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Estimating labour income-based inequality of opportunity for a selection of EU-SILC countries: national and urban-rural perspectives

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ABSTRACT

This paper measures the extent of inequality of opportunity at the national level and by degree of urbanization. Using data from the European Union Statistics on Income and Living Conditions (EU-SILC), we implement regression models to measure the share of the variation in individual's labour income that is due to uncontrollable circumstances, namely the relative importance of parental education, activity status of parents, occupation of father, and household financial situation. Our results indicate that the level of inequality of opportunity at the country-level ranges between 5% and 26% for the sample of countries studied. The analysis by degree of urbanization does not provide evidence of cities as social elevators compared to less urbanized regions.

KEYWORDS

EU_SILC, labour income inequality, inequality of opportunity, urbanization

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1. INTRODUCTION

The concept of inequality of opportunity originates in the philosophical foundations laid down by Rawls (1971), Dworkin (1981), and Sen (1985). Their insights gave rise to the distinction between ethically acceptable and unacceptable sources of inequality. If inequalities in socioeconomic outcomes result from individuals' own effort and merit (e.g., if they study more or work harder), it would be fair and ethically acceptable that these individuals have better outcomes (e.g., a better job and pay). In contrast, if inequalities in socioeconomic outcomes result from individuals' circumstances (e.g., family background, race), they would be ethically unacceptable because they reflect individuals' luck in having been born in wealthy family backgrounds with better socioeconomic prospects. In this sense, the problem is not so much the inequality in outcomes amongst individuals, but rather whether it results from unequal access to opportunities amongst individuals with similar levels of effort and merit.

The aim of this paper is to measure the extent of inequality of opportunity at the national level and by degree of urbanization for the countries covered in the survey European Union Statistics on Income and Living Conditions (EU-SILC).¹ Using the EU-SILC data, we implement regression models to estimate the percentage of the variation in individual labour income that is due to uncontrollable circumstances, namely, parental education, activity status of parents, occupation of father, household financial situation as well as individual's more deterministic characteristics such as age and gender. In addition, we estimate the relative importance of each circumstance variable or group of variables by applying the Shapley decomposition.

¹ This level of territorial disaggregation is determined by EU-SILC data availability.

To the best of our knowledge, this is the first research study on inequality of opportunity by degree of urbanization and is a first attempt to explore whether large(r) cities play the role of social elevators compared to smaller urban and rural areas. As 72% of the EU-28 population live in cities and urban areas, it is important to investigate to what extent the growing income inequality in cities may result from the unfair distribution of opportunities between individuals.

Our results indicate that the level of inequality of opportunity at the country-level ranges between 5% and 26% for the sample of countries studied. The analysis by degree of urbanization does not provide evidence that (larger) cities are social elevators, compared to other less urbanized and rural areas.

The structure of the paper is as follows. In the next section, we give a brief overview of the conceptual framework and previous studies of inequality of opportunity. Then, our empirical strategy and data are described. We subsequently present and discuss the results from the regression models. The paper concludes by highlighting the key findings.

2. OVERVIEW OF RELEVANT LITERATURE

2.1 Approaches to the measurement of inequality of opportunity

In order to translate the distinction between ethically acceptable and unacceptable inequality into empirical models, Roemer (1998) introduces the terms of *effort* and *circumstances*. Using these two categories, Roemer partitions a given population into types and tranches. Types are defined as groups of individuals sharing the same set of circumstances (e.g., family background, age, gender). Hence, outcomes of individuals within a specific type are assumed to be solely due to effort. Tranches, on the other hand, are referred to as parts of the

population exerting the same effort regardless of circumstances. With these categories in mind, Roemer implicitly presents equality of opportunity as a state in which the outcomes of those belonging to the same tranche are equal. This is called a strong definition (Ferreira and Gignoux, 2011; Brunori, 2016) and corresponds to the ex-post approach to inequality of opportunity (Roemer, 1998; Fleurbaey, 2008). In this case, inequality of opportunity is identified by comparing outcomes within tranches.

The ex-post approach to inequality of opportunity shows, however, serious methodological limitations, which are associated with sample sizes often too small to allow estimating type-specific distribution functions, especially when the number of types is large (Ferreira and Gignoux, 2011). To deal with this problem, a 'weak equality of opportunity' criterion was specified giving rise to the ex-ante approach to the measurement of inequality of opportunity. According to this approach, inequality of opportunity is equivalent to inequality between types, i.e., inequality between groups sharing the same circumstances (Van de Gaer, 1993; Peragine, 2004). This considerably facilitates the procedure of measuring inequality of opportunity, as it does not require the measurement of efforts and nor the comparisons of the same effort percentiles across various types of circumstances (Ferreira and Gignoux,

2011)).²³

2.2 Overview of empirical studies

There are a series of studies looking at inequality of opportunity. Brunori et al. (2013) present outcomes of eight studies carried out using the ex-ante approach – both in its non-parametrical and parametrical variants. It is clearly shown that factors beyond individuals' choice (e.g., family background, place of birth, gender, race) play an important role in determining overall inequality. However, their share in total inequality varies considerably across the 41 countries studied (from 2% in Norway to 34% in Guatemala). However, caution should be taken when comparing the results generated from various studies because they differ in the methods of building counterfactual distributions (e.g., parametric versus non-parametric), focus on different outcomes (e.g., income versus consumption) and control for a different set of circumstances as well as the number of circumstance types (Brunori et al., 2013).

The ex-ante approach to measuring inequality of opportunity is also taken by Marrero and Rodríguez (2012). Using the 2004-related wave of the EU-SILC database, they focus on the disposable equivalent income of households whose head is aged between 26 and 50 across

² The counterfactual distributions derived in both ex-post or ex-ante methods are generated as a result of either non-parametric or parametric calculation procedures. In the case of the former (Checchi and Peragine, 2010), the counterfactual distributions are built without any functional assumptions in mind. This approach, however, can encounter the barrier of the limited number of observations which make up each circumstance type and tranche. Consequently, it may imply small samples to obtain precise estimate counterfactual distributions, especially in the case of the ex-post approach (Brunori, 2016). Consequently, parametric measures are often preferred. Here, reduced form regression models are usually adopted to produce counterfactual distributions (e.g. Bourguignon et al., 2007 and Ferreira and Gignoux, 2011) for the relationship between the outcome of interest (i.e. the dependent variable) and the circumstances and efforts (i.e. explanatory variables). Since some of the circumstances are not observable, and thus cannot all be taken into account in the regression model, the measures of inequality of opportunity are merely lower-bound estimates (see Ferreira and Gignoux, 2011 following Brunori, 2016).

³ As Suárez-Álvarez and López-Menéndez (2017) point out, the methods of measuring inequality of opportunity might be also split into three categories, i.e. those based on stochastic dominances analyses, those relying on the concept of fair allocation, and those related to the construction of counterfactual distributions.

23 European countries. Parents' education and occupation, individual's nationality, and the level of household financial situation are defined as circumstance variables in the study. The results obtained clearly show that Nordic countries (Denmark, Finland, Norway, and Sweden), Western continental countries (Germany, Netherlands, Austria, Belgium, and France), and several Eastern European countries (Slovakia, Czech Republic, Slovenia, and Hungary) depicted lower levels of inequality of opportunity, compared to Mediterranean countries (Italy, Greece, Spain, Portugal), the British isles (Ireland, and the U.K.) and other Eastern European countries (Estonia, Latvia, Poland, and Lithuania).

Brzezinski (2015) re-estimated the Marrero and Rodríguez (2012) analysis, but added the 2010-related wave EU-SILC data to the 2004-related wave data. Consequently, the author puts the main emphasis on comparisons between the two periods to investigate how the 2008 crisis affected the extent of inequality of opportunity. The results show that relative inequality of opportunity increased in the case of Belgium, Slovakia, Austria, Hungary and Greece, whereas it reduced in Portugal and Lithuania.

More recent ex-ante method-based results are provided by Suárez-Álvarez and López-Menéndez (2021). They use EU-SILC data on equivalized disposable income of households in 26 European countries as an outcome variable. The sample is restricted to employed and unemployed individuals aged between 25 and 59 years, excluding self-employed persons. The set of circumstance variables includes age, gender, immigration status, degree of urbanization, parental education and occupation. They show that relative inequality of opportunity ranges between 4.3% (Germany) and 20.1% (Luxemburg)⁴. Moreover, using the Shapley decomposition, the authors point to parental education and occupation as the most

⁴ In 2010 when using the mean logarithmic deviation.

important factors determining inequality of opportunity. Interestingly, the average contribution of the type of residential region, measured by the degree of urbanization, was around 14.5% in 2004 and around 10.5% in 2010.

Likewise, Palomino et al. (2018) implement the ex-ante approach to a sample of 26 European countries, using the 2010-based EU-SILC data wave, to study inequality of opportunity of household equivalent income. They define the vector of circumstance variables based on parental education, father's occupation, gender, immigration status, and the perceived financial struggle in the household. The results indicate that Sweden has the lowest extent of inequality of opportunity (2.2%), whereas Luxembourg and Cyprus (26.9% and 20.9%, respectively) have the highest.

