From gender equality to household earnings equality: The role of women's labour market outcomes across OECD countries

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A R T I C L E   I N F O

A B S T R A C T

We assess the impact that full gender equality in the labour market would have on earnings inequality between households, and then decompose that impact by looking separately at the roles played by gender gaps in employment, hours, and pay. We do this by applying a reweighting method to LIS data for 22 OECD countries, across North America, Europe, and Australia. We find that full equality in earnings and employment between women and men would reduce household earnings inequality considerably, with the most substantial reductions coming from closing the gender gap in employment as opposed to closing the gaps in pay and hours worked. A 10% counterfactual decrease in the gender employment gap (relative to the country baseline) is associated with an average 0.6% decline in the Gini for household earnings inequality. Reducing the gender employment gap is thus the pathway through which greater gender equality may most strongly mitigate overall earnings inequality among households: these two key goals for contemporary societies can be pursued simultaneously.

1. Introduction

How does greater gender equality in the labour market affect the distribution of earnings among families and households? This question is highly relevant for the evolution of inequality in contemporary societies (Cancian & Schoeni, 1998; Schwartz, 2010; Breen & Salazar, 2011), with the key roles played by women's labour market outcomes (Esping-Andersen, 2007; Sudo, 2017) and union/marriage patterns (Sweeney & Cancian, 2004; Albertini, 2008; Kalmijn, 2013; Goñalons-Pons & Schwartz, 2017) receiving much attention in the literature. While some, mostly earlier, studies (such as Karoly and Burtless, 1995; Esping-Andersen, 2007) found rising women's employment to be a contributor to greater inequality at the household level, recent research suggests that greater gender equality in the labour market has generally been a powerful equalizing force for the distribution of earnings across households (Pencavel, 2006; Schwartz, 2010; Harkness, 2010, 2013; Larrimore, 2014; Kuhn & Ravazzini, 2017; Blundell, Joyce, Keiller, & Ziliak, 2018). Several comparative studies also point to the equalizing role of increases in women's employment rates in different countries and institutional regimes (Kollmeyer, 2013; Grotti & Scherer, 2016; Nieuwenhuis, Kolk, & Need, 2017).

However, there is no consensus on the mechanism underpinning this relationship, on the circumstances in which it is likely to hold, or on how the scale of effects may vary depending on the initial labour market situation of women *versus* men. Contributions often focus directly on women's earnings as a share of total household earnings (Nieuwenhuis, Van der Kolk, & Need, 2017), or on some of the components helpfully distinguished by Gronau (1982): employment rates (Pasqua, 2008; Kollmeyer, 2013; Grotti & Scherer, 2016; Sudo, 2017), the gender pay gap (Harkness, 2010, 2013; Blundell et al., 2018), and hours worked (Larrimore, 2014). Kuhn and Ravazzini (2017) look at women's employment, hours, and earnings but only for the case of Switzerland. Although a few comparative studies have considered two of those three components simultaneously (*e.g.,* Harkness, 2010, 2013, covers employment rates and the pay gap), none (that we know of) has considered all three simultaneously in a comparative setting. This means that previous studies have not fully disentangled the individual impact of each mechanism on household earnings inequality, or how the scale of effects of each depend on the initial gaps between women and men in employment, hours worked and pay. There is thus a significant gap in understanding the mechanisms at work and thus which policies might most effectively mitigate overall inequality by promoting greater gender

equality in the labour market.

We address this gap in two innovative ways. First, we examine how full gender equality in the labour market would affect household earnings inequality at the country level, considering both households with couples and single-led households. We do so by employing a reweighting approach which allows us to almost perfectly decompose the full equality counterfactuals into the contributions made by each of the three mechanisms. We can therefore assess their individual, as well as joint, potential impacts on earnings inequality. Secondly, while key studies have focused on this issue with a cross-national lens, as well as an over-time lens (Grotti & Scherer, 2016), we expand the scope of the analysis beyond the countries typically included in studies on this topic (though Kollmeyer, 2013, Nieuwenhuis et al., 2017 are exceptions using 16–18 countries) to cover 22 countries across North America, Europe, and Australia, using data from the Luxembourg Income Study. This enables us to show how the impact of closing these gaps depends on the initial circumstances of women *versus* men in the labour market. Finally, in our counterfactual analysis we employ conditional reweighting, whereby observed characteristics of women such as their age and education are taken into account in producing estimates of what they might earn if working or working more, lending greater credibility to the results.

The substance of our findings is that equalising men's and women's earnings and employment would consistently decrease earnings inequality between households. The average change in the Gini index for household earnings is − 9.5%, ranging from − 17% (Czech Republic) to − 4% (Lithuania). The key mechanism behind this decline is reducing the gap in employment rates: if, in each country, the proportion of women in work was the same as the proportion of men, household earnings inequality would hypothetically change by − 6.5% on average. By contrast, counterfactually closing the gaps in working hours and in hourly pay would have little impact on overall inequality if employment levels were not also altered, except in some specific countries. We also find that the impact of closing the employment gap varies quite considerably across countries, being largest in countries where that gap is widest to begin with.

We outline our theoretical framework in Section 2, present the data and methods to be employed in Section 3, report the empirical findings in Section 4, and discuss these further and underline their implications in Section 5.

2. Theoretical framework and policy context

2.1. Impact of women's earnings and employment on household earnings inequality

The relationship between gender inequality and household earnings inequality has most often been studied in a temporal framework - how has increasing gender equality in the labour market affected household earnings inequality over time? - with data from the US most commonly used. Thurow (1975), Karoly and Burtless (1995), and Esping-Andersen (2007), among others, found increases in women's employment rates and earnings to be associated with increasing inequality at the household level, whereas Treas (1987), Cancian, Gottschalk and Danziger (1993), Cancian and Reed (1999), and Harkness (2010), Kollmeyer (2013), Larrimore (2014), Grotti and Scherer (2016), Kuhn and Ravazzini (2017), Nieuwenhuis, Kolk, and Need (2017) find the opposite. This variation can be partly explained by the fact that, as Mincer (1974) pointed out, the impact on household inequality will be determined by the social strata of the women entering the labour market: with the partners of men in upper and lower strata, respectively, increasing and decreasing household inequality. This empirical ambiguity is substantiated by Bergmann et al. (1980) and Sudo (2017), who find a curvilinear relationship between women's employment rates and earnings inequality in both the US and Japan.

In recent work, research finding that increases in women's earnings

and employment have had an equalizing effect has been dominant. This echoes Treas (1987) who argued that the main driver of the increase in household inequality in the US was the increase in the variance of men's earnings (see also Daly & Valletta, 2006) and that, in contrast, the increase in women's earnings ameliorated household inequality. She showed that the variance of women's earnings is reduced by higher rates of women's employment because of the fall in the share of women who have no earnings. This argument was substantiated by later US studies (Cancian, Danziger, & Gottschalk, 1993; Cancian and Reed, 1999). If men's earnings had not changed, increases in women's earnings would have reduced inequality in the United States by as much as 15% (Cancian & Reed, 1999; also Blackburn & Bloom, 1987; Gottschalk & Danziger, 2005).

Some key studies make comparisons over countries rather than time, most of them using data from the Luxembourg Income Study (Cancian & Schoeni, 1998; Harkness, 2010, 2013; Kollmeyer, 2013; Grotti & Scherer, 2016; Nieuwenhuis, Kolk, & Need 2017). They generally find that greater gender equality in the labour market decreases household earnings inequality, but with the magnitude of the effect varying across countries.

