Intergenarational earnings mobility in Spain

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(very preliminary and incomplete; please do not quote)

Abstract

This paper analyse the extent and evolution of intergenerational earnings mobility in Spain. Since there are no Spanish surveys with information on both sons and their fathers' earnings covering a long period, we consider two separate samples: a main sample containing information on sons' earnings and a set of occupational and education characteristics of their fathers and a supplemental one with data on the same set of fathers' characteristics and their earnings. The first sample we use is the Spanish sample of the EU-SILK, called ECV (Encuesta de Condiciones de Vida) and the second is the Household Budget Survey of 1980-1981 (Encuesta de Presupuestos Familiares). We combine information from the two samples by using the two-sample two-stage least square estimator described by Arellano and Meghir (1992) and Ridder and Moffit (2006). We find an elasticity of 0.40 for sons and 0,55 for daughters. Furthermore, we find a little decrease when we move to younger cohorts. Comparing with other studies, the intergenerational mobility in Spain is similar to France, lower than the Nordic countries and Britain and higher than the United State.

Keywords: Earnings mobility, intergenerational mobility, two sample two stage least square estimator, Spain.

JEL classification: D31, J31, J62.

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1 Introduction and Motivation

The degree of intergenerational mobility could be thought as an important indicator of the healthiness and success of a society. One important reason for this belief is the judgement that equal opportunity is a desirable characteristic of a good society. In this context, equal opportunity means that children from different families have equal options regarding investments in their human resource and their expected incomes (Behrman and Taubman (1990)).

Intergenerational mobility studies estimate the correlation between socioeconomic status of parents and their offspring. A high correlation would imply that people born in disadvantaged families have a smaller chance to occupy the highest socio-economic positions than people born in privileged families. A zero correlation would imply instead a high degree of mobility and more equal opportunities.

Different measures of intergenerational mobility have been used in previous studies. Economist have mainly concentrated on the relation between fathers and off-springs' permanent income, ie, intergenerational elasticity in continuous monetary variables, typically income or earnings, while sociologists use association measures between ordered categorical variables such as social and economic class positions[1].

At present, there is no information about intergenerational earnings mobility in Spain for sons belonging to very distant cohorts from their parents. The absence of previous findings is due to the lack of Spanish surveys with information on both sons and their fathers' earnings covering a long period.

The main objective of this paper is to study the extent and evolution of intergenerational earnings mobility in Spain.

Using the ECV we are able to observe sons' earnings and a set of occupational characteristics of their parents when they were aged between 12 and 16. This gives us a set of variables, such as education dummies, age, occupational sector, which can be used to predict the fathers' missing earnings. It is then possible to estimate consistently intergenerational earnings mobility by using the two-sample two-stage estimator. Using this estimator it is possible to combine information from two separate samples; a sample of sons with observations on their earnings and their fathers' characteristics,

[1]See Solon (1999), Björklund and Jäntti (2000), Bowles and Gintis (2002), Erikson and Godthorpe (2002) for a review.

and a sample of potential fathers with observations on earnings and the same characteristics. The latter sample is used to estimate an earnings equation for fathers using their characteristics as explanatory variables, while the former is used to estimate an intergenerational earnings equation by replacing the missing fathers' earnings with its best linear prediction.

Moreover, we try to control for the potential life cycle bias affecting intergenerational mobility estimation. Theoretically we would like to measure intergenerational earnings mobility by considering long run permanent earnings, but we observe instead current earnings at a specific age. Since the earnings profile across age is probably neither constant nor a deterministic function of age, measuring earnings when sons (fathers) are too young or too old can cause an estimation bias, as emphasized by Jenkins (1987) and Haider and Solon (2006).

We find an elasticity of 0.40 for sons and 0,55 for daughters. Furthermore, we find a little decrease when we move to younger cohorts. Comparing with other studies, the intergenerational mobility in Spain is similar to France, lower than the Nordic countries and Britain and higher than the United State.

The rest of the paper is organized as follow. In the next section I briefly present a review of the previous finding on intergenerational mobility for Spain, with a different methodology, and for other countries that used the same methodology I will use. Section 3 shows the theoretical framework. In Section 4 I describe the two-sample two stage least square estimator. In section 5 I explain the data source, the selection sample and the variables used in the empirical analysis. Section 6 reports the results and finally, section 7, conclude with some final remarks.

