Labour Force Participation Hysteresis in Industrial Countries: Evidence and Causes [ℵ]

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Abstract

This paper uses an impulse-response function approach to assess the magnitude and persistence of the labour force participation effects of downturns for a sample of 30 countries over the period 1960-2008. Severe recessions appear to have a significant and persistent impact on participation, while moderate downturns do not. The aggregate participation rate effect of severe downturns peaks on average at about 1½ to 2½ percentage points five to eight years after the cyclical peak, and is still significant after almost a decade. Youths and older workers account for the bulk of this effect. Early retirement incentives embedded in old-age pension schemes and other social transfer programmes are found to amplify the responsiveness of older workers' participation to economic conditions.

Keywords: Crises, Downturns, Labour force participation, Retirement, Hysteresis.

JEL: J21, J26, C23, E32, H55.

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1. Introduction

Unemployment hysteresis has been the subject of an extensive theoretical and empirical literature since at least Blanchard and Summers (1986, 1988). There is a mild consensus today that although changes in institutions alone contributed to the rise in and the persistence of high continental European unemployment starting from the mid-1970s (Bassanini and Duval, 2009; Nickell *et al.*, 2005), interactions between pre-existing institutional settings and a series of adverse macroeconomic shocks, *i.e.* hysteresis mechanisms, also played a role (Blanchard and Wolfers, 2000).

By contrast, the issue of labour force participation hysteresis has received limited attention.[1] Yet basic arithmetic and economic theory both suggest that its contribution to overall employment hysteresis could potentially be large. Aggregate participation rates have changed markedly over the past four decades, and these shifts have been more heterogeneous across countries than those of unemployment (measured in percentage point changes) – although some of this may of course reflect heterogeneous underlying trends in *e.g.* female labour participation (Figure 1). On the theoretical side, some labour force participation decisions have been modeled as being partly or even fully irreversible, not least the retirement decision of older workers (see *e.g.* Lazear, 1987). This opens the possibility that adverse macroeconomic shocks may turn temporary participation declines into persistent or even permanent reductions, especially where social transfer programmes exist that can be used as exit pathways when the value of job search declines – as is typically the case in crisis times.

1. By contrast, there is a more extensive literature on the "scarring" effects of recessions on the future wage and/or job prospects of *cohorts* that enter the labour market in such periods (see *e.g.* Raaum and Roed, 2006), which we ignore here as it does not address the issue of whether crises have persistent effects on the labour force participation of the overall labour force or of particular age groups.

Based on a simple dynamic model of transitions between employment, unemployment and non-participation in the presence of disability schemes, Autor and Duggan (2003) show that such schemes can indeed amplify permanent labour market withdrawal in the event of adverse shocks, and confirm their findings on time-series state-level data for the United States. Based on individual survey data, Coile and Levine (2007, 2009) find that retirement decisions respond to economic conditions – a result supported by Von Wachter (2007) or Hallberg (2008) – and that this cyclical sensitivity is amplified by available public retirement provisions. Tatsiramos (2010) draws comparable conclusions from individual survey data for the EU, showing that more generous unemployment benefits for older workers lower the probability of re-employment in the event of displacement. A number of case studies have also documented durable participation declines in the aftermath of past recessions as a result of large inflows into disability, sickness and early retirement schemes, for instance for the Netherlands and the United Kingdom (Nickell and Van Ours, 2000), Canada (Fortin and Fortin, 1999).

In this paper, we take a broader perspective and assess participation hysteresis for a panel of OECD countries spanning several decades including all major past recessions. Our contribution to the literature is two-fold. First, using an impulse-response function approach, we explore the dynamic effects of downturns on labour force participation both in aggregate and for each demographic group. Second, we exploit cross-country variability in summary measures of retirement incentives to assess the extent to which they account for the greater responsiveness of older workers' labour force participation to downturns.

Our main findings are the following. First, only severe recessions appear to have a significant impact on participation, while moderate downturns do not. The aggregate participation rate effect of severe downturns peaks on average at about 1½ to 2½ percentage points five to eight years after the cyclical peak, and is still significant after almost a decade. Second, youths and older workers account for aggregate participation declines in the aftermath of severe downturns. Third, the labour market withdrawal of older workers is amplified by early retirement incentives.

The remainder of this paper proceeds as follows. Section 2 presents the general empirical approach and implements it to quantify the labour force participation effects of past downturns both in aggregate and for various age and gender groups, based on a panel of OECD countries spanning over four decades. Section 3 focuses on the participation of older workers more specifically and assesses the extent to which early retirement incentives amplify their labour market withdrawal in the aftermath of downturns. Section 4 concludes.

2. The effect of downturns on labour force participation

2.1. Methodology and data

We start by analysing the response of labour force participation during downturn episodes. Downturns are classified on the basis of the magnitude of the change in the OECD's output gap measure between successive *peaks* and *troughs*, where the smallest value in the peak-to-trough change in the output gap which is considered to be a downturn is 3 percentage points. While pitfalls in estimating output gap levels are well known, this strategy for identifying downturns relies on *changes* in output gaps, which removes most of the potential measurement problem. The change in the output gap is equal to the difference between the observed GDP growth rate and the unobserved potential growth rate, and that difference is merely used to assign a zero or one value to the downturn dummy variable that will ultimately be used in the regressions. This approach guards us against the risk of an identification strategy that would rely heavily on unobserved variables, at least provided the OECD estimates of potential growth – which in practice come close to filtered GDP growth – are not "too" mistaken. Once downturn episodes are identified, a downturn dummy variable is constructed that takes value 1 in downturn years and zero otherwise. Alternative thresholds are also used for the change of output gap in order to classify downturns as: a) moderate (when the peak-to-trough change in the output gap is between 3 and 6 percentage points); b) severe (between 6 and 9 percentage points); and c) *very severe* (above 9 percentage points). In particular, downturn dummies for different magnitudes are constructed as:

Moderate Downturn:

$$D_{i,t}^{1} = 1 \; if \quad -3 \geq (TROUGH_i - PEAK_i) > -6 \; ; \qquad D_{i,t}^{1} = 0 \; otherwise \qquad \text{(1a)}$$

Severe Downturn:

$D^2_{i,t} = 1 \ if \ \ -6 \geq (TROUGH_i - PEAK_i) > -9 \, ; \quad D^2_{i,t} = 0 \ otherwise$ (1b)

Very Severe Downturn:

$D^3_{i,t} = 1 \, if \ \ -9 \geq (TROUGH_i - PEAK_i); \qquad D^3_{i,t} = 0 \ otherwise$ (1c)

The choice of these thresholds provides a balanced number of episodes in each category (20 moderate downturns, 20 severe downturns and 11 very severe downturns) and most of the severe downturns can be recognised as episodes when either the global economy was in recession, so occurring in the early 1970s or early 1980s following oil price shocks, or when individual economies were experiencing particular hardship, as for example following the Nordic banking crises of the early 1990s (Table 1).

