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Income Inequality in Europe
What role does gender inequality play?

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Given the demographic structure of the population of the European countries, this paper examines how gender gaps in earned and non-earned income contribute to explain between household income inequality. We show that this impact depends not only on the existing gender gaps but also on the way how they are jointly distributed across the income distribution. Using the 2010 EU-SILC data, we propose a novel methodology that allows assessing the way in which gender gaps in income per adult, participation, labor earnings, hourly earnings, working hours, and in non-earned income affect inequality levels. We find an empirically discrete relationship between gender gaps and income inequality. Although this relationship tends to work differently across country groups (Western, Southern, Scandinavian, and Former Communist Economies), it is empirically not obvious which types of gender gaps are particularly relevant to determine the inequality level of the income distribution. A remarkable result is that the elimination of the gender gap in non-earned income tends to reduce the income inequality levels in a significant way in almost all European countries. This result suggests that there is a large space for reducing income inequality while improving the gender balance public and private transfers.

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1. Introduction

Gender inequality in various aspects of well-being and opportunities is an important issue in the EU.[1] While women outperform men in education, there remain large gaps in opportunities in the labor market as well as in time use and domestic duties. As many studies have shown, these gaps are not only inequitable, but also reduce economic efficiency and growth (e.g. Klasen and Lamanna, 2009; World Bank, 2011; Cuberes and Teignier, 2015). Given the fact that overall income inequality has increased in the EU since the beginning of the new millennium, this paper focuses on the impacts that these gender inequalities might have in shaping the current income distribution.[2]

This increase in income inequality in the EU is likely driven by two separate developments. The first is the development of mean income in member states. Until the early 2000s, poorer EU countries were catching up with richer ones; the reverse has happened since the 2008 financial crisis with richer ones doing generally better than poorer ones. The second is the development of within-country (between-household) inequality in EU member states since around the 1990s, France being a notable exception (see Figure 1).[3]

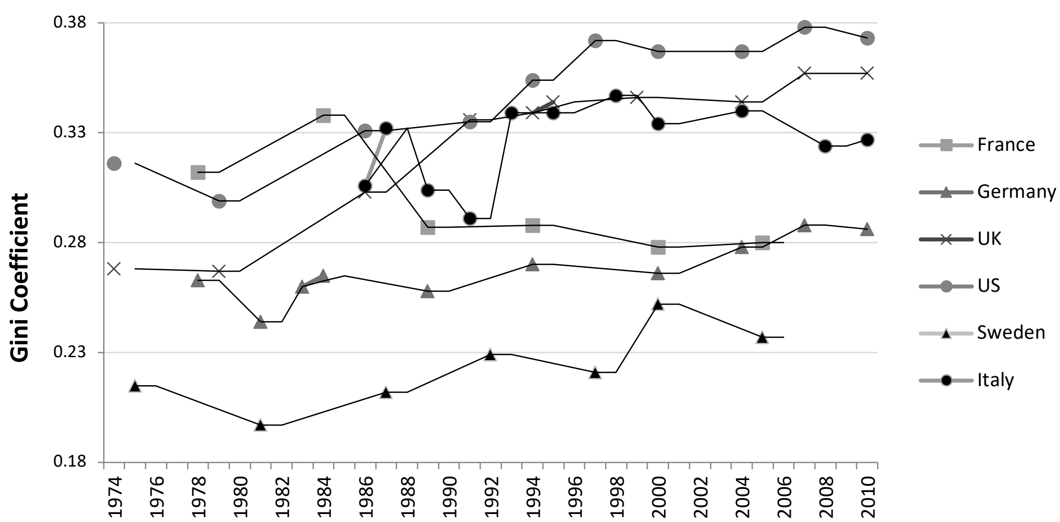

Figure 1: Gini coefficient in the EU countries

Source: Klasen (2014) based on Luxembourg Income Study, using equivalised net income as the relevant income concept.

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[1] In our analysis, we include all 27 EU countries, plus the United Kingdom and Iceland.
[2] Both income inequality by income decile ratio (the ratio of incomes at the tenth and the first decile) and the Gini coefficient confirm this trend.
[3] See Klasen (2014) for a discussion on this.

In what follows, we will focus on within-country inequality and investigate how gender inequality in labor earnings or access to unearned incomes plays a role in influencing these trends in household income inequality.

The past literature has extensively analyzed the forces driving the rising between-household income inequality. Different sets of explanations have been offered so far.[4] One line of argument points to the rising inequality in earnings or market income, which in turn can be due to different supply and demand factors.

On the demand side, modern economic systems have been experiencing a deep restructuring of their industrial composition with the growing relative importance of service sectors. There are studies explaining the consequences of deindustrialization processes on the income distribution (Chevan and Stokes, 2000). In parallel, in many fields of economic activity, an intensive process of skill-biased technological change took place and favored skilled labor relatively more than unskilled workers (Epifani and Gancia, 2008).[5] Additionally, compensation practices seem to have changed, with corporate governance institutions supporting the growing top income and causing increasing labor earnings inequality (Cernat, 2004; Leigh, 2009; Styhre and Bergström, 2019). Beyond earnings, also income inequality especially at the top of income distribution has increased between men and women (Atkinson et al., 2018).

The globalization of national markets has also played a role since the production of goods by less-skilled labor in OECD countries was replaced by imports from developing countries, leading to either stagnating wages or rising unemployment and poverty for less-skilled workers (Wood, 1998; Kurokawa, 2014; Ravallion, 2018). Conversely, high-skilled workers might have benefitted from the increasing demand for capital and technology-intensive goods from developing and emerging countries.

Another line of arguments points to the role played by the redistribution of market income, redistributive policies by the state, and by the distributive impact of private and public transfers. It is generally acknowledged that progressive taxes and public transfers reduce income inequality. However, in many countries, this redistribution has become weaker as taxes were lowered and made less progressive. Thus, redistribution was not always able to counterbalance rising market income inequalities (McCall and Percheski, 2010). Analogously, labor market policies of the last

[4] See McCall and Percheski (2010) for a review of the literature.

[5] Technological change does not need to be detrimental on income distribution. For recent evidence on this, see Antonelli and Gehringer (2017) and Włodarczyk (2017). On the impact of automation on wage inequality, see Lankisch et al. (2019).

few decades tended to introduce more flexibility into job arrangements, with the growing importance of part-time, temporary, seasonal jobs, mini jobs, etc. Although they might have contributed to a more dynamic growth environment, including employment growth, their redistributive consequences could have contributed to the disequalization of the income distribution (Kim and Skott, 2016).

On the supply side, changes in the demographic structure (e.g. with the poor having more children than the rich, poorer young people staying longer with their parents, population ageing etc.) have been also found to influence household income inequality (Lam, 1986; Kremer and Chen, 2002, Dolls et al., 2019).

Whereas there is a huge literature that has examined the factors determining household income inequality, and now literature is also focusing on the study of the drivers of household wealth inequality (Piketty, 2014), it is much less clear how the levels and changes in gender inequality relate to these trends in between-household income inequality.

In this paper, it is argued that gender inequality can also play a role in affecting levels and trends in inter-household inequality. However, there is no obvious or unambiguous direct transmission channel that implies a stable correlation between inter-household income inequality and gender inequality in earnings, labor market participation, or access to unearned incomes. In principle, it is perfectly possible for a society to have very large inter-household inequality, but very low (intra-household) gender inequality. For example, if high-earning women and men increasingly form households together (and low earning men and women do the same), inter-household inequality can be very large, even if gender gaps in earnings and participation within these households are very small. Conversely, one can have very high gender gaps in earnings and participation but low inter-household inequality in a situation where high-earning men pair up with low-earning women and vice versa.[6] Thus, the relationship between gender-neutral income inequality and gender inequality is actually quite complicated and necessitates careful analysis.

There is a small (and now somewhat dated) literature that has examined the impact of changes in female participation and earnings on (inter-household) income inequality in the United States (Cancian and Reed, 1998 and 1999; Daly and Valletta, 2006; Pencavel, 2006) and

[6] Note that the type of marriage arrangements can have an influence on intra-household inequality. For example, it may well be that women with low labor market participation or earnings will have a lower bargaining power and as a result will have lower access to resources. There is empirical support for such a claim (e.g. Lundberg, Pollack, and Wales 1997; King, Klasen, and Porter 2009). Despite the evidence of these effects, it is still not possible to accurately measure the total distribution of household resources in these situations.

Switzerland (Kuhn and Ravazzini, 2017). Using different decomposition methods, these studies invariably find that the rise of female participation and earnings over the past 30 years has served to lower income inequality (slightly) as it tended to increase incomes of poorer households proportionately more than those of richer households. At the same time, the increasing proclivity of highly educated women and men to form households has served to (slightly) increase income inequality. Overall, however, these changes in matching and female participation and earnings have had a rather small impact on changes in inequality, which was largely driven by the rising inequality among male earnings, particularly linked to skill differentials.

While these results are very instructive, it is less clear whether and to which extent they apply to the EU countries. While female earnings and participation has increased within the EU, and the matching processes in the marriage market are likely to be similar compared with the US, there are some key differences. First, the rise in female participation and earnings has been slower and more uneven across Europe and across age groups. Second, the changing household formation patterns, most notably the rise of single households as well as the large increase in female households with children headed by single women can significantly affect inequality dynamics in different ways compared to what happened in the US. Lastly, social policies are generally more generous in Europe and in particular transfer policies that affect gender inequality can have a larger impact on overall income inequality than in the US.

An important aspect here is that within the EU, the implementation of labor market policies, family policies, tax and pension systems remain to a large extent within the national responsibility (Gehringer and Klasen, 2017). Consequently, they can have a different, and highly heterogeneous impact on men and women and, through that, on income inequality in Europe. Particularly, such policies can substantially affect the economic position of single mothers, divorcees, and female elderly, which might lead to a different impact of gender differentials on overall income inequality.

Similar to our conceptual approach, a recent study by the OECD (2015) examines the impact of gender inequality in earnings on between-household income inequality using decomposition approaches. The study also carefully considers different pathways how gender inequality in earnings can affect household income inequality. Similar to our finding, they find that the effect of gender inequality on income inequality differ substantially across countries, while there are still some general trends. Among them is that female earnings are generally more unequal than male earnings (largely due to larger differences in participation and hours of work among women than among men, but it can be also due to the mentioned changes in the formation of households), that female earnings have become more unequal recently, but less so than the increase in earnings inequality among men.[7] They also find that gender gaps among top earners tend to be larger in many OECD countries than lower down in the income distribution (see Atkinson et al., 2018). In a Gini decomposition exercise of household income, OECD (2015) finds that, in a majority of countries, rising female earnings have contributed to increasing income inequality. This piece of evidence is consistent with our results in which the reduction of gender gaps among top earners can have a disequalizing effect on the income distribution as the elimination of this gap would increase the total income among those households at the top of the income distribution. Moreover, in another decomposition exercise, the same study shows that rising female participation and working hours in recent decades has served to lower inequality while the prevalence of women in high-skilled jobs has partly off-set that effect. The effect of overall labor earnings is somewhat less clear.[8]

Our analysis differs from the OECD study in several important aspects. First, we focus on all EU countries. The OECD study includes only a subset of 19 EU members. Moreover, we use EU-SILC as the main source of analysis, while the OECD study is based on the household surveys included in the Luxembourg Income Study (LIS). The latter sometimes reports gross and sometimes net earnings and incomes so that the results are not so easily comparable between countries. Additionally, the OECD focuses particularly on the impact of earnings on household income inequality, and particularly its contribution to inequality changes over time. We instead consider cross-country inequality comparisons between European countries in 2010. Finally, the decomposition analyses done by the OECD use parametric techniques, while we use non-parametric techniques which allow us for more flexibility in the assessment of the effects. In this regard, our analysis allows us to decompose between intensity and composition gender gap effects. Intensity effects are those following the elimination of the gender gaps amongst those currently participating in the labor market, while composition effects are those originated in the

[7] Using the EU-SILC 2010 data and by averaging female and male labor income per ventile across the 29 EU considered in this paper, the resulting Gini coefficients for the female and male distributions reach 0.50 and 0.43, respectively.

[8] It is a bit unclear how the results of the two decomposition exercises are consistent with each other as the latter one, based on RIF regressions, is essentially arguing that lower gender inequality has served to lower overall inequality, while the Gini decomposition exercise suggests that the greater participation and earnings of women has served to increase household inequality.

gaps between women and men in their relative participation in labor activities across the income distribution.

Thus, in many ways our analysis and results complement those of the OECD study, and add further methodological approaches and insights into the complex nature of the issue.

The paper is organized as follows. Section 2 reviews the literature on the link between gender inequality and inter-household income inequality. Section 3 presents a descriptive analysis and the data, whereas Section 4 shows the results of our simulation/decomposition exercise. The discussion of the results of the simulation/decomposition exercises is presented in Section 5. Finally, Section 6 focuses on the conclusion of this study and its policy implications.

2. Gender versus inter-household income inequality

To understand the link between gender inequality and inter-household income inequality, it is first important to map out possible linkages between these two issues.[9] In that context, it is first crucial to clarify to which concept of gender inequality this paper refers. While there are many dimensions of possible gender inequality, the paper will focus here primarily on gender inequality in labor force participation, hours of work, earnings, and access to unearned incomes (such as state transfers).

To tackling gender inequalities more comprehensively, one would like to include gender gaps in time use, care responsibilities, health, education and gaps that arise due to household formation. However, since our effort is devoted to disentangling the transmission channels between gender gaps and household income inequality, it is natural to refer here to gender-related disparities that affect household income inequality the most. One approach to do this is to examine the standard sets of determinants as described above and examine their gender dimension.

For instance, the economic restructuring away from manufacturing and with a growing relative importance of services might have favored women's labor force participation as services are often regarded to be typically female-dominated occupations. Nevertheless, the effect of structural change and the move towards services on the gender pay gap could have been negative. Since the increasing labor participation of women often occurred in lower-paid and less skill-

[9] See also OECD (2015) for a related discussion.

intensive service activities, this might have increased women's representation at the bottom of the earnings ladder. Consequently, as long as women enter into low-earning jobs in the labor market and their relative position in terms of earnings with respect to the corresponding group of low-earning men doesn't change or worsens, the gender inequality in earnings will grow, contributing at the same time to the widening of the overall distribution of earnings. Conversely, if alongside increasing participation rates of low-earning women, the gap vis-à-vis low-earning men in pay and participation diminishes, this reduces gender inequality in that part of the distribution and contributes to lowering overall inequality. Which of the effects prevails, the answer will depend thus on the interplay between the gender participation and the gender pay gap.

Skill-biased technological change could also increase the gender pay gap and promote greater household income inequality (Black and Brainerd, 2004). This is because women are often disproportionally occupied in low-skill activities, despite the fact that in terms of educational attainment women often outperform men. This is also driven by the fact that women – tending more often than men to stay longer outside of the labor market or to assume part-time employment to reconcile family duties – (have to) accept degrading in their actual occupation with respect to their male peers with the same educational attainment. Consequently, the intensifying relative demand for skilled workers and thus increasing wages for skills could favor men's earnings, widening the gender pay gap and indirectly increasing the overall income inequality.

The influence of globalization on gender disparities is complicated as it will depend on the precise channels through which the globalization dynamics occurs. One possible hypothesis, advanced by Gary Becker as early as in 1957, states that increased international competition influenced employers' practices, contributing to a lower degree of costly discrimination against women.[10] This argument is also related to the relationship between market structure and discrimination practices: in industrial contexts where the degree of concentration is high, the lack of competitive pressure would allow gender and other types of discrimination.[11] If progressive international integration effectively contributes to increase the degree of

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[10] Becker (1957) argued that increased competition in the product market would benefit the more equal treatment of women and minorities.

[11] The empirical testing of Becker's theory regarded specific sectoral experiences, as, for instance, the study by Black and Strahan (2001) on the consequences of deregulation in the US banking sector since the 1970s, confirms the hypothesis that deregulation and thus increasing degree of competition reduced discrimination against women and improved their relative wages.

competition, this could reduce the gender pay gap (Black and Brainerd, 2004, see also Rees and Riezman, 2012).[12] Whereas this argument could be true in some historical and localized contexts, also the opposite may occur: one of the consequences of economic integration could be the increasing market domination by few powerful competitors, with monopolization tendencies and, thus, disruptive welfare consequences. To the extent to which the growing market power translates into intensified discriminatory practices, gender gaps in pay (or in employment) could soar (Ben Yahmed, 2012a).

Other channels in which globalization can affect gender gaps are related to international trade, foreign direct investments, outsourcing and offshoring. Regarding these channels, their influence on gender pay gap will normally depend on workers' skill levels.[13] In particular, at the top of the skills distribution, the gender pay gap could widen as a consequence of trade intensification due to enhanced demand for work commitment – being, on average, higher for men than for women – while the gap would be reduced for lower skilled workers (Ben Yahmed, 2012b). Thus, in making a valid statement over the relationship between globalization and gender inequalities it is crucial to be clear about the precise underlying mechanisms.[14]

Lastly, compensation as well as contractual practices along the wage distribution could also have relevant gender dimension. The role of trade unions, minimum wages, and collective bargaining can have substantial impact on gender inequality (McBride, 2018). According to the glass-ceiling effect, women could face difficulties in being promoted to top jobs (Gobillion et al. ,2012; Glass and Cook, 2016). In this regard, OECD (2015) suggests that glass ceiling effects are leading to increasing gender pay inequality at the top of the earnings distribution. While this is of course problematic for the affected women, it might serve to lower household income inequality by compressing the top of the household income distribution.

From the above discussion it is evident that the existing economic policy framework exercises an important influence on the link between gender and income inequality. The issue at stake is complex, as different policy measures might have a priori an unclear effect on gender employment and income equality, often depending on the direction, the extension and intensity

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[12] Confronting this idea with the outcomes of the recent contributions on the link between trade and wage inequalities, which hypothesizes that trade deteriorates earnings of less skilled workers, it becomes clear that trade could have an opposite effect on gender versus inter-household inequalities.

[13] See Ben Yahmed (2012b) for a review of the related literature. In a recent empirical paper based on Norwegian data, Bøler et al. (2014) find that the gender wage gap is unconditionally smaller in exporting firms.

[14] See Rees and Riezman (2012) for different modeling approaches on the impact of globalization on the gender pay gap.

of precise interventions.[15] A prominent example here is the case of financial support offered to families in terms of parental leave and/or family allowance. In principle, such support should be aimed at lowering the potential trade-off between continuing to work after the birth of the child and dropping permanently out of the labor market in order to take care of the new-born. Since such financial support increases non-labor income, a too extensive system of financial benefits could contribute to a positive net income effect, with a clearly negative effect on labor supply, particularly for women (Gehringer and Klasen, 2017). Another example concerns the provision of flexible working time arrangements, including part-time. Since women are often strongly involved in family duties, the opportunity to take up reduced working time could importantly reconcile the family work balance. On the other hand, by not participating fully and without breaks in the labor activities, women effectively face "glass ceilings" later in their careers when striving for advancement. Also, the interactions between different policy measures might be relevant in determining the final outcome in terms of gender rebalancing.

3. Descriptive analysis and data

There are numerous dimensions of gender gaps that can impact inter-household income inequality and that, in many cases, are strongly related with one another. It is unclear how these gaps contribute to the overall income inequality as it depends on where along the income distribution these gaps are particularly prevalent, and how these gaps are combined depending on the density of different types of households across the income distribution. For that reason, the decomposition exercise outlined in the next section is of crucial importance.

