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Labor Supply Along the Extensive and Intensive Margin: Cross-Country Facts and Time Trends by Gender

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VERY PRELIMINARY; PLEASE DO NOT QUOTE

Abstract

This paper documents facts about labor supply along the extensive and intensive margin for various demographic subgroups in the US and 18 European countries for the time period 1983 to 2011. To do this, we recur to three different micro data sets, describe in detail how to make the data sets consistent internationally and over time, and compare them to aggregate data from the OECD and the Conference Board. In a recent pre-crisis cross-section, gender differences in hours worked are largest in Western and Southern Europe, driven mostly by the intensive margin in Western Europe and the extensive margin in Southern Europe. Employment rates have consistently been increasing for women in the last three decades, while the picture for hours worked per employed is more diverse. A very strong stylized fact is a negative correlation of employment rates and hours worked per employed for women in the recent cross-section, over time, and for all demographic subgroups. We present some suggestive evidence that this negative correlation is at least partly driven by a lack of part-time jobs in Eastern and Southern Europe, and that increases in flexibility can raise female labor market attachment. Last, we document that male hours worked declined more than female hours worked in the recent Great Recession, both along the extensive and along the intensive margin, but that this is an artefact of sectoral and educational effects for the extensive margin.

1 Introduction

An active recent literature has documented large differences in the levels and trends of aggregate labor supply across OECD countries. The literature traces these back to, among others, labor income taxation (Prescott (2004), Rogerson (2006), Rogerson (2008), Rogerson (2009), Ohanian et al. (2008), McDaniel (2011)), institutions (Alesina et al. (2005)), and social security systems (Wallenius (2013)).

To better understand the causes of the large differences in labor supply, it is useful to know whether these differences exist uniformly in the population, or are instead driven by specific demographic subgroups. In order to answer this question, one needs micro data to document hours worked by demographic characteristics. In this paper, we use the European Labor Force Survey, the US Current Population Survey, and the German Microcensus to document differences in labor supply across 19 OECD countries along the extensive and intensive margin by gender, also analyzing other characteristics like marital status, the presence of children, education, and sectors. In the first part of the paper, we describe in detail how we calculate annual hours worked from the micro data sets, and compare annual aggregate hours worked per employed and employment rates in our data to comparable data series from the OECD and the Conference Board. The second part of the paper then documents several facts on labor supply along the extensive and the intensive margin for different demographic subgroups in a recent pre-crisis cross-section, over time, and during the Great Recession.

We construct annual hours worked per person by multiplying aggregate employment rates and hours worked per employed. To get the former from the micro data sets, we rely on the self-reported employment status of individuals. To obtain the latter, we construct individual annual hours from actual weekly hours worked in a reference week. Since reference weeks are not spread continuously over the year, and since we find additional evidence for underreporting of vacation days and public holidays, we collect these from external data sources to control for them directly. We report international differences in self-reported and official vacation days and public holidays, as well as in other reasons for hours lost, such as sickness and maternity leave. To maximize the international comparability of the data, we employ a common capping across countries, and document the potential effects of this capping. Last, we compare our data to data from the OECD and the Conference Board in both levels and trends. The micro data sets report on average higher employment rates than the OECD, while the picture for hours worked per employed is somewhat mixed. For Germany and the US, we investigate further potential reasons for the differences in hours worked per employed in the micro data and as provided by the OECD, and present some evidence that in fact the OECD underestimates hours worked per employed, while the micro data sets might give more reliable information. We do not find any significant correlation between under- or overestimation of hours worked per employed and different data sources by the OECD, which relies on either national accounts, establishment surveys, labor force surveys, or mixed sources.

Time trends in the micro data line up well with trends in OECD or Conference Board data.

When we present hours worked facts, we focus on individuals aged 15 to 64, and on differences by gender. In a recent pre-crisis cross-section of the years 2003-2007, we show that hours worked per person are substantially higher in the US than in Europe, but surprisingly homogeneous within Europe. This homogeneity masks however substantial heterogeneity along two lines: first, by gender, with female hours lagging substantially behind male hours, and the gender hours gap being largest in Western and Southern Europe; and secondly, along the extensive and the intensive margin, with countries in Scandinavia and Western Europe exhibiting high employment rates and low hours worked per employed, while the opposite is true in Eastern and Southern Europe. For women, we document a strong negative cross-country correlation between employment rates and hours worked per employed, which is present for all demographic subgroups by marital status and presence of children. The largest difference between Europe and the US arises for unmarried women with school children, which work around 700 hours more in the US than in Europe, mostly driven by a stronger labor market attachment arising after the Clinton welfare reforms of the 1990s. Part-time work rates, defined as the percentage of employed women working less than 30 usual hours weekly, are around 40 percent in Western Europe and Scandinavia, but substantially lower in the other regions. We present some suggestive evidence that part-time jobs are in scarce supply in Eastern and Southern Europe, forcing women there to adjust their hours along the extensive margin. The negative correlation between female employment rates and hours worked per employed also arises in time trends since the 1980s, but becomes somewhat weaker in the last decade. An increase in female labor market participation can be observed in all countries, with an increasing convergence in the last decade, while hours worked per employed developments show more heterogeneity.

Last, we document hours worked during the Great Recession. A striking pattern is that on average across all countries male employment rates and hours worked per employed fell substantially more than female ones. For the employment rate, this is however not driven by an underlying gender effect, but by the different sectoral and educational composition of the male and female work force, as well as by different pre-crisis trends by gender. For hours worked per employed, we still observe a significantly larger decline for men than for women after controlling for many confounding factors. The gender difference of the decline is largest for the low educated. This could indicate an inability of employers to cut back hours worked of women, who often work part-time.

The remainder of the paper is structured as follows: Section 2 describes the micro data sets. The following section explains how we calculate individual annual hours worked from a measure of weekly actual hours worked. Section 4 then explains the construction of aggregate measures of hours worked, analyzes the effect of using external data to account for public holidays and vacation days, and compares aggregate hours worked per employed and employment rates from our data to those reported by the OECD and the Conference Board. The next three sections document hours worked along the extensive and intensive margin for men and women. Section 5 describes facts

from a recent pre-crisis cross-section (2003-2007), while Section 6 looks at trends over the last three decades, starting in 1983. Section 7 then documents the development of employment rates and hours worked per employed by gender in the Great Recession. Finally, Section 8 concludes.

2 Data Sets

We work with three different micro data sets to construct hours worked, namely the European Labor Force Survey, the Current Population Survey, and the German Microcensus.

2.1 European Labor Force Survey

The European Labor Force Survey (ELFS) is a collection of annual labor force surveys from different European countries, with the explicit goal to make them comparable across countries. We use the yearly surveys, since the quarterly ones do not provide information on marital status and education. The ELFS covers Belgium, Denmark, France, Greece, Italy, Ireland, the Netherlands,[1] and the UK from 1983 on, Portugal and Spain starting in 1986, Austria, Norway, and Sweden starting in 1995, Hungary and Switzerland starting in 1996, and the Czech Republic and Poland starting in 1997.[2] The sample size of the ELFS varies across countries and also within a country over time, but is always of considerable magnitude.

2.2 Current Population Survey

For the US, we use the Current Population Survey (CPS), which is a monthly survey of around 60,000 households. Specifically, we work with the CPS Merged Outgoing Rotation Groups data provided by the National Bureau of Economic Research (see `http://www.nber.org/data/morg.html`). This data set includes only those interviews in which the households are asked about actual and usual hours worked, namely the fourth and eighth interview of every household. The data covers around 300,000 individuals per year.

2.3 German Microcensus

The German Microcensus covers a one percent random sample of the population of Germany and is an administrative survey. Participation is mandatory. We use the scientific use files, which are a 70 percent random subsample of the original sample. This leaves us with a sample size of between 400,000 and 500,000 individuals per year. The scientific use files are available biannually from 1985

[1] For the Netherlands, we have information from 1983, 1985, and annually from 1987 on.

[2] The ELFS also covers Finland from 1995 on. However, the Finish data have large numbers of missing observations for several years, which implies that we could only use data from 1997 to 2002 for our analysis. We therefore exclude Finland entirely from the analysis. The ELFS covers also covers more transition countries, which we however exclude from the analysis because of data limitations along several dimensions.

on, and annually from 1995 on. East Germans are included in the sample from 1991 onwards.[3] The German Microcensus groups hours together if the number of observations per indicated hours worked becomes too small. This mostly concerns high numbers of hours worked, and mostly groups two adjacent hours together. In this case, we always take the mid value as the hours worked.[4]

3 Calculation of Annual Hours Worked per Person

3.1 Key Variables

The calculation of annual hours worked is based on four variables from the micro data sets, namely usual hours worked in the main job in a working week, actual hours worked in the main job in the reference week, actual hours worked in additional jobs in the reference week, and reasons for having worked more or less hours than usual in the reference week.

3.2 Capping

In the ELFS, the largest possible value for usual or actual hours worked per week in the main job is 80, with the possibility of another maximum of 80 actual hours of work in additional jobs. In the CPS, the largest possible value for actual hours worked in all jobs is 99 hours per week. We harmonize the different capping procedures implemented by ELFS and CPS by introducing a common cap. To achieve maximum consistency across countries, we cap the possible number of actual and usual hours worked per week in all jobs at 80.

Even though we have not yet introduced how we construct annual hours worked, we can reassure the reader that capping total hours at 80 hardly makes a difference for the amount of average annual hours worked per employed, see Table A.1 in Appendix A.1. For the European countries, the difference between capped and uncapped hours worked per employed only exceeds 0.1% in one case (Norway, where it amounts to 0.11%) and only 0.07% of observations are affected on average. Capping US hours worked reduces annual hours per employed slightly more, with an average of 0.19%. As a caveat, the table only shows the effect of the additional capping that we implement; we cannot gauge the size of the effect of the initial capping implemented by the surveys, but it is likely to be very small. The fraction of observations at the highest allowed value for hours actually worked in the main job is 0.7% for the ELFS, 0.2% for the CPS and 0.03% for the Microcensus.

[3] From 2002 on, data from the German Microcensus are used also as input into the European Labor Force Survey, but before 2002 Germany is missing from the anonymized ELFS available to researchers.

[4] When instead using the maximum values in each grouping, the resulting difference in average annual hours worked per person amounts to only 0.02%.

3.3 Treatment of Missing Values

We drop some observations from the sample due to missing values. If actual hours are missing, we replace them by zero if the respondent indicates not having worked in the reference week. If the respondent states that he/she has been working in the reference week, but actual hours are missing, we drop the observation. Observations with missing usual hours are only dropped when we need usual hours, see the next subsection for further details. Table A.2 in Appendix A.1 shows the percentage of observations dropped due to the different reasons. With the exceptions of Belgium and Switzerland, the percentages are far below 1 percent.

3.4 From Weekly to Annual Hours Worked per Person

We build two different measures of annual hours worked on the individual level. First, we add up actual weekly hours worked in the reference week for all jobs, and then multiply by 52. We call the resulting measure of annual hours worked "Raw Micro Data". This measure should be suitable for calculating average annual hours worked per person if the reference weeks were evenly distributed over the entire year. However, as the following subsection explains, this is not the case, and thus further adjustments are necessary, which we offer in our second measure "Adjusted Micro Data".

3.5 The Distribution of Reference Weeks

The reference week referred to in labor force surveys is mostly the week preceding the interview week. If reference weeks are not spread evenly over the year, then one might systematically over- or underestimate annual hours worked due to under- over overrepresentation of public holidays or vacation days in the sampled weeks.

To give a concrete example, the CPS covers all 12 months of the year, but uses as a reference week always the week into which the 12th of the month falls. Therefore, most major US public holidays, which often lie at the beginning or the end of the month, are not captured by the CPS (e.g. 4th of July, Thanksgiving, Memorial Day). The German Microcensus used one single reference week, which fell into the end of April or beginning of May and deliberately excluded weeks with a public holiday, until 2004, and from 2005 on covers the entire year.

The reference weeks in the national labor force surveys of the European countries initially fell only into specific periods, but all surveys (with the exception of the Irish one) switched to an even spread of reference weeks over the entire year at some point in time, albeit in different years. There are considerable differences in the number of weeks that were covered before continuous surveying emerged, ranging from one single reference week to the coverage of half a year. Eurostat, in its efforts to harmonize the different surveys as much as possible, treated the changes in reference weeks in a two-step procedure. First, when the actual change to continuous surveying occurred in different years for the different countries, the ELFS micro data reflects this by changing from

covering only single weeks to covering the second quarter of the calendar year (April to June) from then on, with some exceptions to this rule (detailed in Web Appendix W.1). In a second step in 2005, when the majority of countries included in the ELFS had changed to continuous surveying, the ELFS micro data switched to covering the entire 52 weeks of the year for all countries that had adapted continuous surveying. The only exceptions to this second step rule are the UK (continuous surveying from 2008 on), Switzerland (from 2010 on), and Ireland, where the switch has not yet taken place.

Table W.1 in Web Appendix W.1 reflects the distribution of reference weeks for the ELFS countries at three different points in time: The year before the actual change to continuous surveying took place, the year of that change, and the year in which the actual change was implemented into the ELFS micro data (2005 in most countries). The appendix also discusses exceptions to the two-step procedure of implementing continuous surveying by Eurostat described above.

3.6 Supplementation through External Data Sources

In order to account for any bias introduced by the lack of representativeness of the reference weeks, we introduce a second measure of annual hours worked which incorporates data from external sources, following a procedure suggested by the OECD, see Pilat (2003).

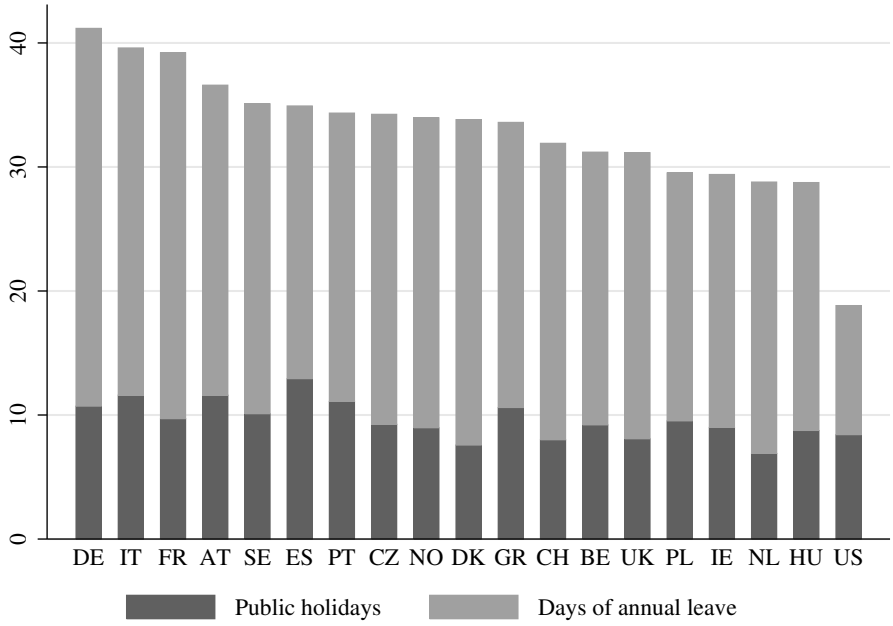
For the construction of our second hours measure "Adjusted Micro Data" we proceed as follows, starting with weekly hours worked. As a baseline, we calculate weekly hours worked as actual hours worked in the reference week in the main job and all additional jobs. However, if respondents indicate that they worked less hours than usual in the main job in the reference week because of public holidays and/or annual leave, we replace actual weekly hours by usual weekly hours in the main job plus actual weekly hours worked in additional jobs.[5]

We then use external data sources to account for average lost working time because of public holidays and days of annual leave. This is done by calculating an adjusted measure of weeks worked per year, $weeks_{adj} = 52 - \frac{\text{daleave+dpubhol}}{5}$, where *daleave* are average days of annual leave, and *dpubhol* is the sum of public holidays. We then calculate individual annual hours worked by multiplying weekly hours by this adjusted number of weeks. The resulting measure is denoted "Adjusted Micro Data". Note that a disadvantage of this procedure is that we cannot account for heterogeneity across the population in terms of days of annual leave and public holidays, and have to assume that these days are actually taken by every employed person, an assumption on which we report some evidence in Section 4.2.[6]

[5] For additional jobs, we don't have information on usual hours. If respondents state that they have been working less hours than in a usual week because of public holidays or annual leave, but usual hours in the main job are missing, these observations are dropped.

[6] In Appendix A.1 we discuss some differences between the CPS and ELFS questionnaire regarding the construction of the hours measure "Adjusted Micro Data", which however have virtually no impact on the statistics presented in the paper.

Figure 1: Public holidays and days of annual leave from external data sources (all available years)



For some countries (Denmark, France, Germany, Netherlands, Switzerland, United Kingdom, United States), we obtain statistics on average numbers of public holidays and days of annual leave covering the entire sample period from the national statistical offices and other public institutions, detailed in Appendix A.2. For the remaining countries, average days of annual leave and public holidays are obtained from the European Industrial Relations Observatory (EIRO), which provides data on days of annual leave and public holidays for the years 2002 to 2011. For the years prior to 2002, we use two different strategies. For some countries (Austria, Belgium, Portugal, and Sweden), we were able to obtain from the International Labor Organization ILO the number of days of national bank holidays (subtracting those falling on a Sunday) as well as the number of days of annual leave, both as indicated by national laws (i.e. ILO refers to labor laws rather than actual collected statistics as sources of these numbers). For the remaining countries (Czech Republic, Greece, Hungary, Ireland, Italy, Norway, Poland, and Spain), we use the EIRO mean over the years 2002 to 2011 to extend the series backwards.

Figure 1 shows the average number of public holidays and days of annual leave for the countries in our sample. The cross-country variation in annual leave days is substantially larger than the cross-country variation in public holidays. The sum of both varies between more than 40 days in Germany and less than 20 days in the US.

Table A.5 in Appendix A.2 details the average number of public holidays and annual leave days at the beginning and the end of the sample period for the different countries. While there is

some time series variation, it is small, namely less than a day, for the majority of countries, with the notable exception of Denmark, where public holidays plus days of annual leave increased by almost 7 days between 1983 and 2011. The Web Appendix W.2 contains detailed graphs displaying the annual numbers of public holidays and annual leave days for all countries, in addition to a comparison to the EIRO data for the group of countries for which we have data from both national statistical offices and EIRO.

Note that if sick leave days exhibit a seasonal pattern, an uneven distribution of reference weeks over the year also leads to systematic under- or overrepresentation of sick days. Since we do not have reliable external data on sick leave days for a large number of country/year observations, we cannot control for this potential bias using external data sources. However, Section A.3 shows some suggestive evidence that the seasonality of sick days is not a large problem for our surveys, since the number of sick days does not change much for most countries as they switch from surveying only specific weeks to continuous surveying.

3.7 Dropping Specific Country/Year Observations

There are a number of country/year observations that have been dropped in the calculation of averages due to different inconsistencies and particularities. Specifically, we exclude the years 1983 for Denmark, 2001 for the UK, and 2005 for Spain from our analysis. The Danish data for 1983 suggest that only around 23 percent of all observed individuals were employed, which is around one third of the employment rate that we observe in other years. In the UK in 2001, 3.2 percent of the respondents report not having worked at all in the reference week despite having a job due to bad weather ("other" reasons), compared to around 0.03 percent before and after 2001. By contrast, in 2001 only 0.32 percent report not having worked in the reference week despite having a job due to annual leave, compared to more than 3 percent in 2000 and 2002. This suggests that the categories have been switched accidentally, but since we cannot be certain, we do not include 2001 into our analysis. For Spain, 3.4 percent of the respondents report having worked less than usual due to compensation leave in 2005, compared to less than 0.03 percent in 2004 and 2006. Average hours lost due to "other" reasons are seven times larger in 2005 than in the previous and subsequent years (2.8 as opposed to 0.4), which ultimately leads to a large drop in hours worked in 2005.

Table A.3 in Appendix A.1 gives the final total sample size of individuals aged 15-64, for each country/year combination. The annual sample size per country ranges from 10,000 to 450,000 with an average of 115,000 observations.

4 Aggregate Measures of Labor Supply

4.1 Construction of Average Hours Worked per Person

We construct average annual hours worked per person HWP by first calculating average hours worked per employed, HWE, and then multiplying by the employment rate, ER, such that $HWP = ER \cdot HWE$. The employment rate is based on the self-reported employment status e_i of the individual and also includes self-employed (with or without employees) and family workers.[7] Formally, $ER = \frac{N^e}{N}$ with N being the sample size and $N^e = \sum_{i=1}^{N} e_i$.

For calculating average hours worked per employed, we calculate the sum of annual hours worked of all individuals who self-report being employed, and then divide by the number of employed individuals.[8] Thus, if h_i are annual hours worked of individual i, then $HWE = \frac{1}{N^e} \sum_{i=1}^{N} h_i * e_i$. Therefore, an individual who is employed but reports zero hours worked in the reference week, e.g. due to sickness, will contribute zero hours to the hours worked per employed. In all these calculations, we only incorporate information from individuals between the ages of 15 and 64. When we look at specific demographic subgroups, the overall population refers to number of observations in this subgroup. Every observation is weighted by the weights provided in the different surveys.

4.2 Comparison of the Raw and the Adjusted Micro Data

We now have two measures of average annual hours worked: the Raw Micro Data only uses information from the labor force surveys, whereas the Adjusted Micro Data uses external data to account for the fact that reference weeks are not spread out continuously over the year in most countries before 2005, with the consequence that public holidays and days of annual leave are misrepresented in the micro data. With the shift to continuous surveying, this concern should evaporate and the Raw and Adjusted Micro Data should in principle yield similar values.

Figure 2 shows the average percentage deviation of the Raw Micro Data from the Adjusted Micro Data for each country for (up to) three different periods: the years before continuous surveying was introduced ("specific weeks"), the years for which continuous surveying was carried out, but only implemented in the ELFS in a first step by introducing the second quarter data ("2nd quarter"), and the years in which ELFS data in fact covers the entire year ("continuous"). For some countries, not all three definitions apply.

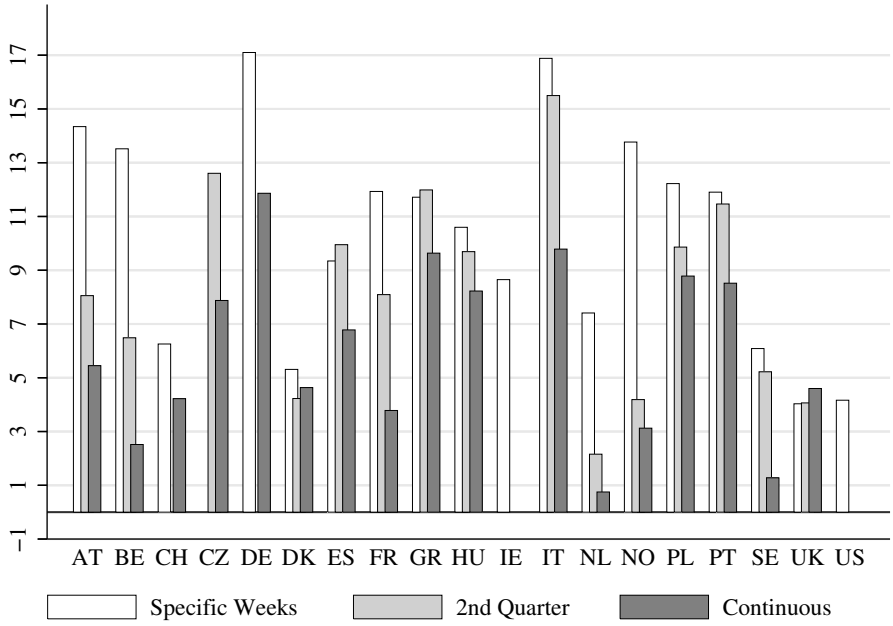
Since public holidays and annual leave days are underrepresented before continuous surveying over the entire year is introduced, the Adjusted Micro Data always reports lower hours than the Raw Micro Data. The difference is significant, ranging between 3.5 and 17 percent.[9] Covering the second quarter mostly leads to a decrease in the difference between the Adjusted Micro Data and

[7] e_i is a dummy variable taking the value 1 if the individual reports being employed, and 0 otherwise. Section W.3 in the Web Appendix reports alternative measures of employment.

[8] Non-employed individuals are not asked about their hours worked, which are zero by definition.

[9] The difference is largest for Germany, which until 2004 used only one single week as reference week.

