Women's Careers and Family Formation

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Contents

Abstract

This paper discusses research on the relationship between fertility and women's labor force participation. It surveys methods used to obtain causal identification and provides an overview of the evidence of causal effects in both directions. A few themes are highlighted as important in guiding research and in reading the evidence. These include the importance of distinguishing between extensive and

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intensive margin changes in both variables; consideration not only of women's participation but also of occupational and sectoral choice and of relative earnings; the relevance of studying dynamic effects and of analyzing changes across the lifecycle and across successive cohorts; and of recognizing that women's choices over both fertility and labor force participation are subject to multiple constraints. Crucially, while technological innovations in reproductive health technologies have muted the family-career trade-off primarily by allowing women to time their fertility, policy has not achieved as much as it might.

Introduction

At a global level, women's labor force participation has plateaued and even declined over the last 20 years, but this masks regional and income differences, there being some evidence of growth in participation in sub-Saharan Africa, the Middle East, and Latin America, and of decline in South and East Asia (Verick 2018). The data do not consistently obey the well-known U-shaped associating country GDP and the female labor force participation rate. Potential drivers over and above GDP that contribute to explaining differences in women's labor force participation across countries include women's characteristics such as education, age, and religion; household characteristics such as income, financial security, and fertility; and gendered social norms at the community level (Klasen et al. 2021). Alongside the broad upward trend in women's labor force participation is a broad downward trend in fertility. This too exhibits considerable variation across countries both in the date of onset of decline and in the speed of decline. In this review, the focus is on the relationship between fertility and women's labor force participation, looking at both directions of causation. Fertility drives women's labor force participation by changing their reservation wage, and it is, in turn, influenced by the opportunity cost of women's time.

A broad sweep sketch of causal approaches and evidence is provided, without claiming to be comprehensive. Strategies used to address endogeneity when considering impacts of fertility on labor market outcomes are summarized in Clarke (2018), and a broader summary of this literature, including of mediators, is provided in Finlay (2021). Earlier survey papers by Hotz et al. (1997) and Schultz (1997) review models of fertility and fertility choice in developed and developing countries, respectively. These papers do not particularly focus upon women's labor market outcomes. Focusing on women in developing countries, Jayachandran (2021) discusses how social norms act as a barrier to women's work, referring to issues such as safety at work, while Jayachandran and Heath (2018) provide an overview of the bi-directional causal relationship between education and work. Also relevant but distinct from this review, Jayachandran (2015) surveys drivers of gender inequality in developing countries, of which fertility is one; it considers GDP, infrastructure, and social norms such as patrilineality. In a similar vein, Walther (2018) describes how women do better under matrilineality in Malawi. Using a wealth of microdata

from richer and poorer countries, Aaronson et al. (2020) find that a trade-off between fertility and women's LFP is evident in richer but not in poorer countries. In a recent survey focused on fertility, Doepke et al. (2022) highlight that two key stylized facts that have guided research on fertility no longer hold everywhere. In particular, (a) the income-fertility relationship has flattened in high-income countries and in some cases reversed, and (b) the cross-country relationship between women's labor force participation and fertility is now positive.

Section "Trends in Fertility and Female Labour Force Participation" begins with an illustrative description of trends in the two key variables, fertility and female labor force participation (LFP). Section "Conceptual Framework" briefly references the classical economic theory that has guided empirical work in this area. The contribution is to highlight the importance of considering extensive vs intensive margins, dynamics, lifecycle vs cohort data, and the many constraints on women's choices. Furthermore, while the initial focus of the literature was on women's LFP, as LFP has begun to stabilize, there is increasing interest in women's choice of sector and occupation and, in the gender pay gap, both of which are also potentially influenced by their fertility choices. Section "Impacts of Fertility on Women's Labour Market Outcomes" considers the impacts of fertility on women's labor market outcomes and also introduces the econometric approaches used to identify causal evidence. Section "The Impact of Women's Work on Fertility" then examines the evidence on the impacts of job finding and job destruction on fertility, looking both at changes in women's actual and prospective employment and at changes in labor market conditions for men and for the population as a whole. Section "Summary" concludes and provides an overview of emerging topics in the literature on the fertility-labor force participation relationship.

Trends in Fertility and Female Labor Force Participation

In this section, descriptive trends in fertility and labor force participation rates are examined for illustrative purposes, allowing us to comment on the joint movement of these variables in aggregate terms. Data on fertility rates are available from 1960 onward, but harmonized data on female labor force participation (FLFP) are only available over the past three decades. First, aggregate trends for a larger set of countries over a shorter time frame are presented and then a look at a longer period of development for Mexico and the United States, two instances in which a longer time series was available. For a discussion of longer-run trends in labor force participation rates and fertility, see Sprague (1988) for the United Kingdom and Engelhardt and Prskawetz (2004) for the OECD.

Referring to Fig. 1, while the total fertility rate began to fall in higher-income countries from the 1960s (and, in some cases, earlier), it only started to decline, on average, across low-income countries from the 1980s. Interestingly, standardized data are not consistently available prior to 1960; however historical data from the International Historical Statistics compendium suggest that a decline in fertility occurred as early as the 1870s in Sweden or the early 1900s in Portugal, for example.

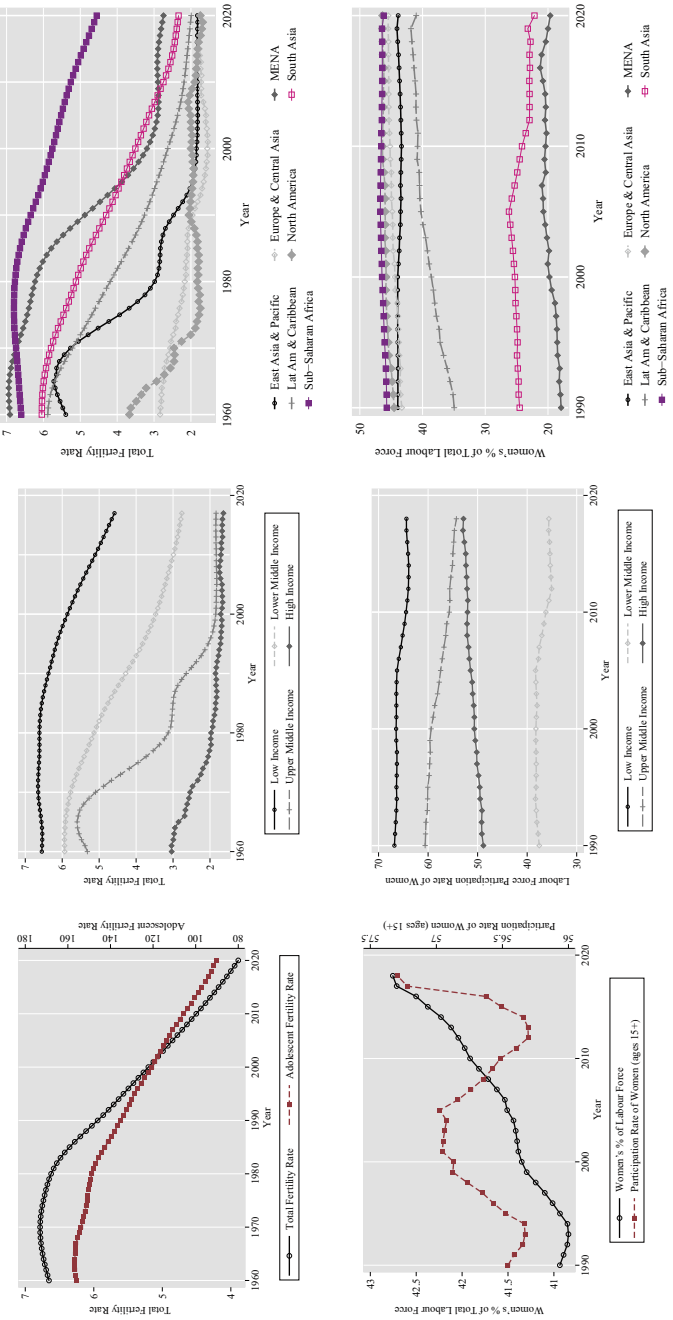

Fig. 1 Fertility trends (1960–2018). **Panel A: Fertility Measures.** (**a**) Fertility rates in least developed countries. (**b**) Fertility rates by country income level. (**c**) Fertility rates by region. **Panel B: Female Labor Force Participation** (**d**) Female labor markets in least developed countries. (**e**) FLFP by country income level. (**f**) FLFP by region. Notes: Fertility data are drawn from the World Bank Databank. Total fertility rate refers to the total number of children projected to be born to women if she were exposed through her lifetime to the age-specific fertility rates prevalent in a given year. The adolescent fertility rate refers to the number of births per 1000 women aged 15–19 years. Labor market figures are drawn from the International Labour Organization, ILOSTAT database, and World Bank population estimates. "Least developed countries" in panel (**a**) are based on the United Nations classification of LDCs in each year. Country income groups in panels (**b**) and (**e**) are based on the World Bank's classification in each year, while regional classifications in panels (**c**) and (**f**) are based on World Bank

