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A Stall Only on the Surface? Working Hours and the Persistence of the Gender Wage Gap in Western Germany 1985–2014

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Abstract

To what extent has the closing of the gender gap in hourly wages ('gender wage gap'; GWG) in Western Germany stalled due to an increasing supply of non-standard working hours? We use descriptive trend analyses and Juhn–Murphy–Pierce decompositions of German Socio-Economic Panel data for the last 30 years (1985–2014) to analyse the extent to which the expansion of part-time and marginal work, as well as overwork, may have contributed to the dynamics of the GWG in Western Germany. We find that the large increase in part-time work among women in combination with increasing wage gaps between part-time and full-time work substantially widened the GWG (by about one-sixth). Working hour effects were large enough to offset the equalizing effects of declining gender gaps in human capital, and they existed even in the public sector. In contrast to the United States, trends in overwork did not have a meaningful impact on the GWG. In an add-on, we find a widening of the gender gap in monthly earnings, but also an important closing of the gender earnings gap unconditional on employment due to an increased labour supply of women. Our results suggest that working hours should be given more consideration in research on family–work conflict and gender earnings inequalities.

Introduction

In Western countries, including Germany, strong efforts have been made to reduce the 'work-family conflict' and increase gender wage equality, in particular by improving opportunities to combine unpaid (child) care and paid labour market work (see, e.g. McGinnity, 2012). A key measure in this context has been the flexibilization of working hours. Not only flexible time schedules, but also flexible amounts of working hours are important in mitigating work–family conflict (McGinnity and Russell, 2013). In Germany, almost all employees now

have the right to reduce their working hours to part-time. In Western Germany, these reforms in work–family policies were accompanied by higher female labour force participation.

However, as long as there are gender differences in working hours, and, the same time, hourly wages are lower for shorter than longer hours, the expansion of part-time work might have unintentionally widened the gender gap in hourly wages (the so-called 'gender wage gap'; hereafter GWG). More general work has already shown that the introduction of generous parental leave

entitlements can have the side effect of deepening gender wage inequality (e.g. Mandel and Semyonov, 2006; Aisenbrey, Evertsson and Grunow, 2009; Gangl and Ziefle, 2015). The option to work shorter hours may have had similar effects on the GWG: Although the main objective was to facilitate women's labour force participation, reduced working hours might have decreased their earnings potential by offering fewer career and training options, less extensive labour market experience, and possibly also because employers offer the amenity of flexible working hours only in exchange for lower pay. Studies on the United States have shown that widening gender gaps in working hours have strongly stalled the closing of the GWG there (Cha and Weeden, 2014; Goldin, 2014). This raises the question whether similar associations between trends in working hours and the GWG can be found in Europe and Germany with a different institutional context.

In this study, we will focus on Western Germany. Western Germany is an interesting case to study, as there has been a substantial expansion of short-hours work by women, with almost every second women now working part-time. This trend has been accompanied by a sharp rise in female labour force participation. At the same time, Western Germany has a persistent, puzzling GWG, which is among the highest in OECD countries: Over the last years, women's average hourly wages have almost continuously been more than 20 per cent lower than men's, according to official statistics (Federal Statistical Office, 2021). In this article, we argue that these trends may be interrelated: The GWG may not have closed because an increasing number of women with low wage potential entered the labour force; and, besides these compositional shifts, widening gender gaps in working hours, coupled with their lower remuneration, might have increasingly contributed to the adjusted GWG. If so, there were likely important changes under the surface of a seemingly stalling GWG: More flexible working hours may have brought more women into the labour force, but only with the disadvantage that the non-standard working hours were compensated with (increasingly) lower wages, stalling the closing of the GWG.

We therefore ask: To what extent have expansions of non-standard working hours contributed to the stall of the GWG in Western Germany over the last 30 years? We are particularly interested in effects of working hours that existed net of compositional shifts (e.g. changing compositions of workers with different human capital endowments; e.g. Hunt, 2002). We restrict our analyses to Western Germany because there are still large differences in the labour force and wage structure between Western and Eastern Germany. We use descriptive trend analyses and Juhn–Murphy–Pierce (JMP) decompositions of 30 years of data from the German Socio-Economic Panel (SOEP) from 1985 to 2014. Following standard notions in the literature, we distinguish short working hours, including marginal part-time (less than 15 labour market hours per week) and regular part-time (15 to less than 35 hours), as well as overwork (50 hours or more) from standard full-time (35 to less than 50 hours). Based on these methods, we find that changes related to working hours indeed slowed the GWG closing. This was due to both larger gender gaps in supplied working hours, and increasing gaps in hourly pay for short-hours work versus standard full-time work. According to our estimates, the GWG in Western Germany would have closed by about one-sixth if there would not have been the changes in working hours and their remuneration. The effects of working hours were more pronounced in the private sector but, interestingly, also observable in the more regulated public sector. In a small add-on, using two alternative indicators to the gender gap in hourly wages, we also show that the expansion of short-hours work accumulated to a larger and widening gender gap in *monthly earnings*, but that it was associated with a meaningful closing of the gender earnings gap *unconditional* on employment. It appears that the increased availability of short-hours work was accompanied by increased labour market integration of women. These results suggest that there is a trade-off between gender inequalities in wages and in labour supply.

Note that our decomposition analysis is descriptive and not causal in nature. We do not aim to *causally* explain the possible mechanisms underlying different working hours supply and their remuneration. Instead, we only seek to quantify different channels through which trends related to working hours might have influenced GWG dynamics (composition, quantity, and price effects). Such descriptive analysis should be valuable for its own sake, if only to provide indications for causal analyses on the channels that are most relevant to gender (wage) inequality (for similar arguments on the strong need for more descriptive research in the social sciences, see Rozin, 2009; Besbris and Khan, 2017). Important avenues for future (causal) research that emerge from our analyses will be provided in our conclusions.

Theoretical Considerations and Previous Research

Reasons Why Shorter Working Hours Pay Less

Although flexible working policies that encourage part-time work aim to reduce work–family conflict

associated with long working hours, shorter working hours may also have a price in form of lower hourly wages and thus contribute to the GWG. A first reason is 'composition effects': Labour market segmentation theory implies that employers use marginal and part-time work to respond to increased competition from globalization or to adjust to volatile business cycles in a secondary segment of the labour market where jobs are primarily filled with low-skilled workers (Ermisch and Wright, 1993; Barbieri *et al.*, 2019). Similarly, overwork has long been typical for low-skilled workers. However, for the United States, overwork has become more concentrated among high-skilled male workers, reflecting changes in the labour market combined with 'skill biased technological change' (Acemoglu, 1998), meaning that overwork in the United States is now associated with higher hourly wages (premiums) relative to standard full-time work (Kuhn and Lozano, 2008; Cha and Weeden, 2014).