There are also several studies using the ex-post approach to the measurement of inequality of opportunity. Salvi (2007) controls for circumstance variables such as family background, ethnicity, and local infrastructure (e.g., presence of bus service and electric power in the village, number of secondary schools, etc.) to measure inequality of opportunity in consumption across Nepalese households and finds that inequality is mainly driven by infrastructure and ethnicity rather than by family background. Bourguignon et al. (2007) measure the extent of inequality of opportunity in individual earnings in Brazil by controlling for the role of parental education, father's occupation, race, and region of birth. They also measure how circumstances affect earnings using three effort variables, namely, education, migration out of hometown, and labour market status. The results obtained show that 25% of overall earnings inequality is due to inequality of opportunity. The authors conclude that the circumstances that affect earnings inequality the most are those associated with family background.

The methodological differences between the ex-ante and ex-post approaches to measuring inequality of opportunity are reflected in significant differences in their findings. As Checchi et al. (2010) show in their EU-SILC-based analysis of 25 EU countries, the ex-post approach tends to generate greater values (from 16% to 45% of total net income inequality) than the ex-ante approach (from 2.5% to 30% of total net income inequality). The importance of both approaches is underlined as providing two complementary angles to look at the problem of inequality of opportunity, i.e., “*distances between social groups*” (ex-ante approach) and “*the individual income gaps due to circumstances*” (ex-post approach) (Checchi et al., 2010). On the basis of the two definitions and using as circumstance variables the individual’s gender, residential area, education, parental education and occupation, they identify three groups of countries: 1) the former communist countries (Hungary, Poland, Latvia and Estonia) and Portugal, which are characterized by intermediate levels of inequality of opportunity and greater values of overall inequality; 2) Norway, Sweden, Denmark, Finland, Slovenia and Slovak Republic with low levels of both total inequality and inequality of opportunity; and 3) other continental Europe’s countries showing moderate levels of total inequality along with relatively high levels of inequality of opportunity. The outcomes might suggest a significant impact of more egalitarian social welfare systems (e.g., prevailing in the Nordic countries and former centrally planned economies) on building more equal opportunities for individuals’ socioeconomic development.

In a recent study, Checchi et al. (2015) use both ex-ante and ex-post approach to estimate the extent of inequality of opportunity in pre-tax individual earnings. Both the 2004 and 2010-related EU-SILC data waves are used, for 26 and 29 European countries, respectively. The sample analysed is restricted to individuals working full or part-time, unemployed and those fulfilling domestic tasks and care responsibilities aged between 30 and 60. The circumstance

vector includes: parental education and occupation, and individual characteristics, i.e. gender, nationality and age. The results clearly show that the ex-post inequality of opportunity (44% of total inequality on average) is greater than the ex-ante measures of inequality of opportunity (15% of total inequality on average). But the distribution of the measures across countries is similar regardless of the approach used.

In another study using both ex-ante and ex-post approaches, Checchi and Peragine (2010) use non-parametric techniques to estimate the extent to which earnings inequality in Italy is due to inequality of opportunity. The vector of circumstance variables includes parental education, and the relative position in the income distribution (e.g., quintile) is used as a proxy for individual effort. The authors also control for gender and residential region (Centre-South and North). The results show that around 20% of overall income inequality in Italy is due to inequality of opportunity. This effect is stronger in the southern regions of Italy, particularly for women. Perez-Mayo (2019) also carry out a regional analysis of inequality of opportunity for Spain. Using parametric regression models and EU-SILC microdata for 2010, they analyse ex-ante inequality of opportunity in Spanish NUTS-2 regions by controlling for the role of circumstance variables referring to parental education and occupation, and household financial stress during childhood. The results show that around 10% of income inequality in Spain is due to circumstances beyond individual's control. Specifically, father's education alone explains nearly 25% of the variation in individual's income. The regional-level analysis reveals wide spatial heterogeneity in the extent of inequality of opportunity in determining total income inequality, ranging from 3% (Cantabria) to 33% (Extremadura).

Andreoli and Fusco (2017) carry out ex-ante and ex-post analyses of inequality of opportunity for 19 EU countries using the EU-SILC 2004 and 2010-based waves of the dataset. They use

father's educational attainment as the main circumstance factor in explaining labour income. The ex-post analysis shows that the Nordic countries, Germany, Austria, Belgium, France, Cyprus and the Netherlands have low inequality of opportunity (from 2.3% to 4%), whereas the remaining EU countries studied, mainly lower-income member states, have greater inequality of opportunity (from 4.3% to 9.8%). The ex-ante approach reveals a similar geographical pattern of inequality of opportunity. However, as in the case of Checchi et al. (2010), the ex-ante approach values are lower compared to the ex-post approach. In addition, they find no significant changes in the extent of inequality of opportunity between 2004 and 2010.⁵

There are also other methods employed when analysing inequality of opportunity. Brunori et al. (2018) use a classification and regression trees method with the circumstance vector including gender, country of birth, presence of parents at home, number of adults (aged 18 or more) in respondent's household, number of working adults (aged 18 or more) in respondent's household, number of children (under 18) in respondent's household, father/mother country of birth and citizenship, parental education, parental main occupation and occupational status, managerial position of the father/mother and tenancy status of the house in which the respondent was living. They study 31 European countries included in the 2010-related EU-SILC wave and restrict the sample to working age adults between 30 and 59. The greatest extent of absolute inequality of opportunity is reported for Bulgaria (0.14), Portugal (0.14), and Luxembourg (0.13), whereas the countries with the lowest values were Iceland (0.01), Finland (0.02) and Norway (0.02).

⁵ For more examples of empirical studies of inequality of opportunity refer to, e.g., Ramos and Van Gear (2012).

Although there is some evidence of inequality of opportunity at the regional level, we could not find any studies looking specifically at the extent of this phenomenon across the urban hierarchy and, in particular, between urban and rural areas. Since cities are often presented as “social elevators”, we are interested in studying the difference in the degree of inequality of opportunity between urban and rural areas.

3. DATA AND METHODS

3.1 Empirical strategy

From a theoretical point of view, both the ex-ante and ex-post approaches provide us with complementary perspectives when looking at the extent of inequality of opportunity. However, when it comes to their operationalization, the latter usually entails stronger assumptions necessary to estimate efforts (Juárez and Soloaga, 2014). In addition, the ex-ante approach gives us a greater chance of comparability of results as it is more widely applied in the literature. Consequently, we decided to follow the ex-ante approach to the estimation of inequality of opportunity, similarly to previous studies using the EU-SILC microdata (e.g., Perez-Mayo, 2019; Suárez-Álvarez and López-Menéndez, 2021). To this end, we measure the level of inequality of opportunity using the following index (Ferreira and Gignoux, 2011):

$$\theta_a = E_0(\{\mu_i^k\}) = \frac{1}{N} \sum_{i=1}^N \log \frac{\mu_i}{\mu_k}, \quad (1)$$

where:

θ_a - absolute index of inequality of opportunity,

E_0 - mean logarithmic deviation (inequality measure),

$\{\mu_i^k\} = (\mu_1^1, \dots, \mu_n^1, \mu_i^K, \dots, \mu_N^K)$ - counterfactual (“smoothed”) distribution of income with N individuals (i) and K types (k),

μ - overall mean.

Following Ferreira and Gignoux (2011), we use the mean logarithmic deviation as the inequality measure for individual labour income.⁶ The first step taken to calculate the index of absolute inequality of opportunity given by equation (1) is to construct the “smoothed” distribution ($\{\mu_i^k\}$). For this purpose, each individual outcome within a type (y_i^k) is replaced with the type-specific mean ($\mu^k(y)$). Individual outcome y in our analysis corresponds to labour income. We approximate the “smoothed” distribution using a parametric approach⁷ drawing upon a reduced-form regression model (Ferreira and Gignoux, 2011), as follows:

$$\ln y = C\Psi + \varepsilon, \quad (2)$$

where:

C – vector of circumstance variables,

Ψ – parameters reflecting both the direct and indirect (via efforts) effects of circumstances on outcome y ,

ε - error term.⁸

⁶ The mean logarithmic deviation is a member of the generalized entropy indices and satisfies the following axiomatic properties: principle of population, scale invariance, normalization, within-type symmetry, within-type transfer insensitivity, between-type transfer principle as well as additive decomposability, i.e., path-independent decomposability. For more details about the axiomatic properties in question, see e.g., Ferreira and Gignoux (2011). Importantly, this index is widely used in analyses of inequality of opportunity and, consequently, permits one to achieve comparability with other research studies.

⁷ As noted by Suárez-Álvarez and López-Menéndez (2017), the nonparametric method-based estimates tend to be less accurate when the set of circumstances is large.

⁸ The results of the estimation of the regression model (Equation 2) were shown in Tables 2 and 3 in the Appendix.

Using the OLS estimator, the “smoothed” distribution is given by:

$$\tilde{\mu}_i = \exp[C_i \tilde{\Psi}], \quad (3)$$

where:

$\tilde{\mu}_i$ - counterfactual “smoothed” distribution from the OLS regression model,

$\tilde{\Psi}$ - parameter estimates from the OLS regression model.

