The Parental Gender Earnings Gap in the United States

by

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Abstract

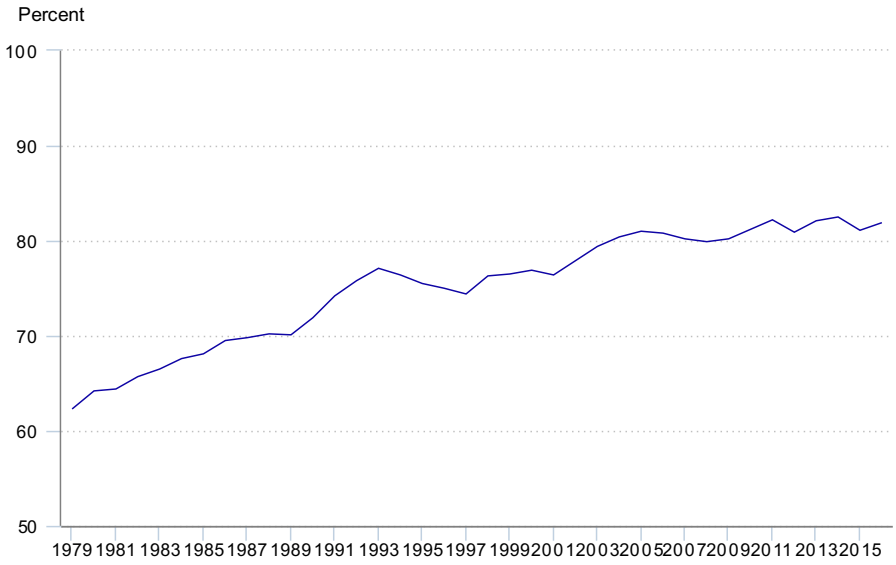
This paper examines the parental gender earnings gap, the within-couple differences in earnings over time, before and after the birth of a child. The presence and timing of children are important components of the gender wage gap, but there is selection in both decisions. We estimate the earnings gap between male and female spouses over time, which allows us to control for this timing choice as well as other shared external earnings shifters, such as the local labor market. We use Social Security Administration Detail Earnings Records (SSA-DER) data linked to the Survey of Income and Program Participation (SIPP) to examine a panel of earnings from 1978 to 2011 for the individuals in the SIPP sample. Our main results show that the spousal earnings gap doubles between two years before the birth of the first child and the year after that child is born. After the child's first year of life the gap continues to grow for the next five years, but at a much slower rate, then tapers off and even begins to fall once the child reaches school-age.

[*] All opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the U.S. Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed.

1 Introduction

Over the last three decades the gender earnings gap in the United States has fallen. Women earned 64% of men's average earnings in 1979, but earned 82% of men's average earnings in 2016 (See Chart 1). Most of this gain was made between 1979 and 1993, and the earnings gap has remained between 80 and 82% for the last decade.

Chart 1. Women's earnings as a percentage of men's, for full-time wage and salary workers, 1979–2016 annual averages



Click legend items to change data display. Hover over chart to view data.
Note: Percentages are calculated from annual averages of median usual weekly earnings for full-time wage and salary workers.
Source: U.S. Bureau of Labor Statistics, Current Population Survey.

The earnings gap varies by demographics. The earnings of young men and young women are more comparable than that of older men and women. Women under 35 earn 89 to 96% of men's earnings, while the gap for workers over 35 is 75 to 83%. The earnings gap varies for workers with and without children as well. The earnings gap for workers without children is 87%, while the earnings gap for workers with children is 75% (U.S. Bureau of Labor Statistics 2016).

This relationship between the earnings gap and children has been explored in detail in the economics and sociology literature. Juhn & McCue (2017) show that while marriage is no longer associated with lower earnings of women relative to men in recent cohorts, children

are still associated with lower earnings for women. Hotchkiss et al. (2017) explore the effects of absence from the labor force on earnings of women and find that it plays an important role in the lower relative earnings of women, especially for higher human capital workers. This corresponds with the analysis in Anderson et al. (2002) which shows women with more education pay a higher wage penalty for children than lower income mothers. Bertrand et al. (2010) follow the progression of a specific example of high human capital male and female workers, MBA students after they graduate, and find that while the earnings of men and women start off approximately equal, the female MBAs gradually lose ground to the male MBAs as they have children. This is due to less job experience, more career discontinuity, and shorter work hours.

In addition to the literature showing that children are associated with lower female earnings, there is a literature showing the relationship between the timing of children and earning penalties for women. Miller (2011) and Herr (2012) use plausibly exogenous variation in fertility timing to show that women who have children later have higher long-run earnings than those who have children earlier. Goldin & Katz (2002), Bailey (2006) and Bailey et al. (2012) show that the introduction of the birth control pill was an important factor in the increase in female labor force participation.

The contribution of this paper to the vast literature on the gender earnings gap is a close examination of the growth trajectory in the gender earnings gap relative to the timing of fertility among parents. This is closely related to the literature on fertility timing effects on earnings. Our paper is most similar to Angelov et al. (2016), which uses Swedish panel earnings data of parents to explore the transition of men and women from not having children to having children. This paper does a similar analysis using U.S. data. Assuming that the timing of the fertility decision is not dependent on the growth of couple's earnings gap, the panel structure of the data allows us to identify the growth trajectory of parental earnings gap relative to pre-birth growth.

The choice to become a parent is endogenous to other life decisions. Using the earnings differences within couples allows us to use the spouse to control for everything that is consistent within the couple that would drive differences in both income and the choice to

have children. That includes external factors, like the local economic environment, which Schaller (2016) shows can have a significant effect on the choice of when to have children. It also controls for pre-child life choices, like education, location choice, and occupation and industry choice, which Bayard et al. (2003) and Blau & Kahn (2017) show are important factors in the gender earnings gap. However, our identification strategy does not control for gender-specific (local) labor market shocks that may affect the fertility decision.

There are several ways in which the parental earnings gap may increase after the birth of a child. The female spouse could reduce her hours relative to the male spouse, which would cause a decrease both in her earnings at time birth and slower growth in future periods, due to the decreased experience. She could also take a different job, either with the same firm or a different firm, which could change her constant starting salary or her wage growth rate. Alternatively, the earnings gap could be due to changes in the male spouse's employment, either in increased hours or a change in jobs. Given the literature that shows a strong relationship between women's earnings and fertility, the gap is unlikely to be solely driven by a "baby bump" in the earnings of the male spouse, but we are able to show the gender-specific changes in earnings dynamics, to explore this possibility.

This analysis also allows for a close examination of intra-household bargaining. We can observe the change in the income dynamics of couples around the timing of the birth of their first child. It also addresses a potential confounder in examining the earnings of women with and without children - the effect of the spouses' income on her post-birth decisions. In dual earner households, both labor force participation and hours/earnings decisions will be made at the household, rather than individual, level. The earnings of the male spouse may have a strong effect on the earnings of the female spouse, and vice-versa, whether or not the couple has children. There may be reason to believe that the effect will be stronger once the couple becomes parents because there is more "home production" required for children and childcare is expensive. Thus, there is a labor/childcare tradeoff that must be made at the household level. This makes examination of couples, rather than examining men and women with children separately, important.

2 Data

We use two sources of data for this project, the Survey of Income and Program Participation (SIPP) and the Social Security Administration Detailed Earnings Record (SSA-DER). The SIPP is a nationally representative short-panel household survey that collects detailed information on income, employment, social program participation and demographics of individuals and households in the United States. It is composed of a continuous series of short panels that last between 2.5 and 4 years, each with the sample size of approximately 14,000-52,000 households. The SSA-DER data is administrative earnings and social security retirement and disability benefit data. The earnings data originate from Internal Revenue Service (IRS) Form W-2 records.

We construct our estimation sample using the pooled 1984, 1990-1993, 1996, 2001, 2004 and 2008 SIPP Panels. Our sample consists of heterosexual married couples who are married at the time of the SIPP survey and whose first child is born between 1978 and 2011. We identify married couples through their responses to the SIPP survey and know the timing of their marriage, as well as any previous marriages, from the SIPP marriage history module[1].

Children are matched to the couples through the SIPP fertility module, which was only asked of women ages 16-65. We restrict our sample to couples within the age range 16-65 during the survey years. Since the fertility module was only asked of women the child's relationship to the male spouse is not clear. The child may neither be the male spouse's first child nor a biological one. We can use the marital history module to limit the sample to the children who were born within the observed marriage, but this would leave a selected sample of couples, since the longer-lasting marriages are more likely to be observed during the survey period. We choose to keep all couples, but show a specification with only the couples who were married to the SIPP spouse at the time they had their first child.

