Inequality of Income and Inequality of Opportunity In Spain

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Abstract

The paper aims to take into account the responsibility-sensitive measure of economic inequality proposed by Roemer. Therefore, we propose to explain the acquisition of income by two kinds of determinants: the circumstances which are beyond the control of the individual and the effort factors which are under the individual's control. In this way, we estimate inequality of opportunity of labor income, its main determinants, and its evolution over the life-cycle. To that end we estimate wage equations for both men and women and by dividing into two age cohorts. The Heckman procedure reveals selection bias for women. Then we measure the extent to which inequality of opportunity accounts for labor income inequality in Spain, both for gross and net labor earnings, and assess the contribution of each circumstance.

1 Introduction

To assess the distribution of resources among the members of a society, one option is to rely on egalitarian theories. In such a case, the departure point is that inequality is not desirable per se, so the more equal a society is, the fairer it is. Any level of inequality is viewed as an obstacle for the realization of principles of fairness. In addition, ranks between countries in terms of economic inequality are also ranks of countries in terms of the realization of goals of social justice.

However, we can observe that no country claims to be totally egalitarian. Most of them claim to have reduced economic inequality. The question is to define such a limit. Indeed, egalitarian policies have been criticized on the basis of several types of arguments. First of all, unequal rewards are useful signals of relative scarcity, so they are necessary in the efficient management of

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resources. Also, unequal rewards give information but also offer incentives to the individuals to produce the adequate effort to achieve their ambitions. Without extending the list of these arguments, it remains noticeable that inequality plays an essential role in our liberal societies.

Nevertheless, the notion of equality remains appealing. In liberal and democratic societies with such wide spread inequalities, there is a real and constant claim to limit economic inequality. That is why both economists and philosopher tend to establish various concepts to reconcile both tendencies in a coherent framework. The key problem is that individuals can accept inequalities in some areas but cannot accept them in others. To disentangle this apparent paradox, it seems to be instructive to scrutinize the history of inequality between individuals.

Put simply, economic inequality must be assessed on the basis of its determinants. What matters is the formation or history of inequality. If inequality can be explained by factors we consider as an acceptable reason for generating inequality, so we need not be concerned about this part of inequality. On the contrary, inequality due to factors that can be considered as unfair should be eliminated.

Equality of opportunity is the name progressively given to these theories that investigate how to combine inequality with principles of fairness. Precisely, it is the concept that reconciles equality with a responsibility-sensitive approach. The idea is to evaluate the determinants of the distribution of resources and not the distribution per se. In fact, the term "equality of opportunity" groups a lot of different and sometimes rival theories: the capabilities approach, the discrimination literature and also branch of the intergenerational mobility studies can be considered as many branches of the equality of opportunity concept. But what makes them similar is this preoccupation with reconciling equality ambition with a concern for individual responsibility.

What are their implications for the empirical field? The equality of opportunity approach has been extensively applied in some countries such as Brazil [13][14], France [33], Italy [17] and the United States [45]. This list is far from being exhaustive but it shows the growing interest in this approach and at the same time, the scarcity of empirical measurement.
Indeed, plenty of studies exist in the field of economic inequality measurement but very few studies have considered the case of Spain in assessing the extent of inequality of opportunity. That is why the focus is given to the evaluation of inequality of opportunity for labor income in Spain.

First of all, one theoretical definition of equality of opportunity has to be selected. The choice of Roemer's proposal is explained in the following section. Then, the measurement strategy partly follows the methodology advanced in the paper by Bourguignon et al [13][14]. It consists in the estimation of a wage equation by two kinds of factors: those which are under the individual's control and those that are beyond their control. Then, it develops a strategy of inequality decomposition to rank the factors that have more impact of inequality of opportunity. This paper adapts the estimation for the Spanish case. But we also produce an evaluation of inequality of opportunity for both gross and net

earnings. In this way we can compare how much the market produces inequality of opportunity but also, how much the state achieves to reduce it.

Therefore, Section 2 proposes a non-exhaustive review of the evolution of the concept of equality of opportunity, and a special emphasis is placed on Roemer's proposal [43][44]. In Section 3 an overview of the main empirical challenges in measuring inequality opportunity is given to explain the strategy used in the present paper. Section 4 presents the data and methodology. In Section 5 are grouped the main results. Finally, section 6 summarizes the results and presents the conclusion.

2 Defining the scope for equality of opportunity

2.1 A review of the issues raised by the concept of Equality of Opportunity

As mentioned in introduction, one of the theoretical ambitions in equality of opportunity issues is to make acceptable inequalities in a society driven by fairness principles. A first step has been made, through anti-discrimination legislation. By avoiding the arbitrary distribution of resources, attention is paid to the notion of merit. A society is fair if it shares positions and advantages only on the basis of merit.

The problem is that merit can be biased by family background. For example, a doctor's son can be better prepared to become a doctor than a farmer's son because he has grown up in an environment that helps to develop knowledge useful for this profession. That is why it is crucial to inspect the extent to which the individual is responsible for his talents. His talent would be partly due to natural talents and personal effort but the social component has to be taken into consideration. It explains why equality of opportunity theories develop a responsibility-sensitive approach.

At the same time, a parallel question to consider is what kind of outcomes a society should distribute among its members. If we want to compare two individuals, should we measure their welfare or their resources? Arneson [4][5] recommends a welfarist approach. But in the empirical field, measuring welfare is far from easy (Dworkin[20][21]). So, because of the lack of compromise about an appropriate way of measuring welfare most of the authors measure equality of opportunity for some resources, such as wages, capital assets, education or any specific good or service. In fact, they also develop theories to justify the use of one specific correct benchmark for assessing equality of opportunity. Sen proposes to consider "functionings". Rawls defends the access to the "primary goods". The "functioning" concept enlarges our understanding of welfare in developing countries but it is still difficult to use successfully in developed countries [47]. It is not a reason to marginalize it but it explains its low use in empirical studies. "Primary goods" also enlarges the scope of redistribution by including liberty, goods and services necessary to assure self-respect. But

the "maximin" principle drawn up by Rawls consider neither the whole use of income distribution nor the responsibility issue in assigning resources. Nevertheless, these instruments highlight the limits of the income as the yardstick for equality of opportunity measurement.

The present research measures the equality of opportunity in Spain using labor income and does not consider other likely valuable dimension of welfare. In fact, even if people do not want to maximize their labor income, it remains convincing that an equality of opportunity policy should affect the distribution of labor income due to its importance in achieving personal ambition.

Also, to take into account the role played by social environment, theories focus on individual responsibility. To this extent, the equality of opportunity idea can be defined as a responsibility-sensitive egalitarianism. But the way of including responsibility consideration is plural (Arneson[5], Cohen[18], Dworkin[20], Fleurbaey[26], Roemer[44], Van de Gaer[37]). Each author highlights some particular solution in assessing a fair distribution of resources [1]. Here, to implement the equality of opportunity concept in an economic framework, we propose to consider the Roemer's methodology because it embraces some important advantages. It can include a large list of factors as contributors to the inequality of opportunity, it is a user-friendly theory for empirical measurement and it benefits from a large support among economic literature.

Finally, before entering the details of this approach, it is worth noticing that responsibility is far from being a perfect benchmark to define the frontier of acceptable inequalities. Indeed, it demands two kinds of principles, compensation and liberal reward, that cannot be always fulfilled at the same time (Fleurbaey, Maniquet[23]). Also, it does not solve the problem of luck in the formation of inequalities. Should we compensate for luck? This question remains open in the literature and is of major importance in empirical studies (Lefranc, Pistolesi, Trannoy[34]). So, Fleurbaey's[26] proposal to understand equality of opportunity in terms of freedom would give another instructive insight for the future understanding of the concept.

Here, the paper follows Roemer's proposal as a way to offer a measurement for the extent of the inequality of opportunity in Spain which can be reliable and commonly accepted to allow further international comparisons.

2.2 Roemer's proposal

Briefly, Roemer states that inequality in the acquisition of any result (such as wages, education) can be explained by two kinds of factors, those that are under the individual's control (denominated effort) and those for which the individual cannot be held responsible (denominated circumstances). So an equality of opportunity policy consists in compensating only for the effects of circumstances on the outcome, and not for the effects of effort. Under these conditions, the access to any outcome would only depend on effort variables. Inequalities are fair to everyone only if they rely on differences in the exercise of the individual's

[1] See Peragine [38] for a complete review of the literature

responsibility.