Different compositions of workers and jobs affect unadjusted wages. However, working hours could also affect wages adjusted for differences in human capital, occupations, and other wage-related factors (Ferber and Waldfogel, 1998; Kalleberg, 2000). A first argument on the supply side of workers is compensating wage differentials (Rosen, 1986). Workers with less time availability and flexibility (e.g. mothers with family responsibilities) may accept jobs that offer reduced working hours even when they provide lower remunerations (Goldin, 2014). Indeed, studies based on panel data have shown that women who switch from full-time to part-time work move downward to low-paid, feminized work (Blackwell, 2001; Connolly and Gregory, 2008; Manning and Petrongolo, 2008). In particular, mothers re-entering the labour market after parental leave have been found to switch to part-time jobs that pay lower wages and also to be willing to accept these lower wages for the exact reason of gaining more flexibility in working hours (Felfe, 2012; Drasch and Abraham, 2019).

On the demand side of the labour market, these arguments are complemented with theories on monopsonistic discrimination (Manning, 2003): If groups of workers are willing to accept lower wages in exchange for workplace amenities, such as more flexible working hours, employers interested in maximizing profits will pay these workers correspondingly lower wages. Part-time penalties may additionally result from employers viewing the preference for shorter hours as a signal for a poorer career orientation and weak labour market attachment (Spence, 1973; Lott and Klenner, 2018).

Finally, differences in hourly wages may be caused by higher fixed employment costs for short than long working hours (Oi, 1962; Barzel, 1973; Montgomery, 1988). If basic costs for hiring and training are similar for all employees, the shorter the workers' hours, the higher the fixed hourly costs. In addition, substituting part-time and marginal employees for full-time employees could increase coordination costs because instructions must be given more frequently and employees on a larger team must coordinate with each other (Manning and Petrongolo, 2008). If employers pass on these additional transaction costs to the workers, hourly wages will be lower for short-hours compared to long-hours contracts.[1]

Possible Effects on Trends in the GWG and Previous Research

There are two logical ways in which trends in working hours could affect GWG dynamics (c.f. Cha and Weeden, 2014), net of possible composition effects. A first reason would be changes in the *relative remuneration of long versus short working hours* ('*price effect*'). Price changes may result, for example, from the increase in flexible working hours options, which mainly correspond to worker's preferences but not employer's preferences and thus case disproportionately high coordination costs (Goldin, 2014). Given that short-hours work is less well paid (for whatever reason), a second channel through which working hours can influence trends in the GWG would be a *rising gender gap in working hours* ('*quantity effect*'). An increase in short-hours employment, especially for women, would make women more affected by the price effect and thus widen the GWG.

Previous studies mostly focused on the United States and found evidence for both effects. Based on decomposition analyses of data from the United States Current Population Survey, Cha and Weeden (2014) conclude that rising overwork premiums (price effect) combined with more men than women working longer hours (quantity effect) have greatly stalled the closing of the GWG over the last three decades. Together, these two effects offset wage-equalizing trends of higher educational attainment and labour force experience of women. In contrast, the trend in part-time work has been associated with a small GWG closing in the United States, largely because the proportion of men and women working part-time has converged slightly in recent years (Weeden, Cha and Bucca, 2016). Similar results of long-hours premiums were found by Claudia Goldin, who even concluded that the GWG in the United States 'might vanish altogether if firms did not have an incentive to disproportionately reward individuals who labored long hours' (Goldin, 2014: p. 1091).

Mandel and Semyonov (2014) found for the United States that working hours have become the most important factor for explaining the GWG in both the private and public employment sectors, although much more dominantly in the private sector.

However, it is questionable whether these findings generalize to the different institutional context in Europe. The United States is a special case with a culture of overwork. In Germany, overtime is less regulated and less likely compensated or only with time off (Anger, 2006). At the same time, while in the United States there is no right for workers to work part-time, in many European countries (the right to) part-time employment has become more standard, as will be explained in the following using Western Germany as a prime example.

Work–Family Policies and Trends in the GWG in Western Germany

Germany has long been considered a prime example of a conservative welfare state (Esping-Andersen, 1990), with a dominant male breadwinner model and very low female full-time labour market participation, especially among parents (for statistics, see Lott and Chung, 2016). In recent decades, numerous policies have been implemented to improve work–family balance in Germany (Trappe, Pollmann-Schult and Schmitt, 2015), one of the most important being the flexibilization of working hours. First, employment regulations for marginally employed persons have been relaxed somewhat by reforms in the 1990s and 2000s to allow employers more flexible work organization in response to macroeconomic impacts of growing international competition (Di Prete *et al.*, 2006; Freier and Steiner, 2008).[2] Later, a general right to reduce working hours to part-time on a voluntary basis for most employees was introduced by the 'Part-Time and Limited Term Employment Act' (Teilzeit- und Befristungsgesetz).[3] At the same time, public childcare provision has been expanded since 2009, but is mainly half day, as are primary school schedules (McGinnity and McManus, 2007). Also tax policy in Germany provides strong incentives for second earners to work part-time only (McGinnity and McManus, 2007).[4] Furthermore, women's part-time employment is supported by persistent traditional gender role attitudes, such as the ideal 'mother norm' that women prioritize care work (Lott and Klenner, 2018).

In the cultural context of Western Germany, these reforms and the increasing part-time employment of women were accompanied by a higher female labour force participation (Vogel, 2009; Barbieri *et al.*, 2019). In particular, married women and mothers in Western Germany were increasingly pursuing part-time employment as an alternative to being a homemaker (Matysiak and Steinmetz, 2008; Simonson, Romeu Gordo and Titova, 2011). Based on survey responses to the SOEP, the strong rise in part-time employment has been mostly voluntary, meeting especially the preferences of female employees for shorter working hours (Holst, 2009), and not employer's demands.

Although women's (part-time) employment increased, the GWG in Western Germany was remarkably stable. Whereas educational expansion and the resulting catching up of women with men in human capital endowment led to a narrowing of the GWG in Western Germany in the 1960s and 1970s, it has stalled at women earning on average 26–24 per cent per hour less than men over the past 30 years between 1985 and 2014 (own estimates based on the SOEP). While the GWG adjusted for differences in human capital, demography, and occupation (but not yet working hours) was lower and decreasing, the smallest adjusted gap was still −13 per cent in 2010–2014. The stall in the GWG is puzzling, considering that Germany has attempted to close it through numerous policy initiatives. However, the substantial change in labour supply and the composition of the workforce over the last decades might be exactly the reason for the stagnation of the GWG.

Research Aims and Assumptions

While there are studies showing that long working hours have become a major source of the GWG stall in the United States, the relationship of trends in non-standard working hours and the GWG in Western Germany is much less clear. Existing studies on the causal effects of part-time work on wages have found that the effect of a switch to part-time work is close to zero once selection into part-time work is controlled, although there is a penalty for men (e.g. Hirsch, 2005). Nonetheless, important long-term part-time penalties were found for past part-time work experience (e.g. Connolly and Gregory, 2009). There were no substantial differences for small (typically 1–14 hours) and regular part-time work (15–34 hours), except in Germany, where there were even small premiums for regular part-time work that is fully subject to social security benefits (Wolf, 2014). However, as she acknowledges, the author assumed symmetry between the wage effects of switching into and out of part-time work, which may underestimate the causal effects. Trend studies of the GWG comparable to those in the United States are lacking in Europe (for individual years, e.g. Matteazzi, Pailhé and Solaz, 2018). Although some studies have focused on compositional shifts (e.g.

