Senior activity rate, retirement incentives, and labor relations*

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Abstract

In order to face the ageing of their populations governments of developped countries reformed their retirement systems during the last two decades, by discouraging early retirement and increasing incentives to work for older workers. Considering the results of these policies, we notice that senior participation rates to the labour force not only dier strikingly in level from one country to another, they also dier in their reaction to retirement incentives set by governments.

This paper highlights how disutility to work can merely inuence the eectiveness of such reforms. First, we build a model according to which the reaction of senior activity rate to monetary incentives to work depends on the properties of the specic distribution of working conditions in the country.

Second, we show empirically that reactions to incentives depend on working con- ditions at the individual and country level. People react much stronger to changes in their expected replacement rate if they enjoy going to work. In comparison, people who do not enjoy going to work will just retire as soon as possible, regardless of monetary incentives. This result has aggregate consequences. We use panel data for nineteen OECD countries from 1980 to 2004. We show that the elasticity of senior male labor force participation rate to retirement incentives is stronger in countries with better and more homogeneously distributed working conditions.

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1 Introduction

The issue of the efficiency of economic reforms is a central one in public policy agenda. Once a reform has been shown desirable by economic theory or empirical test, its implementation does not always reach the objectives. This question as been addressed by Acemoglu et al. (2008) who point out that setting an independent central bank is effective at fighting inflation if there are enough constraints on the executive. In this paper, we are interested in the effect of changes in retirement incentives on senior activity rate. We will conclude that their efficiency is conditioned by the quality of labor relations.

One of the main point of the Lisbon strategy to develop Europe was the fostering of senior employment in order to "make Europe, by 2010, the most competitive and the most dynamic knowledge-based economy in the world". The weak values of this economic indicator in some European countries was considered a restraint for growth. Hence, most of developed countries have been constantly adjusting pension systems during the last decades to reach these objectives. Any pension reform or adjustment has two objectives : first, a change in retirement schemes aims to improve the balance between expenditure and resources of the pension system ; second, it also aims to modify senior activity rate. The later objective can of course be a major factor that allow to achieve the former.

In this paper, we focus on the effect of changes in retirement incentives on senior activity rate. We argue that quality of working conditions in a country is likely to alter the response of senior activity rate to changes in retirement incentives. We first present a model where senior workers have the choice between work and retirement. Their choice is affected by their perception of the disutility of labor and by the generosity of the pension system. At the aggregate level, the response of senior labor force participation rate to a change in retirement incentives depends on the distribution of the disutility of labor in the society. Then, turning to empirical evidence, we show : (i) using individual data, that monetary incentives plays a role in the retirement decision only if the disutility at work is weak ; (ii) using aggregate data, that the disutility of labor, approximated by the quality of labor relations, fosters the elasticity of senior male participation rate with respect to the implicit tax on continued work, which is the cost of staying at work compared with retiring.

Instruments to increase senior employment rate can be the postponing of the standard retirement age or the decreasing of retirement incentives which involve pension and contribution rates changes. The importance of that later parameter has been stressed by Duval (2003). He showed that a decrease of the incentive to retirement may reduce the fall of employment between two five-years age groups. In a dynamic approach, Blau and Goodstein (2010) investigated to what extent changes in social security rules explain changes in labor force participation of seniors in the United States. Liebman et al. (2009) also examinated the response of labor supply to social security benefits by older workers in the United States.

The intuition behind the results presented in this paper is fairly simple : monetary incentives can play a role in the retirement decision only if workers sufficiently enjoy going to work. In the opposite case, any decrease in retirement incentives would not have any effect on the seniors' decision since they suffer a large disutility at work. This idea that some factors may interfere with the retirement decision has been investigated by Blau and Shvydko (2007) who focused on the characteristics of firms and contracts. By an empirical study, they showed that seniors' choice of retirement also depends on the rigidities of technologies. Similarly, according to Cheron et al. (2004), trying to increase senior

employment by a change of pension scheme is useless if wages are rigid and above their walrasian level.

At the country level, our proxy for the disutility at work is the quality of labor relations both between workmates and between employers and employees. Such idea on the influence of labor relations on macroeconomic outputs was studied in a very practical approach by Blanchard and Phillipon (2004). Considering the number of social conflicts as a proxy for bad labor relations, they showed that bad relations strengthen the negative effect of asymmetric information on the job market. Understanding labor relations as a component of a country's cultural trait, this paper is also linked to the the literature on economic outcomes of culture. Interactions between labor markets outcomes and culture has been investigated by Aghion, Algan and Cahuc (2008). They show that policy can affect cooperation on the labor market depending on individual expectations regarding collective relations organization. The way culture and beliefs can affect activity rates has been underlined by Giavazzi, Schiantarelli and Seranelli (2010). They show that culture matters for young and women employment rates.

The structure of the paper is as follows. In section 2, we document the evolutions of senior activity rates and retirement incentives between 1990 and 2000. In section 3, we present the model and derive its implications. Empirical evidence at the individual level are presented in section 4. In section 5, we describe the data used in the macroeconomic empirical part and present corresponding results. Finally, section 6 concludes.

2 Evolutions of retirement incentives and senior activity rates

As stressed in the introduction, governments can play on two parameters in order to influence senior activity rates : the standard retirement age[1] and the extent of monetary retirement incentives. In this section, we briefly document the evolution of senior activity rates and retirement incentives between 1980 and 2000.

Table 1 presents changes in the implicit taxes on continued work, the standard retirement age and senior activity rates over the periods 1980-1990 and 1990-2000.[2] The implicit tax on continued work has been computed by Duval(2003). It takes into account expected pension wealth and both employers and employees rates of contribution to the pension system. When the implicit tax on continued work increases, a worker has weaker incentives to continue working. Senior activity rates are from the OECD database.

Over the period surveyed in table 1, standard retirement age changes have been rarely used. Only three countries experienced changes in that parameter. France decreased it of five years between 1981 and 1983. Italy increased it progressively from 60 to 65 between 1994 and 2000. The government of New Zealand conducted the same reform between the late 1980s and the year 2000.

On the contrary, changes in the implicit taxes on continued work are far more frequent. We clearly see that nor the populations treated (age group 55-59 or age group 60-64), nor reactions to these are homogeneous. Over the period 1980-1990, implicit tax on continued work for age group 55-59 and the activity rate of this age group have moved in opposite directions in countries like Finland, Germany, Netherlands, Norway, Sweden and the United States. In other countries, both variables exhibited changes in the same direction. Similar remarks easily apply to age group 60-64 or to the

[1] The standard retirement age is defined as the standard age of eligibility to old-age pension benefits.

[2] In appendix, table 7 presents the data used to construct table 1.

Figure 1: Implicit tax on continued work and senior activity rate 1980-2004 in Finland and Italy.

1990-2000 period. It is clear that the reaction of senior activity rate to changes in incentives is far from homogeneous.

Focusing on Finland and Italy can give us an idea of these striking differences. Figure 1 presents the evolutions of senior activity rate and implicit tax on continued work for age group 60-64 for these countries. In the case of Finland, we notice a perfect symmetric movement of incentives to retire and senior activity rate. The standard retirement age in Finland did not change over this period, remaining at 65. On the contrary, if we look at Italy, the senior employment rate continued its decreasing trend when the Italian government strongly decreased the incentive to retire at the end of the 1990s. It is like Italian seniors did not react to incentives set by the government. It is even more striking if we consider that this decrease in monetary incentive went alongside an increase of the standard retirement age from 60 in 1993 to 65 in 2002.

3 Model

In this section, we present a simple model that can explain the differences mentioned above.

Senior individuals face a trade-off between work and retirement. This model shows how their choice depends on the disutility of labor and how the distribution of that later parameter alters the link between retirement incentives and labor force participation rate at the macroeconomic level.

3.1 Individual trade-off

Assume that there are two periods. In the first period, an individual can choose to continue working or to retire. In the later case, she gets a truncated pension αp, where $0 < \alpha < 1$ and p is the full pension benefit. If she choose to continue working, she receives a wage w and suffers a disutility from labor.