It should be noted that what is not a circumstance variable is by default an effort variable, so it embraces luck, innate talent, ambition and personal preferences. It seems to be correct not to remove inequalities due to individual preferences, but we can also be reluctant to accept they are not influenced by the family and social environment (Arneson [4]). In such a case, they should be included as a circumstance[2].

Here, we consider as circumstances only the variables which are certainly not under the individual control. So, the results can be interpreted as a lower bound for inequality of opportunity. Besides, it remains difficult to defend correcting the effect of natural talent on outcomes. Indeed, it would interfere with efficiency issues, also it would cause undesirable incentive changes and it would produce the "slavery of the more talented" in Rawls' terminology. That is why we have tried to correct the estimation for the effect of ability on effort variables, but we do not want to compensate for it.

Also, a main problem is the difficulty in observing effort variables and their consequences for equality of opportunity measurement. Achievements depend on circumstances and effort but effort is not always observable. Roemer proposes the following method to deal with this issue: A first step consists in defining a vector of circumstances that is the number of circumstances many people share and that represents a specific degree of facility of access to an outcome. Then, people with the same vector of circumstances are assembled in a single large group denominated types. The sum of all the persons of all the types is actually the society. Into each type, the differences between individuals are attributable to effort. And, by assuming the more effort an individual exercises, the better the result he gets, we can rank the persons according to their level of results, so this ranking is also a ranking of the individual effort. Therefore, the function of distribution of the result also corresponds to the function of the distribution of the effort. Besides, Roemer adds that two people have made the same effort if they are located at the same percentile of their respective distribution of income to take into account that effort also depends on circumstances. For example, if we use a scale for effort from 0 to 10. Roemer explains it is reasonable to think that a professor's son receives strong incentives to study because the culture at home is to be likely academically orientated, so the median level of the son's effort would be around six. But, a farmer's son would receive more incentives to work outside than to study; so, the farmer's son median effort would be more around four. So if we consider the level of effort, the professor's son should receive more outcomes because he exerts more effort. But by considering they are located in the same percentile of effort, here the 50 th percentile, they should receive the same outcome which appears a defensible argument. That is why it should be proper to use the location on the function of distribution rather than the absolute level of effort.

Hence, an equality of opportunity policy consists in equalizing achievements

[2]For a detailed reviewing of the problems of correlations between effort and circumstances variables, see Hild [31], Bourguignon, Ferreira, Menendez [14]

when individuals are located in the same percentile of their respective function of distribution. In case this request would be too demanding in terms of resources, Roemer proposes to maximize the minimum achievement the persons can reach when they are the worst in each type; such a proposition catches up with the "maximin" principle drawn-up by Rawls.

This idea has been translated in the empirical field, mainly by considering the whole distribution of income to assess the presence of inequality of opportunity (Lefranc, Pistolesi, Trannoy,[33] Peragine,[40]). Here, this idea is transferred by the use of income ratio proposed in Peragine and Checchi [17]. It allows inequality of opportunity to be shown by comparing the mean labor income for the 10th and 20th percentile of each type considered (table 13) and it is helpful to support the results produced by the estimation of the counter-factual wage equation.

Therefore, this study aims to track only the effects of the circumstances as defined by Roemer. An equality of opportunity situation means that circumstances do not have a significant effect on outcome. In case of inequality of opportunity, the effect of circumstance will be measured by taking into account its effect on relative effort.

3 Some empirical difficulties in measuring equality of opportunity

3.1 A precise goal for the measurement

Far from being exhaustive, the following division of the empirical field only intends to indicate how this study can be related to the empirical literature on equality of opportunity and to set out the goal pursued in the study. So, we propose to single out two main lines of empirical research according the question to which they answer.

The first question would be: Which factors are responsible for the inequality of opportunity among individuals? First, it is worth noticing that most of the studies evidence inequality of opportunity by using a single circumstance. In general father's education or father's revenues is used because of their high level of significativity (Lefranc et al [35], Roemer et al [45]). However, other circumstances have been shown to provide substantial information. For example, Betts and Roemer [9] show that skin color produces more inequality of opportunities than father's education in the United States. Also the educational environment can be significant. Waltenberg [49] proves how the socio-economic diversity in classroom effectively reduces inequality of opportunities in Brazil. Also, Schuetz et al [48] point out the impact of the educational structure. They scrutinize a series of countries and classify them according the numbers of pupils by classroom, day organization in the school, the year at which pupils begin to specialize. So they can rank which factors favor the equality of opportunity implementation for education and which ones hamper it.

A way to embrace a large array of circumstance variables in a single measurement of equality of opportunity was proposed by Bourguignon, et al [14] to measure inequality of opportunities for income in Brazil. They find different channels by which inequality of opportunities is produced for income acquisition (gender, family background, and race) and develop a strategy to rank them. It highlights the fact that inequality of opportunity is multidimensional in the factors that explain it. As we share this goal, we also follow this methodology. However, the selection of the circumstance and effort variables used in Bourguignon et al [14] has to be adapted to the Spanish case.

The second question would be: How to reduce inequality of opportunity? For instance, Aaberge, Colombino and Roemer [1] study how demanding is equality of opportunity in terms of tax and transfers in the United States. They use a welfare function in which risk-aversion is included to estimate labor supply function to assess the impact of taxes on incentives. They found that, in most of the cases, equality of opportunities requires lump-sum taxes. Using a methodology closer to Fleurbaey [22], Kranich [32] measures equality of opportunity with a set of opportunities, where each one defines a specific consumption level. In this way, he works out equality of opportunity conditions based on how many monetary transfers and taxes are necessary to erase differences in opportunities. The gap between the actual transfers and the hypothetical transfers is denominated "equal shadow wealth" and is a proxy to the inequality of opportunity. Maybe one study that forms a bridge between both lines of research is an article by Roemer et al [45] that studies eleven countries. For each one, they frame different types using the father's economic situation as a unique circumstance, they assess the income distribution by type, and they examine what tax and transfer combination maximizes the minimum wage at the first percentile of each income distribution function. The result is that equality of opportunity never occurs, only tax schedules of Sweden and Norway are closed to the theoretical requirements of equality of opportunity.

Obviously, our study is directly related to the first part of the literature. However, it has to be mentioned that signaling the factors responsible for the inequality of opportunity is a necessary first step before answering the second question. Furthermore, ranking the circumstances with the greatest effect on income inequality can be viewed as a useful instrument in giving some orientation for achieving inequality of opportunity reduction.

3.2 Strategy of estimation

Estimating a wage equation to assess equality of opportunity demands some precautions. Let us therefore turn to some estimation issues to introduce the main challenges to be addressed. Three major problems should be clearly defined. These are the role of luck in separating between acceptable and unacceptable inequalities, the endogeneity of the education variable, and the selection bias introduced by estimating a wage equation.

Luck should be directly discussed in empirical studies because it partly determines the magnitude of inequality of opportunity. Whether or not to com-

pensate for luck is still an open issue, and according to the adopted position, the criterion for equal opportunities also varies, as does the econometric strategy of measurement. The article by Lefranc et al [34] raises this issue by showing how the empirical conclusions depend on whether luck is an effort or circumstance variable. On the theoretical side, Fleurbaey [26] has contributed to this debate by pointing out how an intuitive idea of making no compensation for luck can have rather undesirable implications. In this way, he proposes a reformulation of the compensation principle to define equality of opportunity between people with unequal luck. Another valuable work by Alesina and Angeletos [2] has proved how belief in the role of luck directly influence the contribution of luck in income acquisition. Briefly, people who think that luck explained a major part of their income prefer a tax system with higher taxes and transferences. So belief in the role of luck contributes to shape the fiscal system. And because taxes cause distortions in the income distribution, it also enlarges the inexplicable factor contribution in income acquisition. In the end, the more luck is believed to explain income, the more it actually explains it (in this article luck is defined as the non-explanatory factors of income acquisition).

In our study, luck is included in the residual of the wage equation so this study does not reflect the alternative of compensating for luck. It makes up a second reason why the results presented can be interpreted as a lower boundary of the magnitude of the inequality of opportunity.