Hunt, 2002), we are not aware of any studies that specifically focus on the relationship between changes in working hours and the GWG.

We will therefore pursue three closely connected research goals. Our first and main aim is to complement the literature with a trend study for Western Germany in which we quantify the possible contribution of the expansion of non-standard working hours to the persistence of the adjusted and unadjusted GWG through two channels: First, through *quantity effects* (change in gender gaps in working hours), and second, through *price effects* (change in gaps in adjusted wages for long versus short working hours). Given the theoretical arguments on price effects provided before, we expect the wage penalties for part-time work to increase even after adjusting for composition effects; and we expect the quantity effects (more women working part-time) and the price effects (part time wages increasingly falling below full-time wages) to reinforce each other in widening the (otherwise narrowing) GWG.

As a second research aim, we will investigate differences across sectors. Germany has a large public sector (approx. 12 per cent of employed persons, excluding self-employed, or 4.6 million people in 2014; Federal Statistical Office, 2014) with an overrepresentation of women (Melly, 2005). We expect changes related to working hours to play a smaller role for the GWG in the public sector than in the private sector, because employment conditions are more regulated (e.g. promotion of part-time work, more rigid salary structure) and anti-discrimination policies are more enforced (Mandel and Semyonov, 2014).

Finally, in a small add-on, we gauge the nexus between wages and labour supply by focusing on two other important gender inequalities in the labour market that are related to working hours: the trend in the gender gap in *monthly earnings*, which also accounts for inequalities from gaps in working hours, and the gender gap in earnings *unconditional* on employment (i.e. including non-employed individuals with zero earnings), which also considers inequalities due to differences in labour force participation. Although all these gender inequalities accumulate into an even larger overall inequality, there has been little research on the possible trade-off between pay and the non-random selection of

women into labour supply (for rare exemptions, see Hunt, 2002; Olivetti and Petrongolo, 2008).

Methods

We will begin by graphically describing the trends in working hours and labour force participation separately for men and women in order to identify gender gaps. To study the effects of working hours on wages, we then use log-linear wage regression models (Mincer, 1974) of the following form:

$$\ln Y_{ti} = \beta_t^W X_{ti}^W + \beta_t^C X_{ti}^C + \epsilon_{ti} \tag{1}$$

lnY is the vector of log hourly wages of workers i in time periods t (survey year groups), β_t is a regression coefficients vector, X^W is the dummy variable matrix of non-standard working hours (marginal, part-time, over-work; with standard full-time being the reference category), X^C is a matrix of the control variables and a constant, and ϵ is the vector of residuals. We first estimate models that include only the working hours variables. This allows us to determine whether there are, in general, (increasing) total hourly wage gaps between non-standard and standard full-time employments ($\beta^W \neq 0$). In a second step, we add standard predictors for wages such as human capital, demography, and occupation variables (X^C) to net out composition effects. The more these net wage gaps differ (are smaller) from the total gaps, the more the wage gaps are due to composition differences. We estimate these regressions separately for men and women.

However, we are primarily interested in how changes in the gender gap in non-standard working hours have interacted with changes in the adjusted wage gap in non-standard working hours to affect the dynamics in the GWG. To identify these GWG effects, we apply a second-order JMP decomposition (Juhn, Murphy and Pierce, 1991; Blau and Kahn, 1997).[5] The decomposition allows us to detect effects that go in different directions (narrowing or widening of the GWG), i.e. it becomes visible whether there has been a change under the surface of an apparent stall of the GWG. The change in the unadjusted GWG over time is decomposed into two parts: the change in the (A) explained and (B) unexplained GWG; with the explained part summarizing observed quantity and price effects:

$$\underbrace{d\overline{lnY}_2 - d\overline{lnY}_1}_{\text{Change in the unadjusted GWG}} = \underbrace{\underbrace{(d\overline{X}_2 - d\overline{X}_1)\beta_{2p}}_{\text{Quantify effect}} + \underbrace{d\overline{X}_1(\beta_{2p} - \beta_{1p})}_{\text{Price effect}}}_{\text{(A) Change in the explained GWG}} + \underbrace{(d\overline{\theta}_2 - d\overline{\theta}_1)\sigma_{2p} + d\overline{\theta}_1(\sigma_{2p} - \sigma_{1p})}_{\text{(B) Change in the unexplained GWG}} \tag{2}$$

In Equation (2), the '*change in the unadjusted GWG*' is the change in the unadjusted GWG $d\overline{lnY}$ between time period 2 and 1. Part (A), the '*change in the explained GWG*', is composed into the following two components: First, the '*quantity effect*' is changes in gender gaps in observed characteristics and is measured as the difference in the vectors of the gender difference in means of predictors $d\overline{X}$ (X-variables, including both working hours dummies and control variables). Second, the '*price effect*' is changes in returns to observed characteristics and is measured by the difference in the vectors of coefficients β (including different remunerations for non-standard working hours). Part (B), the '*change in the unexplained GWG*' (i.e. the wage gap that still persists after adjusting for observed quantities), is made up by the two final components: changes in gender gaps in unobserved characteristics measured as the difference in the vectors of the gender difference in mean standardized residuals $d\overline{\theta}$, and changes in their returns measured by the difference in the residual standard deviation σ. The coefficients and the residual standard deviations are obtained from regressions pooling men and women (indicated by the index p; for more technical details of the decomposition, see Supplementary Part A1). As standard, the dependent variable in the regressions for men and women and the pooled regression is log wages, thus the change in the GWG corresponds to the change in the difference in the geometric means of women's and men's wages and not the arithmetic means (for more details on effect sizes see the Supplementary Part A2). This change can be interpreted approximately like that of the arithmetic means, but allows for a more precise estimate of the effects (which are, e.g. more robust to extreme values).

Using a decomposition method, the price effects estimate the mean wage difference between different working hours for the whole labour force population (averaging within and between person differences), which is exactly what we want to achieve for our descriptive research question. Although the price effects are adjusted for compositional shifts in observed variables affecting wages (the quantity effects), there is still a possible selection bias due to unobservables that would end up in the unexplained gaps and price effects as long as the selection bias is not the same for both time periods (Fortin *et al.*, 2011).[6] Using fixed-effects (FE) models would allow us to account for time-invariant (unobserved) confounders and estimate causal effects. However, these models can only be estimated for a more selective subsample of individuals who experienced variation in working hours, and therefore provide an effect that can only be generalized to the potentially 'treated'

persons (i.e. persons that change their working hours status over time; Brüderl and Ludwig, 2015). For all these reasons, we use FE-regressions only for robustness analyses. As expected, the FE-estimates show smaller but still negative wage effects for part-time work (except for the first observation period), which, most importantly, also increase (become more negative, suggesting increasing part-time pay penalties) from the first to the second observation period (see the Supplementary Table C4).