Figure 2: %-Deviations of hours worked per employed of the Raw and the Adjusted Micro Data



the Raw Micro Data, and going to continuous surveying to a further decrease in all countries but Denmark and the UK.[10]

However, while for some countries, e.g. the Netherlands or Sweden, differences between the Adjusted the Raw Micro Data almost disappear after continuous surveying is introduced ("after"), for some countries they remain important: in 9 of the 19 countries, the Raw Micro Data still reports more than 5 percent higher hours than the Adjusted Micro Data even when the reference weeks cover the entire year. The discrepancy is largest for Germany, where it amounts to more than 11 percent, and is generally larger in Southern and Eastern Europe than in Scandinavia and Western Europe. This indicates a discrepancy between the numbers of public holidays and annual leave days indicated in the micro data and given in national statistics, where in every case the former is lower than the latter. One reason for this is that even if all weeks are covered by the surveys, they are not always covered evenly.

To further investigate why differences between the Raw and Adjusted Micro Data are still prevalent after introduction of continuous surveying, we compare in the first two columns of Table 1 weeks lost due to vacation/public holidays based on self-reports in the micro data to vacation

[10]Figures W.20 to W.38 in Web Appendix W.4 show the time series comparisons between the Raw and the Adjusted Micro Data for each country. In each figure, the solid vertical line indicates the year in which the first-step of the change to continuous surveying was implemented in the ELFS (mostly resulting in a wider spread of the reference week), while the dashed vertical line indicates the first year in which the micro data available to the researcher actually cover the entire year.

days and public holidays from external data for the year 2006. For the self-reports, we build the difference between actual and usual hours worked in the main job as a percentage of usual hours worked if an individual reports having worked less than usual due to vacation or public holidays, and then multiply by 52.[11] The differences are very large, often amounting to more than 3 weeks. In 6 of the 19 countries, self-reported public holidays and vacation days amount to less than 2 weeks. Overall, given that public holidays alone in many countries sum up to 1.5 weeks, the self-reported number of the sum of vacation days and public holidays seems too small. In some countries, this is driven by the fact that a small number of the population reports working less hours than usual in the reference week due to holidays and vacation days (see column 3 of Table 1), which might indicate that respondents do not use the correct week as reference week when in fact vacation days and public holidays fell into the reference week (this might e.g. be due to the fact that they think it is more appropriate to report hours of a "typical" work week). Appendix A.3 shows the distribution of further reasons for working less hours than usually in the reference week by country.

To understand these discrepancies better, we further analyze the case of Germany as an exemplary country. External data reports 8.3 weeks of vacation days and public holidays, while Microcensus self-reports add up to on average 2.4 weeks, creating a large discrepancy of 5.9 weeks, the largest one of all countries. The external data for Germany come from the IAB (for a detailed description, see Wanger 2013). The IAB calculates vacation days based on agreed vacation days in official labor contract negotiations. They take into account differences across sectors as well as age groups, creating a weighted average.[12] Schnitzlein (2011) reports based on data from the German Socio-Economic Panel that on average 3 agreed vacation days per year go unused. Thus, the underusage of vacation days can probably explain only a very small portion of the discrepancy of 5.9 weeks between self-reports and official vacation days.

Analyzing the Microcensus data further, there could be several reasons for underreporting of vacation days.[13] First, one single household member can answer the questions as a proxy for all household members (and around 25% of observations come that way), and might forget vacation days of the other members. Indeed, the number of vacation days is lower when a proxy interview was undertaken; only 8% of proxy interviews indicate absences in the reference week, while 12% of direct interviews do. Secondly, the Microcensus always takes the week before the interview as reference week (i.e. it does not give fixed dates for the reference week, but refers in questions to the previous week, whenever the interview is carried out). The interview is generally carried out personally, and if a household is not encountered by the interviewer in the intended week, the interviewer comes

[11] The one caveat that arises here is that individuals can only give the main reason for having worked less than usual in the reference week. Thus, if another reason than vacation or public holidays leads to more hours lost during the reference week, we would miss these days. However, given that especially vacation days are often taken for a full week, this is unlikely to introduce a large bias.

[12] One extra day of vacation is added to account for special vacation rights for certain groups/sectors. The IAB also adds 14 weeks of mandatory maternity leave to vacation, but this makes up only half a day per year for the average person.

[13] The following information comes from Thomas Körner at the Statistical Office Germany.

Table 1: Weeks lost due to public holidays and vacation, fraction of sample on leave, within-group averages of usual hours worked of working population and population on leave in 2006

	Weeks lost due to holidays/vacation		Fraction of sample
Country	self-reported	external data	on leave
Denmark	5.3	7.4	15.7
Norway	4.3	6.8	13.3
Sweden	5.0	7.0	18.3
Mean	*4.9*	*7.1*	*15.8*
Austria	3.5	7.4	14.2
Belgium	4.4	6.0	15.4
Switzerland	3.4	6.5	9.9
France	5.4	8.1	15.3
Ireland	1.4	5.8	14.0
Germany	2.4	8.3	7.4
Netherlands	4.7	5.4	14.5
United Kingdom	3.4	6.5	16.9
Mean	*3.6*	*6.7*	*13.5*
Czech Republic	2.4	6.8	11.5
Hungary	1.6	5.6	8.2
Poland	1.2	6.0	6.5
Mean	*1.7*	*6.1*	*8.7*
Spain	2.9	6.8	12.0
Greece	1.3	6.6	10.1
Italy	3.0	7.8	11.1
Portugal	2.0	7.3	13.2
Mean	*2.3*	*7.1*	*11.6*
US	1.5	3.5	4.8

back to the household later on. Therefore, the de facto distribution of reference weeks over the year is not uniform. It could be that due to this procedure, households that were on vacation the week before are missed more frequently than others and are in fact interviewed later when they have been back from vacation for some time. The number of observations is indeed on average smaller in the reference weeks that fall into typical vacation periods, especially the two weeks after Christmas and the late summer weeks.[14] Moreover, the self-reported employment rate is underproportional in these weeks, indicating that especially employed people might not be interviewed for these weeks

[14] For Easter, this problem does not arise.

(unless this reflects true seasonality in the employment rate). Third, respondents might dislike to use a vacation week as a reference week, either because they are too busy the first week after a vacation to fill out the questionnaire, or because they perceive it as "inappropriate" to use a vacation week when in fact they are generally hard working. One indication that goes into this direction is that people who decline to be interviewed in person but fill out the survey by paper and pencil later themselves are less likely to indicate vacation days. Regarding public holidays, the number of full-time employees reporting having worked less hours than usual due to public holidays is not exceeding 30% in weeks with nationwide bank holidays in 2010 and is thus clearly too low, but due to the much lower number of public holidays than vacation days this underrepresentation is of less importance than the underrepresentation of vacation days. [15]

Based on the results of this subsection, we conclude that there is evidence of underreporting of vacation days and public holidays in the labor force surveys even after the introduction of continuous surveying, and that the size of this bias seems to vary from country to country. Therefore, we decide to work with the Adjusted Micro Data data for the entire sample period.

4.3 Comparison to the OECD and the Conference Board

4.3.1 Levels

The aggregate measures of average annual hours worked per employed and the employment rates constructed from our micro data sets can be compared to data series provided by the OECD and the Conference Board (CB). The OECD and the CB both report average hours worked per employed aged 15 and above, and the OECD reports in addition employment rates of individuals aged 15 to 64, while the CB only reports total employment. Thus, we cannot compare the employment rate directly to the CB. For comparisons to the OECD and the CB, we construct the data using exactly the same age definitions as they do.

The OECD and the Conference Board obtain their data from different kind of sources for different countries, including among others labor force surveys, employer surveys, and National Income and Product Accounts. The OECD explicitly states in the description of their hours worked data: "The data are intended for comparisons of trends over time; they are unsuitable for comparisons of the level of average annual hours of work for a given year, because of differences in their sources."[16] In subsection 4.3.2, we will further analyze the correlation of deviations between our data and the OECD/CB and the sources of the latter.

Figure 3 shows the percentage point deviation of the OECD employment rates from employment rates based on the Adjusted Micro Data for the different countries for the average of all years

[15] The same seems to apply for sick days, where Microcensus estimates for 2010 arise at around 7 days, compared to 9.2 days from other data sources.

[16] http://stats.oecd.org/Index.aspx?DataSetCode=ANHRS

Figure 3: Comparison of employment rate: The OECD deviation from the Adjusted Micro Data (all years)

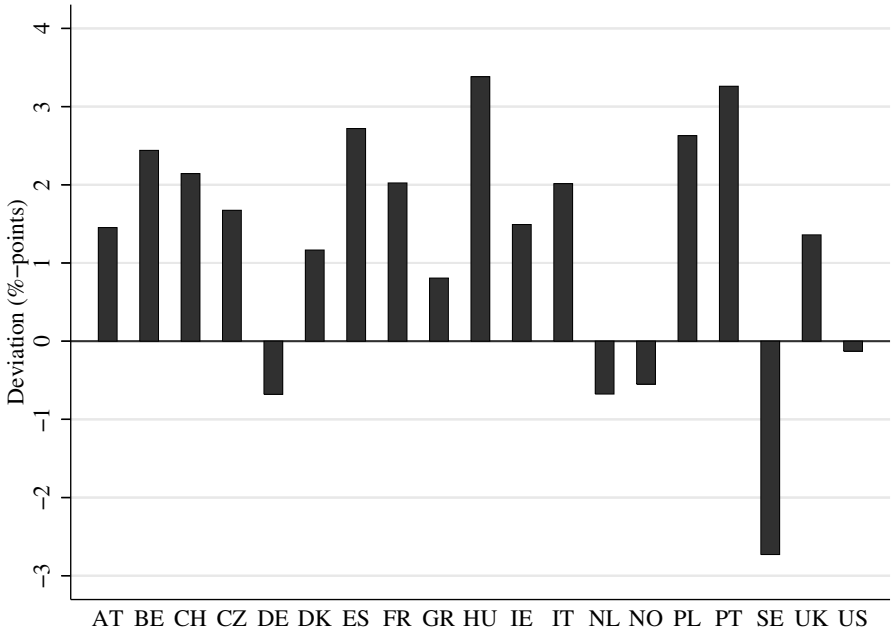
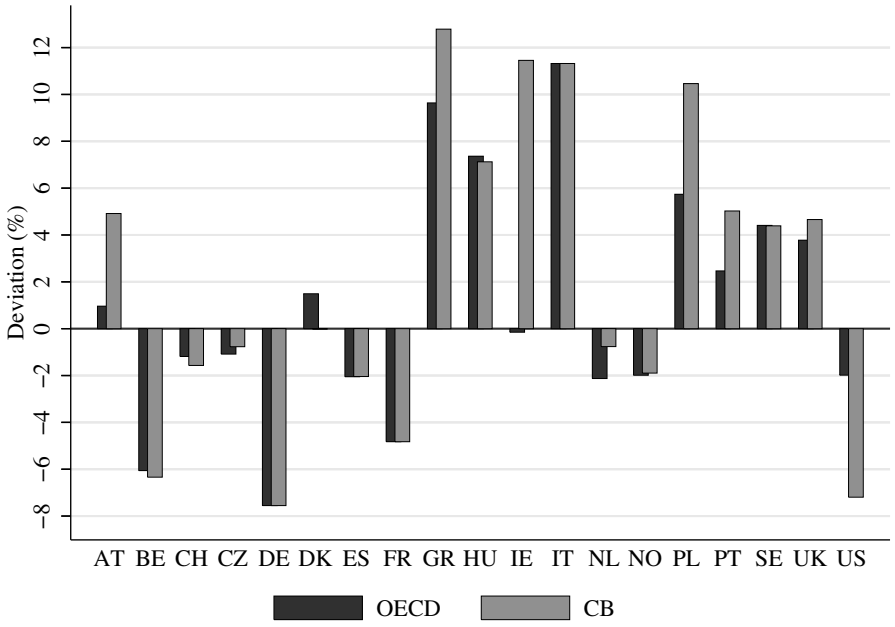


Figure 4: Comparison of hours worked per employed: The OECD and the CB deviations from the Adjusted Micro Data (all years)



for which information is available from both relevant data sources.[17] In most cases, the OECD employment rate is higher, with the exceptions being Germany, the Netherlands, Norway, Sweden, and the US. The deviations never exceed 4 percentage points, and are smaller than 1 percentage point for 6 of the 20 countries.

Figure 4 shows the percent deviation of the OECD and the CB data from the Adjusted Micro Data concerning hours worked per employed. For some countries, the OECD and the CB data completely overlap, while for others they show substantial discrepancies. In all cases except Denmark, Hungary, the Netherlands, and Norway the CB data deviate more from the Adjusted Micro Data than the OECD data. The Adjusted Micro Data does not exhibit consistently smaller or larger hours worked per employed than the OECD or the CB. For 9 countries, the deviations between the Adjusted Micro Data and the OECD/CB amount to less than 5 percent. For countries with the largest deviations, the OECD and the CB sometimes diverge significantly as well (for Ireland, Poland, Portugal, and the US) while in other instances they overlap (Germany, France, Italy, Sweden).

For the US, the OECD and the CB report lower hours worked per employed than the Adjusted Micro Data with a difference of 2 and 7 percent, respectively. Taking the US and Germany as exemplary countries, we provide some possible explanations for the difference between the OECD and the Adjusted Micro Data. One is suggested by Eldridge et al. (2004). The OECD data come from the Bureau of Labor Statistics, which derives its numbers from the establishment reports from the BLS Current Employment Statistics program (CES). The CES, however, only collects data for production and non-supervisory workers. For the rest of the workers (except proprietors and unpaid family workers, for which information is taken from the CPS), the BLS imputes hours by extrapolating from 1978 values, assuming common growth rates of non-production and production worker hours in manufacturing industries, and setting hours of supervisory workers equal to those of non-supervisory workers in the non-manufacturing industries. According to Eldridge et al. (2004), this leads to an under-estimation of average hours worked relative to numbers resulting from the Current Population Survey (CPS). Thus, for the US, the Adjusted Micro Data might give a better estimate of true hours worked per employed than the OECD.[18] The CB relies on unpublished BLS hours data as sources for hours worked, without being more specific which hours series this relates to. For Germany, the OECD uses establishment data collected by the IAB, which does not include unpaid or transitory overtime. In contrast, the Microcensus used for the calculation of the Adjusted Micro Data includes these hours. This is one of the reasons why the Adjusted Micro hours worked per employed are larger than the OECD numbers for Germany.

[17] Figures W.59 to W.77 in Web Appendix W.6 show the time series of hours worked per employed, the employment rate, as well as hours worked per person for each country for the Adjusted Micro Data, the OECD, and the CB data.

[18] The employment rates for the US based on CPS and the OECD are very similar.

4.3.2 Correlation with Sources of OECD

We further investigate whether deviations between the Adjusted Micro Data and the OECD systematically correlate with the sources that the former uses for the construction of their data. Appendix A.4 reports the sources of the OECD and the Conference Board for their calculation of hours worked, which they unfortunately provide only with limited specificity. The employment rate reported by the OECD stems from different labor force surveys. For the majority of countries, we arrive at lower measures of the employment rate than the OECD.

Table 2: Number of countries where the Adjusted Micro Data measures lie above or below the OECD reports

	Employment Rate		**Hours Worked per Employed**	
Source	Below	Above	Below	Above
National Accounts	0	0	4	3
Establishment Surveys	0	0	1	2
Labor Force Surveys	14	5	3	4
Mixed Sources	0	0	1	1

For hours worked per employed, no clear pattern emerges. The Adjusted Micro Data measures are sometimes larger, sometimes smaller than the OECD data, but there is no obvious correlation with the sources on which the OECD relies.

4.3.3 Trends

We calculate trends by computing the percentage difference between the mean of the last three survey years and the first three survey years for the employment rate and hours worked per employed. Here, we do not show deviations from the Adjusted Micro Data, but include the Adjusted Micro Data trend, so that one can easily see whether trends go in the same direction. The results are shown in Figures 5 and 6. We want to stress that these numbers are not intended for cross-country comparisons, since the time trends refer to different periods across countries.[19]

For the employment rates (Figure 5), the earliest data available for the OECD employment rates stems from 1999.[20] The trends over this short period of time line up quite well. For 3 countries, trends go in a different direction for the Adjusted Micro Data and for the OECD, namely Czech Republic, France and the US, but they are also very close to zero. Overall, trends match very closely, with the largest deviations arising in Poland with around 6 percentage points.

[19]The exact numbers corresponding to the figures can be found in Web Appendix W.6 in Tables W.5 and W.6.

[20]The only exception being the US, where we have data from 1983 onwards, and Greece, where data starts in 1998. Later starting points are 2000 for Ireland, Norway and the UK, 2001 for Sweden, 2003 for France and 2005 for Germany and Switzerland.

Figure 5: Trends in the employment rate: The Adjusted Micro Data and the OECD (all years)

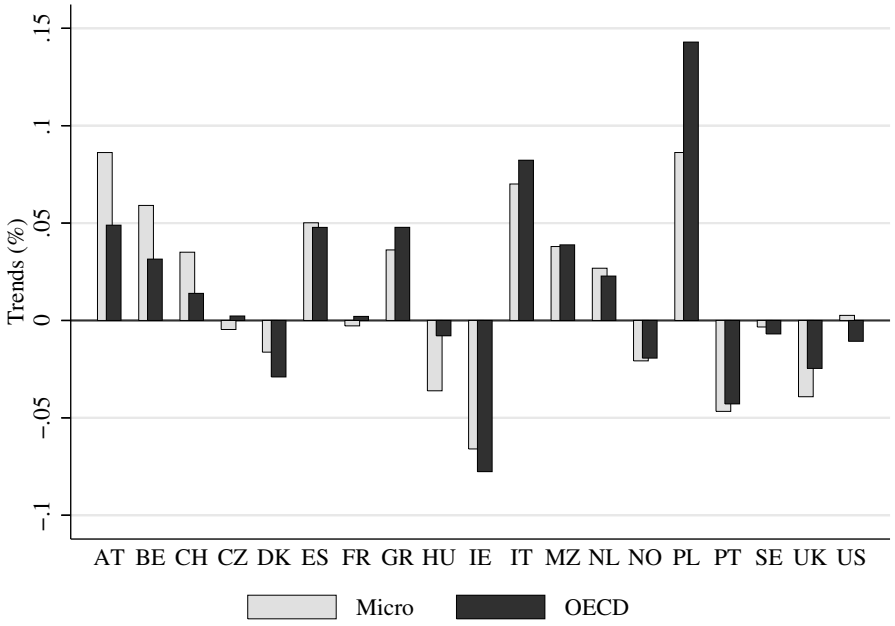
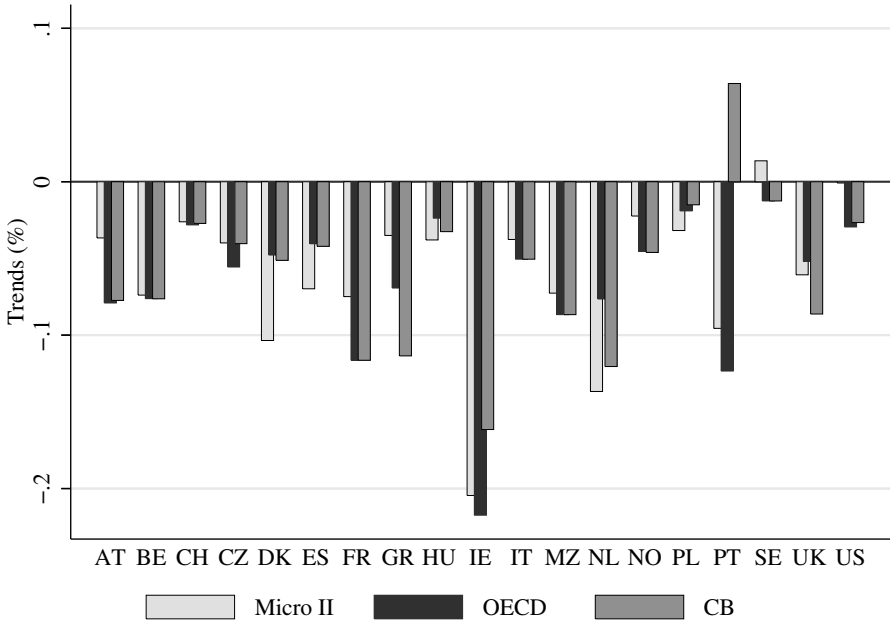


Figure 6: Trends in hours worked per employed: The Adjusted Micro Data, the OECD and the CB (all years)



The generally good overlap of trends is also confirmed for hours worked per employed (Figure 6). Here, the most significant deviation arises for Portugal, where the CB indicates a positive trend, while the Adjusted Micro Data and the OECD indicate a significant negative trend.[21]

Overall, trends match up fairly well between the Adjusted Micro Data and the OECD or the CB. While we see differences in levels, it is not clear whether the macro data sets are more reliable than our data, as the discussion of the US case shows.

5 Hours Worked of Men and Women: Recent Cross-Section

In this section, we describe hours worked for men and women aged 15 to 64 in the recent cross-section. All results refer to averages of the years 2003-2007, i.e. before the crisis hit. The effect of the crisis on hours worked will be analyzed separately in Section 7. We take averages over some years in order to avoid that non-synchronized business cycles influence the results too heavily. We show results grouping European countries by their geographical location into Scandinavia (Denmark, Norway, and Sweden), Eastern Europe (Czech Republic, Hungary, and Poland), Western Europe (Austria, Belgium, France, Germany, Ireland, Netherlands, Switzerland, and the United Kingdom), and Southern Europe (Greece, Italy, Portugal, and Spain). Subsection 5.2 presents results as unweighted averages for the respective country groups.

5.1 Differences in Hours Worked between Men and Women

Figure 7 presents average hours worked per person aged 15 to 64.[22] The black bar refers to female hours worked, the cumulated black and grey bars to male hours worked, and the line within the grey bar to overall hours worked per person. Starting with average hours worked across both genders, there is a large, well-known difference in hours worked per person between the US and Europe, amounting on average to more than 200 hours, but surprising homogeneity across the different European country groups.[23] This homogeneity however hides substantial variation of male and female hours worked per person within Europe.

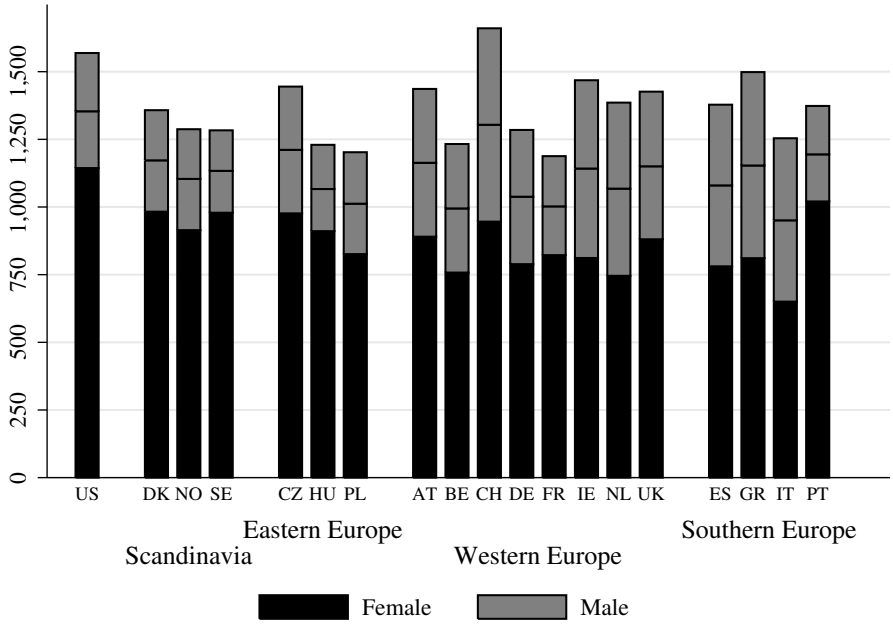
While for the US both male and female hours worked are high with 1570 hours for men and 1140 hours for women, female hours worked per person are lower but still relatively high with 960 and 900 hours on average in Scandinavia and Eastern Europe, and lowest in Western Europe and Southern Europe with 830 and 820 hours. By contrast, Western and Southern European countries exhibit on average higher male hours worked than Scandinavian and Eastern European countries. As a result, the gender hours gap is somewhat similar in the US, Scandinavia, and Eastern Europe,

[21] Only for Sweden do trends otherwise point in different directions, but again they are very close to zero.

[22] The values corresponding to Figures 7-9 can be found in Tables A.7-A.9 in Appendix A.5.

