Heterogeneity in parental time with children:
Trends by gender and education between 1961 and 2012 across 20 countries.

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Abstract

This paper investigates the level and dynamics of heterogeneity in parental childcare time using data from the Multinational Time Use Study across 20 countries over five decades. Applying the Gini coefficient as main summary measure of the dispersion in the distribution at the country level, we show that heterogeneity in paternal time has been higher than that in maternal time throughout the last half-century. The gap has narrowed over the last decade, mainly due to a reduction in paternal time heterogeneity. This pattern is observed not only across countries over time, but also within those countries for which we have repeated observations. We also show relevant socio-economic variations. Heterogeneity among low-educated mothers started to be systematically above that of high-educated mothers in the 1970s. In the group of fathers, heterogeneity has always been higher for the low-educated and it has been on the rise in the last decade. Results of a counterfactual analysis suggest that the main driver of the trends in paternal time heterogeneity is the reduction in the share of fathers who do not provide any childcare, especially among the low-educated.

1. Introduction

Existing literature has consistently shown that starting from the 1960s, and especially since the 1980s, the average parental time spent in childcare activities has increased substantially across the advanced industrialised countries (e.g., Gershuny, 2000; Bianchi, 2000; Sandberg and Hofferth, 2001; Gauthier et al., 2004). At the same time, there has been a growing recognition that time with children, particularly at early ages, has significant life-long consequences, as it affects children's skill development and human capital accumulation process, as well as their psychological well-being (Coleman, 1988; Amato and Gilbreth, 1999; Lareau, 2011; Putnam, 2016). However, many studies have provided evidence of the fact that the increase in the amount of time spent with children has been very heterogeneous, substantially varying by gender (Craig and Mullan, 2011; Bianchi, Robinson, and Milkie, 2006) and education of parents (Monna and Gauthier, 2008; Altintas, 2016).

Studies have identified gender (mothers versus fathers) or parental education as factors that divide parental time with children focusing on a comparison of the average time devoted to childcare across these groups (Schneider et al., 2018). This does not provide information on the distribution of time spent with children. This paper aims to address this gap by examining the level and dynamics of dispersion in the distribution of parental time spent with children, to capture heterogeneity in parental time. Using data from the Multinational Time Use Study for 20 countries in the period 1961-2012, we investigate at the country level and over time whether parents have become more or less homogeneous in terms of the amount of time they devote to children, by gender, and by education level (low- versus high- educated mothers and fathers). Specifically, we address the following research questions: How has heterogeneity in parental time with children evolved over time? Has the well-documented increase in the average amount of time parents spent with children been accompanied by less or more heterogeneity in the distribution of this time for mothers, fathers, and for parents with low or high education? To what extent do effects of gender and parental education shape heterogeneity in parental time with children?

The core contribution of the paper is to descriptively examine the extent and evolution of heterogeneity in parental time with children over time and across countries, where previous analyses have solely focused on changes in mean time spent. Moreover, the study elaborates on the main social dynamics and mechanisms that could shape patterns of heterogeneity in parental time with children over the last decades, where the evolution of social norms on parenting, and the progressive diffusion of dual-earner couples are studied as important driving forces.

We focus on the overall distribution of childcare time of parents, by gender and by education, and adopt summary measures that capture the degree of dispersion characterising those distributions.. In particular, we use both Lorenz curves and the Gini index, two measures of inequality/heterogeneity of a distribution widely used on income and wealth that we apply to parental time with children. This application of the Gini index on parental time with children is novel. To the best of our knowledge, Gimenez-Nadal and Sevilla-Sanz (2012) were the only ones who used the Gini index to measure inequality in time use, but the focus was on leisure time. In particular, the Gini coefficient has the desirable property that it can be decomposed to capture separately the contribution to heterogeneity coming from: i) those parents who do not devote any time to their children (i.e., non-participants), and ii) those who devote a positive amount of time (i.e., participants). By building counterfactual Gini coefficients, we can disentangle how the

evolution of the overall heterogeneity depends on changes in heterogeneity among the participants and/or on changes in the shares of the different groups (participants and non-participants) in the total population.

Overall, this study provides a detailed examination of the distribution of parental time with children and the factors that contribute to heterogeneity in caregiving practices. The application of the Gini index provide new insights into the distribution of parental time with children, which can inform policies and interventions aimed at reducing disparities in caregiving practices.

There is evidence that mothers continue to devote more time to childcare than fathers do (Sayer and Gornick, 2011; Craig and Mullan, 2011), although paternal time with children has substantially increased over time (Bianchi, Robinson, and Milkie, 2006; Sullivan, Billari and Altintas, 2014). That the gender gap in parental time with children is still present has been explained by a slow and uneven increasing participation of fathers in childcare (Bianchi, Robinson, and Milkie, 2006), but also by the evidence that mothers have increased their average childcare time (Hays 1996; Craig and Mullan, 2011). Together with an increase in gender equality within the household, as claimed by the gender revolution framework (Goldscheider et al., 2015), there has been a change in the idea of "good parenting" and in the importance that parents attach to investments in children (Schneider et al., 2018). Studying these dynamics not only by looking at average parental time, but also at heterogeneity of parental time with children for mothers and fathers may provide new empirical evidence on how the gender revolution has unfolded over time for men and women (Goldscheider et al., 2015).

The fact that more-educated parents spend more time with their children (Altintas, 2016; Craig and Mullan, 2010; Leibowitz, 1974; Monna and Gauthier 2008; Sayer, Gauthier and Furstenberg, 2004), especially in human capital enhancing activities (Altintas, 2015; Hofferth and Sandberg, 2001; Bianchi and Robinson, 1997), and that the educational gap in average parental time is growing (Altintas, 2016; Sullivan, 2010; Ramey and Ramey, 2010. For recent evidence on the closing of the educational gap for mothers in the US, see Prickett and Augustine, 2021) are potential threats to equal opportunities, since time use can transmit advantages or disadvantages across generations. Indeed, this evidence, along with other recent demographic trends such as the increase in marital dissolution - which often play at the disadvantage of low SES children - have led some scholars to speculate that the observed rising average parental time with children might be "masking greater heterogeneity among parents than in the past" (Sayer, Bianchi and Robinson, 2004: 32), "concealing possible polarization of parents," (Monna and Gauthier, 2008: 647) and, therefore, potentially contributing to "diverging destinies" of children (McLanahan, 2004).

Our analysis focuses on parents who have a child under the age of five, as childcare time is especially important for their development. In line with the developmental framework for parental time investments, within this age group, childcare activities typically include basic care (e.g., routine tasks, such as feeding), playing (e.g., playing games) and teaching (e.g., reading to the child) (Kalil, Ryan, Coley, 2012). Parental time is investigated at the country level, by aggregating information of two-parent families only. We do not include single-parent families due to the limited number of cases in many countries, particularly between the 1960s and 1980s when the phenomenon was rare, making it difficult to measure heterogeneity in parental time by gender

and socioeconomic status at the country level.[1] Socio-economic status is particularly relevant for single parent families from a substantive point of view, in light of cumulative disadvantage dynamics (Di Prete and Eirich, 2006). We are aware that looking at two-parent families only may expose our study to potential selection bias due to compositional changes over time within this group of families. Nevertheless, evidence suggests that the education gradient in divorce can be positive, null, or negative depending on the country (Härkönen and Dronkers, 2006), and our cross-country perspective helps address this issue. In addition, because time use data does not provide information about the relationships between the members of the household, we might also have stepfamilies in our sample. Although we cannot identify and distinguish them from intact families, their presence is likely to partially reduce selection issues in relation to parental education.

We first elaborate on the theoretical framework and explanatory mechanisms for patterns of heterogeneity in parental time with children; then, we describe the data and methods. After reporting our findings, we provide some concluding remarks.

2. Theoretical framework

Previous research has consistently shown that the average time spent in primary childcare activities by parents has increased since the 1960s, and even more substantially starting from the 1980s across advanced industrialised countries, such as the US (Altintas, 2016; Bianchi, Robinson and Milkie, 2006; Chalasani, 2007; Sayer, Bianchi and Robinson, 2004), the Netherlands (Bianchi, Robinson, and Milkie, 2006), Canada (Zuzanek, 2001; Gauthier, Smeeding and Furstenberg, 2004), the UK (Sayer, Bianchi and Robinson, 2004), and Australia (Bittman, 1999, 2004; Craig, Powell and Smyth, 2014). Findings from Gershuny's (2000) analysis on 20 countries, and those of Gauthier, Smeeding and Furstenberg (2004) on 16 countries, confirmed the trends in increased childcare time, especially since the 1980s.

The observed increase over time in parental childcare may conceal substantial differences by gender and education of parents. In what follows, we therefore postulate a series of hypotheses on the level and dynamics of heterogeneity in parental time with children, combining the two above mentioned stratification dimensions.

