FAMILY AND CAREER: AN ANALYSIS ACROSS EUROPE AND NORTH AMERICA

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Abstract

Using data for 17 countries in Europe and North America, we compare the career trajectories of mothers and fathers and of women and men without children across cohorts and at different points in their life cycle. There is wide cross-country variation in employment and earnings gaps at age 30. At age 50, however, employment gaps between mothers and non-mothers have closed in most countries. We also observe convergence in employment gaps between mothers and fathers by age 50, but these gaps do not close altogether. Motherhood gaps in earnings also close by age 50 between mothers and non-mothers, particularly among the highly educated. But there is strong persistence in earnings gaps between mothers and fathers even among highly educated parents. The main reasons for the remaining gaps at later stages in the life-cycle are part-time work among women and fatherhood premia as fathers' earnings outperform non-fathers' over their life-cycle.

Keywords: gender gaps, employment, earnings, children.

JEL classification: J12, J13, J16, J21, J22.

Resumen

Utilizando datos de 17 países de Europa y Norteamérica, comparamos las trayectorias profesionales de hombres y mujeres con y sin hijos, de diferentes cohortes y en distintos puntos de su ciclo vital. Existe una amplia variación entre países en lo referente a las brechas de empleo y salariales a la edad de 30 años. Sin embargo, a los 50 años, la brecha de empleo entre madres y no madres se cierra en la mayoría de países. También observamos una convergencia en las brechas de empleo entre madres y padres a los 50 años, aunque estas brechas no se cierran completamente. Las brechas salariales también se cierran a la edad de 50 años entre madres y no madres, particularmente entre aquellas con estudios superiores, pero hay una fuerte persistencia de las brechas salariales entre madres y padres incluso entre aquellos con estudios superiores. Las principales razones de las restantes brechas en etapas posteriores del ciclo vital son el trabajo a tiempo parcial entre mujeres y la prima por paternidad, ya que los ingresos salariales de los padres superan a los de los no padres a lo largo de su ciclo vital.

Palabras clave: brechas de género, empleo, ingresos salariales, hijos.

Códigos JEL: J12, J13, J16, J21, J22.

1 Introduction

The recent literature on gender gaps in the labor market shows that the effects of parenthood on women relative to men account for a substantial part of the observed gender inequality in outcomes (Kleven, Landais, and Leite-Mariante (2023)). The estimated gender gap at childbirth is substantial and for most of the countries persists even 10 years after (Kleven, Landais, Posch, Steinhauer, and Zweimüller (2019)).[1] But what happens when children eventually grow? Do mothers in their 50s increase their hours of work again or are they still doing more unpaid housework and care work? Do they catch up relative to fathers or to women without children?

Goldin, Kerr, and Olivetti (2022) use longitudinal data from US college graduates in the National Longitudinal Survey of Youth 1979 (NLSY79) to understand what happens to the careers of mothers and fathers as their children mature and require less oversight. They find that mothers increase employment as their children get older and by their 50s the motherhood penalty or the earning gap relative to women without children is greatly reduced. But, at the same time, fathers manage to maintain their relative gains and do monumentally better than mothers, women without children, and men without children which results in a fatherhood premium that is widening over the life-cycle.[2]

Here, we extend the analysis to include 16 additional countries in Europe and North America. We compare the career trajectories of mothers and fathers and of women and men without children to separate career differences between women and men that are due to family formation from those that are due to genuine gender differences in career profiles in the absence of childbearing, Our setup allows us to make these comparisons across countries, cohorts, educational groups, and at different points of the life-cycle.

[1] Ten years after childbirth, the penalties in earnings for mothers relative to fathers are 21-26% in Scandinavian countries, 31-44% in English-speaking countries, and 51-61% in German-speaking countries. See also Berniell, Berniell, de la Mata, Edo, and Marchionni (2018); De Philippis and Lo Bello (2022); and de Quinto, Hospido, and Sanz (2021) for similar figures in Chile, Italy, and Spain, respectively.

[2] Other studies also suggest that the presence of children is positively associated with men's earnings. However, evidence on the reasons for this fatherhood premium is scarce. Kunze (2020) shows that the cross-sectional comparison of men who have a child and men who remain childless overestimates the (positive) effect of having children on male earnings, as the earnings profiles of men who have a child and childless men differ already before the arrival of the first child. Once accounting for selection, she finds no significant effect of children on male earnings profiles. For females, Staff and Mortimer (2012) find only very small differences between future mothers and those who never have children in the amount of time spent out of the labor force (and not in school) prior to motherhood.

We construct synthetic cohorts based on national data from all countries included in the Deaton Review Country Studies Project (available at https://ifs.org.uk/inequality/country-studies/). The data that span multiple decades and include detailed information on household members' labor market outcomes along with the ages of their children. The evidence indicates that there is wide variation in employment and earnings gaps at age 30 across our sample of countries. At age 50, however, mothers in most countries have closed the gap in employment relative to non-mothers, but not fully relative to fathers. Regarding the intensive margin of labor supply, gaps between mothers and non-mothers in part time shares open at age 30 when children are young in most countries. By age 50 we see again some closing of the motherhood gaps in part-time work. But the pattern is quite different, however, when we compare mothers and fathers with highly persistent gender gaps in part-time employment. Finally, with respect to earnings gaps, mothers do not only catch up to non-mothers, but in several countries mothers even do better than non-mothers in the long run which is reflected in positive earnings gaps at age 50. On the contrary, the earnings gaps remain substantial over the life-cycle between mothers and fathers even among highly educated individuals. We also find evidence of fatherhood premia with earnings gaps that are increasing over the life-cycle between non-fathers and fathers in some countries.

The rest of the paper is organized as follows. In Section 2 we briefly summarise the most recent literature on this topic. Section 3 presents the data and the approach we use. Section 4 shows main results. Finally, Section 5 concludes.

2 Literature Review

A large and internationally wide literature documents that men and women have divergent earnings growth paths after the arrival of the first child, even when they were previously on the same career trajectory. This result holds both within couples, when data permits, and also comparing mothers with fathers (Bertrand, Goldin, and Katz (2010); Angelov, Johansson, and Lindhal (2016); Juhn and McCue (2017); Goldin and Mitchell (2017); Kleven, Landais, and Søgaard (2019); Cortés and Pan (2021); Kleven, Landais, and Søgaard (2021); Andresen and Nix (2022); and Kleven (2023)). Those estimated motherhood penalties could be even

underestimating the true wage gaps if participation after childbirth is especially selective among women (Andrew, Bandiera, Costa-Dias, and Landais (2021)).

Much of the initial divergence between male and female earnings after the first child is born is due to the reduction in days employed (extensive margin) as well as in the hours of paid work of mothers (intensive margin). But over time additional factors seem to also matter, particularly so in professions with more nonlinear wage structures (Bütikofer, Jensen, and Salvanes (2018)). Fewer hours at work may reduce mothers' attachment to the labor force (Costa-Dias, Joyce, and Parodi (2020)), their probability of training (Blundell, Costa-Dias, Goll, and Meghir (2021)), promotion (Bronson and Thoursie (2021)), job opportunities (Jayachandran, Nassal, Notowidigdo, Paul, Sarsons, and Sunberg (2023)), or accessing a more permanent job position when working temporarily or in mini-jobs (Collischon, Cygan-Rehm, and Riphahn (2023)).