[23] The country outliers within Europe are Switzerland, with hours worked per person very close to the US level, and Italy, with hours worked per person below 1000.

Figure 7: Average Hours Worked per Person (2003-2007): Full sample, Men and Women



but much larger in Western and Southern Europe.[24] Overall, women and men exhibit similar cross-country variation: while the standard deviation and thus the absolute variability of female hours worked per person is with 116 hours slightly lower than the standard deviation of male hours worked per person with 129 hours, in relative terms women exhibit larger cross-country variation than men. The coefficient of variation of female hours worked per person amounts to .13, while for male hours worked per person it is .09.

Figures 8 and 9 show the analogous numbers for the employment rate and hours worked per employed separately. While Figure 7 already showed that surprising homogeneity in hours worked per person within Europe masks substantial differences by gender, these two figures further show substantial heterogeneity across country groups, but quite some homogeneity within country groups, in how hours worked per person are split into the employment rate and hours worked per employed.

The male employment rate is uniformly high between roughly 70 and 80 percent, with the notable exceptions of Hungary and Poland, where low employment rates are driven by older individuals who were educated and experienced most of their on-the-job training under Socialism.[25] Female employment rates, however, show substantial variation, being highest in Scandinavia with more than 70 percent, followed by the US and Western Europe, and being substantially lower in

[24] Within the country groups, the Czech Republic and Switzerland stand out with high female and male hours worked by Eastern respectively Western European standards, while Italy has very low hours for both genders compared to the rest of Southern Europe.

[25] Results by age group are available from the authors upon request.

Figure 8: Average Employment Rate (2003-2007): Full sample, Men and Women

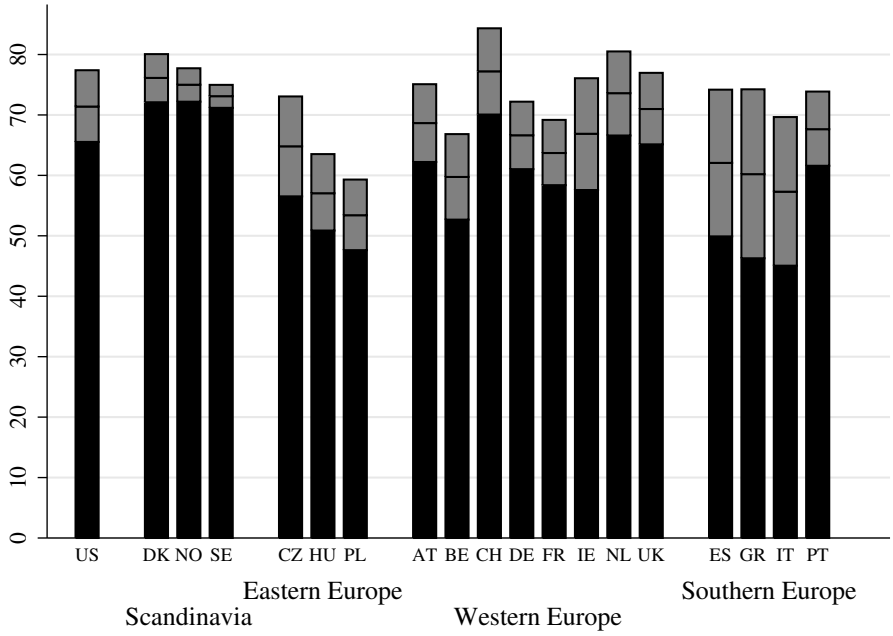
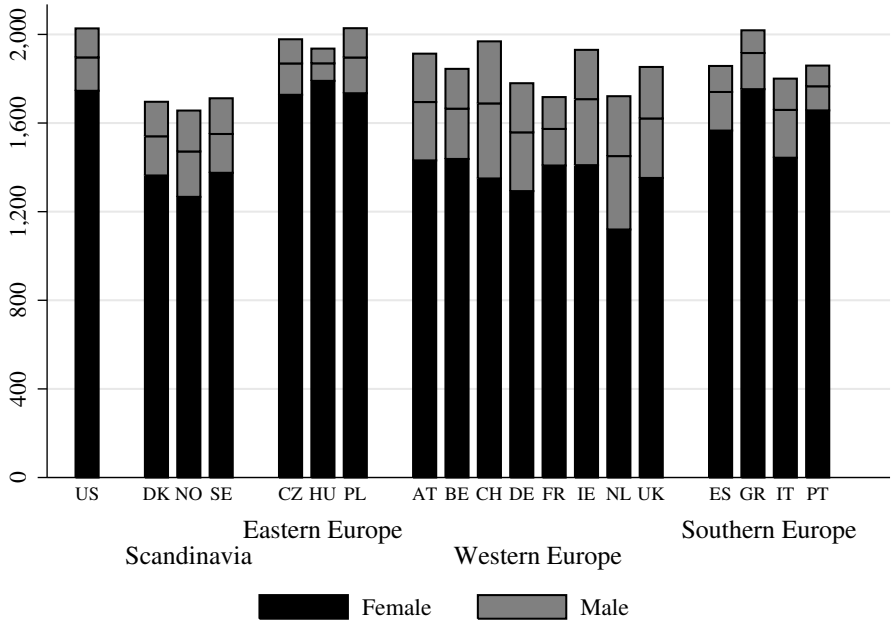


Figure 9: Average Hours Worked per Employed (2003-2007): Full sample, Men and Women



Eastern and Southern Europe with only around 50 percent. The country group ordering for women is opposite when it comes to hours worked per employed: these are highest in the US and Eastern

Europe, closely followed by Southern Europe, and substantially lower in Scandinavia and Western Europe. For men, the country group ordering of hours worked per employed is similar, but the differences are much smaller than for women. The standard deviations and coefficients of variation across countries are much larger for female employment rates and hours worked per employed than for the corresponding male numbers. For employment rates, the standard deviations are 9 and 6 respectively for women and men, while for hours worked per employed they are 196 and 120 respectively. As a result, the coefficients of variation are more than twice as large for women as for men, amounting to .15 vs. .08 for employment rates, and .13 vs. .06 for hours worked per employed. Thus, women are an especially interesting group to analyze if one wants to understand cross-country differences in hours worked.

Figure 10: Female Hours Worked per Employed and the Employment Rate (2003-2007)

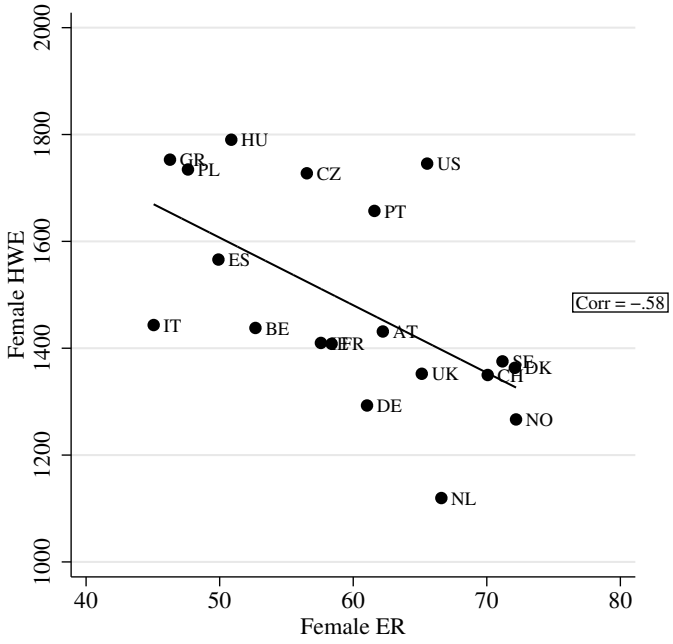


Figure 10 shows the negative correlation between female employment rates and female hours worked per employed across countries, with a correlation coefficient of $-.58$. The US and the Netherlands are somewhat outliers here: both have similar female employment rates of around 65 percent, but US employed women work on average more than 1700 hours opposed to the "predicted" 1400 hours, while Dutch employed women work only slightly more than 1100 hours. Adding up female and male hours and employment rates, the aggregate correlation between employment rates and hours worked per employed is $-.57$. This is however driven by the large negative correlation for women; for men alone, the correlation coefficient is less than half the size, namely $-.24$.

Thus, a first stylized fact that we find in our data is a that in countries with high female

employment rates, the average employed woman works relatively few hours. This could be driven by supply side effects, with the marginal woman entering employment exhibiting lower productivity and choosing lower hours, or demand side effects, with countries that offer higher flexibility in choosing individual hours being more successful in attracting more women into the labor force. The next subsection will provide more evidence on this correlation.

5.2 Marriage and Children

When analyzing differences of male and female hours worked, two natural factors that could lead to divergent labor market behavior by gender are marriage and children. Marriage allows for intra-household specialization in home production vs. market work, and in some countries leads to tax treatment that favors specialization, while children affect the labor supply of women typically more than the one of men. In this Subsection, we therefore analyze how hours worked differ by marital status and presence of children. We differentiate between preschool children, aged 0 to 4, and school children, aged 5 to 14. Three words of caveat are necessary. First, marriage and children are of course endogenous variables, also correlated with other variables like age. Thus, we can only show correlations here and clearly not state any causal effects. We will point to possible other covariates driving the results whenever approrpriate. Secondly, we distinguish individuals by marital status, not cohabitation. This is largely driven by data needs, as cohabitation cannot clearly be identified for most countries and years. Nevertheless, we are able to show later in this subsection that in this recent cross-section differences between splitting the sample by marriage or cohabitation are minor. Third, Scandinavia has to be taken out in this analysis, as the data from Scandinavia does not allow us to identify whether children are present in the household.

Figure 11 shows the cross-sectional decomposition of male hours worked per person. The following three figures are set-up analogously. Panel (a) of the figure shows male hours worked per person in the US by marital status and presence of children. Contrary to the following three figures, which refer to female hours, we do not distinguish the group of the unmarried men by presence of children. Unmarried men with children in the household are a very small group, and are a very special group, combining widowers and divorced parents where the children live with the father, with a group of cohabiting men, which much more resemble married men with children.[26]

Panel (b) of the figure decomposes the differences of the three European country groups to the US into the demographic subgroups. We follow the decomposition approach put forth in Blundell et al. (2013). Overall hours worked in country j are the average of hours worked by different subgroups i, in our case married and unmarried individuals without, with preschool, or with school

[26]The hours worked of unmarried men with children also show large changes in the US time series, likely reflecting the rise of cohabitation.

children, weighted by their population weights $q_{i,j}$:

$$H_j = \sum_{i=1}^{I} q_{i,j} H_{i,j},$$

Following Blundell et al. (2013), we can then decompose the difference in hours worked between country j and the US into a structural effect S_j and a behavioural effect Δ_j. The structural effect is caused by differences in the population structure

$$S_j = \sum_{i=1}^{I} H_{i,j}(q_{i,j} - q_{i,US}),$$

while the behavioural effect is the sum of the differences in hours worked, weighted by the US population weights:

$$\Delta_j = \sum_{i=1}^{I} q_{i,US}(H_{i,j} - H_{i,US}).$$

Structural and behavioral effects are depicted in Panel (b). Specifically, we show here directly the sum of the structural effects S_j, but show the behavioral effects $q_{i,US}(H_{i,j} - H_{i,US})$ for each demographic group i separately. The panel should be read as follows: While in the US male hours worked per person amount to 1569, in Eastern Europe they only amount to 1287. The first light part of the bar shows that around 100 hours of this difference can be attributed to unmarried men without kids, and so on for the following color parts. The 100 hours difference attributed to unmarried men without kids reflects the combination of differences in behavior of this group in the US and Eastern Europe, and their relative size in the overall US male population. The last, black part of the bar represents differences that arise between the US and Eastern Europe due to differences in the population structure. Thus, while e.g. the group of unmarried individuals likely comprises more young and more old individuals than the group of married individuals, this is in principle true for all countries. If differences in marriage or fertility rates, or marriage or fertility by age, across countries played a large role in explaining cross-country differences, this would show up as a large black part of the bar. Panel (c) repeats in the black bars the information shown in panel (b), and adds in the light bar the "pure behavioral" effect that shows the difference in hours between the US and the different European country groups for the respective demographic group, without weighing the latter by the group size in the US, i.e. $H_{i,j} - H_{i,US}$. The first group of bars refers to Eastern Europe, the next to Western Europe, and the last to Southern Europe. Within each country group, we show results for all married, those with preschool and those with school children, and then for unmarried (where for women we also add those with preschool and those with school children), always maintaining this ordering.[27]

[27] We opt for showing all married and unmarried individuals together rather than those without children to be able

As panel (a) of Figure 11 shows, in the US married men work more than unmarried men, and married men with children work more than those without children. Note that the latter group comprises men whose children are older than 16 years. The difference between married and unmarried men, which is absent for women, as we will show later, is driven by unusually low employment rates among unmarried men in the US (results for the intensive and the extensive margin for men are available upon request). Panel (b) repeats the differences in hours worked per person between the US and the European country groups already reported in the previous subsection: US men work around 300 hours more than Eastern European ones, and around 200 hours more than Western and Southern European ones. A negligible part of that can be attributed to differences in the demographic structure between the US and Eastern and Southern Europe, while around 10 percent of the difference to Western Europe comes from different demographic structures. Focusing on individual demographic groups in panel (c) reveals fairly constant differences between the US and Europe for married men, regardless of the presence of children or not. For unmarried men (the last bar in each country group), the differences are smaller than for married men in Western and Southern Europe. Since in the US married men work more than unmarried men, this implies that hours worked of married and unmarried men in these two country groups are more similar than in the US. Only for Eastern Europeans do we find similar differences to the US among married and unmarried men. The low hours by unmarried men in Eastern Europe are driven by the extensive margin and capture again an age effect, driven by older individuals who spent considerable time working in the Socialist labor market. In weighted terms in panel (b) married men without kids play the largest role in explaining differences between Europe and the US, while for Eastern Europe unmarried men without kids are also important in explaining this difference.

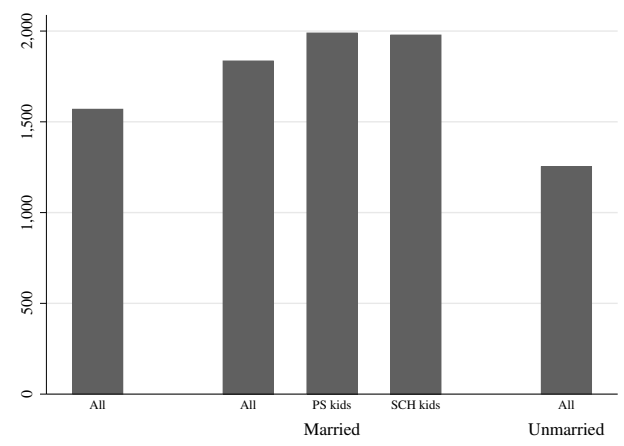
Figure 12 shows the same information on hours worked per person for women, this time also distinguishing by the presence of children for unmarried individuals. In the US, married and unmarried women work very similar hours. Women with preschool children always work less hours than women with school children, but at a higher level for unmarried than for married women. Compared to over 1100 hours in the US, women work 200 hours less in Eastern Europe, and more than 300 hours less in Western and Southern Europe. Thus, while for Eastern Europe the difference to the US is larger for men than for women, it is the other way round for Western and Southern Europe. As panel (b) shows, the demographic structure is only important in explaining differences to the US for Eastern Europe, where it actually would indicate *higher* hours than in the US. Looking at the different subgroups, it becomes clear that unmarried women with children, and especially with school children, show the largest behavioral difference: the latter groups works fairly uniformly 700 hours less in Europe than in the US (see panel (c)). While the groups of unmarried women with children are relatively small, panel (b) shows that the large behavioral differences lead to the fact that they still account for a substantial part of the overall difference to the US, namely around

ot quickly gauge differences by marital status only.

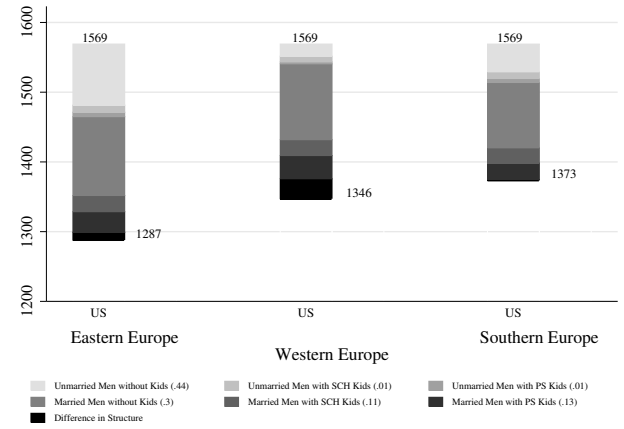
14 to 24 percent. Among all unmarried women, not decomposing by the presence of children, and married women with or without kids, the differences to the US are again fairly uniform, with a few notable exceptions being married women with preschool kids in Southern Europe, which work almost as much as in the US, and married women with school children in Eastern Europe, which work even more than in the US.

Figure 11: Cross-sectional decomposition of male hours worked per person

(a) Male hours worked per person in the US (2003-2007) by marital status and children



(b) Decomposition of difference to US in male hours worked per person (2003-2007)



(c) Weighted and unweighted difference to US (2003-2007) by marital status and children

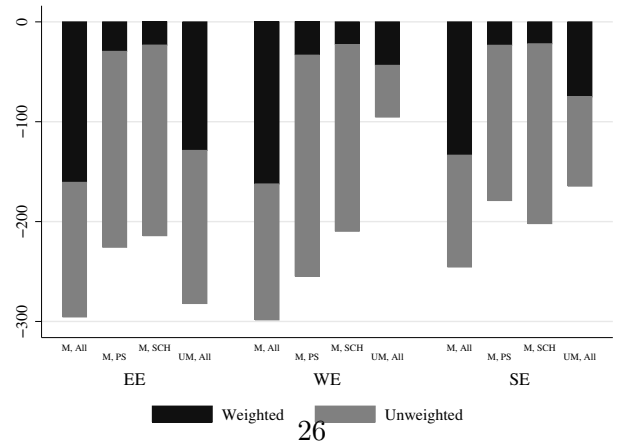
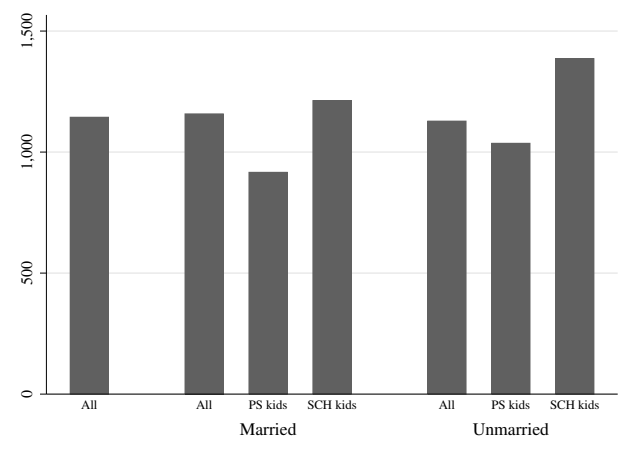
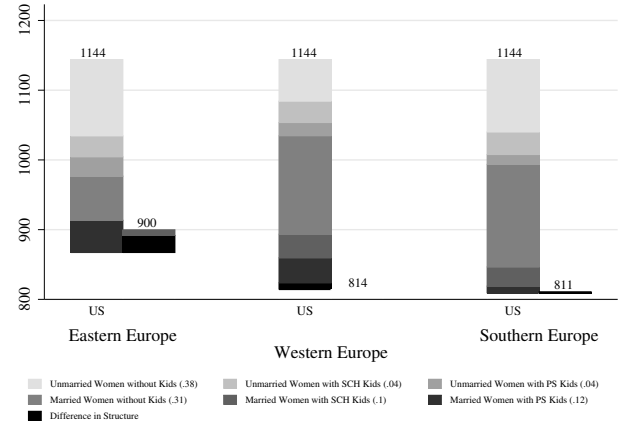


Figure 12: Cross-sectional decomposition of female hours worked per person

(a) Female hours worked per person in the US (2003-2007) by marital status and children



(b) Decomposition of difference to US in female hours worked per person (2003-2007)



(c) Weighted and unweighted difference to US (2003-2007) by marital status and children

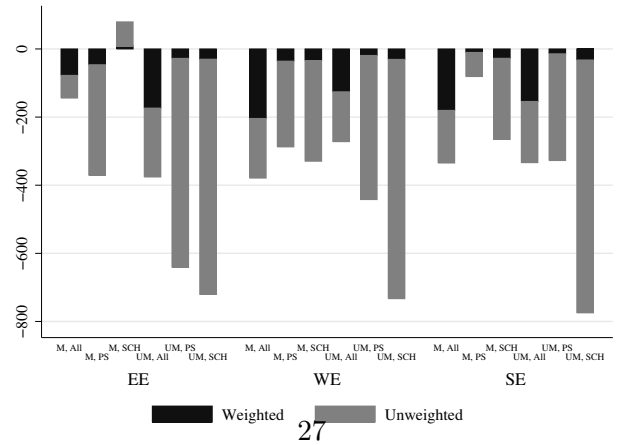
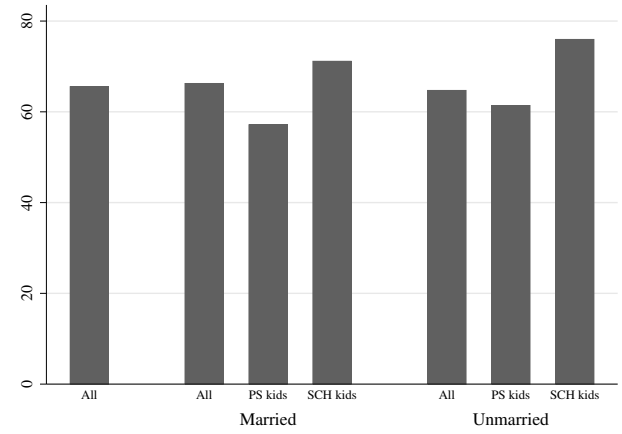
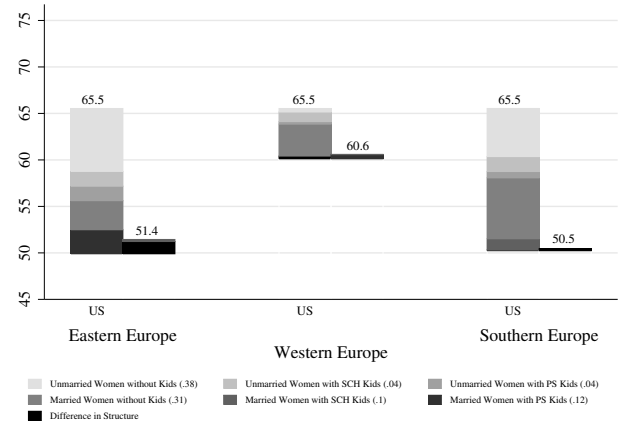


Figure 13: Cross-sectional decomposition of the female employment rate

(a) Female employment rate in the US (2003-2007) by marital status and children



(b) Decomposition of difference to US in female employment rate (2003-2007)



(c) Weighted and unweighted difference to US (2003-2007) by marital status and children

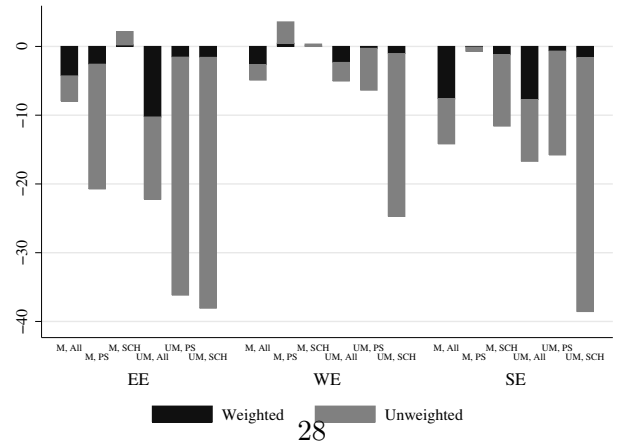
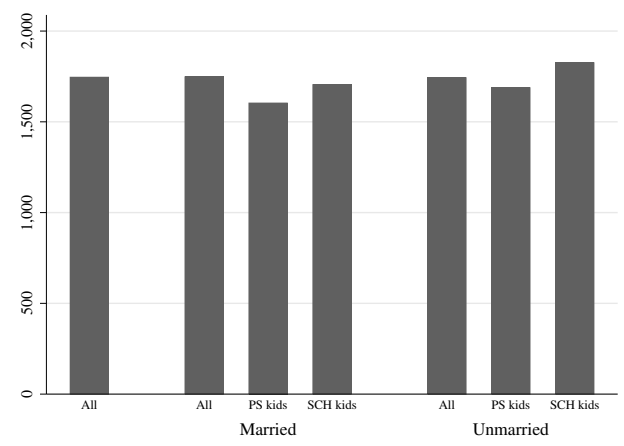
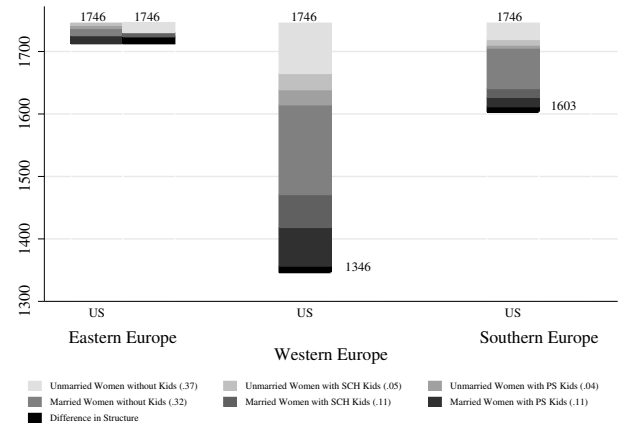


Figure 14: Cross-sectional decomposition of hours female worked per employed

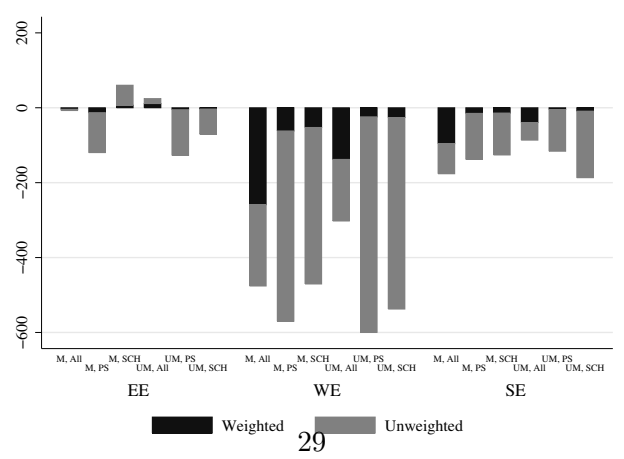
(a) Female hours worked per employed in the US (2003-2007) by marital status and children



(b) Decomposition of difference to US in female hours worked per employed (2003-2007)



(c) Weighted and unweighted difference to US (2003-2007) by marital status and children



The large differences in hours worked per person between the US and Europe among unmarried women with children, together with the relative homogeneity of hours worked of this group within Europe, points to the fact that the main driver of these country differences lies in the US. A likely candidate are the Clinton welfare reforms, which gave single mothers strong incentives to enter the labor force. There might thus be scope to increase hours worked for this group in Europe through similar welfare reforms. Despite the relatively small size of this group, this would still close the gap to the US by a significant number. A second interesting fact is that the difference of women with preschool children in Europe to those in the US is largest for Eastern Europeans, and smallest for Southern Europeans, with the same ordering, though at a different level, among unmarried and married women. This seems to indicate that child care opportunities or cultural effects that affect both unmarried and married women to the same extent might play a role in explaining labor supply of women with preschool children.