2 Previous literature

In Spain the study of intergenerational mobility has been undertaken mainly by sociologist. For example, Carabañas (1999) studied occupational mobility. From an economic point of view, there are some studies of intragenerational mobility like Cantó (2000), Rodriguez, Salas, and García (2002) and Ayala and Sastre (2002a, 2002b). These studies analyse the probability that one individual could change her level of income during her life. The only study for Spain that analyses intergenerational mobility is

Hugalde (2004). She analyses the intergenerational income and education mobility using the Household Budget Survey (Encuesta de Presupuestos Familiares) for 1980 and 1990.

We use the two-sample two-stage least square estimation, these method has been already applied to study intergenerational mobility by Björklund and Jäntti (1997) in Sweden, Fortin and Lefebvre (1998) in Canada, by Grawe (2004)) in Ecuador, Nepal, Pakistan and Peru, by Lefranc and Trannoy (2004) in France and by Ermisch and Nicoletti (2006) in Britain. In all those studies, but the last two, the choice of the instrumental variables is dictated by the few variables available. However, in the last two studies a larger set of instrumental variables are used, which gives them a greater degree of freedom in choosing the instrumental variables to predict the missing fathers' earnings.

3 Theoretical framework

In the analysis of intergenerational mobility, researchers have used several different measures of long-run socio-economics status. Each measure has advantages and disadvantages. There are also several popular methods of examining intergenerational correlations in socio-economic status (e.g., linear regressions, quantile analysis, and transition matrices).

In this paper, following the economic approach, we focus on intergenerational mobility measured by the intergenerational elasticity of sons' earnings with respect to fathers' earnings. More precisely, we consider the following intergenerational mobility equation:

$$y_i = \alpha + \beta x_i + A\gamma + u \tag{1}$$

where y_i is the son's log earnings; x_i is the fathers' log earnings; A is a vector of other control variables, specifically the sons' and fathers' age and age square; α is the intercept term representing the average change in the sons' log earnings, β and γ are coefficients; and u is a random error identically and independently distributed (i.i.d.) with zero mean and homoskedastic. The coefficient β is the intergenerational elasticity of son's earnings with respect to their father's earnings, and it is our parameter of

interest.

Notice that can be alternatively computed by considering the following equation:

$$\tilde{y} = a + \beta\tilde{x} + \varepsilon \tag{2}$$

where $\tilde{k}$ is the residual of the regression of k on A, $\tilde{k} = \tilde{y}$ or $\tilde{x}$, a is a new intercept and ε is a new error term still i.i.d. with zero mean and homoskedastic. Let ρ be the correlation between $\tilde{y}$ and $\tilde{x}$; then β is related to ρ by the following equation:

$$\beta = \rho\frac{\sigma_{\tilde{x}}}{\sigma_{\tilde{y}}} \tag{3}$$

where $\sigma_{\tilde{k}}$ is the variance of $\tilde{k}$, $\tilde{k} = \tilde{y}$ or $\tilde{x}$. In other words, the coefficient is related to the correlation between sons' and fathers' log earnings net of sons' age. Moreover, β is exactly equal to ρ when $\sigma^2_{\tilde{x}} = \sigma^2_{\tilde{y}}$.

A coefficient β equal to zero indicates a situation where all sons have "equal opportunities". When $\beta = 0$ all sons have an average log earnings equal to α plus an additional deterministic component function of their age. When β is instead different from zero, sons' average log earnings depend also on their fathers' earnings.

On the other hand, a value of $\beta = 1$ indicates a situation of incomplete immobility, whereby (apart of the influence of ε) the sons' position in their status distribution is fully determined by their father's position.

4 Estimation method

As we explained above, we estimate the intergenerational equation

$$y = \alpha + \beta x + A\gamma + u \tag{4}$$

by using the TS2SLS (two-sample two-stage least squares) estimator, which is asymptotically equivalent to the 2SIV (two-sample instrumental variable) estimator described by Angrist and Krueger (1992), Arellano and Meghir (1992) and Ridder and Moffit (2006). Both estimators are consistent under the assumptions described in Angrist and Krueger (1992). In particular both estimators are not consistent if the two samples used are not two independent random samples. Moreover, the instrumental

variables common to both samples have to be identically and independently distributed in the two samples.