2.2. Mechanisms: gender gaps in employment, pay, and hours worked

While the recent literature agrees that increasing gender equality in the labour market tends to restrain the growth of household earnings inequality, the key point of debate is the mechanism underpinning this relationship. Since Gronau (1982), the literature highlights three key mechanisms: "the labour force participation rate of women, the hours they work, and sex-related wage differentials" (p. 121). Gronau did not decompose the change into these three components, only noting that "How does a change in married women's labor force participation or a narrowing of the sex-related gap in wages affect inequality? Unfortunately, these questions have no easy analytical answers." (p. 122).

Unsurprisingly, this theoretical ambiguity raised by Gronau (1982) is reflected in the literature: most studies focus on a single mechanism, typically the employment rate of women (Cancian & Schoeni, 1998; Kollmeyer, 2013), with few studies examining two mechanisms at the same time (Harkness, 2010 focusing on employment rates and pay, Larrimore, 2014, on employment rates and hours, Blundell et al., 2018 on hours and pay), and the study on Switzerland by Kuhn & Ravazzini (2017), who rely on all three but only indirectly on the employment rate. We summarise the key features of recent studies focusing on explaining inequality through labour market dynamics with a gender angle and relying on decompositions/counterfactuals, together with their analytic approaches and mechanisms, in Table 1.

To the best of our knowledge, no study has yet disentangled the impact of gender gaps in employment rates, pay gaps, and hours worked at the same time in a comparative setting. Failing to do so risks conflating the impacts of two or more mechanisms. The ambiguity about the drivers of gender inequality in the labour market is particularly problematic because high employment rates for women and low gender pay gaps tend to go hand-in-hand in Nordic countries (Olivetti & Petrongolo, 2016), but there are countries where this does not occur. Mediterranean countries provide an example (Olivetti & Petrongolo, 2008): women who would earn low wages in those countries tend not to work at all, thus decreasing the observed gender pay gap. In other words, there may be a direct trade-off between the gender employment gap and the gender pay gap. Therefore, to understand how full equality in labour market outcomes between men and women may affect household earnings inequality, we need to disentangle how each of the gaps in employment rates, pay, and hours worked, affects earnings inequality.

The literature suggests that household earnings inequality is mainly shaped by women's employment rates (Maxwell, 1990; Cancian & Reed, 1999; Esping-Andersen, 2007; Pasqua, 2008; Harkness, 2010, 2013; Kollmeyer, 2013; Grotti & Scherer, 2016, Nieuwenhuis, Kolk, & Need

Table 1
Review of Analytical Approaches in Recent Counterfactual Inequality Research.

Author (s)	Article Year	Data Used	Countries Analysed (n°)	Years Analysed in Study	Population Analysed	Inequality Measure	Analytic Approach	Labour Market Dynamic
Cancian and Schoeni	1998	LIS	10	1979–1987	couples	Sq. CV	Decomposition and Counterfactuals	Empl. rate
Esping-Andersen	2007	ECHP, PSID	8	1993–2001	couples	CV	Decomposition	Empl. rate
Pasqua	2008	ECHP	14	1994–2001	couples, singles	HSCV	Decomposition and Counterfactuals	Empl. rate
Harkness	2010	LIS	17	2003–2005	couples, singles	CV	Decomposition and Counterfactuals	Empl. Rate, pay
Kollmeyer	2013	LIS	16	1967–2005	couples, singles	Gini Coeff.	Random Effects Regressions	Empl. rate
Larrimore	2014	CPS	1 (US)	1979–2007	couples, singles	Gini Coeff.	Shift-Share	Empl. rate, hours
Grotti and Scherer	2016	LIS	5	1985–2005	couples	Theil Index	Decomposition and Counterfactuals	Empl. rate
Kuhn and Ravazzini	2017	SHP	1 (CH)	2000–2014	couples+ singles	CV, Theil Index	Decomposition and Counterfactuals	Empl. rate by hours categories, hours, pay
Nieuwenhuis, Kolk, and Need	2017	LIS	18	1973–2013	couples	Sq. CV	Decomposition and Counterfactuals	% earnings of women in household
Blundell et al.	2018	CPS, FES/FRS	2 (UK, US)	1979–2016	couples, singles, excludes non-earners	Log(Earnings)	Decomposition	hours, pay

Notes: Table reviews recent inequality research relying on decompositions and counterfactuals approaches, clarifying the datasets used, the geographical scope, the population included, the inequality measure, and the labour market dynamics examined as mechanisms. Datasets abbreviations – LIS (Luxembourg Income Study), ECHP (European Community Household Panel), PSID (Panel Study of Income Dynamics), CPS (Current Population Survey), SHP (Swiss Household Panel), FES (Family Expenditure Survey), FRS (Family Resources Survey).

2017). This is because, as women move from being zero-earners to earners, the variance of women's earnings declines (Cancian & Reed, 1999; Pasqua, 2008). Theoretically, the increase in women's employment may however increase earnings inequality by increasing earnings homogamy (Gronau, 1982; Esping-Andersen, 2007; Sudo, 2017). Empirically, the equalizing direction has been confirmed in the literature: in cross-country analyses, Pasqua (2008) and Harkness (2010, 2013) show how inequality would increase considerably if no women were to work, and that inequality would decrease considerably if all women were to work (Pasqua, 2008; Harkness, 2010). The role of homogamy, on the other hand, is empirically found to be limited and more than compensated by women's rise in employment (Kollmeyer, 2013; Grotti & Scherer, 2016). Combining the cross-national and over-time perspectives, Grotti and Scherer (2013) and Nieuwenhuis et al. (2017) find that this holds across different countries and institutional arrangements, with the latter remarking that the potential equality gains depend on women's employment levels: in countries where they have reached a plateau, further equality gains may be limited. This suggests comparatively large equality gains in countries where women's employment rates are still relatively low, such as Greece, Italy, and Spain.

The second key dimension of gender outcomes in the labour market is the gender gap in pay (Blau & Kahn, 2003, 2020; Mandel & Semyonov, 2005; Olivetti & Petrongolo, 2016). The literature is unclear on what impact closing the gender pay gap should have on household earnings inequality: matching women's pay to men's pay would decrease inequality within the household, but at the same time increase the variance in women's earnings which, all else equal, will cause inequality between households to grow. It may also strengthen economic homogamy and this would also tend to increase inequality. Theoretically, then, the possible impact of closing the gender gap in pay without altering employment or hours worked is ambiguous. The evidence is similarly mixed. Jäntti (1996), focusing on five North American and European countries, finds that changes in gender gaps in pay and hours played the largest role in accounting for changes in inequality across those countries, whereas female labour force participation had the least impact. However, Jäntti (1996) did not clearly identify which was the driver: "Which of these, hours or (relative) wages is more likely to account for

the changes is a question yet to be addressed." (Jäntti, 1996, p. 32).

Some studies do find that a lower gender pay gap decreases inequality (for the US, Blau and Kahn, 1996 and for the UK and US Blundell et al., 2018). Harkness (2010, 2013) provides evidence against this: by conducting counterfactuals closing solely the pay gap without altering women's employment rates, she finds that the equalization effects are relatively small, and, in some cases, inequality is increased.