The US picture for both female employment rates (panel (a) in Figure 13) and female hours worked per employed (panel (a) in Figure 14) resembles very much the one for female hours worked per person. Focusing on female employment rates, the differences to the US are again largest for unmarried women with children, especially with school children, for every single European country group (panel (c) in Figure 13). The differences are overall larger for unmarried than for married women, which is true for every single subgroup (with or without children) and for each European region. The heterogeneity of differences to the US across demographic subgroups is largest in Eastern Europe and still substantial in Southern Europe, but smaller in Western Europe.

By contrast, the differences in hours worked per employed to the US (shown in Figure 14) are relatively homogeneous for the different demographic subgroups within Eastern and Southern EUorpe, but somewhat larger in Western Europe. Thus, employment rate differences explain most of the demographic heterogeneity in Eastern and Southern Europe, but hours worked per employed differences are mostly responsible for the demographic heterogeneity in Western Europe. Hours worked per employed differences to the US are relatively small for all Eastern European demographic groups, where overall female hours worked per employed are exactly equal to the ones in the US, and very large for each of the Western European demographic subgroups, where overall the difference amounts to 400 hours.

The negative cross-country correlation between female employment rates and female hours worked per employed is actually present for each single demographic subgroup, with the exception of married women with school children, where it is negative, but essentially zero (see Table 3). It is especially large for the unmarried, where it amounts to -.6, -.5, and -.3, respectively, for women without kids, women with preschool kids, and women with school kids.

Overall, we find that when looking at male hours worked per person, differences of European country groups to the US are larger for married than for unmarried men, but do not depend much on the presence of children, and are also quite homogeneous across Europe. For women,

Table 3: Cross-country correlation between female ER and female HWE

	Correlation HWE-ER
Married	
No kids	−0.19
Preschool kids	−0.26
School kids	−0.03
Unmarried	
No kids	−0.60
Preschool kids	−0.50
School kids	−0.30

unmarried women with children stand out as the group showing the largest difference, which is likely driven by the Clinton welfare reforms in the US. The decomposition of any female hours worked per person difference into an extensive and an intensive margin shows as a robust fact across all demographic subgroups that the extensive margin matters most in Southern Europe, while the intensive margin matters most in Western Europe. Extensive margin differences show a lot of heterogeneity across demographic groups in Southern and Eastern Europe, while intensive margin differences exhibit high heterogeneity in Western Europe. Thus, to explain international differences in hours worked research should focus on factors which could explain the relative homogeneity in male hours differences to the US across different demographic subgroups, together with the large heterogeneity in female hours worked differences, as well as their decompositions into extensive and intensive margins. The large differences in the labor supply behavior of unmarried women with children point to welfare systems playing a role, but child care, taxation of married couples, divorce risks, gender wage gaps, and cultural factors likely also play a role. We will specifically address the flexibility of the labor market as potential factor in Section 5.4.

Figures A.1 to A.4 in Appendix A.6 replicate all results from this subsection, but splitting the sample by cohabitation, not marriage. Since we do not have cohabitation information for all countries and years, we repeat the results splitting by marriage on the left hand side using the sample for which we also have cohabitation information, while the new results splitting by cohabitation are shown on the right hand side. Overall, results are very similar and mostly almost non-distinguishable whether the sample is split by marriage or cohabitation. The only significant difference that arises comes for men in Western Europe: while unmarried men in Western Europe work around 90 hours less than their US counterparts, non-cohabiting men work around 140 hours less. This difference is driven by the behavior of Western Europeans, not US citizens, where hours worked of unmarried or non-cohabiting men are virtually the same. It indicates that cohabiting but unmarried men in Western Europe resemble in their work behavior more married men (who

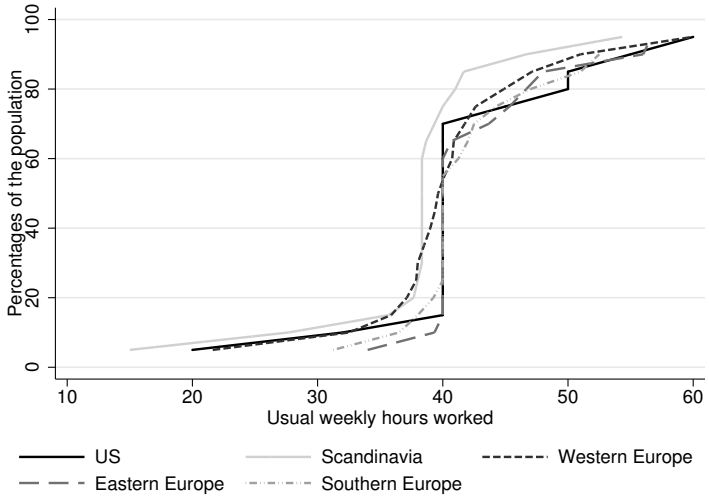
work more than unmarried ones) than cohabiting but unmarried men in the US. Note also that average cohabitation rates in Western Europe are with 10 percent twice as large as cohabitation rates in the other regions.

5.3 Hours Worked Dispersion

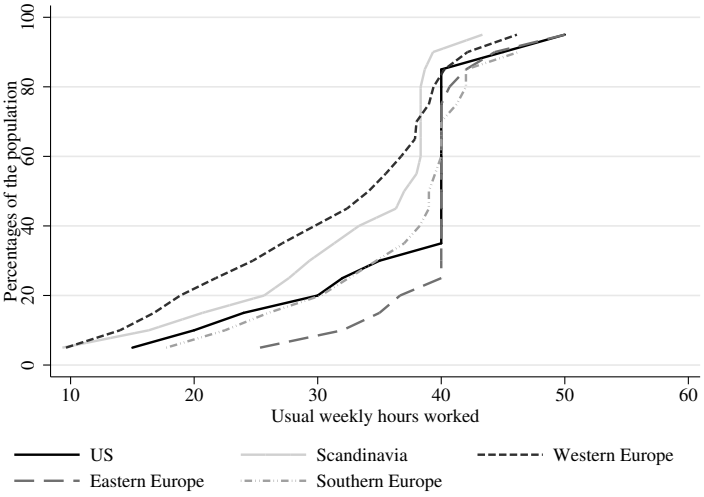
Our data also allow us to analyze the dispersion of hours worked within a county. Since we find that high employment rates are associated with low hours worked per employed, it would be interesting to see how spread out the distribution of hours worked is in different regions. Part-time work is best captured by looking at usual weekly hours worked, and for expositional purposes we call any job involving less than 30 usual weekly hours a part-time job. Figure 15 shows the cumulative distributions of usual weekly hours worked for men in panel (a) and for women in panel (b), conditional on working. For men, full-time work is the prevalent form of employment in all country groups, with "full-time" amounting to slightly less than 40 hours in Scandinavia and some Western European countries. Male part-time work is most prevalent in Scandinavia, but even there amounts to only 10% of men working 30 hours or less, and almost completely absent in Eastern and Southern Europe. For women, part-time work is quite prevalent in Western Europe and Scandinavia, but almost absent in Eastern Europe. 40% of Western European and 30% of Scandinavian women work 30 hours or less per week, while less than 10% of Eastern Europeans do that. The distributions of usual hours worked are surprisingly quite similar in the US and Southern Europe, where in both around 20% of women work 30 hours or less. Overall, for men there is more heterogeneity across country groups in the upper tail of the usual hours distribution, while for women it is clearly at the lower tail. Thus, the prevalence of part-time work still shows significant variation across regions.

Figure 15: Cumulative distribution of usual weekly hours worked

(a) Men (2003-2007)



(b) Women (2003-2007)



5.4 Supply vs. Demand of Part-Time Jobs

The previous subsection documented a high prevalence of female part-time work in Western Europe and Scandinavia, but a low prevalence in the US, Southern Europe, and especially Eastern Europe, similar to the different decomposition of female hours worked per person in an extensive and an intensive margin in Western Europe/Scandinavia vs. Eastern/Southern Europe. Moreover, Subsection 5.2 documented a high heterogeneity across demographic subgroups in employment rates for Southern and Eastern Europe, and in hours worked per employed for Western Europe. A big question that arises in the analysis so far is whether women in Southern and Eastern Europe do not want to work part-time more frequently, as their counterparts in Western Europe and Scandinavia do, or whether there is a scarcity of part-time jobs in Southern and Eastern Europe that forces women to work full-time. In the first case, a negative correlation between employment rates and hours worked per employed could arise due to self-selection into employment according to ability: in countries, which give lots of incentives to work, the employment rate will be high, but the marginal woman will be of a comparatively low ability type and thus optimally decide to work few hours. In the second case, part-time jobs are simply not offered by firms, leading naturally to high hours worked per employed, but at the same time to low employment rates, as low ability women or women who desire less labor market involvement for other reasons, e.g. the presence of small children, will rather opt out of the labor market.

The variability of employment rates and hours worked per employed across different subgroups within a country could give some indication about whether the availability of part-time jobs or the demand for part-time jobs drive the decomposition into employment rates and hours worked per employed. If in country A only full-time jobs are available, we should naturally see a low variability of hours worked per employed across demographic subgroups, but a high variability of employment rates, as individuals in subgroups that desire less labor market involvement (e.g. low educated women, or women with preschool children) will be less likely to work at all if they are forced to work full-time. On the other hand, if in country B individuals have full flexibility in choosing their hours worked, then individuals who desire less labor market involvement will adjust along both the extensive and the intensive margin (e.g. women with preschool children might be less likely to participate in the labor market, and also choose lower hours conditional on participation). As a result, the within-country variability of employment rates across demographic subgroups would be lower in country B than in country A, but the variability of hours worked per employed would be higher. Thus, if the availability of part-time jobs in Western Europe and its absence in Eastern and Southern Europe drives the different decompositions into extensive and intensive margins, we should expect a higher variability in hours worked per employed across demographic subgroups in Western Europe than in Southern and Eastern Europe, but a lower variability in employment rates.

Table 4 analyzes this formally by showing regional coefficients of variation for employment rates and hours worked per employed across the six demographic subgroups from Section 5.2. The

Table 4: Coefficient of Variation in Employment Rate and Hours Worked per Employed by Marital Status and Presence of Children

Country	ER	HWE
Eastern Europe	0.36	0.07
Western Europe	0.13	0.14
Southern Europe	0.16	0.05
United States	0.09	0.04

Table 5: Employment Rate and Hours Worked per Employed by Education

	Population Shares			**Employment Rate**				**Hours Worked per Employed**			
Country	Low	Medium	High	Low	Medium	High	CV	Low	Medium	High	CV
Scandinavia	0.2	0.45	0.30	0.52	0.75	0.85	0.35	1137.5	1333.3	1438.7	0.18
Eastern Europe	0.24	0.62	0.14	0.23	0.57	0.78	0.70	1690.7	1771.9	1729.8	0.06
Western Europe	0.31	0.45	0.22	0.44	0.67	0.81	0.42	1231.4	1331.4	1478.9	0.14
Southern Europe	0.53	0.30	0.17	0.39	0.55	0.77	0.47	1607.2	1633.5	1557.2	0.05
United States	0.14	0.50	0.35	0.37	0.65	0.77	0.48	1462.9	1721.4	1831.0	0.17

coefficient of variation is constructed by first building country-specific coefficients of variation across the six demographic subgroups, and then taking the average of these coefficients of variations over all countries in a given region.[28] As the table shows, Western European countries have a lower within-country variability of employment rates than Southern and especially Eastern European countries, but a more than twice as large within-country variability of hours worked per employed compared to Southern and Eastern European countries. It is noteworthy that the US as a country with both high employment rates and high hours worked per employed is also an outlier here, by exhibiting low coefficients of variation in the within country variability of both employment rates and hours worked per employed across the demographic subgroups. Goldin (2014) stresses in the Presidential Address to the American Economic Association that temporal flexibility is the main way to close the last chapter of the grand gender convergence in the US. While her notion of temporal flexibility is broader than simple part-time work, our results reinforce her thesis to some extent.

Table 5 analyzes education group rather than demographic subgroups, and shows population shares, employment rates, and hours worked per employed of the three education groups low, medium, and high education, always presenting averages across all countries in a region. Additionally, columns 7 and 11 present the coefficients of variation along the extensive and the intensive margin. As the table shows, the education-gradient in employment rates is steeper in Eastern and Southern Europe than in Western Europe and Scandinavia, while the opposite is true for the education-gradient in hours worked per employed, where in fact Eastern and Southern Europe show a U-shape across education groups. Consequently, the coefficients of variation across education groups are larger in Southern and especially Eastern Europe than in Western Europe and Scandinavia for employment rates, but less than half of the size when it comes to hours worked per employed.

Overall, this evidence indicates that there might be a scarcity of offered part-time jobs relative to their demand in Southern and Eastern Europe, forcing all women there to work a large number of hours if they choose to work, and thus resulting in larger within-country variability in employment rates than in Western Europe and Scandinavia, where it seems easier to find a part-time job.

Of course, there is still room for self-selection by ability leading to a negative correlation of employment rates and hours worked per employed. However, this self-selection would have to take place within education group, while being absent across groups, which is less likely. Also, the population shares by education differ somewhat across regions, as Table 5 shows, potentially driving part of the results. Still, it is difficult to reconcile this evidence with a story that explains the negative correlation between mean employment rates and hours worked per employed across countries exclusively by self-selection.

[28] When building country-specific coefficients of variation, we divide the unweighted standard deviation across education groups by the unweighted mean over the six demographic subgroups.

5.5 Cross-Section: Summary

Summarizing, we find that a relative homogeneity of hours worked per person within Europe hides significant heterogeneity across gender and across the extensive and intensive margin. Female hours worked are especially low in Southern and Western Europe, where male hours worked are even slightly above the European average. The US stands out with high hours worked for both genders. High female employment rates coupled with low hours worked per employed in Western Europe and Scandinavia, with the opposite being true in Southern and Eastern Europe, lead to a strong negative cross-country correlation between female employment rates and hours worked per employed. Looking at different demographic subgroups, this negative correlation is present regardless of marital status and presence or absence of children. Low female hours worked per employed in Scandinavia and Western Europe are driven by a large prevalence of part-time work. We present some evidence that a lack of offered part-time job rather than a missing desire to work part-time ar at the root of low part-time rates in Eastern and Southern Europe.

6 Hours Worked of Men and Women: Time Trends

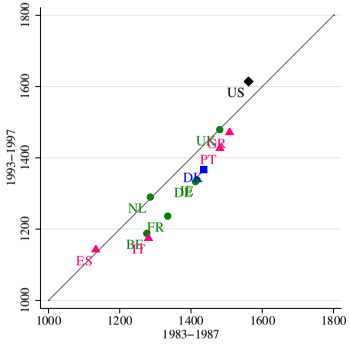
In this section, we analyze time trends in the development of hours worked for men and women. We compare three time periods: 1983-1987, 1993-1997, and 2003-2007. The first time period does not cover the full set of countries, but from the second time period on all countries are included.[29] We analyze hours worked per person, the extensive and the intensive margin, and the distribution of hours.

6.1 Developments from the 1980s to the 2000s

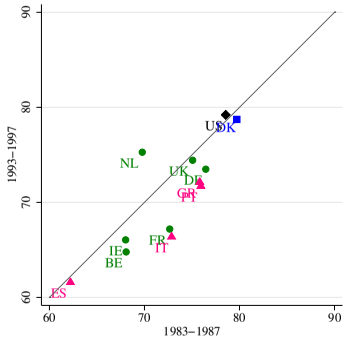
[29] However, for some countries from the ELFS we do not have information for all five years 1993 to 1997, but only the last ones: Austria, Norway, and Sweden start in 1995, Hungary and Switzerland in 1996, and the Czech Republic and Poland in 1997.

Figure 16: Trends in Male Hours Worked and Employment Rates

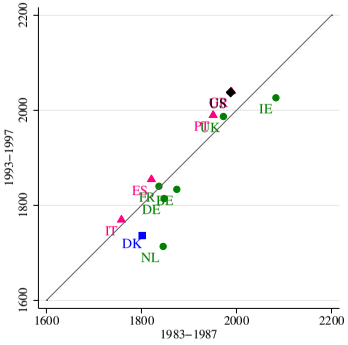
(a) HWP, 80's to 90's



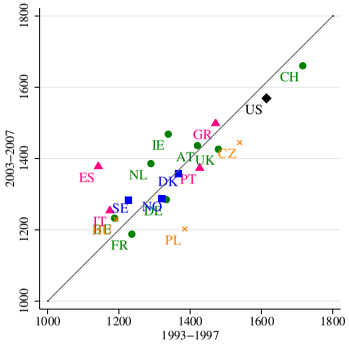
(b) ER, 80's to 90's



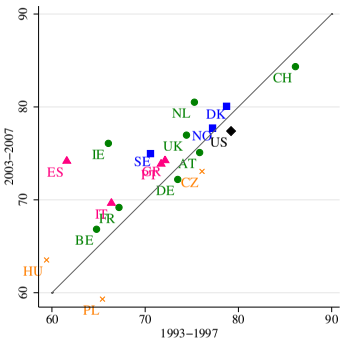
(c) HWE, 80's to 90's



(d) HWP, 90's to 2000's



(e) ER, 90's to 2000's



(f) HWE, 90's to 2000's

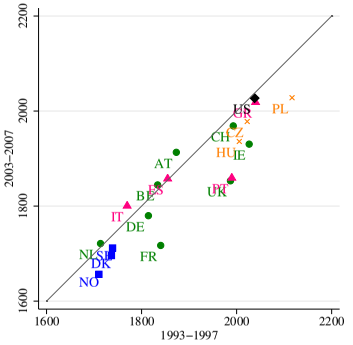
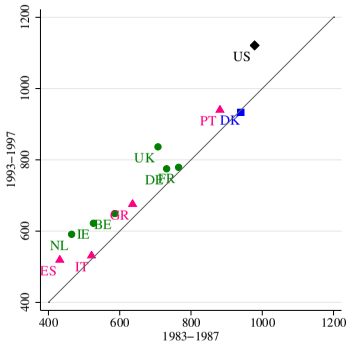
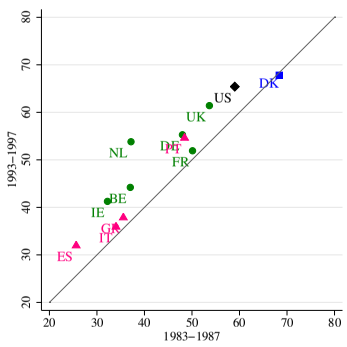


Figure 17: Trends in Female Hours Worked and Employment Rates

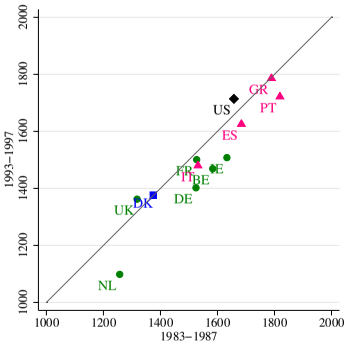
(a) HWP, 80's to 90's



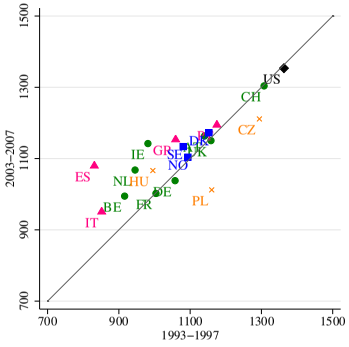
(b) ER, 80's to 90's



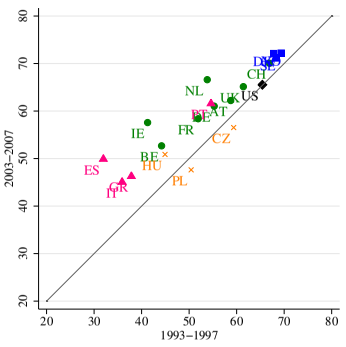
(c) HWE, 80's to 90's



(d) HWP, 90's to 2000's



(e) ER, 90's to 2000's



(f) HWE, 90's to 2000's

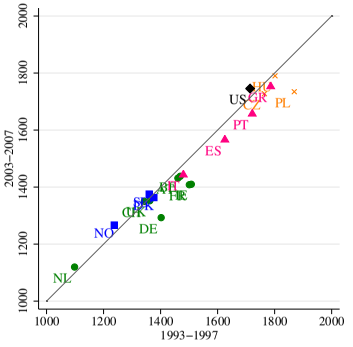


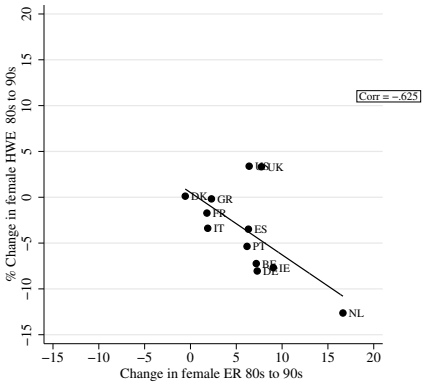
Figure 16 presents time trends for male hours worked per person (left panel), the employment rate (middle panel), and hours worked per employed (right panel) from the 1980s (1983-1987) to the 1990s (1993-1997) (upper panel), and from the 1990s to the 2000s (2003-2007, lower panel). In each graph, the x-axis shows the earlier time period, and the y-axis the later time period, such that an alignment on the 45 degree line means no change, observations above the 45 degree line represent an increase, and observations below the 45 degree line a decrease. Each dot represents a country, with the country groups having different symbols (Scandinavia square, Southern Europe triangle, Western Europe circle, Eastern Europe x, US diamond).