The decline accelerated in the 1990s and has been steady since. This transition was substantial, with total fertility falling from around seven to four births per women from the 1980s to the present and births to teenagers declining by around nearly half, from 150 births per 1000 teens in 1980 to around 90 births per 1000 teens in 2018 (Fig. 1). There is a considerable geographic variation in these outcomes: In sub-Saharan Africa, fertility was rising until after 1980 and only then beginning to fall, while in North America, fertility had reached a plateau by the mid-1970s.

Trends in women's labor market participation are displayed in Fig. 1, in the lower panel. Aggregates by country income levels suggest relatively stable trends from 1990 onward. However, the cross-country variation reveals the stylized fact of a U-shaped (or more precisely, an inverted-J shape) relationship between female labor market participation and economic development (Goldin 1994). Rates of FLFP are highest in low-income countries and lowest in lower-middle income countries, the rate for higher-income (high-income and upper-middle-income) countries being in the middle. Focusing on the least developed countries (panel (d)), the share of all workers that are women grew but only from 41% to around 43%, and while there is some variation over time, the share of all women aged 15 and above in the labor force remained between 56% and 57.5%.

Next, trends in fertility and LFP available for Mexico from 1960 and for the United States from 1950 are analyzed. This not only allows for an examination of co-movements over a longer period of time, but it also avoids aggregation over countries which can veil country-specific movements (see Fig. 2). In both cases, the broad picture is of a declining trend in fertility and an increasing trend in women's LFP. Since 1960, fertility has fallen in Mexico from seven to two births per woman and, in the United States, from 3.5 to about 1.75 births per woman. In Mexico, the decline only started around 1970 but has continued since. In the United States, fertility decline was steady from 1960 to about 1975, after which fertility has fluctuated, and in 2020 was at a level similar to that in 1975. Women's labor force participation has risen from about 12% to 48% in Mexico and from about 32% to 58% in the United States. In both Mexico and the United States, FLFP has risen steadily from 1960 to 1950 onward but leveled off in recent years. In Mexico it has leveled from 2010 and in the United States from 2000 onward.

Studying co-movements of the two variables, it can be seen that, in general, rates of FLFP have continued to rise after fertility has fallen to quite low levels, with both measures reaching more stable levels over later periods in data in both countries. In the United States, FLFP showed a steady rise (1975–2000), a period during which fertility exhibits no secular trend. In Mexico, FLFP was rising during the 1960s when fertility was level, and when FLFP accelerated from 1990 onward, the rate of fertility decline slowed albeit fertility continued to decline.

Fig. 1 (continued) definitions. The LDC designation recognizes both income and economic vulnerability and indicators of nutrition, health, school enrolment, and literacy, while the low-income country classification is based on a single income threshold, such that "low income" and LDC countries are not the same classification

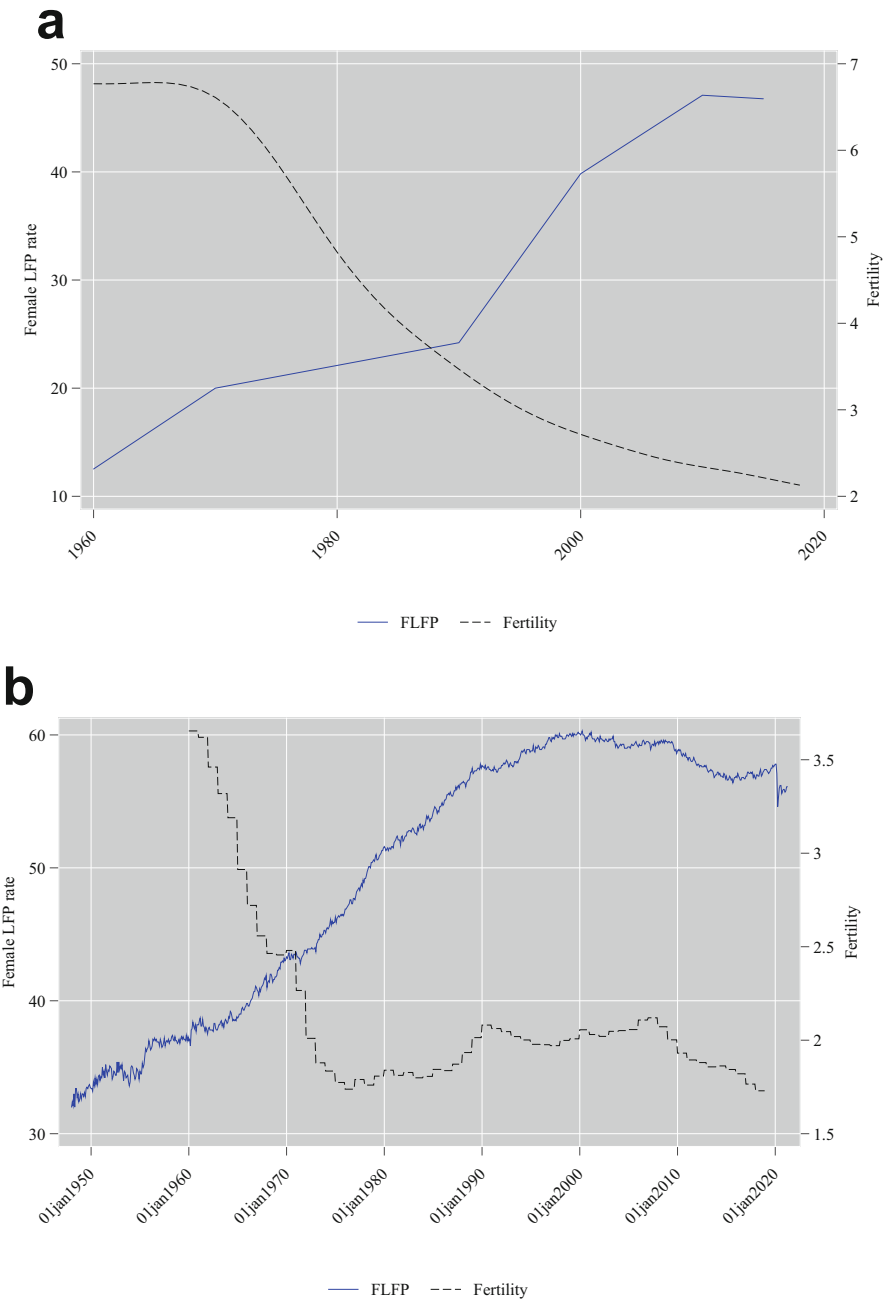

Fig. 2 Longer fertility and labor market trends in Mexico and the United States. (**a**) Mexico. (**b**) United States. Notes: Women's labor force participation measures are drawn from Bhalotra and Fernández (2021) (Mexico) and US Bureau of Labor Statistics (2021) (USA). Fertility rates are provided by the World Bank (2020)

The US data are in line with other OECD country evidence. Female labor force participation rates increased rapidly from the 1940s to the 1980s, with particularly large increases between 1950 and 1980 for married women. For instance, FLFP increased 27 percentage points from around 25% to 52% between 1940 and 1980 in the United States and from 35% to 52% in the United Kingdom between 1950 and 1990 (Costa 2000). In Mexico, FLFP increased by a massive 50% between 1990 and 2015, from close to 40% in 1990 to close to 60% (Bhalotra et al. 2022b).

