Occupational Pension Coverage in The European Union. An Empirical Analysis.

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Abstract

In this paper we use European Community Household Panel (ECHP) data to analyze the determinants of occupational pension coverage outcomes in Denmark, Ireland, the Netherlands, Spain and the United Kingdom. Pension coverage is modelled as a binary outcome explained by a vector of personal, job and …rm speci…c characteristics. The potential endogeneity of current wage earnings, included in this vector, is ultimately faced within a simultaneous equation framework for limited dependent variables originally proposed by Nelson and Olson (1978). The evidence provided answers to a well recognized demand of pension coverage empirical information for policy purposes, both at national and at European Union (EU) level.

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Non Technical Summary

The literature focusing on explanation of pension coverage outcomes is concentrated in the US. To our knowledge, no empirical study has focused on the empirical determinants of occupational pension coverage in EU countries, while the existing empirical evidence, available only for Ireland and for the United Kingdom, has been produced addressing some related issues. Such a lack of empirical evidence represents the main motivation of this paper. In particular, we propose a comparative empirical analysis of occupational pension coverage in a representative sample of EU countries aiming to explain their actual and prospective pension coverage outcomes in the lights of country speci…c labor market structures and of national as well as EU pension regulatory frameworks. Occupational pension plans can be de…ned as any collective arrangement set up to provide employed or self-employed individuals with pension bene…ts supplementary to those o¤ered by statutory pension schemes. The provision of occupational pension plans is heterogeneous within and between the EU countries under study: Denmark, Ireland, the Netherlands, Spain and the United Kingdom. Pension coverage outcomes arise from matching employers' supply and workers' demand for pensions, as well as from institutional constraints. In particular country speci…c pension regulation play a prominent role in de…ning the actual pension coverage rate. In the EU area, additional regulatory constraints are imposed by the EU directives aiming to provide a minimum common institutional set-up for pension provision. Beyond these institutional factors, a number of behavioral explanations have been proposed in the pension literature to explain the economic functions of employer provided pension plans giving particular emphasis either to the demand (why workers want pensions?) or to the supply side (why employers of the pension market?) of the pension market. Demand side theories aim to o¤er a rational for occupational pension plan provision focusing on employees' preferences while accounting for plans' institutional features. Alternatively, a supply-side approach emphasizes the economic incentives provided by pensions, viewing the latters as …rms' tools to regulate workers' e¤ort on the job as well as workers' quality and turnover/retirement ‡ows. In this paper pension coverage is modelled as a binary outcome explained by a vector of personal, job and …rm speci…c characteristics. The potential endogeneity of current wage earnings, included in this vector, is ultimately faced within a simultaneous equation framework for limited dependent variables originally proposed by Nelson and Olson (1978). The empirical evidence obtained provides some elements for a better understanding of pension coverage outcomes and for a preliminary analysis of pension

coverage prospects in the countries under study. The latter analysis is particularly useful for countries such as Ireland, Spain and the United Kingdom, where the need for extending supplementary pension coverage is particularly strong in view of the downsizing prospects of their public pension systems. The empirical …ndings suggest that structural changes in the labor market in these countries will continue to generate pressures on occupational pension scheme coverage. Longer term labor market trends, such as the structural employment shift from industry to services, the expansion of part time employment and the increase labor force participation mobility will exert downward pressure on occupational pension plan coverage. At the same time, current labor market trends that operate to reduce the incidence of stable, high productivity, long-tenured jobs will further work to reduce employer provided pensions coverage. One possible measure to encourage the growth of pension coverage is to favour the development of personal pensions, although this solution cannot guarantee an adequate retirement income if pension contributions are completely left to the individual choice. Our empirical results give also some indications on the e¤ectiveness of the EU directives aiming to guarantee equality of pension treatment for part time and full time employees as well as for men and women. Notwithstanding the usefulness and novelty of the empirical evidence reported in this paper for purposes of pension policy, the reduced form nature of our results should be also kept in mind. Further research and more detailed pension coverage data is required to disentangle the structural determinants of the employer's pension o¤er and on the employee's pension participation decision, viewed as the main determinants of the pension coverage outcome, as well as to assess the e¤ect of the enactment of speci…c pension regulatory requirements on pension coverage outcomes.

1 Introduction

A number of behavioral arguments have been proposed in the pension economics literature to explain occupational pension coverage outcomes, emphasizing either a demand or a supply side perspective. Demand side theories aim to o¤er a rational for employer's pension plan provision focusing on employees' preferences but including the institutional features typical of employer provided plans. On the other hand, a supply-side perspective focuses on productivity enhancing pension incentives. Empirical studies of pension coverage outcomes have usually analyzed US data while very little empirical evidence has been produced for those European Union countries where occupational pension coverage is widespread. It is however well recognized that more detailed information on pension coverage outcomes in these countries is required for policy and regulatory purposes. Using data drawn from the ECHP survey, we analyze empirically occupational pension coverage in a sample of EU countries, modelling pension coverage as a binary outcome explained by a vector of personal, job and …rm speci…c characteristics. The potential endogeneity of current wage earnings, included in this vector, is …rst implicitly assessed analyzing the robustness of probit estimates to exclusion of the latter variable. In a second step, this potential endogeneity is explicitly accounted for within a simultaneous limited dependent variables framework. The empirical results obtained are discussed in the lights of country speci…c labor market and pension regulatory frameworks. The paper is structured in …ve sections. In the next section, we summarize the relevant literature focusing on occupational pension coverage outcomes. Section 3 provides a descriptive analysis of occupational pension coverage in the selected countries. In section 4 the empirical analysis is extended within an econometric framework, while the results obtained are presented in section 5. Section 6 concludes the paper.

