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**Are increasing earnings associations between partners of concern for inequality?
A comparative study of 21 countries**

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Abstract:

Partners increasingly resemble each other in terms of earnings across Western countries. These increases in earnings similarity are often considered to be drivers behind growing income inequality between households. We argue that increases in earnings similarity do not necessarily lead to augmented inequality between households. Their overall effect depends on whether and how the processes that increase earnings similarity affect inequality through other pathways. Using data from the Luxembourg Income Study on 21 countries we decompose changes over time in earnings inequality. We show that even though the correlation in earnings between partners increased in most countries, this only amplified inequality on some occasions. In several countries, increases in the earnings correlation are driven by general changes in employment rates. Given that these increases in employment equalized earnings across households through other pathways, the inherently connected increases in the earnings correlation are of less concern from an inequality perspective. In other countries, where increases in earnings similarity are produced by augmented similarity in earnings among dual-breadwinner couples or by selective changes in employment, increases in earnings similarity are of more concern for inequality between households.

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The idea that earnings similarity between partners contributes to economic inequality between households is intuitive. A society where the poor form unions with the rich will have lower inequality between households than a society where the rich partner with their likes. The increasing correlations between partners' earnings observed in several OECD countries have therefore been met with concern (Esping-Andersen 2009). But, did increasing earnings similarity augment income inequality between households? Conclusions of studies estimating the impact of earnings similarity on inequality between households appear to vary widely. For instance, studies on the United States have found negligible (Grotti and Scherer 2016; Hryshko et al 2017; Larrimore 2014 in the 1990s and 2000s), small (Cancian and Reed 1999; Chen, Förster and Llana-Nozal 2013; Harmenberg 2014), or moderate impacts (Greenwood et al. 2014; Larrimore 2014 in the 1980s; Nieuwenhuis, Van der Kolk and Need 2017; Schwartz 2010) of partner similarity on inequality between households. We argue that this variation in conclusions is due to differences in the way existing studies consider the processes that lead to increases in earnings correlations. Earnings correlations can go up due to a variety of processes, including changes in partner selection and the division of labor (Gonalons-Pons and Schwartz 2017), and not all of these processes increase inequality. For instance, increasing female employment rates drive up earnings correlations, but, overall, reduce inequality between households by lowering inequality in earnings among women (Bouchet-Valat 2017; Chen, Förster and Llana-Nozal 2013; Nieuwenhuis, Van der Kolk and Need 2017). Whether studies conclude that increasing earnings similarity had a positive impact on income inequality therefore depends to a large extent on whether they took into account the more general impact that the processes driving changes in earnings correlations had on inequality.

Empirically, we support our argument by analyzing data from the Luxembourg Income Study on 21 countries. We use log-linear models to decompose the contribution of changes in earnings similarity to inequality between couples. Even though the correlation in earnings between partners increased in most countries, this only amplified inequality between couples on some occasions. In several countries, increases in earnings similarity are primarily produced by increases in employment rates which reduce inequality between couples through other pathways. This "package deal" of increasing employment and augmented earnings similarity is therefore to be welcomed from an inequality perspective. In countries where increases in earnings similarity are produced by augmented similarity in earnings among dual-breadwinner couples or by selective changes in employment, increases in earnings similarity are of more concern for inequality between households.

Increasing Earnings Similarity between Partners

The question of how partners' earnings similarity between partners relates to income inequality between households is rooted in two different but connected bodies of literature. The first has focused on the changing role of women in the labor market, the increasing importance of women's earnings for household income and the resulting increased similarity in earnings among partners. The second body of research regards partner selection, and how changes in selection based on socioeconomic characteristics might have impacted inequality between households.

The first body of research relies on the argument that increases in women's labor market participation could have consequences for levels of economic inequality between households (Esping-Andersen 2007; 2009). Socioeconomically advantaged households can now consist of two high-earning adults, whereas disadvantaged households combine the presence of one or two low-earning adults with a remaining risk of having no earners at all in the household. In other

words, the increasing similarity in earnings between men and women could lead to a greater concentration of economic resources within households. The correlation between women's employment and their partner's employment has indeed reversed from negative to positive in some contexts (Reed and Cancian 2012; Schwartz 2010), and the correlation in partners' earnings has augmented across OECD countries with a few exceptions (Nieuwenhuis, Van der Kolk and Need 2017).

However, increases in female employment rates also reduce inequality among women, and a sole focus on changes in earnings similarity between partners might oversee these concomitant effects. A large body of studies has aimed to quantify the relative importance of both factors for earnings inequality between households. These studies show that the equalizing effects of female employment on earnings among women dominate over the inequality increasing effects of augmented earnings similarity (Bouchet-Valat, 2017; Callan et al. 1998; Chen, Förster and Llena-Nozal 2013; Cancian and Reed 1998, 1999; Cancian and Schoeni 1998; Del Boca and Pasqua 2003; Grotti and Scherer 2016; Mastekaasa and Birkelund 2011; Nieuwenhuis, Van der Kolk and Need 2017; one exception is Australia between 1982 and 1997 according to Austen and Redmond 2013).

It is useful to distinguish here between general changes in employment rates (i.e. the percentage of women and men employed overall) and changes in employment that are unequally distributed across socioeconomic groups. The extent to which increases in female employment rates equalize income between households will depend on the characteristics of those who enter the labor market (Chen et al. 2013; Schwartz 2010). Variation in the socioeconomic profile of women who participate in the labor market makes countries differ in the extent to which changes in female employment reduce inequality. For instance, policies that support the sharing of employment and care tasks within couples, such as public childcare and parental leaves for fathers, are related to increases in women's employment earnings that are less limited to the socioeconomically advantaged as compared to contexts with more market-oriented or traditional family policies (Korpi et al. 2013).

The second body of literature on earnings similarity within couples has focused on partner selection. If individuals increasingly select each other based on characteristics that determine earnings and income, earnings similarity between partners and subsequently inequality between households will increase (Blossfeld 2009; Schwartz 2013). Several theoretical arguments have been given why earnings potential could have become more important in partner selection over time. First, the expansion of education has prolonged educational careers, which could have increased educational homogamy by influencing social networks (Blossfeld 2009; Lewis & Oppenheimer 1998). However, recent research has shown that even if meeting in school has become more common, more frequent repartnering at later ages has cancelled out most of this trend (Rosenfeld, 2012; Bouchet-Valat & Grobon 2019). A second reason why earnings potential can have become more important in partner selection is because two sources of earnings in a household are increasingly needed to attain economic security (Oppenheimer 1997). This could have increased the importance of economic considerations in partner search (Schwartz 2010), especially for men. However, it is not so clear whether educational and socioeconomic homogamy have increased as uniformly as is often stated. Recent studies indicate that educational homogamy has decreased in several European countries (De Hauw et al. 2017). In addition, most studies that have attempted to quantify the importance of partner selection for income inequality have found very little impact of changes in educational homogamy on income inequality between households (Breen and Salazar 2011; Breen and Andersen 2012). This limited impact arises partly because changes in educational homogamy have been relatively minor, and

partly because most inequality in income between households derives from inequalities within rather than between educational groups (Boertien & Permanyer 2019). Hence, the conclusion that increasing earnings similarity accentuates inequality between households still lacks clear support.

Earnings similarity and inequality: Three different approaches

In this section, we give an overview of existing empirical research that has aimed to estimate the impact of earnings similarity on income inequality between households. A major division line in terms of motivation and logic can be drawn between studies that focus on how much earnings associations contribute to inequality at a given point in time and studies that ask the question of whether changes in this association over time have contributed to changes in inequality (see Cancian and Reed 1998, 1999; and Gonalons-Pons 2017 for a similar argument regarding studies on the impact of female employment).

The cross-sectional contribution of earnings association to inequality

The first category of studies simulates how high income inequality would be if individuals were to partner at random instead of as observed. Most of these studies found weak disequalizing effects (Greenwood et al. 2014;¹ Harmenberg, 2014; Hryshko, Juhn and McCue 2017; Kuhn and Ravazzini 2017; Pestel 2017 for West-Germany), though in some cases a somewhat larger effect was found (Frémeaux and Lefranc 2020; Pestel 2017 for East-Germany). How can changes in the earnings association over time have contributed to inequality if this association has little impact on inequality to begin with? A first complication is that in several countries, like the United States, the correlation between male and female partners' earnings reversed from negative to positive over the last decades (Reed and Cancian 2012; Schwartz 2010). Hence, the cross-sectional contribution of the earnings association might reverse from equalizing to disequalizing over time (Harmenberg 2014). In such cases, the contribution of changes over time in assortative mating to changes in inequality can be larger than the cross-sectional contribution of mating patterns at a given point in time.

The impact of changes in the earnings association over time on inequality

The second category of studies looks at the impact of changes over time in the earnings association on inequality. These studies ask how high inequality would be if employment rates and/or earnings associations between partners were to be as in the past. They rely on simulations using decomposition or reweighting methods, and apply distributions of couples with given characteristics of one period to another period to investigate the influence of changes in specific patterns of the association between partners' earnings.²

Studies differ in the extent to which they consider changes in employment rates as inherently related to changes in the earnings association. A first sub-group considers both processes together, whereas a second sub-group has conceptually separated changes in overall employment rates from changes in earnings similarity *net of general changes in employment rates*. Studies from the first group have generally shown that increases in female employment rates have reduced inequality, despite the inherently related increases in the earnings association. Studies that looked at changes in earnings similarity net of general changes in employment rates often concluded that increases in the earnings association have augmented inequality. This is the case in particular for the United States (Blackburn and Bloom 1995; Larrimore 2014; Schwartz 2010), especially in the late 1970s and 1980s when changes in the earnings association have been

reported to account for 44% of changes in earnings inequality between households in the United States (Schwartz 2010, 1548).

In our view, it is difficult to interpret results that simulate changes in the earnings association (including zero-earners) while keeping overall employment rates constant. Changes in male and female employment rates, by definition, affect the share of dual-breadwinner (and jobless) households, which is, in turn, a determinant of the earnings correlation between partners (Schwartz 2010, 1531). Even if employment changes are not related to households' earnings levels, they affect the correlation between partners' earnings. Therefore, a counterfactual situation where only the earnings correlation between partners (including zero earners) is simulated to change, but levels of employment are held constant, is an unrealistic scenario (see also Cancian and Reed 1998, 1999). This methodological issue affects results based on the Coefficient of Variation decomposition (Austen and Redmond 2013; Blackburn and Bloom 1995; Cancian and Reed 1999; Mastekaasa and Birkelund 2011; Nieuwenhuis, Van der Kolk and Need 2017). Whereas this decomposition can be very useful to address the question of the combined effects of changes in employment rates and changes in earnings associations (first sub-group of studies), the decomposition of this overall effect into two components does not have a clear interpretation.

Some studies allow distinguishing effects of changes in overall employment rates from those in earnings associations as they are based on reweighting methods. Chen, Förster and Llana-Nozal's (2013) analysis of 23 OECD countries indicated that in most countries inequality would have been lower in the 2000s if, net of changes in overall employment rates, the association between partners' earnings had remained at its 1980s level. In all cases, effects on inequalities are modest: less than 0.01 points for the vast majority of countries, with a maximum of 0.02 points in Luxembourg. Similar results have been found by other authors (Fortin and Schirle 2006; Grotti and Scherer 2016; Larrimore 2014).

Summarizing the above stated, studies which properly distinguish changes in employment from other changes in earnings associations generally find a weak to moderate impact on inequality, whereas studies who do not tend to find larger impacts. However, it makes little sense from a policy perspective to stress the disequalizing effect of increased earnings associations without taking into account the possible parallel equalizing effects of increased female employment rates. We argue that the key question to ask is not whether earnings associations changed, but why they changed. If increases in the earnings correlation are due to augmented female employment rates, it is unclear whether these trends are of concern for inequality (as increases in female employment generally reduce inequality between households). If, on the other hand, earnings associations changed because of changes in partner selection, or because employment changed unequally according to partner's earnings, changes in the earnings association are of more concern for inequality between households.