Overall, in neither of the two countries do trends in fertility and FLFP mirror one another. This is not surprising as these trends move in concert with many other variables. For instance, the relationship will tend to be modified by trends in childcare costs and trends in return to women's work. Also, a growing body of research illustrates that fertility has significant and lasting impacts on women's earnings (relative to those of men), conditional on their labor force participation. In the following sections, economic theories delineating potential links between these variables are discussed, and then a literature which aims to isolate causal links between fertility and women's labor market outcomes in both directions is reviewed.

Conceptual Framework

Economic theory predicts that shocks that increase a woman's fertility, other things equal, will increase her reservation wage and thereby tend to decrease her labor force participation. Conversely, shocks that increase her offered wage (or the opportunity cost of her time) will tend to increase her labor force participation and lead her to have fewer children. The pioneering economic model of fertility describes it as a resource (time) allocation problem that is responsive to prices (Becker 1960; Schultz 1969; Willis 1973). An extension of the model incorporates the idea that the number of children a woman decides to have is co-determined with the investments she plans to make in each child, generating a quantity-quality trade-off Becker and Lewis (1973).

Aaronson et al. (2014) point out that the trade-off can only hold at the intensive margin, once the family has at least one child. They argue that extensive margin fertility will increase in response to interventions that lower the costs of investing in children and that it will decrease in response to interventions that increase the offer wage for women. They propose that, as a result, the direction in which extensive margin fertility (childlessness) moves is informative of the relative importance of investment prices and women's wages in delivering the demographic transition. Bhalotra et al. (2023) extend the Aaronson et al. (2014) model, adding dynamics and incorporating women's dynamic labor force participation decision into the quantity-quality model for the first time. They show that improvements in child survival lead women to initiate fertility later and invest more in the labor market, with the eventual result that both extensive and intensive margin fertility decline.

A further extension of the Beckerian model might allow that woman's preferences over both the quantity and the quality of children vary with child gender. Son preference has been documented in South and Southeast Asia (which comprise a large fraction of the world's population), and, importantly, son preference appears to

intensify as fertility declines (Das Gupta and Mari Bhat 1997; Bhalotra and Cochrane 2010; Jayachandran 2017).

Identification is a challenge because a woman simultaneously decides how many children to have and whether to participate in the labor force. More generally, she also simultaneously decides how much to invest in her skill development. For this reason, changes in the policy or natural environment that occur earlier in a woman's life may have greater potential to influence her trajectory than any interventions or shocks that are incident after some of these choices are made. In this paper the focus is restricted to studies that take the individual's education and other skills as predetermined, considering mostly the bi-directional relationship between fertility and FLFP. To the extent that women anticipate fertility, they will tend to invest less in education and to sort into occupations or sectors that are consistent with parenting schedules. Thus estimates that condition upon women's skills and occupational choice will provide a lower bound on the true cost of having children (Adda et al. 2017). Among studies that examine impacts of fertility on sorting into occupation or sector are Goldin (2014), Le Barbanchon et al. (2021), Wasserman (2019), Benny et al. (2021), and Chinhui and Rubinstein (2021). They indicate that women sort into more flexible occupations and, in doing this, incur a wage penalty. Thus women's preference for flexibility, driven by their attention to childcare, appears to be an important contributor to the gender wage gap.

In reading the evidence, it is relevant to consider other variations around the main theme. First, these relationships can vary with whether either or both of the response variable and the stimulus variable (fertility or labor force participation, as the case may be) change on the extensive vs the intensive margin. In an important contribution, briefly discussed above, Aaronson et al. (2014) show that the Beckerian model implicitly considers intensive margin changes in fertility, allowing no corner solution. In particular, if the price of child quality (or the cost of investment in children) falls, the model predicts increased investment in children and a decline in the chances of having an additional child (the quantity-quality trade-off). However, when the decision pertains to the extensive margin, i.e., to moving from childlessness to having at least one child, then there is no trade-off, and events that lower the cost of investing in children should lead to an increase in the chances of having at least one child (no trade-off at the extensive margin).

Second, an understanding of observed patterns in fertility and female LFP is enhanced by allowing for timing or dynamics in the decision process. In an extension of the Beckerian model formulated in Aaronson et al. (2014), Bhalotra et al. (2023) incorporate dynamics in the fertility and LFP decisions. They show that it is only optimal to get pregnant early when the insurance value exceeds the option value of delay and that this trade-off tends to tilt in favor of delay when child survival rates improve (as they did, in their setting, with the innovation of antibiotic treatments for early childhood pneumonia infections). This generalization of the model generates new predictions that are borne out in their data. Broadly related, in research using miscarriage as a source of exogenous variation in birth spacing, Karimi (2014) finds that longer birth intervals allow women in Sweden to re-enter the labor market between births. In their structural model, Adda et al. (2017) predict that shorter birth spacing diminishes the long-run child penalty (for women who have at least two

births) by shortening the total time that women are off work. Twins present a limiting case of short birth intervals. Bhalotra et al. (2022a) provide evidence of how the motherhood penalty reacts to twin vs singleton birth, showing that twins impose an excess penalty in the first 2 years after birth but that this vanishes thereafter, consistent with scale economies from twins and with a large fraction of women with a singleton moving on to have a subsequent birth. As twins are an increasing share of births, disproportionately occurring among women with strong career attachments, this is important to establish.

More generally, empirical research may discover meaningful adjustments to birth spacing in response to opportunities for labor force participation even in cases where the total number of children does not change. Similarly, women may delay joining the labor force or drop out for varying durations around childbirth. These adjustments will be invisible or muted in studies that rely upon data that capture whether the woman has ever worked or whether she has worked in a fixed interval preceding the date of survey or enumeration. An advantage of studying the evolution of women's wages, or the gender wage gap, is that it does tend to reflect the influence of career disruptions and birth spacing (Kleven et al. 2019b).

A third point is that the relationship between fertility and women's LFP over the lifecycle (during which age and calendar time vary) can look different from the relationship across cohorts at any given age. It seems fair to say that microdata-based research in economics has looked more carefully at how these variables evolve over the lifecycle, rather than across cohorts. For instance, Kleven et al. (2019b) and the many studies that follow from this work analyze how the gender pay gap evolves over time after the birth of a child. Both lifecycle and cohort patterns in UK microdata are shown and analyzed in Benny et al. (2021). Fourth, the initial focus of the literature was on women's LFP, but, as LFP has begun to stabilize, there is increasing interest in women's choice of sector and occupation and, related in their relative wage or the gender pay gap, all of which are also potentially influenced by their fertility choices.

Finally, standard economic theory assumes no constraints on choice other than a budget constraint which captures the fact that FLFP produces earnings and that there is a cost to bearing and rearing children. In fact women face a plethora of constraints on their choices. There is a large unmet demand for contraception, the instrument by which women can limit, delay, and space fertility. On the other side of that coin is a large unmet demand for abortion, particularly but not only in developing countries. Women who successfully delay fertility may go on to infertility treatments like IVF, access to which is also severely limited for many women. The barriers to women accessing contraception and abortion are often financial, religious, and political. There may additionally be social barriers, and male partners may have different preferences from women and dominate these decisions – e.g., Ashraf et al. (2014), Doepke and Kindermann (2019), and Doepke and Tertilt (2018).

Similarly, fertility is not the only barrier to women's labor force participation. There is evidence that women's work is inhibited by social norms that couch the view that women belong in the home and/or that the man is the breadwinner (Bursztyn et al. 2020; Tur-Prats 2019; Erten and Keskin 2021; Bhalotra et al. 2021) and other evidence of women's participation being inhibited by women

having limited control over the income they earn (Field et al. 2021). There is further evidence that in many regions of the world women feel unsafe walking or commuting to work in public spaces (Borker 2020). Recent evidence shows that workplace sexual harassment inhibits women's work (Folke and Rickne 2020). These barriers to women's participation also influence the gender pay gap conditional upon participation. For instance, social norms that dictate that mothers rather than fathers are the primary carers of children result in a gender wage gap opening up after the birth of a child. Kleven et al. (2019b) and (Folke and Rickne 2020) show that workers give up wages to select into workplaces with reduced sexual harassment risk.