One theoretical argument we explore to explain levels and trends in heterogeneity is how strong and widespread social norms about "good" and intensive parenting are. Standards of good parenting imply significant time investments in children (Sayer, Gauthier and Furstenberg, 2004; Wall, 2010), as well as more "quality time", i.e., more interactive and developmentally-focused time (Bittman, Craig and Folbre, 2004). When children are little, like in our analysis, intensive parenting, in line with Craig, Powell and Smyth (2014), involves spending more time in primary childcare, that is specific childcare activities as main activities for parents at a specified time on a given diary day. When children are in their school age, intensive parenting has been shown to be associated with a specific type of parenting style (authoritative, and helicopter parents. For a discussion see Doepke and Zilibotti, 2019) that imply a strong involvement in children's school

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[1] In particular, between the 60s and the 80s, the number of single fathers in our data ranges from 1 to 34 depending on the country considered.

activities and, more broadly, a marked influence on children's performance-oriented choices. We envision that the stronger the norms about involved parents are, the lower the heterogeneity in parental time with children is. Indeed, in situations where anomie about how to behave as parents is higher, constraints to individual agency are lower and more heterogeneity in how parents spend time with children may emerge. Of course, norms about intensive parenting have spread differently and at a different pace in different social groups (i.e., mothers versus fathers and high- versus low-educated parents) (Hays, 1996; Lareau, 2011) and by analysing heterogeneity of parental time with children between and within these groups over time we can gain a better understanding of such dynamics. Although out of the scope of our study, it is important to acknowledge that the way parenting norms translate into a more or less homogeneous use of time with children by parents is likely to be moderated by the institutional context, such as public policy and degree of economic inequality (factors that have already been shown –see Doepke and Zilibotti, 2019– to be associated with the level of parental time).

Let us first focus on gender differences. Although many studies show that the average paternal time with children has substantially increased in the last decades (Fisher, McCulloch, and Gershuny, 1999; Bianchi, 2000; Bianchi, Robinson, and Milkie, 2006; Sullivan, Billari and Altintas, 2014), mothers still devote more time on average to childcare, especially routine and physical activities (Gauthier, Smeeding and Furstenberg, 2004; Craig and Mullan, 2011). That fathers' time has not reached parity with mothers' is due to its uneven increase, depending on the country considered (Craig and Mullan, 2011), and on the level of education, with highly educated fathers guiding the change (Sullivan, Billari and Altintas, 2014). Moreover, there is evidence that also mothers' time has increased (Hays, 1996; Craig and Mullan, 2011): it is very unlikely for a mother living with a young child to do no regular caregiving. Substantial divergence from that social norm is rarely observed. In the case of fathers, the parenting behaviour is more likely to be diverse, depending on norms surrounding fatherhood, on the understanding of the role of parenthood, and on the involvement of the spouse in market work. Fathers' daily care practices, therefore, are more heterogeneous than those of mothers. In light of the presence of more well-established and widely agreed norms on motherhood than on fatherhood, we expect *a relatively more homogeneous distribution of childcare time among mothers than among fathers (H1)*.

However, starting from the 1960s, women have increasingly been involved in the labour market, thereby experiencing the "second shift" (Hochschild and Machung, 1989) of the dual burden of work and family. Therefore, the other social dynamics that may have shaped heterogeneity in parental time throughout the five decades is the increasing female labour force participation and the progressive diffusion of dual-earner families. The increasing women's participation in the labour market was not accompanied by a substantial relief from their family responsibilities. This phenomenon has been framed as the "first half" of the Gender Revolution (Goldscheider, 2010; Goldscheider et al., 2015). Women started to undertake new roles and, while engaging more in paid labour, the care of children has no longer been the life-long, full-time job for women. We expect that this substantial reshape of women's life-course could be responsible for changes in trends of maternal time with children. Indeed, although there is evidence that on average mothers have remained highly involved physically and emotionally in childcare even when employed (Bianchi, 2000), building on the time-availability framework (Presser, 2003), we might expect that the way women allocate their time to work, childcare and other activities becomes more diversified over time and across maternal education groups, with some mothers devoting even

more time than before to childcare (e.g., those highly-educated) and other less. In other words, the changing role of women in society may have translated in more room for individual agency in defining how to allocate time between the public and private sphere, thereby leading to a multitude of ways in which women spend their time that may not be visible simply looking at the evolution of average maternal time with children. Therefore, within the group of mothers we anticipate an increasing heterogeneity in time devoted to childcare during the "first half" of the Gender Revolution, followed by a reduction in that heterogeneity due to the strengthening of the norms about the importance of intensive parenting towards the end of the period of observation (i.e., 1990s, 2000s), despite the time-squeeze that many working mothers experience.

The increasing men's involvement in the household observed in the last few decades could be considered as a signal of the unfolding "second half" of the Gender Revolution, which has slowed or stalled in more recent years (England et al., 2020). A growing number of fathers have embraced gender equality and consider "caregiving" as an essential part of fatherhood, suggesting a substantial change in attitudes towards fatherhood. The role of a "good father" is no longer limited to being the breadwinner of the family, the gender role model, or the moral authority (Lamb and Tamis-Lemonda, 2004; Wall and Arnold, 2007; Lamb, 2010, Pleck and Masciadrelli, 2004). Fathers are now expected to spend time with their children, actively contribute to family life, and be involved in parenting. The diffusion of dual-earner couples, on the back of the increasing female labour force participation, that has likely led to downsize the role of gatekeepers played by mothers, together with the spread of the "involved father" ideal and norm might lead to a more homogenous time with children for fathers. Therefore, following the evolution of mothers and fathers' roles, we can expect that *heterogeneity in time with children among mothers follows an inverse U- shaped pattern, whereas that among fathers decreases over time in a more linear way. (H2).*

The hypothesised reduction in heterogeneity in parental time among fathers could be driven by two main factors: i) a decrease in the share of fathers not involved at all in childcare, or ii) an increasingly more homogenous parenting style among those fathers who are involved. We envision that the strengthening of norms about the importance of intensive parenting led many fathers to start an active involvement in childcare activities, a phenomenon that could more than offset the rising number over time of single fathers (not accounted here; see Edin and Nelson, 2013) and stepfathers (instead included, who could feel legitimate to be not at all involved in the care of stepchildren), which may favour an increase in the share of non-involved fathers. Therefore, in light of the fact that in the 1960s and 1970s many fathers were not involved at all in any childcare activities (Altintas and Sullivan, 2017), we expect that *heterogeneity in childcare time among fathers has decreased over time mainly due to a reduction in the share of fathers who are not involved at all with their children (H3).*

We turn to educational differences in time spent with children by mothers and fathers, with the aim to intersect the gender dimension with the socio-economic one. Existing literature has shown that, on average, highly educated parents devote more time to children (for qualitative work see Hays, 1996 and Lareau, 2011 in the United States and Domìnguez-Folgueras et al., 2017 in Spain; quantitative studies supporting the same evidence are England and Srivastava, 2013 in the US and Gracia, 2015 in the UK). Educational inequalities in parental childcare time have so far been

identified comparing the average time spent with children by high- and low-educated parents. We postulate that such inequalities might also be driven by a different degree of heterogeneity in parental childcare time within the two educational groups of parents. Concerted cultivation norms and intensive parenting norms are likely to be more well-established among highly educated parents (Bianchi and Robinson, 1997; Gracia and Garcìa-Romàn, 2018; Prickett and Augustine, 2021), making the parenting practices within this group of parents more homogenous than those within the group of lower-educated parents. Therefore, we expect that *heterogeneity in childcare time is lower among highly educated mothers and fathers than it is among low educated mothers and fathers (H4)*.

We also explore how the dynamics of educational inequalities intersects with the gender of the parent. Based on the evidence that the spread of new norms about fatherhood is still weak and uneven among low educated fathers (Sullivan, Billari and Altintas, 2014), we envision a relatively high share of non-involved fathers in this group. Therefore, heterogeneity in parental time within this group may decrease at a slower pace compared to that within highly educated fathers, possibly due to a persistent pattern of non-participation.

3. Data and methodology

Time use data exploited in this study come from the Multinational Time Use Study (MTUS), a collection of harmonised time use diary surveys based on samples from over 20 countries from the early 1960s to the 2010s. [2] Time-diary methodology provides reliable and accurate information on daily time-use patterns, especially if the duration of the activities is not institutionally controlled, such as childcare (Chenu and Lesnard, 2006; Kelly et al., 2015). Unlike stylised survey questions, where the respondents are required to remember the total amount of time spent on an activity, diarists self-describe their 24 hours without being prompted about specific activities. The diary method, therefore, is less prone to recall error or social desirability response bias (Bianchi, Robinson and Milkie, 2006; Gershuny, 2000; Harvey, 1993; Juster and Stafford, 1985; Robinson and Godbey, 1999). Social desirability bias is particularly strong when reporting developmentally salient childcare activities (Hofferth, 2006) and thus, time diary evidence is especially appropriate to examine trends in childcare.