The SIPP sample described above is linked to the SSA-DER to create a panel of earnings for each SIPP respondent from 1978 to 2011. The analysis was originally run on the synthetic implicates of this data available in the Cornell Virtual RDC, then was validated on the SIPP

[1] Although our estimates are based on heterosexual married couples, decreased earnings due to fertility is a broader issue that will affect a broad variety of families

Gold Standard File (U.S. Census Bureau 2017)[2]

Table 1 shows summary statistics for the couples in the SIPP-SSA sample. Race is defined for the couple rather than for the individuals, since the regressions will be run at the couple level. The majority of our sample are couples where both male spouse and female spouse are white, with only 7% who are black and 7% who are mixed/other, which can consist of both couples who are neither black nor white as well as mixed race couples. Most of the couples in our sample were not married to their SIPP spouse (the person they were married as of the SIPP sample) when their first child was born. Since we can only measure the earnings of SIPP spouses, not the biological parents of the child, the earnings differences may not reflect the actual circumstances of the woman/child during the year of birth. We explore heterogeneity over marital status in our estimates. The average birth year of the couples in our sample is 1978.

Table 1: Summary Statistics by Couple

% White	0.855
	(0.353)
% Black	0.0726
	(0.259)
% Mixed/Other	0.0729
	(0.260)
% Married at T	0.397
	(0.489)
Total Children	1.782
	(1.542)
Year of Birth	1978.3
	(14.31)
Observations	159333

Table 2 shows summary statistics for the male spouses and female spouses separately. This table shows that women in our sample are more likely than men to have a high school

[2]Specifically, this analysis was first performed using the SIPP Synthetic Beta (SSB) on the Synthetic Data Server housed at Cornell University which is funded by NSF Grant #SES-1042181. Final results for this paper were obtained from a validation analysis conducted by Census Bureau staff using the SIPP Completed Gold Standard Files and the programs written by these authors and originally run on the SSB. The validation analysis does not imply endorsement by the Census Bureau of any methods, results, opinions, or views presented in this paper. These data are public use and may be accessed by researchers outside secure Census facilities. For more information, visit http://www.census.gov/programs-surveys/sipp/methodology/sipp-synthetic-beta-data-product.html .

diploma. This pattern continues as the educational level rises to some college but men are slightly more likely to be college graduates.

Table 2: Summary Statistics by Individual

	Men	Women
% HS Grad	0.848	0.865
	(0.359)	(0.342)
% Some College	0.277	0.294
	(0.447)	(0.456)
% College Grad	0.258	0.221
	(0.438)	(0.415)
Observations	159333	159333

Table 3 presents summary statistics on the earnings level. Earnings are winsorized at the 95% level by year. All earnings are in 2011 dollars. Women earn around $20,500 less than men in our sample for all observed periods, but that amount is smaller, at $12,600 before their first child is born, and larger, at around $25,100, after their first child is born.

Table 3: Summary Statistics, Earnings

	All	Before Birth	After Birth
Mens Earnings	37402.1	30673.1	40970.8
	(48485.6)	(33205.9)	(39413.5)
Womens Earnings	16894.1	18066.0	15840.6
	(27630.5)	(22964.4)	(23586.4)
Earnings Difference	20508.0	12607.1	25130.2
	(50576.5)	(32036.2)	(42137.9)
Observations	5417322	57395	67653

3 Methodology

4 Empirical Specification

Our analysis explores the differential in parental earnings. We measure the within-couple difference in earnings, since couples experience the same shock at the same time. Our measure of interest is the difference in log earnings between the male spouse and female

spouse around the time of the birth of the first child. We show the effect of this "shock" on the earnings differential and the persistence of the shock over time.

Our main specification is an event study around the time of the birth of the first child with the dependent variable defined as the log difference between the earnings of the female spouse and the earnings of the male spouse. The analysis sample only includes parents or future parents. All women and their spouses who have no recorded date of first birth are excluded from the sample. This allows us to abstract from the decision to have a child at all and just focuses on the timing.

We use a sample of women ages 16-65 at SIPP survey year matched to their spouses, as observed in the SIPP. We drop any observations that cannot be matched to a spouse, do not have children, or do not have a valid birthdate for her first child. We flag observations where the first child was born outside of the current marriage and show the analysis both excluding these cases and including them.

We prefer the full sample of couples to this set of couples who were married from the time of their first birth to the time they appear in the SIPP survey due to the sample selection inherent in choosing only those continuing marriages. Although the internal validity of the analysis would potentially be improved by using only the couples who were married at the time of the child's birth, the ability to generalize our estimates becomes more constrained, especially when showing the results for certain sub-populations with lower marriage rates and/or higher divorce rates. Lundberg et al. (2016) find that out of wedlock childbirth is more likely in lower income households, so we would also be selecting for a higher income population.

We include all couples in every period, even when one or the other has no earnings observations for a given year. Their earnings are replaced with ln(1)=0 in the difference. Without this correction, we would have severe sample selection issues, since a large proportion of our observations have at least one year with no observed earnings for at least one member, and just selecting the couples with a continuous series of earnings would be a very specific set of individuals, with different expected behavior than the general population.

We estimate the following equation:

$$Y_{ht} = \sum_{d=-3}^{18} \pi_d(t - birthyear_h = d) + \gamma_h + \eta_t + \varepsilon_{ht}$$

where Y_{ht} is the difference in log earnings of the male spouse and log earnings of the female spouse for household h at time t. When either spouse has no earnings at time t their earnings values is replaced with 0 (i.e. log(1)) before the difference is taken. γ_h is a household fixed effect, which controls for anything constant for the couple, including the age and education differences between the couple. η_t is a calendar fixed effect that controls for sample-wide changes in the earnings gap across time. The coefficients of interest are the π_d coefficients, which are the coefficients on a series of dummies that indicate the number of years have passed between the birth of the first child $birthyear_h$ and the current year t.

By using the difference in earnings between the male spouse and female spouse, we are abstracting from anything that is shared by both members of the couple. But anything that is changing differentially across time, but is unrelated to the relationship between the birth of the child and parental earnings will bias our estimates of the effect of the childbirth.

Our methodology differs somewhat from that in Angelov et al. (2016), in that we use fixed effects to difference out the constant characteristics of the couple instead of including the dependent variable at time $t = -2$ as a regressor. But we use observation $t = -2$ as our reference period, as in Angelov et al. (2016), thus the indicator variable for 2 years before the birth of the child is excluded from the event study, and the event study is centered at zero at t=-2. Since the earnings series starts in 1978, the child must be born in 1980 or later for the couple to have pre-birth earnings information.

The event study only explores the birth of the first child on income differences. Ideally, we would like to include later children as second and subsequent "events" in the event study, but we do not know the exact timing of the birth of these children. We show a separate specification that breaks the sample into couples who have 1, 2, or 3+ kids to examine the heterogeneity over these family types.

In our main specification, we include all couples, even those who were not married,

according to the SIPP marital history module, at the time of the birth of the first child. This may inaccurately characterize the relationship of spousal income dynamics. In a robustness check, we limit the sample to couples continuously married since the birth of the child.

Although using couple controls for shared environments driving the timing of fertility, we cannot control for within-couple endogeneity of fertility timing. Couples may time their first child for when the earnings of the female spouse would be lower than normal or the earnings of the male spouse would be higher than normal for external reasons. Thus, our estimate of the parental gender earnings gap may be an overestimate of the true gap. Despite this inherent endogeneity, we feel the examination of the earnings dynamics of this large sample of American couples is informative, and we focus more on the dynamics than the magnitudes of the estimates because of this potential overestimate.

The specification we use is identified on the timing of the child's birth. We show a series of analyses with coefficient estimates for different subgroups. There is no identifying variation driving the analysis of one subgroup versus another. We cannot claim, for instance, that marriage is causing a larger parental gender earnings gap. Thus, the results shown here are primarily descriptive. Our contribution is showing the dynamics of the gender earnings gap directly surrounding the birth of a child. Other work has looked at the interaction of the presence and age of children on the gender wage gap, but usually in bins of child ages for 0-5 and 6-17 years. We believe this analysis of the dynamics of the gender earnings gap around the birth of the first child will lead to future research into the mechanisms and remedies.