The dynamic impact of downturn episodes on labour force participation is estimated following the approach proposed by Jorda (2005), which allows the impulse response functions (IRFs) to be estimated directly. For each year k following the onset of the downturn, the estimation equation has the following form:

$$L^{\mathrm{m}}_{i,t+k} - L^{\mathrm{m}}_{i,t} = \alpha^k_i + \sum_{j=1}^{l} \gamma^k_j \, \Delta L^{\mathrm{m}}_{i,t-j} + \beta_k D_{i,t} + \varepsilon^k_{i,t} \qquad (2)$$

where $L^{\mathrm{m}}_{i,t+k}$ is the labour force participation rate of age/gender group m in country i in period t+k considered, $D_{i,t}$ is a downturn dummy that takes value 1 for the start of a downturn episode in period t in country I and zero otherwise, α_i represents country fixed effects, γ_j captures the persistence in changes in labour force participation and β_{k} measures the impact of the downturn on the change in the labour force participation for each future period *k.* Impulse response functions (IRFs) are then readily obtained from the estimated β_{k} for k = 0, 1,..12. Equation (2) is estimated with a least-squares dummy variable (LDSV) method using annual data for an unbalanced panel of 30 OECD countries over the period 1960-2008. Country fixed effects capture unobserved country-specific determinants of participation and are found to be statistically significant in all specifications. Correction for heteroskedasticity is applied using White robust standard errors, and the error autocorrelation problem is addressed by using the two lags of the increase in labour force participation as control variables. Potential reverse causality is addressed by estimating changes in labor force participation in the years that *follow* a downturn.

An alternative way of estimating the dynamic impact of downturns on labour force participation would to estimate an ARDL equation for labour force participation including downturn dummies, and to derive IRFs from the estimated coefficients. This approach was initially proposed by Romer and Romer (1989, 2010), and it has been recently applied by Cerra and Saxena (2008) and Furceri and Mourougane (2009) to assess the impact of financial crises on economic activity. However, the IRFs derived using an ARDL specification are sensitive to the choice of the number of lags, and as a result tend to be unstable. In addition, long-lasting effects of shocks may be unduly found, reflecting the use of what Cai and Den Haan (2009) call *one-type-of-shock* models. In contrast, the approach used in the present paper does not suffer from these problems because lagged changes in labour force participation enter only as control variables and are not used to derive the IRFs, and because the structure of the equation do not impose permanent effects. Finally, the confidence bands associated with the estimated IRFs are easily computed using the standard deviations of the estimated coefficients β_k, and Monte-Carlo simulations are not required.

2.2. Empirical results

The results suggest a clear distinction between the effect of moderate, severe and very severe downturns on labour force participation (Table 2 and Figure 2). Moderate downturns do not appear to have any statistically significant effect on participation. For severe downturn episodes, there is a negative effect which peaks at about 1½ percentage points five years after the preceding cyclical peak, but is still significant after nine years. For very severe downturn episodes, the maximum effect is about 2½ percentage five to eight years after the preceding cyclical peak, with a significant effect even after ten years.

To test whether different demographic groups have different participation responses to downturns, equation (2) is re-estimated for men and women and for ten different five-year age groups ranging from 15-19 years up to 60-64 years. Somewhat surprisingly, the results show a slightly larger and more persistent impact of downturns on overall labour force participation for men than for women (Figure 3). For men, the effect at the peak is in the order of 2% and it remains statistically significant even 12 years after the shock. For both males and females, the most significant and largest effects are found for the youngest and oldest age groups (Table 2). In particular, for both men and women the labour force participation rate of the 15-19 and 20-24 age groups is found to decrease by up to 6 and 4 percentage points, respectively. For the 60-64 age group the maximum effect is found to be in the order of 4 percentage points for both men and women. There is a further effect on the participation of women aged 55-59 that is not found for men, and an impact on the labour force participation of men aged 20-39 which does not hold for women.

The analysis based on age groups provides information on how labour force participation for different age groups has changed over time. However, the impact of downturns on the labour participation of a specific five-year group at various horizons reflects a mix of effects on the participation of different cohorts who enter this age category at different dates – *e.g.* the estimated impact on the participation of the 60-64 age group at time *t+5* is the impact on the group aged 55-59 at time t of the shock. Therefore, as a complementary analysis, the regressions are re-run focusing only on specific cohorts. The results, not shown here for brevity, confirm the significance of the (persistent) impact of downturns on labour force participation

3. Retirement incentives and the responsiveness of older workers' labour force participation to downturns

The fact that the effect of downturns on labour force participation is mostly concentrated on younger and older age groups worker provides a rationale for focusing on these groups when analysing the drivers of overall participation hysteresis. However, the normative implications of a significant drop in youth labour force participation following downturns are unclear insofar as such decline reflects increased enrolment in education compared to a no-shock baseline scenario. And indeed there is solid country-specific and cross-country empirical evidence that schooling is counter-cyclical (see *e.g.* Dellas and Sakellaris, 2003; Dejong and Ingram, 2001; Heylen and Pozzi, 2007). Accumulating more human capital at times of economic distress may or may not be optimal from individual and economy-wide perspectives, depending on the relative marginal returns from studying versus entering the labour market immediately. Addressing this issue goes beyond the scope of the present paper. Therefore, youth labour force participation is ignored in what follows.

By contrast, labour market withdrawal of older workers in the wake of downturns entails persistent employment output losses that are not offset by any future gains, as the retirement decision is typically irreversible. While retiring earlier than initially planned at times of economic distress might still be individually optimal, it is not necessarily the case at the society level if such retirement is financed by others through their contributions to Pay-As-You-Go schemes and these schemes themselves are not neutral with respect to the retirement decision. One major issue in this regard is whether the early retirement incentives embedded in old-age pension systems and other social transfer programmes that have been used as *de facto* early retirement schemes may amplify the labour market withdrawal of older workers in bad times, and thereby participation hysteresis. In particular, early retirement through dedicated schemes or *via* unemployment or disability systems has typically been an option in some countries *conditional* on being laid off (see *e.g.* Blöndal and Scarpetta, 1998). It would therefore be expected that they would be used more heavily in the wake of downturns than in normal times. The remainder of this paper tests empirically for such effects. Summary measures of retirement incentives across OECD countries and over time are first constructed and discussed, before turning to panel analysis of the interactions between such incentives and cyclical conditions in determining the dynamics of the (relative) labour force participation of older workers.

3.1. Summary measures of retirement incentives in OECD countries

Motivation

In order to explore the impact of early retirement incentives on the response of older workers' labour force participation to downturns, and to cyclical developments more broadly, we compute implicit marginal taxes on continued work at older ages for 30 countries over the period 1960-2008. When the cost of working for an additional year, in terms of foregone pensions and contributions to the system, is not exactly offset by an increase in future pension benefits, *i.e.* when the change in pension wealth from working for an additional year is less than the value of contributions paid, the pension system carries an implicit marginal tax on continued work. This summary measure of retirement incentives embedded in old-age pension systems depends on all of the scheme's parameters, including *inter alia* the minimum age of eligibility to a pension, the replacement rate and the existence and magnitude of actuarial adjustments for anticipated and deferred retirement.