For men, hours worked per person decreased on average by 3.3 percent from the 1980s to the 1990s, driven by a decrease in the employment rate. In results not shown but available upon request, we show that this decrease is driven primarily by men aged 55 to 64: the employment rate for men in this age group decreased substantially from the 1980s until around the mid 1990s, likely due to an expansion of early retirement programs. Moreover, the employment rate of young men aged 15 to 24 also decreased somewhat, while it remained essentially unchanged for the core age group. From the 1990s to the 2000s, the picture for hours worked per person is more heterogeneous. Employment rates tend to increase in the majority of countries, resulting in an average increase of 2 percentage points, while at the same time we observe a decrease in hours worked per employed of on average 2.2 percent. The increase in the employment rate is driven by older individuals aged 55 to 64, caused by substantial pension reforms in many European countries which reversed the trend of early retirement, while the slight decrease in hours worked per employed is more homogeneous across age groups.[30] For women, there is a clear trend increase of on average 11 percent in hours worked per person from the 80s to the 90s and from the 90s to the 2000s, as Figure 17 shows. While from the 80s to the 90s this trend is universal, in the later time period we see some cross-country convergence, with largest increases in countries that started with the lowest female hours worked per person in the 1990s. In both time periods, this increase in hours worked per person, as well as the convergence in the later time period, are driven by increasing employment rates (on average +6 percentage points in both periods). At the same time, hours worked per employed were falling by on average -3.6 percent between the 80s and 90's, and are rather stable between the 90s and 2000s. The convergence in employment rates leads to the fact that employment rate differences across countries are shrinking substantially: the maximum-minimum difference across countries amounted to 43 percentage points in the 80s, 37 percentage points in the 90s, but only 27 percentage points in the 2000s.

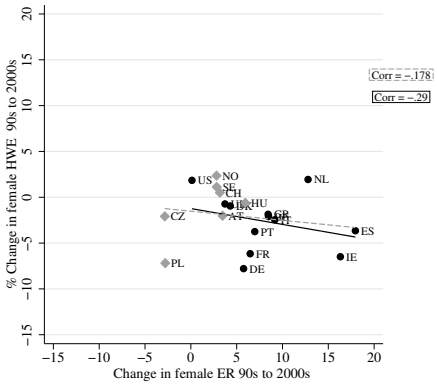
[30] Age group results are available from the authors upon request.

Figure 18: Correlation between change in employment rate and change in hours worked per employed

(a) 80's to 90's



(b) 90's to 2000's



Thus, as in the cross-section, we see in the time series that an increase in the employment rate goes in hand with a fall in hours worked per employed (see Figure 18). In fact, the correlation between the change in the employment rate and the change in hours worked per employed is -.63 for women in the time period 80s to 90s,[31] falling in absolute size to -.18 in the later time period (where it is still -.29 among the countries that were in the sample already in the 80s). This decrease in the absolute size of the negative correlation seems to be driven by the increasing cross-country convergence in employment rates, which is not accompanied by a convergence in hours worked per employed.[32]

[31] The two countries that do not follow this pattern are the US and the UK, which achieved an increase in the employment rate at the same time as an increase in hours worked per employed.

[32] The negative correlation between changes in employment rates and hours worked per employed is also present for men in the first time period, where it amounts to -.53, but disappears in the second time period.

6.2 Trends in Differences by Marital Status and Presence of Children

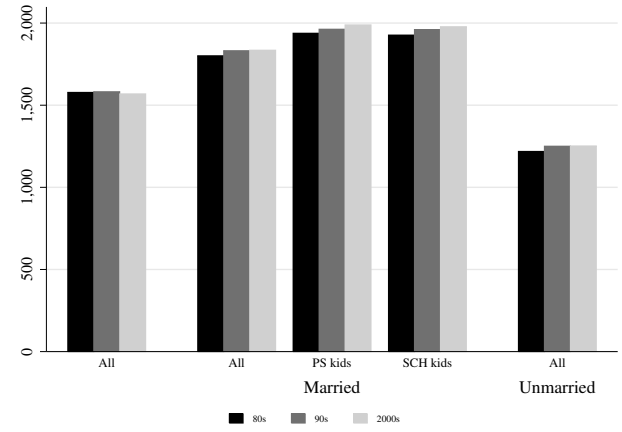
Figures 19 to 22 correspond to the cross-sectional figures on demographic subgroups, but compare differences to the US in the 80s (1983-1987), the 90s (1993-1997) and the 2000s (2003-2007), where the latter correspond to the numbers discussed already in Section 5.2. We omit panel (b) of the Figures presented in Section 5.2, and instead split up the old panel (c) into married individuals (new panel (b)) and unmarried individuals (new panel (c)). In each of panel (b) and (c), we present three groups of bars corresponding to the three country groups. Within each group, we show the time series development for all, and individuals with preschool and school children, respectively, with the exception of unmarried men, whom we do not further decompose by the presence of children, as before. The time series developments are represented by three bars, where the first bar refers to the 80s (1983-1987), the second to the 90s (1993-1997), and the third to the 2000s (2003-2007). Since the Eastern European countries entered the sample only in the 90s, the bar for the 80s is omitted for this country group.

As panel (a) of Figure 19 shows, male hours worked per person were fairly stable over time in the US for all demographic subgroups.[33] Differences to the US increased from the 80s to the 2000s for married men in all European country groups, mostly driven by married men without children. This divergence happened between the 80s and the 90s for Western and Southern Europe, where from the 90s to the 2000s differences mostly decreased, and from the 90s to the 2000s for Eastern Europe, which we do not observe in the 80s. The increasing difference in male hours worked between the US and Western and Southern Europe betweein the 80s and the 90s is likely driven by the increase in early retirement programs in Europe. For unmarried men, by contrast, differences to the US became smaller for Southern and Western Europe, but stayed stable for Eastern Europe. Thus, given the stable hours in the US, this implies that married men decreased their hours in Europe over the sample period, with the opposite being true for unmarried men.

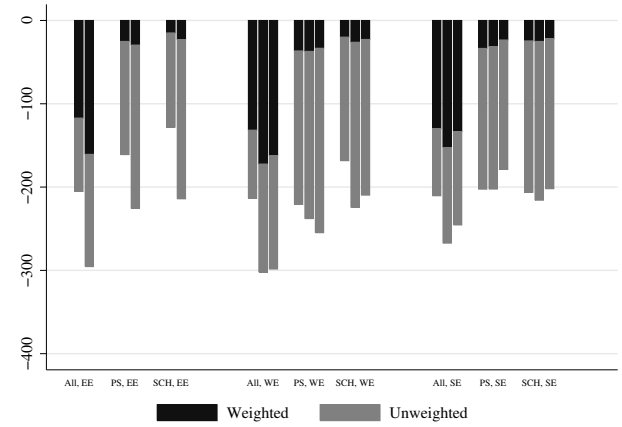
[33] Note that despite the slight increase in hours worked per person of both married and unmarried men, overall hours worked per person slightly decreased from the 80s to the 2000s due to changes in the composition of both groups, with the group of unmarried men increasing in size.

Figure 19: Demographic decomposition of male hours worked per person over time

(a) Male hours worked per person in the US over time by the presence of children



(b) Weighted and unweighted difference to US for married men over time, by the presence of children



(c) Weighted and unweighted difference to US for unmarried men over time

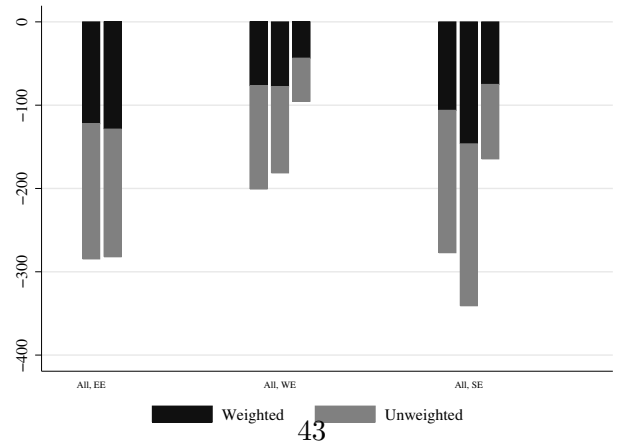
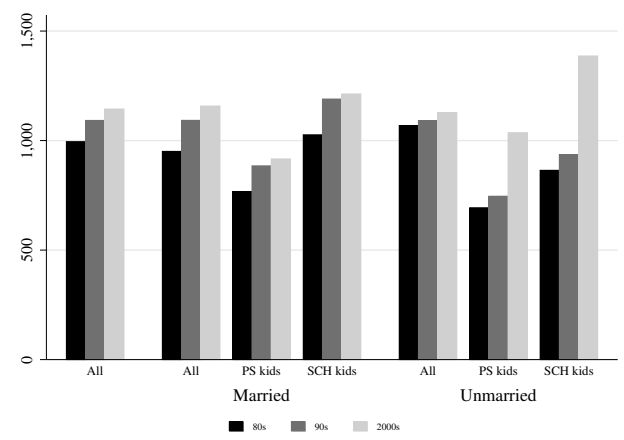
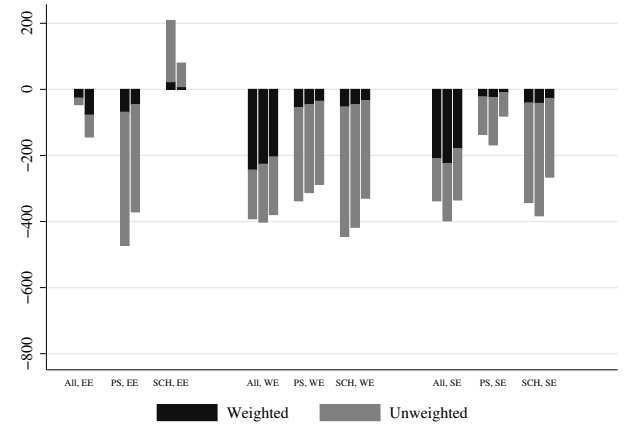


Figure 20: Demographic decomposition of female hours worked per person over time

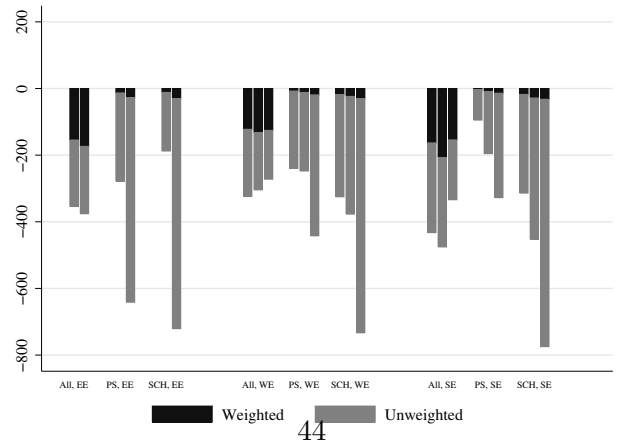
(a) Female hours worked per person in the US over time, by marital status and children



(b) Weighted and unweighted difference to US for married women over time, by the presence of children



(c) Weighted and unweighted difference to US for unmarried women over time, by the presence of children



Female hours worked per person are increasing over time in the US (panel (a) of Figure 20). For married women with children, the increase in hours worked is more pronounced in all European country groups than in the US, thereby lowering the US-Europe gap. The opposite is true for married women without children, leading to overall stable hours differences of married women between the US and the European country groups, or even increasing ones in the case of Eastern Europe. By contrast, for unmarried women without children the US-European difference is decreasing over time, leading to decreasing or stable overall differences for unmarried women. The most remarkable change comes from the large increase in the difference of hours worked for unmarried women with preschool or school children between the US and all European country groups (panel (c)), which is driven by the large increase in the hours of these two groups over time in the US (panel (a)). Thus, we observe quite some differences in relative time trends for married and unmarried women (stable/diverging vs. stable/converging) between Europe and the US, as well as between women with and without children (in the case of married women, diverging without children and converging with children, in the case of unmarried women the other way round).

Figures 21 and 22 show the decomposition of these trends in female hours worked per person into an extensive and an intensive margin. In the US, hours increased for all subgroups along both margins. Yet, the large increase for singles with children is mostly driven by the extensive margin, bringing this group into the labor market. For unmarried women without children, as well as all married women with and without children, we observe mostly a convergence in employment rate differences between Europe and the US over time.[34] For hours worked per employed, the difference to the US becomes more negative for all demographic subgroups in all European regions. The difference and the change are largest for Western Europe, but the uniformity of these trends in hours worked per employed is striking. While hours worked per employed uniformly rise in the US, they decrease in Europe.

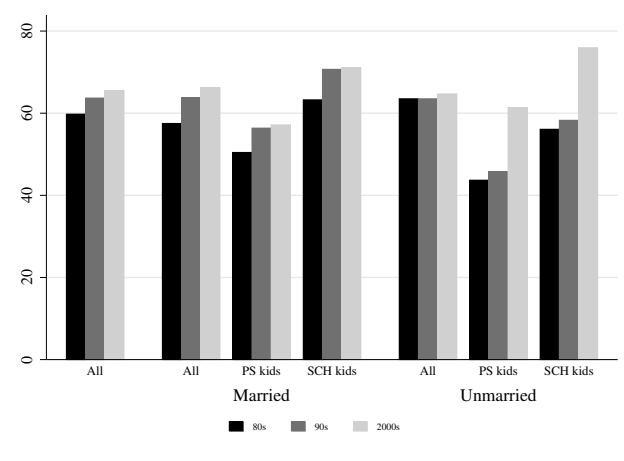
If we analyze the cross-country correlation of changes in the employment rate and changes in hours worked per employed for the different demographic subgroups, it is universly strongly negative for the period 1980s to 1990s, except for married women with preschool children. In the later time period (1990s to 2000s), it remains negative only for married women without children, suggesting that it might be driven by older women.[35]

[34] An exception are married women without children in Eastern Europe.

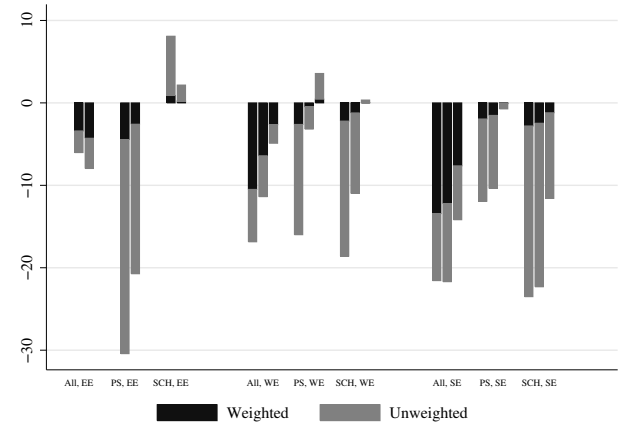
[35] Remember that women with children older than 16 years are categorized as women without children.

Figure 21: Demographic decomposition of female employment rates over time

(a) Female employment rate in the US over time, by marital status and children



(b) Weighted and unweighted difference to US for married women over time, by the presence of children



(c) Weighted and unweighted difference to US for unmarried women over time, by the presence of children

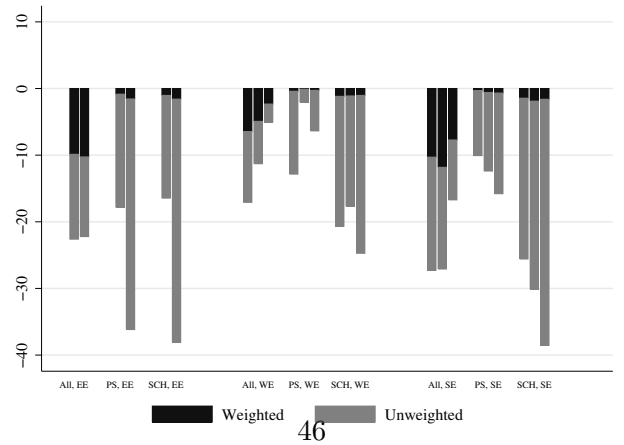
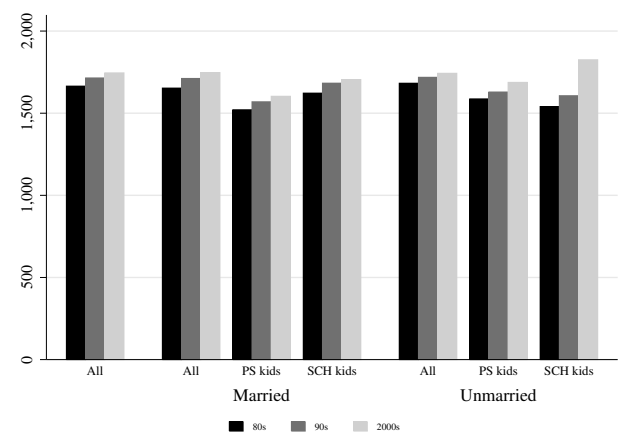
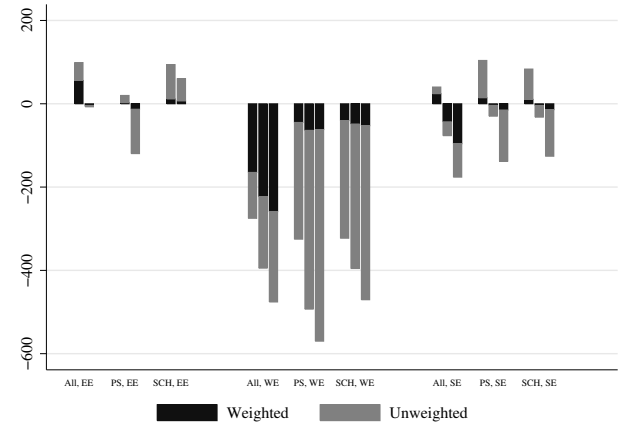


Figure 22: Demographic decomposition of female hours worked per employed over time

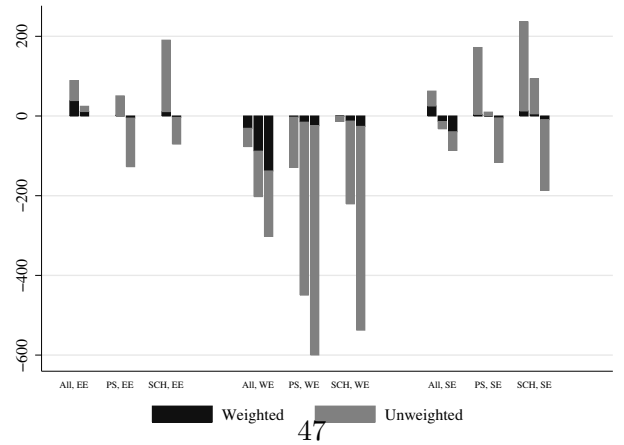
(a) Female hours worked per employed in the US over time, controlling for marital status and children



(b) Weighted and unweighted difference to US for married women over time, by the presence of children



(c) Weighted and unweighted difference to US for unmarried women over time, by the presence of children



6.3 Dispersion Trends

Figures 23 and 24 show the cumulative distribution functions of usual weekly hours worked for men and women for the three time periods 1983-1987, 1993-1997, and 2003-2007. For men in the 80s, the distribution function almost collapses to a vertical line at 40 hours for the US and Scandinavia, with usual hours exceeding 40 hours in Southern Europe, and Western Europe showing some variation around 40 hours. By contrast, the 90s show a decrease in "typical" usual hours worked below 40 for Scandinavia, with Western Europe following suite in the 2000s, as well as more heterogeneity in usual hours worked in general. This is in line with the decrease in hours worked per employed for Western European and Scandinavian men in Figure 16.

For women, part-time work, which we define as working less than 30 hours, was most prominent in the 80s in Scandinavia, and increased in importance in Western Europe from the 80s to the 90s, overtaking the Scandinavian part-time work rate. It kept increasing in Western Europe into the 2000s, while the part-time work rate somewhat declined in Scandinavia in the latest period. At the same time, part-time work lost importance in the US and gained importance in Southern Europe, aligning the distributions for both regions. The part-time work rate in Eastern Europe is at a low level in both the 90s and the 2000s. While the cross-country distribution of usual hours worked in the 80s shows quite some heterogeneity at both the upper and the lower end of the distribution, the distribution at the lower end clearly dominates in heterogeneity in the 2000s.

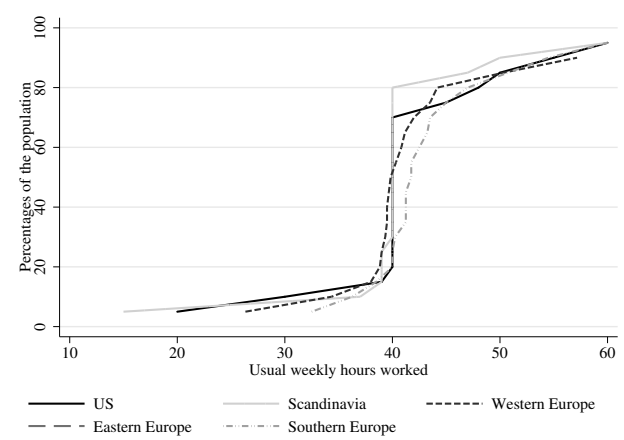
As an interesting fact emerges a positive correlation between changes in part-time work and changes in the employment rate. Blau and Kahn (2013) relate the falling behind of the US female participation rate in the international context in the 2000s to the increase of family-friendly policies in other OECD countries. Indeed, as panel (b) of Figure 25 shows, there is a positive correlation of 0.43 between the percentage point increase in the share of women working less than 30 hours a week and the percentage point increase in the female employment rate between the 1990s and the 2000s. Thus, the countries that experienced the strongest increase in the female employment rate in this decade are the ones that also saw the largest increase in the share of women working part-time. This correlation was even stronger in the time period 80s to 90s, where it amounted to 0.59.[36] In unreported results, we find that the correlation between increases in the part-time share and increases in the employment rate is especially large for unmarried women in the period 80s to 90s, but married women in the period 90s to 2000s. While the negative correlation between changes in employment rates and hours worked per employed becomes weak in the later time period, there is thus still a strong positive correlation between increases in the employment rate and part-time work, supporting the claims by Blau and Kahn (2013) and Goldin (2014) that increases in flexibility are the main step left to close the gender gap in the labor market. At the same time, the results make clear that part-time work becomes a less important margin over time, and other areas of flexibility, e.g. flexible work hours during the day, might become more important in the future to

[36] Keeping the sample of countries fixed, this would compare to a correlation of 0.53 in the 90s to 2000s.

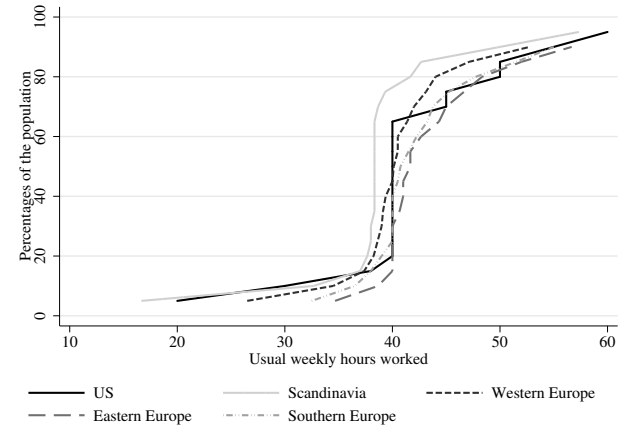
retain women in the labor market, and allow them to make a career (which is beyond the scope of this paper).

