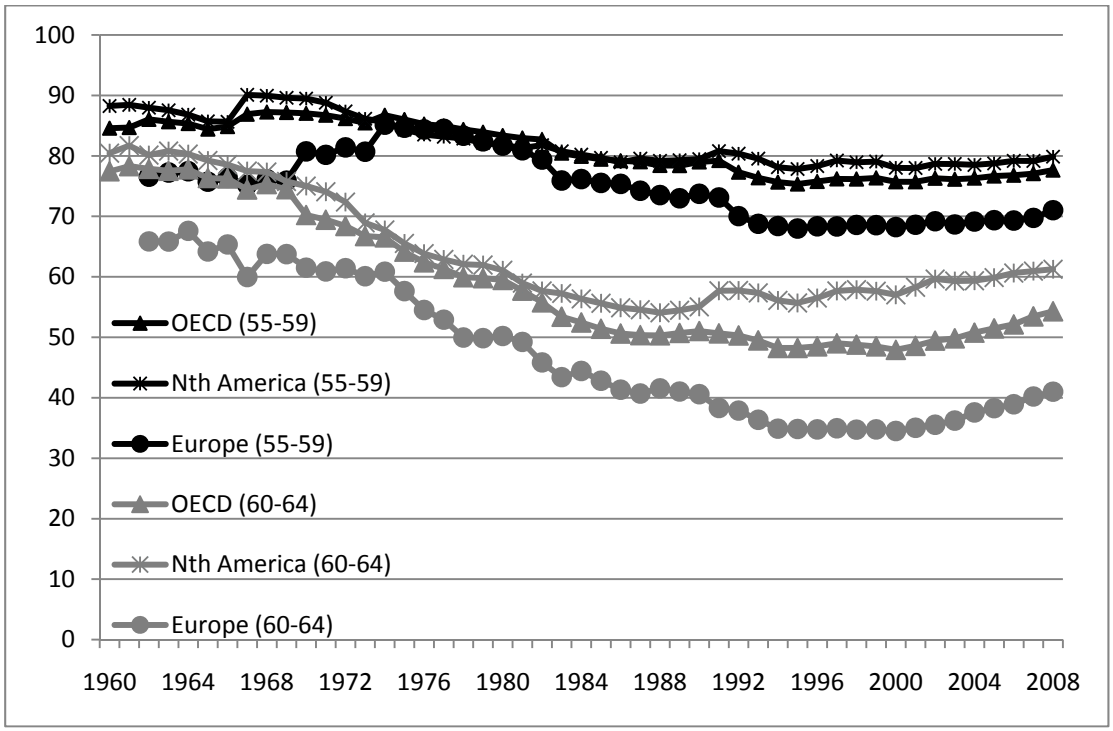
Source: Blöndal and Scarpetta (1998), Burniaux *et al*. (2004), Duval (2003)

3. Older Worker Labour Force Participation Trends and Theoretical Explanations

OECD countries face different policy challenges from ageing populations associated with their older worker labour force participation trends, social security pension systems, and stage of population ageing. The average labour force participation rates over time for OECD, European and North American countries are displayed in Figure 1. The two age groups 55-59 and 60-64 years are presented separately as there are different patterns evident as well as different pension eligibility rules for these age groups. As expected, the labour force participation rates for males aged 60-64 years are noticeably lower than those for aged 55-59. In addition, a more dramatic trend decline in labour force participation rates is evident for those aged 60-64 from the 1970's to the 1990's compared to a more gradual decline for those aged 55-59 years. An increase in labour force participation is observed after the year 2000, particularly for those aged 60-64. Finally, labour force participation rates in Europe are noticeably

lower than for the OECD average, with rates in North America marginally higher. However, this aggregated data conceals a great deal of variation at the individual country level.

Figure 1. Labour Force Participation Rates for Males Aged 55-59 and 60-64 (1960 to 2008)



Source: OECD (2009b)

Theoretical explanations for older worker labour force participation rates include roles for labour supply choice, labour demand, and/or State social security and labour force participation policies. The basic orthodox model of labour force participation derived from the general model of consumer demand, entailing the individual's decision between work and leisure emphasises the individual's response to relative price (financial) variables, which in turn are conditioned by their tastes and preferences for work and leisure (Hicks 1946). These propositions are generally estimated using micro level data. The basic static model has been extended to a dynamic framework with the lifecycle model of labour force participation (for example, Ghez and Becker 1975).

Alternative theories argue that elements left exogenous to this labour supply choice model are fundamental to explaining older male labour force participation. That is, labour demand and the institutional framework. These include the neoclassical labour demand theory and segmented labour market theory, addressing the firm's design of financial incentives, as well as the potential role of structural changes to industry employment and changes to employer labour use strategies within industries (for example, Lazear 1979, Standing 1986, 1997, O'Brien 2005). Other labour market related explanations include the discouraged worker hypothesis and the reserve army of labour explanations. These final explanations emphasise the state of the aggregate labour market, a disadvantaged or marginalised position for older workers, and/or the systematic manipulation of the labour force status of older workers by government policy makers (for example, Bowen and Finegan 1969, Standing 1978, Peck 1996). These latter theories suggest an extreme lack of choice for older workers' labour force outcomes particularly in the face of aggregate labour supply surplus with the reserve army of labour explanation also emphasising the selective way labour markets can be manipulated by policy makers.

O'Brien (2001a) showed a clear divide in the literature between prevalent theoretical explanations emphasised in US versus European literature. A perusal of US literature on older worker participation reveals the apparent unfettered operation of the lifecycle model of labour supply, thereby emphasising preferences and the individual or family unit's response to financial influences. This literature established the role for rising wealth and an income effect, generous social security and (private) pensions, and poor health (for example, Fields and Mitchell 1984, Hausman and Wise 1985, Stock and Wise 1990). Further research suggested that the influence of poor health had been an illusion. With the 'correct' health variable measurement, this decision was also dominated by financial variables (Bazzoli 1985, Costa 1996). This paradigm also suggested job loss resulted in an increase in the expected retirement age (Chan and Stevens 1999). US empirical models have typically incorporated increasing dynamic and structural complexity over time, again reflecting the lifecycle model, and in part reflecting the availability of longitudinal data (Leonesio 1996).