To allow a better understanding of the decomposition exercise, here we show some descriptive analysis based on the 2010 EU-SILC data.

The issue of the gender gap in earnings and the disadvantaged position of women in this respect have been intensively analyzed in the literature and, at least since 2003, have been on the

[15] The complexity of the issue is even higher if one recognizes the interdependences between paid (public or private) and unpaid economy (domestic sector). Since the unpaid sector plays a crucial role in individual socialization and in developing the general sense of social norms – which strongly influence the paid economy, it requires maintenance and investment coming from both public and private sector (Himmelweit, 2002). The focus of the policy makers – and of the analysis in this study – is on the paid economy. This notwithstanding, it is advisable to be aware of such interdependences and at least avoid, if necessary, the negative impact on the unpaid economy. Additionally, it would be inappropriate to ignore the unpaid economy's activities, as this would unduly imply to consider all time spent outside employment as a costless resource (Himmelweit, 2002).

policy agenda in the EU (Rubery et al., 2005). According to the report dedicated to tackling the gender pay gap in the European Union by the Directorate General Justice of the European Commission (European Commission, 2013c), although the gender gap in pay has been continuously decreasing, women in the EU still earn around 16% less on average than men in terms of unadjusted gross hourly earnings.[16] These figures were confirmed in a more recent report by the Directorate General Justice of the European Commission (European Commission, 2018).

Table 1 shows, based on our sample, the estimates of an unadjusted gap of 23% and an adjusted one reaching 27%.[17] The adjusted figure controls for education achievements, age and age squared and hours of work. The cross-country heterogeneity is remarkable, with gaps close to 15% in some countries (Slovenia, Ireland, Hungary, Denmark, and Finland) and a gap of over 30% in other countries (Cyprus, Estonia, Greece, and Netherlands).[18] It is important to note that the adjusted gender pay gap is often larger than the raw gender pay gap, particularly in Central and Eastern European countries where women for a long time have had more human capital and thus should be earning more than men. Moreover, this larger estimate relates to the fact that we also include part-time employment where hourly wages for women tend to be particularly low (see also OECD, 2015). Thus, the pay gap for women working part-time accounts for a very large share of the overall gender pay gap.

Note also that the heterogeneity of gender pay gaps not only depends on how women are treated relative to men but to how the overall wage distribution looks like, and how labor market institutions affect it. For example, in an investigation based on international comparison among industrialized countries, Blau and Kahn (2003) confirm a paradoxical finding that despite a relatively higher average level of qualification observable for US women compared to men in other OECD countries, and despite a long tradition of antidiscrimination laws in the US, the gender pay gap there has been among the highest. As an explanation the authors points to crucial

[16] These data are based on official statistics provided by Eurostat and refer to unadjusted gender pay gap for full-time workers, thus calculated without controlling for the impact of unobserved factors (personal characteristics) and other observed factors, such as educational attainment, work experience, hours worked, type of occupation and sectoral belonging, etc. The adjustment for such factors still leaves around half of the gap unexplained, suggesting that gender discrimination is still an issue.

[17] Note that the estimation of the hourly labor earnings gaps relies on the estimation of hours of work, which requires assumptions regarding past jobs, as well as on second occupations. Details on the estimation of the yearly hours of work are available upon request.

[18] The inter-EU differences in the gender pay gap have been analyzed by Aláez-Aller et al. (2011). With respect to countries with a higher gender pay gap (specifically, Austria, the United Kingdom and northern European countries) they argue that it is mainly the result of an overrepresentation of men in highly paid jobs.

differences in the wage-setting institutions. They are centralized in the majority of the OECD countries leading to a generally larger wage compression that is ultimately beneficial to women, whereas highly decentralized in the United States, leading to overall inequality.

Table 1: Gaps in hourly labour earnings and yearly hours of work in 2010.

	Hourly labour earnings					Yearly hours of work			
Country	Women	Men	Row Gap	Gap (%)	Adjusted gap (%)	Women	Men	Row Gap	Gap (%)
AT	14.1	17.7	3.6	25.57	29.03	1595	2091	496	31.11
BE	16.1	17.7	1.6	9.94	19.14	1654	2074	421	25.45
BG	1.6	1.9	0.3	16.70	25.13	1895	1947	53	2.78
CY	9.4	12.7	3.3	34.76	48.41	1869	1925	56	2.98
CZ	3.8	4.9	1.1	29.72	28.77	1940	2156	217	11.18
DE	13.3	18.0	4.7	35.36	26.48	1558	2088	530	34.03
DK	23.5	25.3	1.8	7.86	10.24	1511	1689	178	11.79
EE	3.6	4.7	1.1	29.38	31.53	1736	1796	60	3.46
EL	8.6	10.8	2.2	25.12	39.92	1791	2121	330	18.41
ES	9.6	11.1	1.5	15.04	22.79	1678	1968	290	17.28
FI	16.2	18.2	2.0	12.28	16.04	1508	1736	227	15.06
FR	13.1	16.7	3.6	27.22	27.25	1582	1885	303	19.16
HU	2.8	3.2	0.4	12.64	14.68	1780	1878	99	5.56
IE	18.7	21.2	2.5	13.53	9.65	1426	1918	492	34.51
IS	10.6	12.7	2.1	19.72	19.42	1618	1975	358	22.10
IT	12.7	14.9	2.1	16.74	19.66	1597	1973	376	23.51
LT	3.3	3.4	0.1	3.07	17.74	1727	1778	52	2.99
LU	20.4	25.8	5.3	26.17	26.41	1736	2172	436	25.12
LV	3.4	3.9	0.5	15.83	20.32	1733	1765	32	1.84
MT	8.0	8.7	0.6	8.06	14.93	1586	1999	413	26.04
NL	19.0	25.0	6.1	32.09	40.84	1266	1773	507	40.08
NO	21.6	27.7	6.1	28.03	28.21	1485	1794	309	20.77
PL	3.4	3.6	0.2	6.04	19.11	1893	2140	247	13.07
PT	6.8	7.6	0.9	12.62	28.16	1846	2013	168	9.08
RO	1.4	1.6	0.2	15.47	26.64	2001	2092	91	4.55
SE	16.9	18.6	1.7	10.30	21.14	1306	1561	255	19.56
SI	7.7	8.4	0.7	9.20	13.36	1609	1737	129	7.99
SK	3.3	4.1	0.8	22.62	20.40	1873	2020	147	7.88
UK	14.8	17.9	3.1	21.34	18.64	1579	2119	540	34.21
Average	11.6	14.2	2.7	23.12	27.18	1644	2001	357	21.72

Note: The adjusted gap was obtained using an OLS equation, which consists of dummies for the levels of education, age, squared age, hours of work and a dummy signalling a male labour earner (gap indicator). Row gaps are unconditional figures. ISO 3166-2 country codes are used in this Table as well as in the whole document.
Source: Own elaboration based on EU-SILC 2010.

The existence and persistence of the gender gap in pay is an issue not only during the working life of women, but has also important long-term consequences, as it normally translates into gender gap in pensions – an issue with significant impact on income inequality between households. Related to this, elderly women more often than men are exposed to poverty when reaching pensionable age.

4. Methodology

When considering within-country inequality, the indicator examined is usually the distribution of household net income per capita (or sometimes per adult equivalent as in Figure 1). Households, and not individuals, have been argued to be the appropriate unit of analysis of the income distribution, since income is – at least to some extent – shared at the household level, especially to provide resources to those who do not earn any income (Lam, 1997). As it is virtually impossible to determine the distribution of income or consumption within households, most studies of income inequality assume that income (or consumption) within households are distributed equally.[19] While this is unlikely to be true, such analyses of income inequality based on this equal distribution assumption tend to understate income inequality (and poverty, see Haddad and Kanbur, 1990) as well as the inequality attributed to gender gaps.[20]

In this study we do account for the income gender gaps in earned and non-earned income when possible. However, we still rely on the assumption of an equal distribution for these incomes whose source cannot be directly connected to a specific adult women or men.[21] The aforementioned underestimation of income inequality and poverty is partially alleviated through this empirical approach.

Our novel methodology consists of two parts. Firstly, we identify a row of identities for the total disposable household per capita income that links household per capita income to its proximate determinants (demographics, labor markets, and other non-labor incomes, see Klasen et al. 2014, and Barros et al. 2006). Secondly, by developing a useful notation, we link the

[19] The reason for this difficulty is that portions of incomes are used to purchase goods used by all members simultaneously (such as housing, durable goods, and household services). Additionally, household members with income provide for access to goods also to those without own income (such as children, the elderly without income or adults without income), which is nearly impossible to observe without very difficult, costly, and intrusive surveys. For a discussion, see Klasen (2007).

[20] It is clear that in some dimensions of well-being, there are clear gender differentials, including in time use. It is much harder to determine to what extent and how large are gender gaps in access to resources within households for the reasons outlined in the previous footnote.

[21] Specifically, we equally distributed among the adult household members income components at the household level such as: income from rental of a property or land, family/children related allowances, social exclusion income not elsewhere classified, housing allowances, regular inter-household cash transfers received, interests, dividends, profit from capital investments in unincorporated business, income received by people aged under 16.

mentioned decomposition framework with the use of quantile-averaged distributions as a suitable proxy for the empirical distributions of the proximate determinants of the household per capita income distribution. This final step allows us to perform microsimulations to assess the impact of gender gaps on income inequality given the demographic composition of the society.

4.1. Proximate determinants of income inequality changes

Our empirical method aims to reveal the relative importance of gaps in labor markets activities as well as in non-market income in explaining differences in the distribution of disposable household per-capita income. Inspired by the identity structure of the household per capita income proposed first by Barros et al. (2006), we provide a way to assess the impact that gender gaps have on income inequality, regardless of how it is measured.[22]

Following Barros et al. (2006), Identity (1) shows the disposable household per-capita income expressed as the following product:

$$y_i = a_i \times r_i \qquad \forall\, i = 1, \dots, N \tag{1}$$

where y_i is the disposable household per-capita income of household i, a_i is the proportion of adults in household i and r_i corresponds to the income per adult in the same household.[23] Our gendered extension of identity (1) can be also written in identity (2) as follows:

$$y_i = a_{i\_f} \times r_{i\_f} + a_{i\_m} \times r_{i\_m} \qquad \forall\, i = 1, \dots, N \tag{2}$$

Here, the demographic characteristics and income contributions of female and male adult household members are denoted by subscripts $\_f$ and $\_m$, respectively. This decomposition rule assumes that all household income that cannot be imputed to a female or male adult (for instance, imputed rent in owner-occupied housing) is equally assigned amongst all adult household members (i.e. without distinction of their gender).[24]

[22] For a description of the basic model of decomposition of a distributional change, see Klasen et al. (2014) and Barros et al. (2006).
[23] The 2010 EU-SILC data considers as adults those aged between 16 and 80.
[24] This is probably a conservative approach since it may tend to reduce gender inequalities from this type of income. Thus, our results can be interpreted as lower-bound impacts of labor market-related gender gaps on income inequality.

Starting with the gendered identity (2), we can decompose household income per adult r into non-earned income per adult o, and into labor earnings per adult t (shown in identity (3) below). Identity (4) shows that t can be expressed as the product of the proportion of working adults in the household u (dubbed participation), and the labor earning per working adult w. In turn, Identity (5) depicts that w can be calculated as the product of the work intensity and its hourly pay per working adult, h and e, respectively (see Klasen et al. 2014 for an ungendered version of this row of identities (1) to (5)).

$$y_i = a_{i\_f} \times \left(o_{i\_f} + t_{i\_f}\right) + a_{i\_m} \times \left(o_{i\_m} + t_{i\_m}\right) \qquad \forall\, i = 1, \dots N \tag{3}$$

$$y_i = a_{i\_f} \times \left(o_{i\_f} + \left(u_{i\_f} \times w_{i\_f}\right)\right) + a_{i\_m} \times \left(o_{i\_m} + \left(u_{i\_m} \times w_{i\_m}\right)\right) \qquad \forall\, i = 1, \dots N \tag{4}$$

$$y_i = a_{i\_f} \times \left(o_{i\_f} + \left(u_{i\_f} \times \left(h_{i\_f} \times e_{i\_f}\right)\right)\right) + a_{i\_m} \times \left(o_{i\_m} + \left(u_{i\_m} \times \left(h_{i\_m} \times e_{i\_m}\right)\right)\right) \qquad \forall\, i = 1, \dots N \tag{5}$$

Based on the above identities, in the next section we present an approach to aggregate the information across households to perform our distributional analysis.

4.2. Quantile-averaged distributions

One of the difficulties associated to the study of distribution dynamics is that usually, within the same survey, or when using data from different geographic/political units (countries), sample sizes are different. As such surveys are not designed for unit-to-unit comparison, changing sample sizes makes it impossible to directly compare two different-sized distributions based on the ranking of their observations. This is the case with the 2010 EU-SILC data that we use.

One alternative to solve this comparability problem is to sort each marginal distribution within the above identities of interest into $q = 1, \dots, Q$ population equal-sized quantiles and then to calculate the mean values per quantile of these marginal distributions. We use the empirical distribution to estimate these quantiles. A random variable $X_1, \dots, X_n$ in quantile p can be estimated using $F_X^{-1}(p) = \inf\{x: F(x) \geq p\}$. Since the cumulative distribution function is unknown, we use the empirical distribution to perform the quantile estimation for a random variable. Then, quantile p can be estimated as $\hat{F}_X^{-1}(p) = \inf\left\{x: \hat{F}(x) \geq p\right\} = \inf\{x: \sum_{i=1}^{n} I(X_i \leq x) \geq pn\}$.

In this way, all ordered samples $X_1, \dots, X_n$ can be divided in $1/p$ groups separated by quantiles $\hat{F}_X^{-1}(1p)$, $\hat{F}_X^{-1}(2p), \dots,$ $\hat{F}_X^{-1}(qp), \dots,$ $\hat{F}_X^{-1}\left({}^1/_{p}-1\right)p$, $\hat{F}_X^{-1}(1)$. Note that if $2 > p > {}^1/_n$, each group will be made of by pn observations.

Now, we can define a quantile-averaged expression for the total disposable household per capita income y_i for the q quantiles in all identities from (1) to (5) as follows:

$$y_{qy} = \frac{Q_y}{n} \sum_{i=1}^{n/Q_y} y_{\frac{(q-1)n}{Q_y+i}} \qquad \forall\ q = 1, \dots, Q_y \tag{6}$$

While the mean of the quantile-averaged distribution y_{qy}, and the mean of the empirical distribution of y_i: $\{y_1 \dots y_n\}$ are the same, the variability of the former distribution can be biased. The variability bias is generally small and tends to disappear with increasing numbers of quantiles.[25] The problem of bias is even smaller when considering a balanced inequality index such as the Gini coefficient.[26]

Table 2 compares the first two moments as well as the Gini coefficients of the empirical distribution of y_i against the empirical ventile-averaged distribution $y_{qy}\ \forall\ q = 1, \dots, 20$; for each European country.[27] The largest variability bias is found in Spain, where the Gini coefficient obtained from the quantile-averaged distribution underestimates the Gini coefficient by 4.46% or 1.56 Gini points.

Regarding the proximate determinants, $a_{qa} = \frac{Q_a}{n} \sum_{i=1}^{n/Q_a} a_{\frac{(q-1)n}{Q_a+i}}, \forall\ q = 1, \dots, Q_a$, corresponds to the quantile-averaged proportion of adults a (second subscript) in all households of quantile q (first subscript). Introducing the gender divide, we have the following two expressions $a_{qaf} = \frac{Q_{af}}{n_f} \sum_{i=1}^{n_f/Q_{af}} a_{\frac{(q-1)n_f}{Q_{af}+i}}, \forall\ q = 1, \dots, Q_{af}$; and $a_{qam} = \frac{Q_{am}}{n_m} \sum_{i=1}^{n_m/Q_{am}} a_{\frac{(q-1)n_m}{Q_{am}+i}}, \forall\ q = 1, \dots, Q_{am}$; for the female and male quantile-averaged distributions, respectively.

[25] The convergence is not surprising as the observed distribution is an averaged-quantile distribution where the size of the observed distribution equals the number of quantiles or $Q_y = N$.
[26] For instance, implementing the procedure with 20 quantiles (or ventiles), it yields an average bias, in absolute values, of 1.29% or a bias of 0.39 Gini coefficient points for the 29 European countries considered in this study.
[27] Ventile corresponds to 20-quantiles. Gaps in the means are due to the exclusion of a minor proportion of households with incomplete information affecting also the standard deviation bias.

Similarly, $r_{qr} = \frac{Q_r}{n}\sum_{i=1}^{n/Q_r} r_{\frac{(q-1)n}{Q_r+i}}, \forall\, q = 1, \dots, Q_r$, is the average household income per adult r (second subscript) amongst all households in quantile q (first subscript).

Introducing the gender divide, the following expressions for the female and male quantile-averaged distributions are $r_{qrf} = \frac{Q_{rf}}{n_f}\sum_{i=1}^{n_f/Q_{rf}} r_{\frac{(q-1)n_f}{Q_{rf}+i}}, \forall\, q = 1, \dots, Q_{rf}$; and $r_{qrm} = \frac{Q_{rm}}{n_m}\sum_{i=1}^{n_m/Q_{rm}} r_{\frac{(q-1)n_m}{Q_{rm}+i}}, \forall\, q = 1, \dots, Q_{rm}$; respectively.[28]

Turning back to the ungendered expressions, note that while identity (1) holds at the household level, the expression $y_{qy} = a_{qa} \times r_{qr}$ does not hold across all quantiles q. This is because the distributions of a_{qa} and r_{qr} are not perfectly correlated at the household level. We call ${y_{qy}}^{max\_ineq} = a_{qa} \times r_{qr}\ \forall\, q = \{1, \dots, Q_{a,r,y}\}$ the most unequal feasible income distribution, given the marginal distributions of demographic endowments a_{qa} and their returns r_{qr}. It means that households with the lowest (highest) proportion of adults are simultaneously those with the lowest (highest) level of income per adult.

However, empirically, the groups of households sorted at the bottom (top) quantile in both of these marginal distributions are never the same. It follows that, ${y_{qy}}^{\max\_ineq} = a_{qa} \times r_{qr}\ \forall\, q = \{1, \dots, Q_{a,r,y}\}$ underestimates (overestimates) the true value of the empirical distribution y_{qy} at bottom (top) quantiles of each marginal distribution.

The observed discrepancy between the product $a_{qa} \times r_{qr}$ and the empirical distribution y_{qy} (in equation 6) is then a measure of the assertiveness in which both distributions are empirically joined. With this in mind, we define $JD_{q(a\leftrightarrow r)}\ \forall\, q = \{1, \dots, Q_{a,r}\}$ as the joint distribution factor that links the marginal distributions of a_{qa} and r_{qr} in a way that, preserving their rank orders, their product generates $y_{qy}\ \forall\, q = 1, \dots, Q_y$, which is a very close proxy of the empirical distribution of interest $\{y_1 \dots y_n\}$.[29]

[28] Note that in order to solve the comparability problem of different sized distributions, in this framework it is needed that $Q_{af} = Q_{am} = Q_{rf} = Q_{rm}$.