Other commonly suggested mechanisms driving the child penalty are gender norms, preferences for child care, and within household specialization (comparative advantage). Andresen and Nix (2022) compare the child penalties among same sex male and same sex female partners to the ones experienced by heterosexual couples in Norway. This comparison allows them to relate pre-set gender roles with child penalties: for female same sex couples, the initial drop in the income of the partner who gives birth is smaller than the one experienced by the mother in heterosexual couples; and her female partner experiences also a drop in income, in contrast to the no child penalty men experience in heterosexual couples. Child penalty disappears five years after birth in female same sex couples. These patterns attribute child penalties to preferences and dominant gender norms in heterosexual couples. Regarding within household specialization, Angelov, Johansson, and Lindhal (2016) find that earnings' potential is important for how monetary costs of parenthood are split between the parents and that the gender gap decreases as women's level of education increases relative to her spouse.

The multi-country approach here helps us better understand how motherhood penalties can vary with political and cultural institutions. Kleven, Landais, Posch, Steinhauer, and Zweimüller (2019) find that those developed countries with larger child penalties are also the ones with much more conservative views. Berniell, Berniell, de la Mata, Edo, Fawaz, Machado,

and Marchionni (2021) document that societies with more conservative social norms or with weak policies regarding work-life balance are characterized by larger motherhood effects in employment. They find that Eastern European countries have small or close to zero effects on employment, part-time- and self-employment as a result of Socialist policies to reach gender equality during the Soviet era, while Western Europe displays the largest motherhood effects. Family policies such as parental leave and childcare provision may affect mother's incentives to work in the short-run in a way that differences in parental leaves schemes across countries play a role in child penalties variation. A longer and more generous parental leave scheme, like that of Sweden, implies larger child penalties in employment and earnings in the short-run (Kleven, Landais, Posch, Steinhauer, and Zweimüller (2019)).

Our study contributes to the literature by extending the multi-country approach to the analysis of motherhood gaps over a larger part of the life cycle. While most of the existing studies focus on gaps up to 10 years after childbirth, our data span motherhood gaps over a 20 year horizon between age 30 and age 50.

3 Data and Definitions

To evaluate the impacts of children on gender gaps in employment and earnings outcomes over the life-cycle, we take advantage of the data that was compiled for the country reports in the Deaton Review Country Studies Project (available at https://ifs.org.uk/inequality/country-studies/). While some countries base their analyses on longitudinal register data, most use repeated cross sectional data from household surveys, such as the labor force survey. These data span multiple decades and include detailed information on household members' labor market outcomes along with the ages of their children.

We define synthetic cohorts to approximate careers over the life cycle, which we construct the following way. Per country, we consider individuals who were born in 5 year birth cohorts in the first half of each decade, from 1940-1945 to 1990-1995. We observe labour market outcomes of individuals in these cohorts around age 30 (aged 28-32), around age 40 (aged 38-42), and around age 50 (aged 48-52). Further, we group them by gender – female or male – and family-type – parents with children, or non-parents without children. To focus on

children who are ageing along with their parents, we restrict the sample to individuals in the 30 age group with young children who are less than 7 years old, or individuals in the 40 age group with middle aged children (10-15 years old) and individuals in the 50 age group with grown children (16 to 20 years old). Non-parents are defined as individuals who do not have any children.

For each country we compute average labor market outcomes in cohort, age, family-type and gender cells, first, for the full population and second, separately by three educational categories (low ISCED 0-2, middle ISCED 3-5, and high ISCED 6-8). In terms of labor market outcomes, we consider the employment rate, the share of part-time employed among employed individuals,[3] and labor market earnings including zeros for the non-employed. In each cell we compute three child related gaps: the *motherhood gap* comparing mothers and non-mothers, the *parental gap* comparing mothers and fathers, and the *fatherhood gap* comparing non-fathers and fathers.

The data structure with synthetic cohorts results in simple stylized measures of child related gender gaps over the parents' life cycle. These measures follow the main concepts used in the literature on child penalties and allow us to compare four groups of parents and non-parents, not just mothers and fathers to investigate the nature of the gaps (Goldin et al., 2022). Furthermore, we can compile a consistent data set for a large number of countries, in total we have data from 17 countries, and for multiple cohorts per country to investigate the career gaps across cohorts.

The disadvantages compared to individual panel data which are used in most of the child penalty literature are three-fold. First, with the strict definition of age groups we cannot take into account changes in sorting into motherhood over time. The age at first birth is heterogeneous across countries and it has been rising over time.[4] We use cohort fixed effects when comparing gaps across cohorts which should take care of the change of the selection into motherhood due to the age at birth. Reassuringly, we do not find evidence of changes in the patterns by which gaps evolve over the life-cycle across cohorts. Second, as in Kleven (2023),

[3] Part time is defined as working 30 hours or less per week.

[4] The mean age at first birth has risen from 1970 to 2020 by 3.8 years on average across the countries in our data (OECD Family Database). We use 5 year age bands when defining age groups which assures that there is overlap mean child ages across cohorts and limits concerns that care responsibilities might change too much over age groups across birth cohorts.

in household surveys we only observe children living in the household but not necessarily all biological children. This gives rise to two types of selection issues. On the one hand, we do not observe fathers if they move out of their children's household. On the other hand, we do not observe children if they have already left the household. This point is especially relevant when we consider mothers in the 50's age group with children aged 16 - 20. Finally, the use of repeated cross-sections does not account for the changing sample composition over time.[5]

In total we compiled data for 15 European countries plus the US and Canada. Appendix Table A1 shows the number of countries with data available in each of the age and cohort cells for employment and earnings outcomes. Appendix Table A2 provides details about the country specific data sources and definitions. As the data from most of the countries span the period between 1970 and 2020 we have the highest data coverage in terms of available countries for the cohorts born in the 1970's, see Appendix Table A1. This is why we start our analysis with this cohort.

4 Child related gaps over the life-cycle

4.1 Graphical Evidence

To visualize the persistence of motherhood gaps over the life cycle for the cohorts born in the first half of the 1970's, we show a series of scatter graphs plotting for each country a measure of the child related gap at age 30 on the horizontal axis against the corresponding gap at age 50 on the vertical axis. Regional country groups are colour coded in the figures. We add a dashed 45-degree line in each figure which indicates the area of persistence of the gap over the life-cycle. Scattered clouds of dots above the 45-degree line indicate convergence, where countries with large (negative) gaps at age 30 close the gaps over the life-cycle relative to countries with small gaps at age 30. Scatter clouds below the 45-degree line indicate divergence over the life-cycle. We also add the horizontal axis at zero which indicates the area where the gap has closed over the life-cycle.

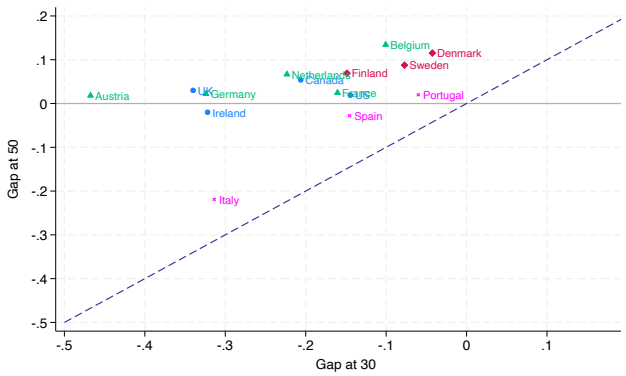
Figure 1, panel (a) presents gaps in employment rates between mothers and non-mothers. There is wide variation in employment gaps at age 30 across our sample of countries. In

[5]There are certainly multiple alternative methods of defining career gaps. We want to focus on one of them and we will make the data available on the web. We leave experimentation with alternative approaches to future research. Ideally, our paper can be seen as the starting point of a wider discussion.