In a special AER issue Gruber and Wise (1998), Kapteyan and De Vos (1998), Blundell and Johnson (1998), and Börsch-Supan and Schnabel (1998) emphasised the

financial incentives in social security, or more specifically the financial disincentives for continued work, in explaining older workers' labour force participation across 11, mostly European countries, with the exceptions of the US and Japan. They found that the accrual of benefits with continued work and the age at which benefits are available were the most important determinants. Findings indicated an implicit tax on continued employment in all countries, thereby providing a financial incentive to exit the labour force. Furthermore, Gruber and Wise (1998) showed that differences in this implicit tax rate explained the majority of the differences between the included countries' older worker participation rates. Of note was that the US and Japan shared a low implicit tax and low unused capacity of older workers, compared to high implicit taxes and high unused capacity in most European countries. Finally, they pointed to evidence that changes in social security provision preceded changes to labour force participation. This implied that early retirement trend could be reversed by changes to social security programs that had induced these early retirement trends.

However, most other literature exploring European countries' older worker labour force participation emphasises a marginalised position of older workers in the labour market, aggregate labour supply surplus and that State policy subsequently reacted to this by allowing older unemployed workers to exit the labour force, as well as actively removing employed older workers in favour of youth employment. Standing (1986) and Westergaard *et al*. (1989) suggested that prolonged excess aggregate labour supply, the dismantling of the 'last in first out' principle and other protection offered to older workers within the internal labour market, and employment restructuring away from internal labour market practices were influential in explaining UK older worker labour force participation. Rather than a voluntary early retirement trend, the involuntary nature of the retirement decision was emphasised, and lower labour force participation was associated with discouraged worker explanations.

Casey and Laczko (1989) questioned the mere description of trends as early retirement, noting the large role of involuntary job loss, instead describing observed trends more accurately as long term unemployment. Laczko and Phillpson (1991) findings also challenged the simple version of the orthodox model of work-leisure predictions, describing the prevalence of a labour force state as 'early exit', representing an indeterminate status between the traditional two states of employment

and traditional retirement age at 65. Early exit was distinguished from early retirement, the former being associated with unemployment, especially for the low skilled and low educated in contracting industries. Laczko and Phillpson thus characterised the older age segment of the labour force as a 'reserve army of labour'.

The concept of the reserve army of labour was proposed by Karl Marx (Power 1983). The existence and persistence of business cycles or crises was fundamental to Marx's depiction of a capitalist economy. Furthermore, Marx argued that a reserve army of (surplus) labour was required for, and was the product of, capitalist production and accumulation. The ability to mobilise marginal labour to the labour force was desirable for capitalists, as it allowed expansion of production without running into labour supply constraints and also kept wages down. This reserve army of labour was then deemed expendable in periods of downturn or stagnation, until required for the next expansion phase. According to Marx, the State protects the interests of the capitalists. Therefore, the key proposition to establish is whether the government is an active party to the manipulation of older workers' labour force status according to aggregate labour market conditions. That is, older male workers being systematically removed from the labour force in periods of sustained high unemployment, and coerced into participation in periods of tighter labour market conditions via policy mechanisms. Researchers have noted the role of aggregate unemployment for some European governments' older worker labour supply policy, such as 'job release schemes' in France, Germany and the UK in the 1980's. Job release schemes offered employers financial incentives and allowed older workers to retire on a State sponsored pension if replaced by a targeted group, such as a youth or long-term unemployed person. This was in contrast to policy measures designed to keep older workers active after World War 2 in the face of labour shortages (Westergaard *et al*. 1989). Other policies may be more passive in nature such as the availability of social security specifically for older people in periods of labour supply surplus and the removal of such in periods of labour supply shortages.

This reserve army of labour explanation has also found acceptance among third generation segmented labour market theorists such as Offe and Hinriches (1985), Rubery (1992) and Peck (1996). Older male workers may form a segment of the labour force that can be manipulated as a reserve army of labour by the State. The

design of social security pensions specifically for older recipients with eligibility reflecting unemployment during periods of poor labour market conditions as part of welfare policy would provide one such avenue. As with the discouraged worker explanation, a weak position in the labour market would be a precondition to the availability of such an avenue of labour force exit for older workers. Furthermore, it may be seen as socially acceptable to target older males as the reserve army if they are subject to employment difficulties, have the alternative role of early retirement, or could be seen as freeing up employment for other deserving groups such as the youth.

Notably, the use of older worker early exit policies in periods of excess labour supply was not evident in all European countries. Stille (1999) noted that older worker labour force participation rates in countries allowing early exit measures tend to be substantially lower than prime-age participation rates, with little difference between older and prime-aged unemployment rates. Examples of such countries include Belgium, France, Italy, and The Netherlands. In contrast, other European nations not encouraging early exit in times of high unemployment exhibit similar labour force participation rates for all age groups, but substantially higher unemployment rates for older workers versus prime age.

The reserve army of labour explanation is quite prevalent in qualitative research but has not been specifically tested in empirical research. Testable propositions would first entail a relationship between older worker labour force participation rates and aggregate labour market conditions or constraints, thus establishing the discouraged worker effect as a precondition. In addition, State policy supporting this relationship directly via job release schemes or more indirectly with the availability of early exit routes in periods of excess labour supply, whereas orthodox theory would emphasise the financial generosity of social security affecting older worker participation rate.