[29] Note that the most unequal household income distribution has a distribution of joint factor indices for the q quantiles constant at the unity or $JD_{q(a\leftrightarrow r)} = 1\ \forall\, q = 1, \dots Q_{(a,r)}$.

Table 2: Comparison between the empirical and Ventile-averaged distributions of the disposable household per capita income.

Country	Disposable household per capita income						Gap (Ventile-averaged vs. actual)		Bias	
	Actual distribution $y_i: \{y_1,\ldots,y_n\}$			Ventile-averaged distribution $y_{qy}\ \forall\ q = 1, \ldots, Q_y = 20$					In Percentage	In Gini points
	Mean	Std. Dev.	Gini Coeff.	Mean	Std. Dev.	Gini Coeff.	Mean	Std. Dev.		
AT	17747	10873	28.90	17597	10266	29.03	150	607	0.44	0.13
BE	15945	10463	27.89	16278	8922	27.58	-333	1542	-1.10	-0.31
BG	2379	1873	33.72	2384	1646	33.49	-5	227	-0.70	-0.24
CY	13701	13921	33.90	13689	9610	33.50	12	4310	-1.19	-0.41
CZ	5680	3464	25.76	5716	3043	25.55	-36	422	-0.80	-0.21
DE	16652	15098	32.39	16754	11234	32.33	-102	3864	-0.20	-0.07
DK	20523	14045	28.04	21283	13417	29.17	-760	628	4.02	1.13
EE	4890	3232	31.99	4939	3083	31.11	-50	149	-2.74	-0.88
EL	9758	7226	33.84	9634	6746	33.87	123	480	0.11	0.04
ES	10621	7426	35.01	11021	7207	33.45	-400	219	-4.46	-1.56
FI	17500	11793	27.24	17386	9991	27.89	114	1802	2.36	0.64
FR	18306	14398	32.24	18287	12578	32.21	19	1820	-0.09	-0.03
HU	3460	2062	26.35	3463	1797	26.43	-3	265	0.30	0.08
IE	16813	11939	32.77	16860	11299	32.53	-47	640	-0.72	-0.23
IS	15131	10287	29.18	15456	9495	28.91	-325	791	-0.90	-0.26
IT	13936	10739	33.87	13966	9525	33.42	-30	1213	-1.35	-0.46
LT	3553	3002	37.18	3582	2731	36.85	-29	272	-0.90	-0.33
LU	28337	21605	31.67	28275	17787	31.63	62	3818	-0.15	-0.05
LV	3854	2932	36.21	3879	2832	35.67	-25	100	-1.49	-0.54
MT	8115	5099	30.23	7985	4914	31.15	131	185	3.05	0.92
NL	17184	10190	27.50	17140	9431	27.84	44	759	1.21	0.33
NO	25961	15469	26.30	25649	13367	26.82	311	2103	2.00	0.53
PL	3796	3056	34.10	3809	2677	33.85	-12	378	-0.74	-0.25
PT	7418	5856	35.66	7384	5656	35.85	34	200	0.52	0.19
RO	1721	1206	34.22	1715	1164	34.41	6	42	0.57	0.19
SE	15360	9203	26.29	15196	7879	27.16	164	1323	3.30	0.87
SI	8749	4516	25.51	8712	4392	25.97	37	124	1.83	0.47
SK	4779	2951	26.01	4804	2469	26.00	-25	482	-0.04	-0.01
UK	14958	11501	34.20	14899	10418	34.20	59	1083	-0.02	-0.01

Note: *Gaps are due to the exclusion of a minor proportion of households with incomplete information on the proximate determinants. Source: Own elaboration based on 2010 EU-SILC household survey.

The index factor of the joint distribution between a_{qa} and r_{qr} at each associated quantile $q = \{1, \dots, Q_{a,r,y}\}$ can be calculated by performing the following quantile-level operation:

$$JD_{q(a\leftrightarrow r)} = \frac{y_{qy}}{a_{qa} \times r_{qr}} = \frac{\frac{Q_y}{n}\sum_{i=1}^{n/Q_y} y_{\frac{(q-1)n}{Q_y+i}}}{\frac{Q_a}{n}\sum_{i=1}^{n/Q_a} a_{\frac{(q-1)n}{Q_a+i}} \times \frac{Q_r}{n}\sum_{i=1}^{n/Q_r} r_{\frac{(q-1)n}{Q_r+i}}} \qquad \forall\, q = 1, \dots, Q_{(a,r,y)} \tag{7}$$

The subscript $q(a \leftrightarrow r)$ in the left-hand side term in (7) denotes the quantile level information of the joint distribution between a_{qa} and r_{qr}.[30] Now it is possible to reformulate identity (1) under the quantile-averaging framework using both a long and a short notation in equations (8) and (9), respectively:

$$y_{qy} = \frac{\frac{Q_y}{n}\sum_{i=1}^{n/Q_y} y_{\frac{(q-1)n}{Q_y+i}}}{\frac{Q_a}{n}\sum_{i=1}^{n/Q_a} a_{\frac{(q-1)n}{Q_a+i}} \times \frac{Q_r}{n}\sum_{i=1}^{n/Q_r} r_{\frac{(q-1)n}{Q_r+i}}} \times \frac{Q_a}{n}\sum_{i=1}^{n/Q_a} a_{\frac{(q-1)n}{Q_a+i}} \times \frac{Q_r}{n}\sum_{i=1}^{n/Q_r} r_{\frac{(q-1)n}{Q_r+i}} \qquad \forall\, q = 1, \dots Q_{(a,r,y)} \tag{8}$$

$$y_{qy} = JD_{q(a\leftrightarrow r)} \times a_{qa} \times r_{qr} \qquad \forall\, q = 1, \dots Q_{(a,r,y)} \tag{9}$$

To illustrate the approach, Table 3 shows the ventile-averaged disposable household per capita income, and the proximate determinants of identity (1) together with the joint distribution factor of the most equal (Slovenia), and most unequal (Lithuania) countries in Europe. Additionally, we include Germany as a median case.

Note that, as expected, inequality levels depend on the dispersion in the distribution of the household income per adult r_{qr}. The ratio between the disposable household per capita income at the top (20th ventile) and the bottom (1st ventile) reaches 8.87 in Slovenia, 11,33 in Germany, and 35.58 in Lithuania. Beside the distribution of r_{qr}, the shape of the joint distribution factor that connects this distribution with the marginal distribution of the proportion of adults in all households per ventile is also important. Figure 2 depicts this distribution factor ($JD_{q(a\leftrightarrow r)}$) and shows that, in the case of Lithuania, while compressing the top of the income distribution similarly to Germany, it compresses the bottom part of it significantly less than in Germany or Slovenia (the Lithuanian dashed curve is strictly below the other curves for the bottom five

[30] Hereinafter, this notation approach is adopted for all joint distribution factors in this study.

ventiles of a_{qa}, and r_{qr}). It means that in Lithuania, and relative to Germany or Slovenia, those household with a lower proportion of adults (within $q \leq 6$) are on average more likely be those at the bottom of the distribution income per adult (within $q \leq 6$).

The corresponding gendered expressions for the gender related joint distribution factor in (7) and (9) are formulated in (10) and (11), respectively.

$$JD_{q(f\leftrightarrow m)} = \frac{y_{qy}}{JD_{q(a\leftrightarrow r)} \times (a_{qaf} \times r_{qrf} + a_{qam} \times r_{qrm})} \qquad \forall\, q = 1, \ldots Q_{(af,am,rf,rm,y)} \tag{10}$$

$$y_{qy} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times r_{qrf} + a_{qam} \times r_{qrm}) \qquad \forall\, q = 1, \ldots Q_{(af,am,rf,rm,y)} \tag{11}$$

Table 3: Quantile-averaged distributions of the main proximate determinants of the household per capita income for the most equal country (Slovenia), a country in the middle (Germany), and the most unequal country in the EU (Lithuania).

Ventiles	Disposable household per capita income y_{qy}			Proportion per adults in the household a_{qa}			Income per adult in the household r_{qr}			Joint distribution factor $JD_{q(a\leftrightarrow r)}$		
	Slovenia	Germany	Lithuania	Slovenia	Germany	Lithuania	Slovenia	Germany	Lithuania	Slovenia	Germany	Lithuania
1	2354	4119	333	0.45	0.41	0.47	2726	5044	380	1.94	1.97	1.85
2	4114	6538	1003	0.50	0.50	0.62	4733	7737	1151	1.74	1.69	1.41
3	4837	7747	1364	0.63	0.58	0.69	5470	8975	1587	1.40	1.48	1.24
4	5323	8704	1673	0.68	0.68	0.77	6005	10037	1954	1.30	1.27	1.11
5	5714	9551	1977	0.75	0.95	0.99	6511	11035	2235	1.16	0.92	0.89
6	6104	10348	2230	0.90	1.00	1.00	6957	11939	2444	0.97	0.87	0.91
7	6481	11132	2409	1.00	1.00	1.00	7380	12856	2617	0.88	0.87	0.92
8	6856	11923	2579	1.00	1.00	1.00	7790	13767	2788	0.88	0.87	0.92
9	7217	12765	2757	1.00	1.00	1.00	8232	14685	2961	0.88	0.87	0.93
10	7586	13631	2924	1.00	1.00	1.00	8660	15655	3156	0.88	0.87	0.93
11	7984	14571	3133	1.00	1.00	1.00	9094	16653	3362	0.88	0.87	0.93
12	8399	15568	3351	1.00	1.00	1.00	9587	17784	3553	0.88	0.88	0.94
13	8841	16671	3554	1.00	1.00	1.00	10136	18972	3807	0.87	0.88	0.93
14	9345	17957	3819	1.00	1.00	1.00	10731	20304	4140	0.87	0.88	0.92
15	9943	19382	4183	1.00	1.00	1.00	11426	21828	4518	0.87	0.89	0.93
16	10598	21202	4617	1.00	1.00	1.00	12347	23696	4988	0.86	0.89	0.93
17	11431	23520	5159	1.00	1.00	1.00	13412	25883	5579	0.85	0.91	0.92
18	12738	26479	5962	1.00	1.00	1.00	14806	28783	6556	0.86	0.92	0.91
19	14633	31064	7292	1.00	1.00	1.00	17202	33528	8135	0.85	0.93	0.90
20	20918	53578	12280	1.00	1.00	1.00	24184	57160	13561	0.86	0.94	0.91

Source: Own elaboration based on 2010 EU-SILC household survey.

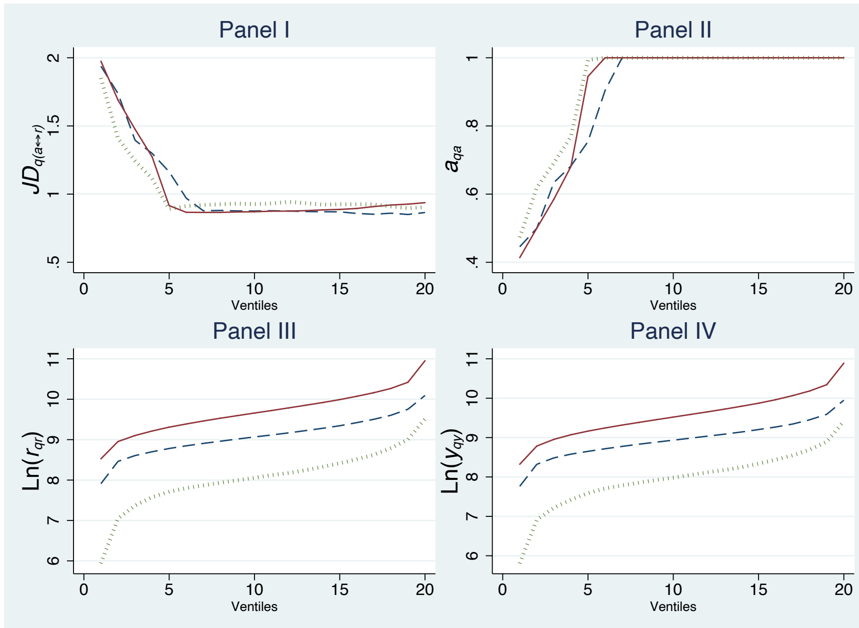

Figure 2: The Slovenian (dashed line), German (solid line), and Lithuanian (dotted line) joint distributing factors between the proportion of adults and the income per adult distributions $JD_{q(a\leftrightarrow r)}$ in Panel I, the marginal distributions of the proportions of adults in the household a_{qa} in Panel II, the natural logarithm of the income per adult $\ln(r_{qr})$ in Panel III, and the natural logarithm of the disposable household per capita income $\ln(y_{qy})$ in Panel IV. Source: Own elaboration based on EU-SILC 2010.

Note that in identity (11), a new source of discrepancy arises when holding $JD_{q(a\leftrightarrow r)}$ and the gendered proximate determinant constant $(a_{qaf}, a_{qam}, r_{qrf}, r_{qrm})$. This discrepancy is captured by $JD_{q(f\leftrightarrow m)}\ \forall\ q = 1, \dots Q_{(af,rf,am,rm)}$. This factor contains all gender-related information about the joint distribution of the proximate determinants which is not captured by the ungendered joint distribution factor $JD_{q(a\leftrightarrow r)}$ in the same identity. In other words, it contains the information about how the female and male income within household is added to reach the level characterized by the expression $y_{qy}{}^{max\_ineq} = a_{qa} \times r_{qr}\ \ \forall\ q = \{1, \dots, Q_{a,r,y}\}$. Accordingly, the expressions $a_{qaf} \times r_{qrf} = y_{qyf}{}^{max\_ineq}$ and $a_{qam} \times r_{qrm} = y_{qym}{}^{max\_ineq}$ represent the most unequal feasible female and male income distributions, respectively. The joint distribution factor $JD_{q(f\leftrightarrow m)}$ accounts for distributional change in the income distribution that arise from splitting the income distribution per adult in two groups (female and male adults) and performing the quantile level operation. It reveals the degree of assortative matching between the income contribution to the household income made by female and male adults. As a matter of fact, high levels of assortativeness are associated to higher inequality levels. While $JD_{q(a\leftrightarrow r)}$ provides the matching information between the demographic characteristic of households (information equivalent to the household size per adult) and the income per adult, $JD_{q(f\leftrightarrow m)}$ provides information on how female and male adults contribute to reach this level of income per adult. (see Figure A.1 in the appendix for the distributions of $JD_{q(f\leftrightarrow m)}$ in Slovenia, Germany and Lithuania).

The next step, shown in identity (12), consists in decomposing the female (male) household income per adult r_{qrf} (r_{qrm}), between female (male) non-earned income per adult o_{qrf} (o_{qrm}), and female (male) labor earnings per adult t_{qrf} (t_{qrm}). This is a decomposition since it is based on the quantile ranking from r_{qrf} (r_{qrm}) (see the second subscript), therefore neither o_{qrf} nor t_{qrf} (o_{qrm} nor t_{qrm}) are in ascending rank-order (but together). Consequently, this decomposition does not require any additional computation of any joint distribution factor.

$$y_{qy} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times \Big(\big(a_{qaf} \times (o_{qrf} + t_{qrf})\big) + \big(a_{qam} \times (o_{qrm} + t_{qrm})\big)\Big)$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,y)} \tag{12}$$

In the same vein, the marginal distribution of the female (male) household labor earnings per adult t_{qrf} (t_{qrm}) can be expanded into the distribution of the female (male) labor earnings per female (male) working adult w_{qwf} (w_{qwm}) and the mean proportion of the female (male) working adults in the household u_{quf} (u_{qum}) as shown below in identity (13).

$$\begin{aligned} y_{qy} = {} & JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \\ & \times \Big((a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times u_{quf} \times w_{qwf})) + (a_{qam} \times (o_{qrm} \\ & + JD_{q(um\leftrightarrow wm)} \times u_{qum} \times w_{qwm}))\Big) \end{aligned}$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{13}$$

The joint distribution factor $JD_{q(uf\leftrightarrow wf)}$ ($JD_{q(um\leftrightarrow wm)}$) is a measure of how adult women (men) within households with low, middle, or high labor market participation levels are simultaneously those women (men) with low, middle, or high levels of labor earnings. Moreover, this joint distribution factor connects the non-zero elements of the nested distribution of female (male) labor earnings per working adult w_{qwf} (w_{qwm}) to the non-nested distribution the female (male) proportion labor market participants u_{quf} (u_{qum}).

The marginal distribution of female (male) labor earnings per worker adult w_{qwf} (w_{qwm}) can be further expressed, with the help of the joint distribution factor $JD_{q(hf\leftrightarrow ef)}$ ($JD_{q(hm\leftrightarrow em)}$), as the product of the distribution of the female (male) hours of work per female (male) working adult h_{qhf} (h_{qhm}), and the distribution of the female (male) hourly labor earnings per female (male) working adult e_{qef} (e_{qem}) as shown below in identity (14).

$$\begin{aligned} y_{qy} = {} & JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \\ & \times \Big((a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times JD_{q(hf\leftrightarrow ef)} \times u_{quf} \times h_{qhf} \times e_{qef})) \\ & + (a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times JD_{q(hm\leftrightarrow em)} \times u_{qum} \times h_{qhm} \times e_{qem})) \Big) \\ & \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \end{aligned} \tag{14}$$

The joint distribution factor $JD_{q(hf\leftrightarrow ef)}$ ($JD_{q(hm\leftrightarrow em)}$) shows the level of assortativeness between the nested distributions h_{qhf} (h_{qhm}) and e_{qef} (e_{qem}). That is, the degree in which worker women (men) at the bottom, middle and top of the distribution of working hours are simultaneously the same working women (men) at the bottom, middle and top of the hourly earnings distribution, respectively. Consequently, the joint distribution factor $JD_{q(hf\leftrightarrow ef)}$ ($JD_{q(hm\leftrightarrow em)}$) provides valuable information (neglected in other empirical approaches) determining the level of inequality of the distribution of the female (male) labor earnings per working adult.

4.3. Micro econometric simulations to estimate the impact of gender gaps on income inequality

Given the demographic structure of society represented by a_{qaf}, a_{qam}, and how the different demographic groups are related to the income distribution per adult $JD_{q(a\leftrightarrow r)}$, the assessment of the partial effect of the gender gap in the household income per adult ($r_{qrf} - r_{qrm}$) $\forall\, q = 1, \dots Q_{(rf,rm)}$ on the inequality levels of y_{qy}, can be calculated by comparing the income distribution from identity (11), using r_{qrf}, and r_{qrm} against a simulated quantile-averaged distribution with no gender gap or $r_{qrf} = r_{qrm}\ \forall\, q = 1, \dots Q_{(rf,rm)}$.

This approach introduces a path dependence problem, in which there are two alternative ways of performing the simulation. One is to increase the income contribution of female income per adult to the level of men, and the other one is to do the reverse (i.e. lowering the male income per adult to the level of women). These alternatives yield two different income distributions because they evaluate the elimination of the gender gap on different aggregated income levels.

The usual way to overcome this problem is by using the averages of these effects, which might also approximate more closely what would happen if these gaps were indeed eliminated. From the point of view of policymakers, this alternative is attractive because it does not require to change drastically the proportion of the national income going to households.