Dividing θ_a by total income inequality ($E_0(y)$), we obtain a relative measure of inequality of opportunity (θ_r):

$$\theta_r = \frac{E_0(\{\mu_i^k\})}{E_0(y)}. \quad (4)$$

The models were estimated with STATA’s user-written command *iop* (Juárez and Soloaga, 2014) to assess ex-ante inequality of opportunity for labour income as a continuous variable with inherent scale as proposed by Ferreira and Gignoux (2011). In addition, we apply the Shapley decomposition, in order to estimate the relative importance of each circumstance variable or group of variables.⁹

3.2 EU-SILC dataset and variables

We use data from the special EU-SILC module on intergenerational mobility for 2004 and 2010 to estimate the inequality of opportunity indices at the national level and by degree of

⁹ In the Shapley decomposition, inequality measures for all possible permutations of circumstances are first estimated. Then the average marginal effect of each circumstance on the measure of inequality of opportunity is computed. It allows one to estimate the relative importance of each circumstance variable or group of variables (Juárez and Soloaga, 2014).

urbanization.¹⁰ The analysis covers 12 countries: Finland, Cyprus, Iceland, Norway, Sweden, Belgium, Estonia, Ireland, Lithuania, Slovakia, Denmark, and the United Kingdom.¹¹

Following Andreoli and Fusco (2017) we use the annual gross employee cash or near cash income as an output variable for labour income. This is the monetary component of the compensation in cash payable by an employer to an employee including any social contributions and income taxes payable by the employee or by the employer on behalf of the employee. We decide to take this approach due to much greater data availability across the EU-SILC countries as compared to net earnings. However, for the limited sample of countries, i.e., Belgium, Estonia, Ireland, Sweden and Lithuania, our analysis of country-specific inequality of opportunity is supplemented by the post-tax earnings-based outcomes. In addition, similar to Andreoli and Fusco (2017), we restrict our main estimation sample to those aged between 25 and 59, who worked full time as an employee. However, we include both male and female individuals. To ensure comparability of the outcome variable across countries, both the gross and the net income were converted into Purchasing Power Standard (PPS) using the Eurostat data on purchasing power parities.

¹⁰ There are three degrees of urbanisation: (i) densely populated areas (ii) intermediate areas; and (iii) thinly populated areas. Densely populated area: This is a contiguous set of local areas, each of which has a density superior to 500 inhabitants per square kilometre, where the total population for the set is at least 50,000 inhabitants. Intermediate area: This is a contiguous set of local areas, not belonging to a densely-populated area, each of which has a density superior to 100 inhabitants per square kilometre, and either with a total population for the set of at least 50,000 inhabitants or adjacent to a densely-populated area. Thinly-populated area: This is a contiguous set of local areas belonging neither to a densely-populated nor to an intermediate area. For more details refer to: https://www.gesis.org/en/missy/metadata/EU-SILC/2011/Cross-sectional/original#2011-Cross-sectional-DB100_tab12.

¹¹ We selected those countries out of 26 countries for which EU-SILC data are available for both analysed years: 2004 and 2010. For Portugal, Greece, Latvia, Italy and Spain there were no data on gross income in 2004. In the case of three countries, namely the Czech Republic, Hungary and Poland, data on gross income took on very low values falling in question their credibility. Moreover, for Austria, Germany and France, there were no data on the financial stress circumstance. Likewise, we did not include the Netherlands and Slovenia in the analysis because they do not report data on degree of urbanization. In addition, we excluded Luxembourg as a highly specific country being an outlying observation in the analysis.

Following Van Kerm and Alperin (2013) data cleaning methods, we decided to exclude observations reporting income levels lower than 75% of the 1st percentile to correct for the presence of lower-end outliers in the distribution of labour income. In addition, we removed upper-end outliers of the income distribution by dropping observations with income 25% higher than the 99th percentile.

The circumstance variables (see equation (2)) essentially refer to individual's family background – i.e., education of father; education of mother; activity status of father; activity status of mother; main occupation of father; and the level of household financial situation, as well as individual's age¹² and gender. Since several countries in the sample (Sweden, Norway, Ireland and Belgium) have more than 50% of missing observations for the mother's occupation, we excluded the variable from the analysis. These cases reflect the fact that mothers often are housekeepers, which is already captured in the variable referring to the activity status of the mother. In an alternative specification of the models, the degree of urbanization is added to the circumstance vector. Table 1 describes the categories of the circumstance variables used in the analysis. Some of the circumstance variables are coded and/or labelled differently among countries or between the 2004 and 2010-related modules, requiring some harmonization procedures. A detailed description of data harmonization across countries and years is shown in Table 1 in the Appendix, notably for educational systems and occupational classification.¹³

¹² There are five age cohorts of six years from 25 to 59 years.

¹³ A detailed description of data harmonization across countries and years is shown in Table 1 in the Appendix. Moreover, the syntax file describing the process of harmonization of the variables among countries and between the modules is available from the authors upon request.

We inspected the pairwise correlations for all variables and there was no evidence of multicollinearity. A summary of the distribution of the circumstance variables as well as the sample sizes are provided in Tables 4–6 in the Appendix.

4. RESULTS AND DISCUSSION

4.1 *Inequality of opportunity: national perspective*

We first present the results for the analysis of inequality of opportunity of individual earnings considering as circumstance variables the individual's age and sex, parental education, parental activity status, father's main occupation, and household financial situation. Tables 2 and 3 show the relative measures of inequality of opportunity as shown in equation (4) for 2004 and 2010, respectively. The results indicate that the extent of inequality of opportunity in gross labour-income across countries ranges between 8%-24% in 2004 and 5%-26% in 2010. Taking one of the most opportunity unequal countries, namely Cyprus, the results can be interpreted in the following way: about 26% of the variation in gross labour-income of individuals with similar levels of effort is explained by differences in individual's age, gender and family background. In particular, older male individuals with more affluent pedigree earn higher wages compared to other individuals with similar levels of effort.

There are practically no differences in the size of the inequality of opportunity measure between the analyses based on gross and net labour-income. This suggests that income redistribution policies seem to have little impact on the extent of inequality of opportunity, at least in relative terms.¹⁴ However, this comparison can only be made for a small group of

¹⁴A slight decrease is clearly seen in most countries studied when looking at the extent of absolute inequality of opportunity. It is, however, compensated by a proportional decline in overall income inequality when shifting from gross to net-based measures. Consequently, relative inequality of opportunity does not change. The

countries due to the limited availability of data for net labour-income. Our results seem to be in line with those presented by Niehues and Peichl (2011) and open up a discussion on the role of governments in redistributing income towards those who come from poorer backgrounds. Comparing the results between 2004 and 2010, we observe that the differences tend to be small. Denmark, Iceland and Lithuania are the only countries showing a decrease in overall inequality of opportunity.

There are considerable differences between our results and those obtained in other ex-ante cross-country EU-SILC studies, which we discussed in the literature review section. This is due primarily to differences in methodology. Although, for instance, we use a sample design and outcome variable similar to Andreoli and Fusco (2017), their model specification is limited to a single circumstance variable (i.e., father's educational attainment), while our analysis contains a vector of multiple circumstance variables. With respect to the other cross-country studies using the EU-SILC survey, notably Checchi et al. (2010), the differences may lie in the methodological assumptions because our sample does not include part-time workers, nor the unemployed and those fulfilling domestic tasks and care responsibilities. In addition, the outcome variable in our study is individual labour-income, whereas Marrero and Rodríguez (2012), Brzezinski (2015), Suárez-Álvarez & López-Menéndez (2021), and Palomino et al. (2018) use household income. This clearly shows an important role of other non-labour-related sources of income, and other household members, in the extent of inequality of opportunity.

We subsequently extended our analysis to include the variable for degree of urbanization in the circumstance vector (Tables 1-2). This EU-SILC variable does not refer to the place of birth,

absolute measures of inequality of opportunity and the income inequality indicators are available from the authors upon request.

but rather to the place of residence. As a result, there may be self-selection of individuals based on preferences or/and socio-economic status. Consequently, residential location may actually not be a circumstance-type factor. However, by including it in the circumstance vector (as several other studies did), we are able to explore the role of place in determining inequality of opportunity. In line with Suárez-Álvarez and López-Menéndez (2021), the results obtained show that the degree of urbanization of the residential area has a weak influence on the inequality of opportunities. In other words, living in a large(r) city does not necessarily rank superior to people who live elsewhere with the same effort. Factors such as age, sex, and family background are the major contributors to inequality of opportunity.

4.2 Inequality of opportunity: urban-rural perspective

Although inequality of opportunity tends to be studied at the national and cross-country level, there may also be differences across regions, notably between urban and non-urban areas.¹⁵ To explore the role of cities as “social elevators”, we carry out the inequality of opportunity analysis separately by degree of urbanization. The results are reported in Table 4. Considering 2004, we find that in six out of 12 countries (i.e., Estonia, Finland, Ireland, Lithuania, Sweden, and Slovakia), the extent of inequality of opportunity was greater in larger cities. Out of the six remaining countries, inequality of opportunity was higher in towns and rural areas than in larger urban areas. In 2010, there were only three countries (i.e., Belgium, Cyprus, and Norway) with higher values for inequality of opportunity in larger cities, however, not significantly larger than those of the smaller urban areas and rural areas. Overall, thus, there is only some evidence that inequality of opportunity may be stronger in larger cities.