Data and Variables

The data used are the last 30 waves (1985–2014) of the German SOEP study, which includes annual information on full- and part-time workers, their weekly working hours, and gross earnings.[7] The 30-year period is used to ease comparisons with the trend studies on the United States, and also to be able to group data to 5-year intervals. These intervals provide sufficient cases for precise estimates, and in addition, taking the mean of observations has the advantage of reducing potential attenuation bias (underestimation of effect sizes) that can result from errors-in-variables problems (Wooldridge, 2010; Coban and Sauerhammer, 2017). We use cross-sectional weights for all samples provided by the SOEP team for the analyses so that the observed distribution is consistent with the known marginal distribution of the German Microcensus (a 1 per cent sample of German households; Haisken-DeNew and Frick, 2005; Solon, Haider and Wooldridge, 2015).

All analyses are based on the same selection criteria, i.e. observations in the sample must have non-missing values for all variables.[8] Our analytical sample includes dependent employees who reside in Western Germany at the time of the survey and are working age 16–64 years. We exclude farm workers, disabled persons in sheltered employment, and years before the first main job (for more details see the Supplementary Table B1).

The main dependent variable is the gross hourly wage including overtime pay (in 2010 prices). Hourly wages were computed using the standard approach: Respondents' reported gross monthly earnings for the month prior to the interview are divided by the average working hours per week and multiplied by 4.33. Following standard econometric procedures (Wooldridge, 2010), log gross hourly wages are used in the multivariate analyses. In descriptive analyses, however, de-logged values are presented for easier interpretation.

The main independent variable are working hours. We use actual weekly working hours including overtime, but excluding implausible values.[9] Hours were categorized into four dummy groups using standard cut points:

marginal part-time: less than 15 hours per week, *regular part-time*: 15 to less than 35 hours, *standard full-time*: 35 to less than 50 hours, and *overwork*: 50 hours or more.

Controls for estimating wages adjusted for compositional shifts are: public sector, current occupation dummy variables for two- or three-digit categories of the International Standard Classification of Occupations (ISCO; we collapsed occupational categories so that the number of person-years was always higher than 300 for men and women), company size ($\leq$ 20, 21–200, 201–2,000, and greater than 2,000 employees), education (number of years in education or training), actual work experience and work experience squared, tenure with the current employer (in years), currently enrolled in education, marital status (unmarried, married, and divorced/widowed), number of children in the household, federal state, metropolitan area residence, age and age squared, and migration background.[10] See Supplementary Table B2 for descriptive information.

Results

Descriptive Trends in Labour Supply and Working Hours

Figure 1 shows for men (left panels) and women (right panels) the trend in working hours status (upper panel) and labour force participation (lower panel) from 1985 to 2014.

Of men, the majority (75 per cent on average) were employed full-time in all years, and there was only a small increase in the proportion of overwork to 20 per cent and a small increase in (marginal) part-time work to (2 per cent) 4 per cent in 2010–2014. Men's labour market participation changed only little over time, averaging 83 per cent from 1985 to 2014.

For women, there were much more changes. The proportion of women working part-time increased strongly, with about half of women working shorter hours in 2010–2014 (marginal part-time 13 per cent + regular part-time 36 per cent = 49 per cent). Second, at the same time and almost in parallel, there was a steep increase in labour force participation by 19 percentage points (%p), from 54 per cent in 1985–1989 to 73 per cent in 2010–2014.

Further insights into the change of labour supply and related composition differences come from a supplementary analysis based on nonparametric kernel-density estimates for men and women by marital status and children (see Supplementary Figure B1). In particular, married women, and in this group especially mothers, switched from no labour force participation in 1985–1989 to more frequent marginal and part-time work in 2010–2014. At the same time, men's labour supply (and composition) also proved to be very stable in this finer-grained analysis: In both periods, all groups of men worked predominantly full-time, with married men and fathers consistently showing a slightly higher labour supply compared to single men. One can also see from the density estimates that part-time working hours strongly differ from standard full-time: Part-time peaks at about 20 hours per week across all groups, which is more than 10 hours per week below the lower bound of our definition of full-time (35 to less than 50 hours).

All in all, these first analyses clearly show the expected quantity effect of a widening of the gender gap in working hours. These trends were accompanied by strong, gender-specific shifts in the composition of the workforce, with partnered women and mothers in particular entering the labour market and switching to part-time work.

Descriptive Trends in Hourly Wages and Composition Effects

The quantity effect would only translate into a widening of the GWG if there were additionally gaps in hourly wages for the different working hours status. Figure 2, upper panel, shows how mean gross hourly wages have changed over time. While wages for full-time and overwork increased over the first 15 years and then plateaued, wages for both marginal and part-time work for men (left panel) and women (right panel) have decreased over the last 15 years. (Marginal work 1985–1989 for men is not shown because fewer than 50 person-years were observed.) This trend of increasing wage gaps between working hours is even more evident in Figure 2, middle panel, which shows the unadjusted log wages from regressions, but relative to full-time work rather than in absolute terms. The wage for overwork remained most similar to full-time (which is the reference line) and was always slightly lower than the standard full-time wage, while the wages of (marginal) part-time workers declined remarkably over time for both genders.

However, these wage dynamics were probably largely caused by the composition shifts described before. To account for (gendered) shifts in the labour force composition, the lower panel of Figure 2 shows wages adjusted for occupation, human capital, and demography

