



IZA DP No. 4720

## Retire Later or Work Harder?

David N.F. Bell  
Robert A. Hart

January 2010

# Retire Later or Work Harder?

**David N.F. Bell**

*University of Stirling  
and IZA*

**Robert A. Hart**

*University of Stirling  
and IZA*

Discussion Paper No. 4720  
January 2010

IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0  
Fax: +49-228-3894-180  
E-mail: [iza@iza.org](mailto:iza@iza.org)

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

## ABSTRACT

### Retire Later or Work Harder?\*

We compare two policies of increasing British state pension provision: (a) increase the pensionable age of men and women, (b) maintain the existing retirement age but require older workers to work longer per-period hours. There are reasons for policy makers to give serious consideration to the under-researched alternative (b). First, from wage - hours contract theory we know that there are potential gains to both workers and firms of allowing hours to rise in work experience. Second, there is strong evidence that job satisfaction rises in age. Third, there has in any case been a significant overall increase in the hours supplied by older workers in the last two decades. We review the relevant theory, model the trade-off between later retirement versus increased work intensity, produce relevant background facts, and provide estimates of the policy trade-offs.

JEL Classification: H55, J11, J14, J18, J22, J26

Keywords: older workers, statutory retirement age, hours of work

Corresponding author:

Robert A. Hart  
Division of Economics  
University of Stirling  
Stirling FK9 4LA  
Scotland  
United Kingdom  
E-mail: [r.a.hart@stir.ac.uk](mailto:r.a.hart@stir.ac.uk)

---

\* We would like to thank the participants at the WDA/Scala workshop on Pension Challenges and the Financial Crisis 30 October 2009, University of St.Gallen, Switzerland for their comments on an earlier draft of this paper.

## 1. Introduction

In an effort to contain the fiscal pressures of population ageing, both major political parties in the UK are proposing to increase the age of retirement. The UK Pensions Commission (2005), chaired by Lord Turner, suggested that the pensionable age for men and women should be increased from 65 to 68 during the next few decades. Motivations for increasing the pension age include: (a) stemming the increasing costs of state pension provision and (b) realising potential growth in the effective labour supply given increasing life expectancy. Officially extending the length of working life implies removing a constraint from the extensive margin of the labour market. *Ceteris paribus* the expected length of job tenure among older workers would be expected to rise. The fiscal gains are three-fold. First, for a given average life expectancy, there will be a smaller cohort of individuals receiving state pension. Second, the cohort of individuals contributing directly to state pension funding will grow. Third, older workers earn relatively high wages and thereby make above average contributions to both National Insurance and tax revenues.

There is a parallel means of increasing pension provision in respect of firms' intensive margins, which has received little research interest. If older workers were to work longer period hours then, though workers' retirement ages might not change, they would make larger pension and tax contributions. Here, however, the growth in contributions would arise from increases in worker utilisation rather than an increase in the stock of employees. In effect, there is a trade-off in building up tax and pension revenues between working for more years at given hours or working more hours for given years. This paper addresses this largely ignored trade-off. It shows that changes in hours of work during recent decades, particularly for women, have made very substantial differences to the total labour input of older workers. It also shows that there is

a tendency for weekly hours of work to decline for both males and females as retirement age approaches and investigates the fiscal effects of arresting this decline.

There are already incentives in place in the UK to encourage workers to provide longer pre-retirement hours. They relate to pension eligibility. To qualify for a state pension, men need to have 44 “qualifying” years and women require 39 “qualifying” years in the workforce. Years “qualify” if individuals are making National Insurance contributions. Since contributions are only payable above a threshold level of earnings. Some workers, particularly the low-paid, may have to increase their weekly hours to augment their total “qualifying” years. In effect, their state pension will be reduced if they do not provide sufficient weekly hours. However, this regulation provides a very weak incentive to extend hours, since the income threshold is set very low – currently £95 per week.

An alternative policy might be to allow workers to trade off between longer hours and an earlier official retirement date. There are theoretical and practical reasons to support this proposal. For example, we know from the human capital theory of wage-hours contracts, that there are potential gains to both firms and workers in allowing hours to rise with the length of work experience. Longer hours provide greater scope for the parties to realise the shared gains from investments in skill training and organisational know-how. Potentially offsetting this is the extent of the income effect on older workers. As wages rise in experience and retirement approaches, we might expect workers to substitute longer work time with more leisure. The extent of this effect is negatively related to the degree of job satisfaction of older workers. Interestingly, however, we provide strong evidence that job satisfaction rises in age. This not only helps to reinforce the prospects for hours’ growth as a means of amortising investment returns but may also signal an untapped willingness to work more hours in late working life.

While introducing a later retirement age for pension eligibility or encouraging longer working hours among older workers share common implications for state pension funding, increasing hours of work carries an additional unique benefit. For health and social reasons, large numbers of older workers retire early. To the extent that they could have been encouraged to work longer hours before their actual retirement, they might have provided additional pension contributions and taxes. By contrast, increasing the statutory age of retirement for such individuals would make no difference to their pension or tax contributions. We now consider the theoretical arguments that might underpin such an approach.

## **2. Hours of Work, Human Capital and the Life Cycle**

What does human capital theory tell us about individuals' working time preferences as they progress through working life? An early insight is provided in the literature on workers-hours demand models. Suppose that a firm decides to increase its investment in a worker's specific human capital. How does it recoup the incremental investment outlay? In demand frameworks that ignore working time, the solution is related to the worker's expected length of stay with the firm. Increased investment expenditure leads the firm to devise a pay strategy that encourages longer tenure so as to extend the period of investment amortisation (Becker, 1962). But this extensive margin response can be reinforced on the intensive margin. Clearly, the firm could increase the amortisation period through requiring longer tenure among trained workers and a more intensive use of labour input for given tenure (Brechling, 1965; Ehrenberg, 1971). Therefore, as workers accumulate experience linked to specific human capital during their working lives, there may be upward pressures on their working hours in order fully to realise investment returns. Unless increments to human capital are reduced as the age of retirement

approaches, the pressure for additional hours could intensify to offset the retirement barrier which limits the extension of worker tenure.

More generally, human capital decisions involve contracts between those who demand and those who supply labour services. Returns to human capital involve rent sharing between the parties. Moreover, a number of seminal wage contract contributions have additionally focused on the implications for contract formulations and outcomes of asymmetrically held private information that is not openly shared between the parties (Hashimoto, 1981; Hashimoto and Yu, 1980; Carmichael, 1983; Malcomson, 1999). But theories of firm-specific human capital require that efficient long term contracting must set hours as well as wages (Kahn and Lang, 1992). Intuitively we should observe within a wage-hours contract that it is in the mutual interest of the parties to allow both wages and hours of work to rise with experience.

Adopting the contract approaches of Hashimoto and Carmichael – i.e. including the problem that information is asymmetrically held by the bargaining parties - Hart and Ma (2008) investigate such a contract within a life-cycle model that incorporates general and specific human capital investments. The model embraces four distinct periods. The first involves initial investment and this is followed by post-investment, pre-retirement and retirement periods.<sup>1</sup> The strength of a four period set up is that it enables the derivation of results about relative investment intensities over the life cycle and hence establishes the expected concave shapes of wage and hours profiles. Four main sets of results are obtained that are of relevance to the issues of this paper.

- (i) The optimal level of training investment rises initially and then declines as the worker becomes older. The main driver behind this outcome is the fact that the statutory age of

---

<sup>1</sup> See also Gustman and Steinmeier (1986) who build a labour supply life cycle model incorporating hours of work.

retirement shortens the expected length of amortization of human capital investments in period 2 compared to period 1. Provided quits and layoffs and the depreciation rate are small, returns in the pre-retirement period are less than the preceding period.