¹⁵ For analysis of country-specific instructional factors determining inequality of opportunity refer to Checchi et al. (2010) and (2015).

Despite our results are not conflicting with the view that cities can work as “social elevators” due to the many opportunities they offer individuals, they certainly do not support it either. Although several scholars, such as Glaeser (2012), have posited that cities can offer better opportunities for both high-skilled talented individuals and those with low skills and low education, the overall effect may fall short of expectations. This might occur due to stronger complementarity between city size (i.e., urban agglomeration) and human capital at the top of the skill (and income) distribution, which is highly dependent on family background, and social capital and peer effects. In fact, our results reveal that up to 27% of labour-income disparities in cities is associated with individuals’ age and socioeconomic background.¹⁶ Weck et al. (2020)¹⁷ and Andersson and Malmberg (2018)¹⁸, for instance, point to the role of segregation in cities as an obstacle to individuals making use of educational, cultural, and health care resources, which in turn may prevent them from escaping disadvantaged environments. This is aggravated by the fact that deprived neighbourhoods are usually struck by lack of access to public transport and services (EC, 2019). Musterd et al. (2017) analysed 12 EU capital cities (Amsterdam, Athens, Budapest, London, Madrid, Oslo, Prague, Riga, Stockholm, Tallinn, Vienna, and Vilnius) and concluded that in all cases there was an increase in socioeconomic segmentation by which they mean “(...)residential segregation of population groups based on occupation, income, and/or education”. They propose that socioeconomic segregation in cities is determined by multiple factors, namely social inequalities, globalization and economic restructuring, welfare regimes, and housing systems

¹⁶ As sample sizes for Belgium (rural areas), the United Kingdom (small urban and rural areas) and Sweden (three types of areas) are small, caution ought to be exercised when interpreting the outcomes. It needs to be, however, emphasized that except for the UK, the sample-based distribution of individuals by degree of urbanization is representative, i.e., in line with the structure of the whole population.

¹⁷ Weck et al. (2020) analyse 33 case studies from the EU.

¹⁸ The authors use geo-coded data in order to isolate the effects of different types of neighbourhoods in Sweden.

(e.g., the scale of public investment on the housing sector). The role of spatial segregation in limiting access to opportunities for those living in deprived neighbourhoods is also emphasized by OECD (2018).

It needs to be also emphasized that the types of places studied here, i.e. urban and rural areas, are internally heterogeneous. Therefore, highly diverse characteristics of urban areas, e.g. metropolitan areas, ought to be taken into account in the future research.

4.3 Shapley decomposition

We calculate the Shapley decomposition for the different circumstance variables considered in the empirical analyses. Figure 1 shows that there is substantial variation across countries and circumstance categories in 2004. The results reveal that in many countries, sex explained most of inequality of opportunity. With respect to the family-related circumstances, parents' economic activity and father's occupation and parents' education were the main factors underlying inequality of opportunity. The role of the household financial situation was generally the one with least importance. The relative importance of degree of urbanization is also rather small. When comparing the Shapley decomposition between 2004 and 2010 (Figure 1), the relative importance, or ranking, of the different circumstance groups seems stable over time. However, in some countries there is a considerable change in the decomposition structure (e.g., Sweden).¹⁹

¹⁹ In addition, we carried out the Shapley decomposition by degree of urbanization. The results show substantial differences among the countries in terms of the structure of circumstances determining inequality of opportunity. The results from the Shapley decomposition by degree of urbanization can be obtained from the authors upon request.

5. CONCLUSION

The analyses carried out in this study show quite strong variation in the extent of inequality of opportunity across EU-SILC countries, ranging between 5% to 26%. Our research is, however, focused on inequality of opportunity in one major labour market outcome, i.e., gross earnings, and the findings should not be generalized to other types of income, e.g., social benefits, which could better reflect the role of welfare state in counter-acting inequality of opportunity. Our findings also point to a somewhat negligible impact of redistribution policies on inequality of opportunity, at least for the sub-sample of countries for which we could compare the results between gross- and net-labour income. This requires a greater role of fiscal policy in equalizing opportunities than in equalizing income itself.

As for the relative importance of different circumstance factors, we find that that parents' economic activity and occupation, and education are the main family background drivers of inequality of opportunity. In other words, parents' socioeconomic and human capital background play a strong impact on their offspring economic prospects. However, it is sex that accounts for the largest proportion of the size of the effect of inequality of opportunity in the majority of countries studied. This result is a major call of attention for ongoing gender discrimination in the labour market. Consequently, supported by the Shapley's decomposition results, public interventions should prioritize gender discrimination and greater access to affordable education and training.

The regional analysis, by degree of urbanization, did not reveal substantial differences between urban and non-urban areas, although there were some instances where inequality of opportunity was higher for larger cities. It calls for a stronger role of urban policies in making cities act as social elevators. In particular, addressing spatial segregation as a factor

that effectively limits access to opportunities for those living in deprived neighbourhoods, should be high on the agenda of public intervention in cities.

Admittedly, there are other reasons besides the degree of urbanization which may influence the extent of inequality of opportunity within countries and across regions. However, the dataset used for this analysis does not allow us to explore other potentially relevant factors relating to political, institutional, and economic dimensions of local economies. Future research should explore the role of these types of factors in the extent of inequality of opportunity. Additionally, different types of income, other than earnings, should be used in the simulations.

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APPENDIX

Table 1: Description of circumstance variables

Variable	Category
Education of father/mother	Does not have higher education degree
	Has higher education degree
Activity status of father/mother	Employed and self-employed (including family worker)
	Unemployed
	In retirement or in early retirement or had given up business
	Fulfilling domestic tasks and care responsibilities
Main occupation of father	Armed Forces Occupations
	Managers
	Professionals
	Technicians and Associate Professionals
	Clerical support workers
	Services and Sales Workers
	Skilled Agricultural, Forestry and Fishery Workers
	Craft and Related Trades Workers
	Plant and Machine Operators and Assemblers
	Elementary Occupations
	Not paid domestic activities
Financial situation of the household	Very bad
	Bad
	Fair
	Good
	Very good
Sex	Male
	Female
Age	25-31
	32-38
	39-45
	46-52
	53-59
Degree of urbanization	Large urban areas
	Small urban areas
	Rural areas

Table 2: Relative inequality of opportunity (IOP) by country and income type with and without degree of urbanization as circumstance variable (2004)

Country	GROSS INCOME (incl. degree of urbanization)	GROSS INCOME (without degree of urbanization)	NET INCOME (incl. degree of urbanization)	NET INCOME (without degree of urbanization)
Cyprus	0.25***	0.24***		
Iceland	0.21***	0.20***		
Sweden	0.19***	0.17***	0.19***	0.17***
Norway	0.17***	0.16***		
Finland	0.16***	0.13***		
Slovakia	0.15***	0.13***		
Belgium	0.15***	0.15***	0.15***	0.15***
Denmark	0.14***	0.13***		
United Kingdom	0.13***	0.10***	0.13***	0.1***
Estonia	0.11***	0.11***	0.11***	0.11***
Lithuania	0.11***	0.08***	0.11***	0.09***
Ireland	0.11***	0.09***	0.11***	0.09***

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Accepted

Table 3: Relative inequality of opportunity (IOP) by country and income type with and without degree of urbanization as circumstance variable (2010)

Country	GROSS INCOME (incl. degree of urbanization)	GROSS INCOME (without degree of urbanization)	NET INCOME (incl. degree of urbanization)	NET INCOME (without degree of urbanization)
Cyprus	0.27***	0.26***		
Sweden	0.24***	0.24***	0.21***	0.21***
Belgium	0.2***	0.20***	0.19***	0.19***
Finland	0.18***	0.15***		
Norway	0.17***	0.16***		
Slovakia	0.15***	0.13***		
United Kingdom	0.14***	0.13***		
Ireland	0.14***	0.13***	0.15***	0.14***
Iceland	0.14***	0.13***		
Denmark	0.13***	0.11***		
Estonia	0.11***	0.11***	0.11***	0.11***
Lithuania	0.06***	0.05***	0.06***	0.05***

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Accepted

Table 4: Relative inequality of opportunity (IOP) by degree of urbanization

	2004		2010	
	IOP	Sample size	IOP	Sample size
Belgium				
Large urban areas	0.15***	1186	0.23***	1211
Small urban areas	0.15***	1030	0.19***	1074
Rural areas	0.17**	103	0.21***	92
Cyprus				
Large urban areas	0.25***	1838	0.27***	1735
Small urban areas	0.22***	374	0.25***	456
Rural areas	0.28***	855	0.26***	880
Denmark				
Large urban areas	0.12***	593	0.1***	496
Small urban areas	0.24***	536	0.11***	616
Rural areas	0.11***	631	0.13***	377
Estonia				
Large urban areas	0.14***	861	0.10***	829
Rural areas	0.09***	1696	0.12***	1720
Finland				
Large urban areas	0.18***	779	0.20***	327
Small urban areas	0.16***	444	0.20***	165
Rural areas	0.11***	1548	0.12***	628
Ireland				
Large urban areas	0.13***	703	0.13***	451
Small urban areas	0.07***	513	0.15***	296
Rural areas	0.10***	448	0.13***	344
Iceland				
Large urban areas	0.19***	520	0.13***	604
Rural areas	0.24***	304	0.22***	314
Lithuania				
Large urban areas	0.08***	1342	0.04***	1273
Rural areas	0.07***	1413	0.06***	1415
Norway				
Large urban areas	0.18***	1091	0.19***	982
Small urban areas	0.24***	323	0.15***	292
Rural areas	0.12***	572	0.14***	466
Sweden				
Large urban areas	0.32***	83	0.32	64
Small urban areas	0.17*	61	0.43***	38
Rural areas	0.17**	292	0.28***	197
Slovakia				
Large urban areas	0.16***	1100	0.13***	1134
Small urban areas	0.12***	1585	0.13***	1327
Rural areas	0.11***	1690	0.13***	1765
United Kingdom				
Large urban areas	0.14***	884	0.13***	1581
Small urban areas	0.13***	229	0.14***	929
Rural areas	0.23**	57	0.15***	413

Statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 1: Harmonization of EU-CILS variables across countries and years

Variable	Response categories	Countries	Harmonization
Activity status- father /mother (2004)	1- employed and self-employed (including family workers) 2- unemployed 3- retirement 4- domestic tasks and other	Finland, Belgium, Cyprus, Denmark, Estonia, Ireland, Iceland, Lithuania, Norway, Sweden and Slovakia	1 ==1+2+3 2==4 3==5 4==6+7
		United Kingdom	1==1+2+3 2==4+7 3==5 4==6+8
Activity status- father /mother (2010)	1- employed and self-employed (including family workers) 2- unemployed 3- retirement 4- domestic tasks and other	All	1 ==1+2 2==3 3==4 4==5+6
Education -father/mother (2004)	0- other than higher education 1- higher education	All	0==0+1+2+3+4 1==5
Education- father/mother (2010)	0- other than higher education 1- higher education	Finland, Belgium, Cyprus, Estonia, Ireland, Iceland, Lithuania, Norway, Slovakia, United Kingdom	0==0+1+2 1==3
		Sweden, Denmark	0==1+2 1==3
Financial stress (2004)	1- very bad 2- bad 3- fair 4- good 5- very good	Slovakia	1==5 2==4 3==3 4==2 5==1
Financial stress (2010)	1- very bad 2- bad 3- fair 4- good 5- very good	All	1==1 2==2 3==3+4 4==5 5==6

Table 2: Regression results for 2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	FI ²⁰	CY	IS	NO	SE	BE	EE	IE	LT	SK	DK	UK
VARIABLES	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income
Higher education- father	0.0933* (0.0405)	-0.0111 (0.0600)	0.1459* (0.0632)	0.0233 (0.0490)	-0.0379 (0.0926)	0.0564 (0.0297)	0.1635*** (0.0477)	0.0233 (0.0531)	0.1192* (0.0565)	0.0597 (0.0329)	0.0279 (0.0401)	0.1552** (0.0476)
Higher education- mother	0.0276 (0.0401)	0.0650 (0.0572)	-0.0153 (0.0746)	0.0346 (0.0349)	0.1334 (0.1346)	0.0761** (0.0283)	0.1003** (0.0381)	0.0818 (0.0484)	0.2233*** (0.0518)	0.0779 (0.0399)	-0.0452 (0.0469)	0.0408 (0.0544)
Activity status- father (employed and selfemployed (including family workers))	0.1281 (0.1029)	0.1458 (0.1537)	-0.5184*** (0.0917)		0.1253 (0.1756)	0.0578 (0.0450)	0.0072 (0.1755)	0.0378 (0.0975)	0.0360 (0.1040)	0.1087 (0.1180)	0.1009 (0.0927)	0.0420 (0.0898)
Activity status- father (unemployed)	-0.3443** (0.1228)	-0.3103* (0.1567)			0.3420 (0.2786)		0.5751* (0.2802)		1.7089*** (0.1188)	0.6841*** (0.1179)	0.3038 (0.2777)	0.0652 (0.1469)
Activity status- father (retirement)	0.1456 (0.1242)	0.8883*** (0.1998)			0.4309* (0.2190)		-0.0863 (0.2365)		0.3926 (0.2006)	-0.1252 (0.1797)		-0.3239* (0.1315)
Activity status- mother (unemployed)					0.0503 (0.2717)	0.0005 (0.1137)	0.2640*** (0.0705)		-0.3393* (0.1486)	-0.1056 (0.1671)	-0.2021 (0.2258)	-0.3440*** (0.0595)
Activity status- mother (retirement)	0.0608 (0.0814)		-0.0474 (0.2135)		0.3464** (0.1322)	-0.1465 (0.1062)	-0.1193 (0.2083)		0.0456 (0.7689)	-0.0727 (0.0575)	0.0047 (0.0261)	
Activity status- mother (domestic tasks and other)	-0.0602 (0.0374)	0.0221 (0.0215)	-0.1125* (0.0458)		0.0726 (0.0890)	-0.0146 (0.0183)	-0.0159 (0.0449)	0.0079 (0.0304)	-0.0727* (0.0343)	-0.0751*** (0.0191)	-0.0042 (0.0450)	0.1529* (0.0742)
Main occupation of father (Professional)	-0.0385 (0.0530)	0.1940 (0.1120)	0.0407 (0.0663)	0.0118 (0.0642)	-0.1665 (0.1343)	0.0233 (0.0378)	0.0134 (0.0620)	0.1323* (0.0570)	-0.0423 (0.0674)	0.0439 (0.0420)	-0.0162 (0.0591)	0.0600 (0.0811)
Main occupation of father (Technicians and associate professionals)	-0.0651	0.0208	-0.0252	-0.0426	-0.0307	-0.0871* (0.0380)	0.0380	-0.1485	-0.0092	0.0282	0.0534	0.0023

²⁰ BE- Belgium; CY- Cyprus; DK- Denmark; EE- Estonia; FI- Finland; IE- Ireland; IS- Iceland; LT- Lithuania; NO- Norway; SE – Sweden; SK- Slovakia; UK- the United Kingdom.

	(0.0483)	(0.1124)	(0.0731)	(0.0514)	(0.1014)	(0.0431)	(0.0587)	(0.1146)	(0.0833)	(0.0353)	(0.0518)	(0.0801)
Main occupation of father (Clerical support workers)	-0.1366	0.1661	-0.2113	-0.0566	-0.0635	0.0071	-0.0674	0.1202*	-0.0693	-0.0187	0.0062	0.0410
	(0.0830)	(0.1136)	(0.1441)	(0.0688)	(0.1215)	(0.0360)	(0.0836)	(0.0516)	(0.1041)	(0.0492)	(0.0537)	(0.0695)
Main occupation of father (Service and sales workers)	0.0448	-0.0788	0.0182	-0.0263	-0.1927	-0.0645	-0.2268*	0.0031	-0.1148	-0.0568	0.0008	-0.1190
	(0.0558)	(0.1107)	(0.0818)	(0.0603)	(0.1354)	(0.0499)	(0.1083)	(0.0545)	(0.0927)	(0.0395)	(0.0557)	(0.0692)
Main occupation of father (Skilled agricultural, forestry and fishery workers)	-0.1800***	-0.2050	-0.1365*	-0.0929	-0.3138	-0.0877	-0.1056	-0.0129	-0.1725*	-0.1230**	-0.0769	-0.0775
	(0.0453)	(0.1097)	(0.0651)	(0.0550)	(0.1801)	(0.0534)	(0.0672)	(0.0912)	(0.0687)	(0.0454)	(0.0544)	(0.4724)
Main occupation of father (Craft and related trades workers)	-0.0614	-0.1345	-0.0118	-0.0498	-0.2645*	-0.0779*	-0.0527	-0.0595	-0.1800**	-0.0630*	-0.0405	-0.1670
	(0.0426)	(0.1078)	(0.0623)	(0.0472)	(0.1065)	(0.0342)	(0.0426)	(0.0394)	(0.0588)	(0.0309)	(0.0491)	(0.1409)
Main occupation of father (Plant and machine operators, and assemblers)	-0.0429	-0.1978	-0.0837	-0.0764	-0.2105	-0.0907*	-0.0731	-0.1261**	-0.1508*	-0.0707*	-0.1091*	-0.2966***
	(0.0453)	(0.1111)	(0.0767)	(0.0492)	(0.1255)	(0.0385)	(0.0434)	(0.0429)	(0.0601)	(0.0312)	(0.0543)	(0.0806)
Main occupation of father (Elementary occupations)	-0.1042	-0.2068	-0.2516	-0.0174	0.1033	-0.0875*	-0.1310**	-0.1467***	-0.1782**	-0.1407***	-0.1223*	-0.2813***
	(0.0643)	(0.1096)	(0.1312)	(0.1179)	(0.1353)	(0.0381)	(0.0470)	(0.0386)	(0.0593)	(0.0336)	(0.0557)	(0.0702)
Main occupation of father (Not paid domestic activities)	-	-	-	-	-	-	-	-	-	-	-	-
Financial stress- bad	0.0114	0.1215*	-0.0372	0.0605	0.0707	0.0604	0.0963	-0.1069	0.0242	0.0013	-0.0708	0.0047
	(0.0502)	(0.0517)	(0.0974)	(0.1168)	(0.1735)	(0.0711)	(0.0602)	(0.0700)	(0.0483)	(0.0375)	(0.0767)	(0.0692)
Financial stress- fair	0.0348	0.2469***	-0.0180	0.0621	0.0403	0.1268*	0.2181***	-0.0014	0.0713	0.0178	0.0123	0.0065
	(0.0435)	(0.0479)	(0.0904)	(0.1021)	(0.1908)	(0.0628)	(0.0554)	(0.0596)	(0.0462)	(0.0358)	(0.0586)	(0.0614)
Financial stress- good	0.0799	0.3329***	0.1276	0.0586	0.1902	0.1279*	0.2462***	0.0568	0.0913	0.0531	-0.0457	-0.0185
	(0.0453)	(0.0490)	(0.0863)	(0.0986)	(0.1621)	(0.0635)	(0.0582)	(0.0594)	(0.0492)	(0.0359)	(0.0615)	(0.0609)
Financial stress- very good	0.0301	0.3783***	0.0407	0.0659	0.1510	0.1963***	0.2166***	0.0661	0.0893	0.0820*	0.0014	0.0069
	(0.0436)	(0.0618)	(0.0806)	(0.0979)	(0.1554)	(0.0577)	(0.0599)	(0.0579)	(0.0485)	(0.0371)	(0.0556)	(0.0592)
Age (32-38)	0.2801***	0.2229***	0.2105**	0.1965***	0.2615*	0.1814***	0.0427	0.2253***	0.0873	0.0460*	0.3212***	0.2223***
	(0.0403)	(0.0314)	(0.0648)	(0.0509)	(0.1053)	(0.0283)	(0.0462)	(0.0414)	(0.0469)	(0.0228)	(0.0447)	(0.0398)
Age (39-45)	0.3896***	0.3617***	0.3764***	0.3510***	0.2771*	0.2461***	0.0935*	0.2467***	0.1418**	0.1374***	0.3941***	0.2526***
	(0.0390)	(0.0309)	(0.0681)	(0.0465)	(0.1347)	(0.0282)	(0.0438)	(0.0440)	(0.0445)	(0.0216)	(0.0432)	(0.0446)