In summary, a stylised characterisation of US literature would emphasise the apparent unfettered operation of the lifecycle model with individual choice and reaction to financial variables. European literature suggests a greater role for the labour market and government policy. These forces can also be captured in a lifecycle model of labour supply, however, it does suggest the predominance of uncertainty and constraints, the environment, or other exogenous variables, rather than the simpler

orthodox model of work-leisure choice. As such, the discouraged worker and reserve army of labour explanations are prevalent in European literature to explain older worker participation trends.

4. Methodology

A panel econometric model will be specified and estimated in this paper capturing 12 OECD countries and annual data covering the period 1967 to 2007. In line with the above discussion of various explanations of older worker labour force participation over time we assume that older male labour force participation rates are a function of financial variables that may 'pull' workers from the labour force in line with orthodox theory, as well as aggregate labour market constraints that may 'push' workers out which are more attune to discouraged worker and reserve army of labour explanations. Separate models are estimated for males aged 55-59 and 60-64 years which take into account different age eligibility rules that may be present in early retirement routes as well as the different standard age for receipt of countries' old age pension. The basic fixed effects models are specified as follows:

$$LFPR_{kit} = \beta_0 + \beta_1(ITAXK_{it} \text{ or } SSRR_{it}) + \beta_2 RETAGE_{it} + \beta_3 UNEMP_{it} + \beta_4 PRIME_{it} + \gamma_i + \varepsilon_{it} \quad (1)$$

where *k* denotes the age group 55-59 years or 60-64 years, *i* denotes an OECD country (i = 1, …, 12), *t* represents time (1967 to 2007), *LFPR* denotes labour force participation rates of older males aged 55-59 or 60-64 years, *ITAXK* is the implicit tax (%) on 5 years continued work in the 'early retirement' route for each age group, *SSRR* is the social security replacement rate of unemployment benefits (%), *RETAGE* is the standard retirement age for receipt of the old age pension, *UNEMP* denotes the prime aged (25 – 54 years) male unemployment rate (%), and *PRIME* represents the percentage of prime age males to the population of males aged 15 to 64 years.

Two alternative variable specifications are included in the specification to capture financial incentives for early labour force exit in countries' social security pension systems, namely, the implicit tax on continued work (*ITAXK*) and the replacement rates of unemployment benefits (*SSRR*). Following the work of Gruber and Wise (1998), Kapteyan and De Vos (1998), Blundell and Johnson (1998), Börsch-Supan

and Schnabel (1998), and more recently Duval (2003), the implicit taxes on continued work, *ITAX55* and *ITAX60*, are calculated as the change in net pension wealth from working an additional 5 years at ages 55 and 60, respectively (expressed as a percentage). [1] If additional contributions outweigh additional benefits an implicit tax is present. In theory the effect of this variable should be ambiguous because of opposing income and substitution effects, however, evidence suggests that implicit taxes will have an inverse effect on labour force participation (Lumsdaine and Mitchell 1999). The implicit tax is calculated for 'typical early retirement' routes such as early retirement pensions, disability pensions, and unemployment related pensions that can be taken prior allowing exit from the labour force prior to receipt of the old age pension. OECD reform policies entail a reduction of this implicit tax.

The social security replacement rate of unemployment benefits expressed as a percentage (*SSRR*) was also used as a proxy for the financial generosity of social security available as a non-wage source of income. Again, we would expect a negative coefficient if social security generosity entices workers from the labour force. The replacement rate is used to represent social security value relative to potential labour market earnings to take into account the work/non participation choice of older individuals. This particular measure is also expected to be a good proxy of social security available to older males including disability pensions and early retirement pensions during the period of analysis. First, replacement rates from unemployment benefits are significantly positively correlated to other non-employment benefit schemes such as disability pensions, which are the predominant form of non-employment benefit used by those aged 55-64 years. Second, many unemployment benefit schemes available to older males do not entail active job search. In such cases recipients are expected occupy the 'not in the labour force' status in labour force surveys.

This replacement rate is calculated by the OECD as the average of the gross unemployment benefit replacement rates for two earnings levels, three family situations and three durations of unemployment (Martin 1996). Therefore, this measure takes into account schemes with short duration such as the US and Canada

[1] The implicit tax data was obtained directly from Duval. Greater detail of the calculation of this data is given in Appendix 2 from Duval (2003).

with a lower value. However, in 1995 over half of OECD countries allowed individuals to draw on unemployment related benefits from the age of 55 to the standard retirement age (Blöndal and Scarpetta 1998). We use *ITAXK* and *SSRR* in alternative specifications as we would expect a high positive correlation between the two variables. The replacement rate directly captures the income replacement effect while the implicit tax captures age eligibility and pension accrual.

The standard retirement age (*RETAGE*) was included to account for variation in old age pension receipt eligibility. It is generally the age of 65 years in most countries, however, some countries such as Canada, France and Italy is as low as 60 in some years. In these latter countries we would expect a lower labour force participation rate for those aged 60-64. This variable has taken on increased relevance in recent years in light of OECD policy recommendations to increase standard retirement age to 67 years. It was also used in the model for males aged 55-59 years on an experimental basis to see if it has any noticeable effect on the labour force participation of older workers not necessarily close to standard retirement age.

Cyclical labour force discouragement is captured by the *UNEMP* variable, the unemployment rate of prime aged males. We would expect a negative coefficient if labour force discouragement is a significant influence. Prime aged males are used for this measure to avoid endogeneity, with the labour force participation rate of older males being jointly determined with unemployment rates. Also, past research has shown a significant role for hidden unemployment for older male labour force participation, therefore the use of older male unemployment rates (which, by definition, conceal hidden unemployment) would not adequately capture this effect (for example Beatty *et al*. 2000, Fothergill 2001, O'Brien 2001b).