- (ii) Conditions may exist whereby hours of work in period 3 exceed those in period 2. This is most likely to occur if the worker (a) can obtain similar hours in an outside firm, (b) has a low probability of quitting, (c) has a low disutility of working pre-retirement, and (d) enjoys a higher period 3 wage compared to period 2. If, for example, (b) and (c) do not hold, then hours could *fall* in the pre-retirement period independently of the wage.
- (iii) A deeper insight into pre-retirement hours of work in comparison with the prior phase in the life cycle involves analysing the income effect on hours. As wages grow and retirement approaches, we might expect that income effects dominate substitution effects with the result that a worker will devote less time to working and more to leisure. Two important factors are shown to increase the income effect in the pre-retirement period compared to the previous period: these are (a) the worker's wage drops pre-retirement compared to the previous period, (b) job satisfaction lowers as retirement approaches.
- (iv) What about workers who change jobs relatively late in their working life? Clearly, in the last phase of employment expected job tenure is relatively short. How is this likely to affect their wage and hours profiles relative to workers who stay long term in their given jobs? Unsurprisingly, there is a higher chance that their pre-retirement wage is lower than their wage in previous employment. For example, they would suffer losses in returns to firm-specific human capital. The effect on hours is less certain. A lower pre-retirement wage might serve to depress hours, but this tendency would be counteracted by the income effect.



Basing their empirical work on longitudinal data from the British Household Panel Survey (BHPS) from 1991 to 2003, Hart and Ma find that both wages and hours rise with work experience. A representative worker is estimated to realise an 11.6% growth in the straight-time wage after 5 years of experience rising to 33.5% by 20 years of experience. It is further established that the experience effect on hours of work exceeds the income effect. After 5 years, hours grow by 1.3% due to experience and by 30 years of experience, the growth in hours of work peaks at 5%. When combining the wage and hours effects, earnings growth at 5 years is 13% compared to 11.6% for the wage alone and, at 25 years the respective percentages are 36.8% and 30.5%. When comparing individuals with short and long expected tenures in the later stages of working life, it is found that the latter display significantly lower experience effects on both wages and hours growths.

There is also evidence based on the BHPS that senior trained employees work more overtime hours and that, moreover, job separations among non-managerial staff are less likely to occur if overtime is being worked (Hart and Ma, 2010). Again, wage-hours contract theory underpins these findings. In a seminal wage contract model, Carmichael (1983) introduces a compensation rule that reduces inefficient quits and layoffs in a climate of specific investments being undertaken when relevant information is asymmetrically held by the firm and its workers. In the post-training period, equally trained workers are divided into two groups. These are senior trained workers with relatively long tenure and junior trained workers with relatively short tenure. The post-training wage applies to all trained workers given that they are trained to the same level. Additionally a bonus is paid to a fixed number of senior workers. Their junior counterparts wait in a queue until – due to quits and retirements- their turn arrives to receive the bonus. The incentive to wait in the queue is provided by the fact that the second period wage

plus bonus is set to be higher than marginal product and the second period wage is less than marginal product. Hart and Ma (2010) show that this mechanism can be naturally extended to a wage-hours contract in which higher levels of efficiency are derived. If overtime hours paid at premium rates are set at above marginal product and offered to longer tenured workers while the base wage paid to all workers is set below marginal product then the firm can additionally enhance investment returns through a combination of longer tenure and increased working time among more senior workers.

Wage-hours contract theory, featuring human capital investment, provides a rent-sharing motivation for both employers and employees to extend working hours at later stages of working life. But, of course, other considerations may serve to weaken, or strengthen, these tendencies. One weakening influence stems from the likelihood that additional human capital investments would be expected to decline as the age of retirement approaches and, therefore, investment amortisation periods shorten. Of course, it would be in the interest of bargaining parties to recognize such a constraint and to bargain accordingly. Ohashi (2005) develops a Nash bargaining model in which older workers bargain with the firm over wages, hours of work and job investments. This recognizes that older workers may be required to bear part of the cost of training investments in the form of lower wages and longer hours of work. Another complicating consideration is the degree of job satisfaction among older workers. Attempts to encourage longer working time would be impeded if job satisfaction is low and, therefore, income effects are strong. However, the evidence on age and job satisfaction is relatively clear. Older workers have greater job satisfaction than prime age workers. Clark, Oswald and Warr (1996) illustrate this relationship using the BHPS and cite a number of possible explanations of increasing job satisfaction with age.

1. Older workers have more opportunity to select into jobs that have more desirable characteristics
2. Older employees may place less weight on jobs characteristics such as income and promotion opportunities. If these are characteristics of jobs that are generally less satisfactory, then one will observe a positive relationship between age and job satisfaction.
3. Older workers may have lower expectations, which may generate more positive work attitudes.
4. Earlier cohorts may have been generally more satisfied with their jobs.
5. Self-selection effects may result in the less satisfied taking early retirement.
6. Job satisfaction may be linked with measures of general well-being, which are also U-shaped in age.

Clark et al. show that this age/job satisfaction relationship is robust to the inclusion of a large set of individual and household controls.

Of course, considerations that lie outside the scope of contract models may influence older workers' working time and retirement decisions. For example, members of households reaching retirement age may work longer hours in order to pay off an outstanding mortgage before their post-retirement income falls. In his work on retirement decisions of older Japanese workers based on the Work Survey of Older People, Ohashi (2005) finds that older worker who are paying off a mortgage tend to earn more, work longer hours and express lower satisfaction with wage levels. Another influence that may encourage longer hours among many older workers is their need to finance the higher education and/or job training of younger family members.

### 3. Relative Fiscal Effects of Working More Hours or Retiring Later

In this section, we formalise the policy tradeoff between extending the statutory retirement age and making increased use of the intensive labour market margin. At this stage, we ignore behavioural responses. Assume a representative individual retires at the statutory age of retirement,  $S$ , when the old-age pension become available<sup>2</sup>. The government decides to introduce a policy to extend working life by  $G$  years, so that the age at which a pension is first available is postponed until  $S+G$ . The fiscal benefits of this are the increased social security contributions and the saving of pension payments from  $S$  to  $S+G$ <sup>3</sup>. These are shown for a representative individual in equation (1). Here the fiscal benefit of increasing the state retirement age is given by  $B_{SR}$ , which comprises two components. The first is the additional social security contributions generated from the additional hours worked,  $h_\tau$ , and per-period wage rate,  $w_\tau$ , during the period from the existing retirement age to the new retirement age. The combined rate of social security contributions from employer and employee is  $T$ .<sup>4</sup> The second fiscal benefit is the pension payments that are not being made over the same interval. From the perspective of an individual's lifetime social security contributions and pension payments, these benefits should be discounted at the appropriate rate, which is likely to be close to the risk-free rate. However, from the

---

<sup>2</sup> In the UK, the term “statutory age of retirement” does not imply compulsion – but solely signifies when individuals first become eligible for a state pension.

<sup>3</sup> We focus on the social security aspects of extending the intensive and extensive margins of the labour market. These are intended to fund the pension system inter alia. While consideration of tax benefits would be informative, it would involve a more extensive theoretical structure.

<sup>4</sup> Employee contribution rates in the UK are complex, but average around 11 per cent for most employees. Employers also have to contribute. Those not participating in a recognised pension usually pay around 12.8 per cent of the wage bill.

government's perspective, discounting would not be necessary in the economy was in steady state with identically sized cohorts.

$$B_{SR} = \int_S^{S+G} (Th_\tau w_\tau + P_\tau) e^{-\phi\tau} d\tau \quad (1)$$

An alternative policy might provide incentives to encourage workers to work longer hours in the period before retirement. Thus, for example, one might envisage a scheme which keeps workers' hours constant after some age,  $r^*$ . This would offset significant income effects on worker hours. Thus, instead of workers providing  $h_\tau$  hours at age  $\tau$ , they continue to provide  $h^*$  hours until the original pension age,  $S$ . The fiscal gain is the additional tax and social security generated by the extra hours worked. This is shown as  $B_{WH}$  in equation (2).

$$B_{WH} = \int_{r^*}^S (h^* - h_\tau) T w_\tau e^{-\phi\tau} d\tau \quad (2)$$

Again the social security rate is  $T$ . The additional payments are discounted to age  $r^*$ . The lower the age at which the additional hours scheme is introduced, the greater will be its discounted benefits, *ceteris paribus*. For the individual, the issue is one of inter-temporal utility maximisation. Is it preferable to work additional hours prior to retirement or to work more years, but at lower work intensity? The income and substitution effects that we have already discussed clearly influence this judgement. In turn, these will reflect issues of job satisfaction and household budget constraints. On the demand side, the offered wage will reflect levels of productivity, which, as discussed previously, will depend on past investments in general and specific human capital. It may also reflect the individual's investment in health capital (Grossman 1972).