All the surveys in the MTUS apply the time-diary methodology; time expenditure and background variables are harmonised to a common format. Weights are applied to account for daily and seasonal variations, as well as underrepresentation of certain demographic groups (Fisher and Gershuny, 2013). These characteristics make MTUS a powerful data source, widely used across disciplines for cross-national comparative research (see for example, Hook, 2010 on gender division of labour; Gauthier, Smeeding and Furstenberg, 2004 on time with children; Andersen, Curtis and Grabb, 2006 on social capital and volunteering; Ng and Popkin, 2012 on physical activity and energy expenditures). However, there is considerable methodological variation in MTUS surveys that needs to be highlighted (full list of countries by technical information can be found in Table 1.2 in Fisher and Gershuny, 2013). First, surveys in MTUS vary in their time

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[2] Australia, Belgium, Bulgaria, Canada, Czechoslovakia, Denmark, Finland, France, Germany, Hungary, Israel, Italy, Netherlands, Norway, Poland, Spain, Sweden, United Kingdom, United States, Yugoslavia/Slovenia. More information on the data used are available at: http//www.timeuse.org

intervals. The length of slot diarists report their activities in changes between free, 1, 5, 10, 15 or 30 minutes, 10 or 15 minutes being the most common interval. Second, the number of diary days differ. While most surveys collect one- or two-day diaries (1 weekday 1 weekend), all Dutch surveys and four of the earliest UK surveys are 7-day diaries. US 1975 is a four-day survey and Germany 2001 and Norway 1971 have three-day diaries. Third, surveys differ in their sampling methodologies and age of population covered. Some surveys (e.g., US) sample one member per household, whereas others sample all household members older than a certain age (commonly 15). Finally, fieldwork often takes place through the year, but in some cases, it is shorter than 12 months (e.g., 6 months in Israel 1991 and 9 months in Sweden 1991). Survey period in the Netherlands is October.

The first two of the listed issues, varying time intervals and window of observation, are the most relevant to this research, because the minimum time the respondent can report an activity and the number of diary days affect the number of individuals reporting zeros, i.e., no participation to a given activity (see also Hook, 2006). Notwithstanding the potential bias in the measurement of heterogeneity arising from varying time intervals and window of observation, MTUS is the best data source to address our questions. However, we acknowledge important limitations. As highlighted by Stewart (2018), we work with a sample of person/days rather than a sample of the population. This generates random variation, since individuals in some days of the week experience a different time schedule, making it hard to distinguish between "true non-participation" and "random non-participation". In more details, denoting t_{id} as the total time devoted to childcare by individual i in day d, we can write: $t_{id} = m_i + e_{id}$, with m_i indicating the long-run childcare time, and e_{id} representing the day to day variation.

While we can compute measures of heterogeneity in t_{id} using our data, the same cannot be done for m_i, which is the variable we are interested in. In other terms, random variation enters our measure of heterogeneity, leading to biased estimates. We have tried to address this issue by calculating heterogeneity in parental time only for weekdays/weekends and different combinations of weekdays, with no impact on our main findings.[3] In addition, we believe that we should expect an increase in random variation over time due to the macro-trend of increased globalisation, more travelling and rising non-standard work schedule. This runs counter our results, which show a decrease in heterogeneity over time, and in particular, a reduction in the share of non-involved fathers.

In order to use all the available information, we included as many surveys as possible from the countries of interest in our analysis. Of the eight surveys conducted in 1965 and coming from Szalai Multinational Comparative Time Budget Research Project, only two (Belgium and Germany) are nationally representative random sample surveys. In the six other cases (Bulgaria, Czechoslovakia, Hungary, Poland, US and Yugoslavia) the sample is drawn from one or several small to middle-size towns and is limited to households in which at least one member was employed in the non-agricultural sector (Fisher and Gershuny, 2013). Therefore, the figures from the 1960s should be interpreted with caution.

The sample of the study is limited to married or cohabiting men and women aged between 19 and 50 years who live with at least one child under the age of five in the household. The sample is limited to parents of young children for theoretical and data-related reasons. First, time spent in

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[3] Further details are available upon request.

primary childcare is especially high during the pre-school period when children are more reliant on adult care. Second, this is the period where parental time is particularly salient for children's cognitive and social skill development. Third, having a child under the age of five is the most common cut-off point, which minimises the problem of lack of comparability across surveys.[4] Because of data limitations, in our analysis we cannot control for the number of children: therefore, our measure of childcare time refers to the overall time provided by a parent to her/his children and not to the time received by each child. Moreover, the data does not provide information on the relationship between the child and the respondent: thus, we consider women and men living with a child in the same household as respectively mothers and fathers. As mentioned before, we cannot distinguish intact families from stepfamilies. As far as parental education is concerned, we define mothers and fathers with at most secondary education (i.e. non-college graduates) as lower-educated parents and mothers and fathers with more than secondary education (i.e. college graduates) as highly educated parents.[5]

We focus on childcare as primary activity. This refers to the total minutes spent in all forms of childcare activities (e.g., changing diapers, reading to a child, etc.) and reported as the main activity at a specified time on a given diary day. Limiting the focus on childcare as a primary activity ignores more passive forms of childcare; hence, it is likely to underestimate the total caregiving time (Folbre and Yoon, 2007; Zick and Bryant, 1996). However, MTUS does not have comparable data on secondary childcare activities. Furthermore, for investigating trends in parental time, the focus on primary care activities is preferable because primary childcare captures the total time during which the child is the main centre of attention and direct recipient of parents' time.

To provide a summary measure of the heterogeneity inherent in the distribution of parental time with children we use the well-known Gini coefficient (Gini, 1909). The Gini coefficient is widely used as an indicator of inequality in income and wealth. We here adopt it to capture the extent and the evolution of heterogeneity in parental time at country level.[6] The coefficient ranges from 0 to 1, with 1 indicating the maximum degree of heterogeneity and 0 denoting a situation in which there is no heterogeneity. There are many equivalent definitions of the Gini coefficient (Yitzhaki, 1998): the most common one relates Gini to the Lorenz Curve. The Lorenz curve is a graphical device for a summary representation of a distribution. The graph of the Lorenz curve has the cumulative proportion of population on the horizontal axis and the cumulative proportion of an attribute (e.g. income, wealth or, in our case, time) on the vertical axis. Points on the Lorenz curve tell us, for instance, that the bottom 30 per cent of the population has 20 per cent of the attribute under exam. When all the units in the population have the same value of the attribute, the Lorenz curve is the 45-degree line, which represents the line of perfect equality. The Gini coefficient is the ratio of the area between the line of perfect equality and the Lorenz curve, over the area of the triangle below the line of perfect equality. In our context, the Gini coefficient is equal to 0 if all

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[4] Indeed, the age of youngest child as a continuous variable is not available in a number of surveys, especially in early ones. Early surveys are more likely to have this variable as a categorical variable with different cut-off points and the category child under five is present in all the surveys.

[5] The educational threshold that defines a highly educated individual might have changed over time. To take this into account, we have considered an alternative threshold: for the period before 1980 (or 1990), we consider as highly educated parents those whose highest educational level is completed secondary education. If we use this alternative definition, our results remain qualitatively unchanged. Details are available upon request.

[6] In the Online Appendix we present the same analysis performed in the main text using the Theil index instead of the Gini coefficient. The qualitative patterns are broadly consistent across these two different measures of heterogeneity.

parents within the country devote time to childcare and each parent spends the same number of minutes with his/her children; it is equal to 1 if only one parent spends a positive amount of time with his/her children and all the other parents within the country provide no time.

A useful property of the Gini coefficient is that it can be decomposed in the following way (see Morrisson and Murtin, 2013):

$$G_{i,t}=(1-p_{i,t})G^{+}_{i,t}+p_{i,t} \tag{1}$$

where for each country i and year t, $G_{i,t}$ is the Gini coefficient, $p_{i,t}$ is the fraction of those not devoting any time to children (non-participants) and $G^{+}_{i,t}$ is the Gini coefficient computed for those who devote a strictly positive amount of time to children (participants).

Accordingly, changes over time in the Gini coefficient can be ascribed to changes in the fraction of non-participants and changes in the Gini coefficient of the participants. In order to isolate the role played by these two forces, we will compute, for each country and year in our sample, a counterfactual Gini coefficient ($GC_{i,t}$) artificially generated by using the actual share of non-participants at each point in time, while keeping constant at its initial value the Gini coefficient of the participants. In other terms, $GC_{i,t}$ is computed by replacing in equation (1) $G^{+}_{i,t}$ with its value in the first year $G^{+}_{i,0}$:

$$GC_{i,t}=(1-p_{i,t})G^{+}_{i,0}+p_{i,t} \tag{2}$$

The different time pattern of the Gini coefficient $G_{i,t}$ and its counterfactual $GC_{i,t}$ is thus only due to changes in the Gini coefficient of the participants. When the Gini coefficient among the participants is constant over time, i.e. $G^{+}_{i,t} =G^{+}_{i,0}$ for any *t,* the dynamics of heterogeneity over time is only driven by changes in the share of participants/non participants and the actual and the counterfactual Gini overlap. When they do not overlap, the actual Gini $G_{i,t}$ is above (below) the counterfactual one $GC_{i,t}$ if heterogeneity among the participants $G^{+}_{i,t}$ has increased (decreased) over time. Overall, the counterfactual analysis will allow us to disentangle the drivers of changing heterogeneity in parental time by gender, and intersecting gender and socio-economic status.