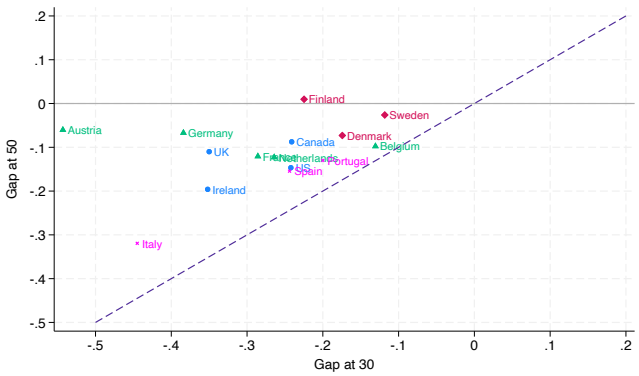
Austria mothers at age 30 are 50 percentage points less likely to be employed as non-mothers, while in Northern European countries and Portugal the gaps are close to zero. At age 50, however, mothers in most countries have closed the gap in employment relative to non-mothers. All the dots in the figure are above the 45-degree line and they cluster around the zero line, indicating convergence across countries. Interestingly, the Southern European countries remain closest to the 45-degree line, while the Anglican and Western European countries mostly close the gap. In Northern European countries the gap reverses and mothers have higher employment rates than non-mothers which might be due to positive selection into motherhood. Overall, in terms of employment rates mothers seem to close the gap to non-mothers once their children grow older. Figure 1, panel (b) shows parental gaps in employment rates between mothers and fathers. The general pattern of countries with larger gaps at age 30 catching up to countries with smaller gaps by age 50 is similar to panel (a). But in most countries mothers do not fully close the gap in employment rates with fathers even at age 50.

Figure 1: Employment Gaps

(a) Mothers and Non Mothers



(b) Mothers and Fathers



Notes: Gaps in employment rates between mothers and non-mothers in panel (a) and mothers and fathers in panel (b), cohort 1970, 15 countries. Four regional country groups are colour coded.

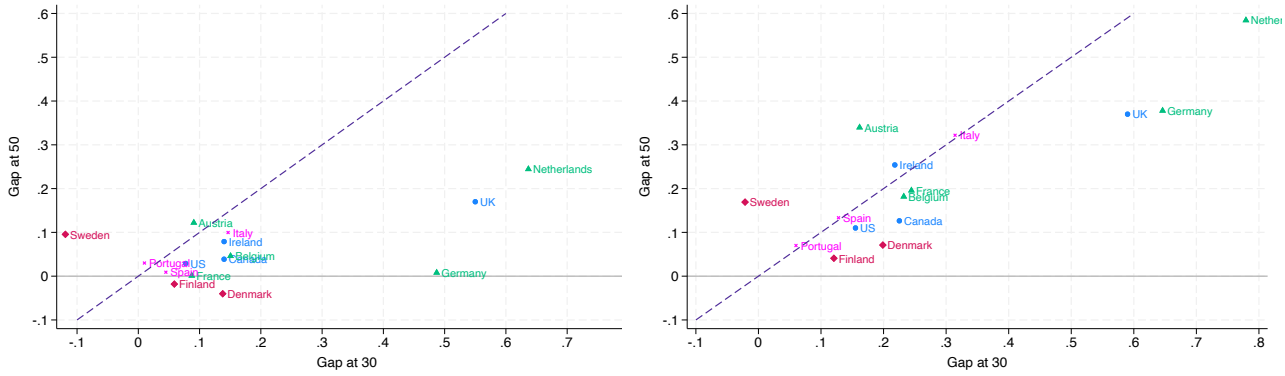
Next, we focus on the intensive margin of labor supply and show gaps in the share of employed individuals working part-time in Figure 2. At age 30, gaps in part-time shares between mothers and non-mothers are around 10 percentage points in most countries, see panel (a). But there are three countries with much larger gaps, Germany, UK, and the Netherlands. By age 50 we see again some closing of the gaps as non-mothers become more likely to work as much part-time as mothers. The pattern is quite different, when we compare

mothers and fathers in panel (b). In this graph, most countries cluster around the 45-degree line indicating that mothers have persistently higher shares of part-time employment than fathers throughout their life-cycles. There is no evidence of catching up, except in the countries with very high gaps at age 30. Overall, mothers and non-mothers become more alike in terms of part-time work as their children grow older. But part-time work choices that women make once they have young children seem to persist over the life-cycle, which is why the gaps never close in comparison to fathers.

Figure 2: Part-time Gaps

(a) Mothers and Non Mothers

(b) Mothers and Fathers



Notes: Gaps in part-time employment rates between mothers and non-mothers in panel (a) and mothers and fathers in panel (b), cohort 1970, 15 countries. Four regional country groups are colour coded.

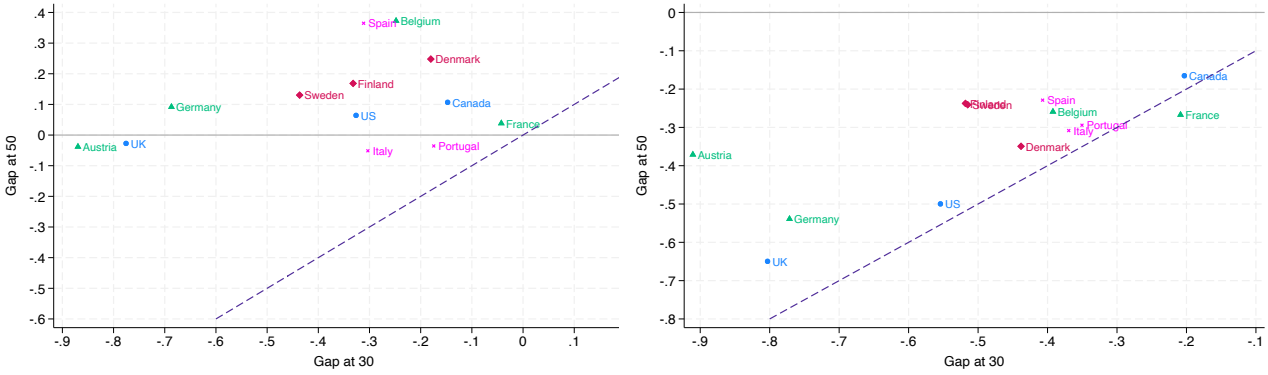
What are the consequences of labor supply choices for gender earnings gaps? Figure 3 shows relative earnings gaps between mothers and non-mothers in panel (a) and mothers and fathers in panel (b). Here the contrast between both panels is quite striking. Mothers not only catch up to non-mothers in terms of their earnings, but in several countries mothers even do better than non-mothers in the long run which is reflected in positive earnings gaps at age 50. However, the convergence in earnings is much lower once we compare mothers and fathers. In panel (b) earnings gaps remain negative at age 50 in all countries and the dots lie just above the 45-degree line which indicates highly persistent earnings gaps. The latter pattern is well in line with part-time choices, which reduce the earnings of mothers relative to fathers also after their children have grown older.