To the government, additional hours increase the individual's income, which in turn boosts social security contributions: extending the retirement age also increases social security

contributions and, in addition, reduces pension liabilities. If fiscally neutral, the state is likely to be indifferent between these alternatives. For a given individual, the two schemes are fiscally equivalent when

$$B_{WH} = B_{SR} e^{-\phi(S-r^*)} \quad (3)$$

since the appropriate discount factor relating  $B_{SR}$  to  $B_{WH}$  is  $e^{-\phi(S-r^*)}$ .

The characterisation of the trade off between the intensive and extensive margins of the labour market described in equations (1) and (2) is oversimplified. It assumes that individuals retire at the statutory age. In practice, we know they retire both before and after the statutory age. Those retiring early significantly outnumber those retiring late. Those retiring early may be doing so because they are already being supported by social insurance schemes, such as incapacity benefits<sup>5</sup>, or have a personal or work-based pension. There is clearly an argument that “work harder” measures might also target this group – a point to which we subsequently return.

How would the schemes described above affect individuals who do not retire at the age at which they become eligible for a state pension? We define the actual age of retirement of as  $r_A$ . Again, for the present, we ignore potential behavioural responses to the schemes, which might lead workers to choose different retirement ages and/or hours of work. We distinguish those who retire early, before the current statutory age,  $S$ , and those who retire late, after age  $S$ .

*(a) Individuals who retire early*

For those that retire early, there are no additional social security contributions if the policy that is being considered is one of extending the statutory retirement age. The only savings are the pensions that are not paid to such individuals between the original and revised statutory retirement ages. The fiscal benefits are shown in equation (4).

---

<sup>5</sup> Approximately 2.6m adults receive incapacity benefits in the UK. This number has not varied substantially in the last decade.

$$B_{SR} = \int_S^{S+G} P_\tau e^{-\phi\tau} d\tau, \quad r_A < S \quad (4)$$

On the other hand, those who provide additional hours will provide additional social security contributions between  $r^*$  and their actual age of retirement. The discounted value of these contributions is given by  $B_{WH}$  in equation 5.

$$B_{WH} = \int_{r^*}^{r_A} (h^* - h_\tau) T w_\tau e^{-\phi\tau} d\tau, \quad r_A < S \quad (5)$$

*(b) Individuals who retire late*

For those retiring later than the new statutory age there will be no change to social security payments or in pension provision and therefore no fiscal effect (equation 6)<sup>6</sup>.

$$B_{SR} = 0, \quad S + G < r_A \quad (6)$$

If there is increased work intensity, there will only be an increase in social security receipts for the period up to the new retirement age or the actual retirement age, whichever is the lesser. Social security is not paid by workers that are older than the statutory retirement age. Since this policy does not influence the actual retirement age, there are no implications for pension costs.

$$B_{WH} = \int_{r^*}^{S+G} (h^* - h_\tau) T w_\tau e^{-\phi\tau} d\tau, \quad S + G < r_A \quad (7)$$

The overall effect of these two policies on government revenue will depend on the distribution of retirement ages among the working population. Recall that in this simple model, we do not allow for individuals to change their retirement date, other than to adapt to the new statutory retirement age.

---

<sup>6</sup> This assumes that those retiring late do not retire between the original statutory date ( $S$ ) and the new statutory date ( $S+G$ ). In addition, we are assuming that there is policy to enhance the pension of those that retire late.

The aggregate effect of increasing the retirement age comes largely through the saving in spending on pensions. Those who retire early will have their pension delayed by a year; those who retire at the statutory age will delay retirement for a year, thus again saving on pensions. Assuming that this group remain in work, they will also make additional social security contributions during this period. For those who retire late, the policy will make no difference. For the policy of increased work intensity, there are no savings on pensions. However, there are increased social security revenues that begin when the individual responds to the policy of increasing work intensity and ends when the individual chooses to retire. Such changes in policy will inevitably precipitate changes in worker behaviour. We have simply assumed that the minority of workers who retire at the statutory age will extend their working life from  $S$  to  $S+G$ , while other workers choice of retirement age will be unaffected.

But how will those retiring at the statutory age adjust their labour input on the intensive margin? If the policy simply involves increasing the minimum age of eligibility for a state pension, then workers' need not aim for a wage that exceeds the state pension plus their valuation of the disutility of work. Given that older workers experience above average job satisfaction, the value of the disutility of work may be quite low. As a result, it might be expected that workers would reduce their hours between the current and new statutory pension ages. If additionally, the policy involves increasing the number of "qualifying" years before a state pension is payable, workers may have to work sufficiently long hours to ensure that their income exceeds the minimum required for a "qualifying" year. As we have already seen, this is not a very high threshold and for most workers will not be a binding constraint.

As we have already suggested, one might manipulate pension eligibility to encourage older workers to maintain their provision at the intensive margin. In subsequent sections, we



estimate by how much hours would have to adjust to compensate for an increase in the retirement age. Thus, for example, workers might be allowed to qualify for an earlier state pension if they maintained their annual income levels over a specified pre-retirement period. This would almost certainly involve them providing more hours than they would otherwise have done. Employers might be able to capture some of the rent from these additional hours through lower per-period fixed costs of employment. Moreover, longer hours of work may encourage firms to extend training investments among older workers due to longer expected amortization periods. In this event, employers and workers would gain from shared rents resulting from improved worker productivity and accompanying income gains would result from higher employer/employee pension contributions.

#### **4. Hours and Participation in the UK Labour Market**

In this section we introduce an empirical aspect to our discussion. We begin by reviewing labour market participation and hours of work for British workers of all ages. We do this to gain not only an understanding of changing participation patterns in the UK labour market, but also the critical role played by variations in working hours in influencing aggregate labour input, particularly in relation to the contribution made by older women.

We begin by looking at employment rates by age group for males and females over the last 30 years, with the data taken from a number of UK Labour Force Survey. Figure 1 shows male employment rates for the years 1975, 1985, 1995 and for the most recent 18 quarters of Labour Force Survey<sup>7</sup> data, which run from 2005 to 2009. Four features stand out.

---

<sup>7</sup> With the exception of 1975, for which weights are not available, data are weighted using the most recent ONS revision of individual weights.

1. Among 16 to 25-year-olds, employment rates for males have fallen. This is mainly due to increasing participation in further and higher education.
2. Among prime age males aged 25 to 49, employment rates tended downward between 1975 and 1995, but then increased between 2005 and 2009. The recent increase is mainly the result of falling unemployment rates during this decade. Nevertheless, current employment rates among prime age males are still lower than the mid 1970s, even though unemployment rates have been historically low. This is due to increasing non-participation that is often associated with disability or incapacity to work among this age group.
3. Among those aged 50 and over there was also a very substantial decline in participation between 1975 and 1995. Lowered employment rates among older males, as with prime age males, was associated with increased non-participation due to disability or long-term illness.
4. There was some recovery in employment rates of older men, between 1995 and 2005-2009. Nevertheless, employment rates among older British males are still substantially below those of 1975, even though male life expectancy in the UK has increased by around seven years since 1975<sup>8</sup>. As we shall see, early retirement and a greater incidence of disability both contribute to this outcome.