Let δ_i be the disutility of labor for individual i. Thus, assuming a linear utility function, utility of individual i in period 1 is either $w - \delta_i$ is she chooses to work, or αp if she chooses to retire. In second period, all individuals have to retire. If the individual chose to work in the first period, she gets pension p. If she chose to retire, she gets pension αp. If β is the discount factor, the utility of

Table 1: Evolutions of senior activity rates and retirement incentives between 1980 and 2000.

	1980-1990					1990-2000				
		Age group 55-59		Age group 60-64			Age group 55-59		Age group 60-64	
	Standard retirement age	Implicit tax on continued work	Activity rate	Implicit tax on continued work	Activity rate	Standard retirement age	Implicit tax on continued work	Activity rate	Implicit tax on continued work	Activity rate
Australia	0	-0,05	-7,60	-0,10	-0,86	0	-0,10	-2,61	-0,19	-4,09
Belgium								3,58		-0,57
Canada	0	-0,49	-6,72	6,86	-13,05	0	2,15	-3,59	1,49	-5,08
Finland	0	1,02	-4,41	8,58	-12,61	0	-4,84	2,54	-3,06	-1,57
France	-5		-13,29	64,57	-25,07	0		-1,91	-0,21	-7,30
Germany	0	-0,45	0,60	-0,80	-8,38	0	0,45	-6,37	-1,60	-5,68
Ireland	0	5,88		5,86		0	-1,06		-1,01	
Italy	0	4,46		8,25	-3,60	5	-22,95	-14,87	6,47	-4,62
Japan			0,86		-4,94			2,11		-0,32
Korea			3,59					-5,64	-1,10	-3,57
Netherlands	0	2,91	-8,46	27,27	-26,16	0	6,26	3,96	6,95	4,55
New Zealand	0,25	-0,09		28,37		3,75	-0,42	3,43	-22,38	25,12
Norway	0	4,95	-2,98	6,34	-9,18	0	-2,34	2,78	-1,19	-3,57
Portugal	0	-0,81	-6,08	3,09	-9,49	0	-7,13	-1,88	1,61	-1,36
Spain	0	-2,05	-8,18	-6,08	-17,03	0	-5,59	-0,95	9,44	-3,60
Sweden	0	12,36	-0,22	0,00	-5,24	0	0,44	-2,50	0,00	-6,91
Switzerland						0	-0,97		4,26	
United Kingdom	0	-0,15		-0,71		0	1,76	-6,60	1,97	-4,12
United States	0	0,64	-1,85	-0,18	-5,28	0	-0,36	-2,84	-1,11	-0,56

All numbers are changes over the periods 1980-1990 and 1990-2000
For implicit taxes and activity rates, changes are in points of percentage

early retirement can be written as

$$U^R = \alpha p + \beta(\alpha p) = (1+\beta)\alpha p,$$

and the utility of standard retirement as

$$U^W = w - \delta_i + \beta p.$$

As a consequence, individual i chooses to retire early if and only if

$$\begin{aligned} U^R &> U^W \\ \iff (1+\beta)\alpha p &> w - \delta_i + \beta p \\ \iff \delta_i &> w + \beta p - (1+\beta)\alpha p. \end{aligned}$$

This result only implies that a worker stops to work in the first period if her disutility of labor exceeds the net gain of work during one more period. It is straightforward to see that the incentive to continue working increase with wage w and decreases with the penalty α imposed on pension by early retirement.

All in all, the incentive to retire decreases when the right hand term of the inequality (the gain of work during one more period) increases. However, the agent can be lead to continue working by an increase in monetary incentives if and only if this increase manage to exceed her disutility of labor. In other terms, negative changes in the retirement incentives, characterized by w, p and α, have an effect of the agent decision if her disutility of labor δ_i is weak enough.

3.2 Aggregate consequences

Assume that in a given country c disutility of labor is distributed among seniors according to the cumulative distribution function $F_c(.)$. Then, assuming that there is a mass 1 of seniors, the proportion of seniors working in country c is simply given by

$$n^c = F_c(w + \beta p - (1+\beta)\alpha p).$$

Since $F_c(.)$ is an increasing function, the fraction of seniors in the labor force is obviously increasing with the wage w and decreasing with the penalty on pension α. We can derive additional properties from this simple model :

1. For a given set of the parameters α, p and w, the resulting labor force participation rate in country c depends on the distribution of the disutility of labor $F_c(.)$.

2. The derivative of n^c with respect to α is

$$\frac{\partial n^c}{\partial \alpha} = -(1+\beta) p F_c'(.).$$

   Since $F_c'(.) \geq 0$, we get $\partial n^c / \partial \alpha \leq 0$. This implies that the stronger the incentive to retire early, the larger the proportion of seniors who stop working. Individuals responds to incentives unless

the density of variable δ_i is null. However, the size of the effect of α on n^c depends on the characteristics of the distribution function $F_c(.)$.

As a result, the effectiveness of early retirement incentives depends on the properties of the distribution function of the disutility of labor among workers.

4 Micro evidence

In this section, we test the conclusion from the individual part of the model : changes in monetary retirement incentives have an effect on individual decisions only if the disutility of labor is weak enough. We use the Health and Retirement Study which follows american seniors as long as possible, asking them about their expectations and actual situation.

4.1 Data and methodology

We made the most of the last waves of the Health and Retirement Study, a study led by the University of Michigan and supported by the National Institute on Aging and the Social Security Administration. People are surveyed on many issues every two years. The design of this study gives the opportunity to know the disutility of labor of an individual who is working and to observe her retirement decision two years later. We focus on individuals aged 50 years or older at the time of the first interview.

Disutility of labor In order to measure the disutility of labor, we analyze the answers to the following question : «*Do you strongly agree, agree, disagree or strongly disagree with that statement : I really enjoy going to work?*» . This question has been introduced in the questionnaires in 2000. We construct the scale of answers (from 1 to 4) such that it reflects increasing pleasure to work.

Retirement incentives Monetary incentives are approximated by the sum of the different future retirement incomes. People working are asked how much they expect to get from the different retirement plans they subscribed to (social security included) when they retire. Moreover, we know their yearly salary. Unfortunately they are not asked how much they would get if they retired two years later (that is the marginal income of working two extra years). However, this monetary incentive can give an idea of what a partial pension could be. The variable taken into account is then :

$$\mathbb{E}_t(R_i) = \frac{\text{expected yearly benefits}}{\text{yearly pay while working}}.$$

Non-monetary retirement incentives are measured using the expected time before getting all benefits (from social security and retirement plans).

Other variables As a control variables, we also include age, gender, race, education and wave fixed effects. We also control for occupation and industry in some specifications.

Methodology We want to estimate the effect of working conditions and retirement incentives on the probability to retire. Thus we estimate the following model :

$$\mathbb{P}(retired,\ t+2)_i = \alpha_1 + \alpha_2 X_{i,t} + \alpha_3 enjoy_{it} + \alpha_4 \mathbb{E}_t(R_i) + \alpha_5 \mathbb{E}_t(R_i) \text{ x } enjoy_{it} + \varepsilon_{it}, \qquad (1)$$

where $\mathbb{P}(retired,\ t+2)_i$ is the probability of individual i interviewed at time t to be retired at time $t+2$. The variable $enjoy_{it}$ is the disutility of labor of individual i at time t, whereas $\mathbb{E}_t(R_i)$ is her expected replacement rate. $\mathbb{E}_t(R_i)$ x $enjoy_{it}$ is the interaction term between working conditions and expected replacement rate. $X_{i,t}$ is a vector of control variables. ε_{it} is the error term.

4.2 Results

In table 2, the dependent variable equals 1 if the individual is retired at $t+2$, and 0 if not. The reported results are from ordinary least squares regressions, such that we can interpret the size of the coefficients. Estimated coefficients for the corresponding probit model are presented in table 8 in appendix. The significance of variables is similar in both models.