In theory, labour supply effects of implicit taxes on continued work are ambiguous (Mitchell and Fields, 1984). As suggested by Lazear (1987), they can be regarded as an additional component of the "true wage", over and above the usual wage rate. From this perspective, a rise in the implicit tax on continued work is equivalent to a fall in the wage rate, producing opposite substitution and income effects. In practice, there is overwhelming empirical evidence that the substitution effect dominates (Lazear, 1987; Lumsdaine and Mitchell, 1999). Implicit tax rates on continued work also bear a very close (negative) relationship with measures of the option value of postponing retirement derived from an option value model *à la* Stock and Wise (1990), which have also been found to affect the retirement decision in microeconometric studies (see *e.g.* Gruber and Wise, 2002). Therefore high implicit taxes on continued work tend to bias the retirement decision towards early labour market withdrawal. The question addressed below is whether such taxes also lead to labour force participation hysteresis, over and above any effects on steady-state participation rates.

Computation

Implicit tax rates on continued work vary depending on a large number of mostly individual factors.[2] In this paper, summary measures of implicit taxes are computed for an illustrative worker under a set of common simplifying assumptions. This hypothetical worker is assumed to be single, to have entered the labour market at age 20, and to have worked full-time at the average wage until the age considered. In order to make the calculations manageable for a wide range of countries and time periods, the tax treatment of earnings – with the exception of contributions to pension schemes, which are taken into account – and benefits is omitted, so that "gross" implicit tax rates on continued work are computed (for methodological details and data sources, see Duval, 2006).

2. For instance, in flat-rate pension systems, these factors may include earnings history, household composition and the amount of other income and/or assets. In earnings-related pension schemes, they usually include inter alia the length of the working life and other periods to be credited for pension purposes (education, child care, unemployment…), as well as the age-earnings profile over the worker's career. Furthermore, these schemes may differ across sectors and/or types of jobs.

Under this set of assumptions, implicit tax rates are computed as follows. As a first step, for each possible retirement age R between 55 and 70, the future stream of expected pension payments is computed from age R to age 105. Pension wealth is then computed as the present value of this stream using the following formula:

$$PWY_R = \sum_{A=R}^{A=105} (S_A * R_A)/(1+r)^{(A-R)}$$

where PWY_R is the pension wealth (as a proportion of earnings) for a single individual with APW earnings retiring at age R, R_A is the replacement rate (computed as P_A/Y) that this individual would receive at age A if he or she stops working now, r is the real discount rate, and S_A is the value of the survival function at age A.

Pension wealth levels are computed for all possible retirement ages between 55 and 70. For the three retirement ages 55, 60 and 65, changes in pension wealth from working for five additional years (*i.e.* from R to R+5) are then computed as:

$$DPWY_R = [PWY_{R+5}] * [S_{R+5}/(1+r)^5] - PWY_R - \sum_{A=R}^{A=R+4} [(S_A * C_A/Y)/(1+r)^{A-R}]$$

where C_A / Y is the sum of employees and employers rates of contributions to the old-age pension system.

The choice of 5-year rather than annual changes in pension wealth is dictated by the fact that the historical series of labour force participation statistics used in the empirical analysis are available only for 5-year age groups. When the change in pension wealth from remaining in the labour market during each of these life spans – *i.e.* from working between ages 55 and 60, 60 and 65 and 65 and 70, respectively – is negative, continuing to work for five additional years carries an implicit tax whose average over the 5-year span is $-DPWY_R / 5$.

Accounting for early retirement schemes

Implicit tax rates on continued work are computed not only for old-age pension systems but also for various social transfer programmes, which in a number of industrial (mostly continental European) countries have often enabled certain categories of older workers to withdraw from the labour market before the early age of entitlement to old-age pension benefits.

These early pathways into retirement include special early retirement provisions as well as unemployment-related and disability benefits (Blöndal and Scarpetta, 1998; Duval, 2003). They often entail high implicit taxes on continued work for two main reasons: replacement rates are usually high, and pension rights continue to accrue even if, in some cases, at a reduced rate. As a result, these schemes have been found to lower participation of older workers (*e.g.* Kyyrä and Wilke, 2007).

The computation of implicit tax rates in these schemes is the same as presented above, except that the stream of payments considered is what the individual would receive through these schemes rather through the "regular" old-age pension system. However, no attempt is made here at being comprehensive in the coverage of these programmes. Rather, in order to provide an overall assessment of retirement incentives arising from them, a "typical early retirement route" is modeled along the following lines: in those countries where unemployment-related benefits can be used *de* facto to bridge the time until people are entitled to an old-age pension,[3] implicit taxes on continued work are computed for the same illustrative cases as for old-age pension schemes; where unemployment-related schemes cannot be used effectively as an early retirement device but other schemes (*e.g.* disability schemes) are widely available, the latter are considered; where no social transfer programme can be used to withdraw from the labour market before the minimum pensionable age, the "early retirement route" is simply the old-age pension pathway into retirement.

The implicit tax on continued work obtained using the above methodology provides a good but imperfect estimate of the average retirement incentives facing each age group in each country and time period. The focus on a single "early retirement route" leaves aside the participation effects of a number of other social transfer programmes that may actually be used as early retirement devices. Furthermore, the actual strictness of eligibility criteria for these programmes is imperfectly reflected in the calculations, as the latter assume – based on *de jure* policy settings as reflected in the law – that eligibility criteria are either fully strict or fully lax without allowing for intermediate degrees of stringency and enforcement.

3. Social transfer programmes that can be used de facto as early retirement devices are identified as follows. Unemployment benefit schemes fall into this category when they include special dispositions for older workers, such as no obligation to search for a job. Similarly, disability schemes are classified as early retirement schemes when disability pensions can be granted not only on the basis of health but labour market criteria.

Implicit taxes rates on continued work across countries and time

Looking at current policy settings, the dispersion of implicit tax rates in the "early retirement route" is very large across OECD countries (Figure 4).[4] Furthermore, implicit tax rates rose throughout most of the 1970s and the 1980s, especially at age 55, as early retirement schemes were created and/or were becoming more generous. However, this expansion has come to a halt since the early 1990s, and has even been reversed in some countries (Figure 4). Implicit tax rates in old-age pension schemes only – *i.e.* ignoring early retirement schemes – show similar cross-country and time-series patterns, although they have typically been lower especially for workers in their late 50s.

3.2. Empirical analysis of interactions between early retirement incentives and adverse shocks

We now analyze whether implicit taxes on continued work significantly affect the response of labour force participation to downturns. For this purpose we estimate the following regressions:

$$L_{i,t+k}^{\widetilde{60-64}} - L_{i,t}^{\widetilde{60-64}} = \alpha_i^k + \sum_{j=1}^{l} \gamma_j^k \, \Delta L_{i,t-j}^{\widetilde{60-64}} + \beta_k \Delta y_{i,t} + \delta_k \Delta y_{i,t}(P_{it} - \bar{P}) + \gamma_k P_{i,t} + \varepsilon_{i,t}^k \qquad (3)$$

where y indicates the (log) of real *GDP* and P is the level of the implicit tax on continued work. $L_{i,t}^{\widetilde{60-64}}$ is now the *difference* between the labour force participation rates of the 60-64 and 25-54 age groups. This specification implies that 25-54 years-old are used as a control group, which allows controlling for all common factors that affect that affect the labour force participation among all age groups and drastically limits the risk of reverse causality between the dependent variable and output growth. The risk of reverse causality between the dependent variable and the implicit tax is also quite small: implicit taxes vary little over time but a lot across countries, and it is their level at time t that enters the specifications while changes in labor force participation are estimated for subsequent periods (*t+1* to *t+5).*

4. These figures refer to the "steady state" of current pension systems. As a consequence, they incorporate all future effects of enacted reforms, some of which may not be fully felt before many years, as in particular in Italy where the so-called New Pension System is being gradually phased in and will not fully replace the existing one before the mid-2030s. In the empirical analysis, these "steady state" implicit taxes are not used and implicit tax rates facing the current generation of older workers are considered instead.