---

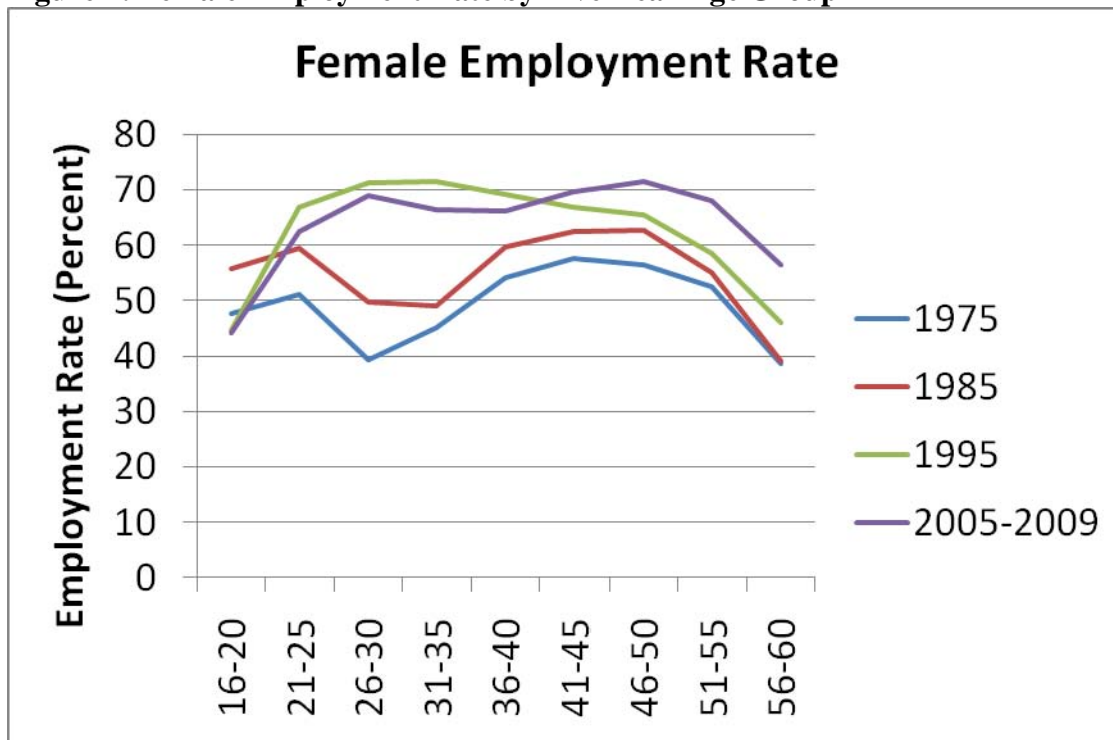
<sup>8</sup> Source: OECD Health Data 2009

**Figure 1: Male Employment Rate by Five-Year Age Group**



Source: Labour Force Survey

**Figure 2: Female Employment Rate by Five Year Age Group**

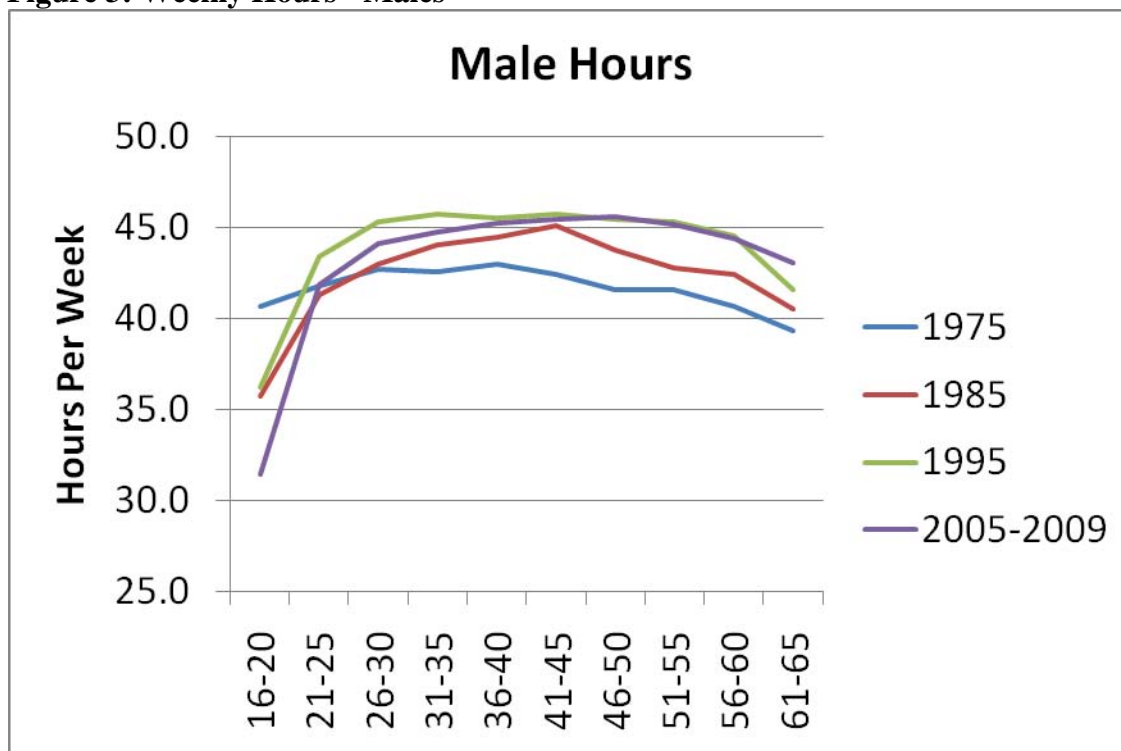


Source: Labour Force Survey

In contrast, female employment rates (see Figure 2) have followed a quite different pattern from those of males between 1975 and 2009. Key developments include:

1. A slight reduction in younger female participation rates, again as a result of increased participation in further and higher education.
2. Substantial increases in employment rates among females aged 25 to 49. Increased labour market participation among prime age females coincided with a substantial decline in the birth rate over this period.
3. Increased labour market participation among older females. Thus in 1975, less than 40% of females aged 56 to 60 were employed, while in 2005 almost 60% of this age group was working. Increased employment rates among females may reflect higher investment in their human capital, as well as a number of supply-side explanations such as marital breakdown and pension uncertainty. It may also reflect intra-household labour supply decisions, including substitutability between female and male labour supply.