2 Background

Occupational pension plans can be de…ned as any collective arrangement set up to provide employed or self-employed individuals with pension bene…ts supplementary to those o¤ered by statutory pension schemes. While this de…nition embraces a wide variety of plans, our analysis is limited to privately managed plans covering private sector employees and established through employers' initiative or through collective agreements, belonging to the second pillar in the standard "three pillar" classi…catory framework. There are two fundamental types of occupational pension plans. In de…ned contribution plans the employer promises an annual contribution to the employee's individual account, which is then invested on behalf of the employee. After a short vesting period the worker assumes ownership of his pension account;

this ensures full portability of accrued pension rights. Upon retirement the worker is entitled either to an actuarially fair lump sum or to a pension annuity. In de…ned bene…t plans the employer promises a predetemined pension annuity, based on a formula accounting for years of pensionable service, average salary over a service period (tipically the last years before retirement) and an annual accrual rate. The typical backloaded structure of pension accruals generates turnover and retirement incentives, assigning to de…ned bene…t pensions a prominent role in a variety of labor market implicit contract models[1].

Pension coverage outcomes arise from matching employers' supply and workers' demand for pensions, as well as from institutional constraints, imposed either by country speci…c pension regulation or by plan speci…c rules. In an accounting sense, the pension coverage rate can be de…ned as the product of three factors:

- the o¤er rate, re‡ecting employers' decisions to o¤er a pension plan to their employees. It is de…ned as the ratio between the total number of workers employed in private sector …rms o¤ering a plan to the total number of paid private sector employees;
- the eligibility rate, de…ned as the percentage of workers employed in …rms o¤ering a plan who are eligible to participate in the plan;
- the participation rate, de…ned as the percentage of eligible workers who participate in a plan.

Country speci…c institutional factors play a prominent role in de…ning the actual pension coverage rate. Pension o¤er rates as well as eligibility and participation rates are sensitive to changes in the pension regulatory framework. First, whenever participation in a plan is mandated the coverage rate will be determined solely by the o¤er rate and the eligibility conditions de…ned by law, as in most industry-wide plans. When compulsory participation does not apply, employers may usually o¤er di¤erent pension plans for di¤erent groups of workers within the …rm. However, the pension o¤er decision could be constrained by legislation aiming to prevent any discriminatory behavior toward particular workers' categories. This is the approach undertaken at EU level, where a common legislation aiming to guarantee equality of pension treatment for men and women as well as for full-time and part-time workers has been issued[2]. Regulation of pension plan terminations and of pension portability are additional elements in‡uencing the employer's decision to o¤er a pension plan. Employers generally have the authority to voluntarily terminate the plan under particular conditions, such as business sale, mergers, corporate restructuring, bankruptcies, or in response to speci…c institutional

[1] See Dorsey (1995) and the literature cited therein.

[2] Council Directive 79/7/EEC, Council Directive 86/378/EEC, Council Directive.

changes. At EU level, directives have been issued to protect the rights of pension covered workers in case of plan termination[3] and of pension covered migrant workers[4]. The regulatory framework also a¤ects pension eligibility rates. In the countries analyzed here there are not particular eligibility requirements imposed by law. Whenever they exist, eligibility conditions are then speci…c to each plan being essentially based on the number of years of service, on age requirements (minimum or maximum age) or on a combination of the two. A further crucial element a¤ecting the employers' o¤er decision as well as the individual decision to participate in a plan is its tax regime. In order to qualify for tax privileges pension plans are usually required to cope with a speci…c regulation as well as to be monitored by an independent supervisory body. Changes in pension regulation a¤ecting one of the above factors are then re‡ected in the pension coverage rate. For example, the fact that pension coverage has to be made available to part-time workers if full-time workers are o¤ered a plan has two main e¤ects. Although as a …rst order e¤ect pension coverage could increase, it is also likely that in the longer run the increasing costs may deter new employers to o¤er a pension plan or even may lead some …rms to terminate existing plans. In a similar way, provisions for greater portability of de…ned bene…t pensions are likely to increase employer's costs reducing the o¤er rate or increasing the o¤er of de…ned contribution plans, while at the same time increasing worker's participation.

Beyond these institutional factors, a number of behavioral explanations have been proposed in the pension literature to explain the economic functions of employer provided pension plans giving particular emphasis either to the demand (why workers want pensions?) or to the supply side (why employers of the pension market?) of the pension market[5]. Demand side theories aim to o¤er a rational for occupational pension plan provision focusing on employees' preferences while accounting for plans' institutional features. Assuming that employers are indi¤erent between remunerating their workers through cash wages or pension compensation, they o¤er occupational pensions to satisfy workers' demand of a retirement saving vehicle. In this framework, one of the main determinants of workers' demand for occupational pensions is their tax preferred status, that makes pension savings less expensive than many other non pension retirement savings vehicles. Insurance motivations for pensions o¤er an alternative demand-side theory for occupational pensions. Bodie (1990) emphasizes that pensions provide income insurance against a number of retirement-age risks, such as longevity risk, replacement rate risk, risk from potential social security cuts, investment and in‡ation risks, for which workers demand protection and which is not readily available in the private annuity market.

[3]Council Directive 77/187/EEC, Council directive 80/987/EEC.

[4]Council directive, 98/49/EEC.

[5]See Gustman, Mitchell and Steinmeier (1994) for a literature survey.