5 Results

The results of our main empirical specification, regressing the log difference in spousal earnings on a series of dummy variables generated by the timing of the birth of the first child, are shown in graphical form in Figure 1. The date two years prior to the birth is the excluded category, set to zero in the graph. The results show that the spousal earnings gap expands dramatically between one year before the birth of the first child and the year after

that child is born. After the child's first year of life the gap continues to grow for the next five years, but at a much slower rate, then tapers off and even begins to fall once the child reaches school-age.

Table 5 shows the estimates from Figure 1, which includes a full set of couple and year fixed effects, compared to two alternate specifications, which used differences in spousal earnings two years before the child is born to control for pre-birth conditions. The earnings year fixed effects are important for controlling for aggregate trends, and both the coefficients magnitudes and the dynamics over time differ for the estimates in column 1 of Table 5 from the other two columns. However, the coefficients of the specification with the period $t = -2$ controls and the coefficients of the estimates with the couple fixed effects follow similar trends and are within two standard deviations of each other. The remaining estimates in the paper use the more parsimonious model with the couple fixed effects, rather than $t = -2$ controls.

Figure 1: Main Results

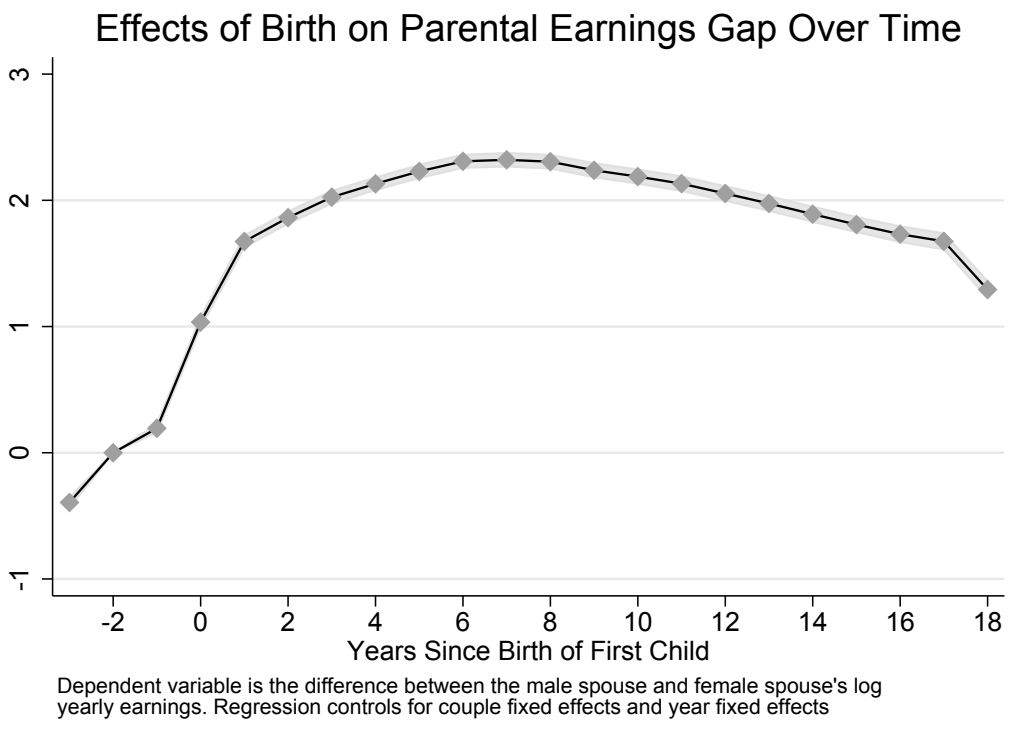


Figure 2 shows a specification that differs from the main specification because it uses the log earnings of the individuals, not the difference in their earnings, as the dependent variable. Thus, the effect of childbirth is less well identified than in the main specification, where the earnings of the male spouse controls for the local labor market conditions and other couple-specific changes that may be contemporary to the birth of the first child. Nonetheless, the patterns seen here are informative for the main results. Figure 2 shows that, within our estimating sample, the main shock at the time of the birth of the child is experienced by the women, whose earnings fall at the time the child was born. They do not recover until the child is 9 or 10 years old. Since the earnings of the male spouse do not undergo the initial shock, the wage gap between the two genders never recovers.

Figure 2: Separation by Gender

Dependent variable is the log yearly earnings for each individual in our sample. Regression controls for individual fixed effects and year fixed effects and controls for the spousal difference in earnings two years before the child was born and differences in spouse ages and education levels.

We only use the variation in the timing of the first birth in our estimates, so for the full population it is not clear if the continued growth after the first birth is continued effects of

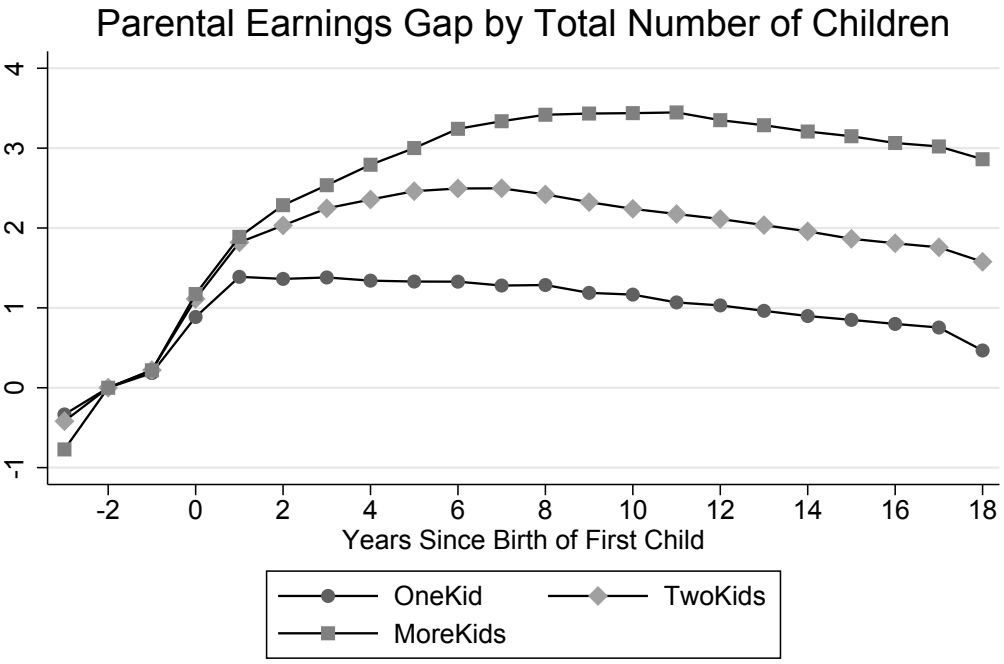
Table 4: Event Study Estimates of the Parental Gender Earnings Gap

	No FE	Year FE	Full Controls
Birth Year -1	0.126***	0.190***	0.194***
	(0.0160)	(0.0160)	(0.0160)
Birth Year	0.899***	1.027***	1.035***
	(0.0200)	(0.0200)	(0.0200)
Birth Year +1	1.474***	1.662***	1.674***
	(0.0230)	(0.0230)	(0.0230)
Birth Year +2	1.600***	1.848***	1.863***
	(0.0240)	(0.0240)	(0.0240)
Birth Year +3	1.697***	2.005***	2.025***
	(0.0240)	(0.0240)	(0.0250)
Birth Year +4	1.740***	2.107***	2.131***
	(0.0250)	(0.0250)	(0.0250)
Birth Year +5	1.776***	2.202***	2.229***
	(0.0250)	(0.0250)	(0.0260)
...			
Birth Year +10	1.443***	2.142***	2.188***
	(0.0260)	(0.0270)	(0.0280)
...			
Birth Year +15	0.785***	1.744***	1.808***
	(0.0270)	(0.0290)	(0.0300)
Δ Spouse Log(Earn)	0.219***	0.260***	
	(0.0040)	(0.0040)	
Δ Spouse Age	-0.0210***	-0.0210***	
	(0.0020)	(0.0020)	
Δ Spouse Edu	0.616***	0.583***	
	(0.0080)	(0.0080)	
Constant	1.560	1.715	1.729
Mean	1.684	1.684	1.684

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The first regression includes no fixed effects but controls for the difference in age and education of the two parents the second includes calendar year fixed effects and the third includes year fixed effects and couple fixed effects (within couple differences are dropped). * $p<0.05$ ** $p<0.01$ *** $p<0.001$

the first birth or if the estimates are complicated by additional children. Figure 3 shows the estimates by the total number of children in the family. For families with only one child, the series abruptly stops rising at 1 year and starts to very gradually decline. Larger families display the continued rise over the next several years that is apparent in the main estimate, implying that the gap is driven by the years immediately following the birth, but couples with multiple kids experience that first year after childbirth multiple times.