In panel (c) we show the earnings gap between non-fathers and fathers to examine the evidence for the fatherhood premium documented by Goldin et al. (2022) for the US. Indeed,

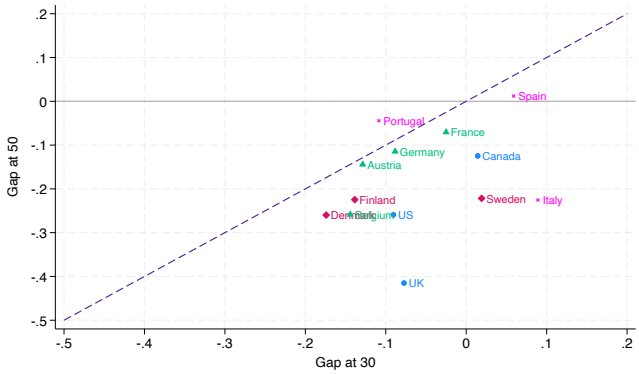
Figure 3: Earning Gaps

(a) Mothers and Non-Mothers

(b) Mothers and Fathers



(c) Non-Fathers and Fathers



Notes: Earnings gaps between mothers and non-mothers in panel (a), mothers and fathers in panel (b), and non-fathers and fathers in panel (c), cohort 1970, 13 countries. Four regional country groups are colour coded.

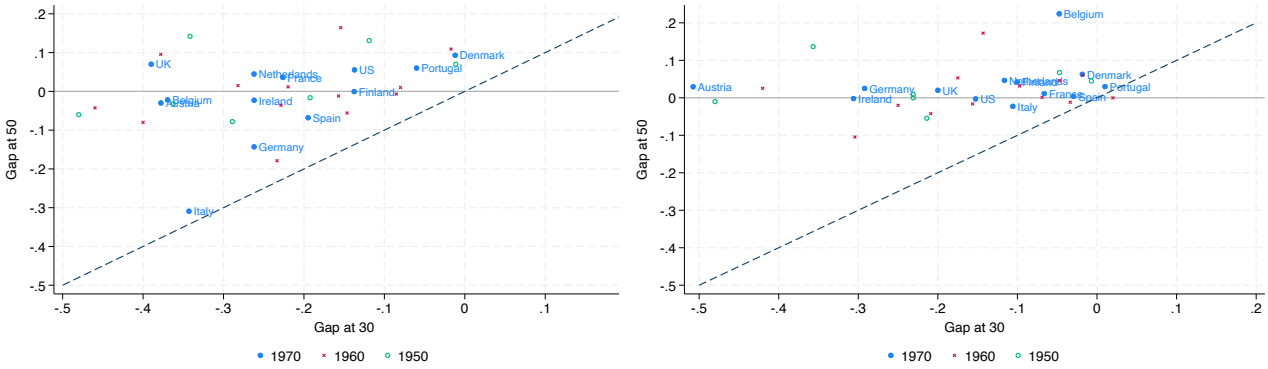
in several countries fathers outperform non-fathers in terms of earnings already at age 30 which indicates positive selection into fatherhood. But fathers also gain in earnings relative to non-fathers at a later stage in their life-cycles as gaps turn negative in all countries by age 50. While fatherhood gaps in earnings are mostly persistent over the life-cycle in Central and Western-European countries as well as Spain and Portugal, we find evidence of widening fatherhood premia in Nordic and Anglican countries.

Figures 1 to 3 show interesting evidence about changes in child related gaps over the life-cycle. But they also indicate that positive selection of mothers and fathers may play a role in shaping the gaps. We next study child related gaps by education where the impact of selection should be reduced.

Figure 4: Employment Gaps by Education

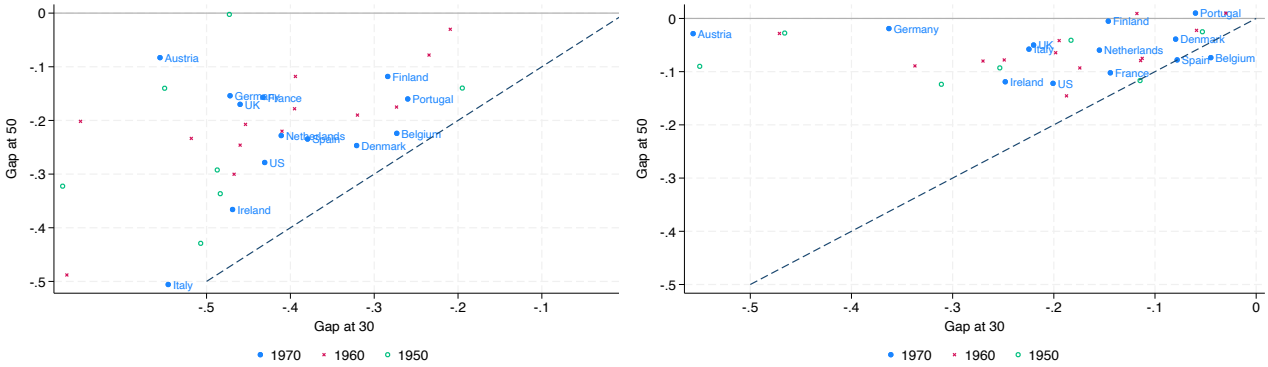
(a) Mothers and Non Mothers, ISCED 0-2

(b) Mothers and Non Mothers, ISCED 6-8



(c) Mothers and Fathers, ISCED 0-2

(d) Mothers and Fathers, ISCED 6-8



Notes: Gaps in employment rates between mothers and non-mothers in panel (a) and (b) and mothers and fathers in panel (c) and (d), 14 countries.

Figure 4 compares motherhood gaps and parental gaps in employment for low educated individuals (ISCED 0-2) in the left panels (a) and (c), and for highly educated individuals (ISCED 6-8) in the right hand side panels (b) and (d). These figures show very clear patterns of convergence for highly educated groups. While there is a wide variation in employment gaps at age 30, the gaps close across all countries over the life-cycle relative to non-mothers, and they converge to the lowest country levels relative to fathers. The patterns are much less systematic among low educated groups. Especially parental employment gaps for low educated individuals remain large over the life-cycle in many countries. In these figures we also add observations for older cohorts in addition to the 1970's cohorts, shown by the red and green dots. The main patterns are relatively stable across cohorts and visual evidence does not show dramatic cohort effects.

Figure 5 shows the corresponding child related gaps in earnings by educational groups in the left and right columns. The top panels (a) and (b) confirm convergence in earnings

gaps between mothers and non-mothers. Mothers outperforming non-mothers by age 50 in terms of earnings in many countries is mainly driven by the highly educated groups. The patterns for maternal gaps strongly contrast with those for parental gaps in panels (c) and (d). Earnings gaps between mothers and fathers are persistent especially among highly educated parents. Even though highly educated mothers outperform non-mothers in terms of earnings they do not catch up with fathers. In panels (e) and (f) we show parental earnings gap to find out if the divergence over the life-cycle in earnings gaps between non-fathers and fathers is related to education. But we conclude that a pattern of widening earnings gaps across several countries over the life cycle is visible in both education groups.