Age (46-52)	0.4035*** (0.0420)	0.4074*** (0.0350)	0.4559*** (0.0718)	0.4049*** (0.0479)	0.4758*** (0.1103)	0.3181*** (0.0301)	0.0492 (0.0433)	0.3010*** (0.0417)	0.1921*** (0.0456)	0.1445*** (0.0221)	0.4369*** (0.0458)	0.2057*** (0.0475)
Age (53-59)	0.5175*** (0.0409)	0.5517*** (0.0388)	0.4197*** (0.0783)	0.4070*** (0.0469)	0.4188** (0.1331)	0.4181*** (0.0331)	0.0126 (0.0450)	0.2316*** (0.0475)	0.1758*** (0.0498)	0.1327*** (0.0257)	0.3632*** (0.0500)	0.1518** (0.0518)
Sex (female)	-0.2685*** (0.0211)	-0.4567*** (0.0214)	-0.3785*** (0.0373)	-0.3389*** (0.0263)	-0.3767*** (0.0699)	-0.1561*** (0.0179)	-0.2884*** (0.0230)	-0.2076*** (0.0257)	-0.1626*** (0.0240)	-0.2692*** (0.0136)	-0.2229*** (0.0226)	-0.2900*** (0.0303)
Degree of urbanization (small urban areas)	-0.1337*** (0.0331)	0.0327 (0.0297)		-0.0940* (0.0369)	-0.0241 (0.0951)	0.0424* (0.0167)		-0.1292*** (0.0318)		-0.1036*** (0.0179)	-0.0689* (0.0295)	0.0385 (0.0391)
Degree of urbanization (rural areas)	-0.2300*** (0.0242)	-0.1091*** (0.0235)	-0.1310*** (0.0383)	-0.1002*** (0.0292)	-0.1630 (0.0856)	-0.0343 (0.0461)	-0.0944*** (0.0251)	-0.1864*** (0.0296)	-0.2367*** (0.0244)	-0.1887*** (0.0179)	-0.1384*** (0.0282)	0.0123 (0.0782)
Constant	9.8464*** (0.1057)	9.4365*** (0.1259)	6.2320*** (0.1152)	7.9176*** (0.1121)	7.5376*** (0.1965)	9.9410*** (0.0771)	8.8767*** (0.1847)	10.1463*** (0.1132)	8.9180*** (0.1047)	8.7753*** (0.1209)	7.9807*** (0.0995)	10.6175*** (0.0882)
Observations	2,771	3,067	824	1,986	436	2,319	2,557	1,664	2,755	4,375	1,760	1,170
R-squared (adj.)	0.14	0.24	0.18	0.12	0.09	0.14	0.11	0.12	0.10	0.14	0.14	0.15

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table 3: Regression results for 2010

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	FI	CY	IS	NO	SE	BE	EE	IE	LT	SK	DK	UK
VARIABLES	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income	ln_income
Higher education- father	0.0453 (0.0518)	0.0836 (0.0586)	0.1506* (0.0740)	0.0310 (0.0366)	0.2122* (0.0956)	0.1596*** (0.0276)	0.0030 (0.0457)	-0.0256 (0.0519)	0.2124** (0.0668)	0.0968** (0.0315)	-0.0052 (0.0495)	0.1139*** (0.0310)
Higher education- mother	0.0375 (0.0466)	0.0253 (0.0519)	-0.1391 (0.1204)	0.0699* (0.0346)	-0.0365 (0.1545)	0.0690** (0.0246)	0.1103** (0.0352)	0.0399 (0.0523)	0.1771*** (0.0538)	0.0517 (0.0361)	0.0094 (0.0362)	0.0774** (0.0287)
Activity status- father (employed and selfemployed (including family workers))	-0.0909 (0.2039)	-0.0767 (0.2278)	0.0822 (0.1316)		-0.9966 (0.5766)	0.1663 (0.0921)	0.2744 (0.1735)	0.1781 (0.3592)	-0.0097 (0.2057)	0.1465 (0.1015)	0.1295 (0.3003)	0.1353 (0.1064)
Activity status- mother (unemployed)	0.1188 (0.0866)	-0.5807 (0.4083)		-0.0760 (0.2260)	-0.2197 (0.1921)	0.1812 (0.1108)	0.3681** (0.1267)	0.1882 (0.2159)	0.2937 (0.4272)	-0.2454 (0.1527)	0.1821 (0.2438)	-0.0798* (0.0356)
Activity status- mother (retirement)	0.8158*** (0.1216)	0.3265*** (0.0445)		0.1092 (0.1149)	-0.6949*** (0.1936)	0.4805*** (0.0403)	-0.4114** (0.1254)			0.9041*** (0.0432)	-0.3673 (0.2831)	-0.2154 (0.1735)
Activity status- mother (domestic tasks and other)	-0.1841* (0.0732)	0.0429 (0.0223)	-0.0350 (0.0392)	-0.0359 (0.0301)	-0.1011 (0.1019)	-0.0029 (0.0182)	0.0101 (0.0480)	0.0811* (0.0359)	-0.0502 (0.0456)	-0.0361 (0.0216)	-0.0227 (0.0240)	0.0004 (0.0231)
Main occupation of father (Managers)	0.1734 (0.1757)	0.4873* (0.2052)	0.0034 (0.1186)	0.1066 (0.1041)	0.1867 (0.2536)	0.0916 (0.0584)	0.1686 (0.1151)	0.1215 (0.1396)	0.0405 (0.1714)	0.0799 (0.0612)	0.1319 (0.1440)	0.0736 (0.0766)
Main occupation of father (Professional)	0.0735 (0.1765)	0.2551 (0.1967)	-0.0296 (0.1262)	0.0691 (0.1051)	0.2047 (0.2443)	0.0386 (0.0532)	0.2745* (0.1152)	0.2184 (0.1441)	0.0057 (0.1690)	0.0520 (0.0597)	0.1731 (0.1508)	0.0475 (0.0748)
Main occupation of father (Technicians and associate professionals)	0.1453 (0.1743)	0.2798 (0.1994)	0.0310 (0.1385)	0.0781 (0.1030)	0.2934 (0.2503)	0.0857 (0.0489)	0.1237 (0.1182)	0.0545 (0.1494)	0.1770 (0.1763)	0.0454 (0.0571)	0.0989 (0.1463)	0.0031 (0.0784)
Main occupation of father (Clerical support workers)	0.1499	0.2159	-0.0251	-0.0108	0.2696	0.0764	0.0530	0.2373	-0.0359	-0.0257	0.0412	0.0525