Let Z be a set of proper instrumental variables for x, then we can estimate equation 4 by using a generalized method of moment estimator (or generalized instrumental variable estimator) based on the following conditions:

$$E((y - \alpha - \beta x - A\gamma)A) = 0 \tag{5}$$

$$E((y - \alpha - \beta x - A\gamma)Z) = 0 \tag{6}$$

Since the instrumental variable estimator is numerically identical to the two-stage least squares, [2] we can replace x with its best linear predictor in Z, say $\tilde{x} = Z(Z'Z)^{-1}Z'x$, and rewrite the population moment conditions as:

$$E((y - \alpha - \beta \tilde{x} - A\gamma)A) = 0 \tag{7}$$

$$E((y - \alpha - \beta \tilde{x} - A\gamma)\tilde{x}) = 0 \tag{8}$$

When combining two independent samples the instrumental variable and the least square estimators become respectively the 2SIV and TS2SLS estimators.

Let us consider two independent samples: the first one has data on fathers' log earnings, x, and their age, education and occupational characteristics, Z, which we call the supplemental sample; and the second sample has data on sons' log earnings, y, sons' and fathers' age and age square, A, and characteristics of their fathers, Z, which we call the main sample. Then the 2SIV estimator will be still based on the conditions 5 and 6 which can be rewritten as:

$$E((y - \alpha - A\gamma)A) - E(\beta x A) = 0$$

$$E((y - \alpha - \beta x - A\gamma)Z) - E(-\beta x Z) = 0$$

[2] The two types of estimators produce mathematically the same estimated coefficients when using a single sample, their equivalence holds instead only asymptotically when combining two separate samples. In our estimation procedure we use the TS2SLS to estimate the intergenerational mobility equation, but we consider standard error properly estimated to take account of the replacement of x with its prediction, see Arellano and Meghir (1992).

where the first addends in the left hand sides can be estimated using the main sample and the second addends can be computed using the supplemental sample.

In the empirical application we combine the supplemental and the main sample by using the TS2SLS estimator. In the first step we use the supplemental sample to estimate a log earnings equation for fathers using as explanatory variables their characteristics, Z, that is

$$x = Z\delta + v \tag{9}$$

In the second step we estimate the intergenerational mobility equation 4 by using the main sample and replacing the unobserved x by its predictor, $\tilde{x} = Z\tilde{\delta}$, where $\tilde{\delta}$ are the coefficient estimated in the first step while Z are the variables observed in the main sample. This method can be viewed as a cold-deck linear regression imputation. Cold-deck refers to the fact that an external data source (the supplemental sample) is employed to estimate the coefficients used to impute the missing x in the main sample. This method was first proposed by Klevmarken (1982).

The choice of the instrumental variables in some previous papers that estimate intergenerational mobility combining two different datasets was dictated by the few variables available. Björklund and Jäntti (1997) use father's education and occupation. Grawe (2004) uses only the education levels, while Fortin and Lefebvre (1998) uses only 16 occupational groups, which, as the author admit, can affect the quality of the imputation of earnings for fathers. One of the exceptions is Lefranc and Trannoy (2004) who use instead 8 different levels of education, 7 occupational groups and age. In Ermisch and Nicoletti (2006), the set of candidates as instrumental variables is also quite large and they try different combinations of the instrumental variables available.

As emphasized by J. Bound and Baker (1995), when the instrumental variables are weakly correlated with the variable to be instrumented, "[...] then even a weak correlation between the instruments and the error in the original equation can lead to a large inconsistency in the IV estimates." This suggest choosing instruments such that the R^2 of the imputation regression be as higher as possible.

Nevertheless, in our case, in contrast to J. Bound and Baker (1995), the variable to be instrumented, the fathers' log earnings x, is exogenous or at least assumed so. In other words x is independent of u and u is independent of v. Under this assumptions,

the ordinary least squares (OLS) estimation of the intergenerational mobility equation produces consistent estimators. The reason why we use the TS2SLS estimator is to combine two separate samples to solve the problem of missing x. The consistency of the TS2SLS (2SIV) estimator requires that $\tilde{x}$ be exogenous. In the following we compute the asymptotic potential bias of the TS2SLS(2SIV) estimator for the coefficient β when $\tilde{x}$ and u are not independent. Since we are considering an asymptotic result, we can replace $\tilde{x}$ with its limit in probability $Z(Z'Z)^{-1}Z'x = P_z x$

Ermisch and Nicoletti (2006) also discuss what happens when the instruments are endogenous. They arrive to the conclusion that the well-known rule for the choice of the instruments still applies. Instruments should be independent of u, that is such that $\lambda_2 = 0$, and with maximum multiple correlation with x, that is such that R^2 be maximum.

5 Data Sources and Sample Selection Rules

We combine two separate samples to estimate intergenerational mobility, a main sample and a supplemental sample.