In odd-numbered columns of table 2, we estimate equation (1) without the interaction term $\mathbb{E}_t(R_i)$ x $enjoy_{it}$. In even-numbered columns, we estimate equation (1). In columns 3 to 8, we use occupation, industry and both occupation and occupation fixed effects as control variables.

The estimated coefficients presented in odd-numbered columns, i.e. without interaction term, show that the expected replacement rate alone has no effect on the retirement decision. The estimated coefficient of $\mathbb{E}_t(R_i)$ is positive but not significantly different from zero. However, the effect of the quality of working conditions is negative and significant at the 5% level. This means that enjoying going to work at time t decreases the probability to be retired at time $t+2$. In other terms, the more you enjoy your work, the more likely you are to stay at work. The estimated effect of the expected time before getting all benefits is negative and significant. The longer you have to wait before being entitled to full retirement benefits, the more likely you stay at work during the following two years. Comparing the size of the coefficients of the two significant explanatory variables, we note that increasing the pleasure to work of one unit is equivalent to receiving full benefits two years later in terms of retirement decision.

In even-numbered columns, i.e. when including the interaction term between the quality of work conditions and the expected replacement rate, all estimated coefficients are significantly different from zero. The coefficients of the expected time before full benefits and of the pleasure at work are still negative. So does the coefficient of the expected replacement rate. The coefficient of the interaction term is positive. Given that the overall effect of expected replacement rate is now given by $\alpha_4 + \alpha_5 enjoy_{it}$, the total effect of an increase in monetary retirement incentives on the probability to stay at work can be positive. For example, according to the results presented in column 2, the total effect of a one unit increase in expected replacement rate for in individual who strongly enjoy going to work equals $-0.001 + 0.0003 \text{ x } 4 = 0.0002 > 0$. In others terms, an increase in expected replacement rate increases the probability to be retired for individuals with good working conditions.

This conclusion confirms the fist result of the model : if an individual has low disutility of labor, then a decrease in her monetary retirement incentives can push her to stay at work.

Table 2: Individual relationship between the probability to retire, retirement incentives and the disutility at work.

The dependent variable equals 1 if respondent is retired at t+2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected replacement rate (A)	1.88e-06	-0.00110**	4.09e-06	-0.00100*	3.94e-06	-0.00129**	7.84e-06	-0.00133**
	(0.897)	(0.0382)	(0.788)	(0.0525)	(0.808)	(0.0174)	(0.653)	(0.0175)
Enjoy going to work (B)	-0.0399**	-0.0629***	-0.0389**	-0.0629***	-0.0511**	-0.0884***	-0.0519**	-0.0906***
	(0.0109)	(0.000974)	(0.0270)	(0.00375)	(0.0151)	(0.000848)	(0.0145)	(0.000786)
Interaction term (AxB)		0.000363**		0.000332*		0.000428**		0.000442**
		(0.0397)		(0.0535)		(0.0179)		(0.0177)
Expected time before full retirement	-0.0229***	-0.0233***	-0.0284***	-0.0288***	-0.0278***	-0.0280***	-0.0277***	-0.0282***
	(7.41e-09)	(3.77e-09)	(1.95e-09)	(1.30e-09)	(7.84e-07)	(6.04e-07)	(6.28e-07)	(4.29e-07)
Occupation fixed effects			Yes	Yes			Yes	Yes
Industry fixed effects					Yes	Yes	Yes	Yes
Observations	1240	1240	973	973	690	690	690	690
R-squared	0.103	0.107	0.108	0.112	0.124	0.132	0.133	0.142

Robust p values in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Alll columns include gender, age, education, race, wave fixed effects and a constant term
OLS regressions

5 Macro evidence

5.1 Data and methodology

This sub-section describes data used in the empirical macroeconomic section of this paper. We use data from several sources. Our sample includes 19 countries : Australia, Belgium, Canada, Finland, France, Germany, Ireland, Italy, Japan South Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States.

Senior activity rates Senior activity rates are taken from the OECD database. Data are available for males and females by age group from the mid-1980s onwards. We built two measures and selected data for males in age groups 55-59 and 60-64. In this part of the paper, we focus on senior male individuals for a very simple reason : data on retirement incentives are available only for male workers. However, this restriction offers the advantage to avoid all issues related to female employment. These questions are obviously beyond the scope of this paper.

Pension system Pension system generosity is measured using the implicit tax on continued work developed by Duval (2003). The average implicit tax on continued work is computed at a given age for a five year period. It takes into account expected pension wealth and both employers and employees rates of contribution to the pension system. In other terms, when the implicit tax on continued work increases, a worker has weaker incentives to continue working. For a detailed presentation of the methodology, see Duval (2003). In this paper, we use the measures for the 55-59 and 60-64 age groups. For each age group, the implicit tax is available with or without taking into account early retirement schemes. However, implicit tax including early retirement route is by construction less trustworthy since information about early retirement eligibility are hard to assemble. This is why we focused on the indicators without early retirement schemes.[3]

Working conditions We define the disutility to work modeled in this paper as a non-monetary payoff workers can get through their work. This concept covers the quality of relations at the workplace. We use ISSP surveys about work orientations to build measures of the quality of working conditions. This survey has been conducted in 1989, 1997 and 2005 in 30 countries. Among the broad set of questions asked to workers, we selected two questions that reflect the human dimension of working conditions, namely :

- *rel management* : "In general, how would you describe relations at your workplace between management and employees ?"
- *rel workmates* : In general, how would you describe relations at your workplace between workmates/colleagues ?

Answers to those questions are coded from 1 (very bad) to 5 (very good).

For each of these questions, we construct two basic indicators that may reflect some aspects of the distribution of working conditions at the country level. The simplest indicator is the average answer.

[3] Estimations involving implicit tax on continued work including early retirement route are available upon request.

The other one is the coefficient of variation, i.e. the ratio of standard deviation to mean for each variable. This is a broad measure for the dispersion of the variable.

Unfortunately, these questions are only asked to workers and since we are interested in working conditions perceived by all seniors, including those who are retired, the computed indicator may be biased upward if only seniors are selected. Hence, we used male workers aged between 35 and 54 as a proxy of the perception of working conditions at the country level. Figures 3 and 4, presented in appendix, plot the average values of *rel management* and *rel workmates* for seniors and prime-age male workers in 2005. The correlation is strong and positive. This shows a specificity of labor relations in each country. Furthermore, the average answer of seniors mainly above the 45 degrees line, which confirms the expected bias.

In panel data estimations, we assign working conditions for missing years using the following simple method : for years 1980-1989, we use the 1989 working conditions measure if available, for years 1990-1996 the 1997 measure and for years 1998 onwards the 2005 measure. If a country has been surveyed only once or twice, we replicate this method, but using only available data.

Control variables Panel data regressions include wealth and economic activity indicators as control variables. Wealth is measured using the (log of) real GDP per capita provided by the Penn World Table. We take the OECD male unemployment rate as a proxy for economic activity at the country level. We also use the standard retirement age provided by Duval (2003).

5.2 Results

This sub-section presents empirical evidence. We first show that working conditions explain some of cross country differences in senior activity rates. Then, we use panel data estimates to show that senior activity rate does react stronger to changes in incentives in countries with better and more homogeneously distributed labor relations.

5.2.1 Cross country evidence

We pooled all available observations in order to investigate the cross-country relationship between working conditions and senior activity rates. Table 3 presents the estimated coefficients for different specifications. The activity rate of age group 55-59 is the dependent variable in the upper part of the table, whereas the activity rate of age group 60-64 is the dependent variable in the bottom part.

In column 1, we merely regress senior males activity rate on average relation between management and employees. The estimated coefficient is positive and significant at the 10% level. In column 2, we include a dummy variable for European countries to ensure that this relationship is not driven only by the opposition between Europe and the rest of the world. Indeed, Alesina et al. (2001) pointed out the specificity of the European welfare states that could explain at port of the differences in senior activity rates. The estimated coefficient on *rel management* increases and becomes significant at the 5% level. The dummy variable for European countries is negative and significant. This implies that senior labor force participation rates are weaker in Europe than in the rest of the world. In column 3, we control by the implicit tax on continued work for age group 55-59 : this variable is not significant whereas the quality of the relations between management and employees remains significant at the 5%

Table 3: Relationship between senior activity rate and the quality of labor relations, pooled cross sections for 1989, 1997 and 2004.