A major empirical goal and contribution of this paper will be to study the impact of changes in earnings associations while taking into account the impact of processes that drive these changes in earnings similarity on inequality more generally. A second goal is to look at cross-national variation. Policies regarding female employment implemented in OECD countries since the 1970s can be categorized into dual earner-carer, market-oriented, and family-oriented models (Korpi et al. 2013). Arguably, family-oriented models come with greater inequality among women due to obstacles for women from socioeconomically disadvantaged households to enter the labor market. Such access is more equal in countries actively supporting a dual earner-carer model. Because lower earnings inequality among women implies, *ceteris paribus*, less economic

inequality between households, one would expect increases in employment to have reduced inequality in particular in countries that supported the dual earner-carer model. However, for many of the countries in the analysis, the observation window starts in the 1980s or 1990s, at a time when female employment was already high in dual earner-carer countries. This means we do not capture the complete unfolding of these differences in policies across countries. Therefore, we formulate a set of general expectations regarding cross-national variation based on how changes in employment and earnings correlations affect inequality.

In countries where we observe important increases in female employment, we would expect increasing earnings correlations among partners, but an overall reduction in inequality. The extent to which this is the case should depend on the measure in which women in low-earnings households increased their earnings, and we can therefore expect weaker reductions in inequality in countries that have family-oriented policies regarding employment and care. Changes in partner selection can further reinforce these patterns. However, as mentioned, few empirical studies have documented whether and where partner selection based on earnings potential increased. We can formulate the more general expectation that increases in earnings correlation are likely to be accompanied with increases in inequality between households in countries where we do not observe major increases in female employment nor other changes in employment rates. In these cases, processes not related to changes in employment rates that increase earnings correlations, such as increased homogamy in partner selection, are likely to translate more directly into increases in inequality between households.

Data and Methods³

We use data from the Luxembourg Income Study (LIS) for 18 European countries plus Australia, Canada, and the United States. The LIS data are harmonized representative cross-sectional surveys that have been used in many key studies on income inequality. Countries are selected based on the availability of data spanning at least more than a decade, and the provision of comparable data on personal labor income. Most countries are covered from the 1980s or early 1990s until the 2010s, but some countries provide longer series (e.g. 1974-2016 for the United Kingdom), and others shorter ones (e.g. 2000-2013 for Greece). In robustness checks, we aimed to harmonize time periods across countries (covering the period of the early 1990s to the early 2010s).⁴ This selection process covers a wide variety of high-income countries, with the exception of East-Asian countries.

We select households where the head of household and partner are both between ages 30 and 54. Households where the head of household is single and same-sex couples are dropped from the analysis.⁵ Table 1 displays the countries and periods covered, as well as the range of the sample sizes for each annual dataset. Final sample sizes range across datasets from 440 to 52,000 couples (13 datasets out of 173 have less than 1,000 observations).

Our main variable of interest is individual labor income (including self-employed income) of the head of the household and her or his partner (the *pil* variable in LIS). We disregard labor income of other household members but keep households in the analysis regardless of their presence. Most countries report gross income, but net income is reported for Austria, France, Greece, Hungary, Ireland, Italy, Luxembourg, Slovenia, and Spain.⁶ In robustness checks, we “netted down” personal income in all countries, general conclusions remained unchanged (available upon request). Negative incomes are recoded to zero. In several countries, self-employed income is only reported at the household level. In such cases, we split household-level self-employed

income evenly across all self-employed individuals in the household.⁷ In other datasets, individual self-employed income is recorded to be zero for large parts of the sample and is not recorded at the household level either. Therefore, we exclude all couples in which a self-employed individual has zero labor income (after redistributing household-level self-employed income) from all samples, as these are likely to represent situations of missing information. Finally, in nine out of 163 datasets, large shares of employed individuals (between 3% and 11%) have zero labor income recorded. For these datasets, we exclude all couples in which an employed individual has zero earnings.⁸

Table 1. Selected datasets and sample size ranges.

Country	Years	<i>N</i> (range)	Country	Years	<i>N</i> (range)
Australia	1985-2014	1,901-4,170	Italy	1987-2014	1,594-3,208
Austria	1994-2016	652-1,652	Luxembourg	1991 - 2013	594-1,954
Canada	1987-2013	3,588-12,555	Netherlands	1983-2013	1,400-3,531
Czechia	1992-2013	1,150-9,281	Norway	1986-2010	1,681-52,299
Denmark	1987-2016	2,938-20,203	Slovenia	1997-2015	1,075-1,637
Finland	1987-2016	2,722-4,683	Spain	1990-2016	1,532-7,818
France	1978-2010	2,882-3,281	Sweden	1975-2005	3,205-4,443
Germany*	1973-2016	1,650-19,880	Switzerland	1982-2013	1,509-2,387
Greece	2000-2013	1,077-1,967	United Kingdom	1974-2016	1,708-7,131
Hungary	1991-2015	440-651	United States	1974-2016	3,316-26,541
Ireland	1994-2010	904-1,651			

Note: *N* expresses the final (unweighted) number of couples used in the analysis

* Germany covers only West Germany until 1991.

To ensure that our final samples still give accurate indications of country-level inequalities we compared estimates of household labor income inequality based on our sample to estimates from Solt (2016) using the same data. These estimates prove to be very consistent (a correlation of 0.97). We also obtained a correlation of 0.97 between estimates of inequality before and after applying our adjustments to calculate individual labor income.⁹ Household weights provided by LIS are employed in the analysis.

We use a decomposition approach based on log-linear models inspired by Schwartz (2010), but with several adjustments to separate the effect of changes in employment rates from other

changes affecting the earnings association between partners.¹⁰ We divide the earnings distribution of men and women into twenty equally sized groups based on every 5th percentile of the earnings distribution, plus a specific category for zero earners. We subsequently build for each country-year a 21×21 homogamy table crossing partners' earnings (including zero earnings). The idea behind this approach is to simulate alternative distributions of households across the cells of the table using log-linear models. These simulated distributions of households are combined with the observed median earnings of women and men in each group to compute a simulated distribution of couples' earnings. Couple earnings are here defined as the sum of partners' earnings. Inequality for the corresponding country-year is subsequently calculated by computing the Coefficient of Variation on this distribution (robustness checks using the Gini coefficient are presented in Appendix E). A major advantage of dividing continuous earnings into discrete categories is that associations can be described in detail without making any parametric assumptions (contrary to using e.g. the correlation coefficient).

Four nested log-linear models are used to simulate counterfactual distributions across the 21×21 table of households for each country. The starting point is the saturated model, which corresponds to the observed data (model M4; see below). We then progressively add constraints to the models, while still forcing components of the association to take the values observed in the first year within each country. All models therefore perfectly reproduce the observed level of inequality in the first year, but they are allowed to diverge in subsequent years. As a first restriction (model M3), we fix the association between partners' earnings among dual-earner couples to their value in the first year.. As a second restriction (model M2), we additionally fix the associations between employment and partner earnings for men and women to the value observed in the first year. Finally, in the baseline scenario (model M1), we also constrain the proportions of non-zero earners among women and among men to be the same as in the first year. This final scenario implies that both the earnings association and employment rates are the same for all years: only the median earnings of each percentile-group are allowed to change over time (inequality in earnings among men and women with non-zero earnings).

The models are based on the following equations. Contrary to standard log-linear modeling practice, time-invariant parameters are fixed to values for the first year rather than freely estimated: this is necessary to ensure that observed data is reproduced exactly for the first year.¹¹ Noting the counts of couples with men in earnings group m and women in earnings group w for year t :

$$M 1: m_{mwt} = \lambda + \lambda_m^M + \lambda_{ww}^W + \lambda_t^T + \lambda_{mw}^{MW}$$

$$M 2: M 1 + \lambda_{mt}^{MT} + \lambda_{wt}^{WT}$$

$$M 3: M 2 + \lambda_{mt}^{MW_0T} 1_{w=0} + \lambda_{wt}^{WM_0T} 1_{m=0}$$

$$M 4: M 3 + \lambda_{mwt}^{MWT}$$

with $w = 0$ and $m = 0$ corresponding to situations where the woman or the man (respectively) has zero earnings, and $1_{w=0}$ and $1_{m=0}$ indicator functions taking value 1 when the woman or the man (respectively) has zero earnings, and 0 otherwise.

Differences across models allow us to estimate the influence of specific processes on inequality between households. The difference between M4 and M3 quantifies the contribution of changes in the earnings correlation among dual breadwinners to inequality. The difference between M3

and M2 quantifies the contribution of changes in the employment-partner earnings associations to inequality; in other words, it estimates the contribution to inequality of unequal changes in employment across society (i.e. changes not captured by general changes in employment rates, such as relative increases in employment among women whose partners have high earnings). The combined impact of both processes, i.e. the difference between observed (M4) and simulated inequality in model 2 (M2) gives an overall indication of the impact of changes in the earnings association that are *not* due to general changes in employment (i.e. keeping the share of non-zero earners constant).

The difference between M1 and M2 provides an estimate of how important changes in the share of non-zero earners have been. This estimate combines the impact of two consequences of general changes in employment rates: the changes in inequality among women and men that arise because of changes in the number of zero-earners, and changes in the earnings association between partners that emerge due to changes in the proportion of zero-earner and dual-earner couples. To further illustrate our results, we provide estimates of how these simulations affect the earnings correlation in Appendix F and refer to these results throughout the text.

Results

Table 2 gives an overview of some of the key changes that took place in the countries under study (complete trends are displayed in Appendix H). The first column (ΔFER) shows how female labor force participation increased in all countries during the periods covered by the data except Czechia, and Finland. In some countries, such as Germany, the Netherlands, and Spain, the female employment rate increased by more than 40 percentage points across the period studied. Changes in male employment rates were less pronounced but declined in some countries that were hit hard by the 2008 economic crisis (second column). The third column (ΔCV) shows how the Coefficient of Variation in earnings between couples changed over time between the first and last year considered in this study: inequality went up in most countries, but decreased in four of them.

The fourth column (ΔEC) shows the change over time in the correlation between partners' earnings (including zero-earners). The earnings correlation went up everywhere except Austria, Czechia, Finland and Ireland. The most dramatic increases in the earnings correlation (more than 0.2 points) are observed in Germany, Switzerland, and the United States. We resort to our decomposition results based on log-linear models to understand whether these increases in earnings similarity are of concern for inequality.