In our case, the main sample is the Survey of Living Conditions (Encuesta de Condiciones de Vida (ECV)) for the year 2005, that is the Spanish component of the European Union Statistics on Income and Living Conditions (EU-SILC).[3]

The ECV has annually interviewed a representative sample of about 14,000 households, keeping each household 4 years in the sample. Personal interviews are collected, at approximately one-year intervals, for adult members of all households.

From ECV we have information about son's earnings and a set of characteristics of their fathers when the children were between 12 and 14 years old.

My supplemental sample is the Household Budget Survey of 1980-1981 (Encuesta de Presupuestos Familiares). This survey was designed with the aim of estimate consumption and the weights of the different goods used in the consumer index price.

[3]The EU-SILK is an instrument aiming at collecting timely and comparable cross-sectional and longitudinal multidimensional microdata on income, poverty, social exclusion and living conditions. This instrument is anchored in the European Statistical System (ESS). The EU-SILC was launched in 2004 in 13 Member States (BE, DK, EE, EL, ES, FR, IE, IT, LU, AT, PT, FI and SE) and in NO and IS. This first release of the cross-sectional data mainly refers to income reference year 2003 with a fieldwork carried out in 2004. The EU-SILC will reach its full scale extension with the 25 Member States plus NO, IS in 2005. It will later be completed by TR, RO, BG and CH.

But, we also have, for the head of household, information about earnings, occupation and education level. Thus, in this sample we have data on the same set of fathers' characteristics as we have in the main sample and their earnings.

Although we have the same characteristics in both samples, we have to recode some variables to have an homogenous classification across surveys [4].

We consider the main sample given by individuals, either head of household or spouse of the household head, born between 1955 and 1975, self-employed or in paid employment, who report positive labour earnings and they are full time workers. Thus, in the year 2005 they were between 30 and 50 years old and they are 12 or 14 years old between 1969 and 1989. This is the reason I use the Household Budget Survey of 1980-1981 as supplemental sample.

We suppose that when the child are 12 or 14 years old, the fathers are between 37 and 57 years old. Thus, when we estimate the earnings father's regression we select males between those ages.

After the exclusions, I have a total of 4352 pairs and in this sample I have fathers and children employed that reported a positive earnings.

The earnings variable I use in all the specification is the log of current gross annual earnings which is almost directly collected (not imputed) and is not distorted by the national taxation systems.

6 Results

In this section we present the empirical results on intergenerational mobility estimation. As explained before, I use a two-sample two-stage estimation which first step consist on the estimation of the father's earnings regression using the supplemental sample. The results of this regression are presented in table 1. Then, this coefficient are used to impute fathers' earnings in the main sample. I have the same characteristics in both samples (the main and supplemental) and I also have the coefficients from the supplemental sample, thus, we can estimate an earnings for each father in the main sample.

Table 2 reports the second step, the coefficients of the intergenerational regression

[4]For a detailed description of the recode of the variables see the appendix

Table 1: First step: estimates of father's earnings equation

	log salary
age	0,0571 (0,0211)
age2	-0,0006 (0,0002)
educ1	0,1873 (0,0148)
educ2	0,3919 (0,0276)
educ3	0,5254 (0,0326)
educ4	0,5581 (0,0487)
educ5	0,8455 (0,0281)
occup2	-0,4381 (0,0404)
occup3	-0,0753 (0,0986)
occup4	-0,0913 (0,0279)
occup5	-0,3158 (0,0320)
occup6	-0,8155 (0,0306)
occup7	-0,1395 (0,0300)
occup8	-0,2009 (0,0298)
occup9	-0,3177 (0,0285)
Constant	11,9961 (0,4918)
Obs	5929
R^2	0,402

Note: standard errors in parentheses. Regressors are education: none (reference), educ1=primary education, educ2=secundary education (first step), educ3=secundary education (second step), educ4=vocational qualification and educ5=higher education, university; occupation: Higher-grade professionals (reference), occup2=higher-grade manager, administrators, occup7=skilled manual workers, occup8=lower-grade technician, occup9=unskilled workers.

between annual earnings for children (sons and daughters) and fathers' earnings. In both regressions, father's predicted log earnings has a significant positive effect on child's earnings.