Determinants of women's labor force participation include fertility decline (Goldin and Katz 2000; Costa 2000; Cruces and Galiani 2007), changes in marriage rates (Grossbard-Shechtman and Neuman 1988; Fernández and Wong 2014; Greenwood et al. 2016), improvements in technology and capital (appliances) used for home production (Costa 2000; Greenwood et al. 2005; de Cavalcanti and Tavares 2008; Coen-Pirani et al. 2010), and attitudinal changes toward women's work (Rindfuss et al. 1996; Fernández et al. 2004; Goldin 2006; Fernández 2013), often reflected in legislation protection of women's economic rights (Doepke and Zilibotti 2005; Platteau and Wahhaj 2014). Demand side factors that influence women's labor supply include changes in the sectoral and occupational composition of employment, often driven by changes in technology and trade. The sectoral shift from agriculture to goods and service industries is associated with increases in the demand for women's labor (Olivetti and Petrongolo 2014; Ngai and Petrongolo 2017), consistent with men having a comparative advantage in brawn-intensive occupations. Changes in occupational structure, associated with changes in skill requirements in the economy, have also tended to favor women (Acemoglu and Autor 2011; Blau and Kahn 1997; Black and Spitz-Oener 2010; Juhn et al. 2014; Deming 2017).

The literature on women's labor supply tends to analyze a particular determinant and to take demand (and wages) as given, and the literature that estimates labor demand parameters tends to assume inelastic supply. In a departure from many previous studies, Bhalotra et al. (2022b) specify and estimate a model that incorporates all of the determinants of labor supply indicated in the cited literature, allowing them to determine evolution of the wage and occupational structure, jointly with demand trends and under partial vs general equilibrium constructs. They also trace impacts for equilibrium outcomes of changes in the size and composition of the potential workforce, driven by trends in college attainment and migration.

Impacts of Fertility on Women's Labor Market Outcomes

This section first summarizes the key methodological approaches underlying the empirical results provided by the literature and then summarizes a range of available estimates.

Estimation

Empirical models directed at estimating the impact of fertility on labor market outcomes (or the career costs of fertility) typically take the form:

$$\text{labour supply}_i = f(\text{fertility}_i,\ \boldsymbol{X_i},\ \varepsilon_i) \tag{1}$$

specifying that the labor market outcome of woman i is a function of her total number of children – here $fertility_i$ – as well as potentially other observed factors, indicated here by the vector $\boldsymbol{X_i}$ and unobserved factors ε_i. A linear functional form is frequently imposed, which implies that additional children have a constant impact on the outcome, irrespective of parity:

$$\text{labour supply}_i = \beta_0 + \beta_1 \text{fertility}_i + \boldsymbol{X}_i'\boldsymbol{\Gamma} + \varepsilon_i. \tag{2}$$

However, most commonly identification strategies rely on changes at particular margins, and heterogeneity analysis can be conducted to examine changes in the number of children at different margins. The causal parameter of interest β_1 measures the labor market impacts of a marginal birth. Causal estimation is complicated by the fact that family size is a choice variable that depends upon both unobservable and observable factors such as preferences and career-related expectations, moderated by constraints including access to contraceptives or beliefs over their use (Rosenzweig and Schultz 1985).

Instrumental Variables. Commonly used instruments for fertility include twin births (Cáceres-Delpiano 2012; Rosenzweig and Wolpin 1980; Jacobsen et al. 1999; Bronars and Grogger 1994) and the sex mix of the first two births (Chun and Oh 2002; Cruces and Galiani 2007; Angrist and Evans 1998; Ebenstein 2009; Bisbee et al. 2017). Recent studies have also used success rates of artificial reproductive technologies (Lundborg et al. 2017), policy reform mandating single- rather than double-embryo transfers for in vitro fertilization (IVF) (Bhalotra et al. 2019), or infertility shocks (Agüero and Marks 2011; Hotz et al. 1997; Bratti and Cavalli 2014). With the exception of the single-embryo transfer mandate, all of these instruments essentially appeal to exogeneity of biological drivers of fertility.

The twin instrument was introduced in the pioneering work of Rosenzweig and Wolpin (1980). Women expecting a birth typically expect a single child, so the occurrence of a twin birth creates the shock of an additional child. The premise is that twin births are conditionally randomly assigned across women. The sex mix instrument was proposed in Angrist and Evans (1998). The instrument takes the value of one if the first two births of a woman are same-sex and is zero otherwise. Leveraging the stylized fact that many families desire at least one child of each sex, the authors show that women are more likely to move on to have a third (or higher-order) child if their existing children are of the same sex. The premise is that child sex is randomly assigned. Other papers have used miscarriage and/or stillbirth (Hotz et al. 1997; Bratti and Cavalli 2014) or self-reported infertility as instruments for fertility

(Agüero and Marks 2011), on the premise that these shocks are randomly assigned or can be used to form bounds.

The identifying assumption is that the instrument shifts fertility (relevance) while being unrelated to unobservables which are correlated with fertility and labor market outcomes (validity). The aforementioned instruments have been shown to increase fertility in a number of settings, so that one can be confident of their relevance or the strength of the "first stage" in the IV procedure. However, the validity of these instruments has come under considerable scrutiny. The sex mix of the first two children and the occurrence of twin birth are both natural experiments that flow from biological mechanisms, but they have nevertheless been shown to fail the validity condition. Even if the sex of the first birth is quasi-random, as suggested for the United States in Dahl and Moretti (2008) or Almond and Edlund (2008) and for India in Bhalotra and Cochrane (2010) and Anukriti et al. (2021), the sex composition of the first two children is potentially correlated with unobservable preferences. Dahl and Moretti (2008), for instance, argue that it is a function of fertility and divorce decisions.

The occurrence of a twin birth has been comprehensively demonstrated to be correlated with a plethora of indicators of maternal health including height, diet, hypertension, or local availability of public health care in large representative data samples from 72 countries, including rich and poor (Bhalotra and Clarke 2019). The authors argue that maternal health cannot be comprehensively measured, and they demonstrate that failing to account for unobservables correlated with maternal health and the outcome of interest will result in the IV estimator under-estimating the influence of fertility on women's labor market outcomes. They nevertheless demonstrate (Bhalotra and Clarke 2020) the usefulness of partial identification. Essentially, the power of the twin instrument in predicting fertility can be leveraged to estimate bounds on the IV parameter that allow that the instrument is plausibly exogenous if not strictly exogenous.

In a similar vein, recognizing that the miscarriage instrument is random for some women but potentially correlated with relevant behaviors among other women, Hotz et al. (1997) adapt results from Horowitz and Manski (1995) on identification with data from contaminated samples to construct informative bounds on the causal effect of teenage childbearing. Overall, the best practice for papers looking to address the endogeneity of fertility using instrumental variables must involve conducting sensitivity tests and providing partially identified bounds allowing for deviations from IV validity.

Setting aside potential issues with validity of the instrument, consider now the interpretation of IV estimates. IV techniques result in estimation of a local average treatment effect (LATE) which captures mean impacts among individuals whose fertility behavior is shifted by the instrument. This implies that the estimate is specific to compliers, namely, individuals who if the instrument were switched off would not have had another birth, but who cross the margin into having a birth when the instrument is switched on. In the case of a categorical variable such as fertility, it further implies that the LATE is driven by changes in fertility at the particular margins which the instrument shifts. This is described by the average causal

response (ACR) function of Angrist and Imbens (1995), which describes the range of variation in fertility traced out by the particular instrument. Thus, when IV estimates are presented, to understand the variation in fertility that the estimates refer to, it is illustrative to present the ACR function (see Angrist et al. 2010; Bhalotra and Clarke 2020), for example, applied to estimates of fertility shifts.