Table 2. Overview of changes in earnings correlations, employment, and observed and simulated levels of inequality

	Δ FER	Δ MER	Δ CV	Δ EC	S4	S3	Δ S3	S2	Δ S2	S1	Δ S1
Pattern 1: (Averages)							-0.03		-0.05		0.00
Germany 1973-2016	0.46	-0.03	0.12	0.22	0.56	0.54	-0.02*	0.51	-0.05*	0.55	-0.01
Luxembourg 1991-2013**	0.39	-0.00	0.05	0.08	0.54	0.52	-0.02	0.52	-0.02	0.59	0.05*
Switzerland 1982-2013	0.39	-0.01	0.02	0.24	0.54	0.50	-0.05*	0.48	-0.07*	0.53	-0.02
United States 1974-2016	0.21	-0.03	0.21	0.21	0.72	0.68	-0.04*	0.66	-0.05*	0.70	-0.02
Pattern 2: (Averages)							0.02		0.01		0.08
France 1978-2010**	0.35	-0.01	-0.01	0.11	0.56	0.58	0.02	0.57	0.00	0.64	0.07*
Austria 1994-2016**	0.21	-0.00	0.00	-0.09	0.52	0.54	0.02*	0.53	0.01*	0.56	0.05*
Netherlands 1983-2013	0.53	0.06	-0.07	0.02	0.52	0.57	0.04*	0.57	0.04*	0.68	0.15*
Slovenia 1997-2015	0.03	0.03	0.05	0.03	0.55	0.55	0.00	0.54	-0.01	0.57	0.02
Spain 1990-2016**	0.50	0.02	0.07	0.16	0.68	0.69	0.00	0.68	0.00	0.78	0.10*
Pattern 3: (Averages)							0.00		-0.01		-0.01
Czechia 1992-2013	-0.10	-0.01	0.17	-0.09	0.56	0.56	0.00	0.56	0.00	0.54	-0.03
Finland 1987-2016	-0.02	-0.03	0.07	-0.03	0.51	0.52	0.00	0.51	0.00	0.48	-0.03
Hungary 1991-2015	0.06	0.03	-0.15	0.10	0.48	0.47	-0.01	0.47	-0.02	0.51	0.03
Pattern 4: (Averages)							0.02		0.02		-0.02
Ireland 1994-2010	0.16	-0.07	-0.06	-0.05	0.68	0.72	0.03*	0.72	0.04	0.70	0.02
Greece 2000-2013**	0.03	-0.09	0.10	0.02	0.69	0.70	0.01	0.69	0.01	0.63	-0.05*
Pattern 5: (Averages)							-0.02		-0.03		-0.03
Sweden 1975-2005	0.10	-0.03	0.08	0.14	0.51	0.49	-0.02*	0.47	-0.04*	0.47	-0.03
Norway 1986-2010	0.04	-0.03	0.11	0.13	0.49	0.47	-0.02*	0.45	-0.04*	0.44	-0.04*
Canada 1987-2013	0.09	-0.01	0.08	0.04	0.61	0.60	-0.01	0.59	-0.02	0.60	-0.01*
Denmark 1987-2016	0.04	-0.00	0.04	0.14	0.47	0.46	-0.01*	0.44	-0.03*	0.46	-0.01*
United Kingdom 1974-2016	0.13	-0.05	0.27	0.19	0.71	0.67	-0.04*	0.66	-0.05*	0.65	-0.06*
Other:											
Australia 1985-2014	0.10	-0.03	0.11	0.03	0.62	0.61	-0.01	0.62	0.00	0.63	0.01
Italy 1987-2014	0.17	-0.07	0.05	0.09	0.59	0.61	0.01	0.57	-0.02*	0.54	-0.05*

Note. Δ FER = Absolute change in share of women with non-zero earnings (Female Employment Rate); Δ MER = Absolute change in share of men with non-zero earnings (Male Employment Rate); Δ CV = Observed change in Coefficient of Variation from first to last year; Δ EC = Total change in earnings correlation among partners between first and last year; S4 = Observed Coefficient of Variation in last year; S3 = simulated level of inequality in last year if earnings association among dual-breadwinner couples were to have remained stable; S2 = simulated level of inequality in last year if earnings association among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated level of inequality in last year if earnings association among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. Δ S1/ Δ S2/ Δ S3 = Simulated change in Coefficient of Variation under S1/S2/S3 as compared to observed inequality (S4). Countries with net earnings information are signaled with **.

*Value significantly different from 0 in robustness checks using unweighted data and bootstrapping to calculate 95% confidence intervals (see Appendix C).

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54

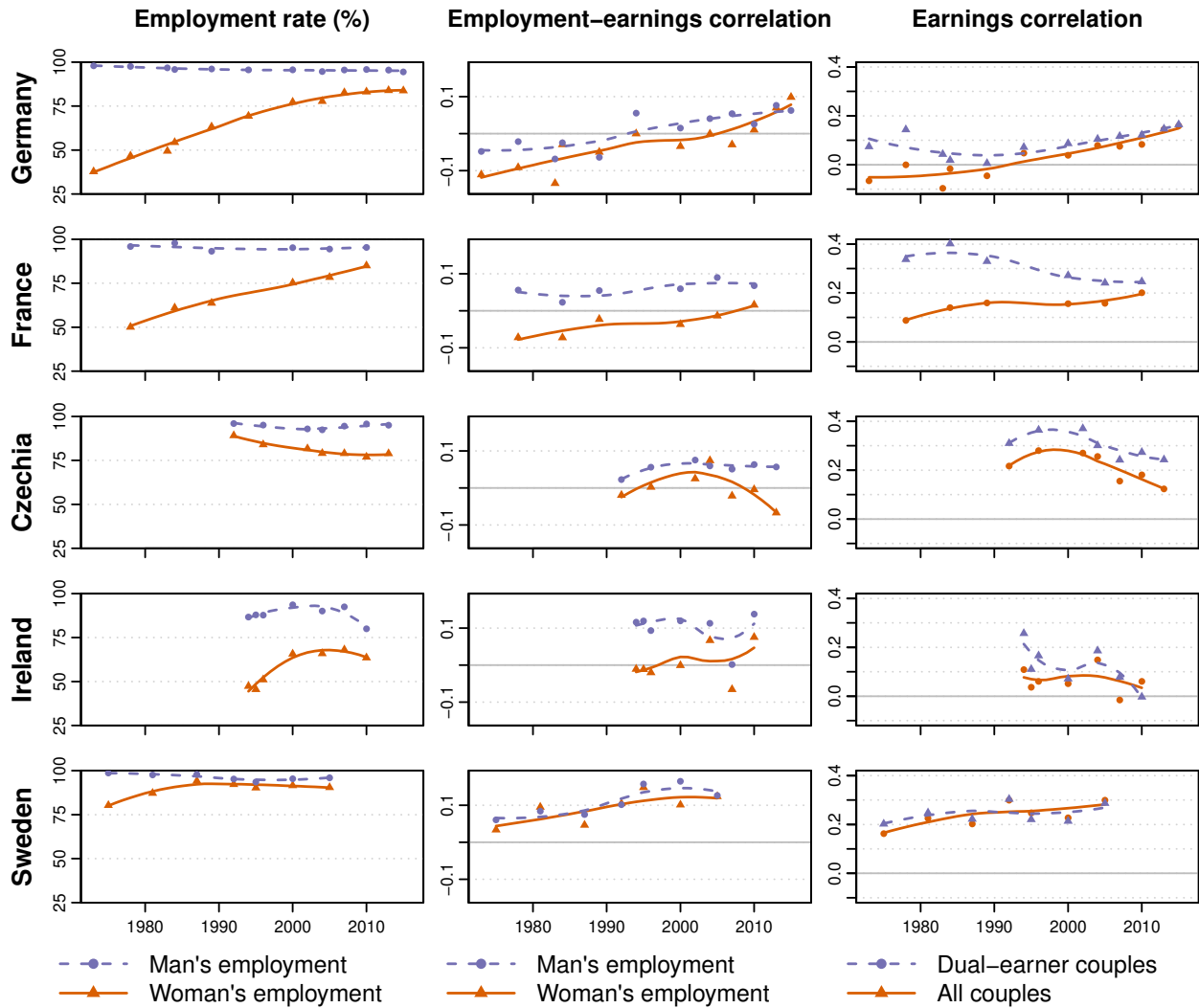
The remainder of Table 2 gives an overview of the decomposition results by showing estimated levels of inequality in the final year under each of the scenarios considered. Results for all years are presented in Appendix H. Due to data restrictions confidence intervals could not be calculated for our main results using weights, but bootstrapped confidence intervals for unweighted results are provided as an indication in Appendix G. Differences across simulated scenarios that are significantly different from zero at the 5% level in Appendix G are marked with an asterisk in Table 2.

To ease the discussion of these results we categorized country-specific results into five broadly defined patterns based on the extent to which employment rates and other components affecting the earnings association changed during the observation period. Note that this categorization is merely made to organize the discussion of the findings, as formulating theoretically relevant clusters of countries is complicated by the variation in time periods covered as well as country-differences in the timing of changes in employment and employment-related policies over time. Patterns 1 and 2 cover countries where female employment rates increased considerably during the observation period (therefore with an equalizing effect when comparing scenarios S2 and S1), patterns 3 and 4 cover countries that experienced decreases in employment rates (disequalizing), whereas pattern 5 covers countries with relatively small changes in employment rates. These patterns are further distinguished depending on whether changes in the earnings association (S4 versus S2) have been disequalizing (patterns 1 and 5) or whether they have been equalizing or have had no effect (patterns 2 and 3) or a nonlinear effect (pattern 4). Each of the five patterns will be discussed in turn by presenting the detailed results for a country that best exemplifies that particular category (in boldface in Table 2).

Pattern 1: Equalizing employment changes countered by increases in earnings associations

The first pattern discussed is exemplified by Germany, which appeared similar in its results to Switzerland, Luxembourg, and the United States. The first row of Figure 1 illustrates the most important changes that took place in Germany during the observation period. Female employment increased dramatically, but these changes have not been equal across society: the employment-partner earnings associations used to be negative in the 1970s, but turned positive in the 2000s, implying that men and women whose partners have the highest earnings are now more frequently employed than those whose partners have lower earnings. As mentioned, Germany experienced one of the greatest increases in the earnings correlation over time. The earnings correlation among dual-breadwinner couples augmented too.

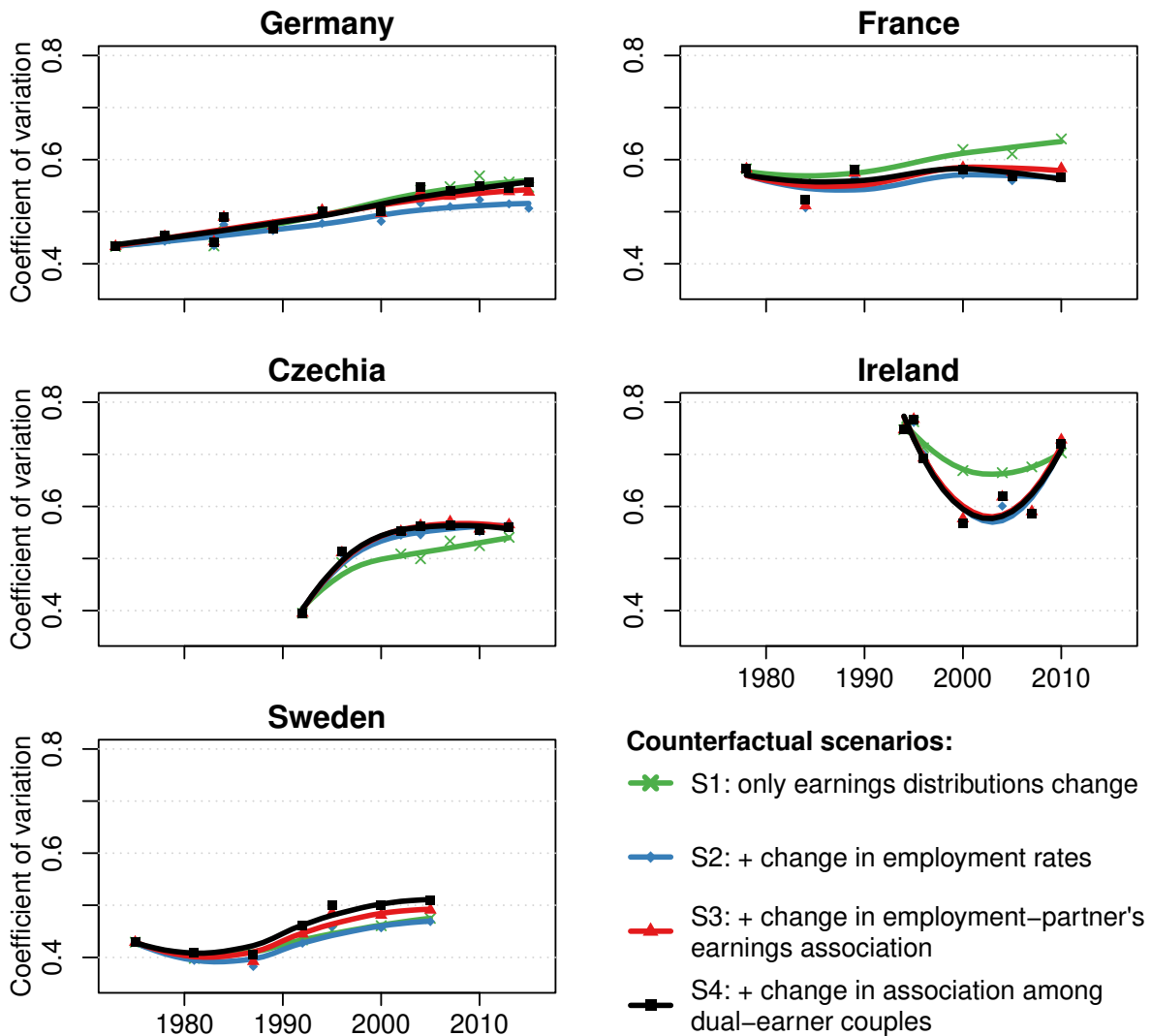
Figure 1. Changes in employment rates, employment-earnings associations, and partners' earnings correlations in countries representing five categories of patterns



Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations, couples where the head of household and partner are both between age 30 and 54

Figure 2. Coefficient of Variation of couples' earnings under counterfactual scenarios for countries representing five categories of patterns



Source: Luxembourg Income Study

Sample: couples where the head of household and partner are both between age 30 and 54

The first panel in Figure 2 displays the results of the decomposition analysis based on simulating levels of inequality for Germany under various scenarios. The black line corresponds to observed inequality (S4). The red line indicates a scenario where only the earnings association among dual-breadwinner couples is simulated to not have changed over time (S3). The difference between the red and black lines indicates the estimated contribution of changes in the earnings correlation among dual-breadwinner couples to inequality. As visible in Figure 2, the inequality trend depicted by the red line is located very slightly below observed inequality (black line). Inequality in 2015 would be 0.02 points (or 3%) lower if the earnings association among dual-breadwinner couples were fixed to its 1973 level.