Figure 3: Results by Number of Kids

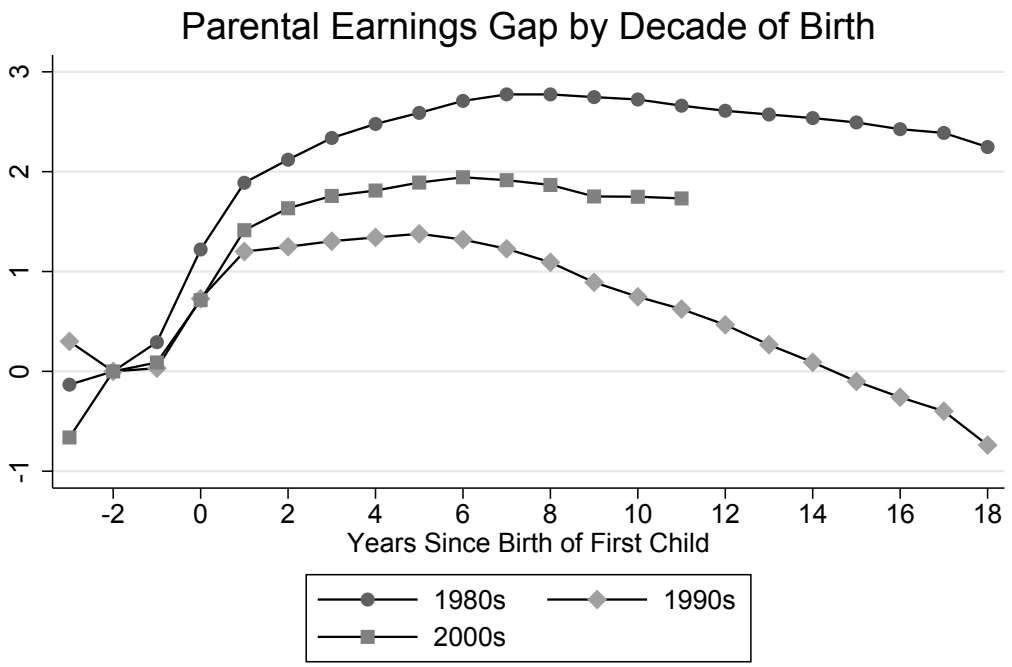


5.1 Heterogeneity Over Time

This data spans the period from 1978 to 2011. As discussed in Blau & Kahn (2017) there have been many changes in the social and economic environment over that time, and spouses who had their first child at the beginning of the sample may have had a very different experience from those who had their children at the end. Figure 4 shows the estimates by

the decade in which the first child was born. The gap between couples whose children were born in the 1980s never recovers from its initial rise. However, couples whose first child was born in the 1990s see the gap start to decline when the child is around 5 years old and female spouses regain the income they had relative to male spouses prior to the child's birth when the child is 14 years old. The couples whose children were born in the 2000s do not appear to be on the same path as those parents from the 1990s. The changes between these time periods include changes in fertility rates and timing, changes in the macroeconomy, and various other social changes such as the change in female educational attainment and labor force participation (Blau & Kahn 2017) that could be driving these differences. The results disaggregated by decade of birth highlight the need to explore this phenomenon further.

Figure 4: Results by Decade of Birth



One major change between the children born in the 1980s versus those born in the 2000s is the average age of the parents of these children. In the 1980s the average age of women at

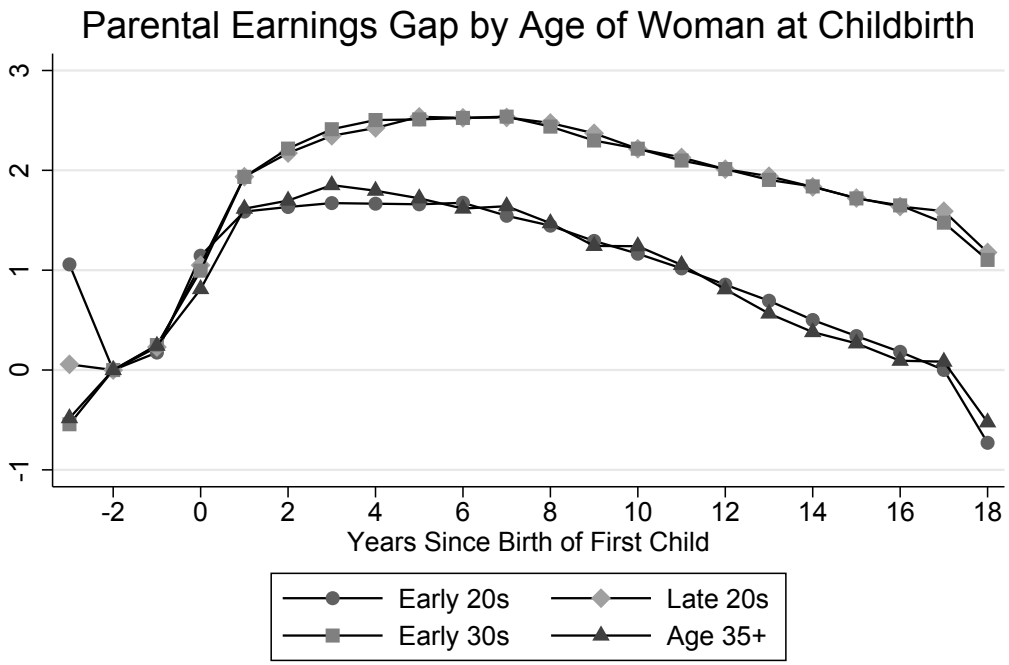
first birth was around 23; by 2014 it had reached 26.3 (Mathews & Hamilton 2016). Figure 5 shows that the dynamics of the earnings gap by the age of the female spouse at the time her first child was born. Surprisingly, the earning dynamics look similar for women who have their first children either on the younger end, less than age 25, or on the older end, over age 35. Women in both of those groups appear to experience a recovery in their earnings relative to their spouses. The women who have their children from age 25 to 35 experience a slightly larger shock, and have a much slower recovery in their earnings. This suggests that the disruption to the early career of women who have children in their late 20s and early 30s is more harmful than either having a child before the career is really started or having it later, when the woman is established in her career. However, there is selection into both the younger and older motherhood categories. Women with less education tend to have their children younger, while women with more education tend to have their children older. Since the selection into age of childbearing is on either end of the education spectrum, it still seems surprising that the earnings dynamics of the older and younger mothers show similar patterns. But the selection makes the patterns of both groups more difficult to interpret.

Another major change over this period is the increase in education, especially the education of women. However, Figure 6 shows that there is no strong visible difference in the earnings patterns for women after the birth of their first child by educational level. Women with less than a high school diploma have a smaller initial childbirth penalty relative to their spouses, but it grows to be equal to those with a high school diploma or college degree.