An important distinction arises between extensive and intensive margin changes in fertility. It seems entirely plausible that moving from having no child to having one has a different impact on labor market outcomes than having an additional birth after having at least one child. Studies using the sex mix instrument necessarily estimate intensive margin impacts and on a potentially selected sample of women who have had at least two births and are on the cusp for whether or not to have a third or higher-order birth. Studies using the twin birth instrument estimate intensive margin impacts, the shock of a twin changing the number of children from 1 to 2. In addition, twin IV estimates capture impacts not only of having an additional birth but also of having two simultaneous births (no birth spacing) (Rosenzweig and Zhang 2009). Studies that use infertility shocks as an instrument (Agüero and Marks 2011; Cristia 2008) estimate impacts of extensive margin changes. These differences are germane when comparing estimates across setting and interpreting them in any setting. Lundborg et al. (2017) rest identification on the randomness of success conditional on IVF, comparing women who do and do not succeed in having a first birth. They thus capture extensive margin effects which they show are larger than the intensive margin effects estimated in other studies. In Bhalotra et al. (2019), the treatment is an IVF policy reform which results in a switch from twin births to singleton birth – a decrement in fertility by one. This is an intensive margin change, but similar to the case of the twin instrument, and acting in the reverse direction, it captures a change in the number of births that is simultaneous with a change in birth spacing.

Natural Experiments and Structural Models. An alternative identification strategy is to exploit policy or natural experiments that impact fertility. Policy experiments include reproductive health policies and legal reforms that result in variation in contraception, abortion, maximum allowed fertility, and IVF provision. The natural experiment that has been leveraged in this literature is the event of birth of a child. Additionally, structural models of women's labor force participation have endogenized fertility.

Led by Bailey (2006), a stream of research has used variation in consent laws across the states of the United States to evaluate impacts of legal access to the pill before age 21 (see also Bailey et al. 2012; Lindo et al. 2020). Among authors leveraging abortion reform are Angrist and Evans (1996) who use state variation within the United States and Bloom et al. (2009) who leverages variation in country-year data for 97 countries observed through 1960–2000. Lundborg et al. (2017) and Bhalotra et al. (2019) gain identification of the impact of fertility on women's earnings using administrative data on ART births. Lundborg et al. (2017) rely upon the assumption – defended on the administrative Danish data they use – that IVF success is independent of a woman's labor market history. This allows them to effectively instrument fertility with IVF success using the universe of women who

attempt IVF. Since IVF births are often but not always multiple, their estimator captures the difference between having no child and having a successful pregnancy resulting in one or more children at once. Bhalotra et al. (2019) also rest identification on a feature of IVF births, but they exploit a policy reform implemented in Sweden in 2003 that mandated single-embryo transfers for women undertaking IVF. The reform resulted in IVF births being significantly and substantively less likely to be multiple births. What they capture therefore is changes in outcomes flowing from an exogenously driven shift in fertility from two births to one birth, other things equal. Godefroy (2018) consider impacts of a reform in Nigeria in 1999 that diminished women's rights, lowering the value of women's testimony in court. Casting the event of birth of a child as a natural experiment in longitudinal data that contain within-mother variation, Kleven et al. (2019b) estimate event study models of labor market outcomes surrounding the time of child birth in Denmark. In the "Evidence" section, evidence from a number of other countries that replicates this pattern is discussed.

These is also a rich literature exploiting legal reforms that affected the maximum number of allowed children (e.g., Wu 2022; Agarwal et al. 2022). The most commonly used of these is China's One-Child Policy, which initially restricted families to only have one child, and this was gradually relaxed to allow specific circumstances in which a second child was allowed. Finally, all families were allowed to have two children in 2016. Vietnam also introduced a two-child policy in 1988 (Ngo 2020). The findings from these papers are discussed in the "Results" section below.

These designs are similar to instrumental variable strategy, where the reform can be considered as an instrument for fertility, and indeed, this argument is at times presented explicitly. Other studies instead present reduced form estimates of labor market outcomes on the reform, backed by an explicit first stage demonstrating the impact of the reform on fertility. The IV estimate is the ratio of the reduced form and the first-stage coefficients.

Identification of causal effects in these settings generally relies upon the assumption that the time of adoption of the reforms is as good as random. Some studies exploit a single nationwide reform, and others exploit staggered adoption of the reform across sub-national regions, be these states (Bailey 2006; Angrist and Evans 1996; Godefroy 2018) or countries (Bloom et al. 2009). Difference-in-difference designs or event studies are estimated, with an examination of pre-trends allowing for partial tests of the validity of the identifying assumption. Threats to validity include that adoption may owe to broader social norms that motivate adoption and that also directly affect women's labor market behavior.

A recent literature demonstrates that dynamic treatment effects estimated using the standard two-way fixed-effects model may be biased in settings where the timing of the reform is staggered and treatment effects are heterogeneous. Under these conditions, some treated units might enter the double differences estimating the treatment effect with weights of opposite signs in different time periods. The estimated treatment effect can then diverge from the average treatment effect, and it is not clear that it is representative of any relevant population of interest

(de Chaisemartin and D'Haultfœuille 2020). This problem is most severe when all or a large share of individuals in the sample are treated at some point. This problem can therefore be mitigated by including a large share of never-treated units. The share of units with negative weights can be estimated following the procedure set out in de Chaisemartin and D'Haultfœuille (2020) and reported as a diagnostic. Goodman-Bacon (2021) provides an approach to decomposition of the averaged two-way FE estimates into components defined by different treatment-control pairs. In addition to diagnostics, the literature provides new estimators that are robust to these concerns. In addition to de Chaisemartin and D'Haultfœuille (2020), see Borusyak et al. (2021), Sun and Abraham (2020), and Callaway and Sant'Anna (2020). Going forward, the literature on fertility and women's labor force participation will, similar to the broader literature, need to adopt these recent innovations in testing for and addressing bias.

Structural models that endogenize the fertility decision in models of women's labor market outcomes include Adda et al. (2017) with data from Germany, Michaud and Tatsiramos (2011) with data from seven European countries, and Francesconi (2002) with data from the United States. A range of strategies are taken in these papers to identify the impacts of fertility on labor market outcomes. Fertility and labor market choices are considered as joint decisions, where optimal decisions are determined by comparing between all possible alternatives related to fertility, career choices, savings, and so forth which are permitted by the model. Career costs of fertility can be calculated based on estimated structural parameters, for example, observing lifetime utility losses associated with exiting the labor market upon child-rearing (Francesconi 2002) or by considering counterfactual simulations, for example, calculating the cost of childbearing as the difference between optimal choices and simulated choices where fertility is fixed at zero (Adda et al. 2017). Michaud and Tatsiramos (2011) document the variation of findings from discrete dynamic choice models depending on the assumptions relating to fertility choices, including cases where variation is leveraged from a sex mix instrument, providing an overview of the importance of the nature of identifying and modeling assumptions in these settings, as well as linking structural estimation to assumptions made in the reduced form of literature discussed previously.

Evidence

Turning to empirical estimates of the relationship between fertility and mother's labor supply, an impressively broad picture is provided by Aaronson et al. (2020). Using census and survey data covering 103 countries as early as the 1780s and as late as 2015, they provide estimates of the link between fertility and labor supply across the developed and developing world. Their results are drawn using both the twin and sex mix IV techniques described earlier. They find that women's labor supply and fertility are more tightly linked in more developed countries. In particular, their evidence suggests small or even null trade-offs at low levels of economic development, alongside large trade-offs at higher levels of development.

Consider the magnitudes and the variation in their estimates, using a twin instrument and focusing on current labor market participation of women with at least two children. Aaronson et al. (2020) estimate that a third birth results in essentially no change in women's labor market participation rates averaged across countries with a real GDP per capita of $0–$2500, $2500–$5000, and $5000–$7500 (all expressed in constant 1990 dollars), while a trade-off gradually emerges in countries with real GDP p.c. of above $7500. This trade-off is estimated at around a 3 percentage point (pp) fall in participation in countries with between $7500 and $10,000 real GDP p.c., monotonically increasing to around a 10 p.p. reduction in countries with GDP p.c. above $20,000. These patterns are observed to be quite stable over time and similar if using a same-sex rather than twin IV strategy.