The scenario represented by the blue line in Figure 2 (S2) also holds constant the employment-earnings association over time. Unequal changes in employment across the partners' earnings distribution are estimated to have amplified inequality. If the two components considered so far had not changed over time, inequality would have been 0.05 points lower in 2015 as observed (or 9% of the final level of inequality). Finally, if employment rates had also remained stable (green line, S1), inequality would have been slightly lower (-0.01 point) than observed inequality in 2015. This suggests that the equalizing effect of increases in female employment almost completely canceled out the inequality-amplifying effects of the other two components.

The results are similar for Luxembourg, Switzerland and the United States where increases in employment also equalized earnings across couples. However, in Switzerland and the United States, inequality would have been 0.02 points (or 3-4%) lower than observed if both employment rates and the earnings association had not changed over time, indicating relatively stronger disequalizing trends than in Germany and Luxembourg. On the contrary, in Luxembourg, inequality would have been much higher (by 0.05 points, or 9%) if employment rates and the earnings association had not changed over time, due to the very strong equalizing effect of increases in employment rates.

Congruent with the results on inequality, additional analysis (Appendix F) showed that all three components had an important impact on changes in the overall earnings correlations in the countries of this group. Increases in the earnings association among dual-breadwinner couples explained between 33% (Germany) and 69% (Switzerland) of the overall increase in the earnings correlation. The rest of the increases can be attributed mainly to stronger employment-partner earnings associations, except in Luxembourg where the marked augmentation of employment rates accounts for 47% of the increase in the correlation.

Pattern 2: Equalizing employment changes, earnings association of little importance

The second pattern is exemplified by France, which is similar to Austria, the Netherlands, Spain, and, to a lesser extent, Slovenia. In France, as in Germany, both female employment rates and the earnings correlation between partners increased over time (Figure 1). But contrary to Germany, the earnings correlation was already positive in France in 1978, and it increased only moderately. The employment-earnings correlation also increased less markedly, which was primarily driven by a rise in employment of women with high-earning partners, rather than to a decline in the employment of women with low-earning partners as in Germany (not shown). Moreover, the earnings correlation among dual-earner couples decreased over time.

In line with these trends, the decomposition analysis for France indicates that the scenarios in which the association among dual-earners and the employment-earnings associations are fixed across time (red and blue lines) are both very similar to observed trends in inequality (Figure 2). This shows that unequal changes in employment had virtually no impact on inequality and the same can be concluded for the reductions in the earnings association among dual-breadwinner couples.

Once simulating a situation where employment rates would also have remained stable over time (green line), inequality would have increased more than the observed trend by 0.07 points (or 13% of the level of inequality in 2010). Hence, increases in earnings similarity over time came with a more equal distribution of earnings across households. General increases in the female employment rate augmented the earnings correlation among couples in France, but given the stronger equalizing effect of increases in female employment through other pathways (notably

reductions in inequality among women's earnings) this is a "package deal" that is to be welcomed from an inequality perspective.

These trends have been very similar in Spain and Austria (inequality is 0.10 and 0.05 points lower, or 15% and 9%, respectively, than a situation where earnings similarity were to be as in the past, primarily due to increases in employment). In the Netherlands, the equalizing effect is even more pronounced (inequality lower by 0.15 points, or 29%), since the earnings correlation has remained very close to zero over the whole period. In Slovenia, the equalizing effect is only 0.02 points high (or 4%), as employment rates increased only slightly (and the equalizing effect of employment changes is not statistically significant in the unweighted results; Appendix G).

Equivalent results where the earnings correlation is the outcome show that increases in overall employment rates are by far the main factor that drove earnings correlations up in this group of countries (the exception is Slovenia where it increased only due to the stronger employment-partner earnings association; see Appendix F).

Pattern 3: Desequalizing employment, earnings association of little importance

So far, all patterns presented referred to contexts where female employment rates increased over time. In Czechia, female employment was at high levels in 1992, but decreased after that (Figure 1). Whereas the correlation between women's employment and their partner's earnings increased somewhat until 2002, it has decreased in recent years, indicating that women whose partners have the highest earnings have withdrawn from the labor market. These two trends have caused a decrease in the earnings correlation overall. However, the decomposition (Figure 2) shows that these trends have barely impacted levels of inequality: fixing the earnings association among dual-breadwinner couples (red line) and employment-earnings associations (blue line) to their initial levels does not lead to a clear change in levels of inequality (black line). On the contrary, keeping the employment rate stable too (green line) predicts a decrease in inequalities by 0.03 points (or 5%). This scenario is therefore similar to the one observed for France, but in reverse, with an inequality-amplifying effect of reductions in employment. Even though the earnings correlation decreased over time in Czechia, its equalizing effect was limited. Once considering changes in employment, an inequality-amplifying contribution is observed. Additional analysis with the overall earnings correlation as the outcome confirms that reductions in employment rates have been the only factor driving it down in Czechia (Appendix F).

Other countries that experienced similar scenarios are Finland and, to a lesser extent, Hungary until 2012. In Czechia and Finland, decreases in employment rates augmented inequality and drove the earnings correlation up (although these effects are not statistically significant in the unweighted results; Appendix G) whereas the other components had little impact. Hungary experienced a similar disequalizing effect of decreases in employment rates until 2012 (see Figures H1 and H2 in Online Appendix H), aggravated by increases in the earnings correlation among dual-breadwinner couples. However, since 2012, employment rates have increased dramatically for both sexes in Hungary between 2012 and 2015, which completely canceled out the disequalizing trends of the 1991-2012 period. Labour force statistics indicate that a similar phenomenon may be taking place in Czechia, for which the latest data we used in this paper is from 2013.

Pattern 4: Decreases in employment after the financial crisis amplify inequality

The fourth group has a relatively similar final outcome as compared to Czechia: employment reductions amplified inequality. However, the trajectory to this final outcome is very different, as exemplified by Ireland. Female employment was increasing until the 2008 economic crisis and decreased inequality in Ireland (Figure 1; see also Callan et al. 1998). However, decreases in both female and male employment following the crisis reversed this trend and amplified inequality, which canceled out the previous equalizing trend. Earnings-employment associations and the earnings association among dual-breadwinner couples increased slightly over time, but are estimated to have had little impact on inequality. A similar scenario unfolded in Greece, which was hit hard by the financial crisis. Spain shares some traits with this pattern, but the increase in female employment after 1990 has been so large that it overrides the consequences of the crisis for levels of male and female employment. Note that employment rates have increased significantly for both sexes in these countries since the last years covered by the LIS data, though without reaching their pre-2008 levels.

Pattern 5: Employment high and stable, earnings association amplifies inequality

The final pattern unfolded in countries where employment for men and women was high at the start of the period and changed relatively little after that: Sweden, Norway¹², Denmark, Canada, and the United Kingdom. Changes in employment rates per se can therefore only play a minor role in these contexts, and increases in earnings correlations are expected to directly translate into augmented inequality between households.

Figure 2 confirms this expectation for Sweden: the green line simulating no changes in employment across time overlaps with the blue line where overall employment rates are allowed to vary. At the same time, the employment-partner earnings association increased for both sexes due to decreases in employment rates of individuals with low-earning partners since the 1990s (not shown), and so did the earnings correlation among dual breadwinners (Figure 1). These changes in who is employed (blue line in Figure 2) and in the correlation among dual breadwinners (red line) are simulated to have increased inequality between couples over time. Inequality would have been 0.04 points (or 8%) lower than observed inequality (black line) by the end of the period if none of these components had changed over time. This corresponds to 52% of the increase in earnings inequality between households observed across the period in Sweden. Given the absence of major changes in the overall level of employment in Sweden, the increasing earnings correlation translates directly into an inequality-amplifying effect.

These inequality-amplifying effects of changes in earnings similarity in the other countries of this group range from 3% in Canada to 6% in Denmark and 7% in the United Kingdom and Norway (statistically significant in all countries but Canada). Additional analysis confirms that increases in the earnings correlation are almost entirely explained by augmented earnings correlations among dual-breadwinner couples or by increases in the employment-earnings associations (in all cases above 79% of the increases in the earnings correlation; Appendix F).

Two unclassified countries

Two countries do not fit in any of the five patterns described so far. In Australia, none of the counterfactuals make a significant difference to the level of inequality, as employment rates and earnings associations have followed irregular trends over the observation period (as observed by Austen and Redmond 2013). In Italy, changes in employment have been disequalizing as only women whose partners have earnings above the median have reinforced their labor market

participation, and the employment rate of men whose partners have low earnings has decreased somewhat. On the other hand, the earnings correlation decreased among dual-earner couples, which somewhat mitigated the disequalizing trend of employment changes. Taken together these processes have increased inequality in Italy.

Comparison to earlier research

Are the results presented above similar to earlier comparable research? Our results regarding the contribution to inequality of changes in the employment-partner earnings association and changes in the association among dual-earner couples (our scenario 2) can be compared to those of Schwartz (2010), who estimated that these two factors contributed to 23% of the total increase in the Coefficient of Variation in the United States between 1968 and 2006. Our corresponding estimates are very close: 24% for the period 1974-2016, and 26% for the period 1974-2007. We also confirm that increases in the association among dual-earner couples account for most of this contribution (scenario 3). In contrast, the different our decomposition provides a quite different estimate of the joint contribution of changes in employment and in partners' earnings association: 10% for the 1974-2016 period, and 8% for the 1974-2007 period, in contrast with Schwartz's estimate of 29% for the 1968-2006 period. Our approach differs from Schwartz because we take as a reference the earnings association observed in the first year, rather than assuming the absence of any earnings association. We give preference to our estimate, as it corresponds better to the counterfactual of how high inequality would be if employment rates and the association between partners' earnings had remained stable over time (Cancian and Reed 1999).