De…ned bene…t plans are mainly designed to assolve this function, while de…ned contribution plans can provide insurance against job portability risks. Other demand side theories focus on economies of scale[6] and union preferences towards de…ned bene…t pensions[7]. Alternatively, a supply-side approach emphasizes the economic incentives provided by pensions, viewing the latters as …rms' tools to regulate workers' e¤ort on the job as well as workers' quality and turnover/retirement ‡ows. While in most theories developed under the implicit contract view[8] such a productive enhancing role is limited to de…ned bene…t pensions, if pensions are interpreted as "self-selection" devices[9] available to …rms to attract high quality workers an even more important role arise for de…ned contribution plans, as they encourage mistakenly hired low quality workers to quit o¤ering actually fair lump-sum distributions to early leavers[10]. Finally, the pension underfunding theory[11] is based on …rm's reactions to the presence of a union. Firms are assumed to employ speci…c phisical capital with low value outside the …rm. This cause an "hold up" problem in that unionized employees have an incentive to ask for excess wages in order to reap a portion of the quasi-rent produced by the presence of speci…c capital. In order to solve this problem and to incentivate …rm speci…c investments, an implicit contract between the employer and the union is arranged whereby workers are partially paid in form of underfunded pensions. In this framework, the need for underfunded pensions secure a role to de…ned bene…t pensions.

3 Empirical Literature

The literature focusing on explanation of pension coverage outcomes is concentrated in the US. Dorsey (1982) models individual pension choices within a two-stage logit empical modelling framework. Analyzing a sample of private sector workers from the 1979 CPS data, he …nds the individual decision to enroll in a pension plan to be positively and signi…cantly correlated with predicted wage earnings, age, job tenure and education. A well known empirical …nding is that female employees have lower pension coverage rates than males, even after controlling for observed characteristics. Even and Macpherson (1990) propose di¤erent explanations for this …nding. The …rst relies on the fact that the tax advantages of pensions rise with wage earnings and on evidence of women's lower returns to observed labor market characteristics. A second explanation hinges on quit penalties imposed by de…ned bene…t pensions to early

[6] Mitchell and Andrews (1981).

[7] Freeman (1985).

[8] See Dorsey (1995).

[9] Ippolito (1997).

[10] Empirical evidence supporting this role for de…ned contribution plans is provided by Gustman and Steinmeier (1993) and by Andrietti and Hildebrand (forthcoming).

[11] Ippolito (1985).

leavers, which could cause women, tipically characterized by frequent career interruptions, to select out of pension jobs, while at the same time employers o¤ering pensions could be less willing to hire workers with high quit propensities such as women. A third possible explanation is that women are more likely to work part-time while full-time working status is often found as an eligibility condition for plan participation. Another established …nding is that employees working in large …rms are more likely to be covered by occupational pension plans. Even and Macpherson (1996) analyze a wide range of US datasets, providing evidence that large …rms are more likely to o¤er pensions to comparably skilled workers than are small …rms. They interpret the latter …nding suggesting that the role of pensions as instruments to reduce labor turnover and retirement could be more evident for larger employers, on the assumption that the latters have greater hiring, training or monitoring costs. Moreover, larger …rms are likely to experience scale economies in their pension plans' administration. Dorsey and Macpherson (1997) …nd a positive association between employer provided pensions and training, although a causal interpretation from training to pension coverage of this complementarity is prevented by the lack of identifying exclusion restrictions in a simultaneous equation model of pension and training.

To our knowledge, no empirical study has focused on the empirical determinants of occupational pension coverage in EU countries, while the existing empirical evidence, available only for Ireland[12] and for the United Kingdom[13], has been produced addressing some related issues. Such a lack of empirical evidence represents the main motivation of this paper. In particular, we propose in the next sections a comparative empirical analysis of occupational pension coverage aiming to explain the di¤erences in actual and prospective pension coverage outcomes between countries in the lights of country speci…c labor market structures and of national as well as EU pension regulatory frameworks.

4 Pension Coverage in EU countries

Occupational pension provision in the European Union is heterogeneous within and between countries. Although pension plans are set up within the limits de…ned by government regulation in order to qualify for a tax-privileged status, some degree of freedom is usually left to the actors involved in the pension contract while de…ning plan characteristics. This contributes to widen the variety of employer provided pension plans, making more di¢cult cross country comparisons. In EU countries like Denmark, Ireland, the Netherlands and the United Kingdom, occupational pension schemes represent a major part of the pension provision, whereas

[12] Hughes and Nolan (1993, 1999).

[13] Disney and Stears (1996) and Barrientos (1998).

in others, like Spain, they still play a relatively marginal role, nothwithstanding their recent growth. An important explanatory factor of the country speci…c "second tier" relative development is whether the social security scheme provides earnings-related bene…ts and whether the ceiling on eligible earnings for social security purposes leaves room to a demand for supplementary pension arrangements. Table 1 reports evidence on national replacement rates expressed as the ratio of state pension values, calculated at retirement age for a typical male married man with a full contributory career following country speci…c regulations, to di¤erent categories of …nal pay. The table clearly shows that even for blue collar workers, representing here individuals with lower wage earnings, …rst pillar pension schemes in the countries analyzed do not generally provide an "adequate" level of income replacement, the only exception being Spain, where the replacement rate is set at 90 percent. These …ndings are strictly related to the structure and objectives of country speci…c …rst pillar schemes. By one side, the beveridgean structure of social security provision, aiming to guarantee the pensioners with a minimum standard of living through ‡at rate bene…ts eventually supplemented by earnings related bene…ts and widely adopted by northern European countries[14], has been particularly favourable to the rise and development of a supplementary occupational second tier. By the other side, the bismarckian approach, aiming to guarantee the pensioners an income "adequate" to mantain the "working life" standard of living and followed by Spain, has limited any second tier development. However, in recent years economic, demographic and social trends, together with …scal restrictions imposed by the European Monetary Union, have put under pressure EU national pay-as-you-go …nanced social security systems, encouraging the development of supplementary forms of pension provision. This latter trend has been coupled with a general preference for de…ned contribution schemes, either through policymakers' or plan sponsors' choices, although de…ned bene…t pension plans remain dominant in the countries analyzed in this study, the only exception being Denmark, where de…ned contribution schemes have always been prevalent.