Looking at effect sizes in a different way, Bhalotra and Fernández (2021) estimate that fertility explains 11% of growth in women's labor force participation in Mexico during 1960–2015. Theirs is a descriptive approach implementing a decomposition analysis using census data. Mexico witnessed a sharp acceleration in FLFP from the 1990s onward. The authors observe that as much as 40% of FLFP growth in the 1990s, through the spike, is unexplained – neither supply side variables (education, fertility, marriage) nor changes in the demand for women (associated with structural changes in sector and occupation) exhibit sharp changes in this period. They suggest that a potential explanation is changes in social norms around women's work. This is difficult to measure, but the literature has pointed to it (Fernández et al. 2004; Goldin 2006; Fogli and Veldkamp 2011; Fernández 2013). Now while this literature highlights social norms in LFP, it seems plausible that there are, similarly, social norms driving fertility. This is highlighted as it becomes relevant when looking at broad sweep changes, either across countries or across long periods of time within country.

Returning to the estimates in Aaronson et al. (2020), which refer to intensive margin changes, it is notable that larger impacts are observed when moving from one to two births, with trade-offs becoming smaller, though still significant and with similar patterns in terms of economic development, when considering marginal changes in fertility up to five children. This is consistent with there being variable costs that scale, possibly non-linearly, with the number of children, in addition to a fixed cost of having any children. Many studies focus their attention on labor market impacts of having children under five or of a (or an additional) birth. Using their global sample, Aaronson et al. (2020) demonstrate labor market penalties for women in families with older children. This is consistent with studies (discussed below) that trace dynamics in outcomes over a long period after birth, showing that while the initial divergence between male and female labor market outcomes begins with the event of the first birth, it does persist. This would imply that if one compared women with and without a 12-year-old child, for example, all else equal, one would expect to observe a child penalty in the labor market outcomes of the mother of the 12-year-old.

Results from Angrist and Evans (1998) and Vere (2011) suggest reductions of around 8 to 10 p.p. in rates of women's labor market participation using US census data from 1980, 1990, and 2000 and IV estimates. However, more varied and in cases muted estimates have been documented in developing countries;

Cáceres-Delpiano (2012) estimate a 3–4 p.p. reduction based on a twin birth instrument with data from 40 developing countries, Heath (2017) finds very small mean effects in Ghana, de Jong et al. (2017) find a reduction in 6 p.p. among non-farm work in Africa, and Cruces and Galiani (2007) find a reduction of between 6% and 10% in middle-income Argentina and Mexico. Work from Nigeria (Godefroy 2018) using an alternative identification strategy finds small impacts of reform-induced fertility change on later labor market outcomes. Also using a twin instrument in urban China, He and Zhu (2016) find only a small effect of fertility on labor force participation that is insignificant in the later period of their data.

While Aaronson et al. (2020) use IV methods which allow them to consider fertility shifts at higher birth orders, a gradient in the elasticity with the level of economic development is also evident when using methods which allow for examination of entry into childbearing. Lundborg et al. (2017) and Cristia (2008), using Danish and US data, respectively, estimate large negative career effects of having an extensive margin birth, while Agüero and Marks (2008) find very limited impacts in six Latin American countries with data from the 1990s, and Agüero and Marks (2011) similarly document limited impacts when the data are extended to consider 26 developing countries.

The contraceptive pill allowed women better control over their fertility and hence may have had an impact on their labor force participation. Goldin and Katz (2002) use state and cohort variation to show that women with pill access delayed their fertility and were better able to invest in professional careers such as law and medicine. In a mold-breaking analysis, Bailey (2006) finds that legal access to the pill for women under 21 significantly reduced the likelihood of a first birth before age 22 and increased women's labor force participation and work hours. Subsequent analysis in Bailey et al. (2012) shows that it can account for 10% of the convergence of the gender gap in the 1980s and 30% in the 1990s, although the earning result does not hold up in the re-examination provided by Lindo et al. (2020). Ananat and Hungerman (2012) examine the children of mothers with pill access and show that more educated mothers postponed their fertility, but overall fertility was not impacted, with these children potentially born into better circumstances as a result of the delay. Analyzing one of the oldest and largest family planning programs, Profamilia in Colombia, Miller (2010) finds that it explains only a small fraction (less than 10%) of Colombia's fertility decline during its demographic transition. However, similar to the results for the United States, enabling delay of first birth facilitated human capital accumulation and an increase in labor force participation among women. Family planning advertisements also have an impact: Tasciotti et al. (2022) show that being exposed to government adverts about family planning on television significantly reduced household fertility.

Bhalotra et al. (2023) leverage sharp declines in child mortality following the invention and release of antibiotics in 1937 as an exogenous shock to the costs of childbearing and investment in children. Their analysis suggests a shift in preferences in favor of fertility delay, rather than a change in legal access to technology (contraception) that enables fertility delay. They argue that fertility delay was a key factor facilitating increases in women's participation, particularly in skilled

occupations in the late 1930s and early 1940s. They also show that fertility delay contributed to increases in childlessness, some of which are likely to have been an unintentional consequence of pursuing a career.

Angrist and Evans (1996) demonstrate impacts of state abortion reforms implemented in 1970 in the United States on marriage, fertility, and employment using 1980 and 1990 Census microdata. Among white women, the stronger response is a decline in teenage marriage, and there is no significant impact on education or labor market outcomes. However black women exhibit stronger declines in teen fertility and out-of-wedlock childbearing, and they also exhibit increased schooling and employment rates. The study illustrates not only a strategy by which the relationship between fertility and employment can be revealed, it also shows on a given sample with a given identification strategy, how different demographic groups may respond on different margins. Bloom et al. (2009) similarly leverage abortion reform, using it to instrument fertility in country-year data for 97 countries observed through 1960–2000. They find reductions in fertility that drive increases in women's labor force participation. The direct effect is concentrated among women aged 20–39, the prime childbearing years, and persists over time for that cohort. These authors extend the analysis further to simulate impacts of both reduced fertility and increased labor supply on income per capita, taking into account changes in both the size and the age composition of the population. Analyzing impacts of a reform in Nigeria in 1999 that diminished women's rights (lowering the value of women's testimony in court), Godefroy (2018) finds an increase in fertility that reflects both greater compliance with male fertility preferences and an increase in marriage rates. He also finds an increase in women's labor supply, rather than a trade-off, which is consistent with women working under duress.

The increasing availability of assisted reproductive technologies (ART) like in vitro fertilization (IVF) since 1978 has allowed women to delay fertility. Gershoni and Low (2021) study the impacts of the introduction of free in vitro fertilization on women's outcomes in Israel, showing that this led to increased investment in education and improved labor market outcomes. Although they do not report impacts on fertility, their results ratify that technological innovations that extend the effect reproductive period can act to mute the trade-off between career and family.

Instrumenting fertility with IVF treatment success and using Danish administrative data, Lundborg et al. (2017) find negative and persistent fertility effects on earnings which are stronger at the extensive margin. These effects are most notable when considering annual earnings in the year of birth and following year; however a small negative impact is still visible 10 years post-birth. Their results for annual earnings are driven by impacts on hourly earnings rather than on labor supply. This is in line with numerous studies demonstrating that women incur a wage penalty by sorting into flexible jobs or jobs that involve a shorter commute in order to be able to combine family and career (see, for instance, Goldin 2014; Le Barbanchon et al. 2021; Benny et al. 2021).

Studying impacts of a Swedish policy implemented in 2003 mandating single-embryo transfers for women undertaking IVF, Bhalotra et al. (2019) demonstrate a

sharp reduction in the probability of twin birth following the reform, with attendant improvements in maternal and child health. They find that women having IVF births following the reform experience a significant increase in earnings in the 9 years following birth (the available data window), which in large part appears to be the result of having a singleton rather than a twin birth. This is appreciable both for women having their first birth and at higher parities. Thus the authors show that a decrease in fertility by one child, at the extensive and intensive margins, results in women having higher earnings after birth. Similar to Lundborg et al. (2017), they find that this is driven by women with positive earnings or, implicitly, by earnings per hour and not labor supply. Given the increasing uptake of IVF, it is useful to provide some background to the Swedish mandate. Pre-reform in Sweden, as in most of the world, the modal procedure was to implant two (and in some settings, more than two) embryos in one treatment so as to increase the chances of fertilization. This approach, on a global scale, has led to IVF births being more than ten times as likely to be twin births as non-IVF births. This is relevant as the children born in a multiple birth are typically less healthy, and their mothers suffer more pregnancy and birth-related complications. And it seems plausible that compromised child and maternal health impede a mother's return to work. The Swedish reform was prompted by medical research (discussed in Bhalotra et al. (2019)) showing that advances in IVF technology meant that the chances of a successful pregnancy were no longer significantly greater with double- than with single-embryo transfer.