Dependent variable is activity rate for reported age group

	Age group 55-59							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
rel management	17.94*	20.50**	20.48**	14,82				
	(9,099)	(7,762)	(7,646)	(10,87)				
rel workmates					16,63	26.35***	27.51***	20.92*
					(11,08)	(9,311)	(9,004)	(11,41)
Europe		-7.447**	-7.737**	-6.978**		-9.694***	-10.35***	-9.124***
		(2,93)	(3,009)	(3,091)		(3,01)	(3,006)	(3,096)
Implicit tax			0,0506	0,0432			0,0885	0,0731
			(0,112)	(0,108)			(0,103)	(0,105)
Real GDP per capita				4,03				1,516
				(5,919)				(4,677)
Standard retirement age				1,138				1,058
				(0,882)				(0,737)
Constant	8,373	4,921	4,301	-89,18	6,865	-25,35	-31,25	-88,27
	(34,43)	(29,91)	(28,75)	(58,69)	(45,99)	(38,32)	(36,79)	(54,67)
Observations	37	37	37	37	37	37	37	37
R-squared	0,124	0,261	0,267	0,318	0,091	0,296	0,317	0,347
	Age group 60-64							
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
rel management	33.19**	38.68***	23,79	16,11				
	(15,78)	(12,42)	(14,31)	(15,25)				
rel workmates					31.56*	52.05***	34.43**	25,57
					(17,5)	(14,38)	(15,68)	(15,92)
Europe		-15.90***	-12.32**	-11.93**		-20.43***	-15.89***	-14.85***
		(4,458)	(5,268)	(4,949)		(4,927)	(5,735)	(5,286)
Implicit tax			-0.221***	-0.167*			-0.183**	-0,132
			(0,0726)	(0,0965)			(0,0792)	(0,109)
Real GDP per capita				3,681				0,294
				(9,563)				(9,028)
Standard retirement age				2,29				2,406
				(1,976)				(1,894)
Constant	-80	-87.36*	-25,59	-184,2	-86,02	-153.9**	-77,4	-201,7
	(58,98)	(45,92)	(53,55)	(113,9)	(72,18)	(57,89)	(64,02)	(119,5)
Observations	37	37	37	37	37	37	37	37
R-squared	0,154	0,345	0,445	0,486	0,123	0,403	0,463	0,501

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses
OLS regressions with time fixed effects
Implicit tax is defined for reported age group

level and has the same order of magnitude as in former specifications. In column 4, we add real GDP per capita and standard retirement age as additional control variable, which lowers the significance of the coefficient on *rel management*. In columns 5 to 8 we repeat the same exercise with the other measure of working conditions. The effect of *rel workmates* is robust to the introduction of standard retirement age.

As shown in the bottom part of the table, the results are very similar when using data for age group 60-64. When significant, the coefficient of the implicit tax variable is negative. This result is consistent with our prediction that controlling for working conditions, generosity of the pension system has a negative impact on senior activity rate.

Figure 2 shows the positive relationship between labor force participation rate of seniors aged 60-64 and the variable *rel management* in 2005. In line with estimations made here, working conditions explain a substantial part of differences in senior activity rate across countries. Figures 5, 6 and 7 in appendix describe the same relationship for age group 55-59 and for the variable *rel workmates*.

These results show that, in a cross section of countries, better working conditions, represented by labor relations, are associated with stronger labor force participation rate of senior males, which is consistent with our model.

Figure 2: Activity rate of age group 60-64 and relations between management and employees in 2005.

ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Table 4: Relationship between senior activity rate and implicit tax on continued work, panel data 1980-2004.

Dependent variable is activity rate for reported age group

	Age group 55-59			Age group 60-64		
	(1)	(2)	(3)	(4)	(5)	(6)
Implicit tax	-0,00338	0,00167	-0,0116	-0.0698**	-0.0668**	-0,0312
	(0,0132)	(0,0146)	(0,0118)	(0,033)	(0,0293)	(0,0261)
Unemployment rate	-0.00586***	0,000862	-0,000252	-0.0229***	-0.0137***	-0.0125***
	(0,00126)	(0,00175)	(0,00174)	(0,00305)	(0,00454)	(0,00421)
Real GDP per capita	-0.105***	0.112*	0,0326	-0.279***	0,0641	0,165
	(0,0214)	(0,0665)	(0,0632)	(0,0566)	(0,154)	(0,149)
Standard retirement age			-0.0225***			0.0497**
			(0,00834)			(0,0194)
Constant	5.433***	3.281***	5.548***	6.942***	3.514**	-0,766
	(0,214)	(0,68)	(0,95)	(0,57)	(1,544)	(2,051)
Time fixed effects	-	Yes	Yes	-	Yes	Yes
Observations	272	272	272	277	277	277
Number of countries	18	18	18	19	19	19
R-squared (within)	0,14	0,372	0,447	0,247	0,396	0,443

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses
OLS regressions with country fixed effects
Implicit tax is defined for reported age group

5.2.2 Panel data evidence

In this sub-section, we test the conclusion of the aggregate part of the model presented above : at the aggregate level, the effect of a change in retirement incentives on senior activity rate depends on the characteristics of the distribution function of working conditions. From now on, senior activity rates and implicit taxes are always taken in log. Thus, estimated coefficients reflect elasticities of labor market participation to retirement incentives.

Benchmark estimations We first estimate the average effect of the implicit taxes on senior activity rate. Table 4 displays estimated coefficients. The model estimated in this table is a standard within OLS regression with country fixed effects.

When significant, the estimated effect of the implicit tax on continued work on senior activity rate is negative. However, the coefficient is never significant for age group 55-59.[4] This suggest that this variable has no effect on activity rate for this group. For age group 60-64, the estimated effect equals $-0,07$. However, it is null when including the standard retirement age.

It is clear that wealth, measured as the real GDP per capita, and economic activity, measured as male unemployment rate, both have a negative effect on labor force participation rate of seniors. The effect of wealth on the dependent variable suggests that non-participation to the labor market increases as the economy grows. However, when including time fixed effect in order to control for the evolution of senior activity rate common to all countries, the effect of real GDP per capita vanishes. This suggests that labor force participation rate of seniors depends more on broad global economic developments than on specific national wealth effects. The estimated effect of standard retirement age is negative in the case of age group 55-59 and positive for age group 60-64, which is puzzling but behind the scope of this paper.

[4] Note that there are only 18 countries in estimations for age group 55-59. Indeed, implicit tax data for this age group are missing for this France. However, data on implicit tax including early retirement route are available. Results of estimations using these data and including France are available upon request and confirm the results presented here.

Interaction between implicit tax and average working conditions We now allow the effect of implicit tax on continued work to vary with the distribution of working conditions. Hence, the estimated equation is now :

$$n_{it} = \delta_1 T_{it} + \delta_2 W_i T_{it} + \delta_3 X_{it} + C_i + \delta_4 + \varepsilon_{it}, \tag{2}$$

where n_{it} denotes labor force participation rate of senior males in country i at time t, T_{it} the implicit tax on continued work, W_{it} working conditions and X_{it} a vector of control variables (wealth, unemployment and standard retirement age). The variable C_i is the country fixed effect, δ the constant and e_{it} the error term. More complete specifications include year fixed effects Y_t not reported in equation (2). Thus, the estimated elasticity may now vary with working conditions :

$$\frac{\partial n_i}{\partial T_i} = \hat{\delta_1} + \hat{\delta_2} W_i.$$

Table 5 presents the estimated coefficients of equation (2). The measure of working conditions is the average value of each variable at the country level. In the case of age group 55-59, the interaction term is always negative and significant, even when adding time fixed effects and standard retirement age as control variables. This implies that countries with average better working conditions react stronger to changes in incentives than others. The two bottom line of the table present the values of elasticities for the countries with lower and higher working conditions. The previously null estimated effect ranges in fact from 0 to -0.03.