4. Results

4.1 Main findings: levels and dynamics of heterogeneity

First, we assess the extent and evolution of heterogeneity in parental time by gender. As a first representation, in Figure 1 we pool the data for all the countries available in our sample and, distinguishing by gender and decade, plot the Lorenz curves of time devoted by parents to childcare. For each country in our sample, we also compute the Gini coefficient on the distribution of time devoted by parents to childcare, distinguishing between mothers and fathers. Figure 2.a shows the results, with data interpolated using both a LOESS curve and a linear regression line.

Table A.1 in the Online Appendix reports the values of the Gini coefficients for each country in the sample for which we have more than one data point,[7] together with the mean and the median of the distribution of time devoted to children within each country, by decade.[8]

The Lorenz curve reported in Figure 1, and the Gini coefficients in Figure 2.a, clearly show that heterogeneity in time spent in childcare has always been higher among fathers than among mothers. Moreover, Table A.1 in the Online Appendix provides evidence that this also holds within each country. This confirms the validity of our hypothesis H1. For fathers, the Gini coefficient ranges from 0.9 in the UK in the 1960-1970 period to a minimum of 0.53 in Norway in the period 2000-2005. For mothers, the highest value of the Gini is registered in Bulgaria (a clear outlier in our data) in the earliest period (0.79) and the lowest is for France in the same period (0.32).[9] Note that these values are much higher than those observed for the Gini coefficient calculated on income, especially for fathers. These higher values come from the larger number of parents who do not participate in childcare, especially in the earlier decades, compared to the number of individuals with zero income. We believe that the lower heterogeneity in maternal childcare time with respect to paternal time is likely due to the presence of gendered norms on parenthood, according to which mothers are expected to be the main caregiver or at least to engage in intensive parenting, more than fathers (Lareau, 2011).

[FIGURE 1 and 2 ABOUT HERE]

Figure 1 and 2.a show that heterogeneity in care time among mothers has been almost stable in the five decades analysed, whereas there has been a decline in the case of fathers. This is evident from the leftward shift of the Lorenz curves and the declining interpolation line for fathers. Note that the declining pattern in the Gini coefficient for fathers and the stable one for mothers hold also in the within-country analyses shown in Table A.1 and Figure A.1 in the Online Appendix. These pieces of evidence are consistent with our hypothesis H2 as far as fathers are concerned, but do not support our hypothesis H2 for mothers. To explain these patterns, in Figure 2.b we

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[7] This excludes Belgium, Czechoslovakia, Denmark, Israel and Sweden.

[8] Though the focus of the paper is heterogeneity, we calculate mean and median time within countries to compare our results with existing evidence. We find that, with a single exception of French mothers, mean and median care time have increased substantially for both parents throughout the period. Additional surveys from the most recent period (2006-2012) allow us to split the 2000s into two and have a better picture of the trends in the last decade for Canada, Italy, Spain and the US. Our findings are in line with previous research in showing a substantial increase in mean parental care time in the US between the 1960s and early 2000s. In the most recent period (2006-2012), however, maternal care time seems to have plateaued, whereas fathers' care shows a modest increase of five minutes. Canadian and Italian parents, on the other hand, continue to increase their childcare in the second half of the 2000s. In the case of Spain, we observe stability in maternal care but a large increase (25 minutes) in fathers' care in the last decade.

[9] One may note that the Gini coefficient for mothers in the Sixties in Bulgaria is very high, compared to other periods and other countries. This result reflects the compulsory paid employment of women under communist regime. About 90% Bulgarian mothers with a child under 5 in the sample of the Sixties are full-time employed (that figure drops to 30 % in 2001). This implies a very low participation rate of Bulgarian mothers to childcare (only 40%) and a very high Gini coefficient. Note that average participation rate in childcare by mothers is 93% in the entire sample (all periods, all countries). Dropping the Bulgarian data for the Sixties does not affect our results.

present how the share of non-involved parents (i.e. non-participant) by gender has changed over time. The data clearly shows that the share of non-participants in childcare activities, i.e. those devoting zero minutes, has reduced over time for fathers, which is very much in line with our hypothesis H3. It is interesting to note that, instead, there is a slight increase in the share of non-involved mothers, that is confirmed by Figure 3.b showing that this phenomenon is fully driven by low educated mothers. We speculate that such pattern could be mainly driven by the rising presence of stepmothers, who might feel somehow legitimate not to provide any care to stepchildren. Another potential explanation could be the increasing tag team parenting due to the rise of shift work (Mills and Taht, 2010).

The different participation patterns clearly shape the Gini coefficient, as shown in Figure 2.c, which reports both the Gini index and the counterfactual Gini index by gender. The latter captures the Gini coefficient under the assumption that the degree of heterogeneity among involved parents (i.e. participants) is constant over time and equal to the level measured in the first year observed in the data (see Section 3 for a detailed explanation). Because the trends of the two indices almost overlap over the entire period, especially for mothers, we can conclude that the change in the degree of heterogeneity in parental time among participants plays a minor role in the dynamics of the overall heterogeneity over time. Instead, the change in the share of involved/non-involved fathers is the key driver behind the decline in the (actual) Gini for fathers. For mothers, the Gini is constant, highlighting that heterogeneity among the participants has not changed and that the share of mothers participating/non-participating has also remained almost constant over time, consistently with Figure 2.b.

We then intersect gender and education. Figure 3.a shows the pattern of heterogeneity in maternal time by educational level. [10] We observe that heterogeneity in maternal time has been higher for low-educated mothers than for high-educated ones starting from the 1970s. A higher heterogeneity among the low educated is also found in the group of fathers, as Figure 4.a shows. The evidence is also consistent with our hypothesis H4, which anticipated that heterogeneity in childcare time is lower among high-educated mothers and fathers. Let us now turn to the dynamics of heterogeneity by education and by gender. Focusing first on mothers, we see an increase in heterogeneity in maternal time among the low-educated: Figure 3.b and 3.c suggest that this is mainly due to an increase in the share of non-involved mothers in recent years, which may speak to their higher presence in paid work, as well as to the diffusion of tag team parenting.

[FIGURE 3 and 4 ABOUT HERE]

Finally, turning to fathers and focusing on the dynamics of the Gini index over time, Figure 4.a shows that heterogeneity among college- and non-college-educated fathers declines until the 1990s, when it reaches a minimum. In the last decades, heterogeneity is stable for college-educated fathers, whereas it is on the rise for low-educated ones.[11] This is novel evidence on the behaviour of heterogeneity in the high- and low-educated groups of fathers, and it points in the

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[10] Early Hungarian data have no information on educational attainment and therefore Hungary is removed from the sample used to study trends by education.
[11] Heterogeneity in time investment in children is highest among low-educated American parents.

direction of a recent increase in heterogeneity among low-educated fathers, where a more homogenous parenting style struggles to emerge. Once again, the role played by the variation in the share of non-involved fathers is crucial, as suggested by Figure 4.b, which reports the share of non-participant fathers by education level. However, Figure 4.c seems also to provide evidence of a slight mismatch between the actual Gini and the counterfactual Gini index both for low- and high- educated fathers, suggesting that also variations in heterogeneity in paternal time for the group of involved fathers matter.

4.2 Potential mechanisms

In this section, we provide some descriptive evidence on the two social dynamics we have proposed as main explanatory mechanisms for patterns of heterogeneity in parental time over the last five decades: spreading of norms on "good" and intensive parenting, and diffusion of dual-earner couples.

Since our study focuses on time parents spend with children under the age of five, building on the work of Craig, Powell, and Smyth (2014), we propose that intensive parenting likely consists in devoting more time to primary childcare, instead of in supervising and monitoring children, while doing other activities or tasks (i.e., secondary childcare). Average parental time devoted to primary childcare is reported in Table A.1 in the Online Appendix. To capture the spreading of intensive parenting norms, we measure at the country level the percentage change between the last and the first data point in the average time devoted to primary child care by mothers and fathers, and correlate it with the percentage change in the Gini coefficient for mothers (Panel a) and for fathers (Panel b) at the country level over the same time period. Figure 5 shows that in countries where the increase in the average time devoted to primary childcare is higher (i.e., stronger norms about parental involvement), the reduction in the degree of heterogeneity in parental time is larger. Moreover, consistently with Figure 1 and 2.a, Figure 5 shows that the percentage change of the Gini index for mothers is concentrated around zero for most countries, while it is generally negative for fathers.

[FIGURE 5 ABOUT HERE]

Turning to the dynamics of the diffusion of dual-earner couples, we show that the increasing participation of women in the labour market is associated with lower heterogeneity in time with children for fathers. Figure 6 indeed provides evidence of a negative relationship between the percentage change in female labour force participation and the percentage change in the Gini Index for fathers.[12] These findings suggest that a greater diffusion of dual-earner families is associated with a more homogeneous paternal participation in childcare activities.