The last two columns of table 2 report o¢cial …gures for pension coverage rate[15] of private

[14]Earnings related pensions are not provided under social security system in Denmark, Ireland and in the Netherlands. However, Danish social security system supplements the old-age tax …nanced pension, provided to all Danish nationals from the age of 67, with a Labour Market Supplementary Pension Scheme (ATP) paid at a …xed rate independently from earnings. Similarly, in Ireland the basic means-tested non contributory old age pension is supplemented by a a.contributory old-age pension and by a contributory retirement pension, both accruing in proportion of contributions paid. The United Kingdom provides a basic ‡at rate old age pension supplemented by an earnings related pension (SERPS). Between the countries analyzed here, Spain is the only one that does not follow a beveridgean social security structure, providing a unique earnings related pension which aims to replace a very high portion (80 to 100 percent) of …nal employees' earnings.

[15]De…ned as the ratio of pension covered full time private sector employees to the number of private sector employees, where pension coverage refers to active participation to an occupational pension plan.

sector workers, from the Green Paper on Supplementary Pensions[16] and from other national and international sources[17]. These …gures represent the …rst element to be taken into account while assessing the role of second tier pension provision within national pension systems, giving rough indications about the pattern of occupational pension coverage followed by each country. Under this perspective, we could divide the countries analyzed in three groups, each following a di¤erent pattern of occupational pension coverage that can be explained by historical, political, economic and social reasons[18].

The …rst group is represented by Denmark and the Netherlands, the countries with highest private sector pension coverage rates, …gured as around 80 percent. In these countries, occupational pension plans have been established mainly at industry-wide level through employers' federations and trade unions. The high degree of union coverage and the mandatory nature of participation to industry-wide funds have guaranteed pension coverage of large sections of the workforce. Currently in Denmark there are 34 compulsory industry-wide funds operating on a de…ned contribution basis and just one pension fund operating on a de…ned bene…t basis, while there are 106 company pension funds operating on a de…ned contribution basis. In the Netherlands there are 81 industry-wide funds, of which 65 compulsory, covering 2.477.000 employees and about 1.000 company schemes covering 657.000 employees, mainly operated on a de…ned bene…t basis[19].

Ireland and the United Kingdom belong to a second group of countries that seems to have followed a di¤erent pattern of second tier development, with a coverage rate of private sector employees ranging between 40 and 50 percent. This lower coverage rate can be explained by the fact that, even if occupational pension plans have a long tradition in these countries playing a major role in integrating basic social security pension bene…ts, the choice of plan membership has been left to the individual[20]. In the United Kingdom, according to the 1991

[16] Commission of the European Communities (1997).

[17] Government Actuary (1994) for the United Kingdom, Hughes and Whelan (1996) for Ireland, and Tamburi (1997) for Denmark, the Netherlands, and Spain.

[18] For a comparative analysis of the rise and development of supplementary forms of pension provision in a sample of EU countries (including the Netherlands, Spain and the United Kingdom) see Andrietti (2000).

[19] Only 2 percent of private sector covered workers belongs to de…ned contribution plans.

[20] In the United Kingdom it is not compulsory for an employer to provide an occupational pension scheme to his employees. Employees' participation to SERPS, as a supplement of the basic ‡at rate public pension, is however compulsory while they have the option to "contract out" for a private occupational pension scheme. The choice left to employees is therefore constrained between remaining in the public system or joining a private approved pension plan. Moreover, since 1988, following the introduction of personal pensions with the 1986 Social Security Act, it has been left to the individual choice whether to "contract out" to an employer provided plan or to a personal pension and, eventually, to "opt out" from an occupational plan in order to join a personal plan.

Government Actuary Survey of Occupational Pensions[21], 39 percent of private sector workers participate to an occupational pension plan. While only 29 percent of occupational pension plans are de…ned bene…t, they cover 86 percent of private sector covered workers. In Ireland, according to the …gures provided by the 1995 Occupational and Personal Pension Survey[22] the private sector pension coverage rate is around 40 percent. Notwithstanding the great development of occupational de…ned contribution schemes in the last years, de…ned bene…t plans are by far dominant.

A last, di¤erent pattern of coverage has been followed by Spain, where the generosity of statutory pensions has limited occupational pension coverage of private sector workers below 15 percent. Employees usually obtain supplementary retirement bene…ts directly through their employer, mainly as a result of collective agreements, through promises supported by book reserves arrangements, or through individual/group policies stipulated by employers with insurance companies. Available data sources, however, do not usually give homogeneous informations relative to pension plan typology[23].

Schmall (1991, p. 253) emphasizes the essentiality of data on pension coverage for "the various type of schemes, membership, bene…t levels, as broken down by economic sectors, occupational categories, full-or part-time employment, and sex" in order to provide adequate empirical information to policy makers for adoption of particular pension policies and regulatory approaches. While administrative data are useful to analyze aggregate trends in pension coverage over time and di¤erence among demographic groups, survey data are needed in order to shed lights on other factors a¤ecting the employer choice to o¤er a plan and/or the individual participation choice. In this sense, the European Community Household Panel (ECHP) survey represents a particularly important source of data for purposes of empirical comparative pension coverage analysis, given its peculiar characteristics:

- it is collected since 1994 in 12 EU Member States under Eurostat coordination
- it aims to represent both cross-sectionally and longitudinally households and individuals;
- it is structured in form of annual interviews to a selected representative sample in each State, covering a wide range of subjects like demographics, labor force behavior, income, health, pension coverage, education and training, migration and housing, poverty and social exclusion;

[21] Government Actuary's Department (1994).