The second major issue is the possible endogeneity of the education variable. We calculate inequality of opportunity through the estimation of a wage equation as a function of effort and circumstance variables. The problem is that labor income is partly determined by natural talent or ability. As ability is correlated with education and wages, if the former is not observed, education variable is endogenous in our model. First strategies to resolve this problem consist in using a proxy for ability. Woessman [50] uses the score obtained in mathematical tests, Roemer (2003) uses IQ tests as a way to correct for the role of ability. Lack of such data prevents us from using this option. Another solution consists in reducing the sample to twins considering they possess the same ability (Behrman, [8]). But this information is not available for Spain. So, we could turn to the most common strategy: the Instrumental Variables (IV) method. However, Bound et al [12] show how the accuracy and consistency of the result precisely depend on the instruments we choose. Indeed, using IV with weak instruments produces more biased estimates than those obtained by OLS. That is why we compute all the necessary tests mentioned by these authors to ensure the correct use of the IV method. From the instruments used in the literature,and for which we have data, we first selct quarter of birth (Angrist and Krueger, [3]) education's mother (Card, [15]) and number of siblings (Dearden, [19]), but finally we only use the last two because they fit with the tests proposed by Bound et al [12].

Nevertheless, we find a higher return to schooling by using IV than by OLS method. Becker [6] explained the more talented people will choose a greater amount of human capital. If instruments erase the effect of ability, the return to schooling should be lower once corrected by IV. Card's [16] survey on IV

displays that most of the studies find higher return to schooling results by IV than with OLS method. Card [16] sheds light on the reason for such results. He explains that to the extent that instruments reflect more the cost of more schooling than its benefits, IV erases the effect of the lower cost of schooling. And, those who are more affected by a decrease in the cost of schooling are the less educated persons, who have a lower return to education. So, if we erase this precise effect, IV will reflect the return to schooling of those who have, before the reform, higher returns to schooling. So IV estimates may correspond to the return to schooling of the more talented and not the mean return to schooling of the whole population. So, IV is not a total satisfactory answer for endogeneity issue. The instruments used in this study can reflect the cost of schooling. Indeed, cost of schooling can be viewed as increasing function in numbers of sibling and decreasing in mother's education. And we find these expected relationships in the first stage equation, so our results are consistent with Card's interpretation.

Therefore we have preferred not to use IV results because until now, solutions to endogeneity seem to be worse than the problem itself. In the table 15 are the IV estimations but the final results will rely on OLS estimates in spite of their possible bias (tables 2, 3, 4). The reason also relies on Bourguignon et al [13] results. They estimate this possible bias by introducing a correlation parameter between education and noise disturbance to take into account the endogeneity issue. So, they estimate the wage equation by OLS without this parameter correlation, and estimate the same equation with this random correlation parameter with Monte Carlo estimation. They find very few differences in the parameters.

Our OLS estimates can be then interpreted as Card does: as a "conservative estimate of average casual effect of education for groups typically affected by supply-side reform". It means OLS results can reflect what happens for those with lower return of education. To the extent we are interested in unequal opportunity evaluation, it is likely that this population is also more affected by unequal opportunities so it is quite reasonable to use OLS.

Finally, wage estimation for women can suffer a selection bias. Indeed, labor market participation is lower for women than for men. As the estimation only considers positive wages, a correction of our estimation is necessary to reflect the fact that women, and possibly also men, choose to work only if the wage they receive is higher than their reservation wage . The Heckman procedure is adopted to face the possible selection bias of the model. We also refer to the literature to select the right instruments. The local unemployment rate is used due to the fact that labor participation is cyclical, and the negative sign we obtain confirms this hypothesis. Marital status is also included, and we also find that married women tend to work less than singles. Finally, we include the earnings received by the rest of the household. The hypothesis is the higher the earnings received by the other members, the less incentive the person has to work, and that is what we found. Mills Ratio is found to be significant for women, but not for men. However, we employ the Heckman procedure for both men and women because we check it does not really affect the OLS estimates

in case of not being significant.

The next section presents the data, the model of estimation selected under the considerations previously presented, and the decomposition methodology to measure the share of inequality of opportunity in the overall earnings inequality.

4 Data and methodology

4.1 Data Discussion

Data are from the Life Conditions Survey (LCS) realized in 2005 in Spain. Over a sample of 30.375 individuals, we select only individuals between 25 and 65 years old that declare themselves as workers and that have positive earnings, so the final sample includes 16447 individuals. By this way, we exclude students and retired people who also work. We estimate the real gross total labor income (w_g) as well as the real net labor income (w_n) by OLS for the reasons explained in the previous section. The explanatory variables are divided into two components: the effort (E_i) and circumstances (C_i) variables such as the estimation of the real labor income (let w_i be the gross or the net real labor income) has the following form:

$$ln\,(w_i) = \alpha_1 E_i + \beta_1 C_i + u_{1i} \tag{1}$$

Because we face a problem of sample selection, we use the Heckman procedure that takes into account the possible bias due to the endogenous labor force participation. It means to define a latent variable associated with work decision. We define $w*_i$ the latent variable. The observed variable w_i equals $w*_i$ when $w*_i$ is higher than zero but w_i equals 0 when $w*_i$ is equal or lower than 0. The latent variable can be expressed as

$$w*_i = aX_i + u_{2i} \tag{2}$$

Where X_i is a vector containing individual's characteristics that can explain the decision to enter the labor market. By using the Heckman procedure to account for the potential bias due to endogeneous labor force participation,, the wage equation can be rewritten as follows:

$$ln\,(w_i) = \alpha_2 E_i + \beta_2 C_i + \nu\lambda_i + u_{3i} \tag{3}$$

Where:

$$\lambda = \frac{\varphi(aX_i)}{\phi(aX_i)} \tag{4}$$

$\varphi(..)$is the normal distribution, and $\phi(..)$ is the normal cumulative distribution. λ is also known as the Inverse Mills Ratio. The instruments we use to estimate $w*_i$ perform quite well. Marital status, local unemployment rate and labor income earned by the rest of the household members are satisfactory instruments to explain work decision. In the result tables, we report λ estimates

and its significance level. For a question of space constraint, we don't report the results of the probit estimation but they are available upon request.

If we enter the details of the variable selection, first let's turn to the dependent variable. We estimate both real gross and real net labor earnings. But we do not consider capital earnings in order not to mix different dimensions of inequality of opportunity. Due to the more unequal distribution of capital earnings in Spain, we can suppose we are underestimating the overall inequality of opportunity for total earnings. The distinction between real net and gross earnings allows to compare how much the market itself generates inequality of opportunity with how much does the fiscal system shrink it.

To select the explanatory variables, a special attention has been paid to previous studies to include the most likely relevant variables. In Spain in terms of measurement of inequality of opportunity, apart from Rodriguez's study (2007) that uses a limited number of explanatory variables, no paper has been published on this precise issue. Nevertheless, many other studies can be helpful to make the circumstance variable selection. In the case of France, number of siblings, mother's and father's education are relevant variables as well as the labor market status (CSP in France, CNO in Spain). We can expect to find some relevancy of these three variables for Spain. In fact, numbers of sibling and mother's education are found to be strong instruments for IV, but in most of the case, they are not relevant in the structural model, neither is the mother's labor market status. So, we include as a circumstance variable, the maximal parents' years of schooling.
However, father's labor market status is usually considered as a proxy for father's economic position. In the LCS, a question refers to the presence of financial problems into the household during adolescence. We consider it is a better proxy for parents household wealth, that is why we can consider that father's years of schooling indicates for parental education and the dummy on financial problems indicates parental wealth. We also focus our attention on the United States (US) (Aaberge et al [1]). Skin color, race often are used and it would be appropriate to apply them to Spain where immigration has increased a lot in the past ten years. That is why we introduce a dummy on the individual's country of birth.

Differences in gender are also of main concern. Because we estimate wage equation for women and men we cannot estimate the gap in earnings between gender all the things being equal. However we can shed light on how circumstances and effort shape earnings inequalities in different ways depending on the gender we consider. Nevertheless in the decomposition analysis, we estimate an unique model for men and women, and we introduce a dummy for the gender. So that, we can measure the inequality of opportunity between men and women and its impact on earnings inequality.