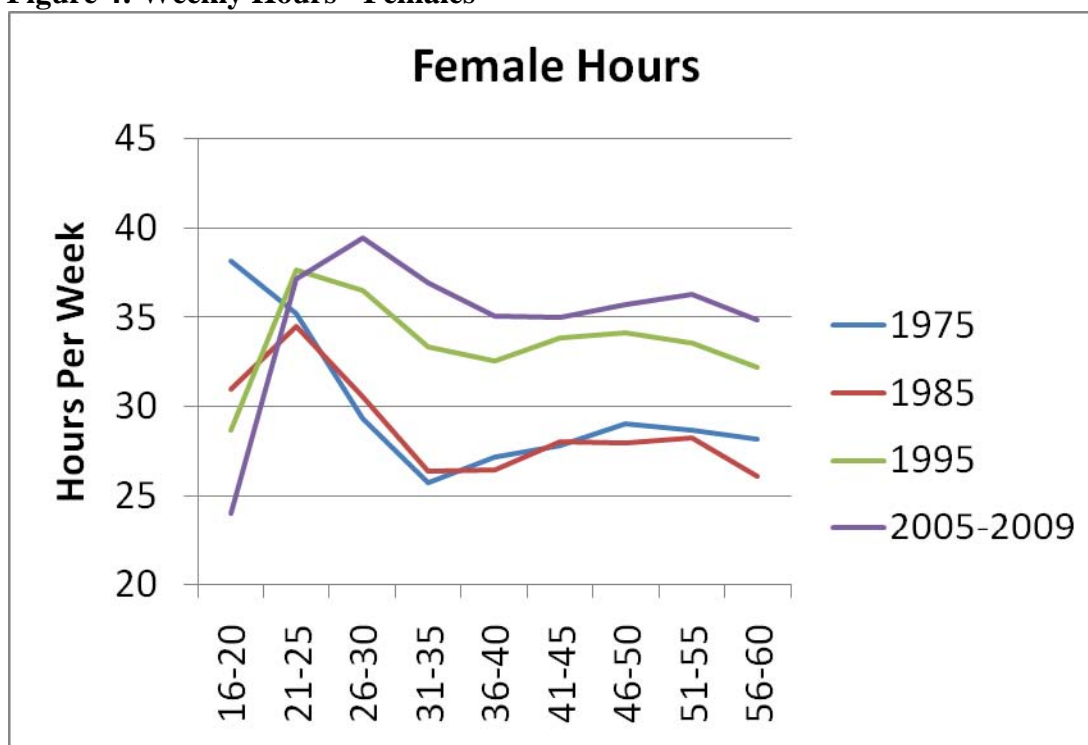
**Figure 3: Weekly Hours - Males**



Source: Labour Force Survey

The weekly hours data drawn from the Labour Force Survey include both regular and paid-for overtime hours. For younger men (see Figure 3), average hours have tended to fall, partly as a result of greater incidence of part time working, sometimes in conjunction with education. For prime-age men, hours have trended upwards since 1975. The data on the weekly hours of older males show a consistent upward trend from 1975: those in the 50-64 age group worked an average of 9% more weekly hours in 2005-2009 than in 1975. Thus, though employment rates have fallen for this age-group, increased labour supply at the intensive margin of the labour market has partly offset the negative impact of reduced supply on the extensive margin.

**Figure 4: Weekly Hours - Females**



Source: Labour Force Survey

For older females, labour supply has expanded on both the intensive and extensive margins. Figure 4 shows that in 2005-2009, average female hours varied little between the 36-40 age group and the 55-59 age group. Thus, compared with 1985, the older female worker in

2005-2009 spent an average of around nine hours per week longer at work than her 1985 equivalent.

The overall impact of changes in the UK labour market between 1985 and 2005-2009 on both the extensive and intensive margins is summarised in Table 1. Increases in employment among younger males have been modest, whereas employment among those aged 50+ has increased by almost 25 per cent. This group has also experienced significant increases in hours of work. Combining these effects, aggregate weekly hours among those 50 plus age group have increased by more than 31%, while younger workers have experienced only a 5% increase in weekly hours.

**Table 1: Weekly Hours, Employment and Aggregate Weekly Hours: Males and Females 1985 and 2005-09**

	Males			Females		
	1985	2005-09	% Change	1985	2005-09	% Change
<b>Average Weekly Hours</b>						
Workers aged 16-49	42.6	44.3	<b>3.9%</b>	29.2	35.7	<b>22.3%</b>
Workers Aged 50+	42.2	44.5	<b>5.5%</b>	27.5	35.6	<b>29.3%</b>
<b>Employment</b>						
Workers aged 16-49	9.546m	9.659m	<b>1.2%</b>	7.707m	8.730m	<b>13.3%</b>
Workers Aged 50+	2.377m	2.962m	<b>24.6%</b>	1.373m	2.228m	<b>62.3%</b>
<b>Aggregate Weekly Hours (m)</b>						
Workers aged 16-49	407.0	427.9	<b>5.1%</b>	225.0	311.8	<b>38.6%</b>
Workers Aged 50+	100.2	131.7	<b>31.5%</b>	37.8	79.3	<b>109.8%</b>

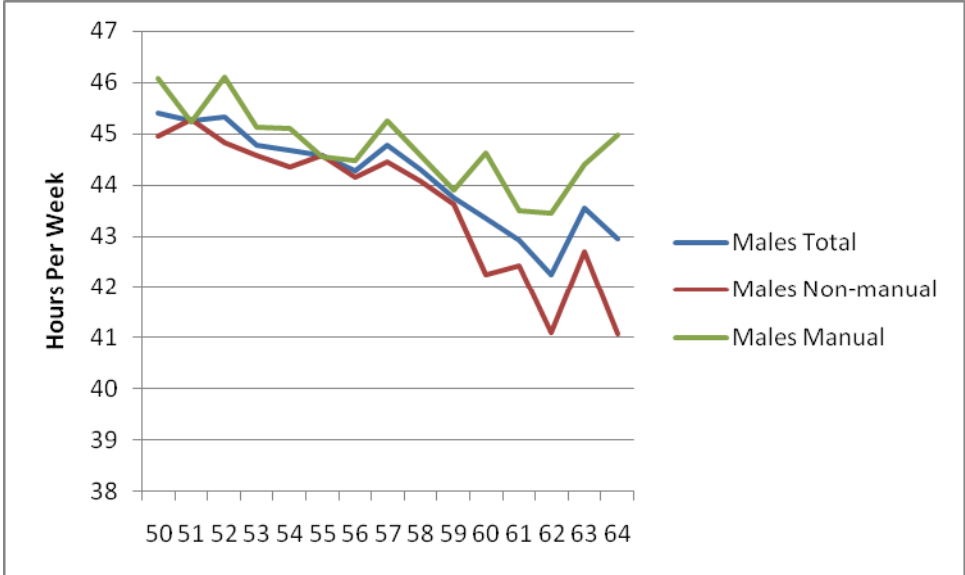
Source: Labour Force Survey (1985 and 2005-09)

Older female workers have already responded to the “work harder” message. The changes in hours of work provided by older females have been dramatic. Employment increased by 29% between 1985 and 2005-09 and hours of work rose by 62%, implying that total weekly hours supplied by women aged 50 plus supplied more than doubled between 1985 and 2005-09.

This has implied a very significant increase in social security revenues as well as a build up of eligibility for state pensions among this group of women.

However, though average weekly hours of work for males and females aged 50 plus have increased in recent years, a more detailed analysis by single year of age indicates that average weekly hours tend to decline as individuals approach statutory retirement age. From our earlier discussion, this might suggest that there are strong income effects among this age group.

**Figure 5: Average Weekly Hours by Single Year of Age: Males Aged 50-64**

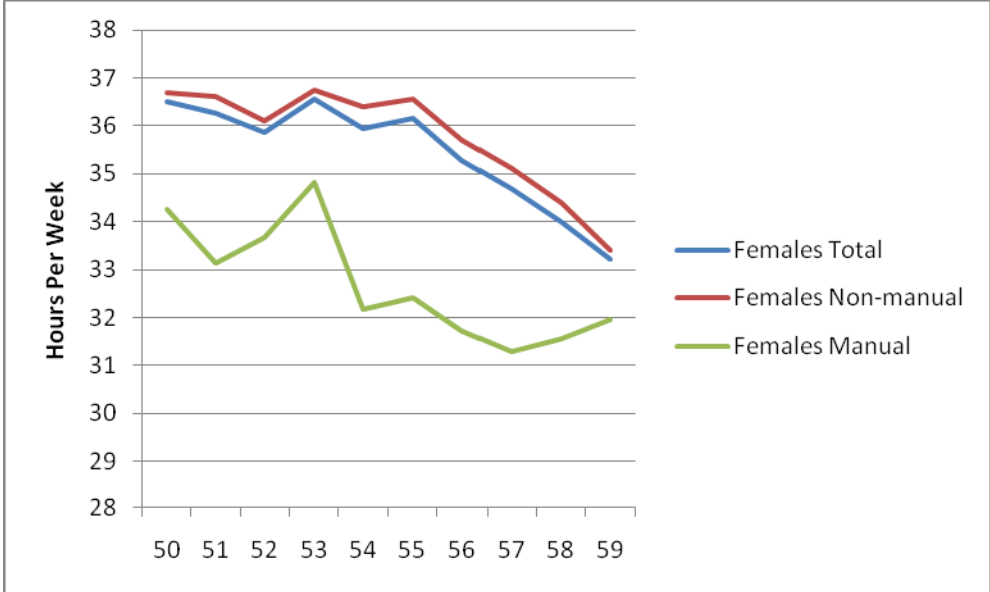


Source: Labour Force Survey 2005-2009

Figure 5 shows average weekly hours for males during the period 2005-2009, using the same data as in Figures 1 to 4. This figure also subdivides male employees into those working in manual and non-manual occupations. It shows that for all males, weekly hours fall by around 5% between the ages of 50 and 64. The decline is more rapid among non-manual males, though the standard errors of the estimates of weekly hours increase with age, due to the decline in sample size as workers retire. For older females, whose average weekly hours are shown in Figure 6, there is a much more marked difference between manual and non manual employees. Manual

female workers consistently work shorter hours than non-manual females, though the gap narrows with increasing age. The decline in total hours worked among women is more than 9% between the ages of 50 and 59, a considerably more rapid rate of decline in hours worked than that among men.