Like Larrimore (2014), we note that changes in female employment and changes in the employment-partner earnings association have become disequalizing in the United States in the 2000s. This explains the overall disequalizing effect of combined changes in employment and in earnings association that we noted above, which has only appeared around 2007 and accounts for most of the increase in between-couple inequality since then. However, at the end of the observed period (2013), increases in the earnings association among dual-earner couples appear to be driving most of the disequalizing trend. Our results are also consistent with Chen, Förster and Llana-Nozal (2013): increases in earnings associations, including employment-partner earnings association but net of changes in general employment rates, have been disequalizing in most countries.¹³ On the other hand, our studies both show that the combined effect of changes in employment rates and in earnings association was equalizing in around half of the countries studied.¹⁴ Contrary to Grotti and Scherer (2016), we have observed clear (although limited) effects of changes in earnings association on inequalities. One possible reason for the discrepancy between their results and the rest of the literature is their reliance on earnings quintiles, which may mask most of the disequalizing impact of earnings associations. Our results for other countries are less comparable to earlier works, as most previous research is based on the decomposition of the Coefficient of Variation.¹⁵

Conclusion and Discussion

Did changes in earnings similarity over time contribute to earnings inequality between couples? Our empirical results showed that whereas the earnings correlation between partners went up in 17 out of 21 countries, this only increased earnings inequality between households in 9 of these countries. In 6 countries, increases in the earnings association did not contribute to inequality in earnings between couples at all. In all these countries, the overall earnings correlation (including zero-earners) increased over time, but this turned out to be a by-product of general increases in

employment rates. Increasing employment rates reduce inequality by lowering earnings inequality among men and women, which cancels out the positive effects of rising employment rates on partner similarity in earnings. In these 6 countries, there was no major impact of changes in the earnings correlation among dual-breadwinner couples nor of changing employment-partner earnings associations. The effects of processes like changes in partner selection or obstacles towards increasing female employment among households where men have low earnings (e.g. lack of affordable quality childcare or higher unemployment) are captured by these two components. Therefore, concerns about assortative mating increasing inequality between households are not universally applicable.

The results also show that increases in employment rates are related to increases in the earnings correlations but reduce inequality between households overall. The observed increases in the partner earnings association are therefore not of concern for inequality in these countries. In fact, they are to be welcomed as they are “mechanically” connected to the equalizing effects of increases in employment rates over time. The overall impact of changes in the earnings similarity, including changes in employment rates, was equalizing and ranged from a 5-13% reduction in inequality in Austria, France, Hungary, Luxembourg and Spain, to a maximum of 29% in the Netherlands.

The opposite scenario unfolded in a few other countries. Even though the correlation between partners’ earnings decreased in Czechia and Finland, it was accompanied by reductions in employment rates, leading to 5 to 6% higher inequality in earnings between couples compared to what would have happened in the absence of changes in employment and earnings associations. Decreasing earnings associations are therefore also not always a welcome development for levels of inequality. In countries hit the hardest by the 2008 economic recession like Greece and Ireland, falling employment rates have boosted inequality despite relatively stable earnings associations. In 9 countries, increases in inequality were caused by augmented earnings correlations among dual-breadwinner couples or by unequally distributed changes in employment rates across the partner earnings distribution (i.e. employment changes primarily benefited those couples that already had high earnings or penalized couples who already had low earnings). These two kinds of processes increased the overall earnings correlation between partners and, therefore, had an inequality-amplifying impact. Contributions to inequality of these two processes combined ranged from 3% in Canada and Luxembourg, to 6-9% in Denmark, Germany, Norway, Sweden, the United Kingdom and the United States, and 12% in Switzerland. In Germany, the United States, and Switzerland, the equalizing impact of increases in employment canceled out part of the impact of these inequality-amplifying processes. Nonetheless, it can be concluded that in these 9 countries increases in earnings correlations are of concern for inequality.

The main aim of this paper was to study the impact of changes in the earnings association by taking into account the more general impact of processes that drive these changes. For 10 countries employment rates form the principal driving force behind changes in earnings similarity and its impact on inequality. For the other countries, increases in the earnings association among dual-breadwinner couples and increases in employment-partner earnings associations played an important role too.

The substantive interpretation of these two latter processes is not straightforward. Changes in partner selection can affect both the correlation in earnings among dual-earner couples (e.g. high earners increasingly selecting high earners as partners) and the employment-partner earnings correlation (e.g. high earners increasingly selecting partners prone to be employed). Similarly, processes that occur after union formation, such as changes in the division of labor, can influence

both components too. Increasing earnings correlations among dual-breadwinner couples can be driven by changes in hours worked or hourly wages, employment-partner earnings associations are affected by exits and entrances into the labor market after union formation.

If changes in working hours matter, this would suggest that the opportunities to embark upon full-time careers are not equally distributed according to earnings, with partners of low earning individuals having relatively fewer opportunities to do so. In their analysis of the United States, Gonalons-Pons and Schwartz (2017) pointed at hours worked as the primary responsible for increases in the earnings association across time, rather than changes in partner selection. Future research could investigate whether this is also the case in other countries. At the same time, studies on changes in educational homogamy within couples have failed to find increased sorting on education, and even observed decreases in educational homogamy in several European countries (Boertien & Permanyer, 2019; De Hauw et al. 2017). This would suggest that unequal possibilities to operate according to a full-time dual-breadwinner career model, rather than changes in partner selection, are of most concern from an inequality perspective.

Existing theoretical perspectives cannot explain very well why employment-earnings correlations or correlations among dual-breadwinner couples increased only in certain countries. We expected differences in the possibilities to have two earners to have become most pronounced in countries with a family-oriented policy regime. This fits the results for countries which are the most typical of this regime (Korpi et al. 2013): Germany and Luxembourg. But in other countries with more moderately family-oriented policies like Austria, France and the Netherlands we did not find increases in employment-earnings correlations or in correlations among dual-breadwinner couples, and hence, no impact on inequality. Other theoretical perspectives predict that partner selection based on earnings potential might increase as women's earnings become more important for a household's economic resources. If there is a certain delay between increases in women's employment and its impact on partner selection, this might explain why in the countries where female employment reached a plateau before our observation window we find increases in employment-earnings associations and correlations among dual-breadwinner couples that augmented inequality. This result applies to countries with either market-oriented policies (like Canada and the United Kingdom) or dual earner-carer policies (like Denmark, Norway and Sweden). Future research can further examine the causes of these trends in high-employment countries.

As more and more countries are likely to reach high levels of female employment in the coming years, the question arises to what extent increases in inequality can be expected to occur there too, and whether and which policies to stimulate employment can be effective to reduce inequality in high-employment contexts. Some support for the expectation of more disequalizing trends in recent years was found in robustness checks where we aimed to harmonize the time period studied (roughly 1991-2013, available upon request). Even though most results did not change substantively, employment changes had less of an equalizing effect in the Netherlands and the United States (because this period covered less of the increases in female employment rates). The Netherlands now looked more like the group exemplified by Germany, whereas the United States showed clear disequalizing trends similar to the group exemplified by Sweden.¹⁶

To conclude, is the increasing resemblance of partners' earnings of concern for inequality? Increases in earnings correlations are not necessarily a concern from a policy perspective. In many cases, increases in earnings correlations are connected to general augmented levels of employment, and not by changes in partner selection or unequal changes across the earnings distribution in the division of labor within couples. Given that increases in employment lead to

lower inequality, increases in earnings correlations resulting from such trends are of little concern. Only in a minority of countries, we observed an increase in the association between partners' earnings which was not a mere byproduct of a parallel augmentation in female employment rates. This shows that there is no universal trend of changes in earnings similarity increasing equality between households over time. Instead, whether changes in the earnings association are concerning depends on the underlying processes that make partners' earnings more similar.

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Endnotes

¹ Originally reported conclusions that earnings similarity has a major impact have been adjusted downward in a corrigendum: https://www.cemfi.es/~guner/ggks_corrigendum.pdf

² Simpler methods, such as those based on decomposing the Coefficient of Variation (e.g. Esping-Andersen 2007; Nieuwenhuis, Van der Kolk and Need 2017) apply earnings correlations of one period to another without considering specific patterns of how individuals distribute across types of households.

³ Replication materials are available from the authors' webpages and upon request.

⁴ See Online Appendix A.

⁵ Households from overseas regions of France are dropped.

⁶ Some countries report gross income in some years but net income in others. In these cases, we estimated the net income of individuals by dividing the household tax according to their relative contribution to gross income (Nieuwenhuis, Munzi and Gornick 2017). This concerns Austria (since 2004), Greece (since 2007), Ireland (since 2004), Luxembourg (since 2004) and Spain (since 2007).

⁷ Robustness checks excluding these households yielded similar results, see Appendix B.

⁸ These datasets are Canada 1981; Hungary 1994; United Kingdom 1986 and 1995; Switzerland 1992; France 1978 and 1984; Hungary 2009; Netherlands 1983. Robustness checks including these individuals as having zero earnings yielded similar results, see Appendix C.

⁹ See Online Appendix D.

¹⁰ The innovative approach developed by Schwartz (2010) does not allow decomposing the total effect of changes in employment and earnings association on inequalities. The baseline scenario against which contributions of changes in the earnings association are calculated corresponds to a situation in which employment rates would vary over time but no earnings association would exist in any year. This implausible reference does not allow evaluating the effect of fixing employment rates and earnings association to the level observed in the first year. Besides, as explained later, we take the first year observed for each country as the reference period, rather than basing our analysis on a cross-year average, which makes the results insensitive to the addition or exclusion of extra years to the analysis.

¹¹ Given the small sample sizes in the first year for some countries, the proportion of zero-earning partners cannot be estimated precisely for each of the twenty quantiles. Therefore, instead of using the observed proportions of partners with zero earnings in the first year directly, we estimate them using a curvilinear relation via the quantile rank and its square (Schwartz 2010). In practice, the two strategies yield almost identical results.

¹² Mastekaasa and Birkelund (2011) obtain different results for Norway as female employment increased dramatically between 1974 and 1986 (our first survey year) but less clearly afterward.

¹³ The exceptions they noted are Czechia, Finland, and Hungary, with slightly equalizing effects. In our analysis, we found no effect in Czechia and Finland, and a limited disequalizing effect in Hungary. This difference is likely explained by our longer observation periods (their analysis stops at 2004-2005) as earnings correlation has been increasing in recent years in Hungary. We also found an equalizing effect in the Netherlands, and no effect in Spain over the same period, while they observe a slightly disequalizing effect.

¹⁴ More precisely, our results agree for France, the Netherlands, and Austria. In Canada, Germany, Greece, and Ireland, our results differ due to developments since the 2000s; in the United Kingdom, because of developments before the late 1980s. They only diverge over the same period for Denmark, Luxembourg, and Spain, as they do not observe any effect but we

observe a disequalizing effect in the former country and an equalizing effect in the two latter countries.

¹⁵ However, regarding descriptive statistics, we should note that the earnings correlations diverge significantly for many countries with those reported by Nieuwenhuis, Van der Kolk and Need (2017:11), even though we both used LIS data. Our results are more consistent with other studies in the literature, notably Schwartz (2010:1540) and Reed and Cancian (2012:10) for the United States, Grotti and Scherer (2016) for Germany, Italy and the United States, and Bouchet-Valat (2017) for France.

¹⁶ Results also changed for the United Kingdom, now covering a period where male employment rates increased, rather than decreased, and therefore showed a more equalizing impact of changes in the earnings association.