The bottom part of table 5 presents the estimated coefficients in the case of age group 60-64. In columns 10 to 12, the interaction variable is the quality of relations between management and employees. In this case, the interaction term is not significant. However, it is significant and negative in the left part of the table, i.e. when the quality of relation between workmates is used as interaction variable. In the most demanding specification, the estimated effect ranges from -0.01 to $-0,07$.

These results imply first that labor participation rate of senior reacts stronger to changes in retirement incentives in countries with better average working conditions ; but also that the situation is different for different age groups. In the case of "young" seniors, i.e. for age group 55-59, both the quality of the relation with employers and between workmates matters. However the effect of retirement incentives on the retirement decision is weak. On the contrary, for "old" seniors, i.e. for age group 60-64, only the quality of the relations between workmates plays a role. This shows a strong conditional effect to retirement incentives.

Interaction between implicit tax and the dispersion of working conditions We will now use the coefficient of variation of working conditions at the country level as an alternative characteristic of the distribution of the quality of labor relations. Table 6 presents the estimated coefficients.

For age group 55-59, the interaction term between implicit tax and the coefficient of variation, is positive and significant in all specifications. The coefficient is positive, which suggests that countries with more a more homogeneous distribution of working conditions, i.e. a weaker coefficient of variation, react stronger to changes in incentives than countries with higher dispersion of working conditions. In the two bottom lines, the reading order is opposite to the one in former tables. The maximum

Table 5: Relationship between senior activity rate and implicit tax on continued work interacted with average labor relations, panel data 1980-2004.

Dependent variable is activity rate for reported age group

	Age group 55-59					
	rel workmates			rel management		
	(1)	(2)	(3)	(4)	(5)	(6)
Implicit tax	0.263***	0.221***	0.147**	0.218***	0.202***	0.135**
	(0,0719)	(0,077)	(0,0655)	(0,0716)	(0,0765)	(0,0652)
Interaction term	-0.0649***	-0.0537***	-0.0384**	-0.0589***	-0.0534***	-0.0387**
	(0,0166)	(0,0176)	(0,0151)	(0,0177)	(0,0187)	(0,0161)
Unemployment rate	-0.00553***	0,000858	-0,000136	-0.00601***	0,000326	-0,000523
	(0,0012)	(0,00166)	(0,00169)	(0,00125)	(0,00169)	(0,00171)
Real GDP per capita	-0.107***	0,0917	0,0266	-0.108***	0,0866	0,0226
	(0,0203)	(0,0566)	(0,0571)	(0,0208)	(0,0587)	(0,0589)
Standard retirement age			-0.0201**			-0.0201**
			(0,00801)			(0,00797)
Constant	5.454***	3.488***	5.455***	5.471***	3.541***	5.497***
	(0,203)	(0,58)	(0,892)	(0,209)	(0,599)	(0,903)
Time fixed effects	-	Yes	Yes	-	Yes	Yes
Minimun effect	0,01	0,01	0	0,01	0,01	0
Maximum effect	-0,03	-0,02	-0,03	-0,03	-0,03	-0,03
Observations	272	272	272	272	272	272
Number of countries	18	18	18	18	18	18
R-squared (within)	0,193	0,407	0,464	0,184	0,407	0,464

	Age group 60-64					
	rel workmates			rel management		
	(7)	(8)	(9)	(10)	(11)	(12)
Implicit tax	0.234*	0,135	0.288**	-0,0557	-0,142	0,042
	(0,123)	(0,132)	(0,136)	(0,133)	(0,14)	(0,128)
Interaction term	-0.0744**	-0,0496	-0.0776**	-0,00378	0,0202	-0,0194
	(0,0313)	(0,0326)	(0,0322)	(0,036)	(0,0373)	(0,0332)
Unemployment rate	-0.0222***	-0.0133***	-0.0118***	-0.0229***	-0.0136***	-0.0125***
	(0,00295)	(0,00451)	(0,00417)	(0,00305)	(0,00456)	(0,00421)
Real GDP per capita	-0.277***	0,0543	0,157	-0.279***	0,0657	0,167
	(0,0554)	(0,149)	(0,139)	(0,057)	(0,156)	(0,148)
Standard retirement age			0.0534***			0.0512***
			(0,0187)			(0,0191)
Constant	6.923***	3.615**	-0,928	6.941***	3.495**	-0,881
	(0,562)	(1,492)	(1,958)	(0,573)	(1,563)	(2,022)
Time fixed effects	-	Yes	Yes	-	Yes	Yes
Minimun effect	-0,06	-	-0,01	-	-	-
Maximum effect	-0,11	-	-0,07	-	-	-
Observations	277	277	277	277	277	277
Number of countries	19	19	19	19	19	19
R-squared (within)	0,256	0,4	0,453	0,247	0,397	0,443

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses
OLS regressions with country fixed effects
Implicit tax is defined for reported age group

Table 6: Relationship between senior activity rate and implicit tax on continued work interacted with the dispersion of labor relations, panel data 1980-2004.

Dependent variable is activity rate for reported age group

	Age group 55-59					
	rel workmates			rel management		
	(1)	(2)	(3)	(4)	(5)	(6)
Implicit tax	-0.0477***	-0.0404**	-0.0399***	-0.0484***	-0.0526***	-0.0510***
	(0,0157)	(0,0155)	(0,0129)	(0,0183)	(0,0162)	(0,0136)
Interaction term	0.309***	0.291***	0.218***	0.198***	0.241***	0.189***
	(0,0795)	(0,0791)	(0,0622)	(0,0659)	(0,0584)	(0,0463)
Unemployment rate	-0.00486***	0,00203	0,000877	-0.00547***	0,00217	0,00104
	(0,00113)	(0,00159)	(0,00165)	(0,00116)	(0,00157)	(0,00164)
Real GDP per capita	-0.0972***	0.132**	0,0662	-0.0979***	0.153**	0,0832
	(0,0196)	(0,0588)	(0,0591)	(0,0203)	(0,0605)	(0,0608)
Standard retirement age			-0.0173**			-0.0172**
			(0,00775)			(0,00771)
Constant	5.358***	3.088***	4.876***	5.364***	2.885***	4.705***
	(0,197)	(0,6)	(0,896)	(0,205)	(0,616)	(0,917)
Time fixed effects	-	Yes	Yes	-	Yes	Yes
Minimun effect	-0,03	-0,03	-0,03	-0,02	-0,02	-0,02
Maximum effect	0,01	0,02	0	0,02	0,02	0
Observations	272	272	272	272	272	272
Number of countries	18	18	18	18	18	18
R-squared (within)	0,223	0,442	0,482	0,195	0,451	0,491

	Age group 60-64					
	rel workmates			rel management		
	(7)	(8)	(9)	(10)	(11)	(12)
Implicit tax	-0.0919**	-0.0819**	-0.0664**	-0,0294	-0,0247	-0,0261
	(0,0418)	(0,0364)	(0,0303)	(0,0464)	(0,0439)	(0,0393)
Interaction term	0,159	0,109	0.288*	-0,159	-0,167	-0,0229
	(0,118)	(0,126)	(0,146)	(0,116)	(0,127)	(0,114)
Unemployment rate	-0.0221***	-0.0128***	-0.0101**	-0.0231***	-0.0148***	-0.0127***
	(0,00299)	(0,00457)	(0,00429)	(0,00311)	(0,00476)	(0,0044)
Real GDP per capita	-0.269***	0,0791	0,219	-0.290***	0,0142	0,156
	(0,0573)	(0,154)	(0,148)	(0,0593)	(0,157)	(0,149)
Standard retirement age			0.0565***			0.0488***
			(0,0189)			(0,0187)
Constant	6.845***	3.365**	-1,752	7.042***	3.989**	-0,624
	(0,576)	(1,542)	(2,06)	(0,592)	(1,565)	(1,982)
Time fixed effects	-	Yes	Yes	-	Yes	Yes
Minimun effect	-	-	-0,04	-	-	-
Maximum effect	-	-	-0,01	-	-	-
Observations	277	277	277	277	277	277
Number of countries	19	19	19	19	19	19
R-squared (within)	0,25	0,398	0,453	0,253	0,403	0,443

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses
OLS regressions with country fixed effects
Implicit tax is defined for reported age group

(minimum) effect is the elasticity associated with the country with the higher (lower) dispersion of working conditions. Whereas some specification leads to a puzzling positive maximum effect, the most demanding specification furnishes a reassuring null maximum effect. Thus, the estimated effect ranges from 0 to -0.02 or -0.03. These estimations are very similar to the former.