In a different approach using legal reforms, a collection of studies focuses on fertility in China and Vietnam, and its response to the maximum allowed number of children. Wu (2022) uses the relaxation of China's One-Child Policy between 2014 and 2016 as a source of exogenous variation in fertility to identify the impact of a second child on women's labor force participation. The first stage indicates significantly higher fertility, with resulting lower maternal labor supply among the extensive and intensive margins. There is indicative evidence for the role of lack of childcare in explaining this effect. Similarly, Ngo (2020) makes use of the Vietnam Two-Child Policy and census data to show that the restriction on maximum fertility led to lower fertility and 1.5% higher maternal labor supply. The policy also caused longer birth spacing. Taking a different angle and using the Chinese One-Child Policy setting, Agarwal et al. (2022) look at the direct impact on women's hiring and wages and show that with the initial relaxation of the One-Child Policy in 2013, 4.4% fewer women were hired, with an increase of 22% in the gender wage gap, indicating discrimination by employers endogenizing the potential higher future fertility of female employees.

Using event study approaches describing labor market outcomes before and after the birth of a child in Denmark, Kleven et al. (2019b) document that women's labor force participation, hours, and wages all decline sharply after the first birth and that these effects persist for 10 and even 20 years after birth. The authors also document impacts on women sorting into more flexible jobs after birth. There are virtually no gender gaps in these outcomes in the years before the first birth. And, following the birth of their first child, men do not suffer a decline in labor market outcomes. In the case of Denmark, where other sources of gender differences in labor market

outcomes have diminished over time, Kleven et al. (2019b) show that the child penalty explains a large and increasing share of the gender gap in wages, hours, and participation. The broad pattern of results has been replicated in six highly industrialized countries (Kleven et al. 2019a), in the United Kingdom (Costa Dias et al. 2021), four Latin American countries (Berniell et al. 2021b), Uruguay (Querejeta Rabosto and Bucheli 2021), Mexico (Aguilar-Gomez et al. 2019), and a broader range of European countries plus Israel (Berniell et al. 2020, 2021a). These studies ratify the broad generality of the child penalty pattern, confirming persistent impacts on employment and earnings, and a tendency for women to move into informal employment or self-employment, often into less secure but more flexible jobs. This evidence underlines the dynamic nature of childbearing and child-rearing. Demands on parental time and investments in children vary over the child's life course. When parents have several children, they are often relatively closely spaced, resulting in dynamic labor market effects of fertility.

Having underlined the wide scope of the evidence of persistent child penalties in women's labor market outcomes, it is useful to acknowledge that it does of course vary with context. Jacobsen et al. (1999) estimate persistent effects of marginal births on women's labor market participation and earnings using 1990 US census data but more transitory effects when using the 1980 US census. Descriptive evidence from Piras and Ripani (2005) suggests quite variable wage profiles for mothers and non-mothers in four Latin American countries suggesting that the largest impacts are among mothers of children under the age of 7. Herr (2016) finds that the wage trajectory following birth depends upon when women have their first birth *and* whether they have already entered the labor market at that time. Recent evidence using within-family variation generated by sister-fixed effects suggests that early childbearing (teen birth) brings about appreciable family income declines even 15 years post-birth (Aizer et al. 2020).

Structural estimates from Adda et al. (2017) based on German data illuminate reasons for persistent effects of childbirth on women's outcomes. Their estimates suggest that as much as one quarter of the "career costs of children" owe to wage losses due to lower skill accumulation and depreciation of experience while out of the labor market. This suggests the importance of facilitating a return to work for women who wish to minimize disruption of their careers. Potentially useful interventions include training (which Blundell et al. (2021) show is helpful for women who left education after high school) and subsidized high-quality childcare, which is useful when childcare costs rather than preferences for maternal time with children inhibit women working (Cattan 2016).

The Impact of Women's Work on Fertility

A rich literature has explored the relationship between work and fertility, aiming to estimate the impact of jobs and job opportunities (or local labor market conditions) on women's childbearing and fertility rates. Much of this literature has focused on estimating causal impacts, looking for exogenous variation in job gain or job loss,

and exploring subsequent impacts on individual child-bearing and other fertility outcomes such as fertility timing.

Approaches and Mechanisms

To identify the impact of work on fertility requires exogenous variation in employment status or employment opportunities. The literature has used a variety of approaches to estimate the relationship. First, there is work on randomized control trials (RCTs), mostly in developing countries, that either randomize individuals into work or into training that improves the probability of securing a job (e.g., Jensen 2012). Next, a set of papers makes use of arguably exogenous firm closures, either due to bankruptcies (Bratsberg et al. 2023) or firm shutdowns (e.g., Del Bono et al. 2012, 2015). The distinction between using an RCT and using plant closures is that the samples are different: the latter estimates effects on individuals who are already in work and hence may have different preferences over work versus fertility and be used to a different level of income. This is key when interpreting the results. Another approach in the literature is the use of local area employment, whether that be employment growth directly (Aksoy 2016), a shift-share style instrument (as in, e.g., Schaller 2016), or even aggregate unemployment rates (Currie and Schwandt 2014).

The impact of employment on fertility for women sheds light on how women trade off career against family. From a theoretical perspective, a trade-off would be expected if the substitution effect dominates the income effect: better labor market opportunities increase the opportunity cost of childbearing, dampening fertility (the substitution effect), but also entail higher income which could increase fertility if children are a normal good (the income effect). Helpfully, the literature on the relationship between male earnings and fertility sheds light on the income effect by shutting down the substitution effect for women and shows sizeable positive income effects. Thus, the question is about whether the income or substitution effect dominates and how that differs across settings and sources of employment variation.

Combining a theoretical and empirical approach, Baudin et al. (2015) and Baudin et al. (2019) put forward the argument that the relationship between income and fertility depends on the level of income: at low levels of income, poverty reduces fertility and drives childlessness, while at high levels of income, the opportunity cost of childbearing also reduces fertility and increases childlessness. They apply this model to the United States and a set of developing countries and show strong evidence for a U-shaped relationship between income and childlessness.

Their analysis points to the income and substitution effects dominating at different levels of income. Of course, the underlying mechanisms will be more complex than a simple income and substitution effect. For example, the results discussed below indicate that the status quo also matters for whether the income or substitution effects dominate: with job finding, the status quo is one where the woman is out of work and with a higher propensity to have a child; the surprise is a higher opportunity cost of childbearing. With job loss, the effects are estimated for a sample of

women with existing labor market attachment and hence a revealed stronger preference for work over family. Although job loss has a negative income effect, it is plausible that their desire to find another job will dampen fertility impacts. Further, job loss often results in loss of maternity leave, and fertility may be delayed until another job is found where the woman will have the security of maternity leave. Finally, a change in a woman's income may result in a change in her bargaining power and in her ability to ensure that household fertility reflects her preferences, which are likely to differ from her partner's (Ashraf et al. 2014). This is especially likely to be important for young, low-income women in developing countries.

Further, there is a third, important channel: uncertainty. Fertility is also likely to be responsive to the amount of uncertainty in the economic environment, and this is seen in Currie and Schwandt (2014) and Bhalotra and Rocha (2018), for example, where increased economic uncertainty dampens fertility. Finally, the age of the woman is crucial: larger impacts on fertility are expected when labor market changes occur earlier in life before fertility has been realized or even begun, such as in Jensen (2012).

Job Finding and Job Loss

Focusing on job finding, Jensen (2012) investigates the effect of this on women's fertility in rural India. The author implements a randomized control trial involving young, unmarried women in which the intervention group is offered 3 years of support in finding jobs in the new business process outsourcing industry, while the control group is provided with no similar support. They find that, compared to the control group, the treated group of women are more likely to enter the labor market or obtain more schooling, less likely to get married, less likely to have children, and report lower desired fertility as well as stronger career aspirations. This provides clear evidence of a trade-off between career and family for young women who would normally not have strong labor market opportunities.