Appendix to “Are increasing earnings correlations between partners of concern to inequality? A comparative study of 21 countries”

Appendix A. Robustness checks using harmonized period (from the early 1990s to the mid-2010s)

Table A1. Overview of changes in earnings correlations, employment, and observed and simulated levels of inequality

	Δ FER	Δ MER	Δ EC	S4	Δ CV	S3	Δ S3	S2	Δ S2	S1	Δ S1
<i>Pattern 1: (Averages)</i>							-0.02		-0.03		-0.01
Germany 1994-2013	0.15	0.00	0.10	0.55	0.05	0.54	-0.01	0.53	-0.01	0.56	0.01
Luxembourg 1991-2013**	0.39	0.00	0.08	0.54	0.05	0.52	-0.02	0.52	-0.02	0.59	0.05
Switzerland 1992-2013	0.23	0.00	0.11	0.54	0.09	0.50	-0.04	0.49	-0.05	0.53	-0.02
United States 1991-2013	-0.03	-0.03	0.09	0.72	0.14	0.70	-0.02	0.68	-0.03	0.65	-0.07
<i>Pattern 2: (Averages)</i>							0.01		0.01		0.06
France 1989-2010**	0.21	0.02	0.04	0.56	-0.02	0.59	0.03	0.58	0.02	0.64	0.08
Austria 1994-2013**	0.21	0.00	-0.09	0.50	-0.01	0.53	0.02	0.52	0.01	0.55	0.04
Netherlands 1990-2013	0.38	0.03	0.01	0.52	0.02	0.52	0.00	0.51	-0.01	0.60	0.08
Slovenia 1997-2012	0.03	0.03	0.03	0.55	0.05	0.55	0.00	0.54	-0.01	0.57	0.02
Spain 1990-2013**	0.45	-0.03	0.10	0.69	0.08	0.72	0.03	0.72	0.02	0.77	0.08
<i>Pattern 3: (Averages)</i>							-0.01		-0.01		-0.04
Czechia 1992-2013	-0.10	-0.01	-0.09	0.56	0.17	0.56	0.00	0.56	0.00	0.54	-0.03
Finland 1991-2013	-0.03	-0.02	-0.05	0.50	0.06	0.50	0.00	0.50	-0.01	0.48	-0.02
Hungary 1991-2015	-0.06	-0.04	0.10	0.63	0.00	0.61	-0.02	0.60	-0.03	0.56	-0.07
<i>Pattern 4: (Averages)</i>							0.02		0.02		-0.02
Ireland 1994-2010	0.16	-0.07	-0.05	0.68	-0.06	0.72	0.03	0.72	0.04	0.70	0.02
Greece 2000-2013**	0.03	-0.09	0.02	0.69	0.10	0.70	0.01	0.69	0.01	0.63	-0.05
<i>Pattern 5: (Averages)</i>							-0.01		-0.01		0.00
Sweden 1995-2005	-0.02	0.01	0.00	0.51	0.05	0.51	0.00	0.50	0.00	0.50	-0.01
Norway 1991-2010	0.03	-0.02	0.03	0.49	0.09	0.48	-0.01	0.47	-0.02	0.46	-0.03
Canada 1991-2013	0.04	0.00	-0.03	0.61	0.05	0.61	0.00	0.60	-0.01	0.61	0.00
Denmark 1992-2013	0.02	0.01	0.06	0.47	0.04	0.46	-0.01	0.45	-0.02	0.47	0.00
United Kingdom 1991-2013	0.07			0.68							
		0.03	0.04		0.05	0.67	-0.01	0.67	-0.02	0.71	0.02
<i>Other</i>											
Australia 1995-2014	0.12	0.04	-0.01	0.62	0.01	0.62	0.00	0.62	0.00	0.69	0.07
Italy 1991-2014	0.10	-0.06	0.11	0.59	0.10	0.60	0.01	0.59	-0.01	0.55	-0.05

Note. Δ FER = Absolute change in share of women with non-zero earnings (Female Employment Rate); Δ MER = Absolute change in share of men with non-zero earnings (Male Employment Rate); Δ CV = Observed change in Coefficient of Variation from first to last year; Δ EC = Total change in earnings correlation among partners between

first and last year; S4 = Observed Coefficient of Variation in last year; S3 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples were to have remained stable; S2 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. $\Delta S1/\Delta S2/\Delta S3$ = Simulated change in Coefficient of Variation under S1/S2/S3 as compared to observed inequality (S4). Countries with net earnings information are signaled with **. Values in **bold** are those which differ from Table 2 by more 0.02 for $\Delta S1/\Delta S2/\Delta S3$ and 0.10 for other indicators. Countries in **red** are those surveys are lacking to get close to the 1991-2013 time range.

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54

Online Appendix B. Replication of Table 2 excluding self-employed without labor income in countries where self-employed income is reported at the household level

Table B1. Overview of changes in earnings correlations, employment, and observed and simulated levels of inequality (robustness check)

	Δ FER	Δ MER	Δ CV	Δ EC	S4	S3	Δ S3	S2	Δ S2	S1	Δ S1
<i>Pattern 1: (Averages)</i>							-0.03		-0.04		0.01
Germany 1973-2016	0.46	-0.03	0.18	0.26	0.56	0.54	-0.02	0.50	-0.05	0.55	-0.01
Luxembourg 1991-2013**	0.41	0.00	0.04	0.05	0.54	0.53	-0.01	0.53	0.00	0.60	0.06
Switzerland 1982-2013	0.39	-0.01	0.13	0.21	0.54	0.50	-0.05	0.48	-0.06	0.54	-0.01
United States 1974-2016	0.22	-0.03	0.22	0.21	0.72	0.68	-0.03	0.67	-0.05	0.70	-0.02
<i>Pattern 2: (Averages)</i>							0.01		0.01		0.08
France 1978-2010**	0.35	-0.01	-0.01	0.12	0.56	0.58	0.02	0.57	0.00	0.63	0.07
Austria 1994-2016**	0.23	-0.01	0.07	0.03	0.52	0.52	0.00	0.51	-0.01	0.54	0.02
Netherlands 1983-2013	0.57	0.07	-0.02	0.02	0.52	0.55	0.03	0.54	0.02	0.68	0.16
Slovenia 1997-2015	0.04	0.05	0.04	-0.01	0.55	0.56	0.01	0.55	0.00	0.59	0.04
Spain 1990-2016**	0.53	0.03	0.06	0.11	0.68	0.70	0.02	0.70	0.02	0.82	0.13
<i>Pattern 3: (Averages)</i>							0.00		0.00		-0.01
Czechia 1992-2013	-0.10	-0.01	0.19	-0.03	0.56	0.56	0.00	0.56	0.00	0.54	-0.02
Finland 1987-2016	-0.02	-0.02	0.06	-0.08	0.51	0.52	0.00	0.51	0.00	0.49	-0.02
Hungary 1991-2015	0.06	0.03	-0.12	0.02	0.48	0.47	-0.01	0.47	-0.01	0.51	0.03
<i>Pattern 4: (Averages)</i>							0.01		0.02		0.00
Ireland 1994-2010	0.18	-0.03	0.03	-0.06	0.68	0.69	0.01	0.71	0.03	0.74	0.06
Greece 2000-2013**	0.03	-0.10	0.10	0.02	0.69	0.70	0.01	0.69	0.01	0.63	-0.06
<i>Pattern 5: (Averages)</i>							-0.01		-0.03		-0.03
Sweden 1975-2005	0.09	-0.03	0.06	0.11	0.51	0.49	-0.02	0.47	-0.04	0.48	-0.03
Norway 1986-2010	0.04	-0.03	0.08	0.11	0.49	0.48	-0.01	0.46	-0.03	0.45	-0.04
Canada 1987-2013	0.11	-0.01	0.09	0.05	0.61	0.60	-0.01	0.59	-0.02	0.61	0.00
Denmark 1987-2016	0.02	0.00	0.05	0.04	0.47	0.46	-0.01	0.45	-0.02	0.46	-0.01
United Kingdom 1974-2016	0.15	-0.04	0.29	0.19	0.71	0.69	-0.02	0.67	-0.04	0.67	-0.04
<i>Other:</i>											
Australia 1985-2014	0.13	-0.01	0.12	0.04	0.62	0.61	-0.01	0.62	0.00	0.64	0.02
Italy 1987-2014	0.21	-0.06	0.20	0.20	0.71	0.73	0.02	0.72	0.01	0.71	0.00

Note. Δ FER = Absolute change in share of women with non-zero earnings (Female Employment Rate); Δ MER = Absolute change in share of men with non-zero earnings (Male Employment Rate); Δ CV = Observed change in Coefficient of Variation from first to last year; Δ EC = Total change in earnings correlation among partners between first and last year; S4 = Observed Coefficient of Variation in last year; S3 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples were to have remained stable; S2 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. Δ S1/ Δ S2/ Δ S3 = Simulated change in Coefficient of Variation under S1/S2/S3 as compared

to observed inequality (S4). Countries with net earnings information are signaled with **. **Values in bold** are those which differ from Table 2 by more than 0.01.

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54.

Online Appendix C. Replication of Table 2 including all employed individuals without labor income as zero-earners (non-employed), rather than excluding them

Table C1. Overview of changes in earnings correlations, employment, and observed and simulated levels of inequality (robustness check)

	Δ FER	Δ MER	Δ CV	Δ EC	S4	S3	Δ S3	S2	Δ S2	S1	Δ S1
<i>Pattern 1: (Averages)</i>							-0.03		-0.05		0.00
Germany 1973-2016	0.46	-0.03	0.12	0.23	0.56	0.54	-0.02	0.51	-0.05	0.55	-0.01
Luxembourg 1991-2013**	0.39	0.00	0.05	0.08	0.54	0.52	-0.01	0.52	-0.01	0.59	0.05
Switzerland 1982-2013	0.40	-0.01	0.02	0.24	0.54	0.50	-0.05	0.48	-0.07	0.53	-0.02
United States 1974-2016	0.21	-0.03	0.21	0.21	0.72	0.68	-0.04	0.66	-0.05	0.70	-0.02
<i>Pattern 2: (Averages)</i>							0.02		0.01		0.11
France 1978-2010**	0.40	0.08	-0.12	0.05	0.56	0.58	0.02	0.57	0.01	0.73	0.17
Austria 1994-2016**	0.21	-0.00	0.00	-0.09	0.52	0.54	0.02	0.53	0.01	0.56	0.05
Netherlands 1983-2013	0.55	0.10	-0.12	-0.01	0.52	0.57	0.04	0.57	0.04	0.72	0.20
Slovenia 1997-2015	0.03	0.03	0.05	0.03	0.55	0.55	0.00	0.54	-0.01	0.57	0.02
Spain 1990-2016**	0.50	0.02	0.07	0.17	0.68	0.69	0.00	0.68	0.00	0.78	0.10
<i>Pattern 3: (Averages)</i>							0.00		-0.01		-0.01
Czechia 1992-2013	-0.10	-0.01	0.17	-0.09	0.56	0.56	0.00	0.56	0.00	0.54	-0.03
Finland 1987-2016	-0.02	-0.03	0.07	-0.03	0.51	0.52	0.00	0.51	0.00	0.48	-0.03
Hungary 1991-2015	0.06	0.03	-0.15	0.04	0.48	0.47	-0.01	0.47	-0.02	0.51	0.03
<i>Pattern 4: (Averages)</i>							0.02		0.02		-0.02
Ireland 1994-2010	0.17	-0.06	-0.07	-0.06	0.68	0.71	0.03	0.71	0.03	0.70	0.02
Greece 2000-2013**	0.03	-0.09	0.10	0.02	0.69	0.70	0.01	0.69	0.01	0.63	-0.05
<i>Pattern 5: (Averages)</i>							-0.02		-0.03		-0.03
Sweden 1975-2005	0.10	-0.03	0.08	0.14	0.51	0.49	-0.02	0.47	-0.04	0.47	-0.03
Norway 1986-2010	0.04	-0.03	0.11	0.13	0.49	0.47	-0.02	0.45	-0.04	0.44	-0.04
Canada 1987-2013	0.09	-0.01	0.08	0.04	0.61	0.60	-0.01	0.59	-0.02	0.60	-0.01
Denmark 1987-2016	0.04	0.00	0.04	0.14	0.47	0.46	-0.01	0.44	-0.03	0.46	-0.01
United Kingdom 1974-2016	0.13	-0.05	0.27	0.19	0.71	0.67	-0.04	0.66	-0.05	0.65	-0.06
<i>Other:</i>											
Australia 1985-2014	0.10	-0.02	0.11	0.03	0.62	0.61	-0.01	0.62	0.00	0.63	0.01
Italy 1987-2014	0.17	-0.07	0.16	0.16	0.71	0.72	0.01	0.68	-0.03	0.66	-0.05

Note. Δ FER = Absolute change in share of women with non-zero earnings (Female Employment Rate); Δ MER = Absolute change in share of men with non-zero earnings (Male Employment Rate); Δ CV = Observed change in Coefficient of Variation from first to last year; Δ EC = Total change in earnings correlation among partners between first and last year; S4 = Observed Coefficient of Variation in last year; S3 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples were to have remained stable; S2 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. Δ S1/ Δ S2/ Δ S3 = Simulated change in Coefficient of Variation under S1/S2/S3 as compared to observed inequality (S4). Countries with net earnings information are signaled with **. **Values in bold** are those which differ from Table 2 by more 0.01.