Based on (11), and while keeping constant a_{qaf}, a_{qam}, $JD_{q(a\leftrightarrow r)}$ and $JD_{q(f\leftrightarrow m)}$, identities (15) and (16) simulate the income contribution of female income per adult to the level of men and vice versa (underlined), respectively.

$$y_{qr:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times \left(a_{qaf} \times \underline{r_{qrm}} + a_{qam} \times r_{qrm}\right) \quad \forall\, q = 1, \dots Q_{(af,am,rf,fm,y)} \tag{15}$$

$$y_{qr:m\rightarrow f} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times \left(a_{qaf} \times r_{qrf} + a_{qam} \times \underline{r_{qrf}}\right) \quad \forall\, q = 1, \dots Q_{(af,am,rf,fm,y)} \tag{16}$$

The income distribution obtained from averaging (15) and (16) can be expressed as $y_{sim\_r} = \frac{y_{qr:f\rightarrow m}+y_{qr:m\rightarrow f}}{2}\ \forall\, q = 1, \dots Q_{(af,am,rf,rm,y)}$. Then, the partial effect of the gender gap on inequality can be evaluated using the Gini coefficient by comparing the simulated distribution y_{sim_r} and the empirical distribution y_{qy} as follows:[31]

$$\Delta GINI(y_{qrm=qrf}) = \frac{GINI(y_{sim\_r}) - GINI(y_{qy})}{GINI(y_{qy})} \tag{17}$$

[31] Note that as we simulate the entire distribution, the impact of the gender gap in income can also be evaluated using all possible inequality measures.

4.4. Intensity, composition and total effects of gender gaps on inequality

When assessing the impact of gender gaps in the nested distributions (those distributions that consist only of labor market participants), labor earnings, hours of work and hourly earnings), our framework allow us to decompose the impact of gender gaps into two terms. On the one hand, an intensity term, in which the impact of the gap is calculated exclusively among labor market participants. Empirically, it corresponds to the impact due to a change in one of the marginal distributions ($u_{quf}, u_{qum}, w_{qwf}, w_{qm}, h_{qhf}, h_{qhm}$, and e_{qef}, e_{qem}). On the other hand, a composition effect results from changing the underlying population engaging in labor market activities. Empirically, the composition effect shows how the marginal distributions are connected within a gender and how they are linked to the overall income distribution, conditional on the change in the marginal distribution of interest (labor earnings, hours of work and hourly earnings).

While keeping demographic endowments constant (a_{qaf}, a_{qam}), and based on identity (13), the intensity impact of the gender gap in participation can be calculated by comparing the empirical distribution y_{qy} with the income distribution resulting from averaging simulations (18) and (19), as shown in equation (20).

$$y_{qu:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times \left(a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times (\underline{u_{qum}} \times w_{qwf}))\right) + \left(a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times (u_{qum} \times w_{qwm}))\right) \qquad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{18}$$

$$y_{qu:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times \left(a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times (u_{quf} \times w_{qwf}))\right) + \left(a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times (\underline{u_{quf}} \times w_{qwm}))\right) \qquad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{19}$$

$$y_{sim\_u} = \frac{y_{qu:f\rightarrow m} + y_{qu:m\rightarrow f}}{2} \qquad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{20}$$

Different simulations are now used to estimate the total effect of the gendered labor market participation on the income distribution. However, these simulations need to account for (i) the gender gaps amongst households with currently labor market participating individuals (intensity) and (ii) the gap in how these proportions of female and male working members are tied together across the non-nested income distribution (composition).[32]

Thus, the total effect of the gender gap in participation can be calculated by comparing the empirical distribution y_{qy} against the income distribution obtained from averaging (23) and (24), as shown in equation (25).

$$y_{qu\_total:f\to m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + \underline{JD_{q(um\leftrightarrow wm)}} \times \left(\underline{u_{qum}} \times w_{qwf}\right))) + a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times (u_{qum} \times w_{qwm}))) \quad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{23}$$

$$y_{qu\_total:m\to f} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times \left(u_{quf} \times w_{qwf}\right))) + a_{qam} \times (o_{qrm} + \underline{JD_{q(uf\leftrightarrow wf)}} \times (\underline{u_{quf}} \times w_{qwm}))) \quad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{24}$$

$$y_{sim\_u\_total} = \frac{y_{qu\_total:f\to m} + y_{qu\_total:m\to f}}{2} \,\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,wf,wm,y)} \tag{25}$$

As the total impact of the gender gap in participation is the sum of the intensity effect and the composition effect, it is possible to obtain the latter effect by comparing the empirical distribution y_{qy} and the simulated distributions y_{sim_utotal}, and y_{sim_u}. The intensity effect of the gender gap in participation on inequality can be estimated using the Gini coefficient as follows:

$$\Delta GINI(y_{quf\_intensity=qum\_intensity}) = \frac{GINI(y_{sim\_u}) - GINI(y_{qy})}{GINI(y_{qy})} \tag{26}$$

Similarly, the total effect of the gender gap in participation on inequality can be calculated using the following expression:

$$\Delta GINI(y_{qum\_total=quf\_total}) = \frac{GINI(y_{sim\_utotal}) - GINI(y_{qy})}{GINI(y_{qy})} \tag{27}$$

Finally, the composition effect of the gender gap in participation on inequality can be computed based on the following equation:

[32] The composition effect results from comparing the female and male joint distribution interactions given a change in a marginal distribution. $JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times JD_{q(uf\leftrightarrow wf)}$ vs. $JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times JD_{q(um\leftrightarrow wm)}$.

$$\Delta GINI(y_{qum\_comp=quf\_comp}) = \left(\frac{GINI(y_{sim\_utotal})-GINI(y_{sim_u})}{GINI(y_{qy})}\right) \tag{28}$$

Without loss of generality, the same approach can be used to estimate the total, intensity, and composition effects of gender gaps in the (nested) marginal distributions of labor earnings per working adult. However, to estimate total impact of the gender gaps hours of work and labor earnings per hour, it is needed to include in the simulation the gap between $JD_{q(uf\leftrightarrow wf)}$ and $JD_{q(um\leftrightarrow wm)}$ as shown below from identity (29) to identity (34).

$$y_{qh\_total:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + \underline{JD_{q(um\leftrightarrow wm)}} \times \underline{JD_{q(hm\leftrightarrow em)}} \times u_{quf} \times \underline{h_{qhm}} \times e_{qef})) + a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times JD_{q(hm\leftrightarrow em)} \times u_{qum} \times h_{qhm} \times e_{qem})))$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{29}$$

$$y_{qh\_total:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times JD_{q(hf\leftrightarrow ef)} \times u_{quf} \times h_{qhf} \times e_{qef})) + a_{qam} \times (o_{qrm} + \underline{JD_{q(uf\leftrightarrow wf)}} \times \underline{JD_{q(hf\leftrightarrow ef)}} \times u_{qum} \times \underline{h_{qhf}} \times e_{qem})))$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{30}$$

$$y_{sim\_h\_total} = \frac{y_{qh\_total:f\rightarrow m} + y_{qh\_total:m\rightarrow f}}{2} \qquad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{31}$$

$$y_{qe\_total:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + \underline{JD_{q(um\leftrightarrow wm)}} \times \underline{JD_{q(hm\leftrightarrow em)}} \times u_{quf} \times h_{qhf} \times \underline{e_{qem}})) + a_{qam} \times (o_{qrm} + JD_{q(um\leftrightarrow wm)} \times JD_{q(hm\leftrightarrow em)} \times u_{qum} \times h_{qhm} \times e_{qem})))$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{32}$$

$$y_{qe\_total:f\rightarrow m} = JD_{q(a\leftrightarrow r)} \times JD_{q(f\leftrightarrow m)} \times (a_{qaf} \times (o_{qrf} + JD_{q(uf\leftrightarrow wf)} \times JD_{q(hf\leftrightarrow ef)} \times u_{quf} \times h_{qhf} \times e_{qef})) + a_{qam} \times (o_{qrm} + \underline{JD_{q(uf\leftrightarrow wf)}} \times \underline{JD_{q(hf\leftrightarrow ef)}} \times u_{qum} \times h_{qhm} \times \underline{e_{qef}})))$$
$$\forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{33}$$

$$y_{sim\_e\_total} = \frac{y_{qe\_total:f\rightarrow m} + y_{qe\_total:m\rightarrow f}}{2} \qquad \forall\, q = 1, \dots Q_{(af,am,rf,rm,uf,um,hf,hm,ef,em,y)} \tag{34}$$

5. Results

5.1. Gender gap in income per adult and income inequality changes

For the sake of communicating our results, sometimes we use four group of countries due to their historical and cultural differences. We refer to western countries to Austria, Belgium, Germany, France, Ireland, Luxemburg, Netherlands, and the United Kingdom. Southern countries are Cyprus, Greece, Spain, Italy, Malta, and Portugal. Scandinavian countries are Denmark, Finland, Iceland, Norway, and Sweden. Finally, the former communist countries are Bulgaria, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovenia, and Slovakia.

Simulation 1 in Table 4 shows the relative change of the Gini coefficient after removing the gender gap in the distribution of the household income per adult ($r_{qrf} = r_{qrm}$). On average, the removal of the gender gap in r in western economies reduces the Gini coefficient by 2.5% (or -0.8 Gini points). The impact is less accentuated in the southern economies in which the Gini declines by 1.2% (or 0.4 Gini points). In Scandinavian countries, the impact is equalizing in Norway and Iceland (1.2% or 0.3 Gini points) and almost neutral in the remaining countries. In the former communist countries of Estonia, Hungary, Lithuania, Latvia, Poland, and Slovakia, the impact is disequalizing (1.1% or 0.3 Gini points), while it is still equalizing in Bulgaria, Czech Republic, Romania and Slovenia (0.4% or 0.1 Gini points).

Figure 3 shows the information of Ireland, Malta, Norway and Slovakia in representation of the transmission mechanism for the groups of countries mentioned earlier. In all countries the joint distribution factor $JD_{q(f\leftrightarrow m)}$ is negative sloped. It means that the poorer the household, the higher the level of disassortative matching between the female and male income contribution. It implies that, on average, in household in which women contribute less, men contribute more (and vice versa). However, this is disassortative pattern is much more accentuated in western economies and much less evident in Norway and Slovakia, in which the disassortativeness between male and female income is smaller in size and restricted to the bottom of the distribution. Regarding the gaps between the proportion of adult women (dashed line) and adult men (solid line), there is almost no difference between Ireland, Malta and Norway. However, in Slovakia (and in all former communist countries with the exception of Slovenia), there is a higher proportion of adult women than of adult men across households, and thus, reflecting a higher proportion of women amongst the population. The distributions of female and male income per adult shows a gap which of a higher magnitude in at the bottom of the distribution (within $q \leq 6$) in Ireland and within (within $q \leq 11$) in Malta. The gap is smaller and constant across the income distribution in Norway and Slovakia. The last column of panels in Figure 3 shows in dotted line the percentual change of eliminating the gender gap in the income per adult ($r_{qrf} = r_{qrm}$) $\forall\, q = 1, \ldots Q_{(rf,rm)}$, over the observed income distribution of the household per capita income. The equalization of western countries represented by Ireland is explained by the dynamics at the bottom of the distribution in which the elimination of the gender income gap benefits over proportionally households at the bottom of the distribution. That is, it increases the income contribution of female adult members in a household while, in relative terms, not reducing significantly the income contribution of male adult members in the same households.

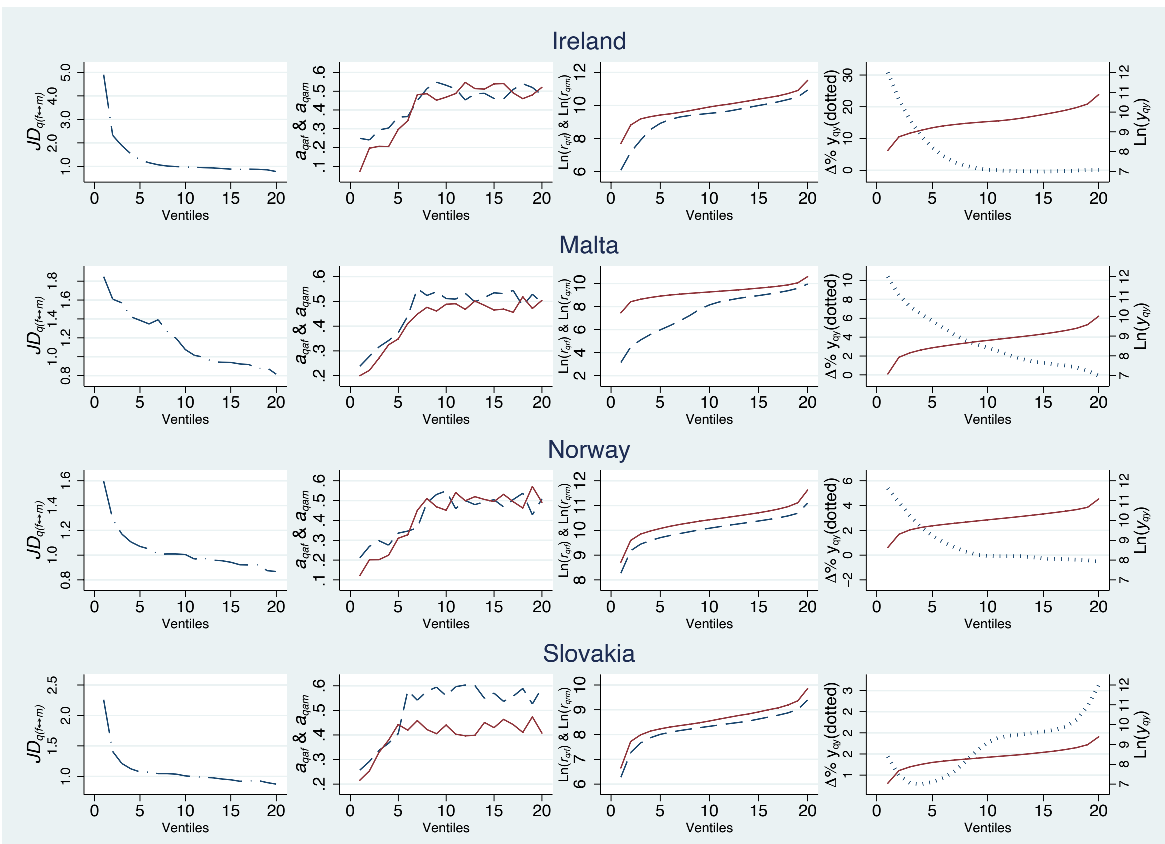

Figure 3: The Irish, Maltese, Norwegian, and Slovakian transmission channels of a change in y_{qy} $\forall\, q = 1, \ldots Q_{(af,am,rf,rm,y)}$ due to the elimination of the gender gap in the distribution of the income per adult ($r_{qrf} = r_{qrm}$). Note: dashed (solid) line corresponds to women (men). Source: Own elaboration based on EU-SILC 2010.

This dynamic explains the fact that, to eliminate the gender income gap in Ireland, the Gini coefficient would decline by 4.7% or 1.5 Gini points. In southern countries represented by Malta, the equalizing impact of $(r_{qrf} = r_{qrm})\ \forall\, q = 1, \dots Q_{(rf,rm)}$, is explained mostly by an important improvement of female income contributions taking places households in which men reduces their income contribution, and thus cancelling out part of the effect. The story is similar but smaller in size in Norway. Finally, in Slovakia, the elimination of the gender income gap is amplified across the distribution, specially at the top of the distribution, since the elimination of the gap that favor women overcomes the income losses by adult men (since they are less numerous in this country).

The conclusion of our simulations is that in most countries, the elimination of the income gap per adult $(r_{qrf} = r_{qrm})\ \forall\, q = 1, \dots Q_{(rf,rm)}$ reduce income inequality levels because women at the bottom would increase their income levels without affecting in the same proportion the income contribution to household income made by male adults. Differently, in former communist countries and the remaining Scandinavian countries, the disequalization is explained by the dynamics at the top of the income distribution which are somewhat countered by the equalizing dynamics at the very bottom.

5.2. Income inequality changes and the gender gap in non-earned income, and in labor earnings.

The elimination of the gender gap in non-earned income would equalize the income distribution in most countries.[33] For example, it would reduce the Gini coefficient by 0.7% in France, 2.0% in Germany, 1.0% (1.1%) in the United Kingdom, and by 0.5% in Norway.[34] Although we do not decompose the impact of the gender gap by the sources of non-earned income, the composition of this income by its sources suggests an important role of the gender gap in pensions and unemployment benefits. On average, 61% and 18% of the non-earned income in Europe consist of pensions and unemployment benefits, respectively. Although we cannot discard some contradictory effects of gender gaps on inequality from some types of non-earned income, we consider safe to sustain this hypothesis that the impacts are unambiguous since almost 80% of the non-earned income has a connection with previous and also contemporary labor earning levels in which women underperform men.

[33] The exceptions are Bulgaria, Estonia, Finland, Hungary, Lithuania, Latvia, Sweden, Slovenia and Slovakia.
[34] Last columns in Table 4 show the percentual contribution to the inequality change (evaluated using the Gini coefficient) due to the removal of the gender gap in non-earned income per adult (B), and due to the elimination of the gender gap in the labor income per adult (C) (summing up the total impact in column (A) of Table 4).

Table 4: Inequality effects of gender gaps in the household income per adult, labor earnings and non-earned income (Gini coefficient).