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[12] We computed the percentage change in the two variables over the same time period, when possible. In some cases, we did not have data for female employment rates for the first data point for the Gini coefficient. This is why we do not have all the countries in our sample in Figure 6. We have also computed the association between female employment rates and the Gini index for fathers at the country level (rather than that between percentage changes) and the negative correlation remains.

[FIGURE 6 ABOUT HERE]

4. Conclusions

This article contributed to the existing literature by providing new theoretical insights and further empirical evidence on heterogeneity of parental time with children. We aimed at investigating trends in heterogeneity in parental childcare time in five decades, across 20 countries. We examined relevant gender and educational divides, elaborating on potential mechanisms that may explain rising or decreasing heterogeneity in parental time devoted to childcare over the period of analysis. We did not simply look at the comparison between the average parental time of different groups in the population, but we focused on the overall distribution of childcare time of the population of parents. We calculated the Gini index on the distribution of parental time at the country-level between 1961 and 2012 using the Multinational Time Use Study (MTUS).

In elaborating on the mechanisms driving heterogeneity in parental time with children, we showed that heterogeneity in paternal time in the last half-century has always been higher than that in maternal time, though the gap has narrowed over the last decade. Decreasing heterogeneity in paternal time is likely associated to the diffusion of dual-earner couples as well as to the fact that there has been a change in attitudes towards fatherhood: more and more fathers (are required to) engage in childcare, and, at the same time, they welcome gender equality and consider "caregiving" as an essential part of fatherhood. However, this change in attitudes and behaviours seems confined to more-educated fathers: heterogeneity among low-educated parents is consistently higher than that among highly educated parents, with the exception of the very early years of our sample. In the case of fathers, the difference is increasing. Starting from the late 1990s, the Gini coefficient for low-educated fathers has been on the rise, whereas that for highly educated fathers has declined. This is indicative of further dispersion within the low-educated fathers' group. Furthermore, our findings provide a conservative assessment of the problem, due to the exclusion of single-parent households from the analysis. The decline in paternal heterogeneity in time with children in recent periods, for example, does not reflect the missing care time due to rising number of non-residential fathers, particularly in low-educated households.

Of course, institutional differences are crucial when drivers of social heterogeneity are investigated. For example, the US stands out as a particularly challenging environment to grow up, especially for children born to low-educated parents. Although time spent in childcare by mothers and fathers in the most recent period is on a par with other countries, heterogeneity in time with children is consistently higher in the last decade in comparison to others. Furthermore, the US is the only advanced country that until very recently had no universal maternity leave or public childcare provision. Both maternity leave policies and childcare provision could work as homogenising forces in parents' behaviour, and their absence may in part be responsible for the high heterogeneity in time devoted by parents observed in the US. Children born to low-educated parents in the US, therefore, are living in an environment where average childcare time is low, heterogeneity is high, and public insurance/support is hardly available. The role of institutional differences in shaping parental time with children should be further investigated and could very well be a direction for further research.

Our study has other limitations that lay the ground for subsequent research. First, these results are for total time spent in childcare as primary care. This covers all types of childcare activities. Yet, previous research shows that some developmental childcare activities (e.g., reading books to children) are more likely to be related with positive behavioural and cognitive outcomes than others (physical care). Some surveys used in this paper, however, do not have developmental care time as a specific activity category. Second, the study is limited to maternal and paternal time only. We do not look directly at other types of time with children (e.g., other family members, time spent in childcare facilities, etc.), since we focus on the changes in parental time. Looking more in detail at the role of other potential providers of care is an interesting future extension. Third, because of data limitations, our measure of childcare time refers to the overall time provided by a parent to her\his children and not to the time received by each child. This implies that we cannot fully disentangle fertility dynamics from parental time dynamics. Moreover, in light of the emphasised relationship between parental childcare and children's wellbeing (e.g., Kalil and Mayer, 2016), information on the parental time each child receives on average would have allowed us to further investigate mechanisms of social heterogeneity among children. Finally, and unfortunately, our data do not allow us to investigate parental time with children in single-parent families, because they are too few, especially in the early period, to make any analysis reliable.

Notwithstanding these limitations, we believe our work has provided new and important evidence on levels and trends in heterogeneity in parental time, highlighting gender and education divides.

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APPENDIX I

In Table A.1 we report the values of the Gini coefficients for each country in the sample for which we have more than one data point, together with the mean and the median of the distribution of time devoted to children within each country, by decade. In Figure A.1 we plot the Gini coefficient by gender and by country, for those countries for which we have more than one data point.

[Table A.1 and Figure A.1 about here]

APPENDIX II

In this Appendix we perform the same analysis of Figs 2, 3, 4 using the Theil index instead of the Gini coefficient. The Theil index is defined as:

$$T = \frac{1}{N} \sum_{i=1}^{N} \frac{x_i}{\mu} \ln\left(\frac{x_i}{\mu}\right)$$

where N is the number of observations, x_i denotes the value of observation i and μ is the average value.

The Theil index can be obtained as a special case of the generalized entropy index denoted by GE(α) when the parameter α is equal to 1.

Since the Theil index requires the computation of the natural logarithm of the data, it is generally thought that it is not well suited to measure inequality when data contains a sizeable number of zero (or negative) values that cannot be disregarded without seriously affecting the results of the analysis. This is exactly the situation we face with our data: indeed, as we discussed in the main text, changes in the number of parents who do not provide any time to children play a key role in understanding the evolution of inequality over time.

However, Morrisson and Murtin (2013) show that, if the Theil index is thought as a limiting case of the generalized entropy index when α tends to 1, it can be written as:

$$T_{i,t} = T_{i,t}^+ - \ln(1 - p_{i,t})$$

where for each country i and year t, $T_{i,t}$ is the Theil index, $p_{i,t}$ is the fraction of those parents not devoting any time to children (non-participants) and $T_{i,t}^+$ is the Theil index computed for those parents who devote a strictly positive amount of time to children (participants).

The Theil index $T_{i,t}$ reported in the following Figures is computed using the formula above.

These Figures show that, qualitatively, the results we have obtained using the Gini coefficient remain unchanged also when we use the Theil index.

[Figs A.2, A.3, A.4 about here]

<div align="center">**MAIN TEXT**

FIGURES</div>

Figure 1. Lorenz curves by gender

Figure 2. Gini coefficient by gender

Figure 3. Gini coefficient by education, mothers

Figure 4. Gini coefficient by education, fathers

Figure 5. Association between % change in average time devoted to primary childcare and % change in the Gini Index

Figure 6. Association between % change in female employment rate and % change in Gini Index for fathers

<div align="center">**APPENDIX I AND II**

TABLES</div>

Table A.1 Cross-national trends in childcare and inequality in childcare

<div align="center">**FIGURES**</div>
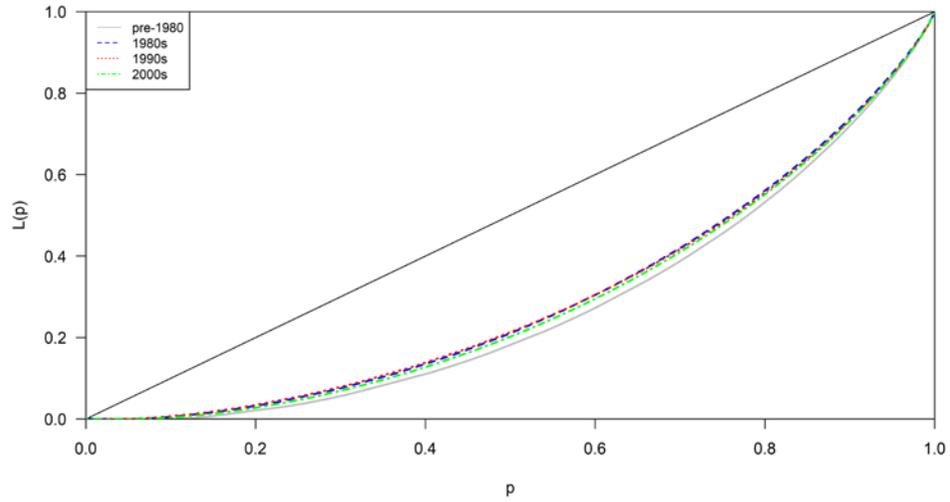
Figure A.1 Within-country Gini coefficient

Figure A.2 Theil coefficient by gender

Figure A.3 Theil coefficient by education, mothers

Figure A.4 Theil coefficient by education, fathers

Figure 1. Lorenz curves by gender

Figure 2. Gini coefficient by gender

(a) Gini coefficient

Red labels indicate Gini for mothers
Black labels indicate Gini for fathers

LOESS curve for fathers
LOESS curve for mothers
Linear regression line for fathers
Linear regression line for mothers

(b) Non-participants

Red labels indicate the fraction of mothers not devoting time to children
Black labels indicate the fraction of fathers not devoting time to children