The third key dimension of gender outcomes in the labour market is the gender gap in hours. This has been less studied in the context of household earnings inequality than the gaps in employment and pay (see Gronau, 1982; Jäntti, 1996; Gornick, 2004; Kuhn and Ravazzini, 2017 for exceptions) but it is considered critical by scholars of gender equality in the labour market (Landivar, 2015). Gronau (1982) suggests that equalizing the gap in hours would equalize the variance in earnings between men and women, but he does not disentangle this effect from the gap in pay (similarly to Jäntti, 1996). Gottschalk and Danziger (2005) suggest that the impact on inequality of changing the distribution of hours will depend on the source of the increase: if it is high-earners who increase their work hours, this will increase inequality; in contrast, an increase in working hours by the low earners may have a neutral or negative effect on inequality. A similar argument comes from Kuhn and Ravazzini (2017), who find that an increase in hours worked by women reduced the variance in earnings, thus decreasing earnings inequality in Switzerland.

In summary, the literature on the relationship between the three gender gaps and household earnings inequality presents both theoretical ambiguity and mixed results, with no study considering the combined and separate impacts of closing the gender gaps in employment, pay, and hours. In Section 3 we will outline the data and methods we employ to disentangle them, having first provided a brief overview of the policy context in which this research is set and our findings are to be seen.

2.3. The policy context

Policy in rich countries has long been concerned with women's position in the labour market, for the most part directed towards closing gender gaps in employment and pay rather than hours worked. Focusing first on employment, family policy plays a central role in efforts to

increase the employment rate for women. As reviewed in Ferragina (2020), research on family policy and women's employment outcomes in high-income countries has for the most part relied on national case studies and cross-country comparisons, with the latter nionizedng countries in terms of their family policy configuration – notably the typology advanced by Thévenon (2011) – as well as broader welfare regime. This research highlights that countries with generous support for working parents display the highest women's and maternal employment rates (see also Daly, 2020). Distinguishing the different elements of family policy, the impact of parental leave is contested: while short parental leaves are associated with positive effects on women's post-natal employability, the extent to which (or circumstances in which) longer leaves may be detrimental is contested (see for example Evertsson and Duvander, 2011, *versus* Keck and Saraceno, 2013). Most comparative and national studies suggest that public childcare services and subsidies generally boost women's employment outcomes,

with childcare coverage especially important for mothers with low education and income. Evidence on the effect of child income support in the form of child benefits and tax-based support is less developed with findings more country-specific; generous and unconditional child income support may be associated with lower maternal employment (*e.g.* Steiber & Haas, 2012) but in-work benefits targeted to low-earners have positive impacts on the employment of lone mothers (Albanesi, Olivetti, & Petrongolo, 2022). Looking beyond family policies, the impact of changes in labour market institutions has received less attention, though Dieckhoff et al. (2015) for example find that increasing union strength, as measured by collective bargaining coverage, has beneficial effects for women's (and men's) likelihood of being employed on a standard employment contract.

Closing the gender pay gap has long been a focus for policy across rich countries. Growing recognition that outlawing pay discrimination on the basis of gender represents only a first step has been reflected in a range of other policies, including making gender pay gaps much more visible and transparent both at national and company levels (OECD, 2015, 2020). More broadly, the impact of both family policies and labour market institutions on gender pay gaps is debated in the research literature. Mandel and Semyonov (2005) for example argued that the generous family policy model in Nordic countries restricted women's access to the most desirable managerial jobs and contributed to the occupational segregation of women's employment, feeding into an on-going debate about the influence of different welfare regimes and family policy typologies on the gender wage gap and women's career progression (Ferragina, 2020). Some evidence suggests that nionized companies and sectors of the economy, as well as countries with a high coverage of collective bargaining, may have a smaller gender pay gap (OECD, 2020); the OECD also notes the role that collective bargaining can play for women in non-standard (temporary and part-time) jobs in particular. Minimum wages have also been shown to play an important role in reducing the aggregate gender pay gap in various countries, reflecting the predominance of female employees in many low-paid sectors (Bargain, Doorley, & Van Kerm, 2018).

Finally, policy plays a much more modest role with respect to closing the gender gap in hours worked and indeed countries have varying stances on whether part-time employment for women (and especially mothers) is to be encouraged and supported *versus* converted where possible into full-time employment. Alongside family policies, labour market institutions and tax/transfer policies are directly relevant. In institutional contexts where regular contracts are highly protected, the deregulation of temporary work may have led to an increase in part-time work (Dieckhoff et al., 2015). Tax/transfer policies framed to encourage employment can also act as a disincentive - alongside childcare costs - for part-timers to increase their hours as they face high marginal tax/-benefit withdrawal rates, which has been an important focus in the labour economics literature (*e.g.* Brewer, Saez, & Shephard, 2010).

3. Data and methods

3.1. LIS data description, sample selection and variables

The Luxembourg Income Study is a cross-national dataset of harmonised micro-data on income, collected from about 50 countries and spanning five decades (LIS User Guide, 2019). LIS contains information on household and person-level income and earnings from many sources, including labour, capital, pensions, taxes and transfers. It also includes data on socio-demographics and labour market participation (LIS User Guide, 2019). LIS data has been widely used in research on the relationship between demographic dynamics and earnings inequality (Cancian & Schoeni, 1998; Harkness, 2010, 2013; Kollmeyer, 2013; Zagel & Breen, 2019) and it is particularly suited to our research questions, given the individual-level data it provides for many different countries. For the purposes of our comparative analysis, we restrict the sample to 22 developed OECD countries. These are Australia, Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Estonia, Spain, Finland, France, Greece, Ireland, Israel, Iceland, Italy, Lithuania, Luxembourg, Netherlands Slovakia, United Kingdom, and the United States. The rationale underpinning this choice is that it allows us to significantly extend the analysis geographically beyond what has been done by the comparative studies on the topic while retaining a considerable degree of similarity across the countries in the sample. This will allow us to engage in cross-country counterfactuals that will be less problematic than with a sample that included a more heterogeneous set of countries in terms, for instance, of economic development. Our analysis is also relatively synchronous: we rely on the 2018/9 wave of the LIS, or on the closest year if 2018/9 is not available. [1] We do not address within-country variation over time as it has been the focus of many papers. We follow common practice and restrict the analysis to the household 'reference person' and their spouse/partner (if any) in the household (Goñalons-Pons & Schwartz, 2017), including same-sex partnerships wherever present, and we focus on those aged 25–60 inclusive (Breen & Salazar, 2011; Zagel & Breen, 2019). We further drop from the sample those currently enrolled in education.

Our sample thus includes four types of respondents: partnered and single women, partnered and single men. Their earnings are equivalized by dividing individual earnings by the square root of the household family size. We therefore define household earnings as the sum of the equivalized earnings of the household head and spouse (if any).[2] We exclude the earnings of any adult children or others (*e.g.*, siblings of the reference person) in the household. This choice reflects a precise goal: to go beyond analyses that focus solely on couples (Cancian et al., 1993; Cancian & Schoeni, 1998; Cancian & Reed, 1999; Esping-Andersen, 2007) while retaining the clear focus on the household head/reference person and their partner (if any) (Goñalons-Pons & Schwartz, 2017). Breen and Salazar (2010) highlight the importance of extending the analysis beyond partnered individuals, which is crucial to capture the role of growing proportions of single-headed households (Martin, 2006; Albertini, 2008; McLanahan & Percheski, 2008) as well as the intertwined decisions of union formation, fertility, and labour supply (Uunk, Kalmijn, & Muffels, 2005; Ferragina, 2020). This selection is highly salient for the results: as noted by Cancian and Reed (1999), the finding by Karoly and Burtless (1995) that higher women's employment rate increases inequality may be a by-product of their sample selection strategy, where they impute a wife with zero earnings in place of a missing partner for a man.