On the other side, effort variable are most of the time shaped by circumstances, so we consider as necessary to explain and justify our choice for effort variable.
First, the analysis of the inequality between regions (as done in Checchi, Peragine [17]) may also be relevant here because the Spanish regional disparity is

quite significant. So, we introduce a dummy that informs on the region's GDP and also a dummy about the urbanization degree of the residence place. But the significativity of geographical variables is questionable. If the individual is considered as responsible for his choices concerning his place of residence, it is reasonable to include these variables into the effort component. However, low geographical mobility in Spain can be interpreted as the fact that individuals are partly constrained in their geographical choices.
By following Roemer's statement that circumstances are only the variables which are totally out of the individual control, the mains results will present the urbanization degree and the region of residence as an exogenous effort variable. Nevertheless, in the decomposition analysis, we will show what are their impact on the opportunity share of earning inequality if they would be considered as circumstances, so, we can measure the share of earnings inequality due to geographical variables.
Years of schooling are also considered as effort variable. Perhaps, up to a certain age, years of schooling are not under the individual control. But they are at least partly a question of choices, so that we interpret years of schooling as the individual investment in academic human capital.
Finally years of labor experience and labor market status [3] are interpreted as the professional human capital. Nevertheless, circumstances, such as family background but also economic environment can shape these decisions. Indeed, literature exists to determine if being employee is under or out of the individual control (Taylor, [46]). That is why, we will first consider them as effort variables, then as circumstance variables, in order to estimate the share of inequality of opportunity in the overall earnings inequality under these two opposite interpretations.

4.2 Estimation and decomposition

To evidence inequality of opportunity for real labor income (w_i) in Spain, we use the following variables. Our effort variables are: years of schooling(S), years of labor experience(E), years of labor experience squared($E2$), labor market status (LS), region of residence(R) and urbanization degree of the place of residence(U). Our circumstances variables are: parental schooling (PS), frequency of financial problems during adolescence (FP), and country of birth(CB)[4]. So we estimate with the Heckman procedure the gross real earnings(w_{gi}) and the net real earnings(w_{ni}):

$$\begin{aligned} ln\left(w_{gi}\right) = \alpha_{g1}S_i + \alpha_{g2}E_i + \alpha_{g3}E2_i + \alpha_{g4}LS_i + \alpha_{g5}R_i + \alpha_{g6}U_i \\ + \beta_{g1}PS_i + \beta_{g2}FP_i + \beta_{g3}CB_i + \nu_g\lambda_{gi} + u_{gi} \end{aligned} \tag{5}$$

[3] Years of labor experience is the number of years the individual declared having worked in earned jobs. And the labor market status is a dummy that differentiates between job-earners and employers.

[4] See table 1 for a detailed description of each variable

$$ln\left(w_{ni}\right) = \alpha_{n1}S_i + \alpha_{n2}E_i + \alpha_{n3}E2_i + \alpha_{n4}LS_i + \alpha_{n5}R_i + \alpha_{n6}U_i + \beta_{n1}PS_i + \beta_{n2}FP_i + \beta_{n3}CB_i + \nu_n\lambda_{ni} + u_{ni} \quad (6)$$

Equation (5) and (6) are simply the linear earnings equations (3) written out in full for gross and net real earnings. They allow us to evidence inequality of opportunity in case the parameters related to circumstance variables are significantly different from zero. And the comparison between the coefficients of the equations (5) and (6) reveals how much the Spanish fiscal system manages to reduce inequality of opportunity. Then, as we estimate this equation for men and women separately, we also be able to observe if there is any difference in the way circumstances and efforts shape earning inequalities for men and women. Last, we divide each gender group into two age cohorts. The first group assembles people between 25 and 44 years old and the second cohort includes people between 45 and 65 years old. So, we can also observe if there is any evolution through time of the inequality of opportunity. Main results are reported and detailed in the next section. They answer to the first goal of the study that is to assess the existence of some inequality of opportunity in Spain.

The second objective is to rank circumstances and to build an objective of inequality reduction based on the equality of opportunity theory. To work it out, we follow the methodology proposed in Bourguignon, Ferreira and Menendez [13] The idea is that inequality of opportunity would be erased if all the individuals shared the same circumstances [5]. So, we define a vector of equal circumstance for the sample. Then, we compute the counter-factual distribution of income, and we observe how much is reduction potential of income inequalities we would achieve in case of equalizing opportunities through an equalization of circumstances. Also, we can build an counter-factual income distribution by equalizing circumstance one by one, so, the more reduction we observe in terms of income distribution inequality, the more impacting is this circumstance in the formation of inequality of opportunity.

This methodology is also very interesting because the opportunity share of earnings inequality can be divided into two components: a direct effect of circumstance on earnings inequality and an indirect effect through which circumstance shape effort and so earnings inequalities. The total opportunity share is the sum of these two effects.

The total opportunity share of earnings inequality is defined as:

$$\theta = 1 - \left[\frac{I(\tilde{w})}{I(w)}\right] \quad (7)$$

$I(w)$ is an inequality index. Here we use the Theil Index and the Gini coefficient and compare the results we obtained with each index. $I(\tilde{w})$ is estimated by simulating a counter-factual distribution of labor income that is given by:

[5] This assertion is more than a necessary condition for equalizing opportunities, but it remains a useful tool to rank circumstance and establish some boundary for inequality reduction.

$$ln\left(\tilde{w}_i\right) = \hat{\alpha}\hat{E}_i + \hat{\beta}\bar{C} + \hat{\nu}\hat{\lambda}_i + \hat{u}_i \tag{8}$$

$\bar{C}$ is the cross-sectional sample mode[6]. $\hat{\alpha}$, $\hat{\beta}$, $\hat{\nu}$,$\hat{\lambda}_i$ and $\hat{u}_i$ were estimated in the equation (6) and $\hat{E}_i$ is estimated by:

$$\hat{E}_i = \hat{\gamma}C_i + \hat{\epsilon} \tag{9}$$

Where $\hat{}_i$, $\hat{}$ and $\hat{\epsilon}$ are obtained by estimating with OLS the effort variables in function of the circumstances variables. In total, we estimate three effort equations as follows[7]:

$$S_i = \hat{\gamma_1}C_i + \hat{\epsilon_1} \tag{10}$$

$$E_i = \hat{\gamma_2}C_i + \hat{\epsilon_2} \tag{11}$$

$$E2_i = \hat{\gamma_3}C_i + \hat{\epsilon_3} \tag{12}$$

So, the total opportunity share of earnings inequality accounts for the direct effect of circumstances on earning inequality and their indirect effect on shaping effort that impact on the final earnings inequality.

The direct effect is estimated as:

$$\theta_d = 1 - \left[\frac{I(\acute{w})}{I(w)}\right] \tag{13}$$

Where $I(\tilde{w})$ is estimated by:

$$ln\left(\acute{w}_i\right) = \hat{\alpha}E_i + \hat{\beta}\bar{C} + \hat{\nu}\hat{\lambda}_i + \hat{u}_i \tag{14}$$

Thus, the indirect effect is:

$$\theta_i = \theta - \theta_d \tag{15}$$

As we consider a society is more interested in equalizing net income than gross income, we only report the decomposition results for net labor income but, results for gross income are available upon request.

And, as a fair society should provide equal opportunities for income acquisition between men and women, we estimate this model including both men and women and we add a gender dummy to reflect inequality of opportunity in genders. So, we can also estimate the impact of gender on inequality of opportunity share.

We compute Gini and Theil coefficients for each actual and counter-factual earnings distribution to build the direct, indirect and total opportunity share of earnings inequality. Also, we begin by considering education, years of labor experience and labor market status and geographical variables as effort variables.

[6] See table 5 for a detailed description of this vector.

[7] Given that the estimation of the variables of region of residence, urbanization degree and wage-earner dummy in function of our circumstances were not satisfactory, we are constrained to consider them as exogenous effort variables.

Then, we equalize all the circumstances together and separately to rank them in terms of their impact on the overall inequality.

Then, we narrow step by step the scope of effort variables and we observe which are the implications in terms of reduction of inequality are.First, we measure the impact in inequality reduction of considering region and urbanization degree as circumstances.Then, we also consider years of labor experience and labor market status as circumstances.