4.2 Regression Results

To analyze the convergence of motherhood gaps over the life-cycle across countries more systematically and to include information from the remaining cohorts in our data, we resort to regression analysis. The idea is to fit regression lines through the country scatters in Figures 1 - 3 and estimate OLS models regressing the outcome gap Y_{ij50} in country i, cohort j at age 50 on the corresponding outcome gap Y_{ij30} in country i, cohort j at age 30 and a set of cohort dummies γ_j:

$$Y_{ij50} = \alpha + \beta Y_{ij30} + \gamma_j + \epsilon_{ij}.$$

We are interested in the slope coefficient β, where β close to one indicates persistence in child related gaps over the life-cycle, while β close to zero indicates that outcomes in countries with large gaps at age 30 converge over the life-cycle towards those with smaller gaps.[6]

Table 1 Panel A shows regression results for the comparison of child related gaps between age 30 and age 40 for the 1970 cohort in Panel A1. These estimates are robust to the inclusion of cohort fixed effects in the specification with all 5-year cohorts in Panel A2. Slope coefficients smaller than one indicate some convergence, slightly more so for employment and for the comparison between mothers and non-mothers than for the part-time shares and earnings and for the comparisons between mothers and fathers. Employment and earnings gaps are more persistent with higher coefficient estimates between age 30 and 40 when we

[6]Tables A3 and A4 in the Appendix contain data on outcome gaps between mothers vs non-mothers and those mothers vs. fathers, respectively.

compare non-fathers and fathers; see columns (3) and (8). The finding that countries with high initial maternity gap in employment catch up over the first 10 years to low gap countries is in line with the results for Europe in Kleven et al. (2023). What we are interested in is whether this convergence continues and closes the gap by the time the children have grown up.

Table 1 Panel B presents comparisons of child related gaps between age 30 and 50. In Panel B.1 we show the slope coefficients for the 1970 cohort corresponding to the scatter plots in Figures 1 - 3. The smaller estimated coefficients confirm the visual impression that by age 50 motherhood and parental gaps are closing in employment rates. The gaps are also closing in part-time employment shares and earnings when we compare mothers to non-mothers. But larger gaps at age 50 remain if we compare mothers to fathers or if we compare non-fathers to fathers.

Note that, as expected, the coefficient estimates in Panel B are smaller than in Panel A which indicates that child related gaps further decline once children no require a lot of care. Panel B.2. shows the specification which also includes observations from other birth cohorts and controls for cohort fixed effects. These results suggest that convergence patterns are very similar across the cohorts we observe in our time frame. There is no indication that motherhood gaps over the life-cycle close faster for more recent cohorts.

Table 1 Panel C shows slope coefficients by education groups in the specification with all cohorts and cohort fixed effects. Here we see a clear pattern of heterogeneity in convergence by education. The group with the least convergence are the lowest educated mothers, ISCED 0-2. Low educated mothers appear to face long-run penalties and have a hard time of catching up to low educated non-mothers and especially to fathers even once their children grow older. The highest convergence, on the other hand, we see for highly educated mothers. In comparison to non-mothers gaps in employment and part-time work seem to have vanished by age 50 when their children do not require care any longer. But highly educated mothers still face difficulties catching up with highly educated fathers in earnings which may be explained by different career trajectories. The persistent gap in part-time employment shares between mothers and fathers suggests working time as a driver for persistent earnings gaps. In terms of highly educated mothers, our findings are in line with (Goldin et al., 2022) who document

Table 1: Gender gaps over the life cycle

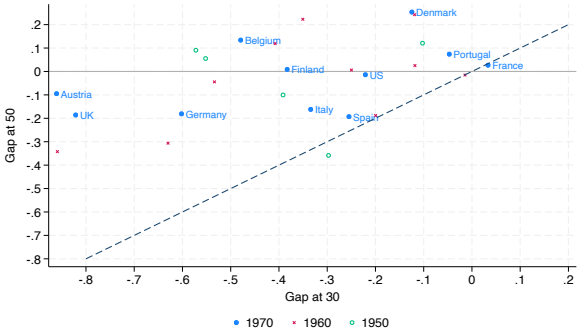
		Employment			Part-time		Earnings		
		Mothers Non-Mothers	Mothers Fathers	Fathers Non-Fathers	Mothers Non-Mothers	Mothers Fathers	Mothers Non-Mothers	Mothers Fathers	Fathers Non-Father
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age 30 to Age 40									
A.1	Cohort 1970	0.49	0.34	0.92	0.56	0.76	0.56	0.51	0.63
		(0.18)	(0.19)	(0.31)	(0.13)	(0.11)	(0.13)	(0.12)	(0.43)
	N Countries	14	14	14	14	14	12	12	12
A.2	Cohort FE	0.41	0.39	0.78	0.56	0.79	0.58	0.63	0.78
		(0.08)	(0.09)	(0.16)	(0.07)	(0.05)	(0.07)	(0.06)	(0.25)
	N Cohorts	49	49	49	48	48	40	40	40
Age 30 to Age 50									
B.1	Cohort 1970	0.30	0.24	0.06	0.20	0.56	0.19	0.47	0.42
		(0.16)	(0.17)	(0.26)	(0.08)	(0.10)	(0.16)	(0.13)	(0.39)
	N Countries	15	15	15	15	15	13	13	13
B.2	Cohort FE	0.25	0.32	0.52	0.24	0.61	0.19	0.47	0.56
		(0.07)	(0.09)	(0.16)	(0.05)	(0.06)	(0.09)	(0.09)	(0.26)
	N Cohorts	40	40	40	39	39	31	31	31
Education Groups									
C.1	ISCED 0-2	0.27	0.48	0.24	0.31	0.73	0.30	0.55	0.36
		(0.12)	(0.15)	(0.22)	(0.07)	(0.05)	(0.13)	(0.11)	(0.42)
C.2	ISCED 3-5	-0.03	0.24	1.11	0.30	0.66	0.10	0.42	-0.20
		(0.07)	(0.08)	(0.24)	(0.05)	(0.07)	(0.12)	(0.13)	(0.26)
C.3	ISCED 6-8	0.09	0.02	0.87	0.22	0.58	0.15	0.52	-0.04
		(0.08)	(0.06)	(0.23)	(0.09)	(0.07)	(0.12)	(0.08)	(0.29)
	N Cohorts	34	34	34	32	32	27	27	27

Notes: This table shows coefficients from regressing the outcome gap at age 50 (or 40) on the outcome gap at age 30 for different variables. Columns (1), (4), (6) presents gaps between mothers and non-mothers, columns (2), (5), (7) gaps between mothers and fathers, and columns (3) and (8) between fathers and non-fathers. Samples in Panels A.1 and B.1 include observations for the 1970's cohort, the remaining panels include observations from all available cohorts and regressions are specified with cohort fixed effects. Standard errors are in parenthesis.

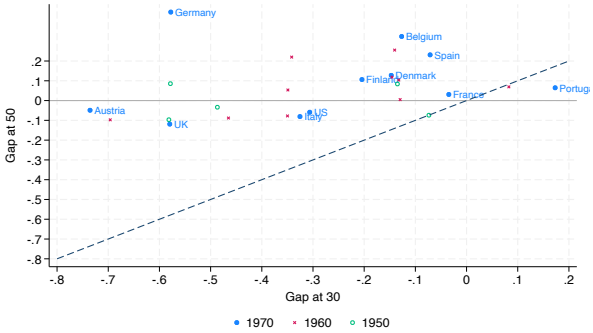
closing motherhood gaps by age 50 for college graduates in the U.S., especially in comparison to non-mothers but less so in comparison with fathers.