The coefficient δ_k measures the effect of implicit taxes on continued work in shaping the response of labour force participation of older workers to economic conditions. The rationale for using the growth rate of *GDP* instead of the downturn dummies constructed above is that a specification with the latter would produce multicollinearity between the downturn dummies and the interaction term, given the low variability over time of implicit taxes on continued work. In contrast, equation (3) does not suffer from this problem.

Table 4 reports various estimates of the interaction coefficient δ_k up to 5 years ahead. The main finding is that implicit taxes on continued work affect significantly the responsiveness of labour force to economic conditions up to 4 years ahead. In particular, a given negative GDP shock leads to a larger drop in labour force participation where early retirement incentives are high. The estimates of β_k and γ_k, not reported here to keep Table 4 simple, indicate that changes in labour force over time respond positively and significantly to (lagged) changes in output, and to a lesser extent to the level of implicit taxes. The results are robust to the inclusion of time trends, which are statically significant (second column of Table 4).

We then check whether the responsiveness of changes in labor force participation differs between downturns and upturns, as should be the case given the asymmetric expected impact of retirement incentives mentioned above (third to sixth column of Table 4). The results indeed suggest that the effect of implicit taxes is mostly significant in periods where output is below potential (negative output gap) or during downturns (output gap lower than -2 %).[5]

As an additional robustness check we repeat the analysis averaging implicit taxes over time for each country. This further reduces any possible risks of reverse causality between changes in labour force participation and implicit taxes. The results in the last column of Table 4 remain very close to those obtained with time-varying implicit taxes in the baseline regression, consistent with the fact that implicit taxes are highly persistent over time, and that most of the variability is between countries. An alternative way of testing for the greater responsiveness of participation to economic conditions under stronger retirement incentives is to turn the implicit tax into a dummy variable based on a high-low cut-off:

$$L_{i,t+k}^{60-64} - L_{i,t}^{60-64} = \alpha_i^k + \sum_{j=1}^{l} \gamma_j^k \Delta L_{i,t-j}^{60-64} + \beta_k \Delta y_{i,t} + \delta_k \Delta y_{i,t} \mathrm{D}(P_{it} > \bar{P}) + \gamma_k \mathrm{D}(P_{it} > \bar{P}) P_{i,t} + \varepsilon_{i,t}^k \quad (4)$$

[5] The results are qualitatively robust to different thresholds of negative gaps.

where $D(P_{it} > \bar{P})$ is an indicator that takes the value of 1 if the implicit tax exceeds a certain threshold and zero otherwise. The results obtained by estimating equation (4) with a sample mean cut-off for the implicit tax still confirm the significant effect of the interaction term up to 4 years ahead (Table 5). These results are robust to the use of the median as cut-off.

Finally, estimation of equations (3) and (4) is repeated for men and women. The results reported in Table 6 and 7 suggest that while there is evidence of a significant effect of implicit taxes for both groups, the effects are significantly more robust for men than women. This could reflect a number of factors, including the fact that as computed, our implicit tax rates apply more strictly to males than to females – who over the sample period had incomplete careers in many countries, did not always benefit from full individual pension rights due to ceilings and tapers for joint pensions...etc For men, the interaction effect is robust to the use of the median as cut-off.

One potential limitation of our empirical analysis is that the measure of retirement incentives covers only public and mandatory private pension systems but not voluntary private pension schemes. However, since the latter are usually designed to be actuarially neutral, omitting them is unlikely to bias much the computation of implicit tax rates and our results. It may still be the case that if downturns result in large and persistent falls in pension wealth, there may be an important income effect *increasing* the participation of older workers. However, this effect is already factored in the baseline estimates presented in Section 2 of the impact of downturns on older workers' participation.[6] These baseline estimates indicate that any such participation-increasing effects are typically more than offset in practice by other participation-reducing factors. This is in line with recent micro-econometric analysis for the United States which finds that incentives to delay the retirement decision stemming from the 2007-2008 asset price crash should be more than offset by the discouragement effects associated with depressed labour markets (Coile and Levine, 2009).

6. The only remaining issue is that such participation-increasing effects should be larger in countries where private-sector defined-contribution pension schemes play a prominent role in retirement provision, as is the case in particular in the United States, the United Kingdom, Canada, Australia, Denmark, Ireland and New Zealand. This hints at some potential heterogeneity in the labour force participation impact of downturns across countries depending on whether private pension schemes play an important role in pension provision, as well as on the design of these schemes (*e.g.* defined-benefit versus defined-contribution schemes) and the extent to which asset prices are affected by the shock.

4. Concluding remarks

This paper has presented new evidence for a panel of 30 industrial countries over 1960-2008 that adverse economic shocks have persistent effects on aggregate labour force participation, mainly through their impact on the labour market attachment of young and older workers For the latter, there appears to be a significant and robust impact of early retirement incentives embedded in pension systems and other social transfer programmes in shaping the responsiveness of participation to economic conditions. Our results also point to partial rather than full participation hysteresis, as would be expected if only because of cohort effects.

One natural question this paper raises is whether the financial and economic crisis of 2007-2008 will lead to persistent declines in labour force participation, amplified in countries where early retirement incentives remain strong. Our results suggest this should be the case, with a peak impact to be expected in a couple of years. On the other hand, in many continental European countries retirement incentives have been reduced over the past decade as a result of pension reforms and some tightening of eligibility criteria to – or outright phasing-out of – other social transfer programmes that have been used as labour market exit pathways in the past. Furthemore, as already noted, this particular crisis has been associated with unusually large losses in pension and housing wealth, and these may induce older workers to stay longer in the labour force. Indeed participation of older workers to the labour force has mostly increased in the first two years following the crisis, in sharp contrast with past recessions (Figure 5). Therefore the jury may still be out.

References

Autor, D. and M. Duggan (2003), "The Rise in the Disability Payrolls and the Decline in Unemployment" *Quarterly journal of Economics*, Vol. 118, No. 1, pp. 157-205.

Bassanini, A. and R. Duval (2009), "Unemployment, Institutions and Reform Complementarities: Re-assessing the Aggregate Evidence for OECD Countries" *Oxford Review of Economic Policy*, Vol. 25, No. 1, pp. 40-59.

Blanchard, O. and L. Summers (1986), "Hysteresis and the European Unemployment Problem" *NBER Macroeconomics Annual*, MIT Press, Cambridge, MA.

Blanchard, O. and L. Summers (1988), "Beyond the Natural Rate Hypothesis" *American Economic Review*, Vol. 78, No. 2, pp. 182-187.

Blanchard, O. and J. Wolfers (2000), "The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence", *The Economic Journal*, Vol. 110, No. 462, pp. 1-33.