**Figure 6: Average Weekly Hours by Single Year of Age: Females Aged 50-59**

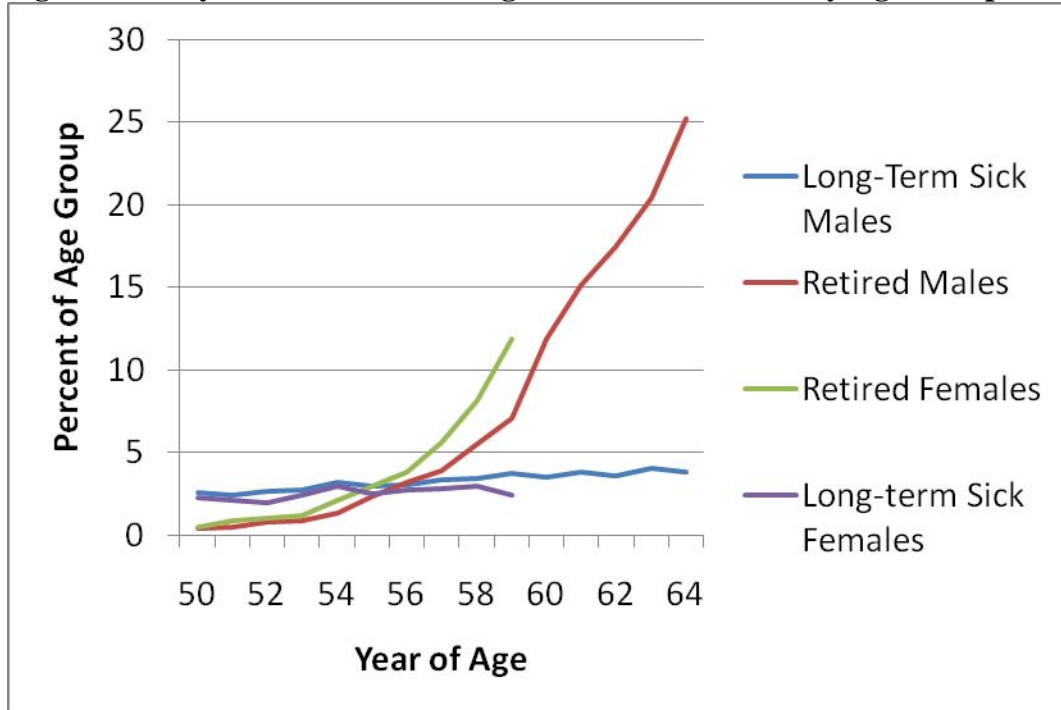


Source: Labour Force Survey 2005-2009

The rate of withdrawal of older workers from the labour market is shown in Figure 7. It plots rates of long-term sickness and early retirement for both genders before the current statutory retirement age. Thus the data for females cover ages 50-59 and for males ages 50-64. Early retirement has clearly the more significant effect, though those describing themselves as retired may have entered that state from long-term sickness as well as employment. The UK population aged 50 plus and less than the statutory pension age comprises around 8.4m individuals. The LFS 2005-09 data suggests that around 537,000 of these (390,000 males and 147,000 females) had taken early retirement – 6.4 per cent of the cohort, though this percentage rises sharply with age, particularly for males.



**Figure 7: Early Retirement and Long-term Sickness Rates by Age Group 2005-09**

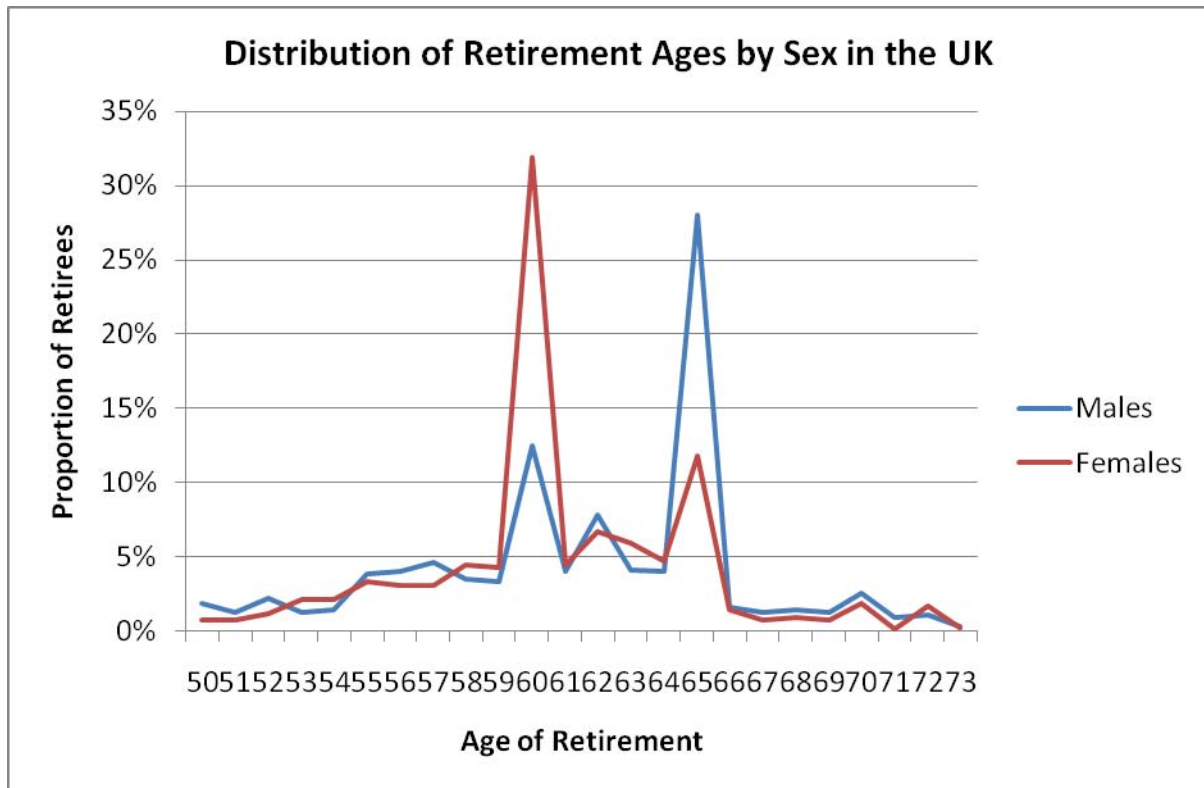


Source: Labour Force Survey 2005-2009

Figures 6 and 7 together indicate that UK workers aged 50 plus significantly reduce their labour input on both the intensive and extensive margins as they approach the statutory retirement age. The importance of early retirement is shown in Figure 8, which draws on the British Household Panel Survey (BHPS) to construct the probability distribution of actual retirement ages in the UK by single year of age for the period 1991-2007. There are clear peaks at the statutory retirement age for both men and women, with 32 per cent of women and 28 per cent of men retiring at the statutory age. But 60 per cent of men and 25 per cent of women who were working at age 50 retire early (another significant group not included in these data are those that were already not working at age 50). These groups may be less likely to react to increases in the statutory retirement age than those who currently retire at the statutory age: health problems

and the availability of private pensions are important reasons for early retirement and these are unrelated to the statutory age of retirement.