Figure 5: Earnings Gaps by Education

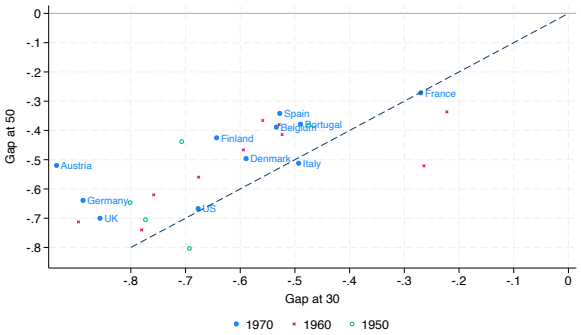
(a) Mothers and Non-Mothers, ISCED 0-2



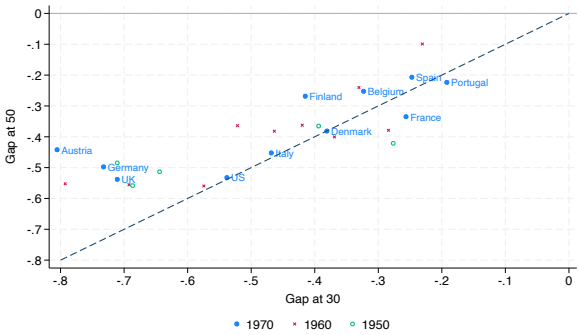
(b) Mothers and Non-Mothers, ISCED 6-8



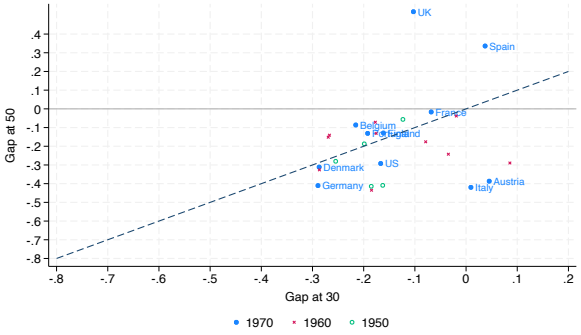
(c) Mothers and Fathers, ISCED 0-2



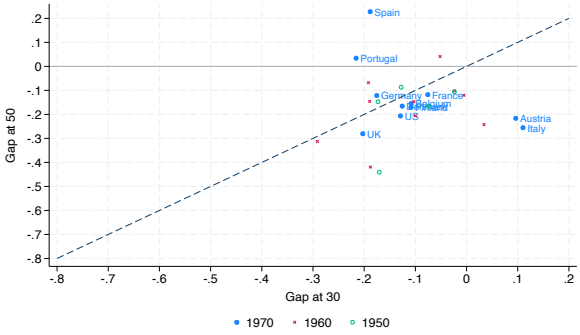
(d) Mothers and Fathers, ISCED 6-8



(e) Non-Fathers and Fathers, ISCED 0-2



(f) Non-Fathers and Fathers, ISCED 6-8



Notes: Gaps in earnings between mothers and non-mothers in panel (a) and (b), mothers and fathers in panel (c) and (d) and non-fathers and fathers in panel (e) and (f), 12 countries.

5 Conclusions

In this paper, we investigate long-run impacts of child related gaps that open with childbirth on gender inequality over the life cycle. Instead of using a data-demanding event study approach that centers around the birth of the first child, we propose simple stylized measures of child related gender gaps over the parents' life cycle that can be applied in a cross-country setting with aggregated cell-level data from a large number of countries, age groups, and cohorts.

Our analysis compiles data from 17 countries that allow us to follow synthetic cohorts over the life-cycle and to distinguish between women and men with and without children. We compute motherhood penalties between mothers and non-mothers and parental gaps between mothers and fathers and fatherhood gaps between non-fathers and fathers to approximate the impact of children on labor market careers and investigate convergence over the life cycle. Our evidence shows that mothers return to the labor market once their children grow older and require less care. Motherhood and parental gaps in employment rates tend to be largest around age 30 when children are young but they converge across countries to low levels. Earnings gaps between mothers and non-mothers also close by age 50 especially among highly educated women. Earnings gaps between mothers and fathers, however, are highly persistent and not even highly educated mothers manage to catch up with fathers in terms of earnings. A driver of the persistence in the parental gaps in earnings is part-time employment. It appears that mothers remain in part-time jobs even once children grow older. A second explanation are paternity premia. We find evidence that in some countries gaps between non-fathers and fathers' earnings increase over the life cycle.

Our work demonstrates the advantages and limits of aggregate data from repeated cross-sections in studying maternity penalties and the gender gap. In contrast to work based on detailed individual-level panel data, we are able to apply our approach to a wider set of countries and multiple cohorts. The construction of synthetic cohorts allows us to trace an important part of the life cycle. But the main limitations are selection into maternity and observability of children in household data. Two pieces of evidence allow us to validate our results relative to approaches based on more detailed data. First, our findings are in line with Kleven et al. (2023) in showing that countries with a high initial maternity gap in employment catch up over the first 10 years after childbirth to lower gap countries. Second, our findings for highly educated mothers confirm Goldin et al. (2022) who document closing motherhood gaps by age 50 for college graduates in the U.S., more so in comparison with non-mothers than in comparison with fathers.

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A Additional Tables

Table A1: Number of countries with data in each cohort and age group

	Employment		Earnings	
	age 30	age 50	age 30	age 50
1940	2	15	2	10
1950	8	17	5	15
1960	16	17	11	15
1970	17	16	15	15
1980	17		15	
1990	15		14	