A set of papers in alternative settings make use of job loss rather than job gain. Among a sample of Finnish women, Huttunen and Kellokumpu (2016) show that female job loss due to plant closure results in lower childbearing, with three fewer children born for every 100 women displaced. In an Austrian context, Del Bono et al. (2012) and Del Bono et al. (2015) confirm this finding, with the former showing that plant closures lead to lower fertility particularly among women in more skilled occupations, and the latter that being displaced from a career-oriented job reduces fertility for 6 years after the unemployment event.

Thus evidence suggests that job finding leads to fertility delay and reduces fertility and marriage rates, consistent with work capturing the opportunity cost of childbearing. On the other hand, job loss appears to reduce fertility. The income effects of job loss may be larger than income impacts of job finding if job loss creates liquidity constraints or if individuals are loss-averse. Further discussion of income effects of job loss on fertility is in section "Men's Earnings and Income Effects". Alternatively, job loss may have negative psychological impacts different to job

gain, which can also affect partnering and fertility. Also, women subject to job loss have already selected into the labor force, while women who are offered support for job finding have not, making it plausible that women subject to job loss have stronger preferences over work. Finally, the difference in the results may instead reflect the very different samples analyzed and differences in extensive and intensive margin fertility responses.

Local Labor Market Conditions

An alternative approach to understanding the impact of work on women's fertility is to look at the impact of labor market opportunities rather than at impacts of individual job status on local area or individual birth outcomes. Schaller (2016) uses a shift-share measure of local labor demand that exploits baseline variation in the gender composition of the workforce across industries interacted with aggregate shocks to estimate the impact of growth in job opportunities on birth rates. She finds that improvements in women's labor market opportunities lead to small reductions in local birth rates, while improvements in men's labor market opportunities have strong positive effects on birth rates. In a similar vein, Aksoy (2016) explores the impact of local gender-specific unemployment rates on fertility in England and finds that increases in women's unemployment are associated with more births, while increases in men's unemployment are associated with fewer births.

A handful of other studies examine impacts of local area unemployment rates on fertility, but without distinguishing unemployment by gender, and in so doing shed light on the uncertainty mechanism. Currie and Schwandt (2014) show that an increase in unemployment rates for women aged 20–24 in the United States leads to a reduction in women's fertility that is not compensated for by the time fertility is complete. Using county-level data for North Carolina in 1990–2010, Ananat et al. (2013) find that economic downturns are associated with lower fertility among teenage black women, but not among teenage white women. They provide some evidence that black teens are less likely to conceive and more likely to terminate during a downturn. Similar findings emerging from state-level data are in Dehejia and Lleras-Muney (2004), who analyze the impacts on newborn health of economic downturns in the United States. They show that selection into birth operates in opposite directions for black and white women. In downturns, poorer black women avert fertility, consistent with Ananat et al. (2013), so that black children born in downturns are born to mothers of relatively high socioeconomic status (indicated by education and marital status). These results are consistent with income shortfalls discouraging fertility among less well-resourced women. On the other hand, white women averting birth in downturns are negatively selected on education. This is consistent with the timing of birth among white women being determined by the opportunity cost of women's time more than by income effects and with less educated women experiencing more cyclical employment than more educated women. Using regional variation in economic opportunities across the cycle in India, Bhalotra and Rocha (2018) find that fertility is lower in recessions than in

upturns. Women with low levels of education are most responsive, and the relationship is attenuated in states that are at a more advanced stage of the demographic transition, consistent with theory. The response is driven by the intensive margin of fertility and is not explained by birth spacing. Overall, these papers document a trade-off between women's work, and fertility, with both labor market opportunities, both generic and specific to women, tending to dampen local birth rates.

Using data from Sweden in the 1880s, Schultz (1985) leverages a natural experiment which results in an increase in the price of butter relative to grains. This generated an increase in the relative wage of women, given that women specialized in dairy produce and men in agriculture. Consistent with the increase in the opportunity cost of childbearing, there was a reduction in overall fertility, which Schultz (1985) argues contributed to the demographic transition in Sweden, explaining up to a quarter of the fertility decline during this period. In another paper studying fertility rates in the long run with a macroeconomic take on the question, Chatterjee and Vogl (2018) combine survey data on women across various countries to show that long-run growth was associated with fertility delay and lower fertility overall, again contributing to the evidence of a trade-off between work opportunities and fertility. Taking a structural modeling approach, Caucutt et al. (2002) show that the labor market has provided incentives for fertility delay among young women in the United States.

While most studies analyze changes in the number of births, the timing of births is an important margin of choice. It is conceivable that labor market incentives change the timing of fertility delay without changing the number of children born to a woman. It is equally possible that they lead to a change in the number of children without any change in timing – age at first birth or birth spacing. Often, there are changes on both margins, such as illustrated in Jensen (2012), Caucutt et al. (2002), and Bratsberg et al. (2023).

Men's Earnings and Income Effects

Now consider research that investigates impacts of changes in men's local labor market opportunities on fertility, thus isolating the income effect. Kearney and Wilson (2018) find that the boost in men's earnings and job finding rates as a result of the fracking boom of the 2000s in the United States led to higher local birth rates, with no effect on marriage. Autor et al. (2019) analyze impacts of the change in relative labor market opportunities of men and women as a result of the increase in Chinese import competition in the United States. They find that declines in men's relative labor market opportunities reduced both marriage and fertility, with more births taking place out of wedlock and to single mothers. The positive relationship between fertility and men's income is confirmed in another setting by Black et al. (2013), who use the exogenous increase in men's earnings due to the 1970s Appalachian coal mine boom and show that local fertility increased as a result. Focusing on men's individual job loss rather than opportunities in the local area, Lindo (2010) shows that overall fertility declines when men lose their jobs. This

body of evidence is confirmed in Norway using registry data: low-income men have the largest rates of childlessness in the population, and these rates have grown dramatically over time (Bratsberg et al. (2023)). The evidence points to a large-income effect via men's earnings: when household income declines as a result of male job loss (or increases with improving local employment), fertility also declines (increases).

Summary

On balance, the evidence is consistent with standard economic theory. Shocks or policies that decrease fertility tend to lead to persistent increases in women's labor force participation – and to improvements in women's labor market outcomes more generally. However, there are important variations depending, for instance, on whether the fertility shock involves transition into first- or higher-order birth and on the demand for female labor – which will vary across regions and cohorts in line with differences in women's skills, the role of technology and trade, and the extent of gender discrimination in hiring and pay.

In the other direction, women's employment tends to dampen fertility although the relative size of the substitution and income effects varies across regions. There are relevant differences between impacts of job finding and job loss and, also, material differences between impacts of actual changes in individual employment status and changes in labor market opportunities.

The tension of interest is around combining career and family. Advances in reproductive technology have made a significant contribution in this regard – innovations in and coverage of contraception, abortion, and reproductive health technologies. The key idea is that allowing women to time their fertility can contribute to women building careers. Policy has, on the other hand, a lot of catching up to do. In this paper cursory attention was paid to policies that might support families in managing the balancing act of maintaining both women's careers and family. Policy innovation would appear to be in order given that the evidence on maternity leave (Dahl et al. 2013) and universal and subsidized childcare (Havnes and Mogstad 2011; Cornellisen et al. 2018) is rather mixed. There is somewhat more positive evidence that training programs (Blundell et al. 2021) help. In line with this contention, in their recent survey, Doepke et al. (2022) argue that the focus of research is now shifting toward family policy, more egalitarian social norms, and the relevance of job flexibility. Analysis of the relationship between fertility and women's economic participation has preoccupied economists for decades. This relationship appears to be evolving (Myrskylä et al. 2009), opening up opportunities for further analysis.

Cross-References

- ▶ Gender and Income Inequality
- ▶ Gender Roles and Families
- ▶ Gender Wage Gaps and Skills
- ▶ Gender, Time Allocation and Birth Controls

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