The results are detailed in the following section.

5 How fair are earnings inequalities in Spain?

5.1 Evidence of inequality of opportunity

5.1.1 'Fair' Inequalities

Human Capital Components First, earnings equations (tables 2, 3 and 4) show that returns to schooling are increasing through time and are somewhat superior for women of the two cohorts. On the other hand, the return to schooling is inferior for net earnings than for gross earnings. It means that tax schedules reduce the effect of differences in schooling among individuals. If we consider education as part of the individual effort, we would conclude that taxes increase fair inequalities. But the schooling equations (tables 8, 11, 12) can lead to a different conclusion by shedding light on the determinants of schooling. It is noticeable that parental schooling and parental economic situation have a strong and significant effect on schooling. So what can previously appeared as a fair source of inequality should be questioned, on the contrary, by scrutinizing the determinants of efforts, we highlight the necessity to take into account the indirect effect of circumstances on earnings trough their impact on the individual effort.

Concerning the effect of labor experience, its impact is positive and not linear as expected. It has been measured as the number of years the individual declares he has worked in paid jobs, so it gives a reliable information of the return to professional human capital. We observe that return to labor experience are higher than return to academic human capital. However, for men, the return of labor experience is lower for the oldest cohort while it become higher for women. From this observation, professional and academic human capital appear not to be perfectly substitutable, labor experience is negatively correlated to higher educational achievement but their returns are different, return to professional human capital remains superior for all cohorts. It also reflects relative scarcity. Because the intercept in the schooling equation is strongly larger for the eldest cohort, we can point at the large expansion of academic human capital across cohorts. So, relative abundance of high academic human capital can also explain the decreasing return to schooling and the increasing return of professional human capital for the youngest cohorts.

Labor Market Status Concerning the individual's labor market status, the effect of being a wage-earner is strong, significantly positive, and become larger in the net income equation. But this result has to be interpreted with an extreme caution. In fact, the Statistics Spanish Institute highlights the self-employed workers have a strong tendency of under-declaring their earnings. And as wage-earner has a significant and positive impact on schooling, it may also cause an over-estimation of this coefficient.

We reproduce the estimation without this variable and we find similar but slightly higher coefficients for the rest of the parameters. In this way, we decide to keep such information in our estimations.

Geographical Variables With the highly urbanized place of residence as a reference, only living in a low urbanized region has a significant and negative effect on earnings for both men and women. But the negative impact decreases when considering net income. It occurs the same phenomenon with the economic level of the place of residence. Only living in a the region with a GDP larger than 105 per cent of the average Spanish GDP has a significant and positive impact on earnings. And tax schedules tend to reduce this impact. Although we correct for differences in regional price indices, it remains questionable to include these variables into the effort ones. Indeed, low geographical mobility in Spain points at how it may be difficult to move from a region to another one. So, following Fleurbaey's distinction between the reward and the compensation principle, people who moved have put forth an extra effort, so the reward principle demands for not correcting these inequalities. But if structural factors hamper mobility, compensation principle would demand to correct the inequalities between people coming from different regions. That is why this paper illustrates the difficulty of defining the scope of responsibility and the questions raised by the unsolved classification between effort and circumstances. Perhaps, to a full understanding of this question, it would be necessary to have information about the region where the individual was born and the age at which they moved if they did it, to establish if region of residence tend to be under the individual control or not. In this case, we could use a criterion used in the literature on poverty measurement. It is commonly accepted to assess that a person is poor in the access of a good if she cannot afford a good that most people have. In a similar way, we could say a person does not control her geographical place of residence if most people don't move from where they were born.

5.1.2 'Unfair' Inequalities

Family Background First, inequality of opportunities is observed through the effect of the family background. It is understood as the sum of parental schooling and the frequency of financial problems during the individual's adolescence. The first element can be viewed as the academic family background and the second one as the family economic position. If we turn to the academic family background, parental schooling has a strong and significant effect on earnings for men and women. It is noticeable that taxes don't reduce at all

this effect neither for the youngest nor for the oldest cohort for which the effect of parental schooling on earnings is larger.

If we turn to the schooling determinants (tables 8, 11, 12), we notice a decreasing transmission of academic human capital across generations. But the larger intercept can also participate in the explanation of this phenomenon. Indeed, between the two generations, the expansion of schooling should have impacted more on people with low parental academic background. So, the reduction of the impact of parent schooling on children schooling may not reflect only a reduction of the human capital transmission.

Then, family wealth is really crucial to explain children earnings. With a high frequency of financial problems into the household during the adolescence as the reference, having few or not facing at all these financial problems has a strong and positive impact of earnings and on schooling also. Moreover, family economic situation have a stronger effect on women. It may be that women suffer first the presence of economic problems. Poorest families would decide to invest less on their daughter's education rather than on their son's education. The persistence and transmission of economic problems through generation seems to be higher also for women. Here, tax schedules tend to decrease the effect of parental economic situation on women labor income but they widen this impact for men. So, we can conclude that tax and transfers distribution are not consistent for what an equality of opportunity policy demands.

Country of Birth Net and gross real earnings equations put into evidence equality of opportunity between people born in the European Union (EU) and people born in Spain. It occurs for men and women and for each cohort. This result can serve to demonstrate how the European policies to set up a single labor market for Europeans are being successful.

On the contrary, people who were born outside the EU suffer inequality of opportunities for income acquisition. Nevertheless, net income presents lower but still significant and negative coefficient related to being born outside the EU. It would mean that such inequality of opportunity is only partly corrected. And men from outside the EU suffer more inequality of opportunity than women from the same geographical origin.

Lack of more detailed information about the country of birth prevent us from more precise conclusions although the variety of immigrant origins in Spain would advocate for more information. Indeed, it would be instructive to make a difference between people from South America and people from Africa to see if supposed cultural similarity between South America and Spain would favor less inequality of opportunity or whether it widens them for the historical relationship of domination between these two regions. Anyway, schooling equations give some interesting indications. There is no significant differences in schooling between people born in Spain and people born in the EU. On the contrary, people between 45 and 65 years old born outside the UE tend to be more educated than Spanish natives while it is the opposite for the youngest cohort. So, the profile of the immigrants is significantly different from a cohort to another one.

The expansion of the education across natives can also contribute to explain this evolution in the relative educational profile of the immigrants.

To conclude, inequality of opportunity has been evidenced for income acquisition in Spain. The main sources of unfair inequalities are family background and country of birth. Gender inequalities are not yet assessed because we decide to analyze first how men and women can face different inequality of opportunities. In the next section, we account for inequalities of opportunity between gender. These previous results also shed light on the difficulty of establishing a frontier between effort and circumstances variables. Schooling determinants are mainly composed by circumstances. And geographical variable status is far from clear. Therefore, this paper tries to highlight the necessity to pursue further studies on the proper scope to give to responsibility. Finally, it is noticeable to see how tax and transfers mostly don't correct at all inequalities of opportunity. In some cases, they can widen them by enhancing the effect of parental economic situation, and sometimes they correct them in the case of the country of birth. But it remains reasonable to conclude that the fiscal system has not been implemented in order to be consistent with equality of opportunity requirements.

5.2 Impact of the circumstances

5.2.1 Ranking Circumstances

In order to rank circumstances in function of their impact on earnings inequality we proceed by equalizing circumstances separately and building the counter-factual income distribution we would obtained under the equalization procedure. We use the circumstance mode as the common equalized value of reference (see table 5). From the counter-factual income distribution we build, we report two inequality indices for each income distribution: the Theil and Gini indices. This choice relies on the idea that they are quite complementary, the former one gives more weight to the poorest, the latest gives an overview evaluation of the income inequality.

We can assume that the more Gini or Theil index reduces after equalizing one circumstance, the more this one contributes to inequality of opportunity. Here, we decide to use a common model for men and women in order to evaluate also the magnitude of the inequality of opportunity between genders (table 4). We measure the counter-factual income distribution due to the direct effect of circumstances on earnings and also their indirect effect. Each measurement reveals somewhat different conclusions (see table 14).