Table A2: Variables and data source, by country

COUNTRY Source	Concept	Variable	Definition
AUSTRIA	Cohorts	coh	1940, 1950, 1960, 1970, 1980, 1970
	Age groups	age	30, 40, 50
	Population	obs	n. of observations per cell
	Employment	emp	
	Earnings	earn	
		earn_empl	
	Wages	fem_income_share	
	Part-time	part	
	Parenthood	parent	
	Education	edu_cat	
BELGIUM	Gender	dgn	Female/Male
	Cohorts	cohort	40, 50, 60, 70, 80, 90
	Age groups	age_cl	30, 40, 50
	Population	cellsize_empl	n. of observations
		cellsize_earnings	n. of observations
		cellsize_hwage	n. of observations
		cellsize_parttime	n. of observations
	Employment	empl_rate	
	Earnings	monthly_earnings	
	Wage	hourly_wage	
	Part-time	share_pt_employed	
	Parenthood	parent	1 / 0
	Education	deh	ISCED 1-2 or no educ; ISCED 3-4; ISCED 5-8
CANADA	Cohorts	cohort	Birth cohort (=1 if 1940-45, =2 if 1950-55, =3 if 1960-65, =4 if 1970-75, =5 if 1980-85, =6 if 1990-95)
Canadian Labour Force Survey from 1976 to 2021. The survey provides employment estimates by industry, occupation, hours worked, among others, all cross-classifiable by a variety of demographic characteristics. The target population is the non-institutionalised population 15 years of age and over. The survey is conducted nationwide, in both the provinces and the territories.	Age groups	age	Age group (=1 if 30 years old, =2 if 50 years old). Age 30 defined as age 27-29; age 50 defined as age 45-49.
	Population	population	n. of observations per cell
	Employment	employed	n. employed including self-employed
		employed_nse	N. employed excluding self-employed
		ER	Employment Rate
	Earnings	mean_earn	Mean hourly earnings
		med_earn	Median hourly earnings
	Part-time	pt_nse	N. part-time excluding self-employed
		pt_se	N. part-time including self-employed
		PTR	Part-time rate excluding self-employed
		PTR_se	Part-time rate including self-employed
	Parenthood	parent_type	Indicates what type of parent or non-parent someone fits into (=1 for mothers, =2 for non-mothers,=3 for fathers, =4 for non-fathers). Someone is defined as a parent if they are in the age 30 category and have a child under 18, or in the age 50 category and had children under the age of 25.
	Education	edu_cat	1, 2, 3
DENMARK	Gender	female	1 if female and 0 if male
Administrative data for 1987-2019. Same variables across education levels.	Cohorts	cohort	5-year birth cohort_groups: 1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	age_groups: 30 (age 28-32), 40(38-42), 50 (48-52)
	Population	obs	n. of observations per cell
	Employment	emp	share employed
	Earnings	earn	mean annual earnigs, zero for non-working
	Wages	wage	mean hourly wage, conditional on employment
	Part-time	part	share working 30 hours or less per week, conditional on employment
	Parenthood	parent	0 if no child lives in the household; 1 if at least one child ¡7 years old lives in the household (for age 30), if at least one child 10-15 years old lives in the household (for age 40), or if at least one child 16-20 years old lives in the household (age 50).
	Education	edu	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
FINLAND	Gender	female	1 if female and 0 if male
FOLK-dataset administrative data on whole population from 1997 for employment rate and monthly earnings. Harmonised Structure of Earnings (SES) dataset from 1997 to 2020 for hourly wages and part-time work. SES is a survey for employers with data covering between 55-75% of private sector employment in different years and industries.	Cohorts	cohort	5-year birth cohorts: 1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	age_groups: 30 (age 28-32), 40(38-42), 50 (48-52)
	Population	obs	n. of observations per cell
		obs_part	n. of observations per cell
	Employment	emp	Employment rate, share employed
	Earnings	earn	Mean monthly individual earnings, zero for non-working
	Wages	wage	mean hourly wage, conditional on employment
	Part-time	part	Share part-time employed, working 30 hours or less per week
	Parenthood	parent	Defined as living in joint household with children. Equals 0 if no child lives in the household; and 1 if at least one child ¡7 years old lives in the household (for age 30), if at least one child 10-15 years old lives in the household (for age 40), or if at least one child 16-20 years old lives in the household (for age 50).
	Education	edu	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
FRANCE	Gender	female	1 if female and 0 if male
Labor force surveys (enquête emploi) starting 1990 due to limited information on salaries for earlier periods.	Cohorts	cohort	5-year birth cohorts: 1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	30, 40, 50
	Population	obs	n. of observations per cell
		obs_part	n. of observations per cell
	Employment	emp	share employed
	Earnings	earn	mean monthly earnings using net monthly salaries, conditional on employment
	Wages	wage	hourly wages using net monthly salaries among employed individuals
	Part-time	part	Using information on the hours usually worked among employed individuals
	Parenthood	parent	Defined as living in joint household with children. Equals 0 if no child lives in the household; and 1 if at least one child ¡6 years old lives in the household (for age 30); if at least one child 6-15 years old lives in the household (for age 40), or if at least one child 16-20 years old lives in the household (age 50)
	Education	edu	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)

COUNTRY Source	Concept	Variable	Definition
GERMANY	Gender	female	gender dummy
German Socio-Economic Panel (SOEP)	Cohorts	cohort	5-year birth cohorts: 1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
1984-2020 panel (1983-2019 for income data).	Age groups	age	28-32, 38-42
	Population	obs	n. of observations per cell
		obs_part	n. of observations per cell
		obs_earn	n. of observations per cell
		obs_wage	n. of observations per cell
	Employment	emp	employed being defined as working at least 52 hours/year and having positive wages
	Earnings	earn	yearly individual labor income (incl. Self-employed, bonuses, military or community pay, and profit-sharing) divided by number of month
	Wages	wage	yearly individual labor income (incl. Self-employed, bonuses, military or community pay, and profit-sharing) divided by hours worked
	Part-time	part	conditional on employment, parttime is defined as working 1560 h/year (30h/week) or less
	Parenthood	parent	0 if no biological child lives in the household; 1 if at least one biological child ¡10 years old lives in the household (for age 30),
			or at least one child 10-20 years old lives in the household
	Education	edu_cat	low education, middle education, high education
GREECE	Gender	gender	0 female, 1 male
Labor Force Survey 1987-2020.	Cohorts	coh	5-year birth cohorts: 1940-45, 1945-50, 1950-55, 1955-60, 1960-65, 1965-70, 1970-75, 1975-80, 1980-85, 1985-90, 1990-95, 1995-2000
	Age groups	age_g	1 (28-32), 2 (38-42), 3 (48-52)
	Population	empl_count	n. of observations per cell
		part_count	n. of observations per cell
		earn_count	n. of observations per cell
		h_earn_count	n. of observations per cell
	Employment	empl	share of persons employed
	Earnings	earn	mean monthly individual earnings, (take-home) pay from main job
	Wages	h_earn	monthly (take-home) pay from main job divided by the number of weeks and hours per week
	Part-time	part	share of employed individuals working 30 hours or less
	Parenthood	parent	0 if no child lives in the household; 1 if at least one child ¡7 years old lives in the household (for age 30), or
			at least one child 10-15 years old lives in the household (for age 40),
			or at least one child 16-20 years old lives in the household (for age 50)
	Education	isced	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
IRELAND	Gender	female	1 female, 0 male
SILC data.	Cohorts	cohort	1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	30, 40, 50
	Population	obs	n. of observations per cell
	Employment	empl	
	Part-time	part	
	Parenthood	parent	0 / 1
	Education	edu	1 (low education); 2 (mid education); 3 (high education)
ITALY	Gender	female	1 female, 0 male
Survey on Household Income and	Cohorts	cohort	1945, 1950, 1955, 1960, 1970, 1975, 1980, 1985, 1990, 1995
Wealth (SHIW) 1987-2020 repeated	Year	year	1989-2020
across sections.	Age groups	age_group	1 if 28-32, 2 if 38-42, 3 if 48-52
	Population	obs	n. of observations per cell
	Employment	employed	share employed
	Earnings	ind_earn	mean monthly individual earnings (net), zero for non-working
	Wages	hwage	mean hourly wage conditional on employment (net)
	Part-time	partime	share part-time employed, working 30 hours or less per week
	Parenthood	parent	0 if no child lives in the household; 1 if at least one child ¡7 years old lives in the household (for age 30),
			or at least one child 10-15 years old lives in the household (for age 40),
			or at least one child 16-20 years old lives in the household (for age 50)
	Education	educ	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
NETHERLANDS	Gender	female	1 female, 0 male
Data on the employment rate and share	Cohorts	cohort	1 if 1940-45, 2 if 1950-55, 3 if 1960-65, 4 if 1970-75, 5 if 1980-85, 6 if 1990-95
working part-time are from the LFS	Age groups	age	1 if 28-32, 2 if 38-42, 3 if 48-52
1996-2020. Lefting out parents that have	Population	obs	n. of observations per cell
an older child living at home		obs_part	n. of observations per cell
(parent is missing instead of 0).	Employment	emp	share employed
	Part-time	part	share part-time employed
	Parenthood	parent	0 / 1
	Education	edu_cat	1, 2, 3