5.2 Heterogeneity Over Family Characteristics

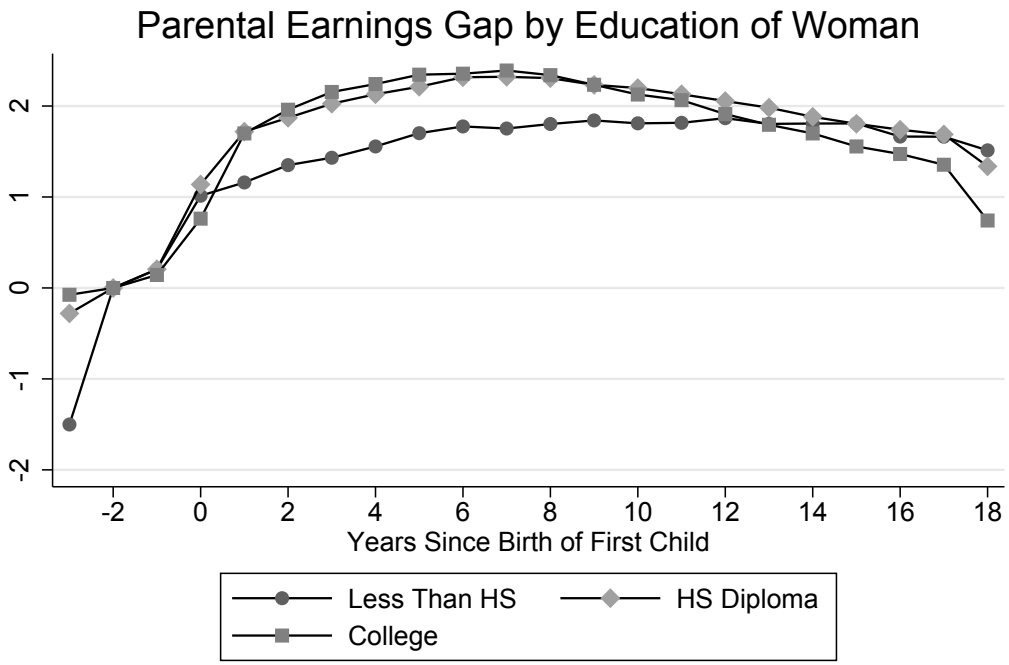
Figure 7 shows the difference in the estimates if we only include those couples who were married at the time of their child's first birth. The shock to the gender earnings gap is larger for married couples who were married at the time of the child's first birth. All of these couples are married at the time of the SIPP sample, so this graph does not show the difference between the married and unmarried women, but instead shows the potential measurement error from including couples who were not married at the point of time we are assuming that the spouses experience a similar life event. Some of these "unmarried"

Figure 5: Age of Woman at Childbirth



Dependent variable is the difference between the male spouse and female spouse's log yearly earnings. Regression controls for couple fixed effects and year fixed effects

Figure 6: Results by Education of Female Spouse



Dependent variable is the difference between the male spouse and female spouse's log yearly earnings. Regression controls for couple fixed effects and year fixed effects

couples in our larger sample may have been married to someone else when the child was born and have since divorced and remarried. Others may have been unmarried at the time of the birth of the child. And some may have incorrectly responded to the SIPP marital history module. The addition of these couples who were not married to each other at the time of the first child's birth appears to attenuate the magnitude of the effect, but does not obscure the pattern.

Figure 7: Results by Marital Status

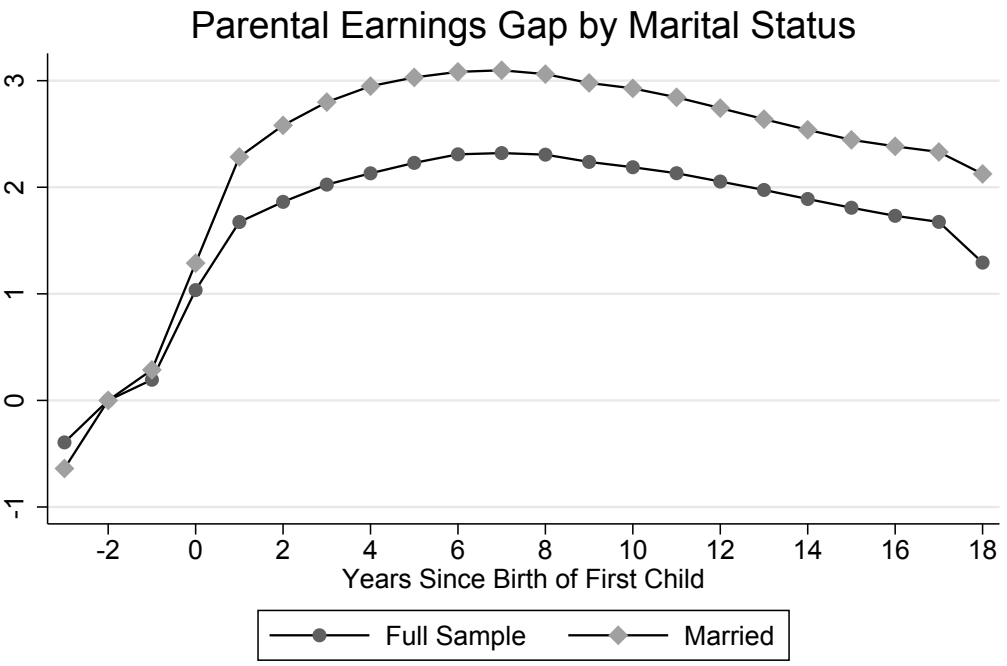
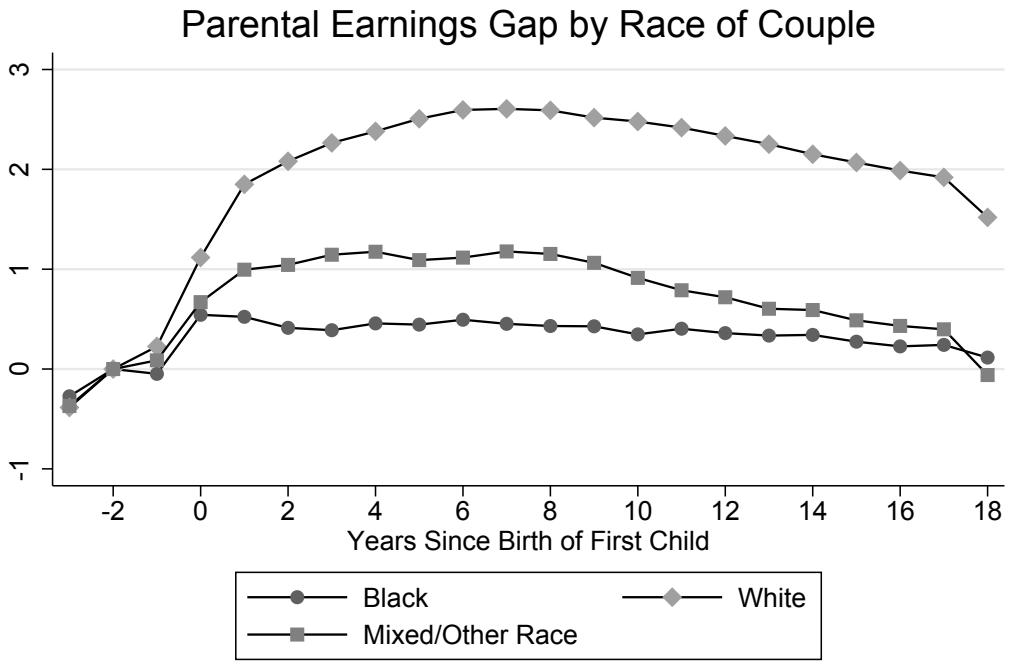


Figure 8 shows the earnings gap dynamics by the race of the couple. The pattern for white couples, where both the male spouse and female spouse are white, resembles the main results. However, the results for black couples and mixed race or other race couples show a much smaller increase in the gap around the birth of the first child. Since race is correlated with marriage rates, income levels, and other variables that might impact the earnings gap dynamics, it is hard to interpret the race results alone, but the contrast with the dynamics of

the coefficients of the white couples is notable and this finding deserves further investigation.

Figure 8: Results by Race



Dependent variable is the difference between the male spouse and female spouse's log yearly earnings. Regression controls for couple fixed effects and year fixed effects