Distribution of working hours conditional on labour force participation

Men

Women

Marginal (1–14 hrs)   Part–time (15–34 hrs)   Full–time (35–49 hrs)   Overwork (50–80 hrs)
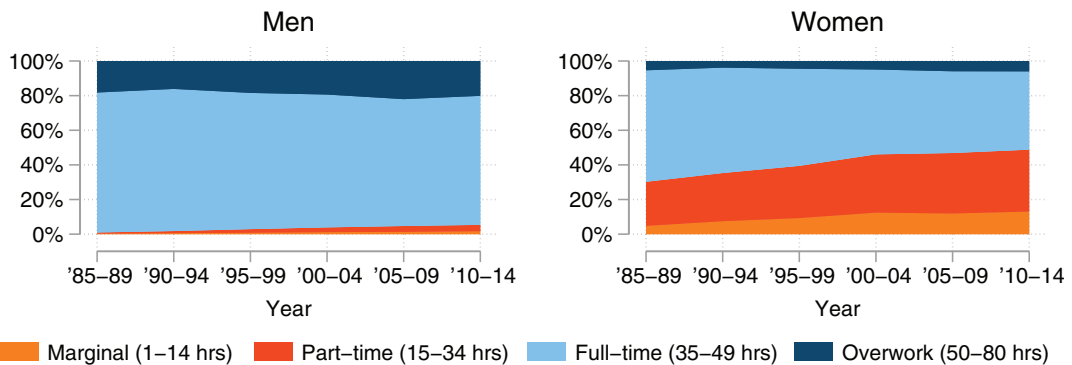
Percentage of labour force participation
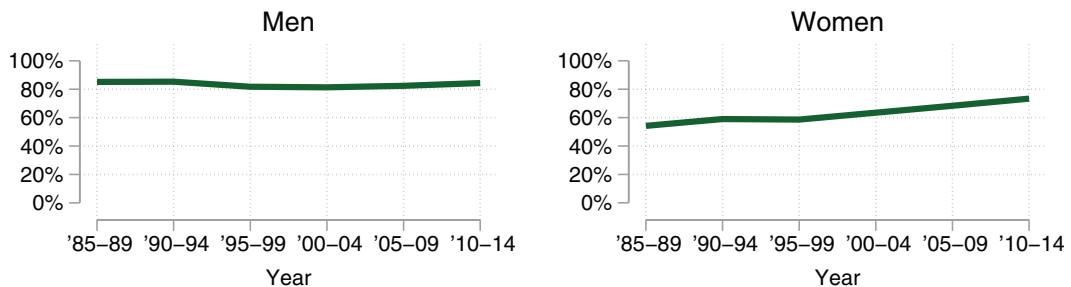
Men

Women

Figure 1. Distribution of working hours and labour force participation by gender and year

Note: At least $N = 18{,}348$ person-years per 5-year interval.

variables (see the Figure notes). Adjusted this way, the wage gaps to standard full-time work were much smaller, especially for marginal, but also for part-time work. However, there were still substantial wage gaps for (marginal) part-time, which have increased over time to (−14 per cent) −10 per cent for women and even (−22 per cent) −27 per cent for men in 2010–2014. Interestingly, adjusted wages for overwork were lower than those for full-time work (see again Figure 2, lower panel); i.e. in contrast to the United States, we do not observe overwork premiums in Western Germany, but rather wage penalties. (These could result, e.g. from unpaid overwork, which is more common in Germany than paid overtime; see Anger, 2006.[11]) However, since the proportions of men and women who overwork were rather small and quite stable, overwork probably had little impact on the change in the GWG in Western Germany. In contrast, while wage penalties in the case of short-hours work were larger for men, women were much more affected by these penalties because a much

higher proportion of women switched to short-hours work over time. Thus, in Germany, we observe both possible channels through which trends in working hours may have stalled the GWG: price and quantity effects.

Decomposition Analysis

The remainder of this article is dedicated to tracing the relationship between these shifts. Our JMP decomposition analysis brings the quantity and the price effect of working hours together and also quantifies their magnitude relative to other explanatory covariates and to the unexplained GWG. We decompose the change in the GWG over 30 years between 1985–1989 and 2010–2014, with the gap in 1985–1989 being the reference point. The estimated coefficients are given in log points, but we transform them into %p to get a more illustrative measure of the effect sizes (for technical details, see Supplementary Part A2).
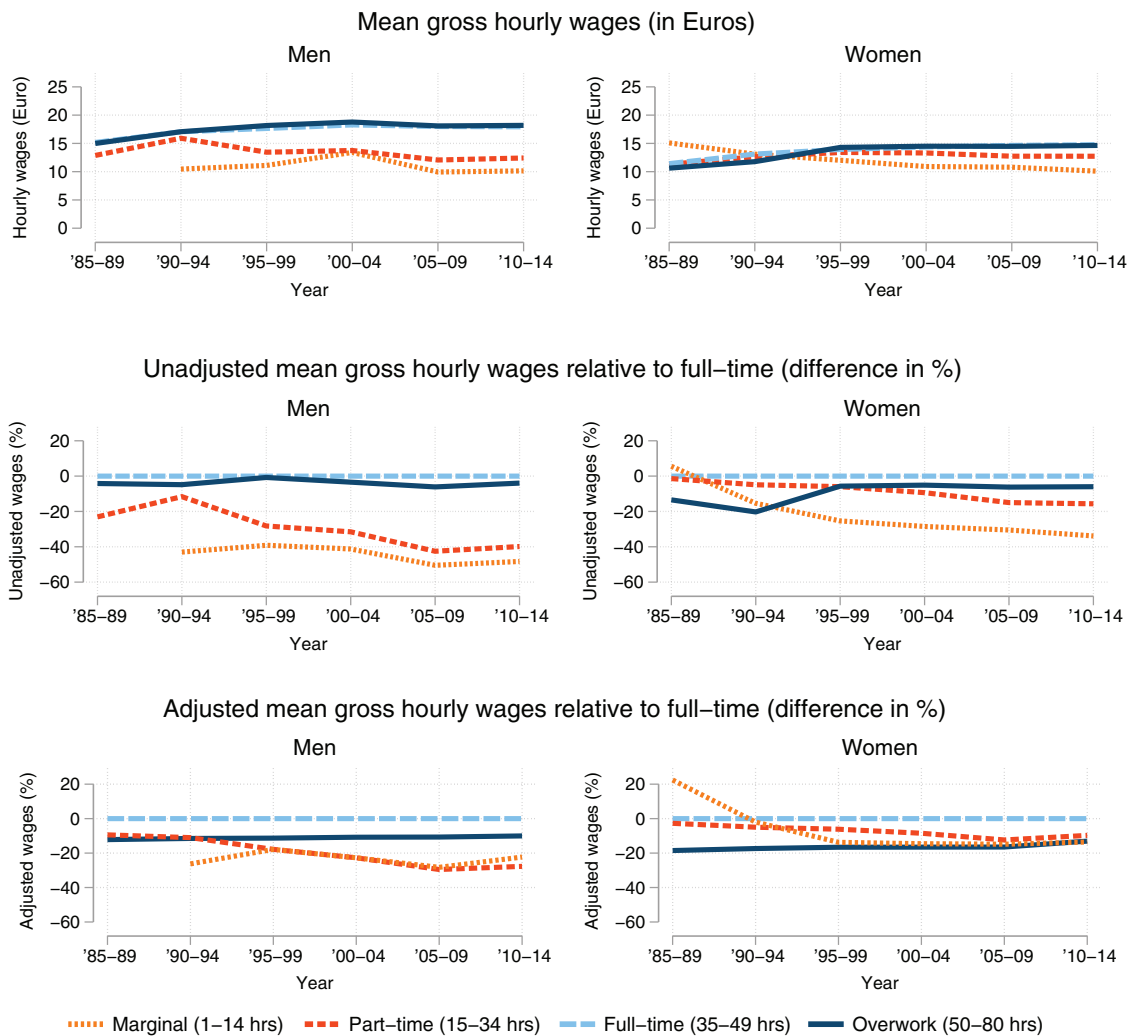
Figure 2. Mean hourly wages and unadjusted and adjusted hourly wages relative to full-time by gender and year

Notes: Relative wages: percentage difference to full-time wages. Adjusted wages: Adjusted for public sector, occupation (ISCO), company size, human capital (education, labour market experience, tenure, currently enrolled in education), and demography (e.g. marital status, age). $N = 91{,}968$ person-years for males and $N = 72{,}960$ person-years for females.