COUNTRY Source	Concept	Variable	Definition
NORWAY	Gender	female	1 female, 0 male
Employer-employee data from 1986-2017 and	Cohorts	cohort_group	1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
data from the 1980 census. Data on annual	Age groups	age_group	30, 40, 50
income spanning 1967-2018 but it measures	Population	obs	n. of observations per cell
annual labor market earnings including any taxable	Employment	emp	
benefits such as parental leave, unemployment, or	Earnings	earn	
sickness benefits. Some of the cohorts are missing	Part-time	part	
the employment data from 1981-1985, so there	Parenthood	parent	0 if no child lives in the household; 1 if at least one child ¡7 years old lives in the household (for age 30),
exists differences between the N which is listed			or at least one child 10-15 years old lives in the household (for age 40),
and the N which has non-missing data.			or at least one child 16-20 years old lives in the household (for age 50)
	Education	edu	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
PORTUGAL	Gender	female	1 female, 0 male
	Cohorts	cohort	1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	30, 40, 50
	Population	obs	n. of observations per cell
	Employment	emp	
	Earnings	earn	
		income_employed	
	Part-time	part	
	Parenthood	parent	
	Education	edu	1 (isced 0-2); 2 (isced 3-6); 3 (isced 7-8)
SPAIN	Gender	female	1 female, 0 male
Employment data: Spanish Labor Force	Cohorts	cohort	1940-45, 1945-50, 1950-55, 1955-60, 1960-65, 1965-70, 1970-75, 1975-80, 1980-85, 1985-90, 1990-95, 1995-2000
Survey (EPA), Earning data: EU-SILC	Age groups	age	30, 40, 50
(2004-2020).	Population	n_obs_employment	n. of observations per cell
		n_obs_gross	n. of observations per cell
		n_obs_net	n. of observations per cell
	Employment	empl	shared employed
	Earnings	mean_month_earnings_gross	Mean monthly gross earnings
		mean_month_earnings_gross_wself	Mean monthly gross earnings including self-employment
		mean_month_earnings_net	Mean monthly net earnings
		mean_month_earnings_net_wself	Mean monthly net earnings including self-employment
	Wage	mean_hour_wage_gross	Mean hourly gross wages
		mean_hour_wage_net	Mean hourly net wages
	Part-time	part	Share part-time
	Parenthood	parent	Both / childless/ children
	Education	education	Low (L), medium (M), high (H), all
SWEDEN	Gender	female	1 female, 0 male
Observations with parent missing are dropped.	Cohorts	cohort	1(1935-40), 2(1940-45), 3(1945-50), 4(1950-55), 5(1955-60), 6(1960-65), 7(1965-70), 8(1970-75), 9(1975-80),
			10(1980-85), 11(1985-90), 12(1990-95)
	Year	year	1985-2018
	Age groups	age_group	30, 50
	Employment	employed	
	Earnings	earnings	
		median_earn	
	Part-time	parttime	
	Parenthood	parent	0 if the sum of children all ages = 0, 1 if at least one child aged 0-10 and age group of parent is 30, 1 if at least one child
			aged 11-20 and age group of parent is 50 if none of the above holds

COUNTRY Source	Concept	Variable	Definition
UK	Gender	female	1 female, 0 male
Labour Force Survey 1979-2020. Questions on	Cohorts	cohort	1940, 1950, 1960, 1970, 1980, 1990
part-time work only included in LFS from 1992	Age groups	age	30, 40, 50
onwards and on weekly earnings and hourly pay	Population	obs	n. of observations per cell
only included in surveys from 1993 onwards.		obs_part	n. of observations per cell
Data both including and excluding self-employed.		obs_earn	n. of observations per cell
		obs_wage	n. of observations per cell
	Employment	emp	share of employment
	Earnings	earn	
	Wage	wage	
	Part-time	part	share part-time conditional on being employed
	Parenthood	parent	0 if no child lives in the household; 1 if at least one child ¡5 years old lives in the household (for age 30), or at least one child 10-15 years old lives in the household (for age 40), or at least one child 16-18 years old lives in the household (for age 50)
	Education	edu_cat	1 (below GCSE: ISCED 0-2), 2 (below degree: ISCED 3-5), 3 (degree or above: ISCED 6-8)
US	Gender	female	1 female, 0 male
	Cohorts	cohort	1940-45, 1950-55, 1960-65, 1970-75, 1980-85, 1990-95
	Age groups	age	30, 40, 50
	Population	obs	n. of observations per cell
	Employment	emp	
	Earnings	earn	
	Wage	wage	
	Part-time	part	
	Parenthood	parent	
	Education	edu	1, 2, 3

Table A3: Gaps between mothers and non-mothers, cohort 1970, by country

Country	Employment Gaps		Part-time Gaps		Earnings Gaps	
Age	30	50	30	50	30	50
			Anglo-Saxon			
Canada	-0.206	0.054	0.140	0.039	-0.147	0.107
Ireland	-0.322	-0.020	0.140	0.079		
UK	-0.340	0.030	0.550	0.170	-0.776	-0.027
US	-0.145	0.019	0.077	0.029	-0.326	0.064
			North			
Denmark	-0.043	0.115	0.138	-0.040	-0.180	0.248
Finland	-0.149	0.069	0.059	-0.018	-0.332	0.169
Norway	-0.120		0.137		-0.263	
Sweden	-0.077	0.088	-0.119	0.096	-0.436	0.130
			West			
Austria	-0.468	0.018	0.091	0.122	-0.870	-0.038
Belgium	-0.101	0.134	0.151	0.046	-0.248	0.373
France	-0.160	0.025	0.087	0.001	-0.042	0.038
Germany	-0.324	0.022	0.487	0.008	-0.687	0.092
Netherlands	-0.223	0.067	0.637	0.244		
			South			
Greece	-0.282		-0.025		-0.073	
Italy	-0.314	-0.219	0.147	0.100	-0.303	-0.051
Portugal	-0.060	0.020	0.010	0.030	-0.174	-0.036
Spain	-0.145	-0.028	0.045	0.009	-0.312	0.365

Table A4: Gaps between mothers and fathers, cohort 1970, by country

Country	Employment Gaps		Part-time Gaps		Earnings Gaps	
Age	30	50	30	50	30	50
			Anglo-Saxon			
Canada	-0.241	-0.087	0.225	0.126	-0.203	-0.165
Ireland	-0.352	-0.196	0.218	0.254		
UK	-0.350	-0.110	0.590	0.370	-0.803	-0.650
US	-0.242	-0.147	0.155	0.110	-0.554	-0.500
			North			
Denmark	-0.174	-0.073	0.199	0.071	-0.438	-0.349
Finland	-0.225	0.010	0.121	0.041	-0.518	-0.237
Norway	-0.199		0.218	0.070	-0.475	
Sweden	-0.118	-0.026	-0.021	0.169	-0.515	-0.241
			West			
Austria	-0.543	-0.060	0.162	0.340	-0.911	-0.371
Belgium	-0.131	-0.098	0.232	0.182	-0.392	-0.259
France	-0.286	-0.121	0.244	0.196	-0.209	-0.267
Germany	-0.384	-0.067	0.646	0.378	-0.771	-0.539
Netherlands	-0.264	-0.123	0.779	0.585		
			South			
Greece	-0.468		0.063		-0.146	
Italy	-0.445	-0.319	0.314	0.322	-0.369	-0.308
Portugal	-0.200	-0.130	0.060	0.070	-0.350	-0.294
Spain	-0.244	-0.154	0.128	0.133	-0.407	-0.229

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