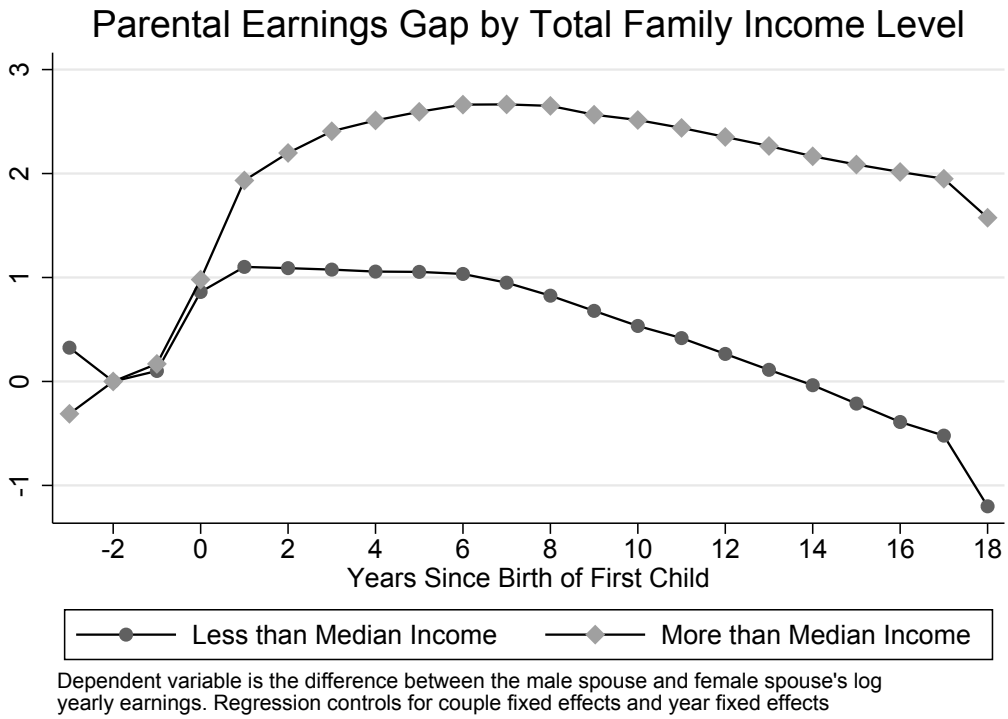
Families in different financial situations may respond differently to the labor market shock of having a child. Figure 9 show the earnings dynamics for families who had total family income (defined by adding the earnings of the male spouse and female spouse) above or below median family income two years before their first child was born[3]. For couples who were earning less than median income, the gender earnings gap increased less than it did for couples with earnings over the median income and reached parity relative to the $t = -2$ earnings gap after 15 years.

This gives an interesting picture of the tradeoff between income and time. Assuming for a moment that earnings are driven by hours, though the data does not allow us to separate

[3]Median family income defined as the U.S. median income for the earnings year from CPS estimates, not the sample median.

hours versus wages: for families who have income over some standard of living threshold, the marginal dollar earned is lower, and for some set of women falls below the value of the marginal hour of home production/child care. However, for families with lower incomes, the female spouse has a higher marginal value of earnings, so does not make as big a switch, on average, from labor hours to home production/childcare hours.

Figure 9: Results by Income Level



5.3 Household Bargaining

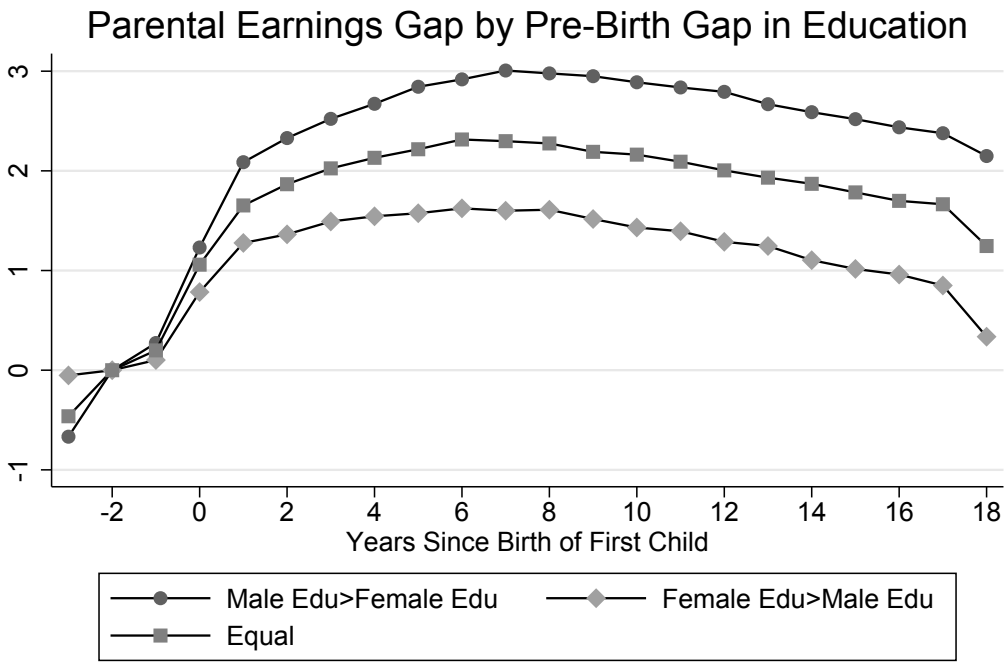
In a household bargaining framework, we need to go beyond the discussion of a shock to earnings in aggregate, to discussing the components of earnings: hours and wages. In the previous discussion, we assume there is a shock to earnings at the time a child is born, but attempt to be agnostic with respect to the mechanism of that shock, because the data, which only measures annual earnings, is necessarily agnostic.

For simplicity, we assume the shock to earnings comes solely in the form of a time shock. The male spouse previously had T_H hours total, which he divided into labor hours T_{HL} and home hours T_{HH}, the female spouse similarly had T_F hours divided into labor and home hours T_{FL} and T_{FH} respectively. After their first child is born, they have a new constraint on their time, childcare. Some of that extra constraint can be transferred to another party in the form of paid childcare. But some of the time cost is non-transferable. The couple then must decide how to accommodate the extra constraint. If it cannot be accommodated from the household production hours alone, then one or both spouses will have to reduce their labor hours.

In the household bargaining framework, the spouse with the lower earnings or potential earnings should reduce their hours in order to maximize the total household income. Figure 10 shows the event-study specification on the log difference in earnings by the relative education of the male and female spouse, using educational attainment as a proxy for potential earnings. Although the gap in post-child earnings increases for all spouses, even when the female spouse has more education than the male spouse, the earnings gap increases more for couples where the male spouse has more education than the female spouse.

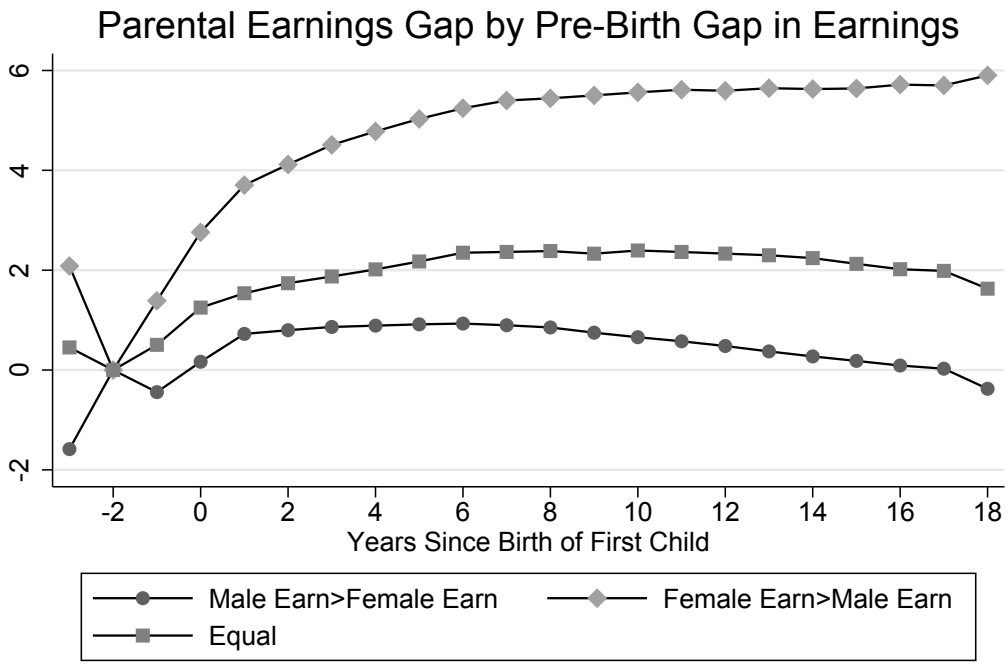
When we use pre-birth earnings as a proxy for potential future earnings in Figure 11, we see the opposite pattern from the one shown for relative education. Those with higher pre-birth earnings for the female spouse than the male spouse have a much larger gap post-birth than those couples where the gap was approximately equal (within $1,000) or where the male spouse earned more than the female spouse initially. This is probably due to serial correlation between the $t-2$ earnings, the boundary condition at zero (i.e. no one earns negative income) and the change in earnings. If the female spouse is earning a lot pre-birth, her earnings relative to her spouse's earnings have further to fall post-birth than someone who earned less.