Figure 3 summarizes the results (for more detailed results, including the quantity differences of variables and the log wage regressions to the decomposition, see Supplementary Parts B and C). First, Figure 3A shows the change in the GWG. The unfilled bar at the left shows that over time, the GWG (explained and unexplained gap together) closed only slightly by 1.5%p from –25.5 per cent in 1985–1989 to –24.1 per cent in 2010–2014 (positive %p effects mean a closing of the GWG).[12] This is the small closing or 'stall' of the GWG. While the unexplained GWG (unfilled bar second from left), which comprises all unobserved variables, closed by

6.0%p, the explained GWG (unfilled bar third from left), including all observed covariates, widened by –4.2%p. This reflects that changes in the unobserved variables have benefitted women compared to men, while changes in the observed variables disadvantaged them.

Second, Figure 3B shows the decomposition of the change in the explained GWG. The bars represent the change that is attributable to the 'quantity' (dark [green] filled bar), 'price' (light [yellow] filled bar), and the total effect (quantity and price effects together; unfilled bar) of observed variables in %p. One can see that effects of working hours widened the GWG. For overwork, both
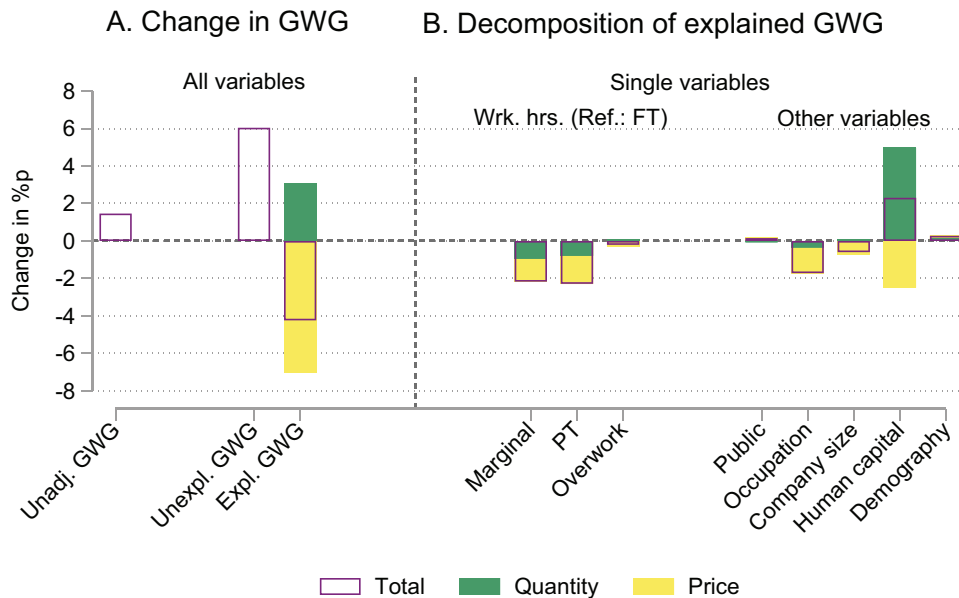
A. Change in GWG   B. Decomposition of explained GWG

Figure 3. JMP decomposition of the changes in the GWG, 1985–1989 to 2010–2014

Note: FT, full-time; PT, part-time. Numbers represent the change in the GWG in %p. Negative (positive) effects represent a widening (narrowing) of the GWG. Occupation is measured with ISCO groups. The human capital variables summarize education, labour market experience and its square, tenure, and currently enrolled in education.

the changes of quantity and price effects are of minor magnitude (+0.1%p and –0.3%p). In the case of part-time work, however, the quantity and especially the price effects played a substantial role, which, according to our estimates, have widened the GWG by –1.0%p and –1.2%p (marginal); and –0.8%p and –1.5%p (part-time).

These changes in working hours completely counteracted the positive effect of human capital variables (education, work experience, tenure, and enrollment in education) that we report together, which totalled +2.3%p (see the effects of 'other variables' on the right of Figure 3B). Changes in the quantity of human capital had the largest positive impact to the closing of the GWG with +5.0%p. Women have caught up with men especially in educational degrees and labour market experience, and this quantity effect was only partially offset by increasing gender differences in the returns to these variables ('prices', which amount to –2.5%p, see the light [yellow] filled bar for human capital).

All in all, the decomposition analysis suggests that changes in working hours substantially stalled the GWG in Western Germany: The (explained) GWG closed only slightly, but would have closed by 4.4%p or one-sixth (–17.2 per cent) from –25.5 per cent in 1985–1989 to –21.1 per cent in 2010–2014, if there would not have been the counteracting changes in the quantity of part-time work and its remunerations.[13] Trends related to working hours completely offset both wage-equalizing trends of women catching up with men in human capital and a declining relevance of unexplained variables (residuals). Thus, similar to the studies on the United States, we observe a growing importance of working hours as an explaining factor for the GWG. But in contrast to the United States, in Western Germany not effects related to very long hours (overwork), but shorter hours (part-time) are the main driving factor.

Differences by Sector

Figure 4 repeats the decomposition of the changes in the explained GWG separately for the private sector (left panel) and the public sector (right panel), identified by respondents' self-classification of the sector in which they work (for more detailed results, see the Supplementary Table C2). It can be seen that, as expected, changes in observed variables were much larger in the private sector than in the public sector, with the exception of overwork, demography, and company size. For marginal and part-time work, quantity and price
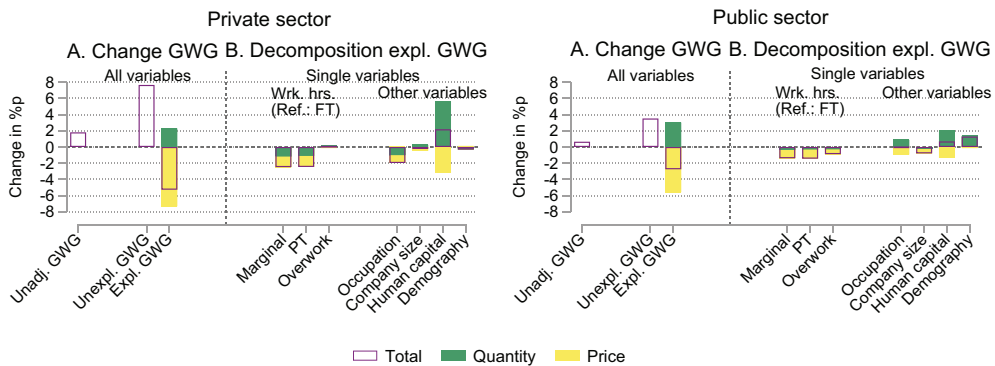
Figure 4. Private and public sector JMP decomposition of changes in the explained GWG, 1985–1989 to 2010–2014

Notes: See Figure 3. The decompositions are the same, except that these are separate for private and public sector, therefore the public sector variable is no covariate. Private sector: $N = 25,977$ person-years for males and $N = 19,384$ person-years for females. Public sector: $N = 7,410$ person-years for males and $N = 8,415$ person-years for females.

effects (i.e. wage penalties that persisted when controlling for all other explanatory variables) were larger in the private sector. More remarkably, however, even in the strongly regulated public sector, there were substantial price effects of marginal and part-time work, which widened the GWG by –2.8%p (–0.6%p + –2.2%p; for the private sector: –5.7%p = –2.6%p + –3.2%p).