Country	Quantile-averaged distribution Mean	Gender gap effect of the household income per adult on income inequality			Gender gap effect of household non-earned income per adult on income inequality			Gender gap effect of household labor earnings per adult on income inequality			Decomposition of the Change (A) in %	
		Simulated Distribution (1) $r_{qrf} = r_{qrm}$	Gini Change (A)		Simulated Distribution (2) $o_{qrf} = o_{qrm}$	Gini Change (B)		Simulated Distribution (3) $t_{qrf} = t_{qrm}$	Gini Change (C)		Non-earned income per adult	Labor earnings per adult
			Gini Points	Percentage		Gini Points	Percentage		Gini Points	Percentage		
AT	29.03	28.33	-0.695	-2.4	28.55	-0.478	-1.6	28.80	-0.226	-0.8	68.7	31.3
BE	27.58	26.75	-0.834	-3.0	27.04	-0.541	-2.0	27.29	-0.296	-1.1	64.9	35.1
BG	33.49	33.41	-0.079	-0.2	33.48	-0.011	0.0	33.42	-0.068	-0.2	14.0	86.0
CY	33.50	33.01	-0.485	-1.4	33.18	-0.314	-0.9	33.32	-0.175	-0.5	64.8	35.2
CZ	25.55	25.41	-0.143	-0.6	25.44	-0.109	-0.4	25.51	-0.035	-0.1	76.5	23.5
DE	32.33	31.49	-0.839	-2.6	31.67	-0.655	-2.0	32.13	-0.192	-0.6	78.1	21.9
DK	29.17	29.25	0.083	0.3	29.12	-0.049	-0.2	29.30	0.131	0.4	-59.3	159.3
EE	31.11	31.72	0.608	2.0	31.30	0.193	0.6	31.53	0.419	1.3	31.7	68.3
EL	33.87	34.00	0.131	0.4	33.84	-0.034	-0.1	34.04	0.164	0.5	-25.8	125.8
ES	33.45	33.30	-0.149	-0.4	33.34	-0.107	-0.3	33.41	-0.043	-0.1	72.0	28.0
FI	27.89	27.95	0.069	0.2	27.88	-0.005	0.0	27.96	0.073	0.3	-6.6	106.6
FR	32.21	31.77	-0.439	-1.4	32.00	-0.217	-0.7	31.99	-0.225	-0.7	49.4	50.6
HU	26.43	26.52	0.091	0.3	26.42	-0.009	0.0	26.53	0.100	0.4	-10.3	110.3
IE	32.53	30.99	-1.543	-4.7	31.36	-1.169	-3.6	32.15	-0.379	-1.2	75.8	24.2
IS	28.91	28.64	-0.270	-0.9	28.79	-0.120	-0.4	28.77	-0.143	-0.5	44.5	55.5
IT	33.42	32.94	-0.473	-1.4	33.09	-0.328	-1.0	33.26	-0.152	-0.5	69.3	30.7
LT	36.85	37.15	0.306	0.8	37.10	0.250	0.7	36.91	0.059	0.2	81.8	18.2
LU	31.63	31.02	-0.606	-1.9	31.37	-0.259	-0.8	31.27	-0.351	-1.1	42.6	57.4
LV	35.67	36.21	0.540	1.5	35.98	0.304	0.9	35.91	0.240	0.7	56.3	43.7
MT	31.15	30.13	-1.023	-3.3	30.51	-0.636	-2.0	30.75	-0.398	-1.3	62.1	37.9
NL	27.84	27.10	-0.738	-2.7	27.38	-0.459	-1.6	27.55	-0.285	-1.0	62.2	37.8
NO	26.82	26.43	-0.397	-1.5	26.68	-0.142	-0.5	26.57	-0.256	-1.0	35.7	64.3
PL	33.85	33.90	0.052	0.2	33.81	-0.036	-0.1	33.94	0.088	0.3	-69.1	169.1
PT	35.85	35.56	-0.287	-0.8	35.78	-0.071	-0.2	35.63	-0.217	-0.6	24.6	75.4
RO	34.41	34.30	-0.112	-0.3	34.37	-0.041	-0.1	34.34	-0.072	-0.2	36.5	63.5
SE	27.16	27.22	0.065	0.2	27.16	0.000	0.0	27.22	0.065	0.2	0.6	99.4
SI	25.97	25.89	-0.078	-0.3	26.06	0.086	0.3	25.81	-0.163	-0.6	-109.1	209.1
SK	26.00	26.42	0.416	1.6	26.02	0.013	0.1	26.40	0.401	1.5	3.2	96.8
UK	34.20	33.84	-0.358	-1.1	33.86	-0.336	-1.0	34.17	-0.025	-0.1	94.0	6.0

Source: Own elaboration based on 2010 EU-SILC household survey.

Table 5: Inequality effects of gender gaps in the proportion of working adults, and labor earnings per working adult (Gini coefficient).

Country	Inequality impact of gender gap in participation					Inequality impact of gender gap in labor earnings per working adult				
	Simulated Distribution (4) $u_{quf} = u_{qum}$	Simulated Distribution (5) $u_{quf} = u_{qum}$ $JD_{q(uf=um \leftrightarrow wf=wm)}$	Percentage Change of the Gini			Simulated Distribution (6) $w_{qwf} = w_{qwm}$	Simulated Distribution (7) $w_{qwf} = w_{qwm}$ $JD_{q(uf=um \leftrightarrow wf=wm)}$	Percentage Change of the Gini		
			Intensity	Composition	**Total**			Intensity	Composition	**Total**
AT	29.09	29.56	0.20	1.64	1.84	29.80	28.89	2.65	-3.14	-0.49
BE	27.59	27.98	0.01	1.43	1.44	28.11	27.29	1.90	-2.96	-1.06
BG	33.63	33.59	0.44	-0.11	0.32	33.74	33.62	0.75	-0.36	0.39
CY	33.82	33.80	0.96	-0.05	0.92	34.04	33.67	1.61	-1.10	0.51
CZ	25.55	25.49	-0.01	-0.23	-0.24	25.65	25.52	0.40	-0.49	-0.10
DE	32.35	32.81	0.07	1.44	1.51	32.97	32.17	1.99	-2.47	-0.47
DK	29.18	28.42	0.03	-2.58	-2.56	29.30	29.27	0.46	-0.11	0.35
EE	31.01	31.08	-0.31	0.22	-0.09	31.50	31.51	1.25	0.03	1.28
EL	33.89	34.30	0.06	1.20	1.26	34.66	34.06	2.34	-1.77	0.57
ES	33.52	33.95	0.21	1.30	1.50	34.15	33.50	2.10	-1.96	0.14
FI	27.88	27.90	-0.02	0.09	0.07	28.09	27.93	0.75	-0.57	0.18
FR	32.23	32.46	0.06	0.72	0.78	32.70	32.02	1.50	-2.11	-0.60
HU	26.45	26.49	0.10	0.15	0.24	26.63	26.58	0.76	-0.18	0.58
IE	32.56	32.23	0.09	-1.01	-0.92	32.53	32.21	0.00	-0.99	-0.98
IS	28.91	28.91	-0.02	-0.01	-0.03	28.66	28.74	-0.90	0.29	-0.60
IT	33.61	34.21	0.57	1.82	2.39	34.56	33.48	3.41	-3.24	0.18
LT	36.80	36.78	-0.13	-0.05	-0.18	37.04	36.94	0.51	-0.25	0.26
LU	31.56	32.82	-0.19	3.96	3.76	33.08	31.20	4.60	-5.93	-1.34
LV	35.56	35.55	-0.31	-0.02	-0.33	35.83	35.90	0.45	0.19	0.64
MT	32.18	32.48	3.32	0.94	4.26	32.71	31.89	5.00	-2.62	2.38
NL	27.89	28.75	0.19	3.09	3.28	28.93	27.63	3.92	-4.66	-0.74
NO	26.81	26.74	-0.04	-0.27	-0.32	26.69	26.51	-0.48	-0.70	-1.18
PL	33.98	33.92	0.38	-0.18	0.20	34.20	34.10	1.04	-0.31	0.72
PT	35.90	35.92	0.14	0.06	0.20	36.20	35.71	0.99	-1.38	-0.39
RO	34.54	34.93	0.36	1.12	1.49	35.02	34.54	1.77	-1.41	0.35
SE	27.15	27.30	-0.02	0.56	0.53	27.47	27.21	1.17	-0.98	0.19
SI	26.06	25.78	0.32	-1.07	-0.75	26.07	25.90	0.36	-0.64	-0.28
SK	26.01	26.08	0.03	0.25	0.28	26.50	26.48	1.92	-0.08	1.83
UK	34.17	34.26	-0.07	0.26	0.19	34.40	34.12	0.58	-0.79	-0.21

Source: Own elaboration based on 2010 EU-SILC household survey.

Table 6: Inequality effects of gender gaps in hours of work, and hourly labor earnings per working adult (Gini coefficient).

Country	Inequality impact of gender gap in hours of work per working adult					Inequality impact of gender gap in hourly earnings per working adult				
	Simulated Distribution (8) $h_{qhf} = h_{qhm}$	Simulated Distribution (9) $h_{qhf} = h_{qhm}$ $JD_{q(hf=hm \leftrightarrow ef=em)}$ $JD_{q(uf=um \leftrightarrow wf=wm)}$	Percentage Change of the Gini			Simulated Distribution (10) $e_{qef} = e_{qem}$	Simulated Distribution (11) $e_{qef} = e_{qem}$ $JD_{q(hf=hm \leftrightarrow ef=em)}$ $JD_{q(uf=um \leftrightarrow wf=wm)}$	Percentage Change of the Gini		
			Intensity	Composition	**Total**			Intensity	Composition	**Total**
AT	29.89	29.44	2.96	-1.55	1.41	29.62	30.09	2.03	1.62	3.65
BE	27.98	27.40	1.43	-2.08	-0.65	27.61	27.78	0.10	0.60	0.70
BG	33.51	33.70	0.06	0.57	0.63	33.70	33.63	0.64	-0.21	0.43
CY	33.87	33.52	1.11	-1.05	0.06	33.61	33.58	0.35	-0.10	0.25
CZ	25.96	25.39	1.61	-2.25	-0.63	25.46	26.04	-0.36	2.29	1.93
DE	32.80	32.42	1.46	-1.18	0.28	32.65	32.87	0.99	0.68	1.67
DK	29.25	28.11	0.29	-3.93	-3.65	28.84	29.25	-1.12	1.40	0.27
EE	31.06	31.03	-0.18	-0.10	-0.28	31.18	31.20	0.22	0.07	0.29
EL	34.19	34.31	0.95	0.35	1.30	34.32	34.40	1.31	0.25	1.56
ES	33.89	33.69	1.31	-0.59	0.72	33.81	33.81	1.08	0.00	1.08
FI	27.93	27.69	0.14	-0.84	-0.70	27.82	27.94	-0.25	0.46	0.20
FR	32.56	32.25	1.09	-0.99	0.10	32.42	32.49	0.66	0.21	0.87
HU	26.53	26.52	0.40	-0.05	0.35	26.57	26.78	0.53	0.80	1.33
IE	32.68	31.77	0.44	-2.78	-2.34	32.14	32.53	-1.20	1.20	0.00
IS	28.75	28.77	-0.58	0.09	-0.49	28.70	28.87	-0.74	0.59	-0.15
IT	34.45	34.25	3.09	-0.60	2.48	34.36	34.74	2.83	1.12	3.95
LT	36.86	36.95	0.03	0.26	0.29	36.89	36.86	0.10	-0.08	0.02
LU	32.65	31.91	3.23	-2.32	0.91	32.25	32.45	1.98	0.62	2.60
LV	35.70	35.57	0.08	-0.37	-0.29	35.91	35.72	0.68	-0.54	0.14
MT	32.51	33.01	4.36	1.62	5.99	32.42	33.25	4.07	2.66	6.73
NL	28.87	28.37	3.71	-1.81	1.90	28.49	28.89	2.33	1.44	3.77
NO	26.80	26.50	-0.08	-1.12	-1.20	26.56	26.79	-1.00	0.86	-0.13
PL	34.10	33.96	0.73	-0.41	0.31	33.83	34.08	-0.06	0.73	0.66
PT	36.15	35.74	0.83	-1.14	-0.31	36.00	35.70	0.41	-0.83	-0.42
RO	34.55	35.01	0.40	1.34	1.74	35.02	34.73	1.75	-0.84	0.91
SE	27.02	27.22	-0.51	0.76	0.25	27.21	27.11	0.20	-0.36	-0.16
SI	26.03	25.90	0.21	-0.47	-0.26	26.10	26.00	0.49	-0.40	0.09
SK	26.16	26.09	0.60	-0.27	0.33	26.36	26.83	1.39	1.79	3.18
UK	34.44	33.91	0.71	-1.55	-0.84	34.07	34.59	-0.38	1.53	1.15

Source: Own elaboration based on 2010 EU-SILC household survey.

The elimination of the gender gap in labor earnings is equalizing in 19 out of 29 countries.[35] However, it is disequalizing in Denmark, Estonia, Greece, Finland, Hungary, Lithuania, Latvia, Poland, Sweden and Slovakia. In these countries, the disequalizing effect at the top of the distribution of labor earnings (which can be an indication of an accentuated glass ceiling effect) dominates the expected equalizing impact at the bottom of the distribution.

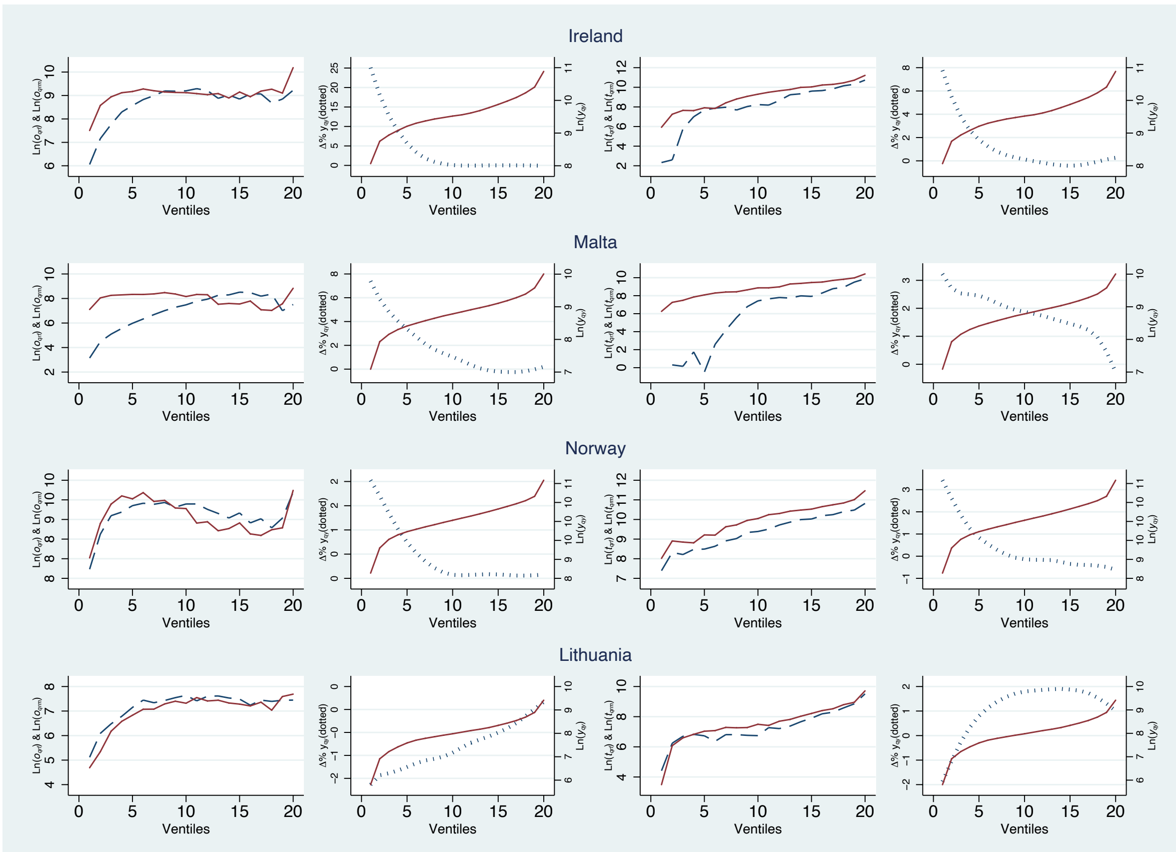

Figure 4: The Irish, Maltese, Norwegian, and Lithuanian transmission channels of a change in y_{qy} $\forall\, q = 1, \ldots Q_{(af,am,rf,rm,y)}$ due to the elimination of the gender gap in the distribution of non-earned income per adult ($o_{qrf} = o_{qrm}$) and in due to the elimination of the gender gap in the distribution of the labor earnings per adult ($t_{qrf} = t_{qrm}$). Note: In the first and third columns of figures, the dashed (solid) line corresponds to women (men). In the second and fourth columns of figures, the solid line represents the observed household per capita income distribution and the dotted line represents the relative change of this distribution at each ventile. Source: Own elaboration based on EU-SILC 2010.

Figure 4 sheds light on this issue by investigating the transmission channel of these effects For each country, the first figure (from the left to the right) shows the distribution of non-earned income per adult by gender, the second figure depicts the percentage change of the household

[35] These countries are Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Spain, France, Ireland, Iceland, Italy, Luxemburg, Malta, Netherlands, Norway, Portugal, Romania, Slovenia, United Kingdom.

per capita income distribution along the observed household per capita income distribution. Figures three and four display the same information but related to the gap in labor earnings per adult.

The explanation why in former communist countries, represented in Figure 4 by Lithuania, the equalization of labor earnings per adult is disequalizing lies in the fact that households at the middle of the income distribution would benefit relatively more than those at the bottom. As a result, the income distribution stretches to the right. Differently, in Western, Scandinavian and Southern countries, the elimination of the gap compresses the distribution from the left. That is, poorer households would benefit the most. Regarding non-earned incomes, there is a gap in favor of women across the whole distribution of income per adult. Richer households would progressively benefit more and thus, disequalizing the income distribution. On the contrary, in most other countries, households at the bottom benefit the most when equalizing this type of income, and thus, the inequality level would decline.

5.3. Gender gap in participation and in labor earnings per working adult and income inequality changes

Results reported in Table 5 show that the elimination of the gender gaps in participation is disequalizing in 21 out of 29 countries. In this group of countries, on average, it increases the Gini coefficient by 1.26%. Contrarily, it is equalizing for the Czech Republic, Denmark, Estonia, Ireland, Lithuania, Latvia, Norway, and Slovenia. For this group of countries, on average, the total effect following the elimination of the gender gap in participation reduces the Gini coefficient by 0.67%. For the vast majority of countries, intensity and composition effects work in the same direction. In order to investigate the transmission mechanism of this gap into inequality changes, panels (A) in Figure 5 show the total effect (intensity and composition effects together in Table 5) that the elimination of the gender gap in participation produces on the income distribution. This result suggests that the gender gap in participation affects the middle and upper parts of the income distribution in Austria, Malta and Norway. Thus, removing them would increase the earnings of these relatively well-positioned households, thereby increasing inequality. On the contrary, in Norway the elimination of this gap comprises the income distribution from the bottom and therefore reducing inequality.

When looking at the intensity effect, in almost all EU countries, the removal of the gap in participation amongst those households with female and male adult labor market participants causes inequality to rise (on average, a 0.40% increase in the Gini coefficient). The exceptions are the Czech Republic, Estonia, Finland, Island, Lithuania, Luxemburg, Latvia, Norway, Sweden and United Kingdom. In these countries the gender equalization reduces on average the Gini coefficient by 0.11%. Regarding the composition effect after removing the gender gap in participation, it is disequalizing for most countries (on average, a 1.13% increase in the Gini coefficient). However, it is equalizing in Bulgaria, Cyprus, Czech Republic, Denmark, Ireland, Island, Lithuania, Latvia, Norway, Poland and Slovenia (on average, a 0.50% increase in the Gini coefficient).