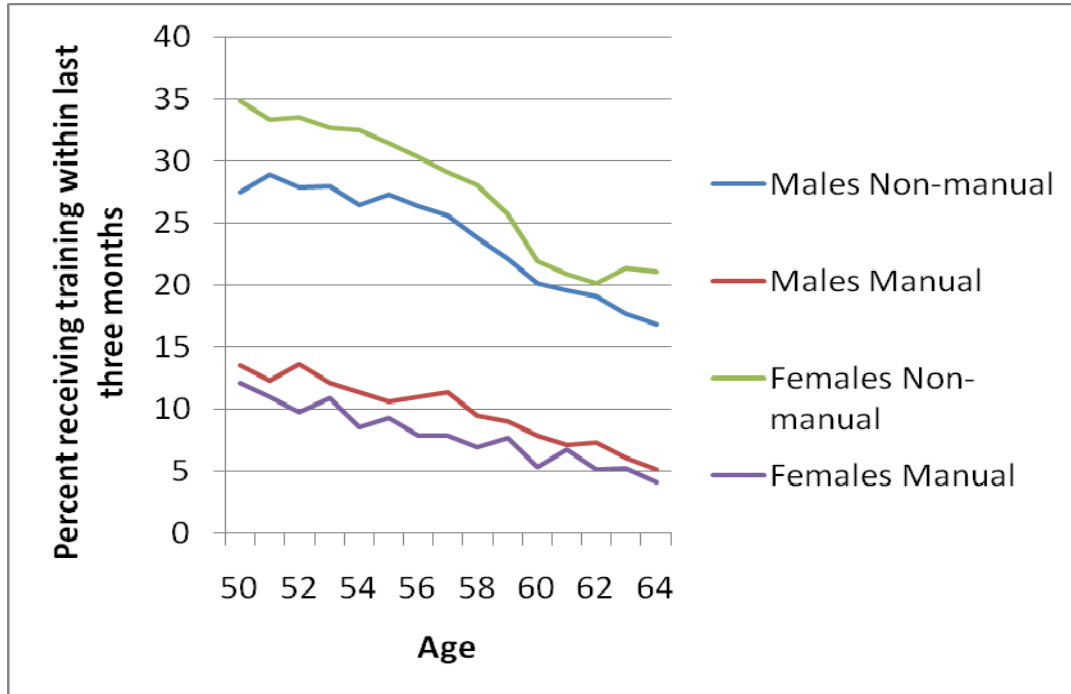
**Figure 8: Probability Distribution of Age of Retirement by Single Year of Age, Males and Females 1991-2007**



Source: BHPS 1991-2007

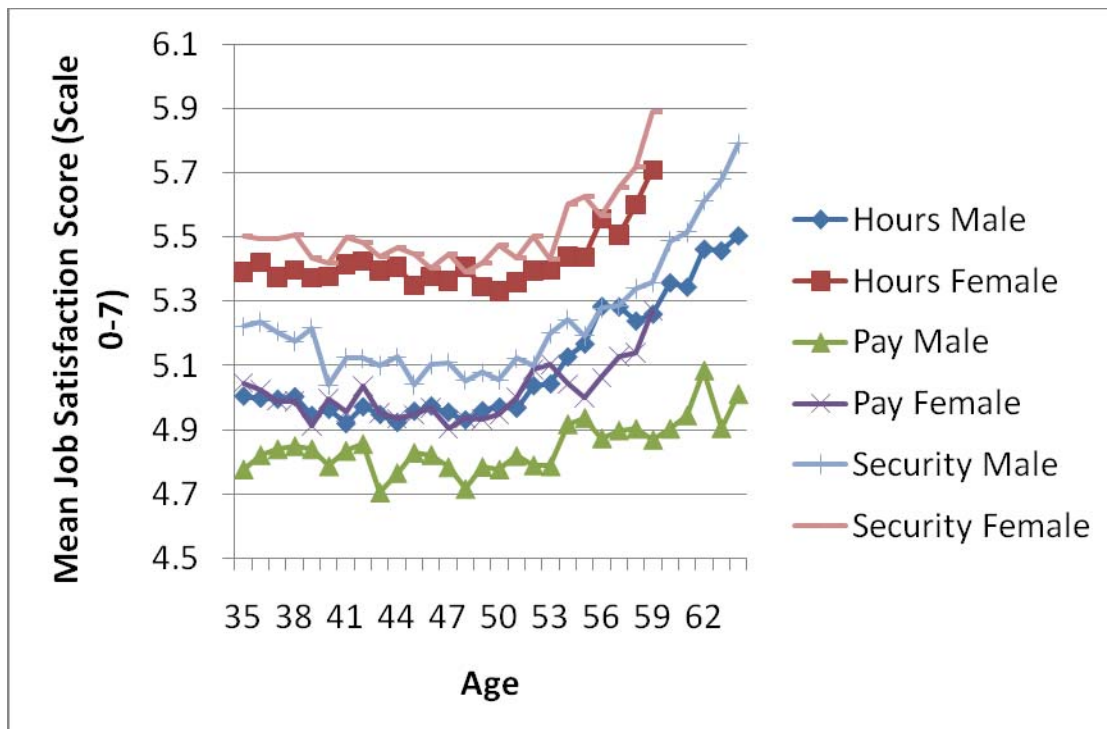
Next, we examine firm specific training by age group. Figure 9 shows the proportion of employees receiving training from their employer in the last three months, again using the 2005-09 LFS. The disaggregation by manual/non-manual, and by gender, shows that occupational distinctions are more important than gender in predicting levels of investment in the human capital of older workers. There is also a clear downward trend by age, which is consistent with our previous arguments regarding the length of time during which such investment can be amortized.

**Figure 9: Proportion of Employees Receiving Training in Last Three Months**



Source: Labour Force Survey

**Figure 10: Age, Gender and Components of Job Satisfaction**



Source: BHPS

Figure 10 shows how various aspects of job satisfaction vary by age. Data are again drawn from the 1991-2007 BHPS. Satisfaction with hours, with pay and with job security are shown for both males and females. Not surprisingly, since they use the same dataset, these findings are consistent with those of Clark, Oswald and Warr. All aspects of job satisfaction increase with age. In general, women have higher levels of satisfaction than men. Both genders express least satisfaction with their pay rates. But satisfaction with hours of work and job security increase substantially with age. All of the possible reasons cited by Clark, Oswald and Warr may be relevant to these findings. In addition, given our earlier arguments, workers may be increasingly content with their job security because they know that past joint investment in human capital will make employers less likely to lay them off. But this begs the question as to why hourly wages, human capital investments and hours themselves decrease with age. One consideration may be that older workers are more expensive to make redundant due to employment laws. And on the supply side, in line with the arguments of Ohashi, some older workers may have:

- (a) built up a significant pension entitlement,
- (b) largely paid off a mortgage ,
- (c) finished contributing to the financial needs of their descendents ,

and so may be less concerned about job security and wage rates.

## **5. Some Estimates of the Tradeoff Between Retiring Later and Working More Hours**

In this section, we estimate some of the magnitudes relating to our previous discussion. Specifically, we calculate the fiscal equivalent of a policy of increasing the statutory retirement age by one year of a policy which increases labour supply on the intensive margin, but within the existing retirement age. We carry out the analysis using the 2005-09 LFS dataset. To forecast

employment, hours and hourly earnings at age 65 for men and 60 for women, we extend the trends in these variables for ages 50-64 and 50-59 respectively (see, for example, Figures 5 and 6). Based on these, we estimate aggregate social security contributions using a combined employers and employees contribution rate of 20 per cent. This is an approximation to the complex structure of employees' and employers' contribution rates. In addition to these, we assume saving of £95 per person per week for pensions saved by this policy. This is attributed to those that we would estimate are likely to be employed in their 65<sup>th</sup> (men) or 60<sup>th</sup> (women) year. Additional contributions will come from those who have left the labour market who are receiving private pensions. Those who have no savings going into their 65<sup>th</sup> or 60<sup>th</sup> year are likely to have their incomes made up to the equivalent of the old age pension through income support.

Our estimates of the combined aggregate saving from increasing the retirement age is shown in Table 2, while the effects of maintaining working hours of those aged 50 plus are shown in Table 3.