Blöndal, S. and S. Scarpetta (1998), "The Retirement Decision in OECD Countries", *OECD Economics Department Working Papers*, No. 98.

Cai, X. and W. Den Haan (2009), "Predicting recoveries and the importance of using enough information," *CEPR Discussion Papers*, No. 7508.

Cerra, V. and S.C. Saxena (2008), "Growth Dynamics: The Myth of Economic Recovery," *American Economic Review*, American Economic Association, Vol. 98, No. 1, pp. 439-57.

Coile, C. and P. Levine (2007), "Labor Market Shocks and Retirement: Do Government Programs Matter?", *Journal of Public Economics*, Vol. 91, No. 10, pp.1902-1919.

Coile, C. and P. Levine (2009), "The Market Crash and Mass Layoffs: How the Current Economic Crisis May Affect Retirement", *NBER Working Papers*, No. 15395.

DeJong, D. N. and B. F. Ingram (2001), "The Cyclical Behavior of Skill Acquisition," *Review of Economic Dynamics*, Vol. 4, No.3, pp. 536-561.

Dellas, H. and P. Sakellaris (2003), "On the Cyclicality of Schooling: Theory and Evidence", *Oxford Economic Papers*, Vol. 55, No. 1, pp.148-172.

Duval, R. (2003), "Retirement Behaviour in OECD Countries: Impact of Old-Age Pension Schemes and Other Social Transfer Programmes", *OECD Economic Studies*, No. 37, pp 7-50.

Duval, R. (2006), "Pension Systems, Social Transfer Programmes and the Retirement Decision in OECD Countries", in J. Messina, C. Michelacci, J. Turunen and G. Zoega (eds.), *Labour Market Adjustments in Europe*, Edward Elgar Publishing.

Fortin, M. and P. Fortin (1999), "The Changing Labor Force Participation Rates of Canadians, 1969-96: Evidence from a Panel of Six Demographic Groups", *Canadian Business Economics*, Vol. 7, No. 2, pp.12-24.

Furceri, D and A. Mourougane (2009), "The Effect of Financial Crises on Potential Output: New Empirical Evidence from OECD Countries," *OECD Economics Department Working Papers*, No. 699, OECD, Economics Department.

Gruber, D. and D. Wise (ed.), *Social Security Programs and Retirement Around the World: Micro Estimation*, University of Chicago Press, Chicago.

Hallberg, D. (2008), "Economic Fluctuations and Retirement of Older Employees", *Institute for Labour Market Policy Evaluation Working Paper,* No 2008-2.

Heylen, F. and L. Pozzi (2007), "Crises and Human Capital Accumulation," *Canadian Journal of Economics*, Vol. 40, No. 4.

Kyyrä, T. and R. Wilke (2007), "Reduction in the Long-term Unemployment of the Elderly: A Success Story from Finland", *Journal of the European Economic Association*, Vol. 5, No. 1, pp. 154-182.

Lazear, E. (1987), "Retirement from the Labor Force", in O. Ashenfelter, O. and R. Layard, (ed.), *Handbook of Labor Economics,* Vol. 1, North Holland, Amsterdam.

Lumsdaine, R. and O. Mitchell (1999), "New Developments in the Economic Analysis of Retirement", in Ashenfelter O. and D. Card (ed.), *Handbook of Labor Economics,* Vol. 3, North Holland, Amsterdam.

Mitchell O. and G. Fields (1984), "The Economics of Retirement Behaviour", *Journal of Labour Economics*, Vol. 2, No. 1.

Nickell, S., L. Nunziata and W. Ochel (2005), "Unemployment in the OECD Since the 1960s: What Do We Know?", *The Economic Journal*, Vol. 115, No. 500, pp. 1-27.

Nickell, S. and J. Van Ours (2000), “Why Has Unemployment in the Netherlands and the United Kingdom Fallen So Much?”, *Canadian Public Policy,* Vol. 26, No. 1, pp. 201-220.

Raaum, O and K. Roed (2006), “Do Business Cycle Conditions At the Time of Labor Market Entry Affect Future Employment Prospects?“, *Review of Economics and Statistics*, Vol. 88, No. 2, pp.193-210.

Romer, C. D. and D. H. Romer (1989), “Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz,” *NBER Chapters, in: NBER Macroeconomics Annual 1989*, Vol. 4, pp. 121-184 National Bureau of Economic Research, Inc.

Romer, C. D. and D. H. Romer (2010), “The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks,” *American Economic Review*, Vol. 100, No. 3, pp. 763-801.

Stock, J. and D. Wise (1990), “Pensions, the Option Value of Work, and Retirement”, *Econometrica,* Vol. 58, No. 5, pp. 1151-1180.

Tatsiramos, K. (2010), “Job Displacement and the Transitions to Re-employment and Early Retirement for Non-employed Older Workers”, *European Economic Review,* Vol. 54, No. 4, pp. 517-535.

Von Wachter, T. (2007), “The Effect of Economic conditions on the Employment of Workers Nearing Retirement Age”, *Center for Retirement Research Working Paper,* No 2007-25.

TABLES AND CHARTS

Table 1. Downturn episodes

Moderate		Severe		Very Severe	
country	time	country	time	country	time
AUT	1991	AUS	1993	AUS	1981
AUT	2000	AUT	1980	DNK	1986
BEL	1980	CAN	1981	FIN	1989
BEL	1990	CAN	1989	HUN	1992
CHE	2000	CHE	1990	IRL	1990
DEU	2000	CZE	1996	ISL	1988
FIN	1980	ESP	1978	PRT	1980
FRA	1980	ESP	1990	PRT	1991
FRA	1991	GRC	1992	SWE	1990
ITA	1990	IRL	1981	UK	1979
ITA	2001	ITA	1980	USA	1978
JPN	1980	JPN	1973		
JPN	1991	KOR	1979		
JPN	1997	LUX	1979		
NLD	1991	MEX	2000		
NLD	2000	NLD	1980		
POL	1999	NOR	1987		
PRT	2001	NZL	1989		
SWE	1975	UK	1989		
USA	1989	USA	1973		

Table 2. The impact of downturns on labour force participation

Year after impact	Moderate downturns	Severe downturns	Very severe downturns
t+1	0.063 (0.84)	-0.244 (-1.65)*	-0.600 (-4.12)***
t+2	-0.053 (-0.37)	-0.632 (-2.37)**	-1.535 (-4.96)***
t+3	-0.222 (-0.96)	-1.038 (-3.15)***	-1.940 (-3.40)***
t+4	-0.357 (-1.25)	-1.334 (-3.34)***	-2.345 (-3.49)***
t+5	-0.200 (-0.59)	-1.644 (-3.55)***	-2.520 (-3.39)***
t+6	-0.004 (-0.01)	-1.447 (-2.59)***	-2.424 (-3.36)***
t+7	0.113 (0.30)	-1.395 (-2.37)**	-2.299 (-2.85)***
t+8	-0.284 (-0.66)	-1.208 (-2.13)***	-2.520 (-2.58)***
t+9	0.418 (0.78)	-1.243 (-2.39)**	-2.353 (-2.31)**
t+10	0.622 (1.03)	-0.921 (-1.78)*	-1.944 (-2.23)**
t+11	0.581 (0.89)	-0.928 (-1.68)*	-1.422 (-1.81)*
t+12	0.527 (0.71)	-0.808 (-1.25)	-1.479 (-2.23)**