If we turn to the direct effect of circumstances, the ranking we set up from the most impacting circumstances to the least ones are: family background, gender, geographical variables and country of birth. But by measuring the total effect of circumstances, the ranking defines that gender is the circumstance with the greatest impact in terms of inequality of opportunity, then family background, the rest of the ranking remains stable. Differences are rather small but they can be easily understood. To the extent we build these income distribution with a

common model for men and women, we don't account for the higher return to schooling of women here. That is why the total effect of gender on inequality should reflect both phenomena so that. both the significant direct and indirect effects of gender on inequality magnify the amount of inequality of opportunity. In contrast, geographical variables and the country of birth have only a direct impact while the indirect effect is pretty small. These conclusions could be helpful to define a direction to give to policies that would reduce the factors that are responsible for inequality of opportunity. First, it is important to enhance policies in the education system to correct mainly the effect of family environment on the children's educational achievements. Then, about gender inequalities, women perform better at school, they have higher returns to schooling but men still earn more other things being equal than women, so it urges to focus policies on wage differences rather than on education system. And it may be necessary to correct the increasing disadvantage of men in terms of educational achievement for the youngest generation. Finally, if the Spanish labor market seems to offer equal opportunities for the European workers, people from abroad the EU still face significant inequalities of opportunities that the fiscal system don't manage to completely correct. So, both labor market policies and fiscal system reforms should contribute to reduce this unfair sources of inequalities.

5.2.2 Direct and Indirect impact of circumstances

The second and last objective of the paper aims at providing an estimation of how much inequality of earnings would be reduced if differences in circumstances were erased. Theil index show a bigger inequality of opportunity share than does the Gini index but they point at similar magnitude for the relative contribution of the direct and indirect effect of circumstances. Before presenting the results, it has to be noted that in this section, we also include as circumstances the geographical variables, the labor market status as well as labor experience. As previously explained, geographical variables may be constrained and low mobility in Spain constitutes a argument for including them in the scope of circumstances. And, we put together the last two variables relative to the individual's labor position in the sense they reflect the consequences of labor shock on individual's career. As we can assess the consequences of these shocks are not under the individual's control, it is quite defensible to observe their impact on inequalities if we equalize them among individuals.

First of all, direct effect is not always contributing more to unfair inequalities. If we only consider gender, family background and country of birth, the direct inequality of opportunity share represents 10% of the total observed inequality for the youngest cohort and 12% of the oldest cohort (table 14). While the indirect effect represents 15% of the total observed inequality for the first cohort and 11% for the latest. It is explained by the fact that family background has a strong indirect effect through the individual's education[8] . In total, only by considering the most obvious circumstance variables, total observed inequality

[8]See also the tables 8, 11 amd 12

measured with Theil index would shrink a 25% if differences in circumstances were erased. Gini index gives a smaller result, inequality would reduce a 13,1% for the first cohort and a 14,4% for the second cohort.

In terms of generations, in all the cases we have simulated, we observe a drop in the opportunity share of inequalities. Indeed, while the observed inequality is higher for the oldest cohort the opportunity share is inferior for this cohort. Therefore, we can conclude to a reduction across generations of the inequality of opportunity for income.

Now by including geographical variables, the direct effect becomes slightly superior to the indirect effect for the two cohorts. It is explained by the fact that geographical variable impact directly on wages and they affect indirectly education and labor experience in opposite direction. So once aggregated the indirect effect of circumstances on academic and professional human capital, the total indirect effect is quite small. The total potential reduction is about a 27% in total according to the Theil index and a 14% acoording to the Gini index once we include as circumstances geographical variables, gender, country of birth and family background.

Finally, if we equalize the amount of labor experience and their labor market status, the total opportunity share of earnings inequality slightly decreased about two points. A possible explanation is the following. This last case represents a income distribution where the only source of inequalities is due to differences in education. As labor experience is negatively correlated to education and has a positive return, it contributes to equalize income, so equalizing labor experience cause an increase in inequality levels.

This kind of result shows how inequalities are determined mostly by differences in schooling and by differences in factors that are certainly not under the individual control (Family background, gender and country of birth). So, these conclusions also tend to show that the potential reduction of inequalities is quite high in Spain and cannot be refuted by the problem of imprecision between which factors should be considered as individual's circumstances or effort components .

6 Summary and Conclusions

This paper has evidenced and quantified the role of inequality of opportunity in the income acquisition in Spain. First, we have shown the existence of inequality of opportunity through different channels. Not only family background but also gender and country of birth contribute to the formation of unfair inequalities as defined in this paper. At the same time, we highlight how the boundary between effort and circumstances is difficult to define. That is why this paper calls for more research in defining the proper scope of responsibility.

Then, it has been possible to define a ranking between the circumstances. In Spain, the two major sources of unfair inequalities are the family environment and the gender. Also, by considering their direct and indirect effect, we contribute to show how crucial is to understand the entire process by which unfair

inequalities are build. Circumstances impact on wages, but also on education as we have demonstrated. Other studies ([**?**]) point out how unfair are also health outcomes. These results show the necessity to pursue more empirical studies for a full understanding of the inequality of opportunity in all the individual spheres that contribute to well-being. A reproduction of this work would be interesting to test inequality of opportunity in Spain for other components of well-being.

The comparison between gross and net outcomes reveals how little tax schedules reduce inequalities of opportunities. On the contrary, they can widen them, it is the case for men for which the impact of family background increases at considering net earnings. Therefore, there is plenty of room for establishing fiscal and educational policies to decrease inequality of opportunity.

Finally, this objective of inequality reduction has been measured by building counter-factual distributions of income. We found that around a quarter of the total observed inequality could be eradicated if differences in circumstances were canceled. This condition is more than sufficient to establish equality of opportunity but can be a useful benchmark to determine a quantified objective of inequality reduction based on principles of fairness. In future research, it would be necessary to establish other criteria which would be sufficient and necessary to assess quantified objective for total inequality reduction based on equality of opportunity requirements.

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Table 1: Descriptive Statistics and Detailed Variables

Explicative Variables	Detailed information	Mean/ %	Stand. deviation
Years of schooling	linearized variable in function of the educational attainment declared by the individual	11.33	4.67
Years of experience	years the individual declared having worked in paid job	18.57	12.64
Years of experience squared	value of the variable years of experience squared	506.02	579.26
Labor market status	LS= 0 if the individual is self-employed or employer LS = 1 if the individual is a wage-earner	17% 83 %	
Region of residence	R= 1 is the individual leaves in a region whose PIB is inferior to 95% of the average PIB R= 2 is the individual leaves in a region whose PIB is between 95% and 105% of the average PIB R= 3 is the individual leaves in a region whose PIB is superior to 105% of the average PIB	42.40% 26.63% 30.97%	
Urbanization degree	U=1 if the individual lives in a low population density area U=2 if the individual lives in a medium population density area U=3 if the individual lives in a high population density area	47.73% 22.06% 30.21%	
Parents maximum years of schooling	Corresponds to the maximum years of schooling achieved between the individual's mother or father (linearized variable)	6.97	4.46
Financial problems during adolescence	F=1 if many financial problems during adolescence F=2 if occasional financial problems frequency during adolescence F=3 if no financial problems during adolescence	21.08% 39.76% 39.16%	
Country of Birth	CB= 0 if the individual was born in Spain CB= 1 if the individual was born in the rest of the European Union CB= 2 if the individual was born out of the European Union	93.52% 1.22% 5.26%	
Marital status	MS=0 if the individual is single MS=1 if the individual is married MS=2 otherwise	33.38% 60.70% 5.92%	
Local unemployment rate	Takes the value of the unemployment rate of the region of residence	11.05	3.47