LOESS curve for fathers
LOESS curve for mothers

(c) Counterfactual analysis

LOESS curve for fathers
LOESS curve for mothers
Counterfactual LOESS curve for fathers
Counterfactual LOESS curve for mothers

Figure 3. Gini coefficient by education, mothers
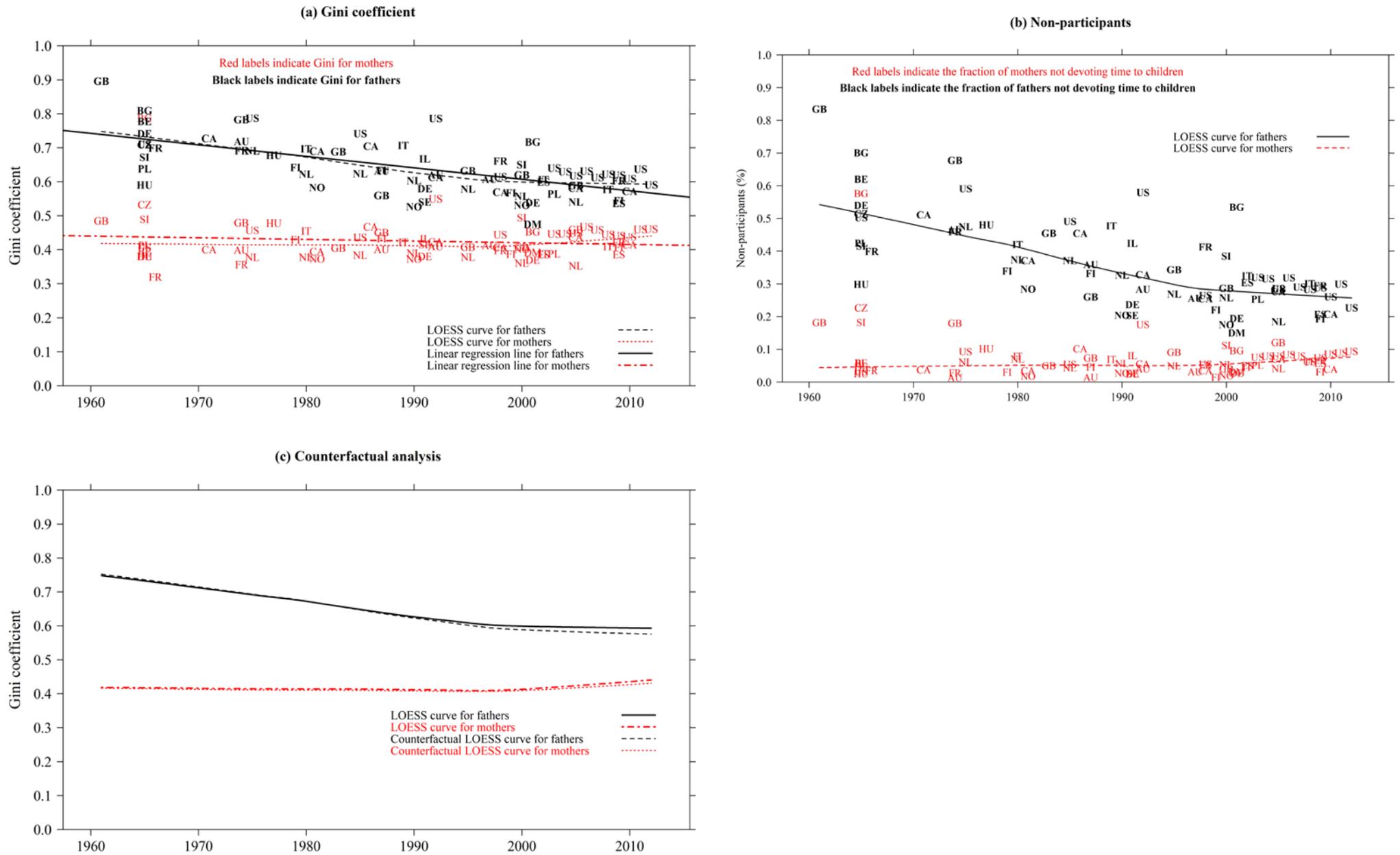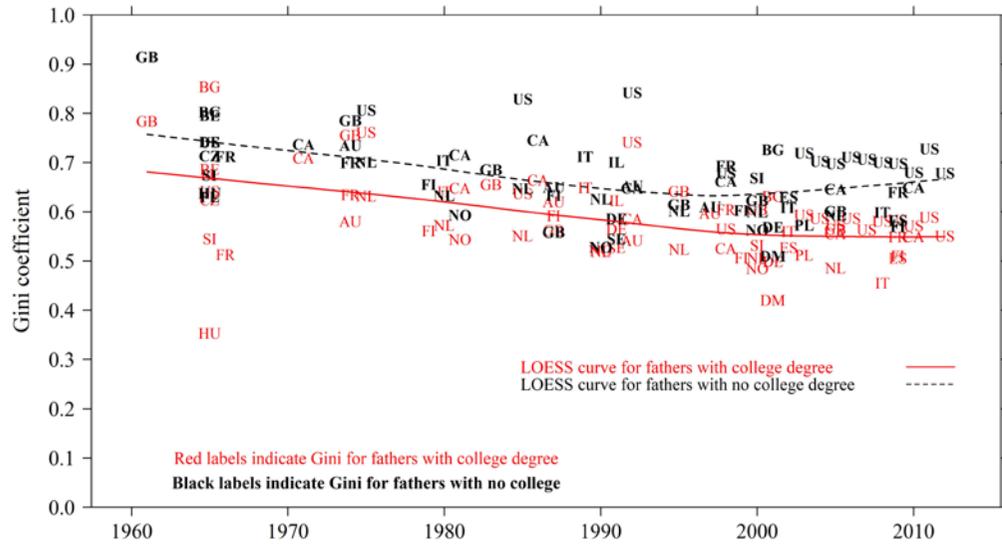

(a) Gini coefficient

(b) Non-participants

(c) Counterfactual analysis

Figure 4. Gini coefficient by education, fathers

(a) Gini coefficient
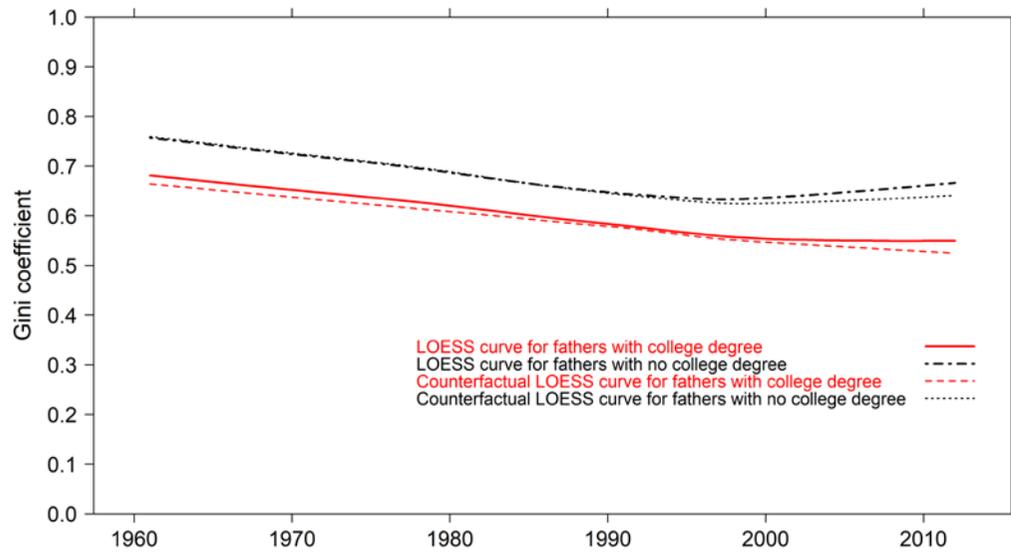
(b) Non-participants
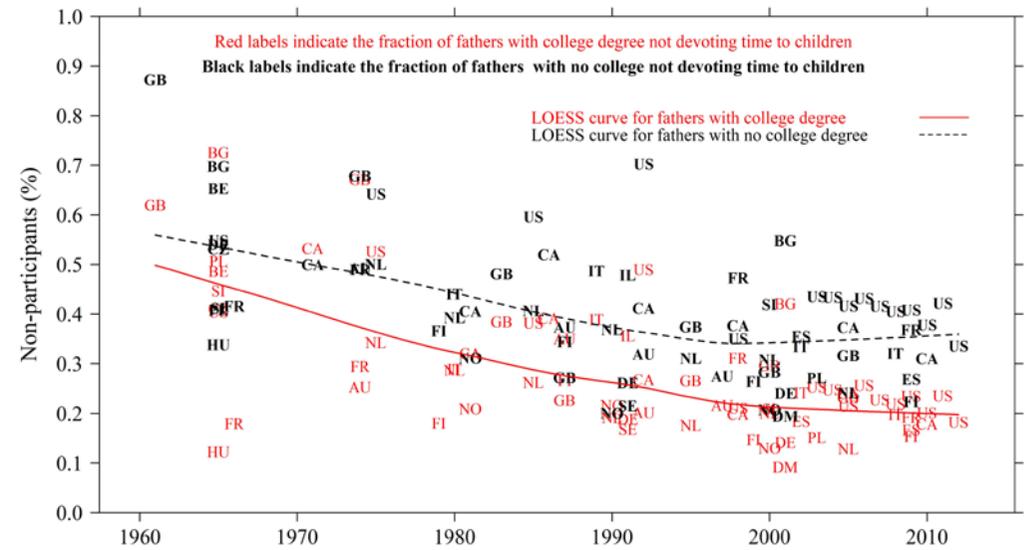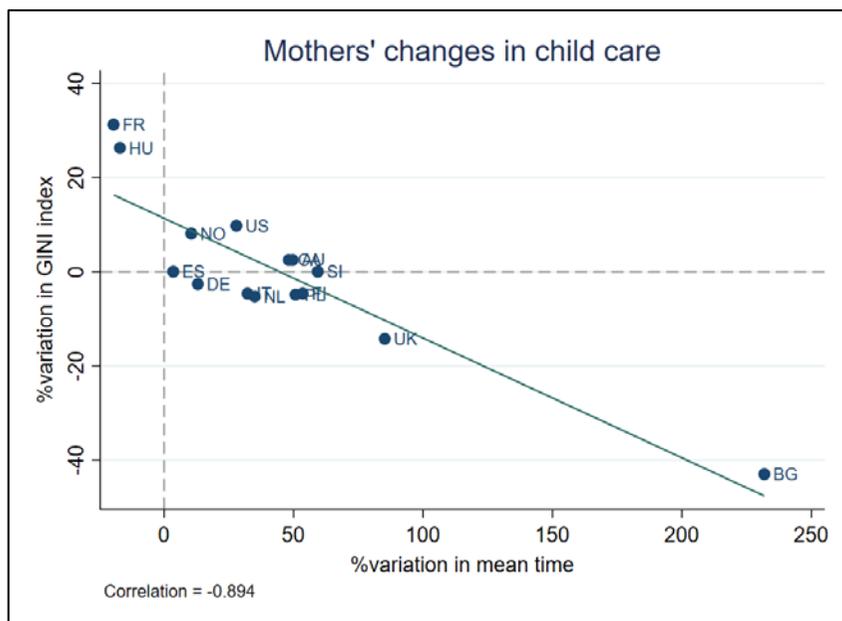
(c) Counterfactual analysis