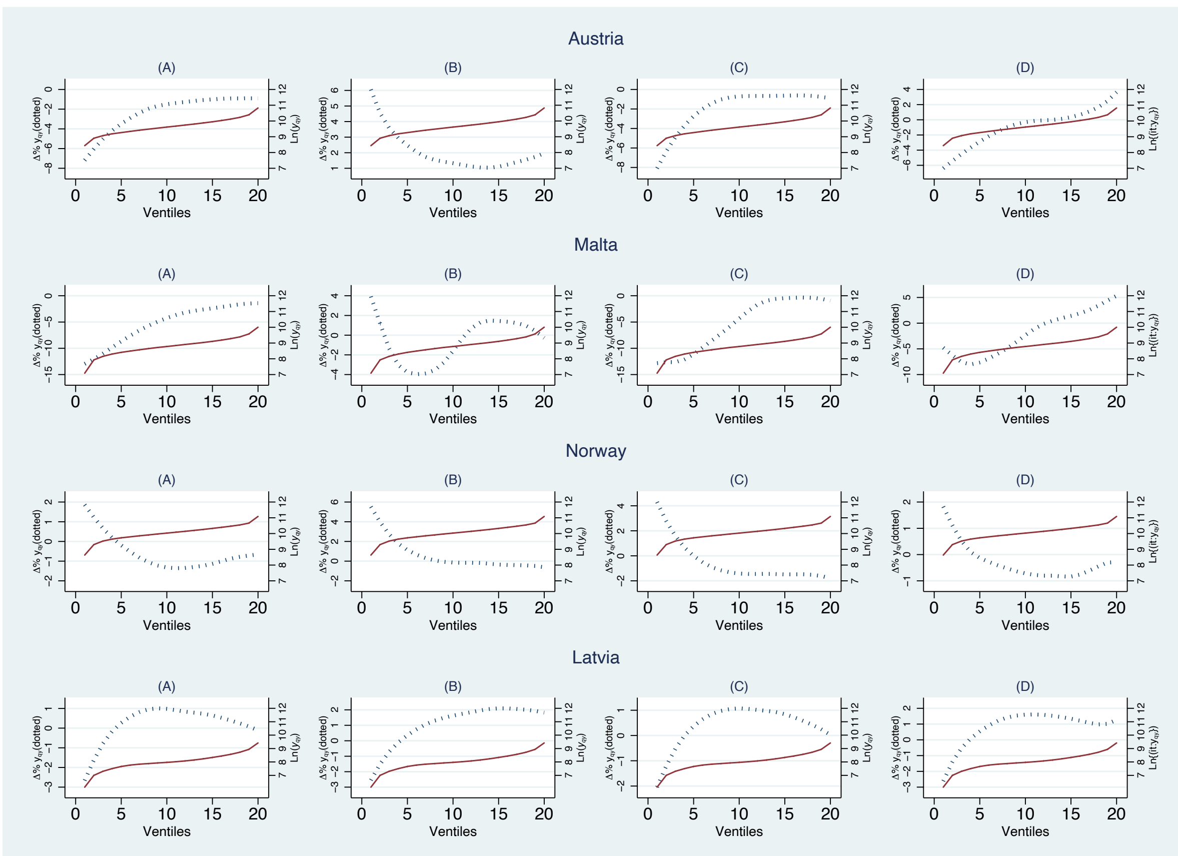

Figure 5: The Austrian, Maltese, Norwegian, and Latvian transmission channels of a change in y_{qy} $\forall q = 1, \dots Q_{(af,am,rf,rm,y)}$ due to the elimination of the gender gap in the distribution of participation ($u_{quf} = u_{qum}$) in Panels (A), due to the elimination of the gender gap in the distribution of the labor earnings per working adult ($w_{qwf} = w_{qwm}$) in Panels (B), due to the elimination of the gender gap in the distribution of working hours ($h_{qhf} = h_{qhm}$) in Panels (C), and due to the elimination of the gender gap in the distribution hourly labor earnings ($e_{qef} = e_{qem}$) in Panels (D). Note: In the first and third columns of figures, the dashed (solid) line corresponds to women (men). In the second and fourth columns of figures, the solid line represents the observed household per capita income distribution and the dotted line represents the relative change of this distribution at each ventile. Source: Own elaboration based on EU-SILC 2010.

While the effect of gender gaps in participation are relatively small in size and equalizing for most countries, our results in Table 5 also show a mixed result corresponding to the elimination of the gender gap in labor earnings per working adult. Overall, it is equalizing in what we could broadly call 'western' economies in Europe (Austria, Belgium, Czech Republic, Germany, France, Ireland, Iceland, Luxemburg, Netherlands, and United Kingdom), but disequalizing in former communist countries (Bulgaria, Estonia, Hungary, Lithuania, Latvia, Poland, Romania and Slovenia with the exception of Slovakia), Scandinavian countries (Denmark, Finland, and Sweden with the exception of Norway), and southern economies (Cyprus, Malta, Italy, Spain, and Greece with the exception of Portugal). For almost all countries, the intensity effect is disequalizing, while the composition effect is equalizing.[36] It means that the disequalizing impact of eliminating the gender gap in the labor income per adult (amongst those currently working) tends to be compensated by who, that is in which households, benefits more after the elimination of this gap. In general, in the mentioned western European economies, the composition effect dominates the intensity effect. With the mentioned exceptions, the reverse is true for the former communist countries, Scandinavian countries, and the Southern economies. Panels (B) in Figure 5 shows the transmission mechanism for the total impact for the selected group of countries.[37]

5.4. The impact of the gender gap in hours of work and hourly labor earnings

Table 6 shows the effects of eliminating the gender gaps in hours of work and hourly labor earnings. Both have associated intensity impacts that are for almost all countries disequalizing (the exceptions are Estonia, Iceland, Norway, and Sweden in hours of work, and Czech Republic, Denmark, Finland, Ireland, Iceland, Norway, Poland, and the United Kingdom in hourly pay). That is, if the currently working women had the same working hours (and hourly pay) than men, the resulting income distribution would be more unequal than the current one. In general, the intensity effect of working hours (mainly reflecting part-time versus full-time work) is small but inequality-increasing (on average, it increases the Gini coefficient by 1.25%). Analogous is the effect of hourly earnings, which tends to penalize women at the top of the distribution (on average, it increases the Gini coefficient by 1.15%).

[36] The intensity impact of eliminating the gender gap in labor earnings per working adult disequalizes the income distribution in almost all countries (in 27 out of 29 countries corresponding to an average 1.64% Gini coefficient increase). On the contrary, the composition effect of removing the gender gap in labor earnings is highly equalizing (in 26 out of 29 countries corresponding to an average 1.60% Gini coefficient reduction). The exceptions are EE and LV where both effects are disequalizing.

[37] Figures for the remaining countries are available by the authors upon request.

The elimination of the gender gap in hours of work has in most countries a composition effect which is equalizing (on average, it reduces the Gini coefficient by 1.25%). That is, if non-participating women matched the level of working hours of men, the income distribution would be more equal (the exceptions are Bulgaria, Greece, Iceland, Lithuania, and Sweden). Differently, the composition effects associated to the elimination of the gender gap in hourly pay is slightly disequalizing (the few exceptions are Bulgaria, Cyprus, Latvia, Portugal, Romania, Sweden, and Slovenia).

Given the fact that in most countries intensity and composition effects tend to work in opposite directions, it is not surprising that the elimination of the gender gap in hours of work has, for most countries, a small impact. However, in some countries the impact is substantial. For instance, in Denmark, Ireland it would equalize the income distribution by 3.7%, and 2.3%, respectively. Contrarily, it would increase inequality 5.9%, 1.9%, and 1.74% in Malta, Netherlands, and Romania, respectively.

Differently, the elimination of the hourly earnings gender gap tends to disequalize the income distribution everywhere (the exceptions are Iceland, Norway, Portugal, and Sweden). This result is not surprising, given the fact that the distribution of the gender gap in hourly labor earnings tends to be more concentrated at the top of the distribution. This is also consistent with the finding by OECD (2015). Nevertheless, Panels (C) and (D) in Figure 5 show that an important reduction at the bottom of the distribution explains also the inequality increase observed in some countries. It implies that the glass ceiling explanation should be complemented by the level of disassortativeness at the bottom of the income distribution between the hours of work and hourly pay. In countries such as Austria and Malta in Figure 5, the elimination of the gender gap can reduce the assortativeness level in households at the bottom. That is, those households would become poorer just because working hours and hourly pay become more substitutes than complements.

The results above depicts a clear trade-off for economic policy: while the removal of such gaps promotes gender equity and efficiency, they would lead to a (modest) increase in income inequality between households. The reverse is, however, the case with public transfers. Equalizing them by gender would reduce income inequality virtually everywhere. For the sake of justice, public transfers are justified since women with low (past) labor force participation are being disadvantaged by employment-linked transfers (such as pensions, unemployment, and other benefits). Our results confirm the importance of gender inequality in pensions and other employment-linked transfers (such as disability, sickness and unemployment benefits) for overall inequality. Equalizing these benefits would not only help women but also promote a more equal income distribution.

5.4 Two alternative ways of closing the gender gaps and their impacts on inequality

In this section we provide simulations showing the potential of policies affecting gender inequality and their impacts on overall income inequality. Firstly, we consider the gender equalization of all proximate determinants of the household per capita income (income per adult, non-earned income per adult including transfers, labor earnings per working adult, participation, hours of work and hourly pay), by raising the levels of women to that of men (rather than taking the average of raising women and lowering men). Secondly, we simulate the elimination of the gender gap for those within the bottom 40% of the income distribution, by taking the average of raising women and lowering men.[38]

Regarding the first set of simulations, Table 7 shows that raising the income of adult women to the level of men (Simulation 1) tends to reduce inequality in most countries, suggesting that the removal of gender gaps would generally move them towards the middle of the distribution and thus lower income inequality (the exceptions are Czech Republic, Denmark, Estonia, Finland, Hungary, Iceland, Lithuania, Latvia, Norway, and Slovakia). Similarly, equalizing the distribution of non-earned income reduces inequality levels in most countries (the exceptions are Denmark, Estonia, Iceland, Lithuania, Latvia, Sweden, and Slovenia). Finally, the equalization of labor earnings is for about half the countries equalizing (the exceptions are Czech Republic, Denmark, Estonia, Finland, Hungary, Iceland, Ireland, Lithuania, Latvia, Norway, Sweden, Slovakia, and the United Kingdom).

The second set of simulations (eliminating the gender gap by taking averages amongst those in the bottom 40% of the income distribution) is presented in Table 8. The gender equalization of the income per adult leads to a general reduction of inequality in most countries, suggesting that the removal of gender gaps would generally move them towards the middle of the distribution and thus lower income inequality (the exceptions are Estonia, Lithuania and Latvia). The same is true when equalizing the distribution of non-earned income (the exceptions are

[38] The Gini coefficients of all simulated distributions are reported in Table A.1 (raising the level of women to that of men), and Table A.2 (Averaging raising women and lowering men) in the Appendix, respectively.

Estonia, Lithuania, Latvia, and Slovenia). Finally, the gender equalization of labor earnings per adult in the household is equalizing in all countries with the exception of Estonia.

Moving to the nested distributions, some patterns are worth describing. Firstly, when leveling the participation of women to the level of men (Table 7), most countries equalize their income distribution through the two channels, intensity and composition. In fact, when considering both effects together, almost all countries become more equal (the exceptions are the Czech Republic, Estonia and Iceland). Regarding the averaging simulation for the bottom 40% (in Table 8), the results are slightly disequalizing, and the above effect shown in Table 7 tends to reverse (in fact, the average change in the Gini coefficient reaches 0.77%). From the differences between Tables 7 and 8, it is clear that the equalizing impact of participation (intensity and composition) operates around the middle and top part of the income distribution rather than at the bottom. This result is not surprising since women at the bottom of the income distribution tend to already participate in the labor market (in low paid occupations) when households are characterized by high levels of economic dependency and low levels of public support.

Removing the gender gap in labor income per working adult has an intensity effect which is disequalizing in all countries in the first row of simulations in Table 7 and in almost all countries in Table 8 (the exceptions are Denmark, Estonia, Iceland, and Latvia). Contrarily, the composition impact is highly equalizing in almost all countries. As a result, the total effect is mixed being disequalizing in 13 out of 28 countries in Table 7, and in Cyprus, Estonia and Malta in Table 8). From the comparison of these results in Tables 7 and 8, it is evident that there are two groups of countries for which the elimination of this gap works differently. Moreover, these patterns are directly related with the gender gap in labor returns of workers at the bottom of the income distribution.

Considering the gender gap in working hours, when raising the level of women to the level of men in Table 7, in 18 out of 29 countries the intensity effect is equalizing. The countries in which this effect is disequalizing are Belgium, Cyprus, Denmark, Estonia, Finland, Ireland, Lithuania, Luxemburg, Latvia, Poland, and Portugal). However, when accounting for the composition effect (eliminating the gap between non-working women to the level of working men), a higher number of European countries equalizes their income distributions (the exceptions are Czech Republic, Estonia, Hungary, Lithuania, Malta, Norway, Slovakia, and the United Kingdom). Furthermore, when equalizing the hours of work by averaging the paths amongst the bottom 40%, results shows more tendency to disequalize rather than to equalize the income distributions. This result suggests that the gaps in working hours increases inequality by reducing work intensity in households in the middle of the income distribution (for example, female headed households having part-time occupations).

Finally, regarding the gaps in hourly labor earnings, the intensity effect after raising the level of working women to the level of working men would disequalize the income distribution in almost all countries (exceptions are Greece, and Romania). When including the composition effect, most countries would disequalize (the exceptions are Belgium, Bulgaria, Cyprus, Greece, Spain, France, Luxemburg, Poland, Portugal, Romania, Slovenia). When focusing on the bottom 40% in Table 8, the effect of eliminating the gap is smaller and more ambiguous.

Table 7: Inequality effects of the elimination of the gender gaps in the proximate determinants by raising female values to the level of men.

	Total Effect			Intensity Effect	Total Effect	Intensity Effect	Total Effect	Intensity Effect	Total Effect	Intensity Effect	Total Effect
Country	Simulation 1 $r_{qrf} \to r_{qrm}$	Simulation 2 $o_{qrf} \to o_{qrm}$	Simulation 3 $t_{qrf} \to t_{qrm}$	Simulation 4 $u_{quf} \to u_{qum}$	Simulation 5 $u_{quf} \to u_{qum}$ $JD_{q\left(\substack{uf\to um\leftrightarrow \\ wf\to wm}\right)}$	Simulation 6 $w_{qwf} \to w_{qwm}$	Simulation 7 $w_{qwf} \to w_{qwm}$ $JD_{q\left(\substack{uf\to um\leftrightarrow \\ wf\to wm}\right)}$	Simulation 8 $h_{qhf} \to h_{qhm}$	Simulation 9 $h_{qhf} \to h_{qhm}$ $JD_{q\left(\substack{hf\to hm\leftrightarrow \\ ef\to em}\right)}$ $JD_{q\left(\substack{uf\to um\leftrightarrow \\ wf\to wm}\right)}$	Simulation 10 $e_{qef} \to e_{qem}$	Simulation 11 $e_{qef} \to e_{qem}$ $JD_{q\left(\substack{hf\to hm\leftrightarrow \\ ef\to em}\right)}$ $JD_{q\left(\substack{uf\to um\leftrightarrow \\ wf\to wm}\right)}$
AT	-16.21	-15.44	-3.78	0.05	-3.03	3.98	-3.28	-3.76	-2.90	3.45	6.42
BE	-19.20	-16.06	-5.95	-0.06	-8.62	6.40	-5.92	2.26	-9.13	3.85	-5.27
BG	-3.72	-0.56	-3.31	-0.85	-3.98	1.70	-1.69	-0.02	-2.37	1.40	-1.62
CY	-10.97	-7.95	-4.51	-1.47	-6.92	4.47	-1.69	10.93	-7.54	5.70	-12.00
CZ	2.65	-6.90	8.70	-0.61	0.79	9.54	9.45	-2.54	5.05	5.08	14.82
DE	-14.49	-16.19	-1.19	0.05	-3.14	5.54	-0.97	-1.42	-4.74	5.72	3.74
DK	6.87	0.96	6.09	0.04	-9.29	12.34	5.86	2.36	-7.04	7.78	4.02
EE	15.27	5.25	10.94	-1.17	0.45	11.05	11.64	3.21	4.90	6.65	8.14
EL	-7.32	-4.41	-3.84	-0.38	-4.37	2.77	-3.45	-1.01	-1.70	-0.36	-1.05
ES	-13.27	-7.79	-7.00	-1.05	-6.20	1.93	-5.83	-0.33	-6.42	1.78	-3.81
FI	4.56	-0.53	5.05	0.20	-3.86	9.35	4.71	0.48	-1.34	5.33	4.52
FR	-7.82	-3.99	-4.52	-0.01	-5.40	3.46	-4.32	-0.75	-4.62	1.64	-1.19
HU	1.54	-0.54	2.05	-0.88	-0.24	3.25	3.21	-1.22	1.35	2.51	5.48
IE	-11.46	-14.88	1.67	0.04	-4.70	6.71	2.02	0.64	-5.97	6.22	3.22
IS	3.32	0.33	3.17	0.21	1.04	1.92	2.89	-2.40	-0.57	3.23	5.29
IT	-15.87	-12.31	-6.22	-0.52	-6.28	5.36	-4.79	-3.00	-2.47	2.19	3.66
LT	6.33	5.53	1.49	-0.66	-1.40	3.31	2.18	0.30	1.67	0.85	1.83
LU	-15.62	-8.52	-9.15	0.10	-8.23	6.60	-9.50	1.36	-8.69	2.64	-4.63
LV	11.95	6.50	6.06	-1.72	-0.54	6.36	7.20	1.15	-0.86	8.18	5.83
MT	-28.95	-27.54	-8.35	-0.33	-7.30	7.68	-2.91	-3.55	1.51	1.05	5.90
NL	-21.61	-17.34	-8.09	0.13	-6.74	4.66	-7.66	-2.71	-5.29	1.56	1.43
NO	0.56	-5.78	5.50	0.34	-1.46	7.37	4.99	-3.29	2.26	2.48	9.06
PL	-2.70	-1.24	-1.78	-1.23	-4.63	3.66	-0.15	2.35	-2.00	1.53	-1.87
PT	-6.92	-2.19	-4.93	-0.54	-5.29	2.01	-4.04	5.37	-5.34	1.85	-8.42
RO	-8.81	-3.23	-5.92	-0.71	-2.32	-0.82	-4.48	-0.75	-1.16	-0.83	-2.94
SE	1.40	0.29	1.10	-0.07	-4.53	6.64	0.95	-2.74	-0.28	1.47	2.66
SI	-3.00	3.91	-6.18	-0.75	-9.54	3.31	-5.02	-0.69	-7.08	2.34	-3.93
SK	5.93	-1.26	6.99	-1.15	-0.86	9.12	8.28	-2.40	1.60	7.37	12.15
UK	-2.97	-9.45	4.81	0.08	-1.03	6.86	4.53	-3.32	0.28	4.03	9.59

Source: Own elaboration based on 2010 EU-SILC household survey.

Table 8: Inequality effects of the elimination of the gender gaps in the proximate determinants by averaging the levels across the bottom 40% of disposable household per capita income distribution.