[22] Hughes and Whelan (1996).

[23] This heterogeneity probably comes from the structural changes that spanish pension funds regulatory framework has undergone in the last years.

- interviews are conducted following a standardized questionnaire, even if each country is allowed, to some extent, to modify the questionnaire's wording in order to reflect her own institutional arrangements.

Although allowing to control for unobserved individual heterogeneity, ECHP data do not report any pension plan institutional detail, making it difficult to account for institutional features in the empirical analysis without relying on strong assumptions. The first wave of the ECHP survey provides information on pension offer, pension participation and pension coverage rates[24], although nothing is known about pension eligibility[25]. However, table 2 reveals that pension coverage data collected in the first ECHP wave in Denmark, the Netherlands and in the United Kingdom seem to be unreliable when compared with figures provided by other national and international sources. Substitution of occupational pension coverage questions in the second wave of the survey[26] has greatly improved data quality for Denmark, the Netherlands and the United Kingdom, at the cost however of losing any information on pension offer and pension participation, and of producing unreliable pension coverage figures for Spain. Our empirical analysis will then be implemented with 1994 data only for Ireland and Spain, and with 1995 data only for Denmark, Ireland, the Netherlands and the United Kingdom, Ireland being the only country whose pension coverage data seem to be consistent in both years.

Table 3 below provides descriptive sample statistics relating pension coverage status to individual and job specific characteristics. It emerges that pension covered individuals are generally more likely to be male[27], household tenants and to have children, compared to non covered workers, although the differences are much less pronounced in Denmark. Furthermore, in Denmark the distribution of educational skills is substantially similar between pension covered and non pension covered individuals, while in the other countries it is more skewed toward higher educational levels for pension covered workers. Pension covered workers are also generally more likely to have a job supervisory status, particularly in Ireland and in the Netherlands, and to receive employer provided training, vocational training and health

[24] In wave 1 the respondent was asked:

" Does your employer provide a supplementary pension scheme to any employees?"

The related variable represents the pension offer rate.

In case of a positive answer, the respondent is was then asked:

"Are you personally in that scheme?"

The related variable represents the pension participation rate.

[25] Individuals that were offered a pension plan but that were not participating in it were not asked any question about the reasons of their "not covered" status.

[26] In wave 2 the questions were changed to:

"Are you a member of a job-related or occupational pension scheme?"

[27] In Denmark, however, females represent the same percentage of pension and non pension workers

insurance coverage. In all countries but Denmark there seems to be a pension-wage gap between covered and not covered workers, and most pension covered workers have a job tenure inferior to 5 years. While in Denmark and Ireland the majority of pension covered individuals is concentrated among small and medium …rms, in Spain and in the United Kingdom the reverse is true. Although not controlling for any unobserved individual heterogeneity, these rough …ndings indicate di¤erent endowments for pension covered and non covered workers. The fact that in Denmark pension covered and not covered individuals are much more similar in terms of individual characteristics could be related to the de…ned contribution and to the industry wide nature of most plans attracting a more heterogeneus work force.

5 Statistical Framework

The dicotomous realization observed for the latent pension o¤er/pension participation/pension coverage outcomes suggest the probit as an appropriate empirical modelling approach, with the following speci…cation:

$$P_i^{\alpha} = \beta_1' \ln Y_i + \gamma_1' X_{1i} + v_{1i}: \tag{1}$$

P_i^{α} is not observed but has a dicotomous observable realization P_i which is related to P_i^{α} as follows:

$$P_i = 1 \text{ if } P_i^{\alpha} > 0;$$

$$P_i = 0 \text{ if } P_i^{\alpha} < 0;$$

where:

$\ln Y_i$ is the log of net hourly wage earnings;

X_{1i} is a vector of individual, household, job and …rm related characteristics;

$\beta_1; \gamma_1$ are vectors of unknown parameters;

v_{1i} is a continuous random variable following a normal distribution with zero mean and variance σ_1:

The probit models are thus functions of employee, job and employer speci…c characteristics. The industry dummy variables are meant to capture sectoral di¤erences in coverage[28]. Controls for broad occupational groups[29] are intended to take into account the fact that different pension plans may be o¤ered to di¤erent groups of workers within the …rm. Dummy

[28] The manifacturing industry constitutes the reference category.

[29] White collar workers represents the reference category.