Figure 5. Association between % change in average time devoted to primary childcare and % change in the Gini Index: Mothers (panel A) and Fathers (Panel B)
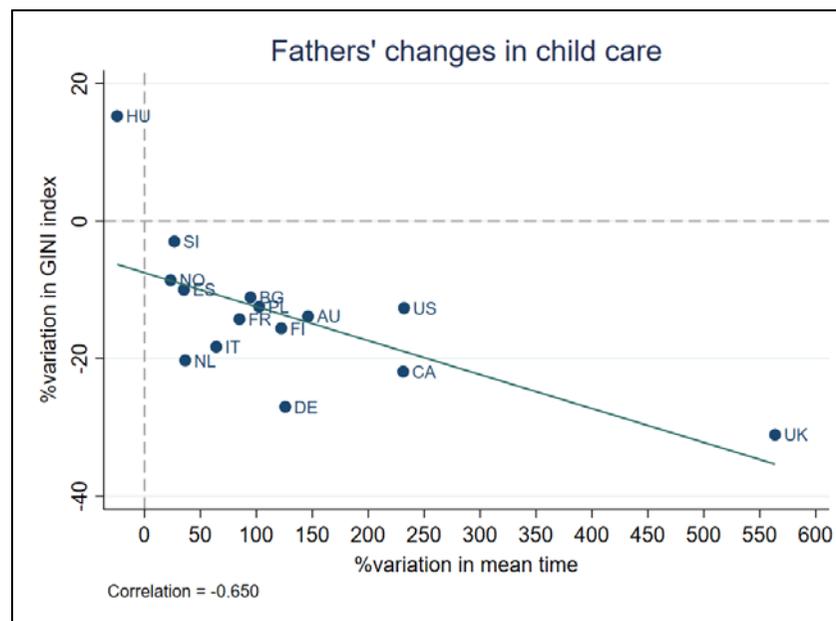
Panel A

Panel B

Figure 6. Association between % change in female employment rate and % change in Gini Index for fathers
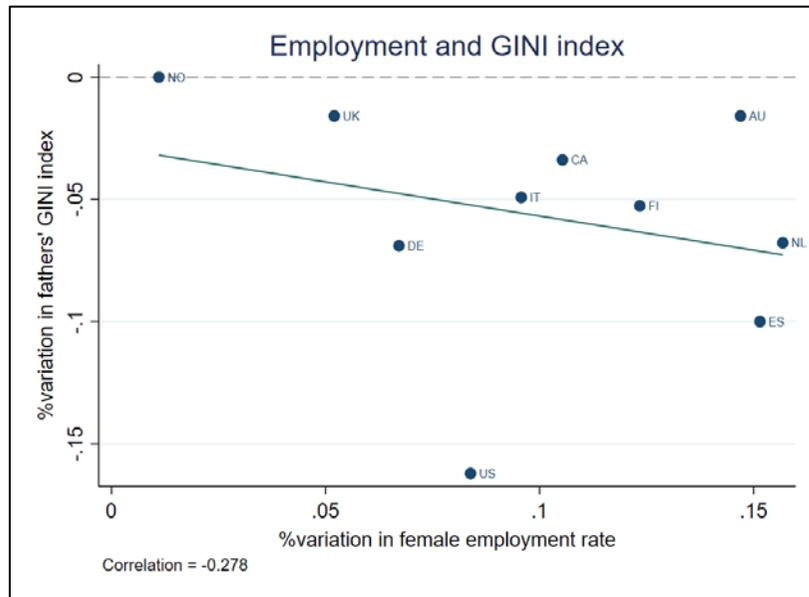

Employment and GINI index

Correlation = -0.278

Table A.1 Cross-national trends in childcare and inequality in childcare

		Mean						Median						Standard deviation						Gini					
Country	Parent	1960-1969	1970-1979	1980-1989	1990-1999	2000-2005	2006-2012	1960-1969	1970-1979	1980-1989	1990-1999	2000-2005	2006-2012	1960-1969	1970-1979	1980-1989	1990-1999	2000-2005	2006-2012	1960-1969	1970-1979	1980-1989	1990-1999	2000-2005	2006-2012
AU Fathers	Fathers		26	48	64				10	25	35				46	58	81				0.72	0.63	0.62		
	Mothers		125	181	187				100	155	155				94	132	142				0.40	0.40	0.41		
BG Fathers	Fathers	19				37		0				0		39				61		0.81				0.72	
	Mothers	44				146		0				120		74				122		0.79				0.45	
CA Fathers	Fathers		32	55	79	88	106		0	20	55	60	70		51	80	90	105	131		0.73	0.70	0.59	0.58	0.57
	Mothers		135	141	171	187	200		120	105	145	150	165		98	122	131	151	156		0.40	0.45	0.42	0.44	0.41
FI Fathers	Fathers		45	52	74		100		20	30	50		100		61	69	84		114		0.64	0.63	0.57		0.54
	Mothers		142	160	182		218		120	130	150		218		113	128	126		156		0.43	0.43	0.39		0.41
FR Fathers	Fathers	33	30		45		61	15	15		30		40	47	45		62		81	0.70	0.69		0.66		0.60
	Mothers	174	150		137		140	165	138		120		110	98	97		102		111	0.32	0.36		0.40		0.42
DE Fathers	Fathers	31			57	70		10			35	50		48			67	74		0.74			0.58	0.54	
	Mothers	146			150	165		125			130	140		98			105	110		0.38			0.38	0.37	
HU Fathers	Fathers	49	37					30	10					56	54					0.59	0.68				
	Mothers	123	102					90	80					85	94					0.38	0.48				
IT Fathers	Fathers			39		55	64			15		40	50			64		76	81			0.71		0.61	0.58
	Mothers			118		136	156			95		110	130			92		99	119			0.43		0.39	0.41
NL Fathers	Fathers		33	30	45	45			15	30	45	45			50	57	70	82			0.69	0.63	0.59	0.55	
	Mothers		100	120	105	135			90	120	105	135			69	90	93	95			0.38	0.38	0.39	0.36	
NO Fathers	Fathers			60	74	74				45	60	50				71	73	80				0.58	0.53	0.53	
	Mothers			143	157	158				120	135	130				98	107	119				0.37	0.37	0.40	
PL Fathers	Fathers	40				81		20				60		52				93		0.64				0.56	
	Mothers	132				199		100				170		95				139		0.41				0.39	
ES Fathers	Fathers					71	96					50	70					86	101					0.60	0.54
	Mothers					170	176					150	160					121	125					0.39	0.39
UK Fathers	Fathers	11	18	45	83	73		0	0	15	53	50		33	35	60	111	95		0.90	0.78	0.65	0.63	0.62	
	Mothers	88	77	142	165	163		60	60	120	150	130		79	70	107	131	131		0.49	0.48	0.42	0.41	0.42	
US Fathers	Fathers	25	27	30	52	78	83	0	0	3	10	48	50	46	61	54	89	112	113	0.71	0.79	0.74	0.73	0.63	0.62
	Mothers	129	104	146	114	166	165	108	79	123	80	130	130	98	92	117	119	138	137	0.41	0.46	0.44	0.53	0.45	0.45
SI Fathers	Fathers	45				57		15				30		64				78		0.67				0.65	
	Mothers	91				145		70				100		85				140		0.49				0.49	