Figure 10: Results by Spousal Educational Differences



Dependent variable is the difference between the male spouse and female spouse's log yearly earnings. Regression controls for couple fixed effects and year fixed effects

Figure 11: Results by Spousal Pre-Birth Income Differences



Dependent variable is the difference between the male spouse and female spouse's log yearly earnings. Regression controls for couple fixed effects and year fixed effects

6 Conclusion

The paper makes two major contributions to the vast literature on the gender earnings gap. The first is the measurement of the parental gender earnings gap, the difference in earnings of spouses at the time their child is born, for couples in the United States. The second is a detailed examination of the trajectory of this gap over time. We show that the gap in parental gender earnings increases during the year of birth and the year after the child is born. After the years immediately following the child's birth, the gap continues to grow for the full sample, but at a much slower rate for several years. The continued growth after the first years appears to be driven by the birth of future children.

Exploring the heterogeneity of this result over various sub-samples suggests a number of areas for future research. The pattern differs for couples having children in different decades, with the couples who had children in the 1990s recovering parity when their children are in their early teenage years. During these decades there were a number of social and economic changes, including increased labor force participation of women, increased education, macroeconomic booms and busts. This paper combined the intensive and extensive margin of labor force participation by looking at all couples after the birth of their first child, but further analysis could look explicitly at women who returned to the labor force immediately versus women who dropped out and returned after the child was older. For the women who drop out of the labor force, their later labor market experiences may differ by the macroeconomic conditions at labor market re-entry.

Our results by socioeconomic subgroups also suggest areas for future research. The racial subgroups show very different patterns, but these patterns are difficult to interpret because race is correlated with income, marital status, education, age at first birth, total family size, and other variables that potentially affect earnings trajectories. Disentangling these competing explanations for the difference in racial groups would allow for a more satisfying explanation of the patterns by the broad racial categories shown in this paper.

The male-female earnings gap has fallen over the last several decades, but the rate of decline has slowed in recent years. To support further declines, we must understand why

the gap still exists. Parenthood is an important factor in the remaining gap. This paper shows that the transition to parenthood leads to a sharp and persistent increase in the gap between the earning of male and female spouses, driven by a decrease in the earnings of the female spouse. To reduce the overall male-female earnings gap, one could target either the size of the initial increase in the gap at childbirth, or decrease the persistence of that earnings shock.

7 Tables

Table 5: Event Study Estimates of the Parental Gender Earnings Gap

	No FE	Year FE	Full Controls
Birth Year -1	0.126***	0.190***	0.194***
	(0.0160)	(0.0160)	(0.0160)
Birth Year	0.899***	1.027***	1.035***
	(0.0200)	(0.0200)	(0.0200)
Birth Year +1	1.474***	1.662***	1.674***
	(0.0230)	(0.0230)	(0.0230)
Birth Year +2	1.600***	1.848***	1.863***
	(0.0240)	(0.0240)	(0.0240)
Birth Year +3	1.697***	2.005***	2.025***
	(0.0240)	(0.0240)	(0.0250)
Birth Year +4	1.740***	2.107***	2.131***
	(0.0250)	(0.0250)	(0.0250)
Birth Year +5	1.776***	2.202***	2.229***
	(0.0250)	(0.0250)	(0.0260)
...			
Birth Year +10	1.443***	2.142***	2.188***
	(0.0260)	(0.0270)	(0.0280)
...			
Birth Year +15	0.785***	1.744***	1.808***
	(0.0270)	(0.0290)	(0.0300)
Δ Spouse Log(Earn)	0.219***	0.260***	
	(0.0040)	(0.0040)	
Δ Spouse Age	-0.0210***	-0.0210***	
	(0.0020)	(0.0020)	
Δ Spouse Edu	0.616***	0.583***	
	(0.0080)	(0.0080)	
Constant	1.560	1.715	1.729
Mean	1.684	1.684	1.684

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The first regression includes no fixed effects but controls for the difference in age and education of the two parents the second includes calendar year fixed effects and the third includes year fixed effects and couple fixed effects (within couple differences are dropped). * p<0.05 ** p<0.01 *** p<0.001

Table 6: Earnings Dynamics Around Birth of Child by Gender

	Men	Women
Birth Year -1	0.405***	0.211***
	(0.0110)	(0.0120)
Birth Year	0.759***	-0.275***
	(0.0130)	(0.0160)
Birth Year +1	1.016***	-0.658***
	(0.0140)	(0.0190)
Birth Year +2	1.236***	-0.627***
	(0.0150)	(0.0210)
Birth Year +3	1.451***	-0.574***
	(0.0160)	(0.0220)
Birth Year +4	1.621***	-0.510***
	(0.0170)	(0.0220)
Birth Year +5	1.770***	-0.459***
	(0.0180)	(0.0230)
...		
Birth Year +10	2.407***	0.219***
	(0.0220)	(0.0250)
...		
Birth Year +15	2.956***	1.147***
	(0.0260)	(0.0270)
Constant	6.450***	4.721***
	(0.0180)	(0.0200)
Mean	1.684	1.684
N	159333	159333

Notes:Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the log earnings of men and women at time t. This includes the same sample as the main estimates but estimates the effect on earning of men and women separately. * p<0.05 ** p<0.01 *** p<0.001

Table 7: Event Study of Parental Earnings Gap by Total Number of Children

	One Kid	Two Kids	More Kids
Birth Year -1	0.184***	0.221***	0.219***
	(0.0280)	(0.0230)	(0.0320)
Birth Year	0.886***	1.113***	1.173***
	(0.0350)	(0.0300)	(0.0390)
Birth Year +1	1.389***	1.820***	1.889***
	(0.0410)	(0.0340)	(0.0450)
Birth Year +2	1.363***	2.032***	2.286***
	(0.0430)	(0.0360)	(0.0480)
Birth Year +3	1.381***	2.246***	2.536***
	(0.0440)	(0.0370)	(0.0500)
Birth Year +4	1.341***	2.357***	2.792***
	(0.0450)	(0.0390)	(0.0510)
Birth Year +5	1.330***	2.461***	3.001***
	(0.0460)	(0.0400)	(0.0520)
...			
Birth Year +10	1.166***	2.240***	3.438***
	(0.0510)	(0.0450)	(0.0560)
...			
Birth Year +15	0.850***	1.865***	3.149***
	(0.0560)	(0.0510)	(0.0600)
Constant	1.909***	1.816***	1.603***
	(0.0490)	(0.0340)	(0.0460)
Mean	1.317	1.788	2.124
N	67207	47212	44914

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The first regression includes families with only one child the second includes only families with two children and the third includes familes with more than two children measured by the value of "own kids ever" for the female spouse. All regressions control for couple fixed effects. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 8: Event Study of Parental Earnings Gap by Decade

	1978-1989	1990-1999	2000-2011
Birth Year -1	0.292***	0.0320	0.0890*
	(0.0240)	(0.0260)	(0.0390)
Birth Year	1.221***	0.728***	0.713***
	(0.0330)	(0.0360)	(0.0490)
Birth Year +1	1.889***	1.200***	1.414***
	(0.0410)	(0.0460)	(0.0610)
Birth Year +2	2.120***	1.248***	1.634***
	(0.0480)	(0.0540)	(0.0670)
Birth Year +3	2.338***	1.304***	1.757***
	(0.0550)	(0.0610)	(0.0700)
Birth Year +4	2.478***	1.342***	1.811***
	(0.0630)	(0.0700)	(0.0730)
Birth Year +5	2.589***	1.378***	1.891***
	(0.0700)	(0.0780)	(0.0770)
...			
Birth Year +10	2.723***	0.747***	1.749***
	(0.106)	(0.126)	(0.125)
...			
Birth Year +15	2.493***	-0.101	
	(0.137)	(0.177)	
Constant	1.827***	0.799***	2.262***
	(0.0440)	(0.0430)	(0.0220)
Mean	1.989	1.799	1.283
N	30529	19322	51671

Notes:Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. Each regression includes children born in the decade with the 1980 decade and 2000 decade inclusive of births that were earlier or later respectively. All regressions control for couple fixed effects. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 9: Parental Earnings by Age of Woman at Childbirth