Add-On: The Nexus between Wages and Labour Supply

In a final supplementary analysis, we broaden the view of gender inequalities in earnings by estimating two important alternative indicators that also reflect inequalities in different labour hours supply: First, the trend in the gender gap in *monthly earnings* rather than hourly wages to account for simultaneous changes in hourly wages and hours worked. Even if there were no longer a gender gap in hourly wages, a gender gap in working hours would still result in gender inequalities in earnings. This indicator also takes into account how gender inequalities in hourly wages and working hours multiply, which is often overlooked due to the predominant focus on the gender gap in hourly wages.

Second, in a more abstract but informative indicator, we include persons not in the labour force with zero earnings in the calculation of the gender gap, so that we estimate the gender earnings gap *unconditional* on employment. With this indicator, the various gender inequalities (labour force participation, amount of working hours, wage levels) accumulate into an even greater overall inequality since this indicator also includes the gender earnings gaps due to gendered labour force participation rates.

For obvious reasons, only unadjusted wages can be used in this analysis (there is no information on employment variables for non-employed persons).[14]

Figure 5 shows the results. For ease of comparison, the GWG (gap in hourly wages) is also shown (solid line). The gender gap in monthly earnings, which are the product of hourly wages and working hours, was throughout much larger and widened from –39.2 per cent in 1985–1989 to –42.1 per cent in 2010–2014 (dashed line). In contrast to this, the gender earnings gap unconditional on employment (including persons not in the labour force with zero earnings), which also measures labour force participation, has declined sharply by more than one-fifth (21.6 per cent) from –66.5 per cent in 1985–1989 to –52.1 per cent in 2010–2014 (short dashed line). Over time, increasing portions of women entered the labour market, and this trend of increasing labour force participation markedly closed the gender gap in access to (any) labour market earnings. This substantial decline in gender inequalities is overlooked when analysing earnings only conditional on employment, as is standard in the literature. The concurrent trend in working hours over the last 30 years (see Figure 1 again) suggests that this decline was parallel to the large expansion of part-time work, which, according to our main results, however, strongly stalled the closing of GWG conditional on employment (see Figure 3 again). In the light of these results, the persistence of this GWG could be seen in a different light: Its level was held (or even slightly reduced) despite the shift in composition that resulted from mothers (and other low-wage groups) increasingly entering the labour market
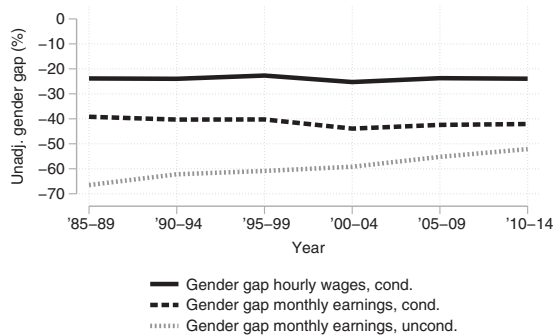
Figure 5. Changes in the unadjusted gender wage gap, the gender earnings gap and the gender earnings gap unconditional on employment, 1985–2014

Notes: This figure shows changes in the unadjusted gender gap in hourly wages (GWG) and gender gap in monthly earnings conditional, as well as the gender gap in monthly earnings unconditional on employment including non-working persons with zero earnings. The gender gaps are calculated in arithmetic means using the following formula: [(mean earnings of women – mean earnings of men)/mean earnings of men] × 100. To get more robust results, 5-year intervals are used (at least $N = 18,348$ person-years per interval).

(possibly attracted in part by more part-time options). We will discuss these and other trade-offs in our final, concluding section.

Conclusions

At first glance, more flexible and shorter working hours offer an appealing solution to reconciling labour market and family work. Part-time workers have access to labour market income and potential skills development and they often report high satisfaction with their work arrangements (Hakim, 1997; McGinnity and McManus, 2007). In many European countries, including Germany, they are fully eligible for social benefits. However, our results suggest that this greater flexibility in working hours comes at the price of reinforcing gender earnings inequalities (and vice versa). In countries like Germany, second earners (which are typically female) have strong incentives to reduce their working hours, but it is the lower pay for these shorter hours that may keep them trapped in the role of a second earner with non-standard employment. Previous work has already found that welfare states that support high levels of female labour force participation with 'family friendly' policies deepen gender inequalities (Mandel and Semyonov, 2006; Aisenbrey, Evertsson and Grunow 2009; Gangl and Ziefle, 2015).

This paper complements this literature by looking at the flexibility in amounts of working hours. Shorter working hours seem to be important for understanding both the

increase in female labour market participation and the stagnation of the GWG in Western Germany: According to our main results, the expansion of part-time work, especially among women, combined with hourly wages for part-time work increasingly falling behind those for standard full-time work, has widened the GWG among employees by no less than one-sixth (17 per cent) over the past 30 years; this effect being large enough to fully offset the wage-equalizing progress achieved by women catching up in human capital and by reducing the unexplained (residual) part of the GWG. Interestingly, not only in the private, but also in the public sector in Western Germany, wages for marginal and regular part-time work have been found to be somewhat lower than those for standard full-time work; i.e. according to our results, even in the highly regulated public sector, working hours trends have to some extent stalled the closing of the GWG. In the bigger picture, the expansion of short-hours work accumulated to a widening of the gender gap in *monthly earnings*, which is often overlooked due to the predominant focus on the gender gap in hourly wages, which is already adjusted for working hours. However, when the increase in female labour force participation is also taken into account, there has been a meaningful closing of the gender earnings gap *unconditional* on employment. Based on these findings, the stall in the GWG could be seen in a different light: The unadjusted GWG has been kept at a similar level and the adjusted GWG has even been slightly reduced in Germany, despite the increase in employment of married women and mothers with relatively low wage potentials.

All in all, our results suggest that there are, in principle, two logical possibilities to further reduce the GWG among employees: To close the gender gap in working hours, i.e. to eliminate quantity effects, e.g. by motivating more men to switch to part-time work; and/or to reduce the wage penalties (price effects) for shorter working hours. An important additional result of our decomposition was that both channels were found to be about equally important. There is a plethora of theories to explain each of the channels; teasing them apart was not in the scope of this paper. In the remainder of this paper, we point to fruitful avenues for future research.