variables for education control for the fact that more educated workers have better access to pension coverage through better information. The inclusion of two age dummies respectively for workers younger than 30 and for workers older than 55 aims to control for pension eligibility requirements as well as for potential age di¤erences in the tendency to participate in volountary plans. The size of the …rm constitutes an important element that employers take into account while deciding to o¤er a plan. This variable is also likely to a¤ect the institutional design of the plan, in that usually small …rms prefer de…ned contribution plans while bigger …rms refer de…ned bene…t plans. Because eligibility conditions are also based on the number of years of seniority we include dummy variables for tenure with current employer between the regressors. These variables also constitute ex-post measures of mobility representing a measure of workers' attachment to the …rm. Positive estimates should at least in part re‡ect the preference of less mobile workers for jobs with pensions. Controlling for part time work and for gender gives some indication on potential discriminatory behaviour towards part time and female workers, while controlling for employer provided …rm speci…c / vocational traning represent a preliminary test of the complementarity of the latter variables with pension coverage. Employer provided health insurance, job supervisory status, labor market experience and marital status complete the common variables included in the speci…cations. The speci…cation of the pension o¤er model only di¤ers from pension participation and coverage equations in that it does not consider some individual speci…c characteristics, such as house tenure status, family size, other household wage earnings and children, which should not have any in‡uence on employer's decision to o¤er a pension plan. Empirical studies of pension coverage typically control also for hourly current wages, as a proxy for lifetime earnings although a better measure would be the annual total compensation (including pension compensation). The standard rationale for the inclusion of wage earnings is that, due to the progressivity of the tax system, the tax advantages of pensions rise with earnings. However, the inclusion of wage earnings in a pension coverage equation is somewhat problematic because of the endogeneity of wage determination. First, workers in highly paid jobs may be highly skilled and …rms may want to o¤er these workers pension coverage in order to reduce costs of turnover. In this sense, wage di¤erences between pension and nonpension jobs will understate the spread between workers in total compensation, given that the latter includes pension compensation, and the wage coe¢cient will overstate the e¤ects of an increase in total compensation on the likelihood of pension coverage. At the same time, the theory of compensating di¤erentials predicts a trade-o¤ between pensions and wages, given total compensation. In this case, as far as some of the variables included in the pension equation represent good proxies for worker's productivity, the wage equation coe¢cient can su¤er of a downward bias. In order to face the endogeneity issue we adopt the following empirical strategy. First, we assess the robustness of the single

equation reduced form probit results to the exclusion of wage earnings. In a second step of the analysis we explicitly account for wage endogeneity estimating a more structural pension coverage model within the econometric framework proposed by Nelson and Olson (1978). In particular, adding to the pension coverage equation a semilog wage equation speci…ed in terms of standard human capital variables such as education, gender, experience, job tenure and in terms of job speci…c variables like industry, occupation, supervisory status, employer size and occupational pension coverage, we have a two equations structural model, with one continuous and one limited dependent variable, speci…ed as follows:

$$\ln Y_i = \beta_2' P_i^* + \gamma_2' X_{2i} + v_{2i}; \tag{2}$$

$$P_i^* = \beta_1' \ln Y_i + \gamma_1' X_{1i} + v_{1i}; \tag{3}$$

$$P_i = 1 \text{ if } P_i^* > 0;$$

$$P_i = 0 \text{ if } P_i^* < 0:$$

In order to obtain consistent estimates for the structural probit equation coe¢cients, we …rst derive the reduced form of the wage earnings equation:

$$\ln Y_i = \pi_2' X_{2i} + \varepsilon_{2i}: \tag{4}$$

Estimating it by OLS, it is possible to create an instrument $\ln \hat{Y}_i = \hat{\pi}_2' X_{2i}$ which is at least asymptotically uncorrelated with the error term in the structural pension coverage equation, $v_{1i;}$ and which is then substituted for its counterpart on the right hand sides of equation (5). Maximum likelihood robust[30] probit estimation of the resulting equation allows ultimately to recover the structural pension coverage coe¢cients. Following a similar procedure, it is possible to obtain structural estimates of the wage equation coe¢cients. Identi…cation of the structural probit equation requires at least one exclusion restriction, that is one variable belonging to the structural wage equation should not be included in the structural pension equation. In our speci…cation such an exclusion restriction is respresented by the experience squared variable.

[30] Given that the log wage instrument is estimated rather than observed, the standard errors in the structural probit equation are corrected for heteroskedasticity using White method.

6 Empirical Results

The results obtained with both 1994 and 1995 data for Ireland in the speci…cations with and without wages are reported in table 4. In the …rst speci…cation, which controls for wage earnings, according to previous literature …ndings, pensions are signi…cantly less likely to be o¤ered to lower educated, not married and part time workers, to blue collar workers and to individuals employed in smaller …rms[31] as well as in agricultural and service …rms. Alternatively, being o¤ered training and health insurance, working in the …nancial or construction sector and in managerial positions, having longer job tenures and higher wage earnings signi…cantly increase the likelihood of being o¤ered a pension plan. Excluding wages from the pension o¤er probit speci…cation produces marginal changes of the coe¢cients' values, while the blue collar workers and marital status dummies reach a 5 percent signi…cance level. Pension participation is found to be signi…cantly lower for females as well as for part-time and agricultural workers, while longer job tenures and higher salaries a¤ect positively and signi…cantly the likelihood to participate in a pension plan. The other variables are unsigni…cant at standard levels. Excluding log hourly wage from the pension participation probit reduces substantially the likelihood of pension participation for females and for agricultural workers while increasing it for longer tenured and part time worker. Small …rm dummies and blue collar dummies becomes signi…cant at 5 percent level while preserving their negative marginal e¤ect on pension coverage. At the same time, the positive marginal e¤ects on pension participation of house tenure and health insurance coverage become signi…cant at 10 percent level. Pension coverage models for 1994 and 1995 give quite similar results[32]. Females, lower educated individuals, part time and blue collar workers, as well as individuals working in the agricultural industry and in small …rms are all signi…cantly less likely to be pension covered, while those receiving employer provided …rm speci…c training and health insurance, with longer tenures and experience, working in managerial positions and in the construction and …nancial sector have a higher likelihood to be pension covered. The log of hourly wage is positive and signi…cant at 5 percent level in both years. However, in 1995 the dummies for blue collar workers and for females are no longer signi…cant, while labor market experience and the service industry dummy become signi…cant. Excluding wages brings marginal increases to the estimated coe¢cients, while sometimes slightly improving their signi…cance level.

The results obtained with 1994 data for Spain are reported in table 5. A surprising …nding is that females seem to be more likely to be o¤ered a pension plan, although only at 10 percent signi…cance level. The same is true at 5 percent signi…cance level for individuals working in

[31] The reference category is that of …rms with 100 to 499 employees (medium …rms).