As first proposed in Blöndal and Scarpetta (1998), the percentage of prime aged males within the working age male population (*PRIMEPR*) is included in this specification as an additional aggregate labour market constraint. This influence is similar to the long-run rather than cyclical labour force discouragement concept proposed by Standing (1978), the BLMR (1983) and Peck (1996). The hypothesis that any increase in the proportion of prime aged males will crowd out older workers implies a negative coefficient. This proposition rests on two assumptions. First, that prime aged workers

are more attractive to employers than older workers, perhaps in terms of education and productivity. Second, employers are rationing available jobs to those most attractive within rigid labour market structures, with relative wages unable to adjust to clear the market. This variable would appear to capture the pressures within many European countries of employers and governments to squeeze out older workers from the labour force in the face of persistent high unemployment in past recent decades which also coincided with a proportional increase in prime aged workers from the baby boomer generation.

The current model specification shares some similarities with the previous OECD fixed effects panel models and combines the relative strengths of Blöndal and Scarpetta (1998) and Duval (2003). However, the restriction imposed upon these previous models to obtain common slope coefficients across all countries would appear to be an over simplistic assumption given the unique features of OECD countries' labour force participation, social security systems and labour market features, and underutilises the panel aspect of the data. Therefore, one of the contributions of the current research is to allow the estimation of country specific slope terms for *TAXK* and *UNEMP*, being the main policy variables suggested by the OECD and ILO, respectively. We could not include country specific slope terms for *RETAGE* because many countries have the age of 65 for all of 1967 to 2007, meaning we would encounter multicollinearity issues with the constant term. We augment the standard fixed effects models by allowing the *ITAXK* and *UNEMP* slope coefficient restrictions to be relaxed in two separate models, thus preserving degrees of freedom.

Another issue not considered by previous OECD modelling is stationarity, unit root testing and cointegration. This would appear to be a major shortcoming of previous modelling considering the relatively long time series aspect of data used and the availability of tests that can readily be conducted in contemporary econometrics software packages. Furthermore, the inclusion of time trends in the models of Duval (2003) may amount to a misspecification unless variables are time stationary.

The Levin, Lin and Chu (LLC) test (Levin *et al*. 2002) and the Breitung (BR) test (Breitung 2000) assume a common unit root process across all cross sections. They consider the basic ADF specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{it-j} + X'_{it}\,\delta + \varepsilon_{it} \qquad (2)$$

The assumption imposed is that $\alpha = \rho - 1$, while allowing the lag order for the difference terms to vary. The null hypothesis assumes a unit root, with an alternative hypothesis of no unit root:

$$\begin{aligned} H_0 &: \alpha = 0 \\ H_1 &: \alpha < 1 \end{aligned} \qquad (3)$$

The difference between the LLC and BR tests relates to how the α term is estimated.

In addition, there are a number of unit root tests that allow ρ_i to vary across different countries, namely, the Im, Peraran and Shin (IPS) test (Im *et al*. 2003), and the Fisher-ADF and Fisher-PP tests (Maddala and Wu (1999) and Choi (2001)). The null hypothesis assumes a unit root for all *i*, with the alternative that some cross sections (countries) do not have a unit root. As is standard practice in stationarity testing all variables are first tested in their level form. If a unit root is present the test is then repeated on the first differenced data. If the first differenced data is stationary then it is deemed integrated of order 1, I(1).

It must be noted that no attempt has been made to allow for structural breaks in this work. Perron (1989) noted that some unit root tests results may be biased to not rejecting the null hypothesis of a unit root in the presence of structural break(s), however, panel unit root tests incorporating structural breaks have only been formulated relatively recently (Im *et al*. 2005, and Hadri and Rao 2008) and are yet to be incorporated in mainstream econometric software.

Non-stationary data (such as I(1)) should not be modelled in level format as a long-run relationship unless a linear combination of those variables is stationary. That is, the variables are cointegrated (Engle and Granger 1987). If variables are non-stationary and modelled in their level form, there is a danger of spurious regression results. The presence of a cointegrating relationship can be tested with unit root tests of residuals from the long-run equation which should resemble white noise and be I(0).

If variables are cointegrated, a valid dynamic model specification is as an error correction model (Engle and Granger 1987). This entails estimating a short run relationship with variables specified in first differences and also including the lagged residual (error correction term) from the long run model specified in levels. The coefficient attached to the error correction term should be negative and thus represents the speed of adjustment to the long run model. That is:

$$\Delta LFPR_{kit} = \beta_0 + \beta_1 \Delta(SSRR_{it} \text{ or } TAXK_{it}) + \beta_2 \Delta RETAGE_{it} + \beta_3 \Delta UNEMP_{it} + \beta_4 \Delta PRIME_{it} + \beta_5 ECM_{it-1} + \gamma_i + \varepsilon_{it} \quad (4)$$

where *ECM* is the stationary residual from the long run model.

Therefore, there are a number of contributions from the proposed modelling. First, we relax parameter restrictions and allow both country specific intercepts (fixed effects) and slope terms to further incorporate unique aspects of different OECD countries' social security system and labour market characteristics. We can therefore simulate changes to pensions suggested by the OECD or labour market suggested by the ILO that are specific to each country. Second, we take into account the time series aspects of the data that have been neglected in previous OECD modelling and address stationarity issues with both unit root and cointegration tests of the data. In addition, these tests are conducted for both the panel as a whole as well as for individual cross sections (countries). Finally, we specify and estimate both the long run models and short run dynamic models incorporating error correction mechanisms.