Table 2: Gross Real Wage Equation OLS

Variables	Women 25-44	Women 45-65	Men 25-44	Men 45-65
Schooling	0.067	0.100	0.040	0.047
	(-17.31)	(7.64)	(12.08)	(14.77)
Labor Market Status(LS=0 omitted)	0.059	0.129	0.313	0.343
	(1.25)	(2.3)	(6)	(11.79)
Experience	0.079	0.107	0.080	0.047
	(-11.02)	(5.62)	(10.02)	(4.51)
Experience squared	-0.002	-0.002	-0.002	-0.001
	(-8.03)	(-5.63)	(-8.45)	(-4.1)
Region(R=1 omitted)				
R=2	0.086	0.066	0.060	0.049
	(-2.6)	(1.3)	(2.68)	(1.68)
R=3	0.174	0.130	0.155	0.131
	(-5.38)	(2.58)	(-6.47)	(4.44)
Urbanization(U=1 omitted)				
U=2	-0.023	0.023	0.020	-0.045
	(-0.67)	(0.42)	(0.85)	(-1.42)
U=3	-0.178	-0.103	-0.080	-0.209
	(-5.51)	(-2.05)	(-3.56)	(-7.27)
Parental Schooling	0.012	0.011	0.012	0.017
	(3.78)	(2.13)	(5.32)	(5.04)
Financial Problems (F=1 omitted)				
F=2	0.066	0.175	0.043	-0.006
	(-1.7)	(3.18)	(1.64)	(-0.19)
F=3	0.153	0.208	0.043	0.037
	(-3.76)	(3.58)	(3.66)	(1.15)
Country of Birth(CB=1 omitted)				
CB=2	-0.050	-0.195	0.020	-0.222
	(-0.52)	(-0.78)	(0.26)	(-1.44)
CB=3	-0.238	-0.254	-0.277	-0.368
	(-4.41)	(-2.41)	(7.1)	(-5.09)
constant	3.017	1.411	3.512	3.617
	(23.35)	(2.37)	(-21.1)	(17.91)
λ	-0.198	0.550	-0.550	-0.036
	(-2.43)	(-1.98)	(-0.29)	(-0.5)
Obs.	4600	3223	4741	3883
R2	0.28	0.36	0.22	0.25
Numbers into brackets correspond to the value of t-statistics				

Table 3: Net Real Wage Equation OLS

Variables	Women 25-44	Women 45-65	Men 25-44	Men 45-65
Years of schooling	0.061	0.090	0.036	0.043
	(16.48)	(7)	(10.91)	(13.39)
Labor Market status(LS=0 omitted)	0.227	0.343	0.450	0.490
	(5)	(6.12)	(8.7)	(16.74)
Experience	0.073	0.099	0.074	0.047
	(10.52)	(5.21)	(9.32)	(4.47)
Experience squared	-0.002	-0.001	-0.002	-0.001
	(-7.69)	(-5.2)	(-7.91)	(-4.23)
Region (R=1 omitted)				
R=2	0.081	0.045	0.042	0.037
	(2.55)	(0.9)	(1.89)	(1.25)
R=3	0.163	0.131	0.136	0.124
	(5.25)	(2.64)	(5.74)	(4.2)
Urbanization (U=1 omitted)				
U=2	-0.015	0.009	0.028	-0.038
	(-0.46)	(0.17)	(1.2)	(-1.18)
U=3	-0.166	-0.109	-0.071	-0.191
	(-5.36)	(-2.21)	(-3.2)	(-6.6)
Parental schooling	0.011	0.011	0.011	0.017
	(3.66)	(2)	(4.98)	(5.06)
Financial problems (F=1 omitted)				
F=2	0.055	0.168	0.040	-0.015
	(1.47)	(3.11)	(1.55)	(-0.53)
F=3	0.130	0.206	0.094	0.025
	(3.5)	(3.59)	(3.51)	(0.76)
Country of Birth (CB=1 omitted)				
CB=2	-0.039	-0.152	0.003	-0.182
	(-0.42)	(-0.61)	-0.04	(-1.17)
CB=3	-0.202	-0.203	-0.239	-0.332
	(-3.87)	(-1.96)	(-6.19)	(-4.57)
constant	2.853	1.320	3.333	3.351
	(22.87)	(2.23)	(20.23)	(16.51)
λ	0.213	0.505	-0.102	-14
	(2.71)	(1.82)	(-0.53)	(-0.19)
Obs.	4600	3223	4741	3883
R2	0.28	0.37	0.22	0.25
Numbers into brackets correspond to the value of t-statistics				

Table 4: Net Real Wage Equation for Both Women and Men OLS

Variables	25-44	45-65
Schooling	0.050	0.055
	(21.09)	(15.9)
Labor Market Status (LS=0 omitted)	0.384	0.450
	(14)	(16.95)
Experience	0.075	0.068
	(16.12)	(8.64)
Experience squared	-0.002	-0.001
	(-12.31)	(-7.89)
Region (R=1 omitted)		
R=2	0.060	0.046
	(3.22)	(1.82)
R=3	0.149	0.136
	(7.91)	(5.41)
Urbanization (U=1 omitted)		
U=2	0.008	-0.021
	(0.41)	(-0.74)
U=3	-0.108	-0.168
	(-5.83)	(-6.77)
Parental schooling	0.012	0.016
	(6.47)	(5.83)
Financial problems (F=1 omitted)		
F=2	0.048	0.041
	(2.19)	(1.55)
F=3	0.111	0.083
	(5.01)	(2.92)
Country of Birth (B=1 omitted)		
B=2	-0.021	-0.122
	(-0.36)	(-0.94)
B=3	-0.224	-0.284
	(-7.07)	(-4.83)
Gender	0.437	0.426
	(21.39)	(17.61)
constant	2.764	2.372
	(28.72)	(12.01)
λ	-0.07	0.082
	(-0.96)	0.91
R2	0.31	0.36
Numbers into brackets correspond to the value of t-statistics		

Table 5: Circumstance Reference Values

Circumstance Variable	Computed Value when equalizing circumstances
Parent maximum years of schooling	7 years
Financial problem during adolescence	Never
Country of Birth	Spain
Region of residence	PIB between 95% and 105% of the average PIB
Urbanization degree	medium
Years of experience	18
Individual labor marker status	wage-earner
Gender	man

Table 6: Years of Experience Determinants when Geographical Variables belong to "effort" OLS

Variables	25-44	45-65
Parental schooling	-0.335	-0.115
	(-20.03)	(-3.64)
Financial problems (F=1 omitted)		
F=2	-1.190	-2.072
	(-5.47)	(-7.07)
F=3	-1.114	-2.790
	(-5.07)	(-8.71)
Country of Birth (B=1 omitted)		
B=2	0.231	2.271
	(0.39)	(1.78)
B=3	0.149	-1.063
	(0.48)	(-1.4)
Gender (women omitted)	3.659	13.099
	(24.94)	(53.76)
constant	14.499	23.437
	(64.59)	(79.48)
Adj. R2	0.11	0.3
Numbers into brackets correspond to the value of t-statistics		

Table 7: Years of Experience squared determinants when Geographical Variables belong to "effort" OLS

Variables	25-44	45-65
Parental Schooling	-9.537	-10.766
	(-19.38)	(-6.22)
Financial problems (F=1 omitted)		
F=2	-35.010	-141.225
	(-5.47)	(-8.82)
F=3	-34.206	-186.115
	(-5.29)	(-10.63)
Country of Birth (CB=1 omitted)		
CB=2	2.564	110.065
	(0.15)	(1.58)
CB=3	-1.844	-91.668
	(-0.2)	(2.2)
Gender (women omitted)	100.910	637.759
	(23.37)	(47.88)
constant	272.168	780.082
	(41.19)	(48.4)
R2	0.1	0.26
Numbers into brackets correspond to the value of t-statistics		

Table 8: Schooling Determinants when Geographical Variables belong to "effort" OLS

Variables	25-44	45-65
Parental schooling	0.407	0.457
	(43.17)	(41.27)
Financial problems (F=1 omitted)		
F=2	0.840	0.801
	(6.8)	(7.85)
F=3	1.660	1.754
	(13.31)	(15.85)
Country of Birth (B=1 omitted)		
CB=2	-0.094	0.680
	(-0.28)	(1.54)
C	-0.514	1.212
	(-2.86)	(4.5)
Gender (women omitted)	-0.520	1.018
	(-6.25)	(12.12)
Constant	7.966	5.200
	(62.99)	(51.43)
R2	0.22	0.27
Numbers into brackets correspond to the value of t-statistics		

Table 9: Years of Experience Determinants when Geographical Variables belong to "circumstances" OLS