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 3. Maximum decline in the participation rate for different age groups

	15-19	20-24	25-29	30-34	35-39	40-44	45-59	50-54	55-59	60-64
Men	-5.9***	-4.6***	-1.2***	-0.8***	-1.0***	-0.8	-0.5	-0.5	-0.2	-4.1***
Women	-6.0***	-3.9***	-1.1	-0.8	-0.2	-0.3	-0.3	-0.8	-4.0***	-3.4***

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 4. The effect of implicit tax in shaping the response of labour force participation to growth-Linear interaction

	Baseline	Baseline with Time Trend	GAP<0	GAP>0	GAP<-2	GAP>-2	Average implicit tax
T+1	0.058 (2.90)***	0.055 (2.78)***	0.052 (2.73)***	0.065 (1.07)	0.059 (2.22)**	0.050 (1.33)	0.069 (2.89)***
T+2	0.079 (2.83)***	0.073 (2.73)***	0.081 (3.04)***	0.073 (1.11)	0.071 (2.18)**	0.075 (1.75)*	0.088 (2.91)***
T+3	0.098 (2.71)***	0.088 (2.93)***	0.092 (2.79)***	0.124 (1.75)*	0.047 (0.89)	0.093 (1.90)*	0.094 (2.63)***
T+4	0.093 (2.21)**	0.081 (2.48)**	0.095 (2.67)***	0.126 (1.82)*	0.061 (1.19)	0.086 (1.67)*	0.089 (1.99)**
T+5	0.050 (0.99)	0.034 (0.83)	0.067 (1.52)	0.033 (0.39)	0.094 (2.12)**	0.021 (0.36)	0.044 (0.83)

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 5. The effect of implicit tax in shaping the response of labour force participation to growth-Alternative interactions

	Baseline with Time Trend	**Average dummy**	**Median dummy**
T+1	0.055 (2.78)***	0.123 (2.15)**	0.092 (1.65)*
T+2	0.073 (2.73)***	0.228 (2.70)***	0.163 (2.21)**
T+3	0.088 (2.93)***	0.261 (2.73)***	0.183 (2.14)**
T+4	0.081 (2.48)**	0.228 (2.04)**	0.177 (1.71)*
T+5	0.034 (0.83)	0.070 (0.53)	0.072 (0.58)

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 6. The effect of implicit tax in shaping the response of labour force participation to growth-Male vs. Female

	Men				Women			
	Baseline	**Baseline and Time Trend**	**GAP<-2**	**GAP>-2**	**Baseline**	**Baseline and Time Trend**	**GAP<-2**	**GAP>-2**
T+1	0.064 (2.12)***	0.059 (2.09)***	0.082 (2.26)***	0.043 (0.80)	0.051 (2.28)**	0.051 (2.34)**	0.068 (1.99)**	0.054 (1.31)
T+2	0.108 (2.71)***	0.098 (2.79)***	0.116 (3.38)***	0.089 (1.20)	0.073 (2.29)**	0.073 (2.39)**	0.098 (2.22)**	0.085 (1.68)*
T+3	0.153 (2.99)***	0.139 (3.41)***	0.143 (2.64)***	0.130 (1.50)	0.072 (1.73)*	0.072 (1.91)*	0.041 (0.55)	0.105 (1.58)
T+4	0.149 (2.60)***	0.130 (2.97)**	0.244 (3.73)***	0.113 (1.25)*	0.043 (0.91)	0.043 (1.11)	0.012 (0.16)	0.065 (0.82)
T+5	0.083 (1.29)	0.059 (1.15)	0.207 (2.53)**	0.031 (0.029)	0.017 (0.28)	0.017 (0.34)	0.100 (1.48)	0.002 (0.02)

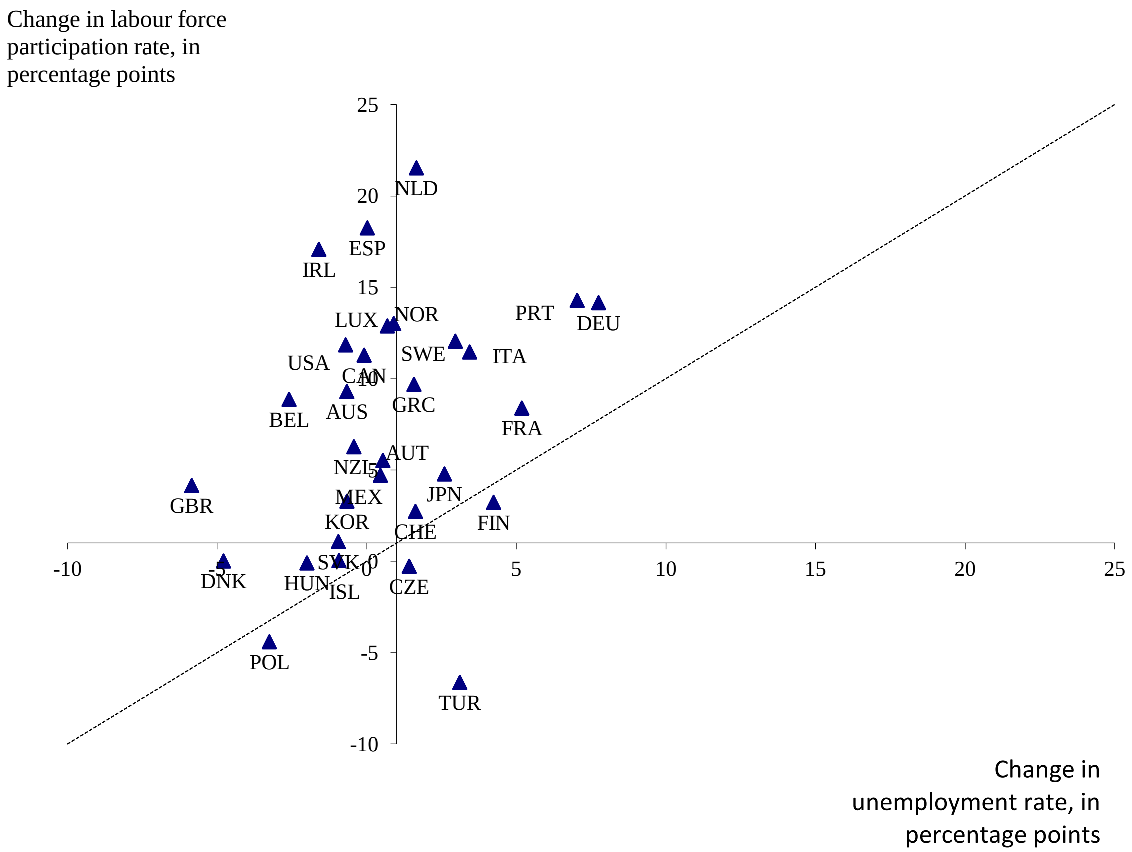
T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 7. The effect of implicit tax in shaping the response of labour force participation to growth-Male vs. Female-Alternative interactions