Figure A.1 Within-country Gini coefficient by gender

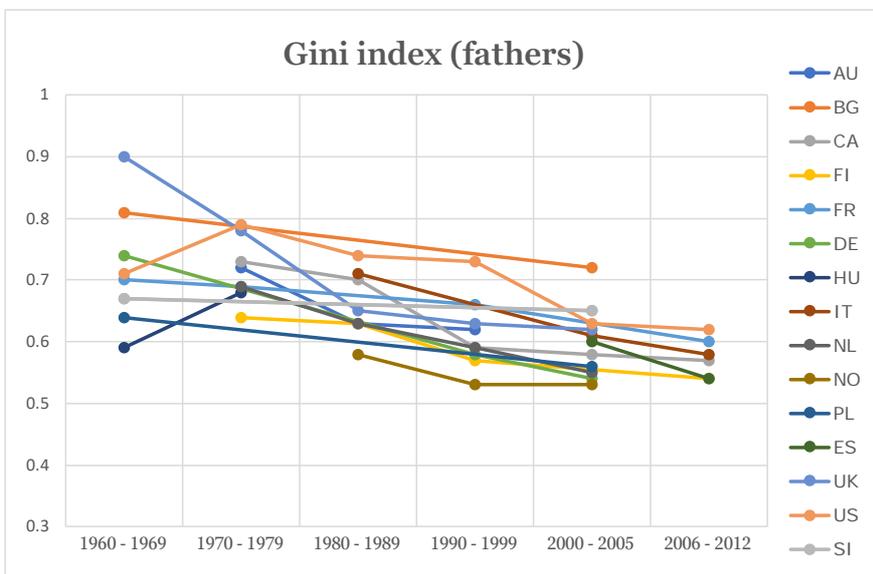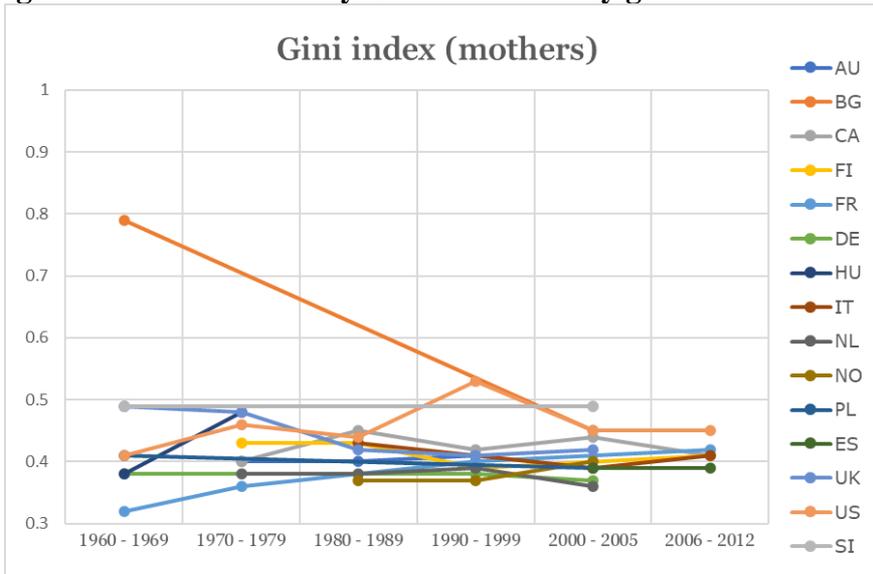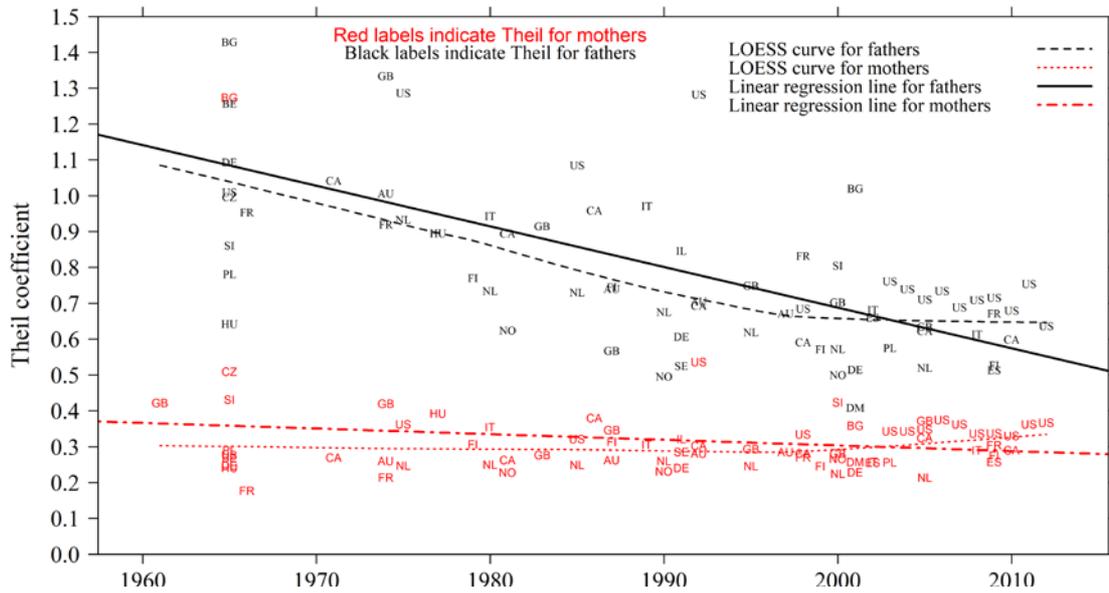Gini index (mothers)

Gini index (fathers)

Figure A.2 Theil coefficient by gender

(a) Theil coefficient

(b) Counterfactual analyis

Figure A.3 Theil coefficient by education, mothers
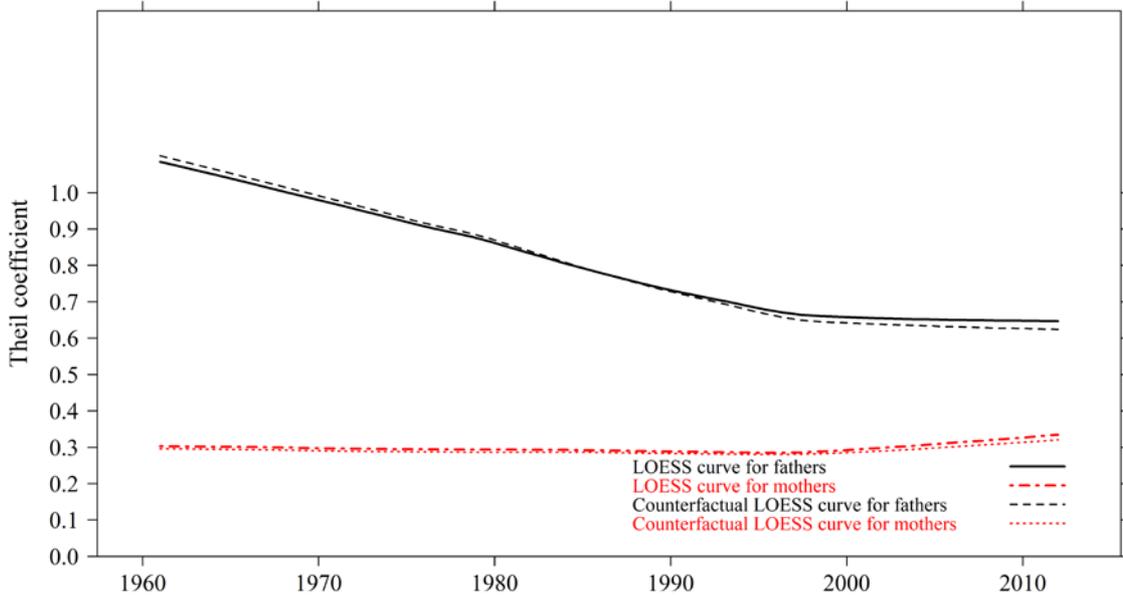
(a) Theil coefficient

(b) Counterfactual analyis

Figure A.4 Theil coefficient by education, fathers

(a) Theil coefficient

(b) Counterfactual analyis