Variables	25-44	45-65
Region(R=1 omitted)		
R=2	0.928	0.851
	(5.01)	(2.81)
R=3	1.735	2.187
	(9.31)	(7.18)
Urbanization(U=1 omitted)		
U=2	0.423	0.295
	(2.18)	(0.89)
U=3	0.895	1.299
	(4.9)	(4.44)
Parental schooling	-0.339	-0.105
	(-19.91)	(-3.29)
Financial problems (F=1 omitted)		
F=2	-1.177	-2.101
	(-5.43)	(-7.19)
F=3	-1.208	-2.869
	(-5.52)	(-8.93)
Country of Birth (CB=1 omitted)		
CB=2	0.191	2.157
	(0.33)	(1.7)
CB=3	0.109	-1.191
	(0.35)	(-1.57)
Gender (women omitted)	3.661	13.135
	(25.07)	(54.07)
constant	13.437	22.035
	(49.97)	(58.18)
R2	0.12	0.3
Numbers into brackets correspond to the value of t-statistics		

Table 10: Years of experience squared determinants when Geographical Variables belong to "circumstances" OLS

Variables	25-44	45-65
Region (R=1 omitted)		
R=2	27.393	58.019
	(5.01)	(3.5)
R=3	41.184	117.237
	(7.49)	(7.04)
Urbanization(U=1 omitted)		
U=2	9.929	22.983
	(1.73)	(1.27)
U=3	26.973	86.108
	(5.01)	(5.38)
Parental schooling	-9.540	-9.920
	(-19.01)	(-5.69)
Financial problems (F=1 omitted)		
F=2	-34.881	-143.712
	(-5.46)	(-9)
F=3	-36.823	-191.194
	(-5.71)	(-10.89)
Country of Birth (CB=1 omitted)		
CB=2	1.713	102.894
	(0.1)	(1.48)
CB=3	-2.239	-95.600
	(-0.24)	(-2.3)
Gender (women omitted)	100.841	639.244
	(23.43)	(48.15)
constant	243.334	693.864
	(30.71)	(33.53)
R2	0.11	0.27
Numbers into brackets correspond to the value of t-statistics		

Table 11: Schooling Determinants when Geographical Variables belong to "circumstances" OLS

Variables	25-44	45-65
Region (R=1 omitted)		
R=2	0.134	-0.258
	(1.29)	(-2.5)
R=3	0.649	0.396
	(6.15)	(3.78)
Urbanization(U=1 omitted)		
U=2	-0.660	-0.775
	(-6.04)	(-6.82)
U=3	-1.174	-1.341
	(-11.42)	(-13.41)
Parental schooling	0.377	0.430
	(39.56)	(38.93)
Financial problems (F=1 omitted)		
F=2	0.852	0.847
	(6.97)	(8.41)
F=3	1.639	1.748
	(13.26)	(15.94)
Country of Birth (B=1 omitted)		
B=2	-0.155	0.798
	(-0.47)	(1.84)
B=3	-0.638	0.952
	(-3.58)	(3.58)
Gender (women omitted)	-0.506	1.046
	(-6.16)	(12.63)
Constant	8.479	5.874
	(56.58)	(45.87)
R2	0.24	0.29
Numbers into brackets correspond to the value of t-statistics		

Table 12: Schooling Determinants when Geographical Variables, Labor Market Status, Years of experience and years of experience squared belong to "circumstances" OLS

Variables	25-44	45-65
Experience	-0.065	0.237
	(-3.19)	(15.8)
Experience squared	-0.002	-0.005
	(-2.49)	(-17.43)
Labor Market Status (LS=0 omitted)	0.325	0.692
	(2.54)	(6.12)
Region (R=1 omitted)		
R=2	0.166	-0.176
	(1.55)	(-1.58)
R=3	0.726	0.431
	(6.72)	(3.83)
Urbanization (U=1 omitted)		
U=2	-0.643	-0.788
	(-5.72)	(-6.76)
U=3	-1.064	-1.317
	(-10.03)	(-12.07)
Parental schooling	0.337	0.421
	(33.56)	(35.7)
Financial problems (F=1 omitted)		
F=2	0.752	0.734
	(5.99)	(6.69)
F=3	1.503	1.587
	(11.85)	(13.27)
Country of Birth (B=1 omitted)		
B=2	-0.120	0.806
	(-0.35)	(1.75)
B=3	-0.509	0.643
	(-2.76)	(2.3)
Gender (women omitted)	-0.277	0.751
	(-3.18)	(7.03)
Constant	9.741	3.639
	(40.53)	(15.03)
R2	0.26	0.32
Numbers into brackets correspond to the value of t-statistics		

Table 13: Income Mean Ratios

Types	Income mean ratio for the 10th percentile of the distribution of income of each type	Income mean ratio for the 25th percentile of the distribution of income of each type
Men/Women	1.94	1.79
Born in the EU/ Born outside the EU	1.21	1.2
Whose father studied more than 11 years / Whose father studied less than 3 years	1.66	1.62
Whose father studied more than 11 years / Whose father studied less than 6 years	1.28	1.03
From a region whose GDP is higher than 105% of the average GDP / From a region whose GDP is lower than 95% of the average GDP	1.38	1.32
From high population density area/ From low population density area	1.31	1.31

Table 14: Effect of Equalizing Circumstances

Index inequality after equalizing circumstances	Theil 25-45	Theil 45-65	Gini 25-45	Gini 45-65
Total observed inequality	0.198	0.239	0.336	0.368
Direct effect of equalizing circumstances				
if only "family background"(FB) is equalized	0.187	0.222	0.327	0.353
if only "country of birth"(CB) is equalized	0.192	0.236	0.332	0.364
if only "gender"(G) equalized	0.189	0.227	0.331	0.36
If FB, CB, G are equalized	0.178	0.21	0.321	0.344
share	0.10	0.12		
If FB, CB, G and geographical variable (GV) are equalized	0.173	0.2	0.316	0.338
share	0.13	0.16	0.060	0.082
If FB, CB, G, GV, wage-earner dummy and labor experience are equalized	0.179	0.211	0.32	0.335
share	0.10	0.12	0.048	0.090
Total effect of equalizing circumstances				
if only "family background"(FB) is equalized	0.166	0.215	0.309	0.345
if only "country of birth"(CB) is equalized	0.171	0.231	0.314	0.357
if only "gender"(G) equalized	0.158	0.2	0.302	0.33
If FB, CB, G are equalized	0.148	0.183	0.292	0.315
share	0.25	0.23	0.131	0.144
If FB, CB, G and geographical variable (GV) are equalized	0.145	0.18	0.289	0.312
share	0.27	0.25	0.140	0.152
If FB, CB, G, GV, wage-earner dummy and labor experience are equalized	0.147	0.197	0.3	0.311
share	0.26	0.18	0.107	0.155
Indirect effect of equalizing circumstances				
share if FB, CB, G are equalized	0.15	0.11	0.080	0.071
share if FB, CB, G and geographical variable (GV) are equalized	0.14	0.08	0.092	0.063
share if If FB, CB, G, GV, wage-earner dummy and labor experience are equalized	0.16	0.06	0.060	0.065

Table 15: Net Real Wage Equation IV estimation

Variables	25-44	45-65
Schooling	0.092	0.083
	(8.27)	(5.6)
Wage-earner dummy	0.222	0.243
	(7.78)	(7.17)
Experience	0.096	0.053
	(15.57)	(7.39)
Experience squared	-0.002	-0.001
	(-1.57)	(-4.12)
Region (R=1 omitted)		
R=2	0.064	0.066
	(3.17)	(2.47)
R=3	0.130	0.127
	(6.04)	(4.89)
Urbanization (U=1 omitted)		
U=2	0.013	0.009
	(0.63)	(0.3)
U=3	-0.088	-0.138
	(-3.82)	(-3.94)
Parental schooling	0.002	0.010
	(0.45)	(1.42)
Financial problems (F=1 omitted)		
F=2	0.106	0.017
	(2.51)	(0.43)
F=3	0.132	0.054
	(3.22)	(1.28)
Country of Birth (CB=1 omitted)		
CB=2	-0.012	-0.138
	(-0.2)	(-0.92)
CB=3	-0.243	-0.365
	(-6.28)	(-4.66)
Gender (women omitted)	0.491	0.427
	(28.2)	(16.49)
constant	3.170	0.290
	(7.9)	(0.23)
R2	0.28	0.35
Numbers into brackets correspond to the value of t-statistics		