We estimate the correlation for sons and daughters for two different cohort, those whose age are between 30 and 40, and also for the cohort born between 1955 and 1965, those who are between 40 and 50 in 2005. For sons (first and second columns), regression coefficients are around 0,40 and for daughters (third and fourth columns)

Table 2: Second Step: Intergenerational regression in annual earnings

	sons 30-40	sons 40-50	daughters 30-40	daughters 40-50
father's earnings	0,380 (0,042)	0,427 (0,041)	0,504 (0,066)	0,582 (0,061)
age	0,140 (0,005)	0,022 (0,005)	0,028 (0,008)	0,010 (0,008)
Constant	4,258 (0,596)	3,315 (0,605)	1,829 (0,936)	1,513 (0,895)
Obs.	1334	1322	875	821
R^2	0,061	0,08	0,072	0,10

Note:Dependant variable is log of annual labor earnings. Fathers earnings refers to the log of father annual labor earnings. Robust standard errors in parentheses.

are around 0,54.

We observe smaller correlation for the younger cohorts. I have two hypothesis for this fact, the first one, is that for younger cohort we do not observe the permanent earnings because they are at the beginning of the working career. The second hypothesis is that in Spain the intergenerational mobility has been increased. The younger cohorts are less correlated with the father earnings.

Comparing the estimates for sons and daughters we obtain a higher correlation for daughters. This result should not be surprising. We have to remember that our sample is restricted to full time workers and the increase of participation of woman in the Spanish labour market began at the end of seventies. It is intuitive that in older women workers are probably more common in some types of household (high educated household or very poor household), thus the correlation is higher.

Since women are getting more and more independent form a financial point of view and the women role is changing, this argument seem less relevant.

Our estimation of intergenerational earnings mobility in Spain can be compared to results obtained for other countries. However, when we want to compare our results, we should be aware of the potential impact of differences in the definition of the children's sample and the estimation method applied.

For example, in the US case, the correlation range from 0.13 to 0.61 depending on the study considered. Solon (1999) provides an extensive survey of the US results obtained in the nineties and conclude: "all in all, 0.4 or a bit higher also seems a reasonable guess of the intergenerational elasticity in long-run earnings for men in the United State". This conclusion is obtained in studies using multi-year averages of father and child earnings, computed from panel data, as a measure of individual permanent income.

? using long panel of social security files, he point out that the larger the time used to average the earnings, the higher is the intergenerational elasticity. For example, averaging earnings over a period of 16 years leads to an elasticity of 0.613.

A good benchmark for comparing our results to the estimation for other countries is provided by **?**, a study that appears very close to ours, both in terms of the sample definition and the method used. Their results show an elasticity of 0.52 for the United State and 0.28 for Sweden. Ermisch and Nicoletti (2006) applying the same methodol-

ogy for Britain, obtain an elasticity of.....In the same way Lefranc and Trannoy (2004) find an an elasticity of.....for sons and ....for daughters. Thus, comparing these results with our estimations for Spain, we observe that Spain presents less intergenerational mobility than France, Sweden and Britain but less than the United State.

One possible explanation why Europe show more intergenerational mobility than the United State is the way higher education is financed. In Spain, France, Sweden the access to higher education is free, while in the United State payment of tuition may be a problem for poor household, even if generous grants are available for bright students.

But clearly this is not a definite answer, our result should be confirmed and bettered using more years of the main sample to obtain a more permanent sons' earnings.

Evidence available for other countries and surveyed by **?** suggest a rather high degree of intergenerational mobility in Finland (**?**) and Canada (**?**), where the elasticity is around 0,2 or lower. There is some empirical evidence for Germany (see **?**) that express a similar correlation with the United State.

Overall, we find an intergenerational correlation for Spain that rank between a group of more mobile societies including Nordic countries, Canada and Britain and a group of less mobile countries composed by the United States. We find an elasticity that is similar to France.

7 Final remarks

In this paper I present the first analysis in the intergenerational earnings mobility to Spain for sons born in a long period and in the adults life. Since there are not Spanish survey with information on sons and their fathers' earnings covering a long period, we consider two samples: a main sample containing information on sons' earnings and a set of characteristics of the fathers and a supplemental sample with the same characteristics for the fathers and their earnings. We combine the two samples by using the two-sample two-stage least square estimator described by Arellano and Meghir (1992)

Our preliminary estimation results suggest that intergenerational mobility increase when we move to younger cohorts. Further more, when we compare the estimation

for sons and daughters, we find more mobility for sons. One possible explanation, since our sample is restricted for sons and daughters full time workers, is perhaps full time women workers for the older cohort are probably more common in some types of household (high educated household or very poor household), thus the correlation is higher.

However, when we analyse the younger cohort, the coefficients are more similar between sons and daughters.

Comparing with other countries, we find that Spain show a degree of intergenerational earnings mobility that is similar to France, lower than the Nordic countries and Britain and higher than the United State.

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