	Total Effect			Intensity Effect	Total Effect	Intensity Effect	Total Effect	Intensity Effect	Total Effect	Intensity Effect	Total Effect
Country	Simulation 1 $r_{qrf} \rightarrow r_{qrm}$	Simulation 2 $o_{qrf} \rightarrow o_{qrm}$	Simulation 3 $t_{qrf} \rightarrow t_{qrm}$	Simulation 4 $u_{quf} \rightarrow u_{qum}$	Simulation 5 $u_{quf} \rightarrow u_{qum}$ $JD_{q\left(\substack{uf\rightarrow um\leftrightarrow \\ wf\rightarrow wm}\right)}$	Simulation 6 $w_{qwf} \rightarrow w_{qwm}$	Simulation 7 $w_{qwf} \rightarrow w_{qwm}$ $JD_{q\left(\substack{uf\rightarrow um\leftrightarrow \\ wf\rightarrow wm}\right)}$	Simulation 8 $h_{qhf} \rightarrow h_{qhm}$	Simulation 9 $h_{qhf} \rightarrow h_{qhm}$ $JD_{q\left(\substack{hf\rightarrow hm\leftrightarrow \\ ef\rightarrow em}\right)}$ $JD_{q\left(\substack{uf\rightarrow um\leftrightarrow \\ wf\rightarrow wm}\right)}$	Simulation 10 $e_{qef} \rightarrow e_{qem}$	Simulation 11 $e_{qhf} \rightarrow e_{qhm}$ $JD_{q\left(\substack{hf\rightarrow hm\leftrightarrow \\ ef\rightarrow em}\right)}$ $JD_{q\left(\substack{uf\rightarrow um\leftrightarrow \\ wf\rightarrow wm}\right)}$
AT	-3.42	-1.45	-1.88	0.30	2.46	2.66	-1.59	2.70	2.00	2.70	2.13
BE	-2.98	-1.88	-1.17	-0.05	1.09	1.67	-1.15	1.54	-0.49	0.45	0.92
BG	-0.68	-0.08	-0.64	0.40	0.25	0.51	-0.04	0.02	0.52	0.46	0.04
CY	-1.95	-1.07	-0.89	0.96	0.65	1.03	0.14	0.48	-0.19	-0.01	0.48
CZ	-1.37	-0.22	-0.96	0.19	0.56	0.47	-0.92	0.64	0.50	0.55	-0.12
DE	-3.08	-2.02	-0.99	0.15	1.33	1.32	-0.87	1.72	0.83	1.37	1.63
DK	-0.82	-0.54	-0.38	-0.08	-2.83	-0.66	-0.48	-0.24	-3.63	-1.17	-0.42
EE	0.35	0.30	0.09	-0.28	0.16	-0.09	0.02	-0.10	-0.15	-0.01	-0.08
EL	-0.95	-0.47	-0.56	-0.02	0.81	0.62	-0.48	0.87	0.80	0.87	0.59
ES	-1.07	-0.56	-0.66	0.06	1.03	1.20	-0.39	1.04	0.39	0.67	0.66
FI	-0.33	-0.13	-0.26	-0.07	0.06	0.21	-0.34	0.05	-0.48	-0.14	0.00
FR	-1.91	-0.85	-1.02	0.10	1.05	1.31	-0.93	1.03	0.52	1.04	0.58
HU	-0.85	0.25	-1.00	0.20	0.16	0.49	-0.80	0.37	0.08	0.48	-0.38
IE	-4.39	-3.45	-0.86	0.19	-0.69	0.15	-0.67	0.28	-1.70	-0.53	0.17
IS	-0.89	-0.37	-0.47	0.03	0.04	-0.76	-0.58	-0.23	0.11	-0.11	-0.07
IT	-2.28	-1.00	-1.24	0.62	2.62	3.10	-0.60	2.00	2.62	3.09	1.44
LT	0.28	0.67	-0.26	0.00	-0.20	0.11	-0.16	0.02	-0.12	0.16	-0.18
LU	-1.81	-0.54	-1.19	-0.11	4.08	4.57	-1.42	3.92	1.65	2.67	3.23
LV	0.48	0.64	-0.25	-0.40	-0.26	-0.08	-0.28	-0.13	-0.29	-0.04	-0.37
MT	-3.30	-2.00	-1.48	3.15	4.33	4.96	2.21	2.13	5.87	3.90	4.23
NL	-3.06	-1.61	-1.33	0.32	3.63	3.90	-1.05	4.06	2.76	3.32	3.71
NO	-1.05	-0.48	-0.49	0.04	0.18	0.23	-0.71	0.02	0.04	0.35	0.24
PL	-0.92	-0.26	-0.81	0.23	0.01	0.40	-0.34	0.20	-0.44	-0.26	0.18
PT	-0.96	-0.20	-0.63	0.28	0.36	0.78	-0.41	0.51	-0.18	0.34	0.15
RO	-0.95	-0.03	-0.88	0.41	1.46	1.78	-0.31	0.36	1.67	1.81	0.03
SE	-0.58	-0.26	-0.47	-0.19	0.02	0.14	-0.52	-0.71	-0.22	0.07	-0.67
SI	-0.86	0.08	-1.04	0.21	-0.79	0.12	-0.69	0.07	-0.34	0.28	-0.38
SK	-0.54	-0.01	-0.53	0.05	0.53	0.51	-0.23	0.22	0.50	0.46	0.02
UK	-1.43	-1.00	-0.45	-0.09	0.24	0.24	-0.58	0.35	-0.15	0.30	0.37

Source: Own elaboration based on 2010 EU-SILC household survey.

6. Conclusions

In this paper, we have shown that the relationship between gender inequality and income inequality is quite complex. The link between gender gaps and income inequality depends very much on how households form, what types of gender-imbalanced households exist, how they fare economically (mostly out of control of policymakers and not addressed empirically in this study), and how gender gaps in earnings, and private and public transfers play out in different EU countries along the income distribution. As a result, policy agendas that could be taken away from this analysis should be country-specific and focus on the particular impacts of these forces in different EU countries. Interestingly, our results show different type of results depending on whether gender gaps are eliminated in Western, Scandinavian, Southern or former communist countries.

The general conclusion of this study is that the gender equalization of non-earned income, (including pensions, public transfers, etc.) has far more equalizing potential than the gender equalization of labor outcomes. Moreover, focusing only on equalizing labor earnings amongst those currently working (intensity effects) would disequalize the income distribution almost everywhere. While the improvement of employment opportunities for women is a moral issue, the inclusion of excluded women to the labor market activities (composition effect in participation) seems to have a minor impact when compared to the inclusion of women to occupations with similar earnings level to those obtained by men (composition effect of eliminating the gap in labor earnings per working adults).

If women follow market signals, the equalization of labor market opportunities for women would tend to increase income inequality in EU countries, at least in the short- to medium-term (due to intensity effects). This is, of course, not a sufficient argument against such policies since they would still promote gender equity and improve growth and efficiency. Nonetheless, they would unlikely contribute to stopping the rise in inequality observed in Europe in recent decades, at least not in the short- to medium-term. However, in the long-term, some composition effects could contribute to reduce the levels of inequality.

Since our analysis suggests that different ways to address gender inequality will have varying impacts on overall income inequality between households, this would also insinuate additional approaches to monitoring gender gaps, over and above indicators that measure gender equity in the labor market (e.g. participation, working hours, hourly earnings). In particular, since our analysis has identified a large role of generosity and gender imbalance in many public transfers, this would also be important to monitor. For this analysis, panel data and a more detailed analysis regarding gender gaps in other transfers (e.g. disability payments, sickness payments, etc.) would be required.

In short, promoting female economic empowerment and reducing income inequality is possible, but not all measures promoting one will also promote the other.

References

Aláez-Aller, R., Longás-García J.C., and Ullibarri-Arce, M.: Visualising gender wage differences in the European Union. Gend Work Organ 18(S1), e49-e87 (2011).

Antonelli, C., and Gehringer, A.: Technological change, rent and income inequalities: A Schumpeterian approach. Technol Forecast Soc 115, 85-98 (2017).

Arulampalam, W., Booth, A.L., and Bryan, M.L.: Is there a glass ceiling in Europe? Exploring the gender pay gap across the wage distribution. Industrial and Labor Relations Review 60 (2), 163-186 (2007).

Atkinson, A. B., Casarico, A., and Voitchovsky, S.: Top incomes and the gender divide. J Econ Inequal 16, 225-256 (2018).

Becker, G.:. The Economics of Discrimination. Chicago: University of Chicago Press (1957).

Ben Yahmed, S.: Gender wage discrimination and trade openness. Prejudiced employers in an open industry. AMSE Working Paper No. 33 (2012a).

Ben Yahmed, S.: Gender wage gaps across skills and trade openness. AMSE Working Paper No. 33 (2012b).

Black, S., and Brainerd, E.: Importing equality? The impact of globalization on gender discrimination. Ind Lab Relat Rev 57, 540-559 (2004).

Black, S., and Strahan, P.: The division of spoils: Rent-sharing and discrimination in a regulated industry. Am Econ Rev 91, 814-831 (2001).

Blau, F.D., and Kahn, L.M.: Understanding international differences in the gender pay gap. J Lab Econ 21(1), 106-144 (2003).

Blossfeld, H.-P., and Timm, A.: Who Marries Whom? Educational Systems as Marriage Markets in Modern Societies. Amsterdam: Kluwer Academic (2003).

Bonsang, E.: Does informal care for children to their elderly parents substitute for formal care in Europe? J Health Econ 28(1), 143-154 (2009).

Bøler, E.A., Javorcik, B., and Ulltveit-Moe, K.H.: Globalization: A woman's best friend? Exporters and the gender wage gap. CEPR Discussion Paper, May 2014. Online at: http://www. cepr. org/sites/default/files/JAVORCIK% 20-% 20Boler% 20at% 20al. pdf.

Cancian M., and Reed, D.: Assessing the effects of wives' earnings on family income inequality. Rev Econ Stat, 80, 73–79 (1998).

Cancian M., and Reed, D.: The impact of wives' earnings on income inequality: issues and estimates. Demogr 36, 173–84 (1999).

Cernat L.: The emerging European corporate governance model: Anglo-Saxon, continental, or still the century of diversity? J Eur Public Policy 11, 147–66 (2004).

Chevan, A., and Stokes, R.: Growth in family income inequality, 1970-1990: Industrial restructuring and demographic change. Demogr 37, 365-380 (2000).

Cuberes, D., and Taignier, M.: Aggregate effects of gender gaps in the labor market: a quantitative estimate. Clark University and Universitat de Barcelona, mimeo (2015).

Daly, M.C., and Valletta, R.G.: Inequality and poverty in the United States: the effects of rising dispersion of men's earnings and changing family behavior. Econ 73, 75–98 (2006).

Dolls, M., Doorley, K., Paulus, A., Schneider, H., and Sommer, E.: Demographic change and the European income distribution. J Econ Inequal 17(3), 337-357 (2019).

Epifani, P., and Gancia, G.: The skill bias of world trade. Econ J 118, 927-960 (2008).

European Commission: Tackling the gender pay gap in the European Union. Report prepared for the European Commission, DG for Justice (2013), available at http://ec.europa.eu/justice/gender-equality/files/gender_pay_gap/gpg_brochure_2013_final_en.pdf.

European Commission: Gender pay gap in EU countries based on SES (2014), Directorate General for Justice of the European Commission (2018).

Gehringer, A., and Klasen, S.: Labor force participation of women in the EU – What role do family policies play? Lab 31(1), 15-42 (2017).

Glass, C., and Cook, A.: Leading at the top: Understanding women's challenges above the glass ceiling. Leadersh Q 27(1), 51-63 (2016).

Gobillion, L., Meurs, D., and Roux, S.: Estimating gender differences in access to jobs. IZA Discussion Papers No. 6928 (2012).

Haddad, L., and Kanbur, R.: How serious is the neglect of intrahousehold inequality. Econ J (1990).

Himmelweit, S.: Making visible the hidden economy: The case for gender-impact analysis of economic policy. Fem Econ 8(1), 49-70 (2002).

Kim, H.-K. and Skott, P.: Labor Market Reforms, Temporary Workers and Wage Inequality, Metroecon, 67(2): 313-333 (2016).

King, E., Klasen, S., and Porter M.: Gender and Development. In: Lomborg, B. (ed.) Global Crises, Global Solutions, 2nd Edition. Cambridge: Cambridge University Press (2009).

Klasen, S.: Pro-Poor Growth and Gender Inequality. In Menkhoff, L. (Ed.) Pro-Poor Growth: Policy and Evidence. Berlin: Duncker & Humblot, 151-179 (2006).

Klasen, S.: Gender-related indicators of well-being. In Mc Gillivray (ed.) Human Well-Being: Concept and Measurement. London: Palgrave (2007).

Klasen, S.: Inequality in the United States and Germany: facts, interpretations, and blind spots. Soc Res: Int Q 81(3), 657-666 (2014).

Klasen, S. and Lamanna, F.: The impact of gender inequality in education and employment on economic growth. Fem Econ 15(3), 91-132 (2009).

Klasen, S., T. Otter, and Villalobos Barría, C.: The dynamics of inequality change in a highly dualistic economy. In Cornia (ed.) Falling inequality in Latin America. Oxford: Oxford University Press (2014).

Kremer, M., and Chen, D.: Income distribution dynamics with endogenous fertility. J Econ Growth 7(3), 227-258 (2002).

Kuhn, U., and Ravazzini, L.: The Impact of Female Labour Force Participation on Household Income Inequality in Switzerland. Swiss J Soc 43(1), 115-136 (2017).

Kurokawa, Y.: A survey of trade and wage inequality: anomalies, resolutions and new trends. J Econ Surv 28(1), 169-193 (2014).

Lam, D.: The Dynamics of Population-Growth, Differential Fertility, and Inequality. Am Econ Rev 76(5), 1103-1116 (1986).

Lam, D: Demographic variables and income inequality. In Rosenzweig, M.R. and O. Stark (Eds.) Handbook of Population and Family Economics. Elseview, 1016-1059 (1997).

Lankisch, C., Prettner, K., and Prskawetz, A.: How can robots affect wage inequality? Econ Model 81, 161-169 (2019).

Leigh A.: Top incomes. In: Salverda W., Nolan, B. and Smeeding, T.M.. (Eds.) The Oxford Handbook of Economic Inequality. Oxford: Oxford University Press, 150-174 (2009).

Lundberg, S., Pollak, R. and Wales, T..: Do husbands and wives pool their resources: evidence from a natural experiment. J Hum Resour, 463-480 (1997).

McBride, A.:. Gender Democracy in Trade Unions. Routledge, London (2018).

McCall, L., and Percheski, C.: Income inequality: New trends and research directions. Annu Rev Soc 36, 329-347 (2010).

OECD: Women, work and income inequality, in In It Together: Why Less Inequality Benefits All, OECD Publishing, Paris, https://doi.org/10.1787/9789264235120-8-en (2015).

Barros, R., De Carvalho, M., Franco, S., Mendonça, R.: Uma análise das principais causas da queda recente na desigualdade de renda brasileira. Rev. Econômica. (2006). https://doi.org/10.22409/economica.8i1.p158

Pencavel, J.: A life cycle perspective on changes in earnings inequality among married men and women. Rev Econ Stat 88, 232–42 (2006).

Ravallion, M.: Inequality and globalization: A review essay. J Econ Lit 56(2), 620-42 (2018).

Rees, R., and Riezman, R.: Globalization, gender, and growth. Rev Income Wealth 58, 107–117 (2012).

Rubery, J., Grimshaw, D., and Figueiredo, H.: How to close the gender pay gap in Europe: towards the gender mainstreaming of pay policy. Ind Relat J 36(3), 184-213 (2005).

Styhre, A., and Bergström, O.: The benefit of market-based governance devices: Reflections on the issue of growing economic inequality as a corporate concern. Eur Manag J 37(4), 413-420 (2019).

Włodarczyk, J.: Innovations and income inequalities – a comparative study. J Int Stud 10(4), 166-178 (2017).

Wood, A.: Globalisation and the rise in labour market inequalities. Econ J 108(450), 1463-1482 (1998).

World Bank: Gender equality and development. World Development Report 2012. Available at: https://siteresources.worldbank.org/INTWDR2012/Resources/7778105-1299699968583/7786210-1315936222006/Complete-Report.pdf (2011).

Appendix

Table A.1: Slovenian marginal distributions and joint distributions (ventiles).

Ventiles	a_{qaf}	a_{qam}	u_{quf}	u_{qum}	h_{qhf}	h_{qhm}	e_{qef}	e_{qem}	o_{qrf}	o_{qrm}	$JD^{q}_{(a\leftrightarrow r)}$	$JD^{q}_{(f\leftrightarrow m)}$	$JD^{q}_{(uf\leftrightarrow wm)}$	$JD^{q}_{(um\leftrightarrow fm)}$	$JD^{q}_{(hf\leftrightarrow ef)}$	$JD^{q}_{(hm\leftrightarrow em)}$
1	0.25	0.19	0.44	0.46	899	1040	0.05	0.04	794	742	1.94	2.11	1.80	8.04	6.84	5.58
2	0.29	0.21	0.50	0.50	1548	1826	0.34	0.34	1901	1876	1.74	1.49	1.10	2.81	2.67	2.24
3	0.32	0.32	0.50	0.50	2010	2064	0.88	0.97	2746	2823	1.40	1.20	0.89	1.58	1.56	1.45
4	0.35	0.34	0.51	0.62	2064	2064	1.24	1.43	3357	3137	1.30	1.12	0.69	1.01	1.56	1.53
5	0.38	0.38	0.75	0.98	2064	2064	1.60	1.95	4207	3447	1.16	1.09	0.29	0.57	1.52	1.43
6	0.51	0.39	1.00	1.00	2064	2064	2.09	2.53	4341	3292	0.97	1.09	0.23	0.59	1.38	1.30
7	0.56	0.44	1.00	1.00	2064	2064	2.65	3.13	4618	3665	0.88	1.06	0.23	0.56	1.22	1.18
8	0.51	0.49	1.00	1.00	2064	2064	3.18	3.60	4340	3518	0.88	1.03	0.32	0.59	1.11	1.13
9	0.49	0.51	1.00	1.00	2064	2064	3.57	4.06	4073	3652	0.88	1.01	0.40	0.59	1.07	1.09
10	0.51	0.49	1.00	1.00	2064	2064	3.93	4.51	4101	3681	0.88	1.00	0.42	0.60	1.04	1.06
11	0.57	0.43	1.00	1.00	2064	2064	4.27	4.93	4079	3411	0.88	1.00	0.46	0.64	1.03	1.04
12	0.51	0.49	1.00	1.00	2064	2085	4.66	5.33	4174	3902	0.88	0.97	0.47	0.62	1.01	1.02
13	0.49	0.51	1.00	1.00	2095	2223	5.11	5.71	4005	3665	0.87	0.96	0.51	0.65	0.98	0.96
14	0.53	0.47	1.00	1.00	2340	2464	5.61	6.13	3880	3464	0.87	0.96	0.54	0.69	0.88	0.86
15	0.51	0.49	1.00	1.00	2989	2781	6.17	6.66	4456	4053	0.87	0.95	0.51	0.66	0.68	0.76
16	0.51	0.49	1.00	1.00	4218	3769	6.83	7.24	3493	3537	0.86	0.94	0.60	0.71	0.48	0.56
17	0.53	0.47	1.00	1.00	4317	4317	7.60	8.02	3820	2173	0.85	0.92	0.61	0.83	0.47	0.49
18	0.54	0.46	1.00	1.00	4554	4534	8.56	9.00	2828	6763	0.86	0.89	0.70	0.60	0.45	0.46
19	0.50	0.50	1.00	1.00	6325	6401	9.82	10.55	4463	3035	0.85	0.87	0.68	0.82	0.33	0.33
20	0.54	0.46	1.00	1.00	6570	6570	14.3	17.08	3054	3379	0.86	0.82	0.79	0.85	0.31	0.32

Source: Own elaboration based on 2010 EU-SILC household survey.

Table A.2: German marginal distributions and joint distributions (ventiles).