Figure 23: Trends in distribution of male usual hours worked

(a) 1983-1987



(b) 1993-1997



(c) 2003-2007

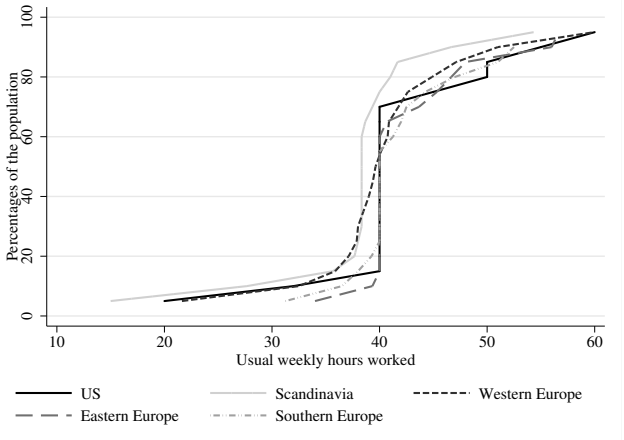
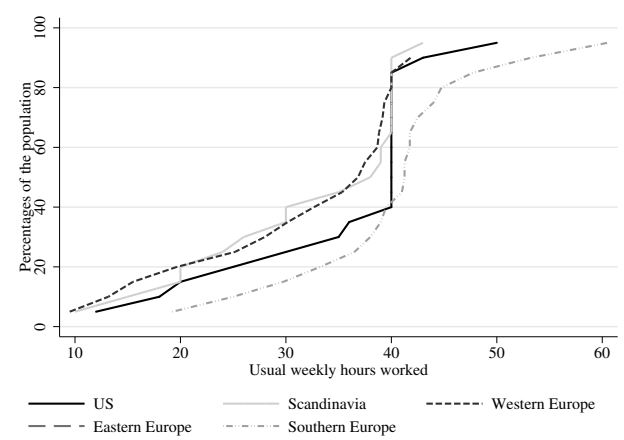
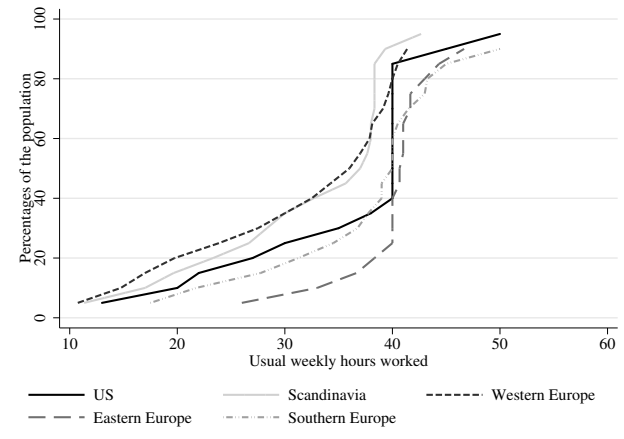


Figure 24: Trends in distribution of female usual hours worked

(a) 1983-1987



(b) 1993-1997



(c) 2003-2007

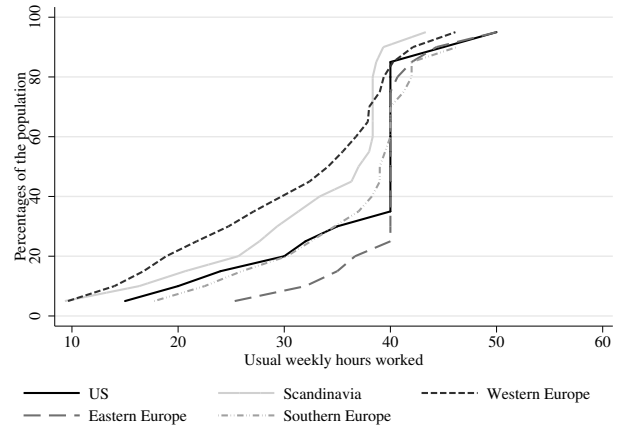
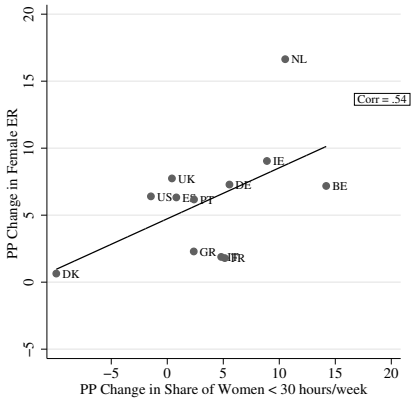
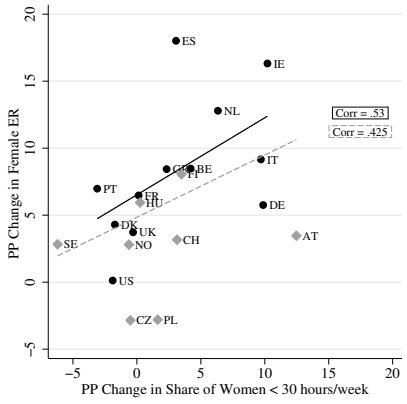


Figure 25: Increase in share of women working part-time vs. increase in female employment rate

(a) 80's to 90's



(b) 90's to 2000's



6.4 Time Trends: Summary

Summarizing, for men, employment rates first decrease from the 80s to the 90s and then increase and converge across countries from the 1990s to the 2000s, in conjunction with a decrease in hours worked per employed. This is driven by an increased participation in the labor market of men aged 55 to 64 from the mid 1990s on. Over the time frame 1980s to 2000s, the within-country dispersion of usual hours worked increases somewhat for men, and the "typical" weekly hours fall below 40 in Western Europe and Scandinavia. For women, the employment rate increases throughout, though at a decreasing rate, and shows some cross-country convergence. The decline in cross-country differences relative to the US is present for every demographic subgroup but unmarried women with children, due to the large increase in their employment rate in the US over time. By contrast, hours worked per employed are consistently falling in Europe relative to the US over time. Recent increases in female labor force participation in Europe go in hand with a fall in hours worked per employed, and an increasing share of women working part-time. For both sexes, hours worked per employed tend to decrease in Western Europe. Between the 1980s and the 1990s, we observe a strong negative correlation between changes in the employment rate and changes in hours worked per person for both men and women, while the negative correlation becomes much smaller for women between the 1990s and the 2000s, and disappears for men.

7 The Great Recession

Last, we analyze the effect of the Great Recession on male and female hours worked.

7.1 Male and Female Hours Worked in the Great Recession

Figures 26 and 27 show the change in male and female, respectively, hours worked per person during the great recession. To do that, they depict on the x-axis the average hours worked per person in the pre-crisis period 2003-2007, and on the y-axis the corresponding hours in the crisis period 2009-2011. For men, Figure 26 makes the strong universal effect of the crisis apparent. Male hours worked per person decline substantially, except for Poland, Germany, and Sweden, and with significant heterogeneity across countries. The largest decreases occur in Ireland and Spain with 22 and 16 percent, respectively. But even disregarding these two countries, the mean decrease amounts to 3.5 percent. Quite surprisingly, this decrease in hours due to the crisis is not present for women. Figure 27 shows that for the majority of countries, female hours worked per person are actually *increasing* during the crisis, with the notable exception of the US and Ireland, where they are decreasing by 6.3 and 9.3 percent, respectively.

Figure 26: Change in male hours worked per person during the Crisis

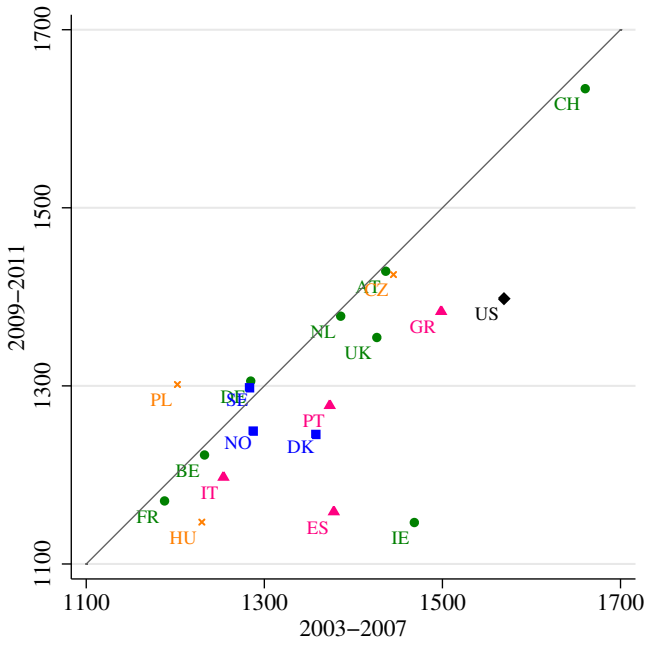
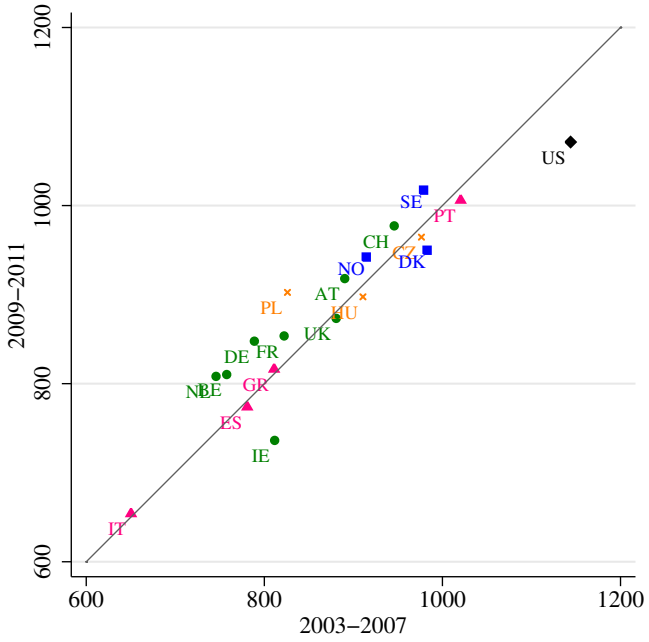


Figure 27: Change in female hours worked per person during the Crisis



7.2 Sectoral and Educational Effects

The smaller effect of the crisis on female hours worked is at first view surprising, given that the literature typically finds that women exhibit a higher labor supply elasticity than men, suggesting that they might adjust hours more over the cycle than men. On the other hand, the added worker hypothesis would stipulate that in a model with intra-household insurance, the secondary earner might enter the labor force or increase her hours when the primary earner loses his job in a recession (see e.g. Lundberg (1985) and Stephens (2002)).

The question arises whether gender was indeed an underlying factor of differential effects during the crisis, or whether the apparent gender difference in the previous two figures is in fact an artefact of some omitted factors. One hypothesis might be that the crisis affected manufacturing and construction jobs, which are predominantly male, more than service jobs. Different education groups could also be affected differently, which might again affect men and women differentially. Last, as we saw before, female hours worked exhibited an increasing trend in the pre-crisis period, so that it could still be the case that this trend was dampened by the crisis without an actual decline in female hours.

In order to investigate these hypotheses, we run the following regression. In the absence of individual-level panel data, we first compute the employment rate and hours worked per employed for each country and year for each gender/sector/education cell, focusing on 15 sectors and 3 education levels. The employment rate by gender/sector/education is defined as the number of women working in this sector and exhibiting this education level, divided by the number of all women, and analogously for men. Summing up across all sector/education cells thus gives the aggregate gender-specific employment rates. We then regress the percent change in this employment rate and the percent change in hours worked per employed for these gender/sector/education cells between 2003-2007 and 2009-2011 (capturing the effect of the Great Recession) on a male dummy, as well as the respective change between 1999-2002 and 2003-2007 (capturing any pre-crisis trends), this pre-crisis trend interacted with the male dummy (allowing for different pre-crisis trends among men and women, which we saw in Section 6.1), sectoral dummies, and education dummies.[37] We analyze percent changes rather than percentage point changes in the employment rate, such that if the number of male and female workers in a given sector declines proportionally, as would be the case for random dismissals, this leads to the same change in the employment rate. Thus, we run the following regression, where the subscript g stands for gender, s for sector, e for education level,

[37] Thus, we first take average of the years 1999-2002, 2003-2007, and 2009-2011, and then look at the percent changes between these averages.

and c for country:

$$\Delta^{crisis}_{c,g,s,e} = \beta_0 + \beta_1 * \text{Male Dummy}_g + \beta_2 * \Delta^{precrisis}_{c,g,s,e} + \beta_3 * \Delta^{precrisis}_{c,g,s,e} * \text{Male Dummy}_g + \sum_s \beta_s * \text{Sector Dummies}_s + \sum_e \beta_e * \text{Education Dummies}_e + \sum_c \beta_c * \text{Country Dummies}_c + \epsilon_{c,g,s,e}$$

Table 6: Regression of crisis change on precrisis change, male dummy, sector dummies, and education dummies

	Employment Share		**Hours Worked per Employed**	
	(1)	(2)	(1)	(2)
Male Dummy	−0.039***	0.005	−0.012***	−0.009***
	(0.011)	(0.009)	(0.002)	(0.002)
$\Delta^{precrisis}$	–	0.342***	–	−0.026
		(0.026)		(0.027)
$\Delta^{precrisis}$* Male Dummy	–	−0.163***	–	−0.032
		(0.037)		(0.042)
Constant	0.022***	−0.275***	−0.009***	−0.024***
	(0.008)	(0.024)	(0.001)	(0.004)
3 Education Dummies	No	Yes	No	Yes
15 Sector Dummies	No	Yes	No	Yes
19 Country Dummies	No	Yes	No	Yes
Obs	1685	1665	1674	1658
R^2	0.007	0.480	0.026	0.430

*** p<0.01, ** p<0.05, * p<0.1. Standard errors in parantheses.

The respective first columns for the employment share and hours worked per employed in table 6 show results from this regression including only the male dummy and omitting any controls. On average across all countries, the female employment share increased by 2.2 percent, whereas the male employment share decreased by 1.7 percent (2.2-3.9). Female hours worked per employed decreased by 0.9 percent, but male hours worked per employed even by 2.1 percent (-0.9-1.2). Controlling for 15 sectors, 3 education groups, 19 countries, and differential precrisis trends for men and women, the male dummy is still negative and highly significant for hours worked per employed, indicating a 0.9 percentage points larger decrease in hours worked per employed on average for men than for women, but becomes insignificant for the employment share.[38] Thus, we find that the differential gender effect of the crisis on male and female employment rates is an artefact of some covariates, but that indeed hours worked per employed decreased more for men than for women.[39] This could be due to the fact that many women already work part-time, making it more difficult for a firm to

[38]The omitted groups in the regressions are low-educated women in the manufacturing sector.

[39]The coefficient on the interaction term of the pre-crisis trend and the male dummy is negative, indicating in the case of the employment share that a pre-crisis trend is significantly less positively correlated with a crisis-trend for men than for women.

reduce their hours.

We also run a specification in which we interact the education dummy with the male dummy. Table 7 presents the results of these regressions, showing the sum of the male coefficient plus the coefficient on the interaction term between the male dummy and the respective sector. The negative male effect on hours worked per employed is present for all education groups, but decreasing in the level of education. Thus, it is strongest for the low educated, where it amounts to 1.2 percentage points. Since hours worked per employed are on average lowest for the low educated (see Table 5), this might again indicate that it is harder for firms to cut back on hours of part-time workers during a recession than on those of full-time workers. For the employment share, we do not find significantly different male effects for any education group, but the coefficient is positive and relatively large with 1.6 percentage points for the medium educated, but negative and large with 1.2 percentage points for the highly educated.

$$\Delta^{crisis}_{c,g,s,e} = \beta_0 + \beta_1 * \text{Male Dummy}_g + \beta_2 * \Delta^{precrisis}_{c,g,s,e} + \beta_3 * \Delta^{precrisis}_{c,g,s,e} * \text{Male Dummy}_g + \sum_s \beta_s * \text{Sector Dummies}_s + \sum_e \beta_e * \text{Education Dummies}_e + \sum_e \beta_{g,e} * \text{Education Dummies}_e * \text{Male Dummy}_g + \sum_c \beta_c * \text{Country Dummies}_c + \epsilon_{c,g,s,e}$$

Table 7: Regression with interaction of dummies for education and gender

	Employment Share		**Hours Worked per Employed**	
Education	$\beta^{ER}_{male} + \beta^{ER}_{male*educ}$	p-value	$\beta^{HWE}_{male} + \beta^{HWE}_{male*educ}$	p-value
Low education	0.000	0.999	−0.012***	0.000
Medium education	0.016	0.219	−0.009***	0.000
High education	−0.012	0.502	−0.005**	0.050

*** p<0.01, ** p<0.05, * p<0.1

When we interact the male dummy with each sectoral dummy separately, we find that in 8 of 15 sectors the male employment rate decreases by more than the female one, but in only 1 significantly so (real estate, renting and business activities) and in 12 of the 15 sectors male hours worked per employed decrease by more than female ones. Seven sectors have significantly negative interaction terms in the hours worked per employed regression, namely manufacturing, construction, wholesale and retail trade, public administration, education, health and social work, and transport, storage and communication. Thus, the gender effect on hours worked per employed is not driven by single sectors, but fairly universal. These results are shown in Section A.7 in the Appendix.

Similarly, we interact the male dummy with country dummies in order to analyze the homogeneity of the result across countries. The results, shown in Table A.11 in Appendix A.7, are very

heterogeneous for the employment rate. In fact, in two countries the male employment rate rose significantly *more* than the female one after controlling for confounding factors, namely by 10.9 percentage points in Poland, and by 6.2 percentage points in Sweden, while in no country it decreased significantly more. By contrast, the negative male effect on hours worked per employed is fairly universal across countries; only in Austria and France did male hours worked per employed decrease less than female ones in the crisis, in France even significantly so. All other countries exhibit a negative male effect, which is significant in Belgium, Denmark, Ireland, Netherlands, Norway, Poland, Sweden, Switzerland, and the US, and largest in Sweden and Norway with -3 and -2.8 percentage points, respectively.

Thus, we conclude that the crisis hit men and women to the same extent when it comes to the extensive margin, but decreased hours worked per employed more for men than for women, which is mostly driven by low- and medium-educated men.

8 Conclusion

In this paper, we document the construction of a new data set that allows the comparative analysis of hours worked along the extensive and intensive margin across countries and over time for different demographic subgroups. In the first part of the paper, we explain in detail the set-up of the data set, and compare it to aggregate data from the OECD and the Conference Board.

In the second part, we derive some stylized facts based on the new data set, focusing on gender. First, it becomes clear that looking only at aggregate data hides substantial heterogeneity across the extensive and intensive margins, and by gender. A very important stylized fact is a strong negative correlation between the employment rate and hours worked per employed for women. In Europe, this can exemplary be seen by comparing Scandinavia and Western Europe, two regions with high female employment rates and low female hours worked per employed, with Eastern and Southern Europe, for which the opposite is true. We find this negative correlation for all different demographic subgroups according to marital status and presence of children. We observe a larger within-country heterogeneity by demographic subgroups for the extensive margin in Eastern and Southern Europe than in Western Europe and Scandinavia, but a smaller within-country heterogeneity in the intensive margin for the first two regions than for the latter ones. This indicates that a lack of part-time jobs in Eastern and Southern Europe forces women there to adjust their hours along the extensive margin. Unmarried women with children stand out as the group that shows by far the largest differences in hours worked between Europe and the US. As the analysis over time makes clear, this is very likely the result of the Clinton welfare reforms in the US, which increased both employment rates and hours worked per employed for this group dramatically in the US, while any similar increase is absent in Europe.

The correlation between the female employment rate and female hours worked per employed is also present in the time series: increases in the female employment rate over time are associated with

declines in hours worked per employed. Related to this, countries which increased their employment rates the most over time also exhibited the largest increase in the share of women working part-time. This share is largest in Western Europe, where around 40 percent of all employed women work less than 30 hours per week, followed by Scandinavia with 30 percent, Southern Europe and the US with 20 percent, and Eastern Europe with 10 percent. The development of employment rates over time for different demographic subgroups is quite heterogeneous, while the hours worked per employed difference relative to the US increased uniformly over time for all country groups and all demographic subgroups.

These data thus unearth interesting facts that call for future research to understand their causes. A crucial challenge for any model will be to explain the different decompositions into extensive and intensive margins. A key question is whether these decompositions and the negative correlation between employment rates and hours worked per employed are driven by supply side factors, with the marginal woman entering employment exhibiting lower productivity and consequently working optimally fewer hours, or demand side factors, with countries that increase the flexibility in work arrangements being more successful in attracting women into the labor force. We provide suggestive evidence for the latter: it seems that part-time jobs are of scarce supply in Eastern and Southern Europe, forcing women there to adjust their hours along the extensive margin. Interestingly, the US is an outlier in this, achieving high female employment rates and high female hours worked per employed at the same time. Overall, our results lend support to the claims by Goldin (2014) and Blau and Kahn (2013) that the next (and possibly last) step in closing the gender gap in the labor market is an increase in flexibility which goes in fact beyond the possibility of working part-time: part-time work seems to have been a major margin in increasing female labor market attachment from the 1980s to the 1990s, but has somewhat lost importance since then.

All our results leave much scope for future research. While we give some suggestive explanations for trends and decompositions into the extensive and the intensive margin, the underlying sources for level differences could be manifold and will be interesting to analyze. For example, the striking differences in the behavior of unmarried women with children over time between the US and Europe point to the importance of social security systems in driving labor supply behavior, as does other evidence as e.g. the fall and subsequent rise in employment rates in Europe during the expansion and reduction of early retirement programs. Besides this, we focus in this paper on hours worked by gender, marital status, and presence of children, but other characteristics are of course interesting as well and could be addressed with the data at hand, such as age and cohort effects, to which we allude only in passing. It would also be possible to construct synthetic cohort life-time profiles of hours worked.

Last, we analyze in this paper what happened to hours worked by gender during the recent crisis. We find that on average across all countries, male employment rates decreased by 3.9 percentage points more than female ones, and male hours worked per employed by 1.2 percentage points more.

However, the larger decrease in the male employment rate is an artefact of sector and trend effects, while male hours worked per employed decreased significantly more than female ones even after controlling for many factors, driven largely by the low- and medium-educated. This could show as a potential pit-fall of part-time work for employers that it makes it harder to reduce hours further during a recession. While the differential gender effect of the great recession is thus likely an artefact of differential sector and education effects, it still remains true that it might have shifted the relative income positions of many couples in the OECD countries.

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A Data Appendix

A.1 Data Issues and Final Sample Size

For the construction of the hours measure "Adjusted Micro Data" it is important to mention that the CPS questionnaire provides less information than the ELFS/Microcensus. First, actual hours worked are only available for all jobs. Second, employed respondents who report positive actual hours but less than usual (in the main job) were only asked why they worked less if their usual hours were at most 33 hours (up to 1993) or their actual hours were at most 34 hours (from 1994 onwards). For those who were employed but did not work at all in the reference week the CPS asks for the same information as the ELFS/Microcensus. These differences in the survey design do not affect our annual hours worked per employed measure "Raw Micro Data" and hardly the second measure "Adjusted Micro Data". For the latter, we recompute hours for the ELFS/Microcensus assuming that we would have exactly the same information set as in the CPS. The difference between the average annual hours per employed based on the full and restricted information (as in the CPS) is at most 0.51% and on average 0.35% from the year 1994 onwards. This estimate is in fact an upper bound for the years 1993 and before. Although the documentation of the CPS states that up to 1993 only respondents with usual hours not exceeding 33 hours were asked for the reason of having worked less, many individuals with usual hours greater than 33 hours in fact also answered this question. Thus, by extending the set of respondents who answer the question any potential bias will be smaller than under the strict cut-off rule.