	Men			Women		
	Baseline and Time Trend	**Average dummy**	**Median dummy**	**Baseline and Time Trend**	**Average dummy**	**Median dummy**
T+1	0.059 (2.09)***	0.166 (2.26)**	0.140 (2.02)**	0.051 (2.34)**	0.067 (1.05)	0.036 (0.57)
T+2	0.098 (2.79)***	0.355 (3.61)***	0.286 (3.20)***	0.073 (2.39)**	0.138 (1.41)	0.070 (0.79)
T+3	0.139 (3.41)***	0.462 (3.97)***	0.363 (3.38)***	0.072 (1.91)*	0.143 (1.31)	0.034 (0.33)
T+4	0.130 (2.97)**	0.433 (3.04)***	0.302 (2.34)***	0.043 (1.11)	0.063 (0.53)	-0.039 (-0.35)
T+5	0.059 (1.15)	0.215 (1.36)	0.106 (0.74)	0.017 (0.34)	-0.013 (-0.09)	-0.089 (-0.64)

T-statistics based on robust standard errors in parenthesis. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

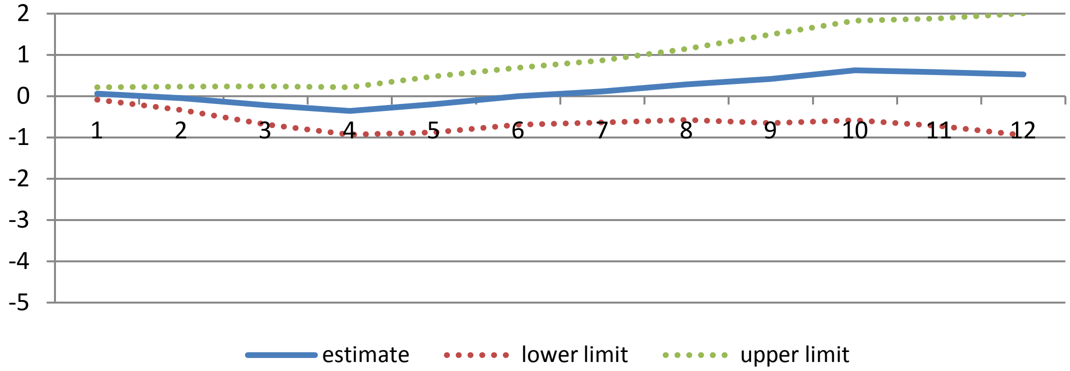
Figure 1. Change in labour force participation rate versus change in the unemployment rate



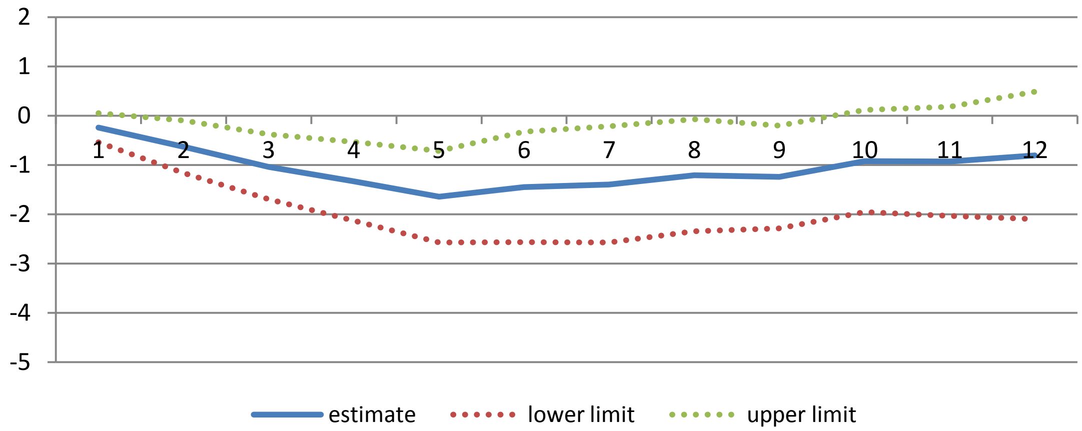
Note: The change in labour force participation rate between the earliest and latest years for which data are available (over the period 1960-2008) are plotted against the change in the unemployment rate over the same period.

Figure 2. The effect of downturns on labour force participation

A. Moderate downturns



B. Severe downturns



C. Very severe downturns

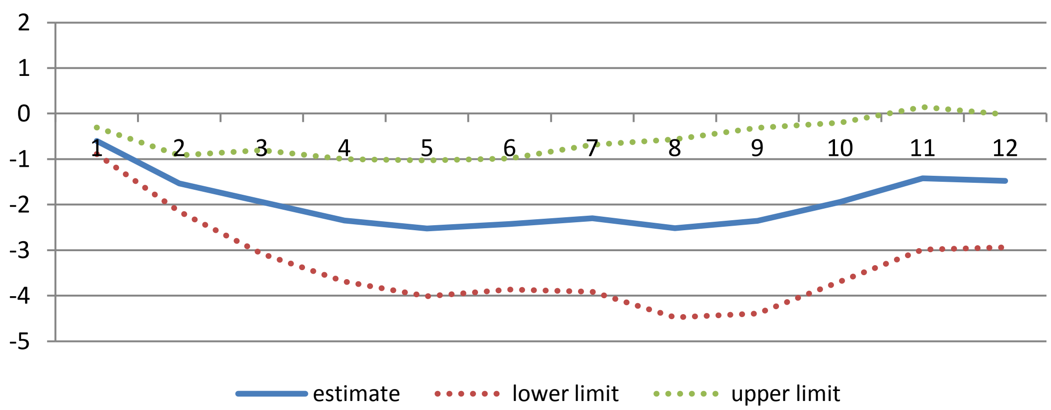
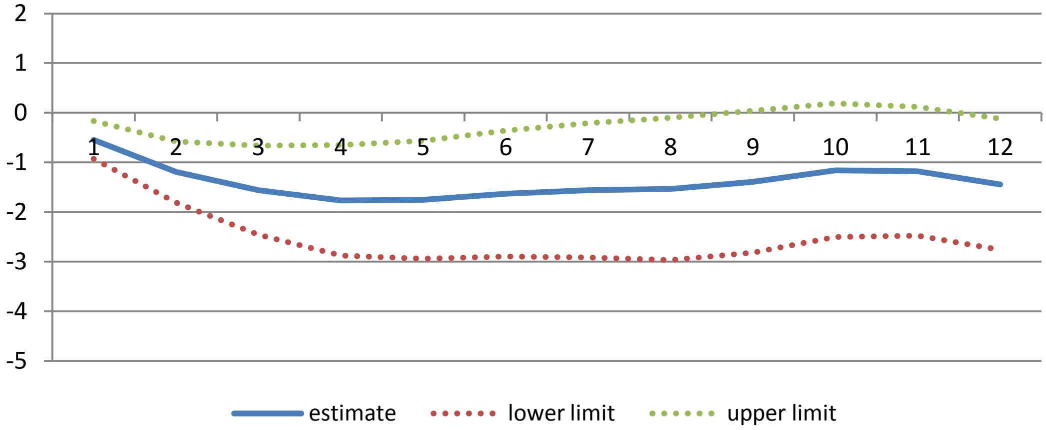
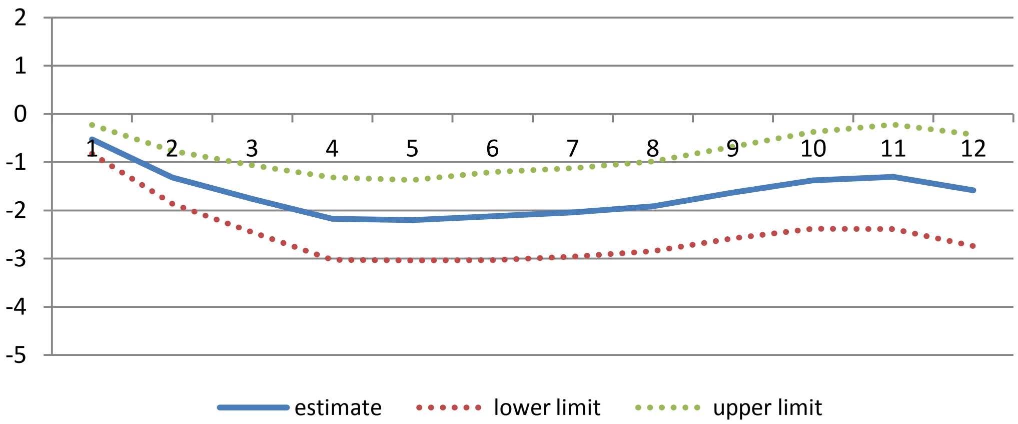