First, we deliberately used repeated cross-sections of broad samples of persons in and out the labour market rather than tracking the same (selective) sample of employees over time. While our design allows for a general description of the trends in the labour force, the latter design would better ensure that unobserved compositional differences can be excluded. To the extent they exist, we might overestimate price effects (but for first robustness checks, see the Supplementary Table C4). At the same time, we might also underestimate some working hours effects due to

'overcontrol' bias: Previous research has already shown that women have to downgrade occupationally when they switch to part-time work (Connolly and Gregory, 2009). By controlling for occupations, we might have explained away some of the costs of switching to part-time work. Panel data methods, where the same persons can be observed in their labour market trajectories, will allow more insights into these possible mechanisms (see Wolf, 2014). With a panel design, one could also use a life-course perspective, allowing for a better conceptualization of the interconnectedness of labour supply decisions, family status, and the division of paid and unpaid work within household contexts. In addition, price effects caused by compensating wage differentials or monopsonistic discrimination, as well as signalling effects, could also be studied in survey or field experiments where potential employees have to evaluate job offers with experimentally varied working hours or employers have to rate candidates for jobs with different working hours supply (see Pedulla, 2016). These experimental designs would allow a more reliable identification of price effects and also a separation of supply- and demand-side effects, as they allow to overcome the endogeneity problem that observational data suffer from (such as: do lower wages induce lower labour supply or is it rather the other way around; see also Ehrenberg and Smith, 2018).

Second, one might compare different organizational contexts (Petersen and Saporta, 2004; Tomaskovic-Devey, 2014). Depending on the occupation, there likely exist different ways of restructuring work organization so that short-hours employees are better able to substitute full-time workers (Goldin, 2014). The theoretical literature suggests that the GWG could be significantly reduced if shorter working hours also become profitable for employers, especially in the private sector. Empirically, however, the effects are still highly speculative. To explore such measures, panel data would ideally be used that contain rich information not only about workers, but also about their workplace organization. Currently, we are not aware of any large-scale data that provide this information for Western Germany. Linked employee–employer data are too limited, for instance, in that they do not provide precise information on working hours for part-time workers. Therefore, many policy recommendations could so far only be derived from studies on full-time employees (for Germany, see Hinz and Gartner, 2005). One lesson from our study is that it is better to broaden the focus from full-time to less selective samples. Otherwise, pronounced gender inequalities associated with gendered labour supply disparities may be missed.

Third, there is a greater need for cross-country research. Interestingly, in Western Germany in particular, the increase in *short*-hours work (marginal, part-time) has widened the GWG, while in the United States, gender gaps in *long*-hours work (overwork) seem to play the most important role. Future research could examine in more detail the extent to which the larger share of (female) part-time workers and the right of workers (rather than just employers) to decide on weekly working hours can explain these cross-country differences.

Taken together, our analyses suggest that working hours deserve more attention in future research. Regardless of the precise mechanisms driving wage penalties for short working hours, our paper shows that the large availability of short-hours work can have the side effect of reinforcing gender wage inequality. If the goal is to both reduce work–family conflict and increase gender equality, the non-proportional increase in wages with working hours needs to be better understood; and/or it needs to better achieved that paid work hours (and, in turn, unpaid work hours in the home) are shared more equally between men and women (McGinnity and Russel, 2013). Improved work–family balance can likely benefit both men and women; but the GWG will only narrow if there is also more pay equity per hour.

Notes

1 There are also some arguments that shorter hours lead to *higher* hourly wages: e.g. workers with low hours might be more productive because they are less exhausted (Wolf, 2002). However, most empirical studies seem to suggest that shorter hours are associated with lower wages than full-time hours.

2 Marginal employments in so called 'mini-jobs' are tax and social security-free for employees, while employers pay a lump sum which reduces their transaction costs. By the reforms, both the maximum earnings limit and working hours for these mini-jobs were raised to allow more flexible use of these jobs.

3 This legally enforceable right implements the 'European Directive on Part-Time Work' that became effective in 2000. It is further reinforced by collective agreements that regulate various sectors in the German labour market and determine the conditions for employer's rejection of employees' requests (Lott and Chung, 2016). There were also changes in parental leave policies, with all employees meanwhile having the right to work part-time during the parental leave that lasts up to 3 years in Germany.

4 Germany's tax-splitting system penalizes the lower-paid earner in couples with high marginal tax rates (McGinnity and McManus, 2007).

5 We estimate the decomposition applying the Stata command jmpierce2 (Jann, 2005). We used Stata

16 for all computations in this article. Replication files can be found on the following OSF project page (Schmitt and Auspurg, 2022, https://osf.io/wy2xs/). We are grateful to Cha and Weeden for providing the syntax files to their 2014 article published in the United States.

6 There are techniques to correct for selective labour force participation in wage equations, but these are based on strong assumptions, and there are fundamental ambiguities in the interpretation of decomposition analysis that were gained with these methods (see, e.g. Neuman and Oaxaca, 2004). We therefore do not apply them.

7 Trend studies such as the German Microcensus only provide classified information on net earnings, but not exact measures of gross earnings. The SOEP panel study (Goebel *et al.*, 2019) is therefore a standard source to estimate trends in gross wages in Western Germany.

8 Imputations to fill-in non-response (as the SOEP team provides them) were excluded because imputations might not correctly capture fluctuations in working hours, which would have invalidated our main analyses variables.

9 These are hourly wages below 1.00 EUR or above 200 EUR which represented 0.05% (N person-years = 88) of the original sample. Additional checks, e.g. comparing different panel waves, suggested that these values likely result from misreporting or coding errors. We also excluded the 2.3% (N person-years = 3,747) of the sample where objective assessments of working hours and respondents' self-assessment of full- and part-time employment status did not match.

10 We account for family variables in the decomposition wage regressions to prevent the overestimation of the unexplained GWG in the decomposition (Averkamp, Bredemeier and Juessen, 2020). Nonetheless, the decomposition results were very similar if family variables were not controlled, with the effects of short working hours still over –4%p (see Supplementary Table C1, Model 2).

11 In our first time period in the year 1987, the SOEP data do not include information whether overtime was paid or unpaid.

12 Note again that the dependent variable in the wage regressions is logs rather than Euro levels and thus the GWG is calculated as the ratio of geometric and not arithmetic means. However, both means are close (e.g. the GWG in arithmetic means is –23.8% in the first and –23.9% in the second period; which is close to the GWG in geometric means of –25.5% and –24.1%).

13 Log points of marginal –0.0312 + log points of part-time –0.0312 = –0.0607 are –4.3878%p or –17.2 transformed into per cent-change of the GWG 1985–1989 (for technical details: Supplementary Part A2).

14 The sample for the gender earnings gap unconditional on employment consists of employed and non-employed persons in Western Germany of working age 16–64 years, excluding students and disabled persons. For comparison with the GWG conditional on employment in the main results, the self-employed were also excluded.

Supplementary Data

Supplementary data are available at *ESR* online.

Authors' Note

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