	(0.1831)	(0.2111)	(0.1574)	(0.1191)	(0.2568)	(0.0511)	(0.1407)	(0.1586)	(0.1803)	(0.0641)	(0.1501)	(0.0862)
Main occupation of father (Service and sales workers)	0.1281 (0.1781)	0.1000 (0.1997)	-0.0883 (0.1259)	-0.0399 (0.1127)	0.3063 (0.2271)	0.0488 (0.0546)	-0.0281 (0.1496)	0.0257 (0.1426)	0.1693 (0.1766)	-0.0637 (0.0644)	0.0271 (0.1438)	-0.0304 (0.0772)
Main occupation of father (Skilled agricultural, forestry and fishery workers)	0.0559 (0.1752)	-0.0736 (0.2000)	0.0424 (0.1111)	-0.0365 (0.1111)	0.1210 (0.2835)	-0.0371 (0.0569)	0.0136 (0.1233)	0.0297 (0.1404)	-0.0586 (0.1693)	-0.1102 (0.0669)	0.0014 (0.1449)	-0.1735 (0.0889)
Main occupation of father (Craft and related trades workers)	0.0664 (0.1740)	0.1614 (0.1986)	0.0871 (0.1097)	-0.0444 (0.1047)	-0.1303 (0.2686)	0.0013 (0.0461)	-0.0180 (0.1122)	-0.0295 (0.1419)	0.1207 (0.1642)	-0.0523 (0.0562)	-0.0279 (0.1433)	-0.1062 (0.0728)
Main occupation of father (Plant and machine operators, and assemblers)	0.0356 (0.1743)	0.0540 (0.1996)	-0.0156 (0.1211)	0.0265 (0.1071)	0.1382 (0.2652)	-0.0719 (0.0499)	-0.0234 (0.1115)	-0.2668 (0.1483)	0.0098 (0.1649)	-0.0738 (0.0568)	-0.0596 (0.1489)	-0.2832*** (0.0751)
Main occupation of father (Elementary occupations)	0.0224 (0.1801)	-0.0620 (0.2006)		0.0755 (0.1128)	0.0508 (0.2996)		-0.1451 (0.1177)	-0.1114 (0.1416)	0.0009 (0.1643)	-0.0998 (0.0588)		-0.1908* (0.0767)
Main occupation of father (Not paid domestic activities)	-	-	-	-	-	-	-	-	-	-	-	-
Financial stress- bad	-0.3336* (0.1610)	0.0003 (0.0502)	-0.0631 (0.1604)	0.0298 (0.1486)	0.5746 (0.7242)	0.1156 (0.0724)	-0.2071 (0.2126)	-0.0593 (0.1391)	0.2140 (0.1458)	0.0708 (0.0687)	0.0178 (0.1274)	-0.0700 (0.0844)
Financial stress- fair	-0.2158 (0.1112)	0.1858*** (0.0407)	0.1271 (0.1093)	0.1119 (0.1206)	0.6189 (0.7150)	0.1749** (0.0566)	-0.1503 (0.2021)	0.1057 (0.0853)	0.1882 (0.1405)	0.1454* (0.0626)	0.0696 (0.1167)	-0.0509 (0.0721)
Financial stress- good	-0.2025 (0.1141)	0.2957*** (0.0435)	0.1588 (0.1144)	0.1563 (0.1216)	0.6273 (0.7215)	0.1971*** (0.0564)	-0.1270 (0.2037)	0.1366 (0.0896)	0.3023* (0.1418)	0.1594* (0.0635)	0.0699 (0.1171)	-0.0381 (0.0738)
Financial stress- very good	-0.1111 (0.1320)	0.2867*** (0.0617)	0.1310 (0.1219)	0.1414 (0.1299)	0.8077 (0.7330)	0.1864** (0.0626)	0.0692 (0.2112)	0.0439 (0.1013)	0.4065* (0.1664)	0.2465*** (0.0706)	0.0681 (0.1192)	-0.0598 (0.0824)
Age (32-38)	0.2108*** (0.0479)	0.3062*** (0.0340)	0.2093** (0.0735)	0.2282*** (0.0497)	0.4415* (0.1758)	0.2000*** (0.0280)	0.0673 (0.0471)	0.2401*** (0.0527)	0.0656 (0.0637)	0.0755** (0.0231)	0.1958*** (0.0519)	0.1824*** (0.0312)
Age (39-45)	0.4209*** (0.0472)	0.4216*** (0.0339)	0.3633*** (0.0763)	0.3671*** (0.0465)	0.4410* (0.1846)	0.3351*** (0.0282)	0.1382** (0.0427)	0.3728*** (0.0604)	0.1304* (0.0570)	0.0912*** (0.0225)	0.3319*** (0.0452)	0.2669*** (0.0308)
Age (46-52)	0.3951*** (0.0565)	0.5689*** (0.0358)	0.3887*** (0.0692)	0.4131*** (0.0495)	0.6729*** (0.1739)	0.4080*** (0.0281)	0.1025* (0.0408)	0.4038*** (0.0602)	0.2240*** (0.0535)	0.1080*** (0.0215)	0.3514*** (0.0455)	0.2371*** (0.0300)

Age (53-59)	0.4442*** (0.0457)	0.6970*** (0.0370)	0.3912*** (0.0678)	0.4508*** (0.0506)	0.6411*** (0.1805)	0.4745*** (0.0311)	0.0197 (0.0422)	0.4170*** (0.0610)	0.2858*** (0.0541)	0.0807*** (0.0239)	0.2930*** (0.0480)	0.2199*** (0.0324)
Sex (female)	-0.2638*** (0.0291)	-0.4363*** (0.0219)	-0.3165*** (0.0397)	-0.3182*** (0.0255)	-0.3002** (0.0992)	-0.1490*** (0.0177)	-0.3033*** (0.0247)	-0.2088*** (0.0338)	-0.0311 (0.0283)	-0.2572*** (0.0134)	-0.1657*** (0.0224)	-0.2828*** (0.0192)
Degree of urbanization (small urban areas)	-0.1157* (0.0489)	-0.0136 (0.0301)		-0.0682* (0.0324)	0.0902 (0.1483)	0.0044 (0.0175)		-0.1398*** (0.0406)		-0.0987*** (0.0185)	-0.0914** (0.0288)	0.0334 (0.0209)
Degree of urbanization (rural areas)	-0.1953*** (0.0366)	-0.1185*** (0.0263)	-0.1104* (0.0439)	-0.1111*** (0.0290)	0.0062 (0.1300)	0.0171 (0.0506)	-0.0146 (0.0284)	-0.1269** (0.0407)	-0.1140*** (0.0286)	-0.1427*** (0.0175)	-0.1510*** (0.0314)	0.0523 (0.0294)
Constant	10.4208*** (0.1641)	9.5713*** (0.1183)	4.7276*** (0.1240)	7.9897*** (0.1680)	7.6831*** (0.3497)	9.7326*** (0.0946)	9.2278*** (0.2263)	9.9411*** (0.2953)	8.6692*** (0.1812)	9.2659*** (0.1046)	8.1023*** (0.2920)	10.2261*** (0.1104)
Observations	1,120	3,071	918	1,740	299	2,377	2,549	1,091	2,698	4,226	1,489	2,923
R-squared (adj.)	0.16	0.26	0.11	0.14	0.12	0.19	0.10	0.14	0.05	0.13	0.13	0.15

Robust standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05

Table 4: Circumstance variables by country - % of the sample (2004)

	BE ²¹	CY	DK	EE	FI	IE	IS	LT	NO	SE	SK	UK
Education (father)												
not higher	81.9	92.5	82.9	84.6	81.7	89.7	85.2	89.6	76.6	85.1	90.6	82.7
higher	18.1	7.5	17.1	15.4	18.3	10.3	14.8	10.4	23.4	14.9	9.4	17.3
Education (mother)												
not higher	87.2	96.2	86.5	84.2	87.1	91.1	92.7	90.1	71.8	90.0	95.8	83.0
higher	12.8	3.8	13.5	15.8	12.9	8.9	7.3	9.9	28.2	10	4.2	17
Activity status (father)												
Employed & self-employed (inc. family workers)	92.37	99.05	98.69	98.75	97.83	98.62	99.88	98.33	100	96.33	99.11	98.32
unemployed	0	0.03	0.17	0.08	0.04	0	0	0.04	0	0.69	0.02	1.17
retirement	0	0.13	0	0.47	0.40	0	0	0.51	0	1.38	0.07	0.19
Domestic tasks and other	7.63	0.78	1.14	0.70	1.73	1.38	0.12	1.13	0	1.61	0.80	0.32
Activity status (mother)												
Employed & self-employed (inc. family workers)	39.11	38.67	63.24	93.43	88.42	27.94	62.01	85.84	100	71.56	81.37	99.81
unemployed	0.43	0.03	0.80	0.04	0	0	0	0.11	0	0.23	0.37	0
retirement	0.47	0	31.48	0.27	1.26	0	0.24	0.07	0	0.46	1.07	0.13
Domestic tasks and other	59.98	61.30	4.49	6.26	10.32	72.06	37.74	13.97	0	27.75	17.19	0.06
Household self-reported level of financial stress												
Very bad	3.19	5.35	2.56	3.95	6.68	5.23	1.82	8.78	1.61	4.59	3.43	7.38
bad	5.26	15.19	4.26	13.14	10.00	7.45	3.88	18.40	4.03	6.65	14.26	8.68
fair	10.91	40.04	14.32	37.78	24.86	22.00	14.44	28.97	12.79	12.84	32.43	24.16
good	11.00	32.05	18.47	22.92	22.88	22.78	15.41	18.62	27.59	19.50	27.91	21.05
Very good	69.64	7.37	60.40	22.21	35.58	42.55	64.44	25.23	53.98	56.42	21.97	38.73
Main occupation (father)												
Managers	11.86	1.40	8.01	12.87	10.72	28.91	20.02	7.19	13.80	9.86	7.50	6.22
Professional	11.34	5.18	12.78	7.55	8.05	9.68	11.89	7.70	9.57	10.55	6.47	9.78
Technicians and associate professionals	7.46	4.96	10.06	5.20	12.02	3.13	10.44	3.59	17.47	10.55	10.01	9.26
Clerical support workers	11.47	5.18	4.89	1.21	1.95	6.43	0.85	2.32	4.13	5.73	3.50	20.27
Service and sales workers	5.56	12.23	5.57	1.13	3.32	5.71	7.04	2.18	4.83	6.88	3.52	23.90
Skilled agricultural, forestry and fish	4.05	18.88	13.64	3.44	22.34	0.78	20.39	6.75	10.27	8.26	3.27	0.45
Craft and related trades workers	22.38	23.70	22.50	28.20	21.11	18.63	20.27	25.77	23.97	30.50	27.61	1.88
Plant and machine operators, and assemblers	8.62	9.42	8.86	28.82	14.94	9.86	5.83	21.38	14.95	13.99	21.69	8.94
Elementary occupations	9.62	18.26	12.56	10.87	3.83	15.50	3.16	22.00	1.01	2.06	15.63	18.98