For each individual, we use the following variables from the Luxembourg Income Study: labour earnings (including from self-

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[1] Countries for which data is not from 2018/9 are: Belgium (2017), Czech Republic (2016), Estonia (2016), Spain (2016), Finland (2016), Iceland (2010), Italy (2016), United States (2020).

[2] Following Breen and Salazar (2012) and many other studies.

employment), marital status (combining marriage, any type of civil union, and cohabitation in the same value), relationship to household reference person (self or spouse/partner), self-reported sex, and number of hours worked. We rely on labour earnings (LIS variable "*pilabour*") as the key measure of earnings in our analysis; this includes "cash payments and services received from dependent employment, as well as profits/losses and value of goods from self-employment, including own consumption." (LIS User Guide, 2019, p.10). In using labour earnings we are following the literature (Goñalons-Pons & Schwartz, 2017), as it most directly reflects earnings coming from labour force participation, as opposed to other sources, such as capital earnings. In the countries we use, *pilabour* is expressed in gross terms, *i.e.* before tax. We transform all earnings to 2017 US$ in terms of Purchasing Power Parity (PPP), obtained by dividing the earnings in the nominal currency by the PPPs provided by the Luxembourg Income Study. Furthermore, we follow common practice in the literature in setting negative earnings (likely from self-employment) to 0 and excluding all earnings above the 99.5th percentile of the within-country distribution.

As regards the proportions of women and men that are employed and not employed, we rely on the LIS variable *emp*. The four proportions (working women, non-working women, working men, non-working men) add up to 1. For work hours we employ *hourstot*, which is expressed as the number of hours worked in a typical week. [3] We then compute the country average of hours worked for both men and women. Hourly earnings (*i.e.*, labour income) is computed by dividing the annual earnings of each individual by 52 weeks, and then by the number of weekly worked hours. [4]

3.2. Analytic methods and strategy

We use the Gini coefficient to measure earnings inequality, computed through the *ineqdec0* STATA package by Jenkins (2021 1999). To discover how the three mechanisms we discussed affect this inequality, we implement a set of counterfactuals that change (a) the proportion of women who are working; (b) the average hours of work of women who are working; (c) the average hourly earnings of women who are working. We reweight our data to generate counterfactual datasets reflecting these changes, using which we can compute counterfactual Gini values. A simple approach along these lines to narrowing the gender gap in participation, for example, would involve generating a dataset in which, compared with the actual data, we gave more weight to observations of women who worked outside the home and less weight to those who did not. The participation rate of women would be higher in the weighted data. Then we could compute the Gini coefficient, or any other measure, from the weighted data and compare it with the Gini coefficient from the original data.

The assumption underlying this method is that, were more women to work outside the home, they would have the same distribution of earnings and the same distribution of partners and partner's earnings as women who were, in fact, working. It is unlikely that this would be true if women's participation rates were really to increase. To address this we employ conditional reweighting, whereby we weight observations of women differentially depending on observed characteristics, such as their age and education. The assumption in this case is that, were more women to work outside the home, they would have the same distribution of earnings and the same distribution of partners and partner's earnings as women who were, in fact, working and had the same level of

education and were of the same age. This assumption seems less stringent, increasingly so as the set of conditioning variables grows richer.

In our analyses we condition on three variables: age (in categories 20–29, 30–39, 40–49, 50–54, 55–60), education (low, medium, and high, using the LIS variable "*educ*"), and partnership status, distinguishing between whether the woman was the single head of her household or headed a household alongside her partner. The choice of these variables is dictated by a desire to capture major relevant dimensions, by the limits of what is available in the LIS data, and by sample sizes. Since our conditioning is non-parametric, we use a weight for each of the 30 combinations of age group, education, and partnership status and these must be estimated from the data, as described below. Small numbers in a combination could lead to unstable estimates.

To give an example: to reduce the gap in participation between women and men of the same age, education and partnership status we weight observations of women working outside the home by $\frac{p_{jkl}}{q_{jkl}}$ where p_{jkl} is the proportion of men working outside the home who are in age group j, educational level k, and partnership status l, and q_{jkl} is the equivalent for women. We weight observations of women who are not working outside the home by $\frac{1-p_{jkl}}{1-q_{jkl}}$. To reduce the gap by, say, 10%, we calculate

$$p_{jkl}^* = q_{jkl} + (p_{jkl} - q_{jkl}) \Big/ 10$$

and use it in the weights in place of p_{jkl}.

Appendix A1 describes our method in detail and shows how we reweight to change not only the gender gap in participation but also the gaps in pay and hours worked. We also explain its relationship to the widely used reweighting method proposed by DiNardo, Fortin, and Lemieux (1996), and we present an algorithm that implements our method.

Unlike counterfactual analyses that change the value of a parameter in an inequality measure (such as changing the relative sizes of groups in a measure decomposed into between- and within-group inequality, as in Breen and Andersen (2012) and many other studies) our counterfactuals are changing the whole distribution of the data. This means that we are not invoking an "all else remaining constant" assumption: on the contrary, reweighting the data to reduce gender gaps can have consequences for other contributions to inequality, notably the correlation between the earnings of men and women in couple households. [5]

Following this approach, we employ a three-fold strategy to explore how women's labour market outcomes affect inequality, and through which mechanisms. First, we examine the relationship at the surface level: what would, hypothetically, happen to inequality if women were to have the same employment and earnings as men? This can be achieved through what we term full equality counterfactuals: we assess how inequality would change in each country by simultaneously setting the proportion of women working equal to the proportion of men who are working, and setting their average earnings, and their earnings variance to the level of men's. We do this conditionally: that is, we set these parameters for single women household heads to match those of single male household heads and we likewise match the parameters for women in couples to those for men in couples, based also on characteristics such as education and age.

By matching these three parameters at the same time, we may have an empirical answer to the ambiguity pointed out by Mincer (1974) and Gronau (1982): the rise in women's employment and earnings may decrease or increase inequality, depending on whether the mean effect dominates the variance effect. We express the impact on inequality in percentage terms against the baseline: for example, for the US, a

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[3] Denmark, Norway, Poland, and Sweden are excluded from our study because their LIS data lacks the hours variable.

[4] We do not use the LIS variable "Weeks" because missing values would considerably reduce the sample size. The level of hourly pay is not significantly affected, with the grand mean for hourly pay using 52 weeks being 8.85 with 12.17 SD, while the grand mean from using the weeks variable is 8.83, with 12.94 SD.

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[5] For example, in Italy the correlation between partners' earnings (including those with zero earnings) is 0.14 but under the counterfactual that sets women's employment equal to men's it is 0.21.

decrease from 0.51 to 0.47 in the Gini coefficient corresponds to about –7.9% of the baseline level. Secondly, we turn to the identification of the mechanisms. Following the counterfactual approaches set out above, we can assess how inequality would change in each country by separately closing the gender gaps in employment, hours, and pay one at a time, without altering the other two. This strategy will show which of the three gaps drives the changes in inequality.

Counterfactuals of this kind are widely used to study the relationship between demographic dynamics and earnings inequality, starting from the approach developed by Lerman and Yitzhaki (1985), but they are much less commonly used in comparative studies. They are not understood as predictions or forecasts of what would be expected to happen if the hypothesised changes were made in reality (even supposing these were possible). They are instead widely used to determine whether and how strongly a given change might potentially affect inequality, and we use them for that purpose too, but our primary use of full equality counterfactuals is to assess the relative importance of the three mechanisms – employment, hours, and hourly earnings – that we consider.