Results for age group 60-64 are presented in the bottom part of the table. They mirror those found in table 5. Indeed, we find no effect of the interaction with the dispersion of the relations with employers. On the contrary, relation with workmates play once again a role in the reaction of activity rate to changes in retirement in the implicit tax on continued work.

Intuitively, this may be explained by the fact that in a country where people are similar in their disutility to work, more people will react to small changes (unless we are situated in the queue of the distribution).

These results suggest that labor participation rate of seniors react stronger to changes in retirement incentives in countries with more homogeneously distributed labor relations.

6 Conclusion

In this paper, we tried to identify one of the causes of different reactions of the senior populations to monetary incentives between countries. By a very simple model we first showed that one of the determinants of how seniors react to policies is their disutility at work. We tested this hypothesis by using both individual and aggregate panel data.

We used the Health and Retirement Study to show that monetary incentives have an effect on the individual retirement decision only if the agent's disutility at work is weak enough.

We then used panel data from OCDE and opinions about working conditions from ISSP in nineteen countries to investigate the interplay between working conditions and retirement incentives at the aggregate level. We found that if the average opinion about labor relations is high in a country, then senior employment will be more sensitive to changes in retirement incentives policy. We have also shown that reactions to policies are stronger when opinions are homogeneous.

To sum up, this paper stressed the key role of the quality of work conditions in the trade-off between work and retirement. Our results imply that changes in retirement incentives are a necessary condition to foster senior activity rate, but surely not a sufficient condition. A policy that would only focus on financial incentives would miss one of its goal and would not have any effect on seniors' activity if the later suffer from a large disutility of labor.

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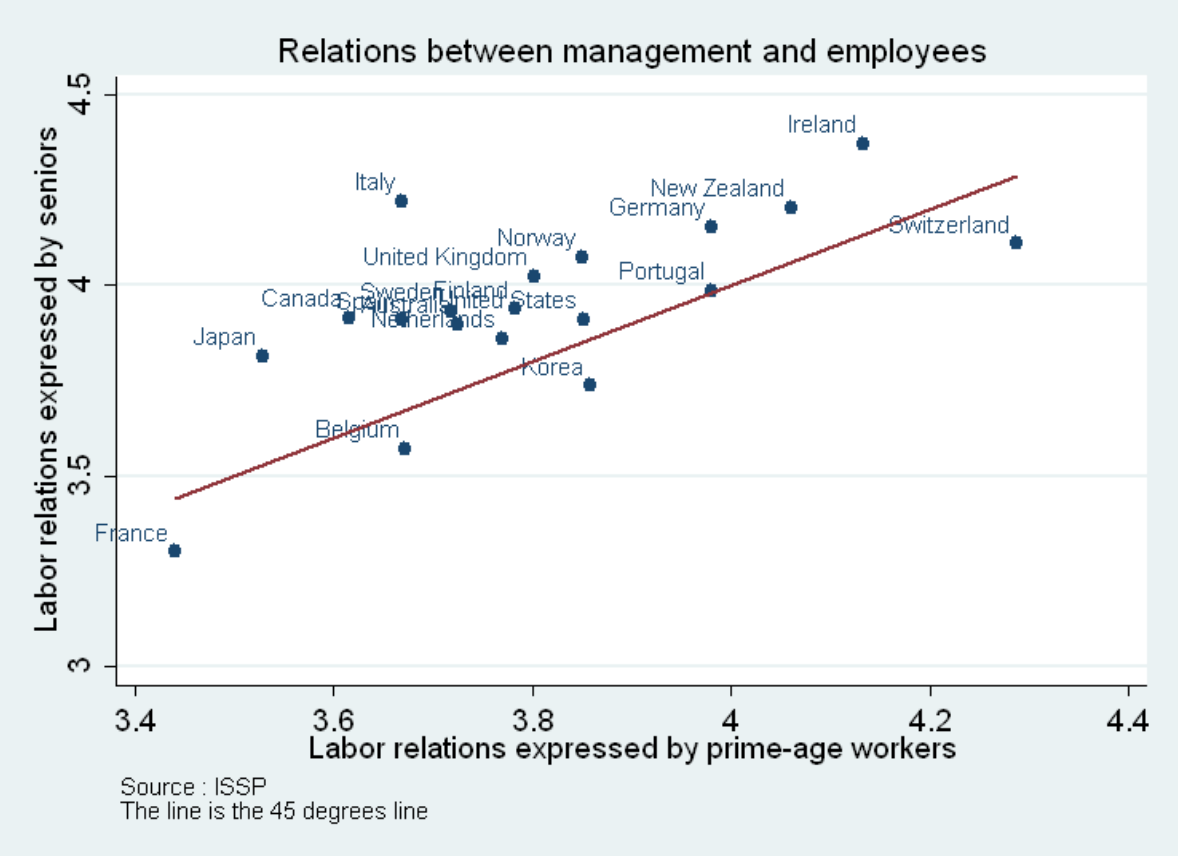
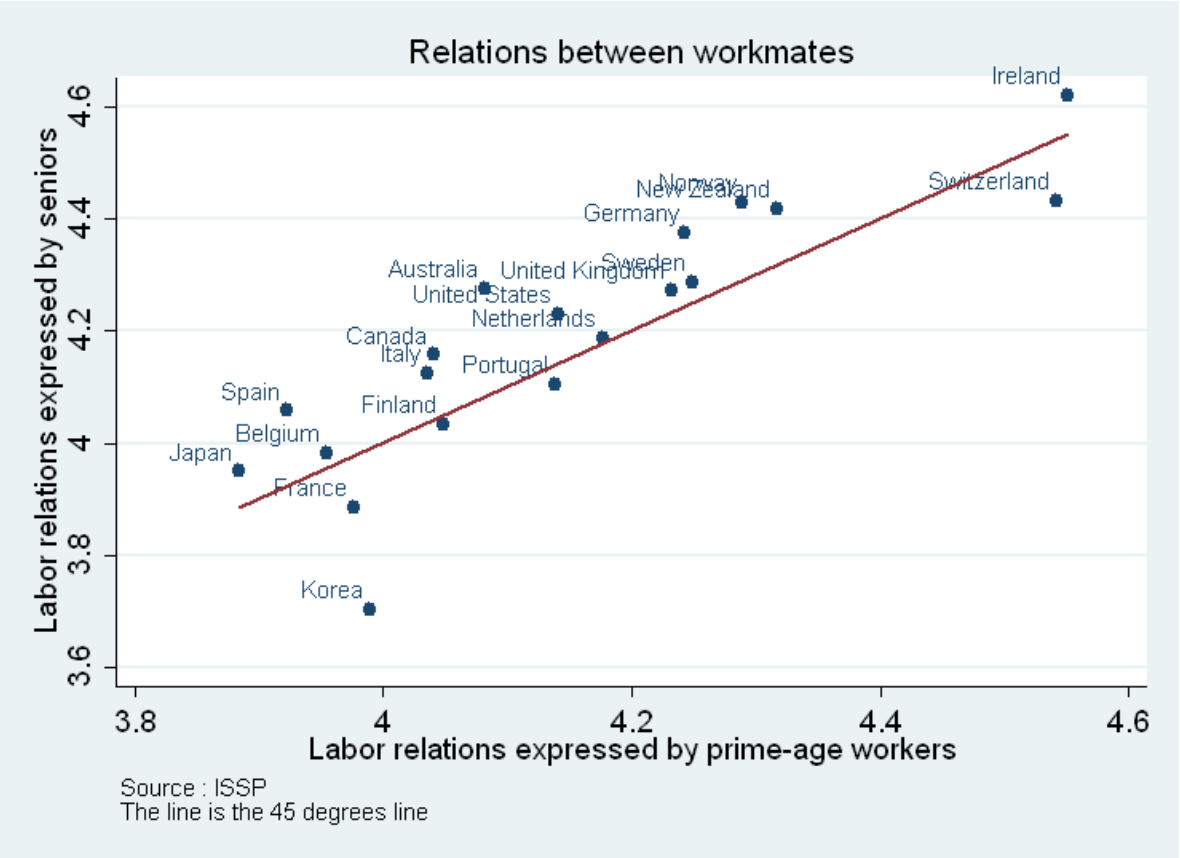
Appendix

Figure 3: Relations between management and employees expressed by seniors and prime-age workers in 2005.