²¹ BE- Belgium; CY- Cyprus; DK- Denmark; EE- Estonia; FI- Finland; IE- Ireland; IS- Iceland; LT- Lithuania; NO-Norway; SE – Sweden; SK- Slovakia; UK- the United Kingdom.

Not paid domestic activities	7.63	0.78	1.14	0.70	1.73	1.38	0.12	1.13	0	1.61	0.80	0.32
Urbanization												
Large urban areas	51.14	59.93	33.69	33.67	28.11	42.25	63.11	48.71	54.93	19.04	25.14	75.56
Small urban areas	44.42	12.19	30.45	0	16.02	30.83	0	0	16.26	13.99	36.23	19.57
Rural areas	4.44	27.88	35.85	66.33	55.86	26.92	36.89	51.29	28.80	66.97	38.63	4.87
Age												
25-31	17.46	18.45	15.40	13.02	14.94	14.18	16.99	11.69	15.41	17.66	19.13	21.89
32-38	23.67	21.49	25.45	17.87	17.54	21.88	23.42	17.89	23.46	18.81	17.92	23.77
39-45	24.75	23.41	26.99	25.07	22.48	24.22	24.15	25.26	22.66	22.48	23.29	21.31
46-52	22.38	21.23	19.26	25.85	23.46	23.92	19.90	26.75	19.69	21.10	24.27	19.56
53-59	11.73	15.42	12.90	18.19	21.58	15.81	15.53	18.40	18.78	19.95	15.38	13.47
Sex												
Male	65.46	55.53	54.43	48.26	49.04	53.55	56.92	47.19	56.55	58.49	49.94	58.42
Female	34.54	44.47	45.57	51.74	50.96	46.45	43.08	52.81	43.45	41.51	50.06	41.58
Total number of observations	2319	3067	1760	2557	2771	1664	824	2755	1986	436	4375	1170

Table 5: Circumstance variables by country - % of the sample (2010)

	BE	CY	DK	EE	FI	IE	IS	LT	NO	SE	SK	UK
Education (father)												
not higher	76.4	90.7	77.8	82.0	75.9	81.0	84.1	90.0	67.3	79.0	90.1	82.0
higher	23.6	9.3	22.2	18.0	24.1	19.0	15.9	10	32.7	21	9.9	18.0
Education (mother)												
not higher	81.7	94.3	81.7	78.0	76.8	84.4	91.6	88.0	76.8	79.3	94.8	84.3
higher	18.3	5.7	18.3	22.0	23.2	15.6	8.4	12.0	23.2	20.7	5.2	15.7
Activity status (father)												
Employed & self-employed (inc. family workers)	98.36	99.64	99.73	98.90	98.57	98.90	98.80	99.26	100.0	99.00	99.46	98.87
unemployed	0	0	0	0	0	0	0	0	0	0	0	0
retirement	0	0	0	0	0	0	0	0	0	0	0	0
Domestic tasks and other	1.64	0.36	0.27	1.10	1.43	1.10	1.20	0.74	0	1.00	0.54	1.13
Activity status (mother)												
Employed & self-employed (inc. family workers)	51.49	49.30	70.85	93.80	95.27	36.66	71.68	88.84	76.78	75.59	90.25	68.76
unemployed	0.55	0.07	0.20	0.12	1.52	0.55	0.0	0.19	0.57	0.33	0.24	6.64
retirement	0.04	0.03	0.74	0.16	0.09	0.0	0.0	0.0	0.75	0.33	0.02	0.24
Domestic tasks and other	47.92	50.60	28.21	5.92	3.13	62.79	28.32	10.97	21.90	23.75	9.49	24.36
Household self-reported level of financial stress												
Very bad	2.19	8.76	1.14	0.24	0.63	1.83	2.29	1.04	0.86	2.68	1.66	2.02
bad	4.00	12.24	3.90	3.53	4.11	5.50	4.90	6.26	2.93	6.35	4.87	4.65
fair	39.88	47.74	45.20	71.24	58.04	52.52	61.33	60.53	45.92	42.14	58.26	59.01
good	43.75	26.31	35.59	22.75	31.88	31.07	23.09	29.84	42.30	38.46	30.74	27.92
Very good	10.18	4.95	14.17	2.24	5.36	9.07	8.39	2.34	7.99	10.37	4.47	6.40
Main occupation (father)												
Managers	7.61	0.62	11.22	0.90	1.25	2.57	12.53	0.93	2.13	1.34	1.04	1.51
Professional	16.58	1.24	13.30	8.63	5.54	17.42	13.83	6.15	12.87	6.69	4.83	10.57
Technicians and associate professionals	13.42	7.49	8.06	9.14	13.84	13.93	7.19	9.67	13.28	13.04	7.08	17.04
Clerical support workers	11.19	8.37	4.90	5.85	12.41	6.14	2.72	3.71	19.48	9.36	11.55	9.44
Service and sales workers	5.55	3.22	11.89	1.45	1.79	2.66	10.24	2.30	2.82	3.34	3.17	4.31
Skilled agricultural, forestry and fish	4.67	10.84	15.18	1.73	6.88	8.80	17.97	3.22	5.69	10.37	4.57	7.90
Craft and related trades workers	22.47	16.44	28.21	4.83	14.55	16.41	21.90	8.27	8.97	9.70	2.56	3.42
Plant and machine operators, and assemblers	13.29	25.95	5.78	25.30	20.27	15.12	9.04	26.06	22.30	28.76	32.13	24.50
Elementary occupations	3.58	12.57	1.21	34.05	17.41	5.68	3.38	17.94	9.25	13.71	21.86	12.73
Not paid domestic activities	1.64	12.89	0.27	7.02	4.64	10.17	1.20	21.02	3.22	2.68	10.67	7.46
Urbanization												
Large urban areas	50.95	56.50	33.31	32.52	29.20	41.34	65.80	47.18	56.44	21.40	26.83	54.09

Small urban areas	45.18	14.85	41.37	0	14.73	27.13	0	0	16.78	12.71	31.40	31.78
Rural areas	3.87	28.66	25.32	67.48	56.07	31.53	34.20	52.82	26.78	65.89	41.77	14.13
Age												
25-31	18.47	17.58	7.59	14.91	21.34	14.57	13.07	9.60	12.41	16.05	18.05	16.01
32-38	22.89	19.18	17.26	17.73	21.52	30.89	21.02	13.42	20.00	17.06	18.39	17.96
39-45	22.55	23.64	25.12	24.52	20.98	21.91	24.62	20.39	25.40	24.08	20.59	22.20
46-52	21.20	22.24	22.83	24.21	10.71	18.70	20.70	31.32	22.24	21.74	24.96	25.28
53-59	14.89	17.36	27.20	18.63	25.45	13.93	20.59	25.28	19.94	21.07	18.01	18.54
Sex												
Male	62.35	50.21	51.71	48.29	52.68	51.70	54.14	45.18	58.56	54.52	48.32	57.54
Female	37.65	49.79	48.29	51.71	47.32	48.30	45.86	54.82	41.44	45.48	51.68	42.46
Total number of observations	2377	3071	1489	2549	1120	1091	918	2698	1740	299	4226	2923

Table 6: Sample sizes

	GROSS INCOME		NET INCOME	
	2004	2010	2004	2010
BE	2319	2377	2317	2374
CY	3067	3071	-	-
DK	1760	1489	-	-
EE	2557	2549	2566	2553
FI	2771	1120	-	-
IE	1664	1091	1663	1094
IS	824	918	-	-
LT	2755	2698	2750	2695
NO	1986	1740	-	-
SE	436	299	437	298
SK	4375	4226	-	-
UK	1170	2923	-	-

Figure 1: Shapley decomposition by country in 2004 (top) and 2010 (bottom): gross labor-income analyses