**Table 2: Fiscal Benefits of Increasing Pension Age by 1 Year**

	<b>Males</b>	<b>Females</b>	<b>Total</b>
<b>Additional Weekly Hours</b>	3,365,646	5,763,548	9,129,194
<b>Annual Pay (£m)</b>	£1,769	£2,589	£4,358
<b>Social Security Contributions (£m)</b>	£354	£518	£872
<b>Pensions Saved (£m)</b>	£396	£891	£1,287
<b>Total Weekly Savings (£m)</b>	£750	£1,409	£2,159

Ignoring discounting, a fiscally equivalent measure based on the intensive margin of the labour market would be required to generate an additional £2.2bn in social security

contributions, which is equivalent to raising incomes by £11bn. This could be achieved by increasing hours of work, say, for all workers aged between 50 and 64 (men) and 50 and 59 (women). We assume that all workers continue to work for their current age-specific wage rate and calculate the aggregate increase in hours necessary to generate the fiscally equivalent change. Our results are shown in Table 3.

**Table 3: Equivalent Change in Labour Input at the Intensive Margin**

<b>(Workers age <math>\geq</math> 50 years)</b>	<b>Males</b>	<b>Females</b>	<b>Total</b>
<b>Increase in labour input (per cent)</b>	4.8	18.5	9.3
<b>Discounted (4%) increase in labour input (per cent)</b>	3.4	15.1	7.4

Note that these estimates will change if the age-profile of additional hours differs from the existing hours/age profile, since the same hours worked at different ages generate different amount of revenue. With this proviso, male labour input would have to rise by 4.8 per cent and female labour input by 18.5 per cent. The discrepancy between the sexes is due to:

- (i) Female wages are lower than males, but pension payments are the same for both genders.

With a lower wage rate, women have to work longer to generate social security contributions equivalent to future pension savings.

- (ii) There is a substantial difference between calculating pension savings for a change in the retirement age from 60 to 61 than from 65 to 66. We have used this approach because these are ranges appropriate for the current statutory retirement ages. By 2020, the retirement age for women will be the same as that for men. The number of males in employment falls dramatically between 59 and 64. This is partly due to cohort size and

mortality effects. It is also due to male workers taking early retirement for reasons of health or preference. Mortality rates will be lower for females, but nevertheless, it is likely that, within any cohort, a significantly smaller number will retire at the statutory retirement age of 65 than the current statutory age of 60, consequently reducing the required increase in female hours.

A number of further points can be made about these estimates:

- (i) The required increases shown in Table 3, particularly for women, seem substantial. But recall that, from Table 1, male workers aged 50 plus increased their actual hours by 5.5 per cent between 1985 and 2005-09, while for the equivalent female workers, the increase was 29.3 per cent. Both these historic increases exceed our estimates of the increase required to produce an equivalent fiscal effect as increasing the age of retirement by one year. This is no guarantee that a further increase in hours would be feasible, but it does suggest that without the increase in hours that has been observed already, there would be even greater upward pressure on the age of retirement in the UK.
- (ii) The estimates do not allow for any change in the participation behaviour of older workers. This might increase in response to an increase in the retirement age, which would increase the attraction of the policy of increasing the statutory retiral age. But a fiscally-challenged government is likely to anyway introduce separate policies to increase participation among older workers.
- (iii) Our estimates are not discounted. Taking discounted values reduces the net fiscal benefits of increasing the retirement age for a specific cohort compared to a policy of increased work intensity from age 50. As shown in Table 3, at a real discount rate of 4 per cent, the

required increase in hours input fall to 3.4 per cent for males and 15.1 per cent for females.

- (iv) We make no allowance for the fiscal impact of those that retire early without a private pension. Many of these will be supported through incapacity or disability benefits. But we have not assumed that this group has changed its behaviour as a result of either policy. Hence these expenditures do not form part of their costs.
- (v) Developing the previous point, the policies contrasted here do not address the pre-retirement extensive margin of the labour market. While different policies may be required to address this margin, success in raising levels of participation will yield increases in social security contributions across all hours provided, rather than just the increment to hours. Not surprisingly, the potential gains from a successful policy addressed at increasing participation among pre-retirement age workers can be larger than for either increasing the retirement age by a year or increasing the hours worked among older workers.

## **6. Conclusions**

In this paper, we have examined the working time of older workers both from a theoretical and an empirical perspective. We have shown that the intensive margin of the labour market should not be ignored when considering policies to increase the statutory retirement age. Employers may ask older workers to work longer hours so they may jointly realise the benefits from human capital investment. Long-tenure older workers may also be better paid, which is likely to increase their attachment to the labour market. But short-tenure older workers may earn less, since employers will be less willing to invest in enhancing their skills. We confirm



empirically that investment in training for older workers declines with age. We also find that older workers hours and wages tend to decline above the age of 50.

There are a variety of reasons why older workers may substitute out of income and into leisure. These might be amplified if job satisfaction decreased with age. But our empirical findings confirm those of earlier studies, namely that job satisfaction increases with age. However, since a large proportion of older workers leave the labour market during their fifties and early sixties, the apparent increase in satisfaction may be subject to selection bias.

There has been a significant overall increase in the hours supplied by older workers in the UK in the last two decades. This is particularly true for women, whose hours input has more than doubled due to a combination of higher employment rates and higher average hours. This is relevant for any discussion of the trade-off between increasing employment levels among older workers (through increasing the retirement age) and increasing hours of work.

One of the most popular policies for offsetting the fiscal burden of population ageing is to increase the statutory retirement age. Our analysis suggests that considerations of such policies should not ignore the intensive margin of the labour market. Welfare enhancing policies might allow older workers to choose between combinations of extended working life and increased work intensity to qualify for a full state pension. Though such policies might be complex to design and implement, existing state pension regulations already implicitly carry minimum work intensity thresholds.

## References

- Becker, G. *Human capital*, 1962, New York: Columbia University Press.
- Brechling, F. “The relationship between output and employment in British manufacturing industries”, *Review of Economic Studies* 32, 1965, 187–216.
- Carmichael, L. “Firm-specific human capital and promotion ladders”, *Bell Journal of Economics* 14, 1983, 251-58.
- Clark, A E, A J Oswald, and P Warr. “Is job satisfaction U-shaped in age?” *Journal of Occupational Psychology* 69, 2006, 57-81.
- Ehrenberg, R G. *Fringe benefits and overtime behavior*, 1971, Lexington, Mass.: Heath.
- Gustman, A L , and T L Steinmeier, ‘A structural retirement model’, *Econometrica* 54, 1986, 555-584.
- Grossman, M. “On the Concept of Health Capital and the Demand for Health”, *The Journal of Political Economy* 80, 1972, 223-255
- Hart, R A. and Y Ma. “Wages, Hours and Human Capital over the Life Cycle”, *Jarbücher für Nationalökonomie und Statistik* 228, 2008, 446-464.
- Hart, R A. and Y Ma. “Wage-Hours Contracts, Overtime Working and Premium Pay”, *Labour Economics* 17, 2010, 170 - 179.
- Hashimoto, M. “Firm-specific human capital as a shared investment”, *American Economic Review* 71, 1981, 475-82.
- Hashimoto, M and B T Yu, "Specific capital, employment contracts and wage rigidity", *Bell Journal of Economics*, 1980, 11, 536-49.
- Hutchens, R M. "Seniority, Wages and Productivity: A Turbulent Decade", *Journal of Economic Perspectives* 3, 1989, 49-64.
- Kahn, S and K Lang, "Constraints on the choice of hours", *Journal of Human Resources* 27, 1992, 661 - 678.
- Malcomson, J M, “Individual employment contracts”, in Ashenfelter, O and Card, D, *Handbook of Labor Economics* Vol. 3B, 1999, Elsevier Science.
- Ohashi, I., “Wages, hours of work and job satisfaction of retirement-age workers”, *Japanese Economic Review* 56, 2005, 188-209.
- The Pensions Commission, “A New Pension Settlement for the Twenty-First Century:

The Second Report of the Pensions Commission”, 2005/ [Accessed at:

<http://www.webarchive.org.uk/wayback/archive/20070801230000/http://www.pensionscommission.org.uk/publications/2005/annrep/main-report.pdf>]