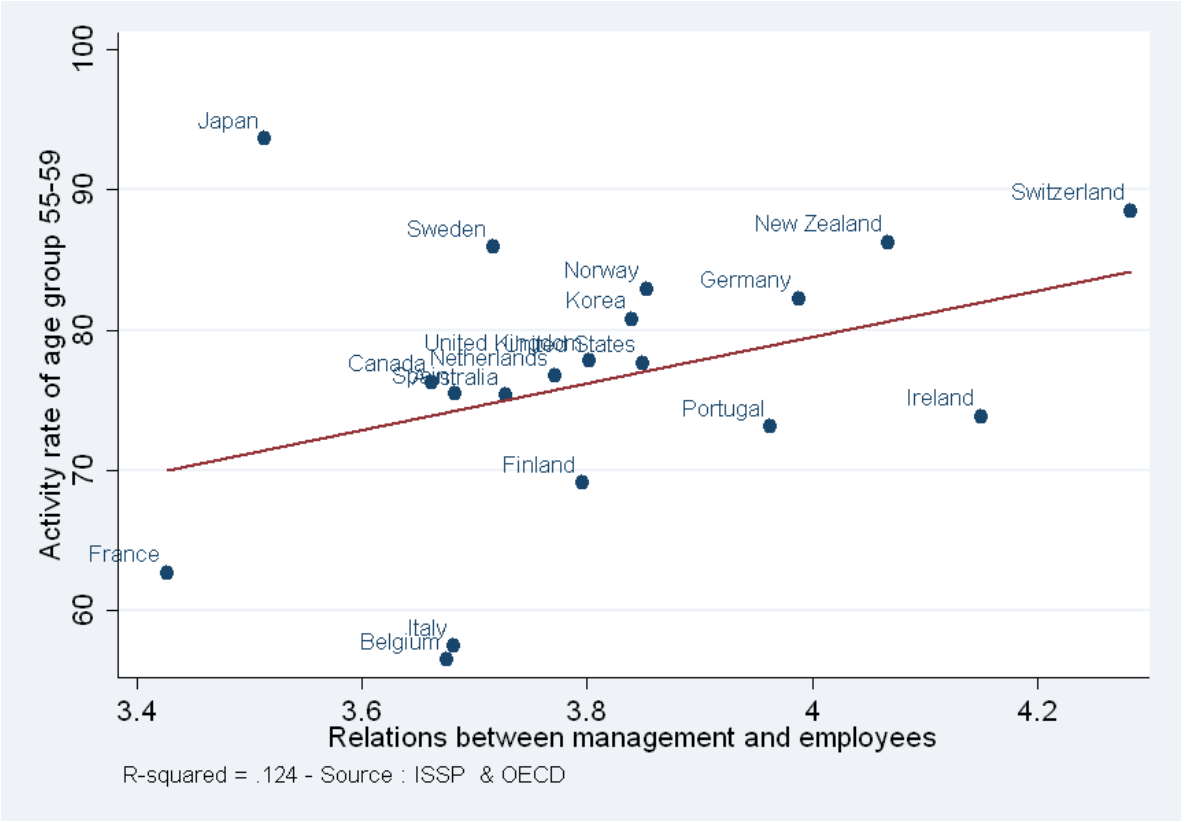
ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Figure 4: Relations between workmates expressed by seniors and prime-age workers in 2005.



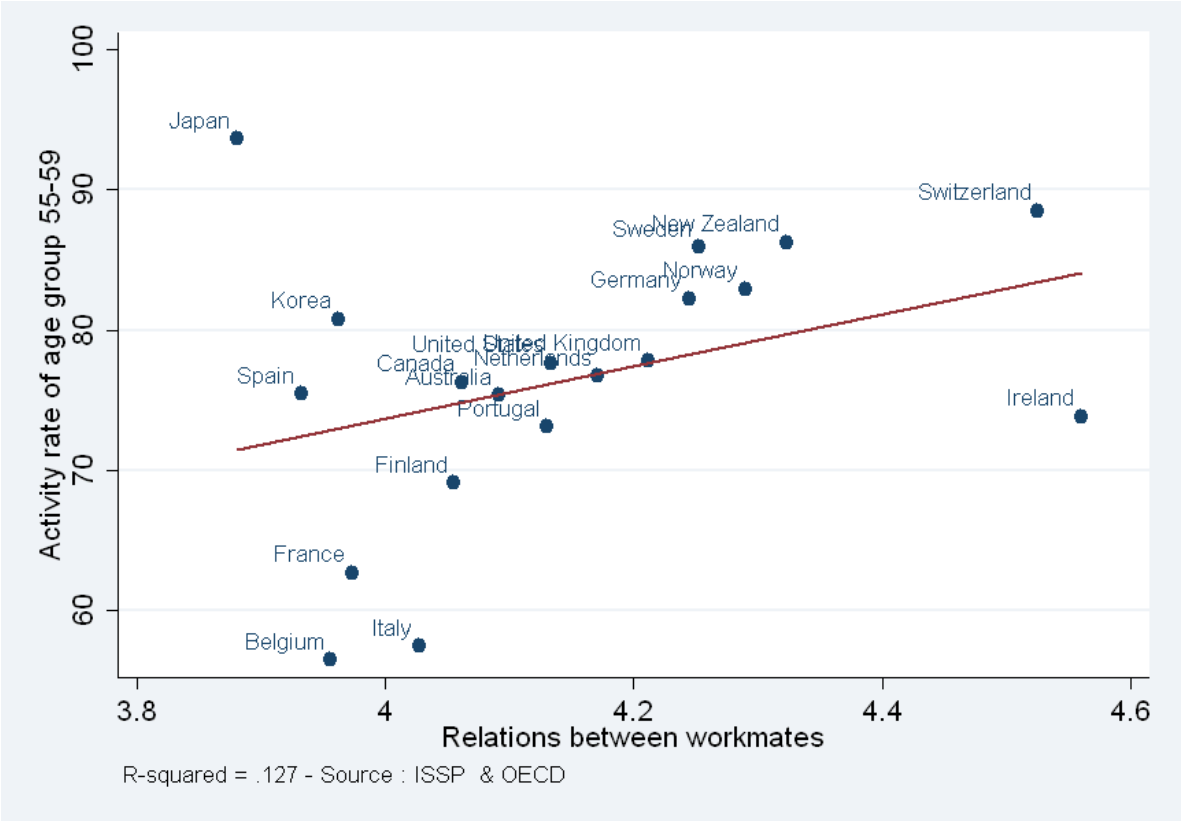
ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Figure 5: Activity rate of age group 55-59 and relations between management and employees in 2005.