The usefulness of counterfactuals as a guide to what might happen in reality depends on the plausibility of the size of the hypothetical changes considered. Closing some or all of the gender gaps completely is something that would be difficult or impossible to achieve in the short or medium term. For this reason, we engage in further counterfactuals. Instead of closing the gender gaps entirely, we simulate relatively feasible short-term scenarios: we counterfactually reduce the gender gap by 10%, 20%, 33%, 50%, 75%, and 100%, and assess what happens to inequality. So, the 10% reduction means 10% of the baseline gap, and not ten percentage points, in order to make the change equal in relative terms across different countries. Assuming such a relatively small change in each country seems to us to be even more plausible and provides a better demonstration of how such changes might influence inequality in the real world. Whereas full gender equality in the labour market is not observed in any of its dimensions in any of the countries in our dataset, narrowing gender gaps by 10% generates counterfactual gender employment, wage, and hours gaps that are found in our dataset.[6] For example, a 10% reduction in the gender employment gap in the US gives a counterfactual gender employment gap that is roughly the same as that observed in Austria. The baseline and counterfactual levels of inequality by country are reported in Appendix Table A1.

4. Results

Descriptive data for household earnings inequality and gender gaps in employment, hours and pay are shown in Appendix Figures A1–A4. The majority of countries in our sample have a Gini between 0.4 and 0.5, with notably higher values in Greece (0.56) and Italy (0.53).[7] Gender gaps in employment are largest in the Czech Republic, Spain, Greece, Italy and the US, with small gaps in Estonia, Finland, Iceland, and Lithuania. Gaps in hours worked are large in Austria, Australia, Switzerland, Germany, Israel, the Netherlands and the UK: these are all countries with large shares of women working part-time. Gender differences in pay are particularly large in the Czech Republic and also large in Estonia, Iceland, and the Netherlands.

Turning to the results of our analyses, we focus first on the full equality counterfactuals: how would inequality in earnings between households hypothetically change if single and partnered women were to have the same employment levels, mean earnings, and earnings variance as single and partnered men respectively? Fig. 1 reports these

counterfactual results in percentage terms for each country, relative to its actual value of the Gini coefficient. We report the results for all counterfactuals in Appendix Table A2.

Notes: Counterfactual changes in inequality (Gini Coefficient), obtained by counterfactually closing the gender gaps in employment, hours, and pay simultaneously. Changes expressed in percentage points relatively to the country Baseline. Gini Coefficient measuring inequality in labour and self-employment gross earnings (*pilabour* in Luxembourg Income Study), transformed in 2017 US\$ in terms of Purchasing Power Parity (PPP). Earnings are top-coded (Top 0.5% is excluded). Earnings are equivalized by the square root of household family size. Sample: household head and partner (if present), aged 25–60, excludes students. *Data source*: Luxembourg Income Study, 2018/2019 wave.

On average, full equality in earnings and employment levels hypothetically reduce household earnings inequality by 9.5% across the selected countries, ranging from 17% in the Czech Republic to 4% in Lithuania. The counterfactual decrease in inequality is substantial, being over 10% in 11 out of the 22 countries in the sample, and over 15% in the Czech Republic, Greece, and Italy. These initial results clearly support the argument that increasing women's employment and earnings would reduce inequality. If the impact of full equality is consistently to decrease overall inequality, how does this come about? Is it through closing the gender gap in employment, in work hours, or in hourly pay that makes the major difference? Given the linearly additive structure of our counterfactuals, we can almost perfectly decompose the Full Equality counterfactuals into the three components, and assess their relative importance in each country.[8] We report the results in Fig. 2, and the results by country for each gap in Appendix Figures A5-A7.

Notes: Counterfactual changes in inequality (Gini Coefficient), obtained by counterfactually closing the gender gaps in employment, hours, and pay separately for each country, and stacked for comparison with full equality counterfactuals in Fig. 1. Changes expressed in percentage points relatively to the country Baseline. Gini Coefficient measuring inequality in labour and self-employment gross earnings (*pilabour* in Luxembourg Income Study), transformed in 2017 US\$ in terms of Purchasing Power Parity (PPP). Earnings are top-coded (Top 0.5% is excluded). Earnings are equivalized by the square root of household family size. Sample: household head and partner (if present), aged 25–60, excludes students. *Data source*: Luxembourg Income Study, 2018/2019 wave.

At a first glance, we can see how the employment counterfactuals are typically the largest component of the full equality counterfactuals across countries, with some exceptions: Germany, where the hours counterfactual change is slightly larger than the employment's, and Estonia and Lithuania, where the pay counterfactual inequality change is slightly larger than the employment counterpart. We now address each component in depth.

How would overall inequality in earnings between households hypothetically change if women were to have the same employment levels as men with the same marital status, level of education, and age range in the same country, while keeping hours worked and hourly earnings constant? Figure A5 reports these counterfactual results in percentage terms for each country, relative to its actual value of the Gini coefficient. Closing the gender employment gap has a consistently negative effect, and is substantial in most countries. The average reduction in the Gini coefficient is 6.5%, ranging from 14% in Italy to 2% in Lithuania. Inequality declines by more than 7% in 11 countries (out of 22) and by

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[6] The exceptions are found among those countries where the gaps are smallest and further reductions will, of necessity, take their counterfactual values outside the range of observed values.

[7] The Gini here measures inequality in household, pre-tax earnings: it will therefore differ from the most commonly reported Gini coefficients for disposable household income.