Table A.1: The effect of capping on hours worked per employed (all years, in %)

Country	Hours Worked without capping	Hours Worked with capping	Difference	Difference in %
Denmark	1557.92	1556.72	−1.20	−0.08
Norway	1475.85	1474.25	−1.60	−0.11
Sweden	1565.86	1565.03	−0.82	−0.05
Mean	*1533.21*	*1532.00*	*-1.21*	*-0.08*
Austria	1683.42	1682.12	−1.30	−0.08
Belgium	1703.42	1702.89	−0.52	−0.03
Switzerland	1693.32	1692.29	−1.04	−0.06
France	1652.39	1651.84	−0.55	−0.03
Ireland	1798.28	1797.48	−0.80	−0.05
Germany	1613.28	1612.20	−1.08	−0.07
Netherlands	1485.24	1484.98	−0.26	−0.02
United Kingdom	1672.55	1672.12	−0.43	−0.03
Mean	*1662.74*	*1661.99*	*-0.75*	*-0.05*
Czech Republic	1865.28	1864.93	−0.35	−0.02
Hungary	1873.75	1873.38	−0.38	−0.02
Poland	1892.50	1891.27	−1.23	−0.06
Mean	*1877.18*	*1876.53*	*-0.65*	*-0.03*
Spain	1757.48	1757.38	−0.10	−0.01
Greece	1922.41	1921.19	−1.22	−0.06
Italy	1665.28	1665.21	−0.08	0.00
Portugal	1827.16	1826.13	−1.03	−0.06
Mean	*1793.08*	*1792.48*	*-0.61*	*-0.03*
US	1880.23	1875.70	−3.59	−0.19

Table A.2: Average fraction of observations (all years) that are dropped because of missings in usual or actual hours worked (in %)

Country	$h_{act} = .$ and set to zero	$h_{act} = .$ and dropped	$h_{usu} = .$ and dropped
Denmark	0.00	0.65	0.01
Norway	1.14	0.77	0.04
Sweden	0.00	0.09	0.00
Mean	*0.38*	*0.51*	*0.02*
Austria	0.30	0.00	0.00
Belgium	0.00	1.49	0.03
Switzerland	0.00	2.07	0.00
France	0.00	0.04	0.01
Ireland	0.00	0.32	0.00
Germany	0.00	0.00	0.00
Netherlands	0.00	0.44	0.00
United Kingdom	0.00	0.90	0.01
Mean	*0.04*	*0.66*	*0.01*
Spain	0.00	0.52	0.01
Greece	0.00	0.01	0.00
Italy	0.01	0.13	0.00
Portugal	0.00	0.26	0.01
Mean	*0.00*	*0.23*	*0.01*
Czech Republic	0.00	0.19	0.00
Hungary	0.00	0.02	0.00
Poland	0.00	0.00	0.00
Mean	*0.00*	*0.07*	*0.00*
US	2.54	0.41	0.20

Table A.3: Final Sample Size, individuals aged 15-64, part 1

Year	BE	DK	FR	GR	IT	IE	NL	UK	US	DE	PT	ES
1983	71106	.	104800	80661	222945	84597	110693	137949	293223	.	.	.
1984	29413	19415	106242	91681	230151	89464	.	105106	289019	.	.	.
1985	60804	19821	106487	91867	223136	90676	107118	106409	288542	303863	.	.
1986	54186	18591	105463	92171	222753	89780	.	106717	282810	.	59098	128768
1987	49152	18407	106881	93192	237109	91013	35103	104823	281228	305693	57850	120401
1988	51087	17793	107535	94192	238476	89977	52160	106626	266234	.	57351	128927
1989	48450	18691	108020	93048	258153	90527	54459	106607	269559	265745	54678	130375
1990	48009	18853	105893	93271	258764	90202	52877	102994	283563	.	54546	132278
1991	49854	19279	105914	92380	130290	90235	52309	101466	280001	352462	55271	131593
1992	50111	17953	107691	90788	137370	93697	53592	100113	275042	.	32222	130074
1993	51357	19576	112283	112590	136621	92749	51610	101991	270768	349187	32636	126612
1994	51432	11480	115299	110089	135404	92408	57438	98985	263369	.	31845	127268
1995	50545	11225	115257	108555	138114	92832	61021	96051	260273	345465	29699	129209
1996	51419	11146	114278	108795	136776	91637	54693	95019	230148	343270	29533	129376
1997	50465	11002	112160	107759	136315	94167	62782	91624	232887	343871	29534	128514
1998	50831	10972	112808	56220	136325	72439	39115	89468	233029	342754	32749	128966
1999	17212	10639	113230	55238	135308	72205	36429	88718	235273	341589	30812	132046
2000	17062	10763	113621	53669	134892	70129	48178	85849	236168	338031	29594	121626
2001	16056	10509	111631	52735	131656	69923	64988	.	252663	336765	29743	116583
2002	18140	10582	109689	50305	129271	70378	69641	84286	274879	335396	29405	115254
2003	18082	10001	55759	47349	127244	67712	69411	80871	273909	333615	30027	117254
2004	18593	10024	56289	52268	110413	57276	82160	77417	269087	329707	33109	116925
2005	73692	37864	219384	200842	448246	60590	343516	76367	268752	312325	123711	.
2006	76889	36787	216427	192420	434234	56970	77719	74700	266688	324161	116170	68048
2007	76217	73656	224295	186256	426063	56643	76256	74170	264106	312952	110960	69017
2008	72462	70657	222326	184897	420881	49292	78729	119280	262758	313384	107887	70328
2009	71063	73216	264813	188855	409672	179531	68640	58743	265326	316452	104944	72958
2010	70520	84449	315206	192444	409654	160114	59932	56983	264798	.	103056	72978
2011	65855	89419	325751	171442	399728	146444	64049	53874	260936	.	100490	69884

Table A.4: Final Sample Size, individuals aged 15-64, part 2

	AT	NO	SE	HU	CH	CZ	PL
1995	40193	19687	15739	.	.	.	.
1996	40047	18860	14673	43489	12536	.	.
1997	39760	18923	14497	42709	12538	48286	44719
1998	41358	18399	14234	57007	12589	47805	45815
1999	41005	18529	16305	58616	13619	46817	44374
2000	39502	18846	15824	56627	13604	44717	38378
2001	39819	18070	48005	56361	14121	44195	39226
2002	39438	18772	53146	55331	30451	42772	39878
2003	37920	18846	53499	59285	44451	41728	39735
2004	30144	19183	48922	55590	41599	43216	39305
2005	136572	76989	138313	209830	39248	171815	154607
2006	133522	18571	196331	209593	36435	174527	148977
2007	134016	18623	193607	204599	36634	172614	142281
2008	129481	17919	190039	193973	35526	164990	142666
2009	124005	18000	183925	192955	36195	159491	146366
2010	121121	17520	240485	189002	48288	157048	286657
2011	120696	17252	232441	188869	51354	30259	291083

A.2 External Data for Public Holidays and Days of Annual Leave: Country Details

- **Denmark**
  - Public Holidays
    - 1983-2008: From the Confederation of Danish Employers (DA) we obtain data on three variables: Agreed weekly hours (AWH), agreed annual hours (AAH, net of days of annual leave and public holidays) and the number of days of annual leave (daleave). Assuming that a regular working week comprises 5 working days, the number of public holidays (dpublic) can be calculated as follows:
      1. Obtain agreed daily hours (ADH) from agreed weekly hours (ADH=AWH/5).
      2. Calculate the number of annual hours worked including public holidays but excluding days of annual leave: $AWH * (52 - daleave/5)$.
      3. Subtract the number of agreed annual hours AAH (where both days of annual leave and public holidays have already been subtracted). This yields the number of annual hours lost due to public holidays.
      4. Divide this by the agreed daily hours (ADH) in order to obtain the number of public holidays, pubhol.

      $\rightarrow$ Public holidays $= \frac{AWH*(52-daleave/5)-AAH}{ADH}$.
    - The Agreed Annual Hours are only available every five years. In order to obtain the number of holidays in the years without AAH we fit a 8th-order polynomial through the years where we have observations. Note that we exclude the year 1985 from this exercise but rather interpolate it as well because of the exceptional high value (14 public holidays as opposed to on average 7.5 days) for which we don't have a plausible explanation. Since the non-interpolated holidays are always integers (with exception of the first two observations 1960 and 1965), we use the respective integer value of the interpolated series. The resulting numbers of public holidays are lower than the EIRO levels and exhibit less variation.
    - 2009-2011: The interpolation employed in the previous years predicts a sharp increase in public holidays, exceeding even the EIRO numbers, so that we instead use those for these years.
  - Annual Leave
    - 1983-2008: Directly given by the Confederation of Danish Employers (DA).
- **France**
  - Public Holidays
    - 2002-2011: EIRO.
    - 1983-2000: "Direction de l'animation de la recherche, des tudes et des statistiques" (DARES), published in the study "Comparaisons internationales de dure et de productivit" by Chagny & Bruyre (2002).
  - Annual Leave

* 1983-2011: "Direction de l'animation de la recherche, des tudes et des statistiques" (DARES), published in the study "Comparaisons internationales de dure et de productivit" by Chagny & Bruyre (2002). We use the value from 1999 to fill in the missing values for the years 2000-2008.

- **Germany**
  - The Institute for Employment Research (Institut f́ur Arbeitsmarkt- und Berufsforschung) provides data on the average number of public holidays, average number of days of annual leave (agreed regular days of annual leave plus additional leave) in its "Arbeitszeitrechnung". As the IAB provides data for all three variables for the entire sampling period, we use this data rather than the data obtained from EIRO.
- **Netherlands**
  - Public Holidays
    * 1983-2008: Central Planning Bureau (CPB) provide numbers of public holidays without Saturdays and Sundays.
  - Annual Leave
    * 1980-1992: Statistics Netherlands ("Centraal Bureau voor de Statitiek", CBS) provides numbers for vacation days including public holidays, from which we subtract the number of public holidays from the CPB.
    * 1995-2005: Numbers are taken directly from the "Enquete werkgelegenheid en lonen" (EWL) provided by the CBS.
- **Switzerland**
  - Public Holidays
    * 1997-2011: The number of public holidays varies strongly between the 26 cantons. The minimum number of public holidays in every canton is 8, which is what we took to control for the number of public holidays.
  - Annual Leave
    * The Swiss Statistical Office provides number on Swiss employees' average number of weeks of annual leave. Multiplying this number by 5 (days per week) yields the number of days of annual leave between 1996 and 2011.
- **United Kingdom**
  - Public Holidays
    * 1983-2008: The UK government's digital service (http://www.direct.gov.uk/) provides the number of public holidays in England, Wales, Scotland and Northern Ireland. These are weighted by the employment shares (obtained from the Office of National Statistics) to calculate the average number of public holidays in the UK. Numbers are available from 1993 onwards, previous years are imputed using the mean.
  - Annual Leave

    - 1983-2008: UK Labor Force Survey asks employees about their entitlement to paid holidays. These numbers are used to calculate the average number of days of annual leave for full-time employees.

- **United States**
  - Public Holidays
    - 1979-1998: Employee Benefit Survey (EBS), conducted by the Bureau of Labor Statistics (BLS).
    - 1999-2008: National Compensation Survey (NCS), also conducted by the BLS.
    - Average number of holidays is based on the product of two data series: the fraction of workers with paid holidays and the average number of public holidays of those with paid holidays.
  - Annual Leave
    - Same sources as for public holidays.
    - When calculating the average number of days of annual leave, we have to take into account the tenure distribution. For details, see "external_data.pdf".

Table A.5: Average number of public holidays and days of annual leave for average over first 5 and last 5 years

	Public holidays		Annual leave		Public holidays + Annual leave	
Country	Start	End	Start	End	Start	End
Germany	11.6	9.8	30.0	31.0	41.6	40.8
Italy	12.0	11.2	28.0	28.0	40.0	39.2
France	8.6	10.8	29.5	29.5	38.1	40.3
Austria	11.8	11.4	25.0	25.0	36.8	36.4
Sweden	10.2	10.0	25.0	25.0	35.2	35.0
Spain	13.1	12.8	22.0	22.0	35.1	34.8
Czech Republic	9.5	9.0	25.0	25.0	34.5	34.0
Norway	9.1	8.8	25.0	25.0	34.1	33.8
Greece	11.0	10.2	23.0	23.0	34.0	33.2
Belgium	8.8	9.6	24.0	20.0	32.8	29.6
Portugal	10.6	11.6	22.0	24.5	32.6	36.1
Switzerland	8.0	8.0	23.4	24.4	31.4	32.4
Denmark	7.9	7.2	22.5	30.0	30.4	37.2
Netherlands	7.0	6.8	22.8	21.0	29.8	27.8
United Kingdom	8.1	8.1	21.5	24.6	29.6	32.7
Poland	9.4	9.6	20.0	20.0	29.4	29.6
Ireland	9.0	9.0	20.0	20.8	29.0	29.8
Hungary	8.9	8.6	20.0	20.0	28.9	28.6
US	9.7	7.1	10.8	10.1	20.5	17.2

A.3 Hours Lost

There can be many different reasons why an individual worked less in the reference week than normally, four of which are explicitly shown in Table A.6: Hours lost due to annual leave, public holidays, sickness, and maternity leave. Hours lost due to other reasons (including bad weather, labor disputes, training, job transition, family reasons, etc.) are captured in a residual category ("other").

Table A.6: Average weekly hours lost due to different reasons (all years)

Country	Total	Annual Leave	Public Holidays	Sickness	Maternity Leave	Other reasons
Denmark	5.65	2.21	0.99	0.74	0.47	1.24
Norway	7.05	2.22	0.86	1.46	0.69	1.81
Sweden	7.48	2.37	1.20	1.44	0.90	1.57
Mean	*6.72*	*2.27*	*1.02*	*1.22*	*0.69*	*1.54*
Austria	4.60	1.67	0.31	0.84	0.51	1.26
Belgium	2.93	1.24	0.25	0.71	0.15	0.58
Switzerland	4.41	2.62	0.00	0.59	0.09	1.11
France	4.43	2.35	0.10	0.89	0.27	0.82
Ireland	2.62	0.83	0.59	0.47	0.22	0.50
Germany	2.70	0.96	0.04	0.58	0.37	0.75
Netherlands	4.27	1.93	0.26	1.30	0.10	0.68
United Kingdom	5.34	2.12	0.81	0.91	0.19	1.31
Mean	*3.91*	*1.72*	*0.30*	*0.79*	*0.24*	*0.88*
Czech Republic	3.63	1.30	0.45	1.04	0.19	0.64
Hungary	2.00	0.81	0.28	0.50	0.09	0.31
Poland	2.19	0.56	0.46	0.37	0.14	0.66
Mean	*2.61*	*0.89*	*0.40*	*0.64*	*0.14*	*0.54*
Spain	3.58	1.80	0.47	0.75	0.11	0.47
Greece	2.78	0.55	0.80	0.12	0.07	1.23
Italy	2.62	0.69	0.23	0.43	0.16	1.11
Portugal	3.00	0.66	0.76	0.80	0.13	0.66
Mean	*3.00*	*0.92*	*0.56*	*0.52*	*0.12*	*0.87*
US	2.72	1.15	0.08	0.49	0.05	0.95

The differences in annual leave and public holidays have already been discussed in Section 3.6 (based on external data) and in Section 4.2 (based on self-reports). Focusing on sick days and maternity leave, one can see that the Scandinavian countries always report the highest number of average weekly hours lost, with a large gap to the other European countries, and the US reporting the lowest numbers. This can largely be explained by the generous social security regulations in Scandinavia (see e.g. Ljunge (2012) for a description of the generous sick day rules in Sweden), and

the least generous ones in the US. In quantitative terms, sick days play a larger role in causing lower work hours than usual in the reference week than public holidays, with the exception of Southern Europe. Annual leave is clearly most important, followed by "other" reasons.[40]

[40]Web Appendix W.5 shows the time series in hours lost for different reasons for each country, and discusses some anomalies in hours lost for the different countries.

A.4 Data sources of OECD and Conference Board (CB)

Country	OECD	CB
Austria	OECD National Accounts questionnaire.	National Accounts (obtained from NIESR database and Eurostat).
Belgium	Secretariat estimates annual hours worked for the total economy based on the ELFS. Estimates take into account the number of public holidays and annual leave shown in the EIRO. Also, a correction is made to account for an estimated 50 per cent underreporting of hours lost due to illness and maternity leave.	OECD Economic Outlook (based on ELFS) until 1990, then national accounts obtained from Eurostat.
Czech Republic	Czech Statistical Office based on Labor Force Sample Survey. Meal breaks are excluded from 2001 onwards.	National Accounts (Eurostat) from 1995 onwards.
Denmark	National Accounts. National estimates of annual hours worked are according to paid hours and do not include neither unpaid overtime nor unpaid absences for different reasons.	National Accounts (Eurostat).
France	National Accounts. Series take into account overtime and second jobs.	National Accounts (Eurostat).
Germany	IAB: establishment survey estimates of weekly hours worked by full-time workers whose hours are not affected by absence. Extended to annual estimates by including public holidays & sickness absences, overtime, short-time, weather, etc. Part-time covered from 1991 onwards.	National Accounts (Eurostat) starting with 1991.
Greece	OECD National Accounts questionnaire.	OECD Economic Outlook (ELFS) until 1994, then national accounts (Eurostat).
Hungary	National Accounts, estimates based on an establishment survey for manufacturing covering five or more employees.	OECD Economic Outlook (ELFS) until 1994, then national accounts (Eurostat).
Ireland	ELFS (see Belgium for more information).	OECD Economic Outlook (ELFS) until 1990, then national accounts (Eurostat).
Italy	OECD National Accounts questionnaire	National Accounts (Eurostat).

Country	OECD	CB
Netherlands	Statistics Netherlands Labor Accounts. Contractual hours minus hours leave, reduced working hours and holidays. Plus paid and unpaid overtime.	National Accounts (Eurostat) from 1995, data extrapolated (backwards) until 1970 using trends on contractual hours from the CBS.
Norway	Statistics Norway, based on national accounts and estimated from a number of different data sources, e.g. establishment surveys, LFS and public sector accounts.	National Accounts (Eurostat).
Poland	Central Statistical Office of Poland, derived from LFS. Total weekly hours worked are divided by average number of people, then multiplied by 52. Break in 1999 due to switch to continuous quarterly survey.	OECD National Accounts 2000-2006. Extrapolated to 1989 using trend from Hungary. 2007 ff. extrapolated from OECD Economic Outlook.
Portugal	ELFS (see Belgium for more information).	National Accounts (Eurostat) from 1990 onwards, 1986-1989 extrapolated with trend from OECD Economic Outlook.
Spain	OECD National Accounts questionnaire	OECD Economic Outlook (ELFS) until 1994, then national accounts (Eurostat).
Sweden	Statistics Sweden, national account concepts estimated using LFS and establishment surveys.	National Accounts (Eurostat).
Switzerland	OECD National Accounts questionnaire, calculations based on Swiss LFS.	National Accounts (Eurostat) (1991-2007), previous years have been extrapolated from 1991.
United Kingdom	Office of National Statistics: weekly hours worked from LFS multiplied by 52.	National Accounts, first from NIESR (until 1990), then Eurostat.
United States	Bureau of Labor Statistics, Office of Productivity and Technology. Upward revised estimates of the annual hour per worker series. These are derived from the CES for production and non-supervisory workers in private sector jobs, imputed for non-production and supervisory workers, and taken from the CPS for proprietors and unpaid family workers.	Hours: unpublished BLS series for total economy. Employment data: 1950-1989: BLS CPS in combination with BEA numbers on military personnel. 1990-2007: BLS CES combined with BEA numbers on military personnel.

A.5 Hours Worked of Men and Women: Recent Cross-Section

Table A.7: Annual Hours Worked per Person (2003-2007): Full sample, Men and Women

Country	All Individuals	Men	Women	Difference
Scandinavia	**1136.6**	**1309.6**	**958.7**	**350.9**
Denmark	1172.4	1357.8	982.8	375.1
Norway	1103.8	1287.5	914.4	373.0
Sweden	1133.6	1283.4	978.8	304.6
Western Europe	**1107.8**	**1385.3**	**830.4**	**555.0**
Austria	1163.4	1436.3	890.3	546.1
Belgium	994.7	1232.8	757.7	475.1
France	1002.3	1187.9	822.2	365.7
Germany	1038.0	1284.7	788.8	495.9
Ireland	1142.1	1468.4	811.6	656.9
Netherlands	1067.9	1385.7	745.7	640.0
Switzerland	1303.9	1660.4	945.8	714.5
United Kingdom	1150.3	1426.3	880.7	545.6
Eastern Europe	**1096.6**	**1292.4**	**904.4**	**388.0**
Czech Republic	1211.2	1445.0	976.4	468.6
Hungary	1066.4	1229.8	910.7	319.1
Poland	1012.2	1202.4	826.0	376.5
Southern Europe	**1094.7**	**1376.1**	**815.6**	**560.4**
Greece	1153.4	1498.6	811.0	687.6
Italy	950.8	1254.1	650.3	603.8
Portugal	1194.6	1373.5	1020.5	353.0
Spain	1079.8	1378.0	780.8	597.2
US	**1353.6**	**1569.1**	**1143.9**	**425.2**
Coefficient of Variation	0.09	0.09	0.13	0.27
Standard Deviation	103.72	128.73	116.63	131.86

Table A.8: Average Employment Rate (2003-2007): Full sample, Men and Women

Country	All Individuals	Men	Women	Difference
Scandinavia	**74.7**	**77.6**	**71.8**	**5.8**
Denmark	76.1	80.1	72.1	8.0
Norway	75.0	77.7	72.2	5.5
Sweden	73.1	75.0	71.2	3.8
Western Europe	**68.4**	**75.1**	**61.7**	**13.4**
Austria	68.7	75.1	62.2	12.9
Belgium	59.7	66.8	52.7	14.2
France	63.7	69.2	58.4	10.8
Germany	66.6	72.2	61.0	11.2
Ireland	66.9	76.1	57.6	18.5
Netherlands	73.6	80.5	66.6	13.9
Switzerland	77.2	84.3	70.1	14.3
United Kingdom	71.0	77.0	65.1	11.8
Eastern Europe	**58.4**	**65.3**	**51.7**	**13.6**
Czech Republic	64.8	73.1	56.5	16.5
Hungary	57.0	63.5	50.9	12.7
Poland	53.4	59.3	47.6	11.7
Southern Europe	**61.8**	**73.0**	**50.7**	**22.3**
Greece	60.2	74.2	46.3	28.0
Italy	57.3	69.7	45.1	24.6
Portugal	67.6	73.9	61.6	12.3
Spain	62.1	74.2	49.9	24.3
US	**71.4**	**77.4**	**65.5**	**11.9**
Coefficient of Variation	0.11	0.08	0.15	0.44
Standard Deviation	7.01	6.00	8.98	6.19

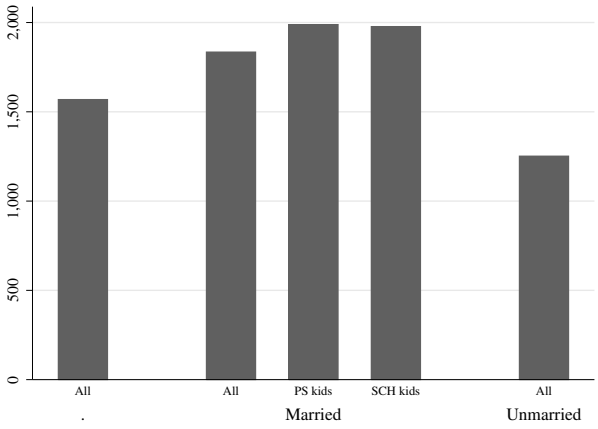
Table A.9: Annual Hours Worked per Employed (2003-2007): Full sample, Men and Women

Country	All Individuals	Men	Women	Difference
Scandinavia	**1520.8**	**1688.0**	**1335.1**	**352.9**
Denmark	1540.2	1696.0	1363.3	332.7
Norway	1471.7	1656.4	1266.7	389.7
Sweden	1550.6	1711.8	1375.4	336.4
Western Europe	**1619.9**	**1841.0**	**1350.2**	**490.8**
Austria	1694.9	1913.2	1431.3	481.9
Belgium	1664.8	1844.5	1437.9	406.6
France	1573.5	1717.2	1408.3	308.9
Germany	1557.9	1779.8	1292.8	487.0
Ireland	1707.8	1930.4	1409.9	520.5
Netherlands	1450.8	1721.2	1119.5	601.7
Switzerland	1688.6	1968.8	1349.9	618.9
United Kingdom	1620.7	1853.2	1352.2	501.0
Eastern Europe	**1878.0**	**1980.7**	**1750.7**	**230.0**
Czech Republic	1868.9	1978.1	1727.4	250.6
Hungary	1869.4	1936.0	1790.3	145.8
Poland	1895.8	2028.1	1734.5	293.6
Southern Europe	**1770.4**	**1884.0**	**1604.8**	**279.2**
Greece	1916.1	2018.6	1752.9	265.7
Italy	1659.3	1800.5	1443.4	357.1
Portugal	1766.0	1859.3	1657.0	202.3
Spain	1740.2	1857.6	1566.0	291.7
US	**1896.2**	**2027.2**	**1745.5**	**281.7**
Coefficient of Variation	0.09	0.06	0.13	0.35
Standard Deviation	147.74	120.39	195.68	131.86

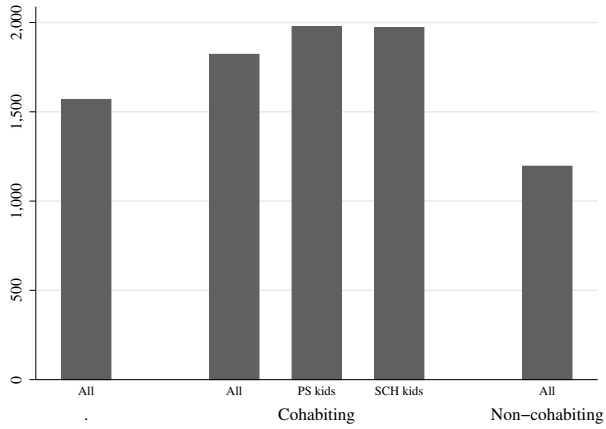
A.6 Cohabitation and Children

Figure A.1: Cross-sectional decomposition of male hours worked per person

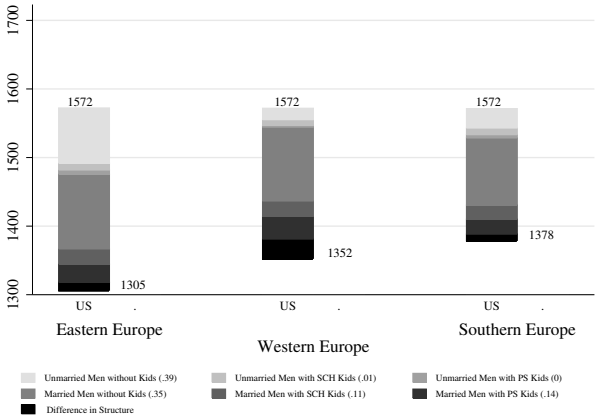
(a) Male hours worked per person in the US (2003-2007), by marital status and children