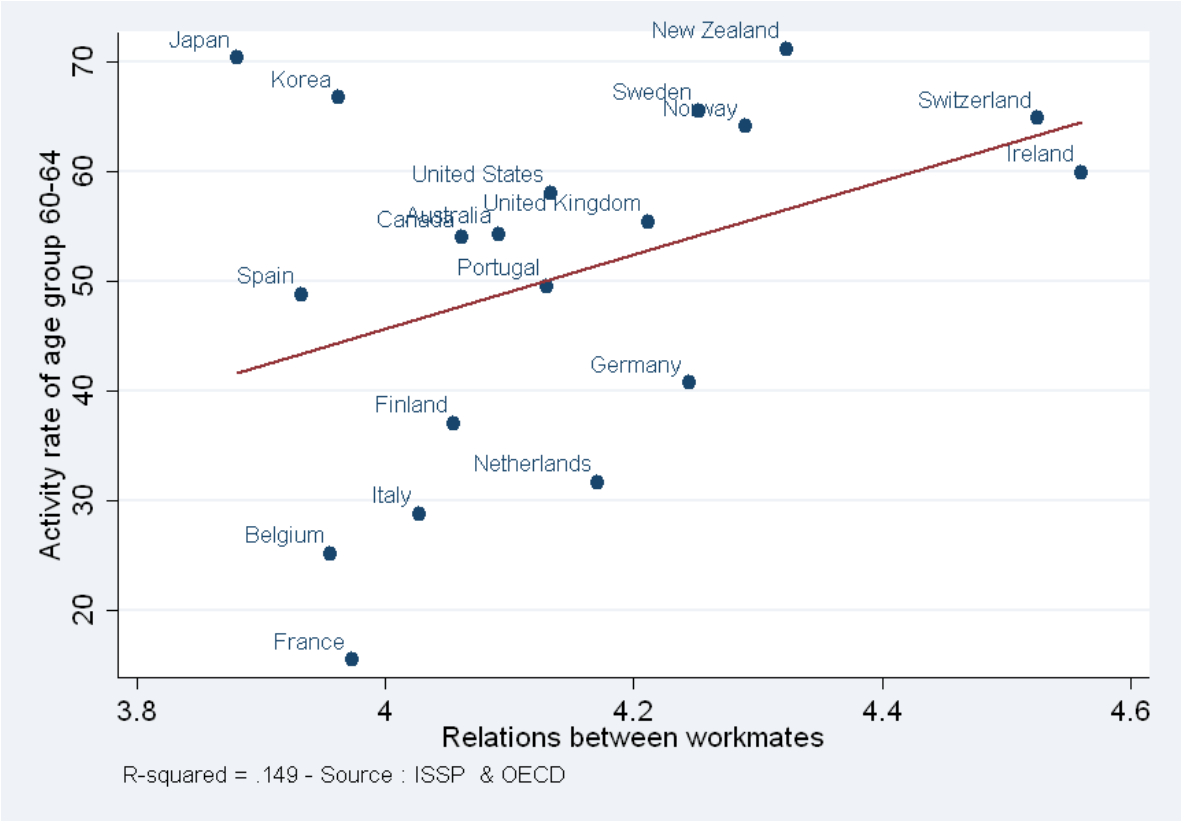
ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Figure 6: Activity rate of age group 55-59 and relations between workmates in 2005.



ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Figure 7: Activity rate of age group 60-64 and relations between workmates in 2005.



ISSP Work Orientation 2005 for all countries except Italy (1997) and Netherlands (1997).

Table 7: Senior activity rates and retirement incentives in 1980, 1990 and 2000.

			Age group 55-59		Age group 60-64	
		Standard retirement age	Implicit tax on continued work	Activity rate	Implicit tax on continued work	Activity rate
Australia	1980	65	0,51	82,62	1,02	51,51
	1990	65	0,46	75,02	0,92	50,65
	2000	65	0,36	72,41	0,73	46,56
Belgium	1980					
	1990			50,21		19,32
	2000	65	8,26	53,79	46,92	18,76
Canada	1980	65	2,58	82,86	4,62	63,93
	1990	65	2,09	76,13	11,47	50,88
	2000	65	4,24	72,54	12,96	45,80
Finland	1980	65	16,43	67,83	16,65	42,53
	1990	65	17,45	63,41	25,23	29,91
	2000	65	12,61	65,96	22,17	28,35
France	1980	65	8,98	80,99	18,20	47,87
	1990	60		67,70	82,77	22,80
	2000	60		65,79	82,56	15,50
Germany	1980	65	9,63	81,86	26,69	44,29
	1990	65	9,18	82,47	25,89	35,91
	2000	65	9,63	76,09	24,29	30,22
Ireland	1980	66	11,54		11,74	
	1990	66	17,42		17,60	
	2000	66	16,37	73,93	16,60	53,71
Italy	1980	60	64,49		90,37	39,60
	1990	60	68,95	68,75	98,62	36,00
	2000	65	45,99	53,87	105,09	31,38
Japan	1980			91,20		77,84
	1990			92,06		72,90
	2000	65	6,62	94,17	39,67	72,58
Korea	1980			80,00		
	1990			83,59	3,62	67,16
	2000			77,95	2,52	63,60
Netherlands	1980	65	4,23	74,75	59,53	48,83
	1990	65	7,14	66,30	86,80	22,67
	2000	65	13,40	70,25	93,75	27,22
New Zealand	1980	60	1,23		0,00	
	1990	60,25	1,15	78,60	28,37	34,99
	2000	64	0,72	82,03	5,99	60,11
Norway	1980	67	12,65	85,00	9,18	73,39
	1990	67	17,60	82,02	15,52	64,21
	2000	67	15,26	84,80	14,33	60,64
Portugal	1980	65	11,22	81,09	12,40	66,23
	1990	65	10,42	75,01	15,49	56,73
	2000	65	3,29	73,13	17,10	55,38
Spain	1980	65	30,11	84,85	18,34	63,91
	1990	65	28,06	76,67	12,26	46,88
	2000	65	22,47	75,72	21,69	43,28
Sweden	1980	65	5,67	87,60	0,00	68,83
	1990	65	18,03	87,38	0,00	63,59
	2000	65	18,47	84,88	0,00	56,68
Switzerland	1980					
	1990	65	19,16		18,56	
	2000	65	18,19	91,51	22,82	64,12
United Kingdom	1980	65	5,82		6,95	
	1990	65	5,67	81,40	6,24	54,37
	2000	65	7,43	74,79	8,20	50,25
United States	1980	65	4,37	81,74	6,70	60,80
	1990	65	5,02	79,89	6,52	55,51
	2000	65	4,65	77,05	5,40	54,95

Implicit taxes and activity rates are in percentage

Table 8: Individual relationship between the probability to retire, retirement incentives and the disutility at work, probit model.

The dependent variable equals 1 if respondent is retired at t+2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Expected replacement rate (A)	5.51e-05	-0.00534**	5.10e-05	-0.00497**	6.51e-05	-0.00609***	9.07e-05	-0.00673***
	(0.545)	(0.0129)	(0.562)	(0.0246)	(0.469)	(0.00669)	(0.308)	(0.00583)
Enjoy going to work (B)	-0.171**	-0.287***	-0.179**	-0.296***	-0.253**	-0.433***	-0.262**	-0.457***
	(0.0315)	(0.00216)	(0.0325)	(0.00334)	(0.0123)	(0.000638)	(0.0103)	(0.000464)
Interaction term (AxB)		0.00177**		0.00165**		0.00203***		0.00225***
		(0.0124)		(0.0243)		(0.00656)		(0.00554)
Expected time before full retirement	-0.203***	-0.204***	-0.198***	-0.201***	-0.222***	-0.224***	-0.232***	-0.237***
	(1.47e-08)	(1.50e-08)	(8.31e-07)	(7.28e-07)	(1.78e-06)	(2.64e-06)	(6.42e-07)	(5.88e-07)
Occupation fixed effects			Yes	Yes			Yes	Yes
Industry fixed effects					Yes	Yes	Yes	Yes
Observations	1240	1240	972	972	690	690	690	690
Pseudo R-squared	0.166	0.172	0.156	0.161	0.188	0.198	0.204	0.215

Robust p values in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Alll columns include gender, age, education, race, wave fixed effects and a constant term
Probit model estimations