5. Data and empirical results

Most data for the included 12 OECD countries covering a maximum time period of 1967 to 2007 was collected directly from the OECD website (OECD 2009b). The data for labour force participation, unemployment rates and population proportions were able to be constructed from annual data available, however, the social security replacement rates were only available biennially (OECD 2009c). Therefore, the replacement rate data for alternate years was imputed by interpolation between available years. This would appear to be appropriate given that there is little short term volatility in this data. The implicit tax rates and standard retirement age data was obtained directly from Romain Duval of the OECD (Duval 2003) for 1967 to 1999,

2002 and 2004. Similarly, missing data for 2000, 2001 and 2003 was imputed by a process of interpolation of available data. This data was not extrapolated beyond 2004, meaning that models incorporating the *ITAXK* variable are only estimated for the 1967 to 2004 period. All variables were not available for all time periods for each OECD country, thus the data used in the econometric models will be an unbalanced panel. Included countries were chosen on the basis of data availability, with only those countries with at least 25 years of observations of all variables chosen for modelling. This left us with the 12 countries of Australia, Canada, Finland, France, Germany, Italy, The Netherlands, Norway, Portugal Spain, Sweden and the US.

Descriptive statistics for each country are presented in Table 2. As expected, the labour force participation rates are greater for those aged 55-59 than 60-64 years in all countries. However, there is much greater variation in the 60-64 participation rates over time. The generosity of social security varies greatly between the countries and is generally higher in European countries compared to Australia, Canada and the US. However, retirement age has been constant at 65 years for many countries (with a standard deviation equal to zero). As mentioned previously, this feature precluded the use of country specific *RETAGE* slope terms. Prime age unemployment rates average less than ten percent in all countries, however, there is a relatively large amount of variation over time, as expected, with cyclical fluctuations. Finally, the average percentage of prime aged males amongst the labour force aged population is very similar in most countries at around 62 to 64% and has moved very slowly over time, as would be expected with demographic data.

Table 2. Descriptive Statistics (mean and standard deviation) for the 12 OECD Countries (1967 to 2007*)

	*LFPR*55	*LFPR*60	*SSRR*	*ITAX* 55	*ITAX* 60	*RETAGE*	*UNEMP*	*PRIME*
Australia	79.602 (6.964)	56.281 (12.209)	22.000 (4.059)	-0.108 (1.657)	3.345 (6.525)	65.000 (0.000)	4.453 (2.444)	62.060 (2.458)
Canada	76.862 (4.182)	53.345 (7.263)	16.436 (3.023)	1.521 (4.027)	5.822 (8.340)	62.561 (2.749)	7.175 (1.814)	63.466 (3.335)
Finland	70.765 (9.087)	44.604 (18.303)	25.745 (12.327)	55.647 (20.087)	57.317 (19.819)	65.000 (0.000)	5.604 (3.605)	62.130 (3.633)
France	74.110 (8.354)	38.430 (21.829)	31.915 (6.527)	49.161 (14.227)	69.821 (19.392)	61.890 (2.423)	5.210 (2.824)	61.669 (2.247)
Germany	80.458 (4.615)	41.279 (12.877)	28.351 (1.671)	40.568 (16.867)	44.564 (15.636)	65.195 (0.601)	5.155 (2.812)	63.404 (1.077)
Italy	62.241 (6.444)	36.103 (12.877)	10.319 (12.891)	54.950 (20.366)	83.780 (22.937)	61.305 (2.049)	3.969 (1.919)	64.184 (4.130)
Netherlands	71.412 (7.634)	37.260 (17.307)	46.628 (10.507)	54.298 (28.626)	73.882 (17.844)	65.000 (0.000)	4.516 (2.852)	63.335 (3.124)
Norway	84.516 (2.319)	68.502 (6.703)	24.979 (15.165)	13.003 (3.728)	13.647 (7.029)	67.329 (0.872)	2.529 (1.629)	63.634 (3.484)
Portugal	75.386 (4.103)	58.424 (7.637)	19.383 (19.392)	33.666 (21.374)	50.741 (27.013)	65.000 (0.000)	3.598 (1.451)	59.792 (2.307)
Spain	79.029 (5.648)	53.973 (11.633)	27.021 (11.302)	58.225 (6.486)	66.033 (9.017)	65.000 (0.000)	8.955 (4.387)	62.466 (3.192)
Sweden	87.566 (3.301)	68.331 (8.727)	22.021 (11.302)	28.247 (17.133)	48.332 (29.685)	65.463 (0.840)	3.305 (2.775)	62.947 (2.416)
US	83.192 (3.875)	63.828 (9.398)	15.723 (9.229)	5.343 (2.473)	9.360 (6.858)	65.000 (0.000)	4.401 (1.495)	62.706 (3.300)

Source: OECD (2009b), OECD (2009c), Duval (2003), author's calculations
Mean with standard deviation in brackets
* *ITAXK* from 1967 to 2004

Unit root tests are presented in Table 3. The bulk of evidence suggests that all variables are I(1) for both the panel and individual country. That is, a unit root present in the level form of the variable with stationarity subsequently established in the first difference of each variable.