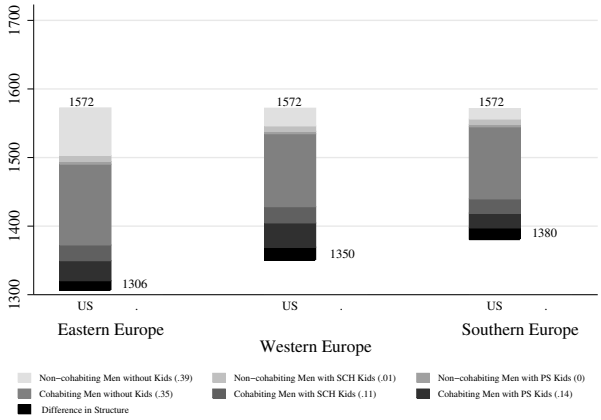
(b) Male hours worked per person in the US (2003-2007), by cohabiting status and children



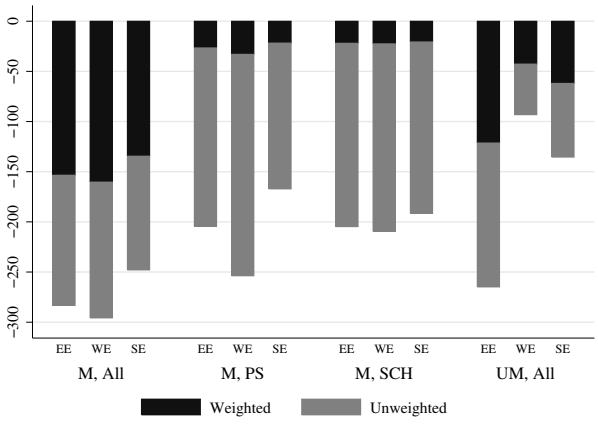
(c) Decomposition of difference to US in male hours worked per person (2003-2007)



(d) Decomposition of difference to US in male hours worked per person (2003-2007)



(e) Weighted and unweighted difference to US (2003-2007), by marital status and children



(f) Weighted and unweighted difference to US (2003-2007), by cohabiting status and children

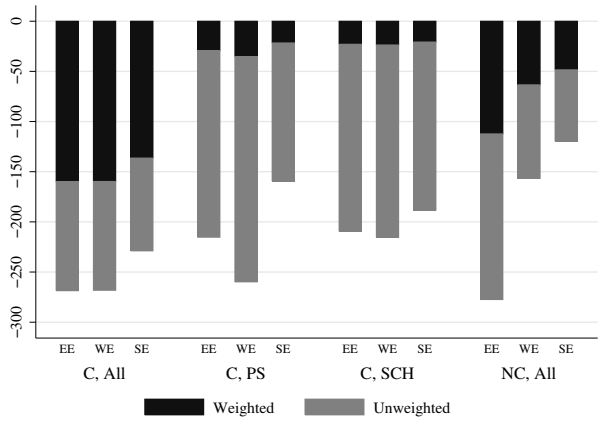
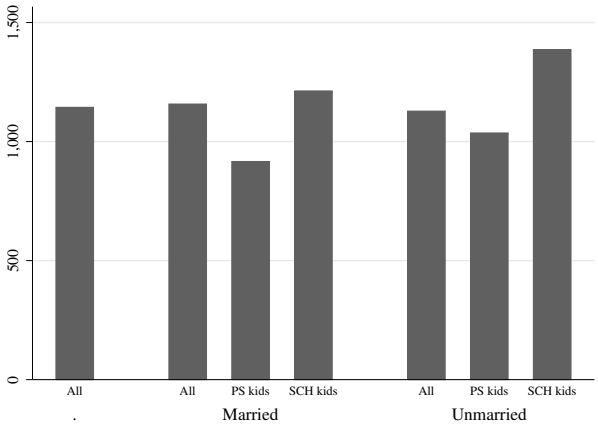
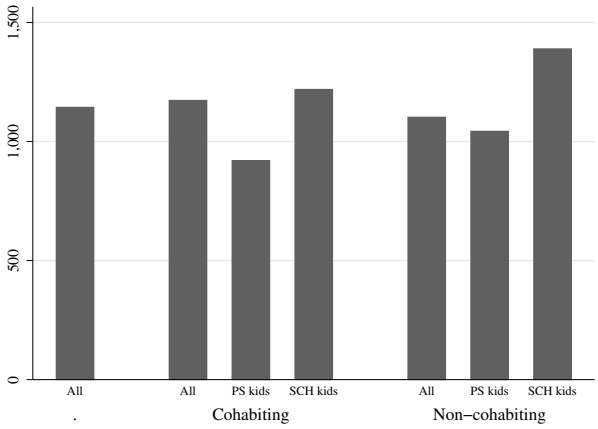


Figure A.2: Cross-sectional decomposition of female hours worked per person

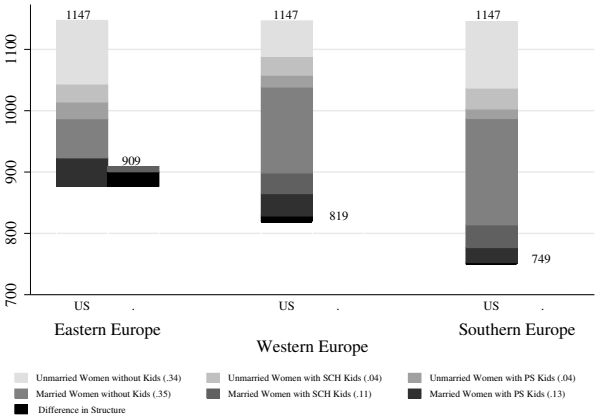
(a) Female hours worked per person in the US (2003-2007), by marital status and children



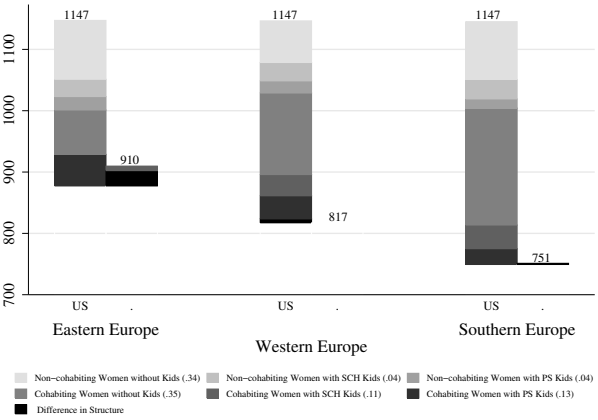
(b) Female hours worked per person in the US (2003-2007), by cohabiting status and children



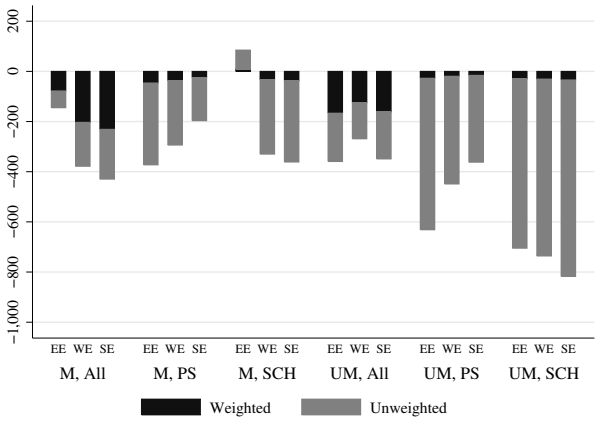
(c) Decomposition of difference to US in female hours worked per person (2003-2007)



(d) Decomposition of difference to US in female hours worked per person (2003-2007)



(e) Weighted and unweighted difference to US (2003-2007), by marital status and children



(f) Weighted and unweighted difference to US (2003-2007), by cohabiting status and children

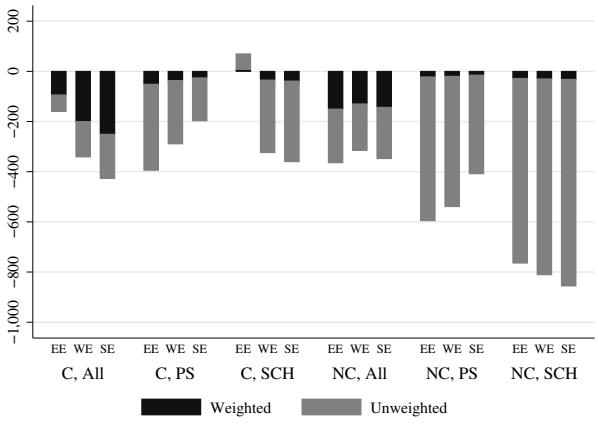
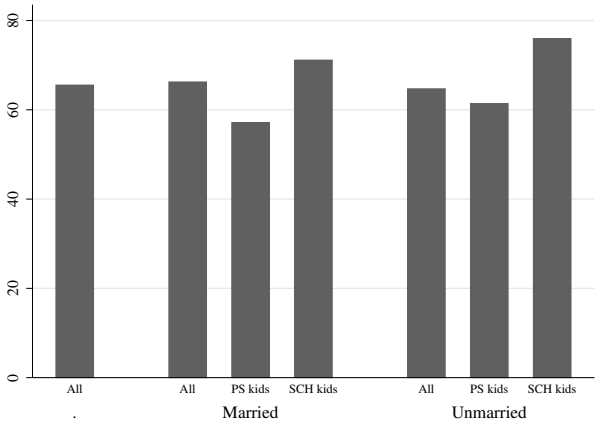
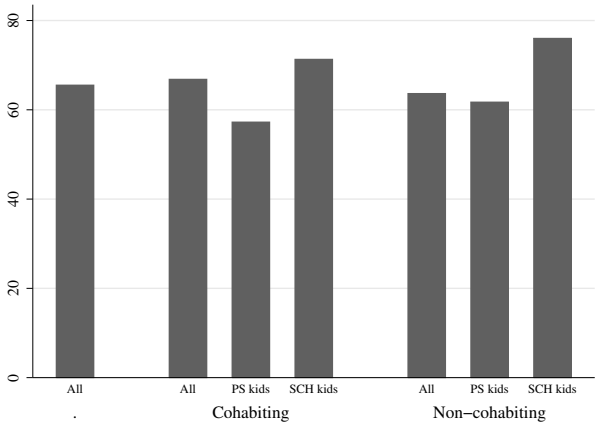


Figure A.3: Cross-sectional decomposition of the female employment rate

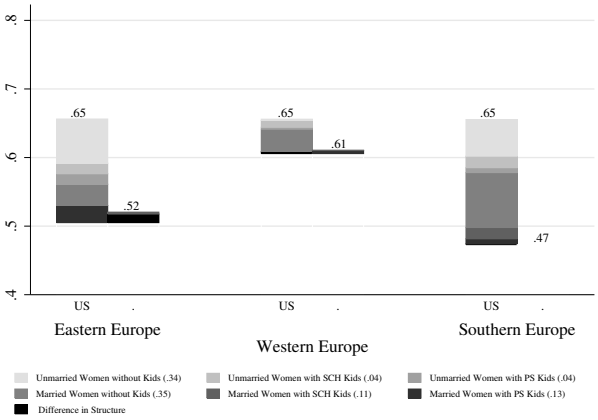
(a) Female employment rate in the US (2003-2007), by marital status and children



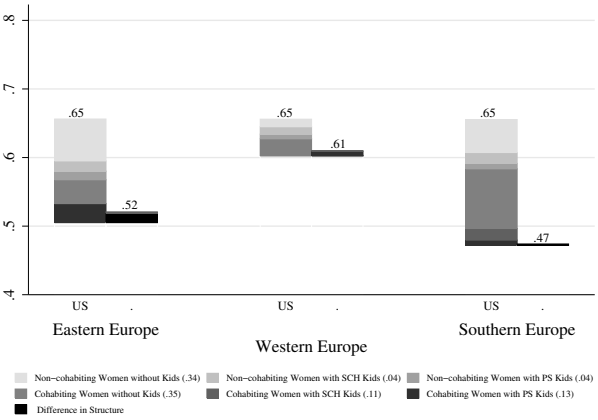
(b) Female employment rate in the US (2003-2007), by cohabiting status and children



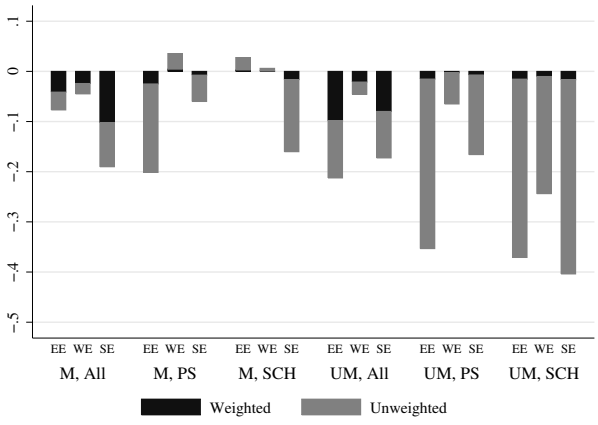
(c) Decomposition of difference to US in female employment rate (2003-2007)



(d) Decomposition of difference to US in female employment rate (2003-2007)



(e) Weighted and unweighted difference to US (2003-2007), by marital status and children



(f) Weighted and unweighted difference to US (2003-2007), by cohabiting status and children

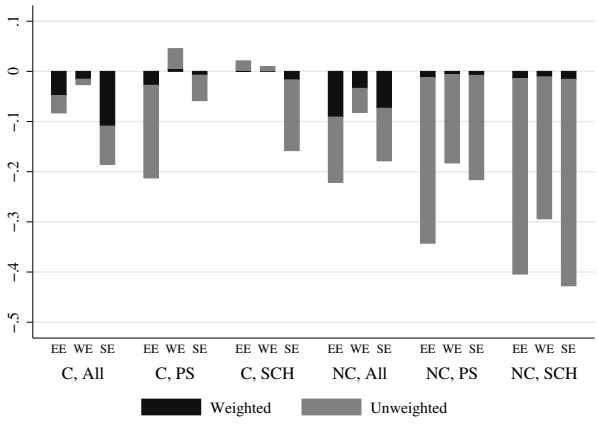
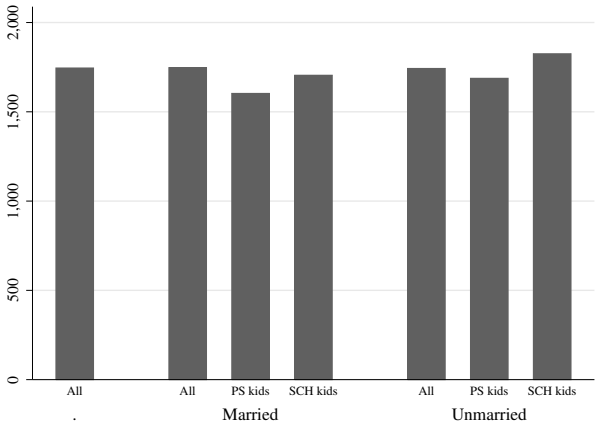
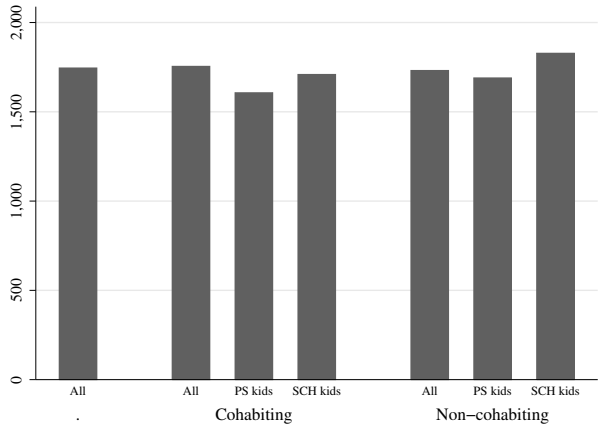


Figure A.4: Cross-sectional decomposition of hours female worked per employed

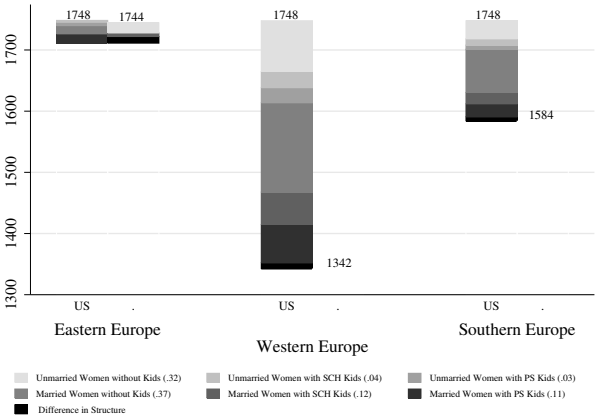
(a) Female hours worked per employed in the US (2003-2007), by marital status and children



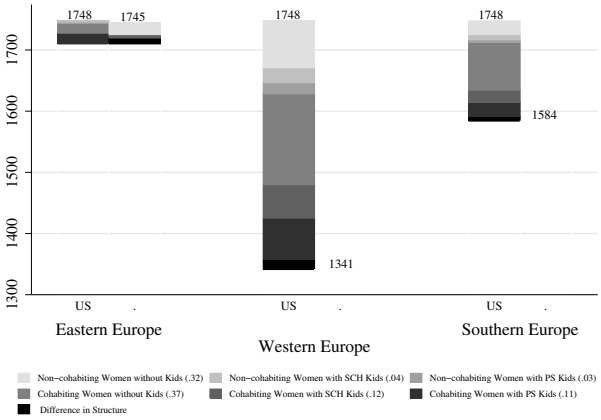
(b) Female hours worked per employed in the US (2003-2007), by cohabiting status and children



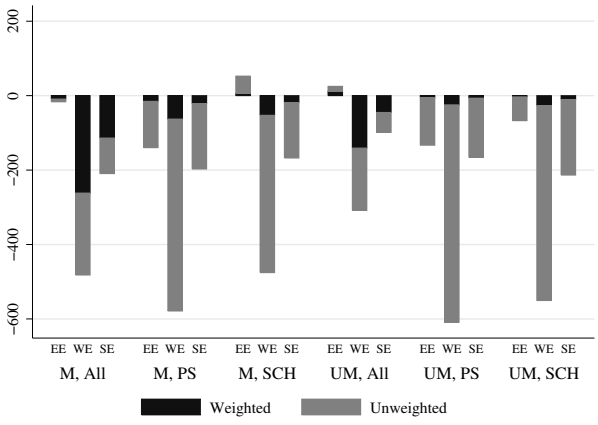
(c) Decomposition of difference to US in female hours worked per employed (2003-2007)



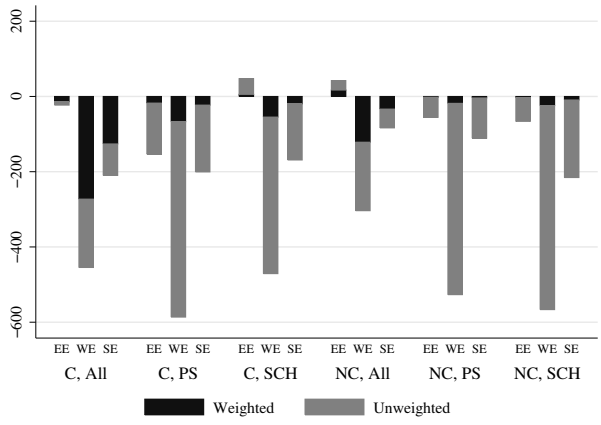
(d) Decomposition of difference to US in female hours worked per employed (2003-2007)



(e) Weighted and unweighted difference to US (2003-2007), by marital status and children



(f) Weighted and unweighted difference to US (2003-2007), by for cohabiting status and children



A.7 Sectoral and Country Effects in Great Recession

Table A.10: Regression: $\Delta^{crisis}_{c,g,s,e} = \beta_0 + \beta_1 * \text{Male Dummy}_g + \beta_2 * \Delta^{precrisis}_{c,g,s,e} + \beta_3 * \Delta^{precrisis}_{c,g,s,e} * \text{Male Dummy}_g + \sum_s \beta_s * \text{Sector Dummies}_s + \sum_s \beta_{g,s} * \text{Sector Dummies}_s * \text{Male Dummy}_g + \sum_e \beta_e * \text{Education Dummies}_e + \sum_c \beta_c * \text{Country Dummies}_c + \epsilon_{c,g,s,e}$

	Employment Share		**Hours Worked per Employed**	
Sector	$\beta^{ER}_{male} + \beta^{ER}_{male*sector}$	p-value	$\beta^{HWE}_{male} + \beta^{HWE}_{male*sector}$	p-value
Agriculture, hunting and forestry, Fishing	0.008	0.836	0.012*	0.084
Mining and quarrying	−0.019	0.911	−0.008	0.780
Manufacturing	0.031	0.141	−0.008**	0.028
Electricity, gas and water supply	0.146	0.133	0.004	0.800
Construction	−0.068	0.199	−0.022**	0.012
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	−0.009	0.688	−0.008**	0.031
Hotels and Restaurants	0.022	0.587	−0.001	0.921
Financial intermediation	0.024	0.604	−0.001	0.898
Real estate, renting and business activities	−0.122***	0.000	−0.004	0.383
Public Administration and defence; compulsory social security	−0.032	0.321	−0.010*	0.071
Education	−0.005	0.884	−0.021***	0.000
Health and social work	−0.020	0.535	−0.023***	0.000
Transport, storage, and communication; Other community, social and personal service activities	0.110***	0.000	−0.009**	0.046
Activities of households	−0.120	0.470	−0.004	0.897
Extra-territorial organizations and bodies	0.106	0.683	0.041	0.343

*** p<0.01, ** p<0.05, * p<0.1

Table A.11: Regression: $\Delta^{crisis}_{c,g,s,e} = \beta_0 + \beta_1 * \text{Male Dummy}_g + \beta_2 * \Delta^{precrisis}_{c,g,s,e} + \beta_3 * \Delta^{precrisis}_{c,g,s,e} * \text{Male Dummy}_g + \sum_s \beta_s * \text{Sector Dummies}_s + \sum_s \beta_{g,s} * \text{Sector Dummies}_s + \sum_e \beta_e * \text{Education Dummies}_e + \sum_c \beta_c * \text{Country Dummies}_c + \sum_c \beta_c * \text{Country Dummies}_c * \text{Male Dummy}_g \epsilon_{c,g,s,e}$

	Employment Share		**Hours Worked per Employed**	
Country	$\beta^{ER}_{male} + \beta^{ER}_{male*country}$	p-value	$\beta^{HWE}_{male} + \beta^{HWE}_{male*country}$	p-value
Austria	−0.023	0.539	0.008	0.165
Belgium	−0.007	0.845	−0.011*	0.068
Czech Republic	0.003	0.937	−0.004	0.504
Denmark	−0.005	0.892	−0.017***	0.005
France	−0.042	0.262	0.021***	0.001
Germany	0.032	0.386	0.000	0.958
Greece	0.017	0.652	−0.007	0.239
Hungary	−0.020	0.594	−0.005	0.395
Ireland	−0.007	0.849	−0.018***	0.002
Italy	−0.025	0.499	0.000	0.989
Netherlands	−0.013	0.724	−0.026***	0.000
Norway	0.015	0.687	−0.028***	0.000
Poland	0.109***	0.006	−0.011*	0.073
Portugal	0.007	0.860	−0.001	0.845
Sweden	0.062*	0.090	−0.030***	0.000
Spain	0.014	0.705	−0.006	0.351
Switzerland	−0.001	0.979	−0.013**	0.034
United Kingdom	0.029	0.434	−0.007	0.281
US	−0.012	0.743	−0.013**	0.029

*** p<0.01, ** p<0.05, * p<0.1