Figure 3. The effect of severe and very severe downturns by gender

A. Total



B. Men



C. Women

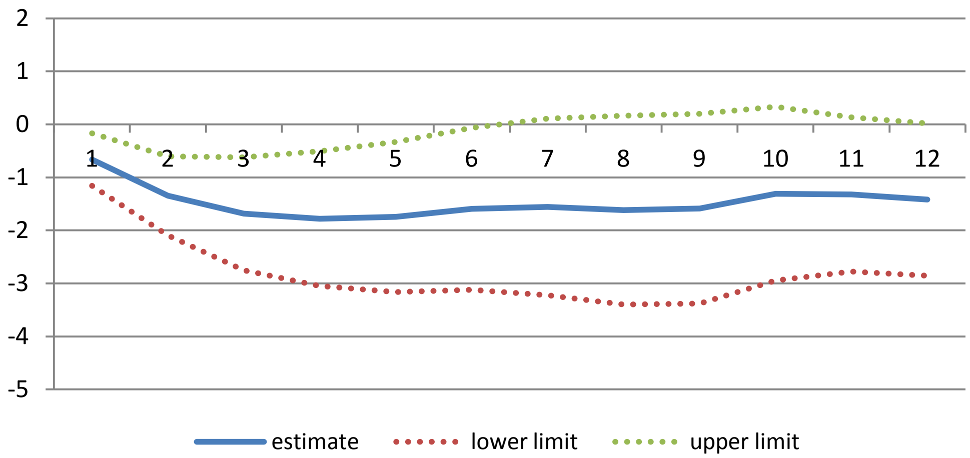


Figure 4: Average implicit tax rates on continued work for five more years in the "early retirement route" across countries and over time

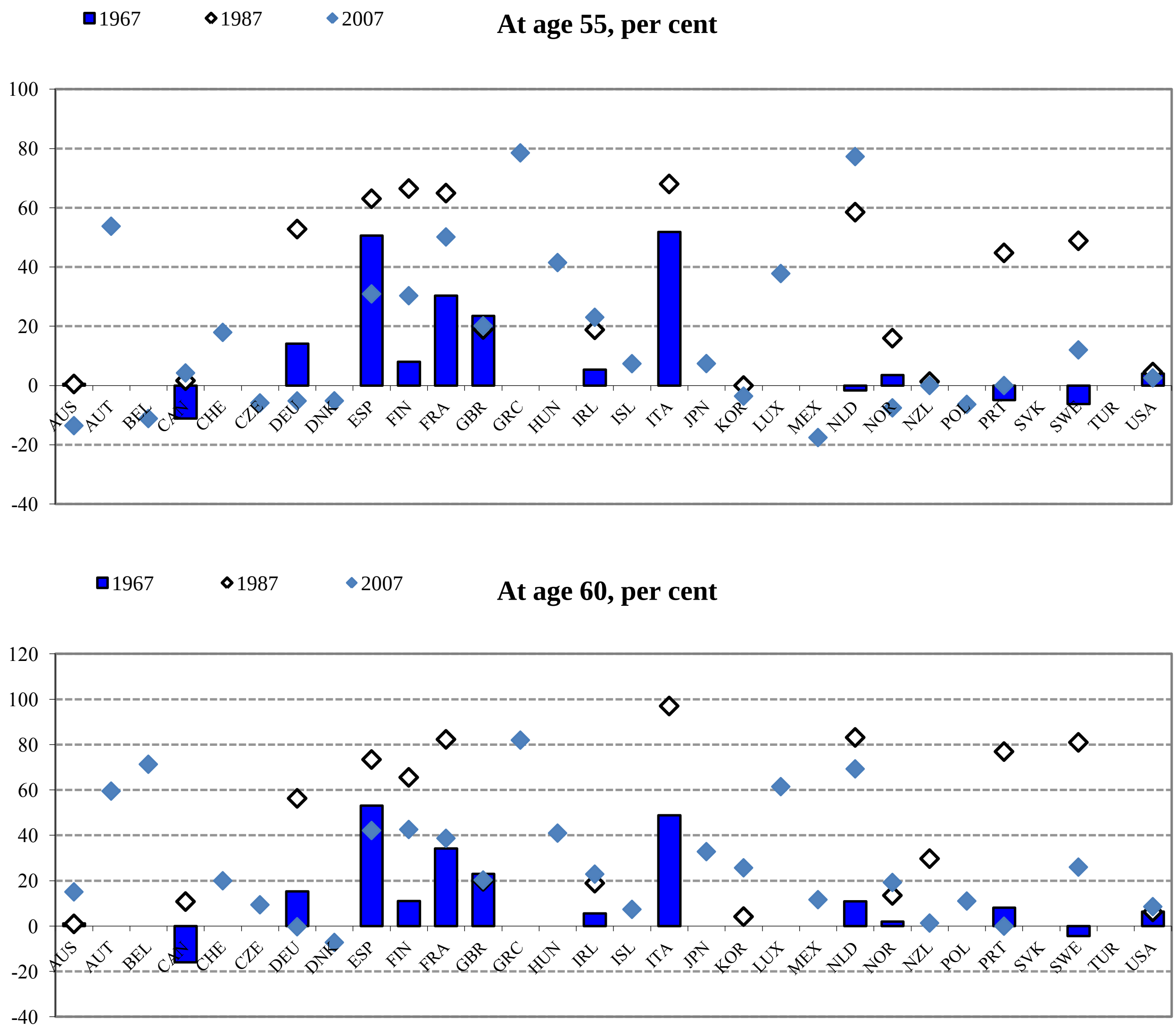


Figure 5: Change in the labour force participation rate of older workers (55-64) between Q2 2008 and Q2 2010