Table 3. Unit Root Tests

	Unit Root Test				
Variables	IPS	ADF	PP	LLC	BR
$LFPR55_{it}$	6.276 [1.000]	6.616 [1.000]	6.819 [1.000]	3.600 [1.000]	5.178 [1.000]
$\Delta LFPR55_{it}$	-15.366 [0.000]	217.631 [0.000]	342.256 [0.000]	-17.378 [0.000]	-12.442 [0.000]
$LFPR60_{it}$	7.324 [1.000]	11.254 [0.987]	10.796 [0.990]	4.510 [1.000]	7.462 [1.000]
$\Delta LFPR60_{it}$	-12.264 [0.000]	168.799 [0.000]	269.577 [0.000]	-13.739 [0.000]	-8.295 [0.000]
$SSRR_{it}$	-0.577 [0.282]	34.751 [0.072]	10.753 [0.991]	0.381 [0.649]	0.949 [0.829]
$\Delta SSRR_{it}$	-15.058 [0.000]	231.579 [0.000]	199.059 [0.000]	-14.439 [0.000]	-11.429 [0.000]
$ITAX\,55_{it}$	3.873 [1.000]	23.354 [0.499]	15.078 [0.919]	-1.027 [0.152]	3.193 [0.999]
$\Delta ITAX\,55_{it}$	-5.860 [0.000]	85.455 [0.000]	302.009 [0.000]	-4.690 [0.000]	-1.579 [0.057]
$ITAX\,60_{it}$	3.175 [0.999]	20.8554 [0.647]	8.617 [0.998]	1.111 [0.867]	5.123 [1.000]
$\Delta ITAX\,60_{it}$	-4.996 [0.000]	79.440 [0.000]	57.270 [0.000]	-5.318 [0.000]	-1.729 [0.042]
$RETAGE_{it}$	0.345 [0.000]	5.657 [0.686]	1.663 [0.990]	-1.042 [0.149]	-0.393 [0.347]
$\Delta RETAGE_{it}$	-3.615 [0.000]	29.358 [0.000]	17.290 [0.000]	-4.442 [0.000]	-3.972 [0.000]
$PRIME_{it}$	-0.768 [0.221]	31.843 [0.131]	6.397 [1.000]	-1.912 [0.028]	-0.764 [0.222]
$\Delta PRIME_{it}$	-4.367 [0.000]	72.596 [0.000]	72.187 [0.000]	-3.570 [0.000]	-1.221 [0.111]
$UNEMP_{it}$	-1.391 [0.082]	45.266 [0.005]	14.157 [0.943]	0.452 [0.674]	0.580 [0.719]
$\Delta UNEMP_{it}$	-8.659 [0.000]	116.050 [0.000]	78.733 [0.000	-7.178 [0.000]	-6.805 [0.000]

Test statistic reported with p-value in brackets
IPS = Im, Pesaran and Shin W-Stat
PP = Fisher PP
ADF = Fisher ADF
LLC = Levin, Lin and Chu
BR = Breitung

The results from the estimated models are presented in Table 4 and 5 for males aged 55-59 and 60-64 years respectively. Models display relatively high adjusted R^2 values, stationary residuals, and generally comparable statistically significant coefficients across specifications for each age group, indicating quite robust results.

Slope coefficients generally increase with age indicating that the labour force participation of males aged 60-64 are more sensitive to both pension value and labour market conditions.

Starting with the basic fixed effects models, estimation results indicate that an increase in social security replacement rates (*SSRR*) of one percentage point will decrease labour force participation rates by around 0.13 percentage points for males 55-59 and 0.28 percentage points for those aged 60-64. This is quite small in magnitude and indicates that a decrease in replacement rates of 10 percentage points will increase labour force participation of males 55-59 by less than 1.5 percentage points and less than 3 percentage points for males 60-64 years. In comparison, a 10 percentage point decrease in implicit tax rates (*ITAXK*) will increase labour force participation rates for males 55-59 by less than 1 percentage point and less than 1.5 percentage points for males aged 60-64. An increase in the standard retirement age of 2 years, as would be the case with most countries increasing retirement age from 65 to 67, would increase the labour force participation rate by up to 1.5 percentage point for those 55-59, although this coefficient was much lower and statistically insignificant in the model containing the implicit tax variable. As expected, it was estimated to have a larger impact for those aged 60-64. However, its magnitude was also small, with an increase in standard retirement age of 2 years increasing labour force participation by only 2 to 4.5 percentage points. These results suggest that OECD pension reforms may not have a large impact on older male labour force participation rates.

The labour force discouragement variable (*UNEMP*) was significant in all models. A 1 percentage point increase in the prime age unemployment rate decreases labour force participation rates by approximately 0.8 to 0.9 percentage points for males 55-59 and by around 2 to 2.4 percentage points for males aged 60-64. Therefore, a labour market policy to reduce unemployment by 1 percentage point would have a larger effect than the hypothetical pension reforms above to increase older worker labour force participation. It would therefore appear that the ILO recommendation to encourage full employment, or at the very least to stimulate the labour demand, could be effective in increasing older worker labour force participation to address ageing society concerns. Note, however, this model does not take account of possible

inflationary effects of this proposed policy nor the natural rate of unemployment or NAIRU.

Finally, evidence of crowding out of the labour market of older males by younger prime aged workers is evident. A 1 percentage point increase in the percentage of prime aged males amongst the working age male population decreases labour force participation of those 55-59 by around 0.7 to 1 percentage point and approximately 1.1 to 1.2 percentage points for those 60-64. This suggests that there is evidence that the baby boomer generation may have crowded out older workers when they were prime aged workers in the 1970' and 80's when this variable was at its highest values. On an optimistic note, a symptom of ageing populations is that the proportion of prime aged males in the labour force aged male population is now on a downward trend, thereby relaxing this aggregate constraint that crowded out older workers in the past. The baby boomers may therefore not experience the same pressure to exit the labour market as the preceding generation of older workers. Model results suggest that increased labour force participation rates of older workers observed in the early to mid 2000's would have predominantly been the result of strong labour markets and a decline in the proportion of prime aged males amongst the labour force aged population rather than the recently enacted pension reforms.

All models allowing for country specific slope terms offer increased adjusted R^2 values compared to the basic fixed effects models, indicating an increased level of explanatory power after allowing for a decrease in degrees of freedom. Furthermore, we observe a large amount of variation in these slopes across different countries. The models that allow for country specific slope terms offer very interesting insights for pension reform policy. The financial incentives for labour force exit are generally stronger than the basic model in Finland, France, Germany, The Netherlands, and Portugal indicating scope in these countries for pension reforms to increase labour force participation. Most of these countries have relatively high implicit taxes. However, the implicit tax on continued work coefficient is insignificant or even positive for both older age groups in half the countries listed, namely, Australia, Canada, Italy, Norway, Spain and the US. Australia, Canada, Norway and the US have quite low implicit taxes but this cannot be said for Italy and Spain. Therefore, these findings are in contrast to Gruber and Wise (1998) that removing implicit taxes

will reverse older worker early retirement trends. Indeed, the current results imply that pension reform policies to decrease the implicit tax on continued work would be ineffective in increasing older labour force participation in many countries.