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54.

Online Appendix D. Measuring earnings and selection of datasets.

To determine the suitability of datasets we first inspected the earnings of employed and self-employed individuals. As mentioned in the main text, we found some suspiciously high shares of (self) employed individuals reporting no individual earnings in many countries. On further inspection, we found that in several countries, self-employed income is only reported on the household level and individual earnings were therefore set at 0 for self-employed individuals with no other sources of income. In such cases, we split household-level self-employed income evenly across all self-employed individuals in the household. In other datasets, individual self-employed income was recorded to be zero for large parts of the sample and not recorded at the household level either. We therefore exclude all couples in which a self-employed individual has zero labor income (after redistributing household-level self-employed income) from all samples, as these are likely to represent situations of missing information rather than actual zero earnings.

Finally, in nine out of 163 datasets, large shares of employed individuals (between 3% and 11%) have zero labor income recorded. For these datasets we exclude all couples in which an employed individual has zero earnings too. These datasets are Canada 1981; Hungary 1994; United Kingdom 1986 & 1995; Switzerland 1992; France 1984; Hungary 2009; Netherlands 1983; Poland 1992. After applying these corrections, there were still several datasets for which we could not reproduce employment rates or inequality trends as found in other sources well, and we therefore decided to exclude them. These excluded datasets are: Australia 1989, Belgium 1992-2000; Canada 1981; Spain 1995; Hungary 1994; Hungary 2009; Luxembourg 1997; Netherlands 1993; Norway 1979; Norway 2013; Poland 1992-2013; Slovakia 1992-2013; United Kingdom 1995. In some cases these discrepancies were produced by small sample sizes, such as the Hungarian datasets.

To double check whether our final measure of individual earnings and sample produced inequality estimates in line with those of inequality estimates from LIS data based on household-level earnings, we compared estimates of inequality with more consolidated estimates of inequality provided by Solt (2016). To guarantee comparability with the Solt estimates, we use gross or net amounts depending on how they were collected by LIS (i.e. we do not “net down” gross numbers in countries that have mixed series of gross and net figures across the years covered).

Solt provides in the SWIID database (available at <https://fsolt.org/swiid/>) estimates of household level market income inequality based on various data sources, including LIS. Our estimates of inequality differ on various aspects:

- 1) Market income in Solt’s estimates includes labour income, capital income and private transfers received by the household. Our measure of earnings excludes capital income and private transfers.
- 2) We set negative incomes at zero.
- 3) We exclude households with at least one self-employed individual without earnings recorded.
- 4) For 9 datasets, we exclude households with at least one employed individual without recorded earnings.

These four decisions were relatively inconsequential for inequality estimates. Figure D1 displays a scatterplot of estimates of inequality from Solt as compared to estimates of inequality based on household level labor income (hil in (old) LIS) after applying these 4 adjustments. The correlation between estimates is 0.97. The outlier is Poland 1995 (a country excluded due to our inability to reproduce consistent estimates of employment trends and inequality trends).

Online Appendix E. Results with Gini coefficient as index of inequality between household rather than Coefficient of Variation

Table E1. Overview of changes in observed and simulated levels of inequality measured with the Gini coefficient

	Δ Gini	S4	S3	Δ S3	S2	Δ S2	S1	Δ S1
Pattern 1:								
Germany 1973-2016	0.07	0.30	0.29	-0.01	0.27	-0.03	0.29	-0.01
Luxembourg 1991 - 2013**	0.04	0.29	0.28	-0.01	0.28	-0.02	0.30	0.01
Switzerland 1982-2013	0.03	0.28	0.27	-0.02	0.25	-0.03	0.28	-0.01
United States 1974-2016	0.10	0.38	0.36	-0.02	0.35	-0.03	0.36	-0.01
Pattern 2:								
France 1978-2010**	-0.01	0.30	0.31	0.01	0.30	0.00	0.34	0.04
Austria 1994-2016**	0.00	0.28	0.30	0.01	0.29	0.01	0.31	0.03
Netherlands 1983-2013	-0.03	0.29	0.30	0.01	0.29	0.01	0.36	0.07
Slovenia 1997-2015	0.03	0.31	0.31	0.00	0.30	-0.01	0.32	0.01
Spain 1990-2016**	0.05	0.38	0.38	0.00	0.37	0.00	0.42	0.04
Pattern 3:								
Czechia 1992-2013	0.08	0.30	0.30	0.00	0.30	0.00	0.28	-0.02
Finland 1987-2016	0.04	0.28	0.28	0.00	0.28	0.00	0.26	-0.01
Hungary 1991-2015	-0.06	0.27	0.26	-0.01	0.26	-0.01	0.28	0.01
Pattern 4:								
Ireland 1994-2010	-0.02	0.38	0.39	0.01	0.40	0.02	0.39	0.01
Greece 2000-2013**	0.06	0.38	0.38	0.00	0.38	0.00	0.34	-0.03
Pattern 5:								
Sweden 1975-2005	0.04	0.28	0.27	-0.01	0.25	-0.02	0.26	-0.02
Norway 1986-2010	0.06	0.27	0.26	-0.01	0.25	-0.02	0.24	-0.02
Canada 1987-2013	0.04	0.34	0.33	-0.01	0.33	-0.01	0.33	-0.01
Denmark 1987-2016	0.02	0.26	0.25	-0.01	0.24	-0.01	0.25	-0.01
United Kingdom 1974-2016	0.13	0.37	0.36	-0.01	0.35	-0.02	0.34	-0.03
Other:								
Australia 1985-2014	0.05	0.34	0.33	0.00	0.33	0.00	0.34	0.00
Italy 1987-2014	0.03	0.33	0.34	0.01	0.32	-0.01	0.29	-0.04

Note. Δ Gini = Observed change in Gini coefficient from first to last year; S3 = simulated Gini coefficient in last year if earnings association among dual-breadwinner couples were to have remained stable; S2 = simulated Gini coefficient in last year if earnings association among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated Gini coefficient in last year if earnings association among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. Δ S1/ Δ S2/ Δ S3 = Simulated change in Gini coefficient under S1/S2/S3 as compared to observed Gini coefficient (S4). Countries with net earnings information are signaled with **.

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54.

Online Appendix F. Results with partners' earnings correlation as outcome rather than earnings inequality between households

Table F1. Overview of simulated earnings correlations between partners under the scenarios

	ΔEC	S4	S3	$\Delta S3$	S2	$\Delta S2$	S1	$\Delta S1$
Pattern 1:								
Germany 1973-2016	0.26	0.17	0.09	-0.08	-0.05	-0.22	-0.08	-0.25
Luxembourg 1991 - 2013**	0.17	0.20	0.12	-0.07	0.12	-0.08	0.04	-0.16
Switzerland 1982-2013	0.30	0.13	-0.08	-0.21	-0.16	-0.29	-0.18	-0.31
United States 1974-2016	0.21	0.13	0.01	-0.12	-0.05	-0.17	-0.09	-0.22
Pattern 2:								
France 1978-2010**	0.11	0.18	0.26	0.07	0.20	0.02	0.09	-0.09
Austria 1994-2016**	-0.02	0.14	0.24	0.10	0.20	0.06	0.17	0.03
Netherlands 1983-2013	-0.02	0.15	0.36	0.21	0.35	0.20	0.15	0.01
Slovenia 1997-2015	0.07	0.32	0.32	0.00	0.26	-0.05	0.26	-0.06
Spain 1990-2016**	0.19	0.34	0.35	0.01	0.32	-0.02	0.17	-0.17
Pattern 3:								
Czechia 1992-2013	-0.02	0.18	0.18	0.01	0.18	0.01	0.23	0.05
Finland 1987-2016	0.04	0.25	0.27	0.01	0.23	-0.02	0.23	-0.03
Hungary 1991-2015	0.08	0.30	0.24	-0.06	0.20	-0.10	0.20	-0.10
Pattern 4:								
Ireland 1994-2010	-0.04	0.07	0.18	0.11	0.19	0.12	0.12	0.05
Greece 2000-2013**	0.00	0.16	0.20	0.05	0.18	0.03	0.15	0.00
Pattern 5:								
Sweden 1975-2005	0.22	0.28	0.18	-0.10	0.07	-0.21	0.05	-0.23
Norway 1986-2010	0.19	0.20	0.12	-0.08	0.01	-0.19	0.02	-0.18
Canada 1987-2013	0.09	0.17	0.14	-0.03	0.10	-0.07	0.08	-0.09
Denmark 1987-2016	0.15	0.28	0.21	-0.07	0.13	-0.15	0.13	-0.15
United Kingdom 1974-2016	0.22	0.19	0.07	-0.13	0.02	-0.17	-0.03	-0.22
Other:								
Australia 1985-2014	0.03	0.12	0.08	-0.03	0.10	-0.01	0.09	-0.03
Italy 1987-2014	0.12	0.24	0.29	0.06	0.13	-0.10	0.12	-0.11

Note. ΔEC = Total change in earnings correlation among partners between first and last year; S4 = Observed correlation in last year; S3 = simulated correlation in last year if earnings association among dual-breadwinner couples were to have remained stable; S2 = simulated correlation in last year if earnings association among dual-breadwinner couples and employment-earnings associations were to have remained stable; S1 = simulated correlation in last year if earnings association among dual-breadwinner couples and employment-earnings associations and levels of employment were to have remained stable across the study period. $\Delta S1/\Delta S2/\Delta S3$ = Simulated change in correlation under S1/S2/S3 as compared to observed correlation (S4). Countries with net earnings information are signaled with **. Note: values reported in the ΔEC column are computed from earnings divided in 20 quantiles (like for other columns), therefore they are not exactly equal to those in the same column in Table 2, which are computed directly on observed earnings.

Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations and Coefficients of Variation, couples where the head of household and partner are both between age 30 and 54.

Online Appendix G. Bootstrapped Confidence Intervals

We computed confidence intervals for our main results of Table 2 based on 500 ordinary bootstrap replicates (Table G1). For each replicate, a sample of couples of the same size as the observed sample was drawn with replacement from the observed sample, and all models and the corresponding counterfactual Coefficients of Variation were estimated on that sample. 95% confidence intervals were then computed based on a normal distribution.

These replicates have been carried out on unweighted tables, as the weighted tables cannot be decomposed into individual observations. Calculating bootstrapped confidence intervals for weighted results is complicated because individual data cannot be extracted from the LISSY remote access system. In a few cases (highlighted in grey in Table G1), unweighted results diverge greatly from weighted results reported in Table 2: in these cases, the bootstrap confidence intervals are of little value. More generally, these unweighted bootstrap confidence intervals should only be taken as an indication of the precision of estimates, and weighted coefficients should be preferred for substantive interpretations.

Let us also note that these confidence intervals use only data for the first and last observed years. Therefore, they discard information regarding trends over years shown in Figure 2 and A6, and should be considered as conservative estimates of the uncertainty of results (as including information from more waves information could reduce uncertainty). In Table G1, columns $\Delta S3$, $\Delta S2$, and $\Delta S1$ correspond to columns with the same names in Table 2. Columns “S3 – S2” and “S2 – S1” provide additional information regarding differences between subsequent scenarios, indicating whether the contribution of a scenario is statistically significant.