[32] The 1995 speci…cation includes a dummy variable for children which was not included in 1994 because of missing value problems.

large …rms or in …nancial sector …rms and having supervisory roles. Longer job tenures as well as employer provision of …rm speci…c training and of health insurance also increase the likelihood of pension coverage. Workers under age 30, with low education, and working in small …rms are signi…cantly less likely to be o¤ered a pension plan. Between the industry dummies, only the …nancial sector is signi…cant and positively a¤ects the likelihood of being o¤ered a pension. The results are not sensitive to the exclusion of wage earnings. The low number of individuals being o¤ered a plan determines a loss of …t in the probit model of pension participation[33]: only the employer health insurance and the dummy for real estate and business activity are found to be signi…cant. The coe¢cients estimated from the pension coverage model are similar in sign and statistical signi…cance to those obtained for the pension o¤er model, and robust to wage exclusion.

In table 6 we report the results obtained estimating the pension coverage model for Denmark, the Netherlands and the United Kingdom with 1995 data. As to Denmark, the …rst thing to remark is the negative, although unsigni…cant, sign attached to the log of hourly wage earnings. This result, together with the low signi…cance of most individual and household speci…c variables could be explained by the di¤usion of industry wide plan. By the other side, most job and …rm speci…c variables are signi…cant and have the expected sign: employer provided …rm speci…c / vocational training and health insurance, as well as job tenure and …nancial sector dummies signi…cantly and positively a¤ect the likelihood of pension coverage, while individuals working as blue collars in smaller, agricultural or real estate …rms are signi…cantly less likely to be covered. The results obtained for the Netherlands seem to tell a di¤erent story. Here individual and household characteristics play a major role in explaining the likelihood of pension coverage. In particular, according to prior expectations, living in bigger a family, being female, younger than 30 or older than 55, single, house tenant and lower educated negatively and signi…cantly a¤ect the likelihood of pension coverage, while having children does the reverse. Moreover, employer provided …rm speci…c training and health insurance as well as labor market experience and job tenure have positive and signi…cant e¤ects on the probability of being covered, while the wage eanings coe¢cient is also positive although unsigni…cant. It is also found that working in smaller …rms or in the trade, real estate and …nancial sector reduces the probability of being covered. In the United Kingdom, females, part timers and individuals working in smaller …rms as well as in the trade and real estate industries are signi…cantly less likely to be covered, while those with higher wages, better educated, with longer job tenures, receiving employer provided training or health insurance

[33] Moreover, …ve observations included in the Agriculture industry dummy are dropped together with this variable in the estimation process because they were predicting success perfectly.

and working in bigger …rms and in the …nancial sector are more likely to be covered[34]. The estimates obtained for all these three latter countries seem to be robust to wage exclusion.

Estimation of the two-stage pension coverage probit model for the countries under study leads to the …ndings reported in table 7 and 8[35]. Comparing these results with those obtained including wages in the single stage probit procedure, it emerges that in Denmark and in the Netherlands most of the estimated coe¢cients either switch their sign or their signi…cance level or both. Dutch females, house tenants, younger and blue collar workers as well as employees of the contruction and trade industries are now more likely to be pension covered at 5 percent signi…cance level. Alternatively, higher educated workers, managers and professionals and workers having a supervisory status are signi…cantly less likely to be pension covered. Longer job tenures, labor market experience and employer provided training, as well as having children, also have a negative, albeit unsigni…cant, in‡uence on the probability of pension coverage. The coe¢cient of predicted log hourly wage is strongly positive and signi…cant at 5 percent level. In Denmark, job tenure, agricultural sector and blue collar workers dummies are no longer signi…cant, although preserving their marginal e¤ect on the probaility of pension coverage, while the remaining previously signi…cant variables remain as such. However, most of the previously unsigni…cant variables switch their sign although remaining unsigni…cant. The predicted hourly wage has a positive but unsigni…cant coe¢cient. In Spain, only the dummy for employer provided health insurance preserves its 5 percent signi…cance level. All the other previously signi…cant variables are now unsigni…cant, although generally preserving their e¤ect on the probability of pension coverage. In Ireland and in the United Kingdom, the two stage probit model gives results which are relatively close to the single stage probit ones.

7 Summary and Conclusions

The …ndings reported in the previous section provide some elements for a better understanding of pension coverage outcomes and for a preliminary analysis of pension coverage prospects in the countries under study. The latter analysis is particularly useful for countries such as Ireland, Spain and the United Kingdom, where the need for extending supplementary pension coverage is particularly strong in view of the downsizing prospects of their public pension systems. In particular, the empirical …ndings con…rm our earlier suggestion that Ireland and the United Kingdom seem to follow a similar pension coverage pattern. In Ireland, a signi…cant lower pension coverage is found among lower educated individuals as well as among those employed in the service sector and in part time jobs. Similarly, in the United

[34] Job supervisory status is omitted from the probit equation because of missing values problems.

[35] The model is estimated on 1995 data for all countries except for Spain.