[8] In practice, the sum of the three individual mechanism counterfactuals does not always equal the full equality counterfactual, due to small variations in the sample size. We report the full equality counterfactuals and the sum of the three mechanism counterfactuals in Appendix Table A4, showing how the average discrepancy is 0.37 p.p., ranging from − 0.55 p.p. (GR) to 1.43 p.p. (IS). These discrepancies do not hamper the goal of relying on the individual counterfactuals to identify the strongest contributors to the change in inequality.
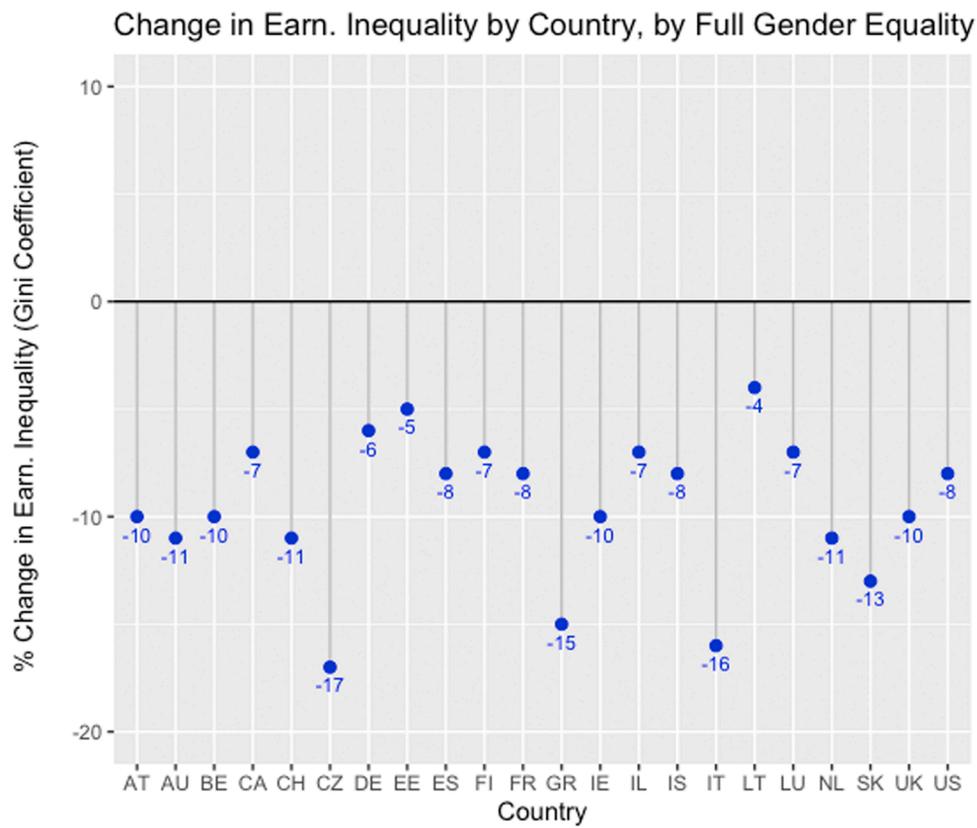
Fig. 1. Impact on Inequality by Country, Full Gender Equality Counterfactuals.
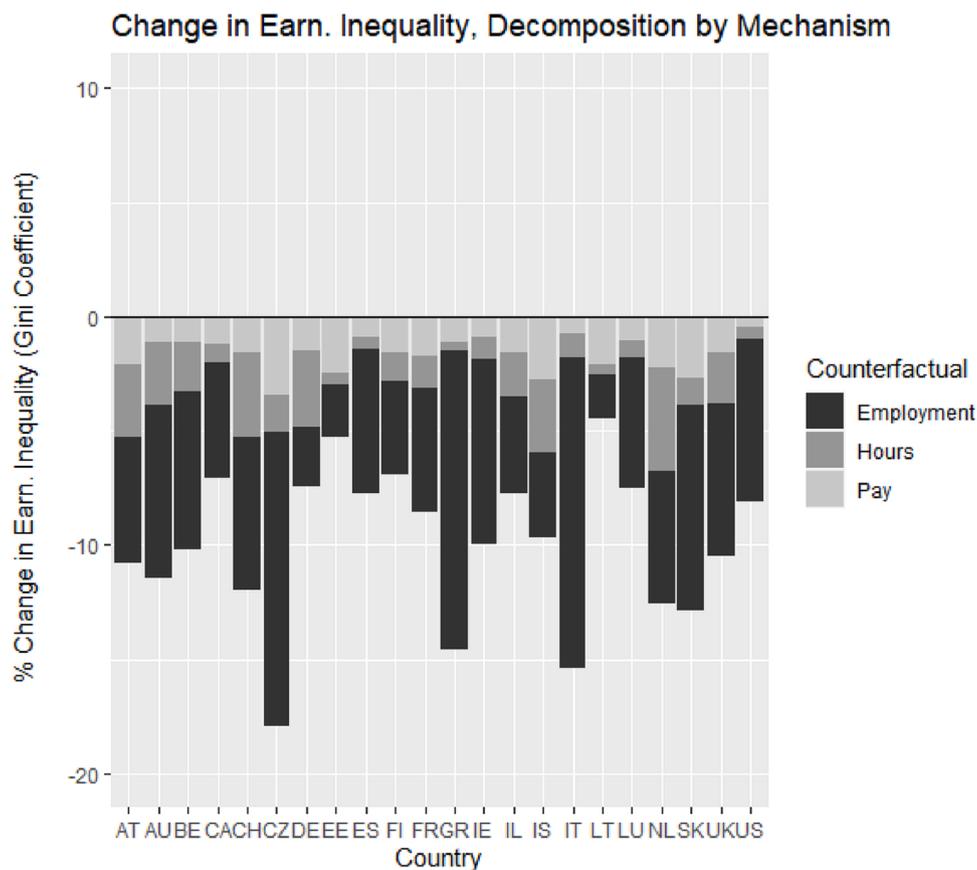
Fig. 2. Impact on Inequality by Country, Decomposing Full Gender Equality Counterfactuals by Mechanism.

around twice that in the Czech Republic, Greece, and Italy (three of the countries with the largest gender employment gap).

Secondly, how would inequality change if women were to work the same hours as men with the same socio-demographic characteristics in the same country? We show the detailed results in Figure A6. The average change is around − 1.8%, ranging from − 5% (Netherlands) to 0% (Lithuania, Luxembourg, United States). While the results are consistently non-positive, inequality between households is not, on average, strongly affected by closing the gender gap in weekly hours worked.

Third, how would inequality hypothetically change if women received the same hourly pay as co-national men with the same characteristics? As shown in Figure A7, the counterfactual impact is, on average, − 1.6%, bounded between − 6% (Czech Republic, Iceland, Slovakia) and 0% (United States). While there are no counterfactual increases in inequality, the impact of closing the gender gap in hourly pay is small.

The counterfactual results in Fig. 2 clearly identify closing the gender employment gap as the key mechanism for the reduction in inequality, while changing the other two gaps independently does not substantially affect inequality in most countries, except for Germany, Estonia, and Lithuania, as can also be assessed by Appendix Figure A8, which reports the relative strength of the individual counterfactual changes over the full equality counterfactual changes, by country. With these exceptions, these results further emphasize the centrality of changing the gender employment gap for the overall reduction in inequality.

Further analyses show that increasing women's labour force participation reduces inequality between households because it reduces earnings inequality among women and this, in turn, is because, across all countries, it increases the mean earnings of women and decreases their variance. To see why this reduces inequality, consider the coefficient of variation measuring inequality in women's earnings. This is equal to the standard deviation of earnings divided by their mean and so decreasing the standard deviation and increasing the mean will cause it to decline. We find an average reduction of 17% in the coefficient of variation of women's earnings, but with particularly large reductions in Italy (39%), Greece (38%), the Czech Republic (26%), Ireland (21%), and Spain (19%). At the same time, however, increasing women's employment also increases the correlation of earnings between partners, tending to increase inequality between households. But nowhere is this effect large enough to offset the equalizing effects of changes in the mean and variance of women's earnings.

We now further investigate the employment counterfactual. We assess how inequality would hypothetically change in each country by closing the gender employment gaps for single and for partnered women separately, and by closing the gender employment gap gradually, rather than fully. Finally, we assess how the national changes in inequality driven by closing the employment gap are shaped by the different gender gaps.

Notes: Counterfactual changes in inequality (Gini Coefficient), obtained by counterfactually closing the gender gaps in employment only for women in couples and only for single women, separately**.** Changes are stacked for comparison with counterfactuals in Fig. 2. Changes expressed in percentage points relatively to the country Baseline. Gini Coefficient measuring inequality in labour and self-employment gross earnings (*pilabour* in Luxembourg Income Study), transformed in 2017 US$ in terms of Purchasing Power Parity (PPP). Earnings are top-coded (Top 0.5% is excluded). Earnings are equivalized by the square root of household family size. Sample: household head and partner (if present), aged 25–60, excludes students. *Data source*: Luxembourg Income Study, 2018/2019 wave.