Table G1. 95% bootstrap confidence intervals for Coefficient of Variation estimates under various scenarios

	$\Delta S3$ (= S3 – S4)		$\Delta S2$ (= S2 – S4)		$\Delta S1$ (= S1 – S4)		S2 – S3		S1 – S2	
	95% CI		95% CI		95% CI		95% CI		95% CI	
Pattern 1:										
Germany 1973-2016	-0.02	-0.01	-0.06	-0.04	-0.03	0.01	-0.04	-0.03	0.03	0.06
Luxembourg 1991 -2013	-0.02	0.03	-0.03	0.02	0.02	0.10	-0.02	0.01	0.02	0.09
Switzerland 1982-2013	-0.05	-0.02	-0.07	-0.03	-0.01	0.04	-0.02	0.00	0.04	0.09
United States 1974- 2016	-0.05	-0.03	-0.07	-0.04	-0.03	0.01	-0.02	-0.01	0.02	0.06
Pattern 2:										
France 1978-2010	0.00	0.03	-0.01	0.02	0.03	0.08	-0.02	0.00	0.03	0.07
Austria 1994-2016	0.01	0.04	0.01	0.04	0.05	0.12	-0.01	0.01	0.03	0.10
Netherlands 1983-2013	0.00	0.04	0.00	0.04	0.14	0.19	-0.01	0.01	0.12	0.17
Slovenia 1997-2015	-0.01	0.02	-0.03	0.01	-0.02	0.05	-0.03	0.00	0.00	0.06
Spain 1990-2016	0.00	0.02	-0.01	0.02	0.08	0.12	-0.01	0.00	0.08	0.12

<i>Pattern 3:</i>															
Czechia 1992-2013	-0.01	-	0.01	0.01	-	0.02	0.03	-	0.02	0.00	-	0.02	0.03	-	0.01
Finland 1987-2016	0.00	-	0.02	0.01	-	0.01	0.02	-	0.01	0.01	-	0.00	0.03	-	0.01
Hungary 1991-2015	-0.03	-	0.01	0.04	-	0.01	0.01	-	0.08	0.02	-	0.01	0.02	-	0.09
<i>Pattern 4:</i>															
Ireland 1994-2010	0.01	-	0.05	-0.01	-	0.05	-0.05	-	0.04	-0.04	-	0.01	-0.06	-	0.02
Greece 2000-2013	0.00	-	0.02	-0.01	-	0.04	-0.11	-	-0.04	-0.02	-	0.03	-0.12	-	-0.06
<i>Pattern 5:</i>															
Sweden 1975-2005	-0.02	-	0.00	-0.03	-	-0.01	-0.02	-	0.01	-0.02	-	-0.01	0.00	-	0.03
Norway 1986-2010	-0.02	-	-0.01	-0.05	-	-0.02	-0.06	-	-0.03	-0.03	-	-0.01	-0.02	-	0.01
Canada 1987-2013	-0.01	-	0.01	-0.02	-	0.01	0.01	-	0.05	-0.01	-	0.00	0.02	-	0.05
Denmark 1987-2016	-0.02	-	-0.01	-0.04	-	-0.02	-0.03	-	0.00	-0.02	-	-0.01	0.00	-	0.03
United Kingdom 1974-2016	-0.04	-	-0.02	-0.06	-	-0.02	-0.08	-	-0.03	-0.02	-	0.00	-0.03	-	0.01
<i>Other:</i>															
Australia 1985-2014	-0.02	-	0.00	-0.02	-	0.01	-0.01	-	0.04	0.00	-	0.02	-0.01	-	0.04
Italy 1987-2014	-0.01	-	0.02	-0.07	-	-0.03	-0.11	-	-0.04	-0.07	-	-0.03	-0.06	-	0.01

Note. S4 = Observed Coefficient of Variation in last year; S3 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples were to have remained stable; S2 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-partner earnings associations were to have remained stable; S1 = simulated level of inequality in last year if earnings correlation among dual-breadwinner couples and employment-partner earnings associations and levels of employment were to have remained stable across study period. $\Delta S1/\Delta S2/\Delta S3$ = Simulated change in Coefficient of Variation under S1/S2/S3 as compared to observed inequality (S4).

Intervals that do not include zero, indicating a statistically significant difference at the 5% level, are in **bold** (one of the bounds may be printed as 0.00 even though the interval does not exactly include zero).

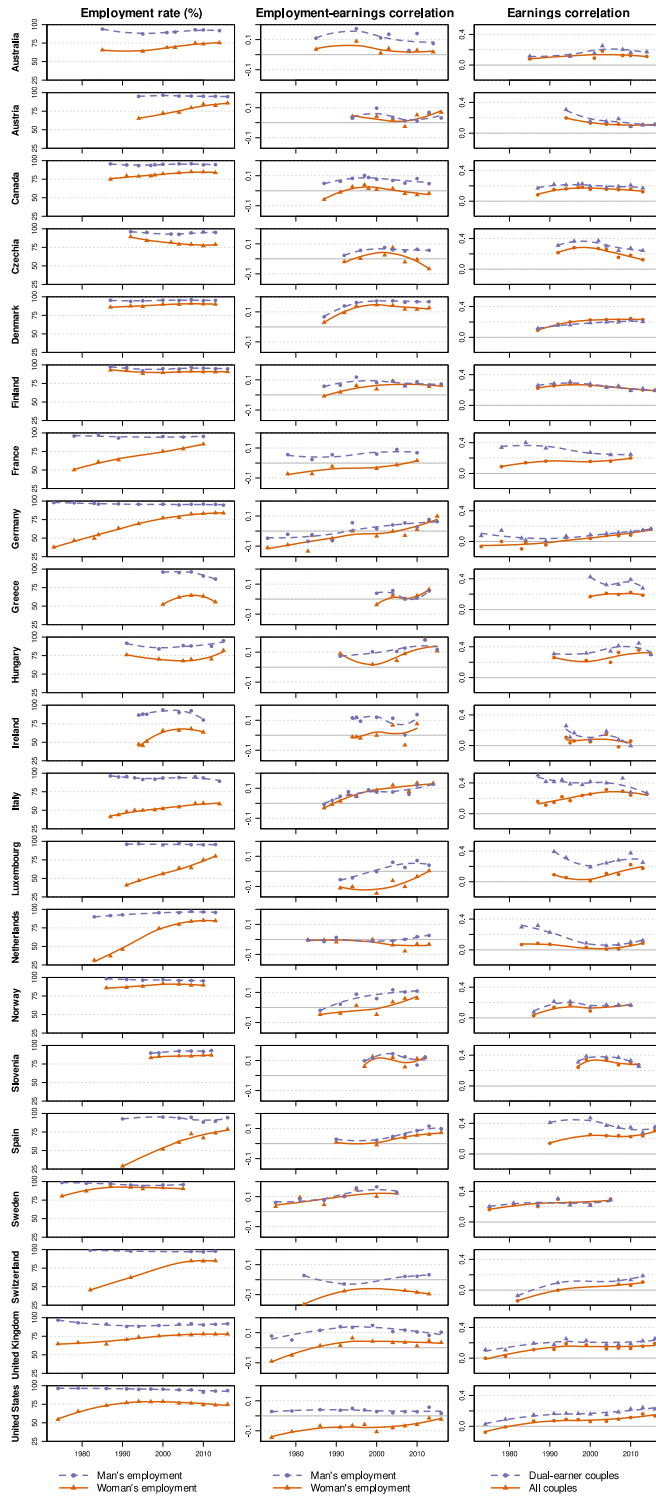
Cells for which the weighted point estimate reported in Table 2 is outside the (unweighted) confidence interval are highlighted in grey.

Source: Luxembourg Income Study

Sample: couples where the head of household and partner are both between age 30 and 54 (unweighted data)

Online Appendix H. Results for all countries.

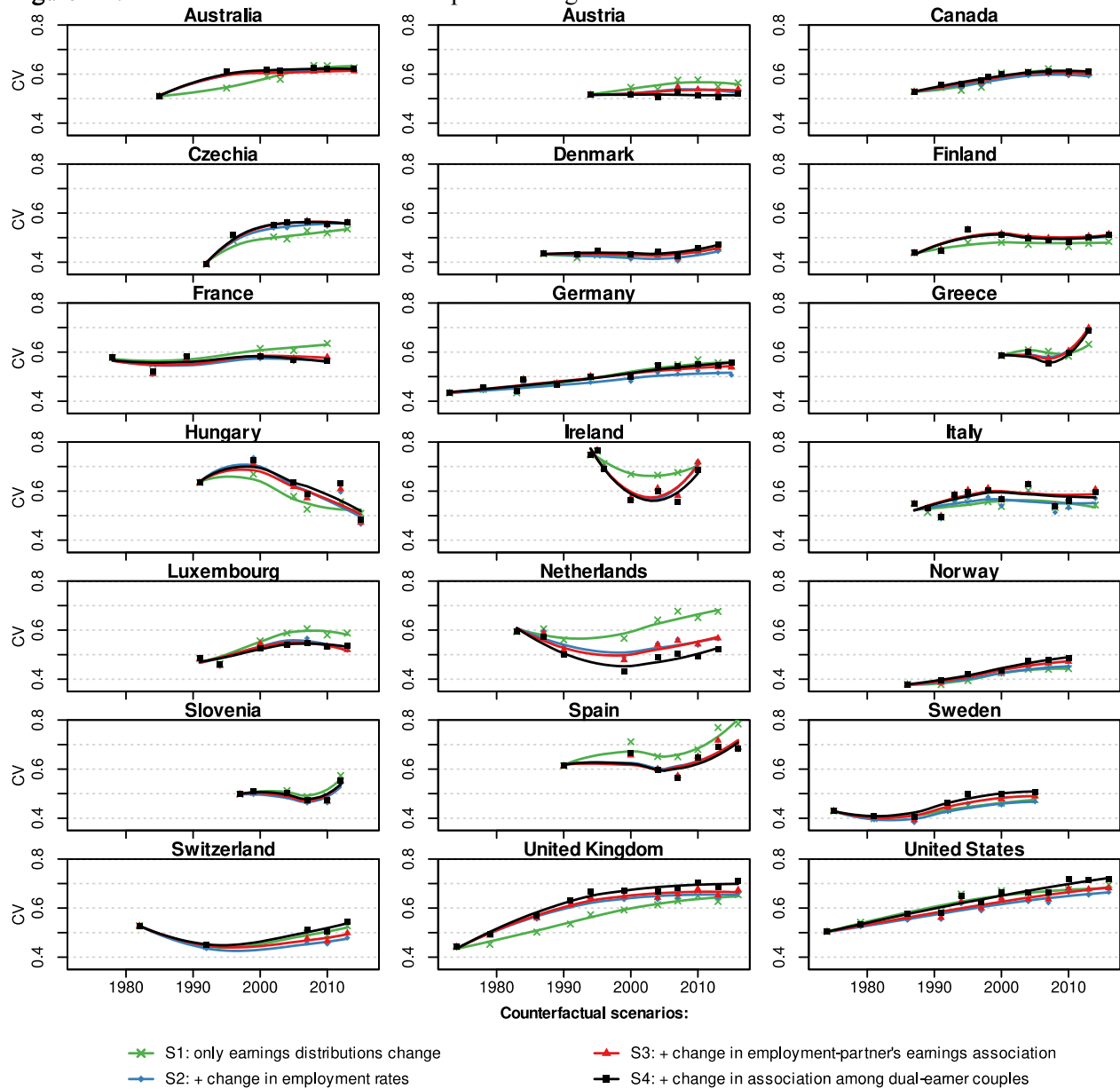
Figure H1. Changes in employment rates, employment-earnings associations, and partners' earnings correlations in all countries



Source: Luxembourg Income Study

Sample: for employment rates, single individuals and couples where the head of household and partner are both between age 30 and 54; for correlations, couples where the head of household and partner are both between age 30 and 54

Figure H2. Coefficient of Variation of couples earnings under counterfactual scenarios for all countries



Source: Luxembourg Income Study

Sample: couples where the head of household and partner are both between age 30 and 54