In contrast, the role of unemployment in the labour market is a significant negative influence on both age groups' labour force participation in all countries except Canada, Finland, Norway and Sweden. A 1 percentage point increase in prime age unemployment rates is estimated to decrease labour force participation in Australia, France, Germany, Italy and The Netherlands, Portugal and Spain by over 1 percentage point for males 55-59 and by between 2 and 5 percentage points for those aged 60-64. Of note is that Australia, France, Germany, Italy, and Portugal had unemployment pensions or unemployment benefit schemes that had long duration and / or exempted active job search for older males from the 1970's, thereby allowing labour force exit during higher unemployment times observed in the period of analysis. Furthermore, Australia, Germany, Italy and The Netherlands had labour market related criteria in their disability pensions, also generally enacted in the 1970's and 1980's, allowing another possible labour force exit in periods of higher unemployment (Blöndal and Scarpetta 1998). Therefore, these OECD countries would seem to neatly fit within the reserve army of labour hypothesis whereby older workers could easily be removed from the labour force largely via social security exits in times of excess labour supply. Furthermore, results would indicate that policies to decrease unemployment would complement pension reform policies in France, Germany, The Netherlands and Portugal where both pension and unemployment variables are significant, and perhaps even substitute for pension reform in other countries where the pension reform coefficients were insignificant. At the very least, findings from these models allowing country specific coefficients imply that different policy tools are required in different OECD countries and not a one policy fits all approach.

Table 4. Fixed Effects Models for Males 55-59

Intercept	88.373 [0.000]	142.045 [0.000]	121.248 [0.000]	150.007 [0.000]
$SSRR_{it}$	-0.133 [0.000]			
$ITAX55_{it}$		-0.078 [0.000]		-0.084 [0.000]
$RETAGE_{it}$	0.698 [0.000]	0.064 [0.694]	0.240 [0.252]	0.041 [0.822]
$UNEMP_{it}$	-0.793 [.000]	-0.883 [0.000]	-0.816 [0.000]	
$PRIME_{it}$	-0.777 [0.000]	-0.990 [0.000]	-0.847 [0.000]	-1.086 [0.000]
Country Specific Slope Coefficients			$ITAX55_{it}$	$UNEMP_{it}$
Australia			0.901 [0.000]	-1.836 [0.000]
Canada			-0.623 [0.092]	-0.050 [0.845]
Finland			-0.127 [0.000]	-0.120 [0.382]
France			-0.223 [0.000]	-1.344 [0.000]
Germany			-0.060 [0.064]	-1.294 [0.000]
Italy			0.107 [0.000]	-3.290 [0.000]
Netherlands			-0.135 [0.000]	-1.097 [0.000]
Norway			0.347 [0.117]	0.684 [0.032]
Portugal			-0.212 [0.000]	-1.072 [0.009]
Spain			0.012 [0.899]	-1.054 [0.000]
Sweden			-0.043 [0.136]	-0.209 [0.226]
US			0.555 [0.000]	-0.872 [0.005]
No. of obs	442	406	406	406
R^2	0.848	0.856	0.890	0.896
$\overline{R}^2$	0.843	0.851	0.882	0.889
F statistic	158.945 [0.000]	154.626 [0.000]	117.865 [0.000]	125.629 [0.000]
LLC	-5.522 [0.000]	-5.393 [0.000]	-6.285 [0.000]	-5.946 [0.000]
ADF	58.136 [0.000]	57.846 [0.000]	71.355 [0.000]	67.890 [0.000]
PP	61.555 [0.000]	59.392 [0.000]	73.079 [0.000]	67.721 [0.000]

Table 5. Fixed Effects Models for Males 60-64 years

Intercept	5.503 [0.799]	41.834 [0.000]	18.125 [0.515]	119.432 [0.000]
$SSRR_{it}$	-0.284 [0.000]			
$ITAX\,60_{it}$		-0.137 [0.000]		-0.134 [0.000]
$RETAGE_{it}$	2.250 [0.000]	1.331 [0.000]	2.277 [0.000]	1.043 [0.006]
$UNEMP_{it}$	-1.968 [0.000]	-2.393 [0.000]	-2.401 [0.000]	
$PRIME_{it}$	-1.135 [0.000]	-1.203 [0.000]	-1.555 [0.000]	-1.891 [0.000]
Country Specific Slope Coefficients			$ITAX\,60_{it}$	$UNEMP_{it}$
Australia			-0.070 [0.699]	-3.017 [0.000]
Canada			1.006 [0.005]	0.021 [0.974]
Finland			-0.179 [0.002]	-1.326 [0.000]
France			-0.0827 [0.215]	-4.078 [0.000]
Germany			-0.361 [0.000]	-4.139 [0.000]
Italy			0.037 [0.491]	-4.841 [0.000]
Netherlands			-0.417 [0.000]	-2.156 [0.000]
Norway			0.249 [0.195]	0.061 [0.927]
Portugal			-0.162 [0.007]	-2.282 [0.000]
Spain			0.106 [0.506]	-2.062 [0.000]
Sweden			-0.120 [0.001]	-1.453 [0.000]
US			0.221 [0.152]	-2.166 [0.000]
No. of obs	455	419	419	419
R^2	0.840	0.843	0.863	0.879
$\bar{R}^2$	0.834	0.837	0.854	0.871
F statistic	153.234 [0.000]	144.257 [0.000]	94.809 [0.000]	109.089 [0.000]
LLC	-6.870 [0.000]	-6.524 [0.000]	-6.891 [0.000]	-6.343 [0.000]
ADF	80.133 [0.000]	79.636 [0.000]	88.678 [0.000]	73.305 [0.000]
PP	71.028 [0.000]	64.749 [0.000]	71.630 [0.000]	67.701 [0.000]

All of the above models specified in levels represent long run relationships. Furthermore, the stationary residuals from these models indicated quite stable and well specified relationships. However, also of interest to this study are the short run or dynamic relationships between these variables in OECD countries, which have not been explored until now. The residuals from the basic fixed effects models were saved, lagged one period, and used as error correction terms in their respective short run models. Thus all variables used in the following models are I(0). For simplicity, these models are estimated using country specific fixed effects, but not country specific slopes.