As regards the role of marital status, we depict in Fig. 3 the counterfactual changes in inequality by country, stacking the impact of closing the gender employment gaps for singles and couples separately.
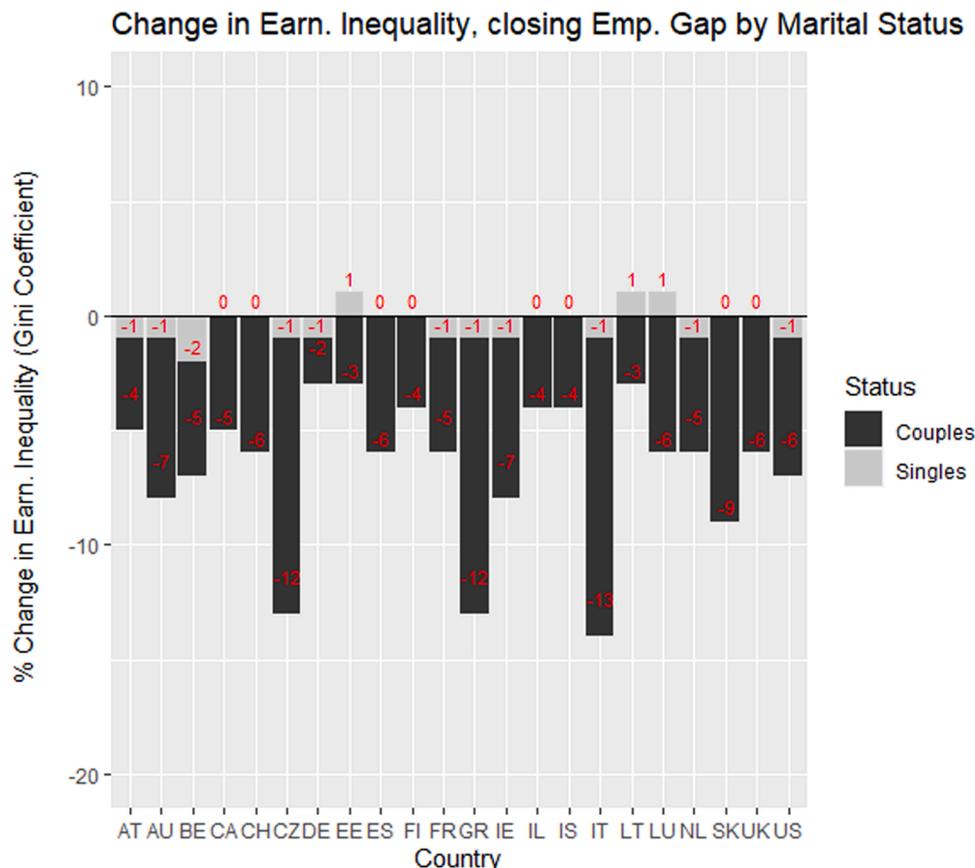
Fig. 3. Impact on Inequality by Country, by counterfactually closing the Gender Employment Gap for Singles and Couples separately.

The sum of the changes for each country is identical to the changes reported in Fig. 1 (*e.g.*, Italy, Singles: −1%, Couples: −13%, Overall: −14%). Restricting the employment counterfactual to singles, the average impact on inequality is − 0.05%, ranging from − 2% (Belgium) to + 1% in Estonia, Lithuania, and Luxembourg; overall the impact is modest. In contrast, counterfactually closing employment gaps among partnered women has a much greater effect (−6%), ranging from − 13% (Italy) to − 2% (Germany). The only country in which both counterfactuals are similar is again Germany (Singles: −1%, Couples: −2%). The smaller impact for changing gaps among singles is not surprising, given that this gap is much smaller, in all countries, than the gap among partnered men and women. Closing the gender gap for women in couples provides the strongest contribution to the overall hypothetical decrease in inequality depicted in Fig. 2.

Notes: Counterfactual changes in inequality (Gini Coefficient), obtained by counterfactually closing the gender gaps in employment fully (100%) and gradually**.** Changes expressed in percentage points relatively to the country Baseline. Gini Coefficient measuring inequality in labour and self-employment gross earnings (*pilabour* in Luxembourg Income Study), transformed in 2017 US$ in terms of Purchasing Power Parity (PPP). Earnings are top-coded (Top 0.5% is excluded). Earnings are equivalized by the square root of household family size. Sample: household head and partner (if present), aged 25–60, excludes students. *Data source*: Luxembourg Income Study, 2018/2019 wave.

In the counterfactuals presented so far, we have reported the impact on inequality between households of closing the three gender gaps completely. While this is useful to assess the relative importance of each of the three gaps, for many countries it is not a feasible real-world goal in the short to medium term. Thus, in Fig. 4, we present the results of counterfactually reducing the gender employment gap not only by 100% as we have done before, but also by 10%, 20%, 33%, 50%, and 75%. The results refer to the average cross-country reduction in household earnings inequality.

Fig. 4 shows that reducing the gender gap in employment has systematically negative average effects: a reduction of 10% in the gap is associated with a 0.6% average decrease in earnings inequality. Afterwards, the effect is almost perfectly linear: each additional 10% reduction in the gender employment gap decreases earnings inequality by 0.6% on average, reaching − 6.5% for the complete reduction. These results suggest that reducing the employment gap, even if not eliminating it completely, can have a substantial impact in reducing overall inequality. We report the results of these gradual changes for each country in Appendix Table A2.

Lastly, we turn to the cross-national variation in the counterfactual change in inequality driven by closing the gender employment gap. In Fig. 5, we depict the marginal effects at the means with 95% confidence intervals, computed after linearly regressing the employment counterfactual inequality change in each country on the three gender gaps (results in Appendix Table A3). Fig. 5 shows that the larger the existing gender employment gap, the stronger the equality gains from hypothetically closing that gap. Therefore, in countries such as Italy and Greece, reducing the gender employment gap will, counterfactually, have a large impact on inequality between households, whereas in Estonia, Finland, Iceland and Lithuania, it will have a rather minor impact. But in 20 of our 22 countries, closing the employment gap brings about the largest reduction in inequality (the exceptions are Estonia and Lithuania where closing the pay gap has a marginally greater impact). Thus, even where closing the employment gap has a modest effect, it is greater than what would be brought about through reducing the gender gaps in hours or pay.