Ventiles	a_{qaf}	a_{qam}	u_{quf}	u_{qum}	h_{qhf}	h_{qhm}	e_{qef}	e_{qem}	o_{qrf}	o_{qrm}	$JD_{(a\leftrightarrow r)}^{\;q}$	$JD_{(f\leftrightarrow m)}^{\;q}$	$JD_{(uf\leftrightarrow wm)}^{\;q}$	$JD_{(um\leftrightarrow fm)}^{\;q}$	$JD_{(hf\leftrightarrow ef)}^{\;q}$	$JD_{(hm\leftrightarrow em)}^{\;q}$
1	0.25	0.17	0.48	0.48	309	826	0.41	0.61	431	2779	1.97	2.86	0.06	0.96	6.73	4.04
2	0.30	0.20	0.67	0.77	545	1598	1.82	2.69	1429	5594	1.69	1.96	0.15	0.46	2.22	1.28
3	0.32	0.26	1.00	1.00	735	1892	3.13	4.49	2147	6549	1.48	1.53	0.21	0.32	1.41	1.10
4	0.34	0.34	1.00	1.00	951	1989	4.14	5.74	2574	6670	1.27	1.31	0.34	0.39	1.02	1.08
5	0.49	0.45	1.00	1.00	1046	2047	4.91	6.75	3367	8259	0.92	1.24	0.32	0.33	1.03	1.06
6	0.53	0.47	1.00	1.00	1165	2064	5.66	7.57	4257	8136	0.87	1.18	0.27	0.38	1.08	1.05
7	0.52	0.48	1.00	1.00	1308	2064	6.33	8.36	5197	8011	0.87	1.13	0.24	0.43	1.04	1.06
8	0.53	0.47	1.00	1.00	1490	2064	6.98	9.17	5858	8750	0.87	1.10	0.24	0.42	0.97	1.08
9	0.52	0.48	1.00	1.00	1584	2125	7.67	9.92	6214	9594	0.87	1.06	0.27	0.41	0.94	1.04
10	0.52	0.48	1.00	1.00	1755	2167	8.31	10.66	6112	8985	0.87	1.04	0.33	0.48	0.88	1.01
11	0.51	0.49	1.00	1.00	1898	2206	8.98	11.43	6785	7817	0.87	1.01	0.34	0.56	0.83	0.99
12	0.53	0.47	1.00	1.00	2009	2285	9.60	12.18	6656	7851	0.88	1.00	0.39	0.59	0.81	0.95
13	0.50	0.50	1.00	1.00	2064	2322	10.2	12.97	6788	7284	0.88	0.96	0.43	0.64	0.81	0.94
14	0.52	0.48	1.00	1.00	2064	2331	10.9	13.90	7183	7261	0.88	0.96	0.45	0.66	0.84	0.93
15	0.53	0.47	1.00	1.00	2107	2469	11.6	14.81	6996	7106	0.89	0.94	0.51	0.69	0.84	0.89
16	0.53	0.47	1.00	1.00	2173	2580	12.4	15.90	6577	8600	0.89	0.94	0.57	0.67	0.83	0.85
17	0.53	0.47	1.00	1.00	2279	2598	13.4	17.35	5829	7468	0.91	0.92	0.65	0.73	0.81	0.84
18	0.49	0.51	1.00	1.00	2403	2923	14.6	19.11	5594	9004	0.92	0.89	0.70	0.72	0.78	0.76
19	0.52	0.48	1.00	1.00	2846	3536	16.7	22.24	5911	9782	0.93	0.89	0.74	0.73	0.66	0.64
20	0.52	0.48	1.00	1.00	6095	6361	29.2	43.12	1011	15202	0.94	0.91	0.73	0.74	0.28	0.33

Source: Own elaboration based on 2010 EU-SILC household survey.

Table A.3: Lithuanian marginal distributions and joint distributions (ventiles).

Ventiles	a_{qaf}	a_{qam}	u_{quf}	u_{qum}	h_{qhf}	h_{qhm}	e_{qef}	e_{qem}	o_{qrf}	o_{qrm}	$JD^{q}_{(a\leftrightarrow r)}$	$JD^{q}_{(f\leftrightarrow m)}$	$JD^{q}_{(uf\leftrightarrow wm)}$	$JD^{q}_{(um\leftrightarrow fm)}$	$JD^{q}_{(hf\leftrightarrow ef)}$	$JD^{q}_{(hm\leftrightarrow em)}$
1	0.25	0.19	0.44	0.46	899	1040	0.05	0.04	794	742	1.94	2.11	1.80	8.04	6.84	5.58
2	0.29	0.21	0.50	0.50	1548	1826	0.34	0.34	1901	1876	1.74	1.49	1.10	2.81	2.67	2.24
3	0.32	0.32	0.50	0.50	2010	2064	0.88	0.97	2746	2823	1.40	1.20	0.89	1.58	1.56	1.45
4	0.35	0.34	0.51	0.62	2064	2064	1.24	1.43	3357	3137	1.30	1.12	0.69	1.01	1.56	1.53
5	0.38	0.38	0.75	0.98	2064	2064	1.60	1.95	4207	3447	1.16	1.09	0.29	0.57	1.52	1.43
6	0.51	0.39	1.00	1.00	2064	2064	2.09	2.53	4341	3292	0.97	1.09	0.23	0.59	1.38	1.30
7	0.56	0.44	1.00	1.00	2064	2064	2.65	3.13	4618	3665	0.88	1.06	0.23	0.56	1.22	1.18
8	0.51	0.49	1.00	1.00	2064	2064	3.18	3.60	4340	3518	0.88	1.03	0.32	0.59	1.11	1.13
9	0.49	0.51	1.00	1.00	2064	2064	3.57	4.06	4073	3652	0.88	1.01	0.40	0.59	1.07	1.09
10	0.51	0.49	1.00	1.00	2064	2064	3.93	4.51	4101	3681	0.88	1.00	0.42	0.60	1.04	1.06
11	0.57	0.43	1.00	1.00	2064	2064	4.27	4.93	4079	3411	0.88	1.00	0.46	0.64	1.03	1.04
12	0.51	0.49	1.00	1.00	2064	2085	4.66	5.33	4174	3902	0.88	0.97	0.47	0.62	1.01	1.02
13	0.49	0.51	1.00	1.00	2095	2223	5.11	5.71	4005	3665	0.87	0.96	0.51	0.65	0.98	0.96
14	0.53	0.47	1.00	1.00	2340	2464	5.61	6.13	3880	3464	0.87	0.96	0.54	0.69	0.88	0.86
15	0.51	0.49	1.00	1.00	2989	2781	6.17	6.66	4456	4053	0.87	0.95	0.51	0.66	0.68	0.76
16	0.51	0.49	1.00	1.00	4218	3769	6.83	7.24	3493	3537	0.86	0.94	0.60	0.71	0.48	0.56
17	0.53	0.47	1.00	1.00	4317	4317	7.60	8.02	3820	2173	0.85	0.92	0.61	0.83	0.47	0.49
18	0.54	0.46	1.00	1.00	4554	4534	8.56	9.00	2828	6763	0.86	0.89	0.70	0.60	0.45	0.46
19	0.50	0.50	1.00	1.00	6325	6401	9.82	10.55	4463	3035	0.85	0.87	0.68	0.82	0.33	0.33
20	0.54	0.46	1.00	1.00	6570	6570	14.3	17.08	3054	3379	0.86	0.82	0.79	0.85	0.31	0.32

Source: Own elaboration based on 2010 EU-SILC household survey.

Table A.4.: Gini coefficient after the gender gaps removal in the proximate determinants by rising female values to the level of men.

Country	y_{qy}	Simulation 1 $r_{qrf} \rightarrow r_{qrm}$	Simulation 2 $o_{qrf} \rightarrow o_{qrm}$	Simulation 3 $t_{qrf} \rightarrow t_{qrm}$	Simulation 4 $u_{quf} \rightarrow u_{qum}$	Simulation 5 $u_{quf} \rightarrow u_{qum}$ $JD_{q\binom{uf\rightarrow um\leftrightarrow}{wf\rightarrow wm}}$	Simulation 6 $w_{qwf} \rightarrow w_{qwm}$	Simulation 7 $w_{qwf} \rightarrow w_{qwm}$ $JD_{q\binom{uf\rightarrow um\leftrightarrow}{wf\rightarrow wm}}$	Simulation 8 $h_{qhf} \rightarrow h_{qhm}$	Simulation 9 $h_{qhf} \rightarrow h_{qhm}$ $JD_{q\binom{hf\rightarrow hm\leftrightarrow}{ef\rightarrow em}}$ $JD_{q\binom{uf\rightarrow um\leftrightarrow}{wf\rightarrow wm}}$	Simulation 10 $e_{qef} \rightarrow e_{qem}$	Simulation 11 $e_{qef} \rightarrow e_{qem}$ $JD_{q\binom{hf\rightarrow hm\leftrightarrow}{ef\rightarrow em}}$ $JD_{q\binom{uf\rightarrow um\leftrightarrow}{wf\rightarrow wm}}$
AT	29.03	24.30	24.52	27.90	29.02	28.12	30.15	28.05	27.91	28.16	30.00	30.86
BE	27.58	22.30	23.17	25.96	27.58	25.22	29.37	25.97	28.22	25.08	28.66	26.14
BG	33.49	32.25	33.31	32.39	33.22	32.17	34.07	32.94	33.49	32.71	33.97	32.96
CY	33.50	29.82	30.84	31.99	33.01	31.18	35.00	32.93	37.16	30.97	35.41	29.48
CZ	25.55	26.18	23.74	27.72	25.35	25.70	27.93	27.91	24.85	26.79	26.80	29.28
DE	32.33	27.62	27.07	31.92	32.32	31.29	34.09	31.99	31.84	30.77	34.15	33.51
DK	29.17	31.20	29.48	30.98	29.21	26.49	32.80	30.91	29.89	27.15	31.47	30.37
EE	31.11	35.85	32.73	34.50	30.74	31.24	34.54	34.72	32.10	32.62	33.17	33.63
EL	33.87	31.42	32.41	32.60	33.77	32.42	34.84	32.73	33.56	33.33	33.78	33.54
ES	33.45	29.06	30.89	31.16	33.15	31.42	34.15	31.55	33.39	31.35	34.09	32.22
FI	27.89	29.17	27.75	29.31	27.96	26.82	30.51	29.21	28.04	27.52	29.39	29.16
FR	32.21	29.68	30.92	30.74	32.20	30.46	33.31	30.81	31.96	30.71	32.73	31.82
HU	26.43	26.81	26.26	26.94	26.17	26.34	27.26	27.25	26.08	26.76	27.06	27.85
IE	32.53	28.78	27.66	33.04	32.51	30.97	34.68	33.16	32.71	30.56	34.52	33.55
IS	28.91	29.86	29.00	29.82	28.96	29.20	29.45	29.74	28.21	28.74	29.83	30.43
IT	33.42	28.10	29.29	31.32	33.22	31.30	35.19	31.80	32.40	32.57	34.13	34.62
LT	36.85	39.13	38.83	37.35	36.56	36.28	38.02	37.60	36.91	37.41	37.11	37.47
LU	31.63	26.66	28.91	28.71	31.63	29.00	33.69	28.60	32.03	28.85	32.43	30.14
LV	35.67	39.97	38.02	37.86	35.09	35.51	37.97	38.27	36.11	35.39	38.62	37.78
MT	31.15	22.17	22.61	28.60	31.10	28.92	33.60	30.29	30.09	31.67	31.53	33.04
NL	27.84	21.79	22.98	25.55	27.84	25.93	29.09	25.67	27.05	26.33	28.23	28.20
NO	26.82	26.95	25.25	28.27	26.89	26.41	28.78	28.14	25.92	27.40	27.47	29.23
PL	33.85	32.99	33.48	33.30	33.48	32.33	35.14	33.85	34.70	33.22	34.42	33.27
PT	35.85	33.32	35.02	34.04	35.61	33.91	36.52	34.35	37.72	33.89	36.46	32.78
RO	34.41	31.37	33.29	32.36	34.15	33.60	34.12	32.86	34.14	34.00	34.11	33.39
SE	27.16	27.58	27.28	27.50	27.18	25.97	29.01	27.46	26.46	27.12	27.60	27.92
SI	25.97	25.22	27.02	24.39	25.81	23.52	26.86	24.70	25.82	24.16	26.61	24.98
SK	26.00	27.54	25.67	27.82	25.70	25.78	28.37	28.15	25.38	26.42	27.92	29.16
UK	34.20	33.18	30.97	35.84	34.23	33.85	36.55	35.75	33.06	34.30	35.58	37.48

Source: Own elaboration based on 2010 EU-SILC household survey.

Table A.5: Gini coefficient after the elimination of the gender gaps in the proximate determinants by averaging the levels across the bottom 40% of disposable household per capita income distribution.

Country	y_{qy}	Simulation 1 $r_{qrf} \rightarrow r_{qrm}$	Simulation 2 $o_{qrf} \rightarrow o_{qrm}$	Simulation 3 $t_{qrf} \rightarrow t_{qrm}$	Simulation 4 $u_{quf} \rightarrow u_{qum}$	Simulation 5 $u_{quf} \rightarrow u_{qum}$ $JD_{q\left(\substack{uf \rightarrow um \leftrightarrow \\ wf \rightarrow wm}\right)}$	Simulation 6 $w_{qwf} \rightarrow w_{qwm}$	Simulation 7 $w_{qwf} \rightarrow w_{qwm}$ $JD_{q\left(\substack{uf \rightarrow um \leftrightarrow \\ wf \rightarrow wm}\right)}$	Simulation 8 $h_{qhf} \rightarrow h_{qhm}$	Simulation 9 $h_{qhf} \rightarrow h_{qhm}$ $JD_{q\left(\substack{hf \rightarrow hm \leftrightarrow \\ ef \rightarrow em}\right)}$ $JD_{q\left(\substack{uf \rightarrow um \leftrightarrow \\ wf \rightarrow wm}\right)}$	Simulation 10 $e_{qef} \rightarrow e_{qem}$	Simulation 11 $e_{qhf} \rightarrow e_{qhm}$ $JD_{q\left(\substack{hf \rightarrow hm \leftrightarrow \\ ef \rightarrow em}\right)}$ $JD_{q\left(\substack{uf \rightarrow um \leftrightarrow \\ wf \rightarrow wm}\right)}$
AT	29.03	28.01	28.58	28.45	29.09	29.71	29.77	28.54	29.78	29.58	29.78	29.62
BE	27.58	26.78	27.08	27.28	27.59	27.90	28.06	27.28	28.02	27.46	27.72	27.85
BG	33.49	33.27	33.47	33.29	33.63	33.58	33.67	33.49	33.51	33.68	33.66	33.51
CY	33.50	32.85	33.14	33.20	33.82	33.72	33.84	33.55	33.66	33.44	33.50	33.66
CZ	25.55	25.15	25.44	25.26	25.55	25.64	25.62	25.27	25.66	25.63	25.64	25.47
DE	32.33	31.31	31.65	31.98	32.35	32.73	32.73	32.02	32.85	32.57	32.74	32.83
DK	29.17	28.96	29.04	29.09	29.18	28.38	29.01	29.06	29.13	28.14	28.86	29.08
EE	31.11	31.21	31.19	31.13	31.01	31.15	31.07	31.11	31.07	31.05	31.10	31.07
EL	33.87	33.58	33.74	33.71	33.89	34.17	34.11	33.74	34.19	34.17	34.20	34.10
ES	33.45	33.14	33.31	33.28	33.52	33.85	33.90	33.37	33.85	33.63	33.72	33.72
FI	27.89	27.81	27.86	27.83	27.88	27.92	27.96	27.80	27.91	27.77	27.86	27.90
FR	32.21	31.58	31.92	31.87	32.23	32.54	32.62	31.90	32.53	32.37	32.53	32.39
HU	26.43	26.17	26.47	26.14	26.45	26.44	26.53	26.19	26.50	26.42	26.53	26.30
IE	32.53	31.07	31.38	32.22	32.56	32.28	32.55	32.28	32.59	31.95	32.33	32.56
IS	28.91	28.64	28.79	28.76	28.91	28.91	28.68	28.73	28.83	28.93	28.87	28.88
IT	33.42	32.64	33.07	32.99	33.61	34.27	34.44	33.20	34.07	34.28	34.43	33.88
LT	36.85	36.90	37.05	36.70	36.80	36.73	36.84	36.74	36.81	36.76	36.86	36.73
LU	31.63	31.03	31.43	31.22	31.56	32.89	33.04	31.15	32.84	32.12	32.44	32.62
LV	35.67	35.87	35.93	35.61	35.56	35.61	35.67	35.60	35.65	35.60	35.68	35.57
MT	31.15	30.17	30.58	30.74	32.18	32.55	32.75	31.89	31.86	33.03	32.42	32.52
NL	27.84	26.95	27.35	27.43	27.89	28.81	28.88	27.51	28.93	28.57	28.72	28.83
NO	26.82	26.52	26.67	26.67	26.81	26.85	26.86	26.61	26.81	26.81	26.89	26.86
PL	33.85	33.59	33.81	33.63	33.98	33.90	34.04	33.79	33.97	33.75	33.81	33.96
PT	35.85	35.46	35.73	35.57	35.90	35.93	36.08	35.65	35.98	35.74	35.92	35.85
RO	34.41	34.07	34.39	34.10	34.54	34.90	35.01	34.29	34.52	34.97	35.02	34.41
SE	27.16	27.04	27.13	27.07	27.15	27.21	27.24	27.06	27.01	27.14	27.22	27.02
SI	25.97	25.78	26.02	25.73	26.06	25.79	26.03	25.82	26.02	25.91	26.07	25.90
SK	26.00	25.86	26.00	25.86	26.01	26.14	26.13	25.94	26.06	26.13	26.12	26.01
UK	34.20	33.71	33.86	34.05	34.17	34.28	34.28	34.00	34.32	34.15	34.30	34.33

Source: Own elaboration based on 2010 EU-SILC household survey.

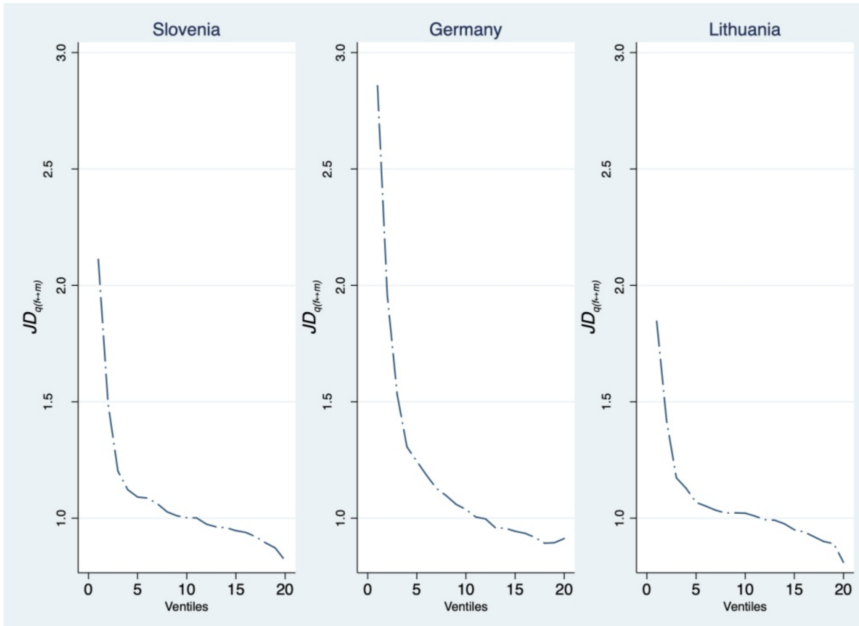

Figure A.1: The Slovenian, German, and Lithuanian joint distributing factors between female and male adults in the household $JD_{q(f \leftrightarrow m)}$. Source: Own elaboration based on EU-SILC 2010.