Results for these short run models are contained in Table 6. Residuals from these models are once again stationary. The adjusted R^2 values are noticeably lower than those for the long run models, however, they are not directly comparable because of a different dependent variable and lower explanatory power is generally expected from a short run dynamic model specified in first differences.

All coefficients are of the expected sign, however, the coefficients for the pension financial variables are not significant at the 1% level. Therefore, results indicate that pension reform policies to decrease the financial value of pensions will not have an immediate impact. Surprisingly, a change in the standard retirement age was estimated to have an impact in the short run. However, there is only limited scope to alter this variable and any policy to increase the standard age of retirement would typically be phased in over a relatively long period. In contrast, coefficiens attached to both aggregate labour market constraint variables, *UNEMP* and *PRIME*, are significant and larger in magnitude than financial pension coefficients. Finally, the error correction terms indicate that any deviation from the long run model is only corrected or adjusted by around 10 % in the following year, indicating a quite slow adjustment to the long run relationship. In summary, the largely insignificant influence of financial variables for pension reform, significant influence of the labour market constraints, and relatively slow adjustment toward the long run model gives added weight to the labour market focus recommended by ILO policies.

Table 6. Short Run Error Correction Models

	$\Delta LFPR55_{it}$		$\Delta LFPR60_{it}$	
Intercept	-0.172 [0.021]	-0.228 [0.004]	-0.522 [0.000]	-0.672 [0.000]
$\Delta SSRR_{it}$	-0.031 [0.258]		-0.076 [0.031]	
$\Delta ITAX55_{it}$		-0.0329 [0.0478]		
$\Delta ITAX60_{it}$				-0.018 [0.315]
$\Delta RETAGE_{it}$	0.841 [0.001]	0.7853 [0.003]	1.484 [0.000]	1.369 [0.000]
$\Delta UNEMP_{it}$	-0.305 [0.000]	-0.308 [0.000]	-0.550 [0.000]	-0.529 [0.000]
$\Delta PRIME_{it}$	-0.541 [0.000]	-0.536 [0.000]	-0.377 [0.004]	-0.355 [0.000]
ECM_{it-1}	-0.111 [0.000]	-0.117 [0.000]	-0.101 [0.000]	-0.110 [0.000]
No. of obs	430	394	443	407
R^2	0.140	0.156	0.241	0.262
$\bar{R}^2$	0.106	0.120	0.212	0.231
F statistic	4.187 [0.000]	4.356 [0.000]	8.445 [0.000]	8.636 [0.000]
LLC	-18.248 [0.000]	-18.006 [0.000]	-13.223 [0.000]	-13.944 [0.000]
ADF	325.387 [0.000]	309.837 [0.000]	240.655 [0.000]	236.062 [0.000]
PP	325.361 [0.000]	310.449 [0.000]	275.841 [0.000]	254.254 [0.000]

Section 6 - Conclusions and Policy Implications

The findings from both long run and short run dynamic econometric models emphasise the role of labour market variables over social security disincentives for employment, and also country specific causal factors, for explaining older worker labour force participation in the long run. Policies to reduce unemployment would appear to have a larger influence in increasing labour force participation rather than restriction to pensions or decreasing financial generosity. Indeed, the implication from model results was that recent increases in older male labour force participation rates from the year 2000 was likely to be the result of declining prime age unemployment rates and easing of crowding out pressures rather than the result of recently enacted pension reforms. However, the role of the labour market is largely ignored in OECD policy prescriptions to address an ageing society. It would therefore appear as if the recent pension reforms to address ageing populations are now out of character with the reserve army of labour hypothesis that has operated in many countries over recent

decades. That is, there is apparent asymmetry in the role of the government within this hypothesis. There is ample evidence of governments in many countries being party to the removal or exit of older males during periods of excess labour supply. Examples range from being indirect or passive through social security eligibility allowing exit via unemployment benefits design or labour market criteria in disability pensions, to very active with Job Release Schemes. However, pension reforms to increase older worker labour force participation would now seem to precede actual labour shortages in the future, and furthermore be predominantly based on fiscal considerations, rather than aggregate labour market conditions.

While there appears to be an explicit recognition of the disadvantage faced by older workers in the labour market within the OECD research, there is an unwillingness to push a strong active policy stance on labour demand and employment. The lack of demand and employment policy reflects a lack of priority to this area and a level of reluctance on the part of the OECD. While a bulk of detailed OECD pension reform literature has been conducted backing up their pension policy reform stance, they meekly cite a lack of research for a lack of older worker employment policy formulation. This preoccupation with pension reform means that supply side policy affecting the relative price and availability of non-wage income is the predominant policy tool recommended to address an ageing society. While this may ease concerns over future budget exposure, it is argued that this policy stance is inequitable and merely shifts the financial responsibility of unemployment or retirement to the individual, and does little to address deficient aggregate labour demand and the labour market disadvantage faced by older workers. It is therefore suggested that many countries would stimulate older worker labour force participation by adhering to the ILO policy focus on a healthy labour market rather than relying solely on OECD pension reform policy.

Finally, future research will incorporate panel unit root tests allowing for structural breaks, inclusion of superannuation or private saving variables, and a regime switching model to test for asymmetric responses to independent variables.

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