From these results, it is clear that women's employment levels are central to the relationship between gender equality in the labour market and overall earnings inequality between households, while gender gaps in working hours and hourly pay play a minor role. Furthermore, we find that inequality is much more sensitive to reductions in the employment gaps among partnered, rather than single, women. Together with the results in Figs. 1–4, the results in Fig. 5 support our argument that changing the proportion of women (especially partnered women) who are working outside the home is a potentially important mechanism for reducing earnings inequality.
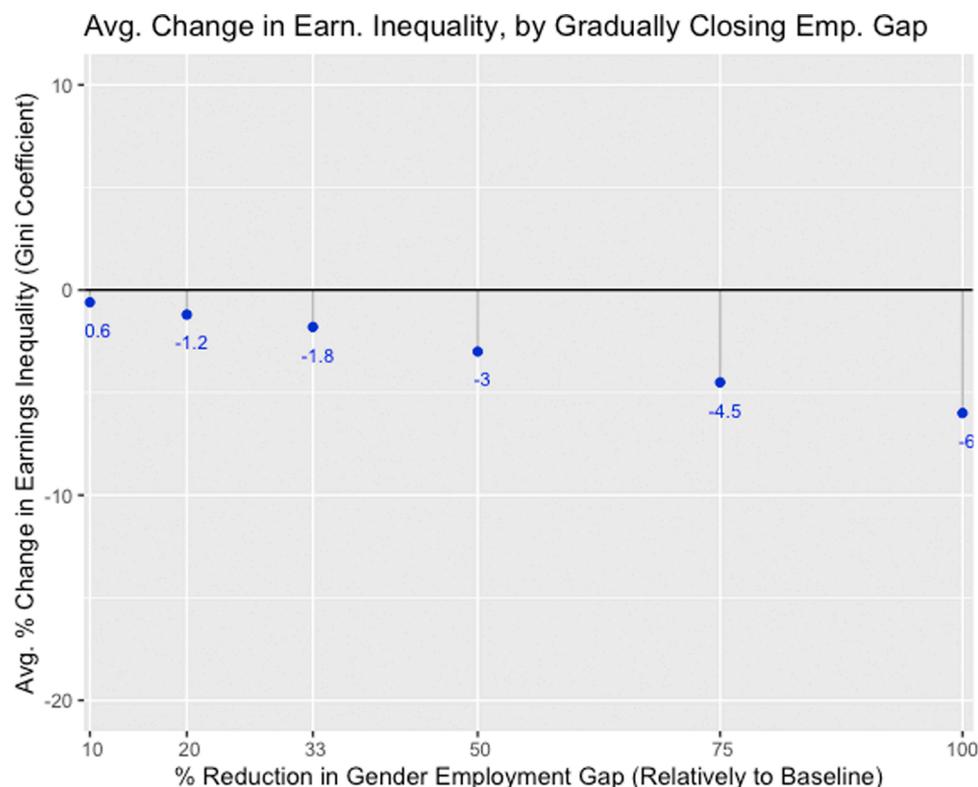
Fig. 4. Average Impact on Inequality across Countries, by counterfactually gradually reducing the Gender Employment Gap.
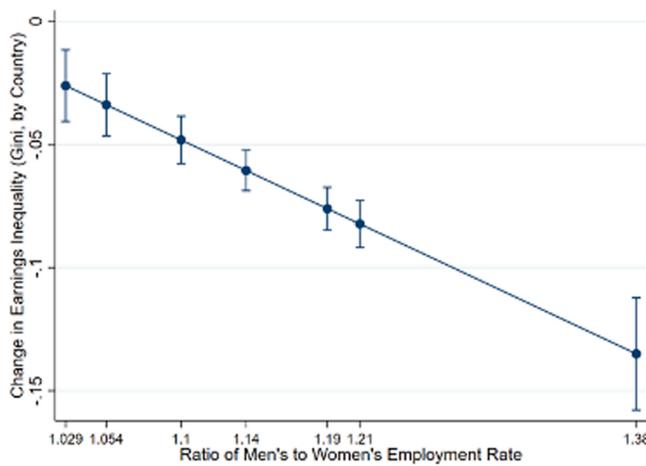
Fig. 5. Sensitivity of Impact on Inequality (counterfactually closing Gender Employment Gap), by national Ratios of Men's to Women's Employment Rates. *Notes*: Marginal Effects at the Means with 95% Confidence Intervals, computed after Linear Regression in Appendix Table A3. **Dependent variable**: Change in Earnings Inequality (Gini Coefficient) relatively to country Baseline, by closing completely the gender employment gap (Emp. 100% in previous table). Regressed on national ratios of Ratio of Men's to Women's Employment Rate, Weekly Hours, and Hourly Pay. Gini Coefficient measuring inequality in labour and self-employment gross earnings (*pilabour* in Luxembourg Income Study), transformed in 2017 US$ in terms of Purchasing Power Parity (PPP). Earnings are top-coded (Top 0.5% is excluded). Earnings are equivalized by the square root of household family size. Sample: household head and partner (if present), aged 25–60, excludes students. *Data source*: Luxembourg Income Study, 2018/2019 wave.

5. Discussion and conclusion

How does gender inequality in the labour market affect overall earnings inequality among households? Recent research has leaned heavily towards the conclusion that greater gender equality is associated with lower overall earnings inequality, but has for the most part either omitted certain relevant dimensions of gender inequality from consideration or conflated one or more mechanisms, as well as covering a relatively narrow range of countries. In this paper we have used a reweighting approach that allows us to gauge the hypothetical impact, for overall earnings inequality among households, of full equality in earnings and employment between men and women, and to almost perfectly decompose it into changes in the three mechanisms that underlie gender inequality in earnings – gender differences in employment, in hours worked, and in hourly earnings. No previous study has been able to do this in a systematic way or to show how the effects of closing these gaps vary depending on the circumstances of women compared with men in the labour market. This counterfactual analysis employed conditional reweighting, whereby observed characteristics of women such as their age, education, and partnership status are taken into account in producing estimates of what they might earn if working or working more, lending greater credibility to the results.

We have applied these methods to data from 22 OECD countries in the second decade of the 21st century. We find that full equality between men and women in their earnings (reflecting equality in employment, hours and hourly earnings) would, hypothetically, reduce earnings inequality between households by an average of 9.5% in the countries in our analyses. This is in line with the findings of most previous studies (Cancian & Reed, 1999; Reed & Cancian, 2001; Gottschalk & Danziger, 2005; Harkness, 2010; Sudo, 2017).

If greater gender equality in the labour market reduces overall earnings inequality, our additional counterfactual results clearly show that the dominant mechanism is eliminating the gender employment gap (which would produce a −6.5% average change in overall

inequality), echoing findings from a number of other studies (Harkness, 2010, 2013), and that the impacts of eliminating the gender gap in pay and the gender gap in hours worked are more modest (producing changes of around −1.7% on average). Yet, cross-national differences matter: our findings support the strand of research that highlights the centrality of women's employment rates as an equalizing force (Kollmeyer, 2013; Grotti & Scherer, 2016) but its magnitude varies across countries based on women's employment levels (Nieuwenhuis et al., 2017). The strongest gains are concentrated where employment gaps are larger, whereas in countries where those are smallest, such as Estonia and Lithuania (around 3%), equalizing pay levels has the largest role (Figs. 2, 5, A8). In Germany (and to a lesser extent in Austria, Switzerland, and the Netherlands), equalizing the gap in hours has a powerful equalizing role, possibly due to the 'one-and-half breadwinner' model (Daly, 2011), which sees a disproportionally high prevalence of part-time work among women. As further contributions, we also show that reducing the employment gap among partnered, rather than single, women is by far the main driver of the employment effect. Counterfactuals that involve reducing rather than eliminating the gender employment gap show that, on average, even small reductions can decrease earnings inequality: reducing the gender employment gap in each country by 10% would counterfactually change inequality by about 0.6% on average.

To further advance these analyses, the reweighting method may be further developed in two ways. First, the reweighting approach may be adjusted to disentangle the three mechanisms in the same country over time or across different countries at the same time, which we do not address in this paper. Secondly, the conditional reweighting that we carry out could be extended to include more conditioning variables: this would not be feasible using the LIS data and may require more detailed data, perhaps specific to particular countries of interest.

In conclusion, achieving greater gender equality in employment rates, particularly among partnered women, emerges as the key mechanism to mitigate earnings inequality between households, while the gender gaps in pay and hours, each taken in isolation, play minor roles. Closing the pay and hours gaps would be beneficial for gender equality *per se* but increasing women's employment rates, and particularly partnered women's employment rates, would simultaneously contribute to improving gender equality and reducing overall earnings inequality among households. This serves to highlight the salience of policies directed towards increasing and supporting women's employment, across the range from family policies, childcare provision and cost, labour market institutions and policies, and tax/benefit systems. Finally, it is important to emphasise in this context that our focus – like most research and policy debate – has been on effects on inequality in terms of earnings, without seeking to capture the implications for unpaid work and for the broader consequences of women being in paid employment as much as men. The failure to recognise and value women's unpaid work is widely seen as a key mechanism underpinning broader gender inequality (*e.g.* Folbre, 2008), as reflected in underinvestment by the state in the care economy (De Henau et al., 2017). Redressing that balance in terms of support for the care economy is an essential plank in a strategy aimed at promoting women's paid employment.

Declaration of Competing Interest

None.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.rssm.2023.100823.

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