Kingdom female and part time workers as well as those employed in the trade and real estate industres are signi…cantly less likely to be covered by an employer provided plan. Alternatively, occupational pension coverage in these countries seems to be restricted to certain groups of employees in jobs with particular demand side characteristics: those employed in the …nancial sector, in medium …rms, in managerial positions, in jobs o¤ering also …rm speci…c training and health insurance and with longer job tenures and higher salaries. In Spain, the single stage probit results show that lower educated individuals and those under age 30 are signi…cantly less likely to be covered, while those working in large …rms, in the …nancial sector, with job supervisory roles, with longer job tenures, higher wages and provided with employer speci…c training and health insurance are signi…cantly more likely to be covered. The above …ndings suggest that structural changes in the labor market in these countries will continue to generate pressures on occupational pension scheme coverage. Longer term labor market trends, such as the structural employment shift from industry to services, the expansion of part time employment and the increase labor force participation mobility will exert downward pressure on occupational pension plan coverage. At the same time, current labor market trends that operate to reduce the incidence of stable, high productivity, long-tenured jobs will further work to reduce employer provided pensions coverage. One possible measure to encourage the growth of pension coverage is to favour the development of personal pensions. This is the policy that has been adopted by the United Kingdom since the 1986 Social Security Act, which has lead to a further 20 percent coverage of private sector workers. However, personal pension coverage does not solve the retirement income problem given the discretionarity of pension contributions and the high costs charged to covered individuals which can result in low pension bene…ts upon retirement.

Our empirical results are also useful as a preliminary assessment of the implementation of EU directives on part time and equality of treatment for men and women. In particular, while in Denmark and in the Netherlands there is no evidence of any signi…cant negative e¤ect of part time working status on the probability of pension coverage, we have seen how such an e¤ect is clear in Ireland and in the United Kingdom. Although this cannot be directly connected to employers discriminating behavior, it can represent a starting point for a more in depth analysis of the e¤ects obtained on pension plan coverage by the EU directives issued in order to extend pension coverage to part time workers. The evidence on pension coverage for females accord to a potential discriminating behavior only in the United Kingdom. Notwithstanding the usefulness and novelty of the empirical evidence reported in this paper for purposes of pension policy, the reduced form nature of our results should be also kept in mind. Further research and more detailed pension coverage data is required to disentangle the structural determinants of the employer's pension o¤er and on the employee's pension participation decision, viewed

as the main determinants of the pension coverage outcome, as well as to assess the e¤ect of the enactment of speci…c pension regulatory requirements on pension coverage outcomes.

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TABLE 1

Replacement Rate by Annual Wage Category (%)

Annual Wage (Euro)	Denmark	Ireland	Netherlands	Spain	UK
Blue collar workers average	38	50	50	90	50
30.000	35	20	27	60	31
75.000	14	8	11	24	13

Source: Jolli¤e (1991)

TABLE 2

Private Sector Occupational Pension Coverage (%)

	Denmark	Ireland	Netherlands	Spain	UK
ECHP 1994	31.5	35.5	13.3	8.3	n.a.
ECHP 1995	77.1	37.6	81.5	96.7	47
EC	80	40	85	15	48
Other Sources	46	38	83	9	39

Sources: Our Elaborations on ECHP 1994-1995 data, Commission of the European Communities (1997), Government Department (1994), Hughes and Whelan (1996), Tamburi (1997).

TABLE 3

Sample Statistics by Pension Coverage Status

	Denmark (1995)		Ireland (1995)		Netherlands (1995)		Spain (1994)		UK (1995)	
	P	NP	P	NP	P	NP	P	NP	P	NP
Female	.36	.35	.29	.44	.31	.51	.26	.30	.31	.53
Under30	.20	.28	.24	.52	.17	.51	.11	.29	.24	.52
Over55	.09	.11	.10	.04	.05	.03	.09	.09	.10	.04
Unmarried	.42	.51	.29	.54	.27	.54	.24	.36	.26	.36
Household Tenant	.21	.26	.06	.13	.31	.46	.12	.14	.11	.23
Household Size	2.8	2.7	4	4.2	3	2.7	3.6	3.9	3	3.1
Kids	.38	.31	.45	.36	.36	.22	-	-	.35	.35
Third Level Education	.31	.27	.24	.13	.17	.11	.34	.20	.32	.15
Upper Secondary Education	.49	.48	.49	.49	.65	.56	.29	.18	.39	.42
Lower Secondary Level	.20	.25	.27	.38	.18	.33	.37	.63	.29	.43
Hourly Net Wage	6.96	7.11	5.68	8.93	6.1	7.58	5.18	8.1	5.64	8.27
Other Household Wage Inc.	9.105	9.152	10.884	11.726	10.145	8.035	6.487	6.257	10.224	10.703
Part-Time	.06	.06	.03	.12	.14	.20	.02	.07	.06	.24
Experience	21.8	20.5	20.6	14.6	20.6	13.8	22.5	20.2	23.2	22
Employer Training	.70	.51	.44	.21	.56	.35	.53	.14	.79	.44
Empl. Voc. Training	.43	.24	.07	.04	.06	.05	.17	.04	.45	.21
Empl. Health Insurance	.11	.03	.31	.09	.24	.1	.78	.38	.49	.17
Job Tenure: <5	.40	.55	.23	.60	.29	.65	.18	.46	.27	.63
Job Tenure:5-10	.22	.19	.26	.24	.28	.22	.18	.17	.27	.21
Job Tenure: >10	.38	.26	.51	.16	.42	.13	.64	.37	.46	.15
Job Supervisory Status	.30	.28	.42	.24	.31	.25	.48	.24	-	-
Employer Size: 0-49	.30	.45	.20	.50	.17	.44	.18	.48	.08	.36
Empl. Size: 50-99	.30	.27	.25	.28	.26	.27	.18	.25	.16	.26
Empl. Size: 100-499	.20	.16	.31	.15	.24	.15	.17	.13	.14	.15
Employer Size: 500+	.20	.12	.24	.07	.33	.14	.47	.14	.62	.23
N. Observations	1.123	390	548	1.067	1.658	493	250	3.054	814	1.076

Source: Our Elaborations on ECHP 1994-1995 data