	Teens	Early 20s	Late 20s	Early 30s	35+
Birth Year -1	-0.403***	0.175***	0.230***	0.250***	0.243***
	(0.0480)	(0.0300)	(0.0260)	(0.0350)	(0.0600)
Birth Year	-0.0440	1.145***	1.050***	0.995***	0.811***
	(0.0590)	(0.0380)	(0.0340)	(0.0450)	(0.0770)
Birth Year +1	-0.444***	1.587***	1.936***	1.934***	1.616***
	(0.0660)	(0.0430)	(0.0410)	(0.0550)	(0.0960)
Birth Year +2	-0.715***	1.633***	2.173***	2.218***	1.697***
	(0.0710)	(0.0450)	(0.0440)	(0.0600)	(0.104)
Birth Year +3	-0.859***	1.672***	2.346***	2.412***	1.852***
	(0.0750)	(0.0480)	(0.0460)	(0.0640)	(0.109)
Birth Year +4	-0.884***	1.666***	2.425***	2.504***	1.796***
	(0.0790)	(0.0510)	(0.0490)	(0.0680)	(0.113)
Birth Year +5	-0.943***	1.660***	2.536***	2.510***	1.720***
	(0.0820)	(0.0530)	(0.0510)	(0.0710)	(0.121)
...					
Birth Year +10	-1.625***	1.165***	2.216***	2.217***	1.240***
	(0.102)	(0.0660)	(0.0640)	(0.0890)	(0.164)
...					
Birth Year +15	-2.528***	0.340***	1.723***	1.719***	0.267
	(0.124)	(0.0800)	(0.0780)	(0.111)	(0.210)
Constant	1.957***	0.729***	1.245***	1.470***	1.337***
	(0.0640)	(0.0430)	(0.0440)	(0.0620)	(0.113)
Mean	1.964	1.984	1.880	1.602	1.346

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. Each regression includes women who had their children when they were less than 20, 20-24, 25-29, 30-34, and 35+ respectively. All regressions control for couple fixed effects. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 10: Event Study of Parental Earnings Gap by Marital Status at Time of Birth

	Full Sample	Married at First Birth
Birth Year -1	0.194***	0.287***
	(0.0160)	(0.0190)
Birth Year	1.035***	1.288***
	(0.0200)	(0.0240)
Birth Year +1	1.674***	2.285***
	(0.0230)	(0.0290)
Birth Year +2	1.863***	2.581***
	(0.0240)	(0.0300)
Birth Year +3	2.025***	2.799***
	(0.0250)	(0.0320)
Birth Year +4	2.131***	2.949***
	(0.0250)	(0.0330)
Birth Year +5	2.229***	3.031***
	(0.0260)	(0.0340)
...		
Birth Year +10	2.188***	2.928***
	(0.0280)	(0.0380)
...		
Birth Year +15	1.808***	2.445***
	(0.0300)	(0.0430)
Constant	1.729***	2.062***
	(0.0240)	(0.0290)
Mean	1.684	2.075
N	159333	63215

Notes:Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The first regression includes all couples the second only includes those that were married at the time of the birth of the first child. Both regressions control for couple fixed effects. * p<0.05 ** p<0.01 *** p<0.001

Table 11: Event Study of Parental Earnings Gap by Race

	White	Black	Mixed
Birth Year -1	0.226***	-0.0480	0.0870
	(0.0170)	(0.0640)	(0.0540)
Birth Year	1.117***	0.543***	0.670***
	(0.0210)	(0.0760)	(0.0680)
Birth Year +1	1.850***	0.523***	0.995***
	(0.0250)	(0.0850)	(0.0760)
Birth Year +2	2.081***	0.413***	1.043***
	(0.0260)	(0.0880)	(0.0810)
Birth Year +3	2.265***	0.389***	1.145***
	(0.0270)	(0.0910)	(0.0830)
Birth Year +4	2.381***	0.457***	1.175***
	(0.0280)	(0.0930)	(0.0870)
Birth Year +5	2.507***	0.445***	1.091***
	(0.0280)	(0.0950)	(0.0910)
...			
Birth Year +10	2.479***	0.347***	0.913***
	(0.0300)	(0.104)	(0.101)
...			
Birth Year +15	2.069***	0.274*	0.488***
	(0.0330)	(0.115)	(0.113)
Constant	1.702***	1.701***	1.692***
	(0.0260)	(0.0890)	(0.0800)
Mean	1.781	0.661	1.563
N	136158	11563	11612

Notes:Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The first regression includes couples that are both white the second shows results for couples that are both black and the third shows results for mixed race/other couples. All regressions control for couple fixed effects. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 12: Event Study of Parental Earnings Gap by Family Income Level

	< Median Income	> Median Income
Birth Year -1	0.101***	0.169***
	(0.0240)	(0.0180)
Birth Year	0.861***	0.980***
	(0.0300)	(0.0240)
Birth Year +1	1.102***	1.933***
	(0.0340)	(0.0300)
Birth Year +2	1.090***	2.198***
	(0.0370)	(0.0310)
Birth Year +3	1.076***	2.407***
	(0.0390)	(0.0320)
Birth Year +4	1.057***	2.511***
	(0.0410)	(0.0330)
Birth Year +5	1.054***	2.594***
	(0.0430)	(0.0330)
...		
Birth Year +10	0.534***	2.515***
	(0.0530)	(0.0350)
...		
Birth Year +15	-0.213**	2.087***
	(0.0660)	(0.0370)
Constant	0.802***	1.548***
	(0.0350)	(0.0300)
Mean	1.750	1.660

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The sample is split into families above and below the national median income, defined as the median income in the CPS for the earnings year. Both regressions control for couple fixed effects. * p<0.05 ** p<0.01 *** p<0.001

Table 13: Parental Gender Earnings Gap by Pre–Birth Gap in Education

	Male Edu>Female Edu	Female Edu>Male Edu	Equal Edu
Birth Year -1	0.273***	0.102***	0.199***
	(0.0310)	(0.0300)	(0.0230)
Birth Year	1.231***	0.784***	1.059***
	(0.0390)	(0.0380)	(0.0280)
Birth Year +1	2.087***	1.277***	1.653***
	(0.0460)	(0.0430)	(0.0330)
Birth Year +2	2.329***	1.363***	1.866***
	(0.0480)	(0.0450)	(0.0340)
Birth Year +3	2.522***	1.492***	2.025***
	(0.0500)	(0.0470)	(0.0360)
Birth Year +4	2.673***	1.544***	2.131***
	(0.0510)	(0.0480)	(0.0370)
Birth Year +5	2.844***	1.575***	2.217***
	(0.0520)	(0.0490)	(0.0370)
...			
Birth Year +10	2.889***	1.432***	2.163***
	(0.0560)	(0.0540)	(0.0400)
...			
Birth Year +15	2.519***	1.016***	1.784***
	(0.0590)	(0.0590)	(0.0440)
Constant	1.860***	1.564***	1.724***
	(0.0470)	(0.0460)	(0.0340)
Mean	2.442	0.843	1.645

Notes: Each column is the results of a regression of a series of indicator variables for the time since the birth of the first child. The dependent variable is the difference in log earnings between the male and female spouse at time t. The sample is split into three couple types, those where the male spouse is more education than the female spouse, those where the female spouse is more educated than the male spouse, and those where the two spouses have equal educational attainment. All regressions control for couple fixed effects. * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 14: Parental Gender Earnings Gap by Pre–Birth Gap in Earnings

	Male Earn>Female Earn	Female Earn>Male Earn	Earn Difference<$1000
Birth Year -1	-0.443***	1.388***	0.505***
	0.0190	0.0330	0.0450
Birth Year	0.166***	2.760***	1.251***
	0.0240	0.0410	0.0530
Birth Year +1	0.724***	3.704***	1.538***
	0.0280	0.0480	0.0590
Birth Year +2	0.798***	4.117***	1.739***
	0.0290	0.0500	0.0620
Birth Year +3	0.863***	4.509***	1.874***
	0.0300	0.0520	0.0640
Birth Year +4	0.889***	4.780***	2.016***
	0.0310	0.0540	0.0670
Birth Year +5	0.915***	5.030***	2.175***
	0.0310	0.0570	0.0700
...			
Birth Year +10	0.658***	5.562***	2.394***
	0.0330	0.0700	0.0880
...			
Birth Year +15	0.183***	5.640***	2.127***
	0.0350	0.0870	0.111
Constant	3.342***	-2.027***	-0.00900
	0.0290	0.0520	0.0530
Mean	1.841	0.268	1.400

Notes:

References

Anderson, D. J., Binder, M. & Krause, K. (2002), 'The Motherhood Wage Penalty: Which Mothers Pay It and Why?', *American Economic Review Papers and Proceedings* **92**(2), 354–358.

Angelov, N., Johansson, P. & Lindahl, E. (2016), 'Parenthood and the Gender Gap in Pay', *Journal of Labor Economics* **34**(3).

Bailey, M. J. (2006), 'More Power to the Pill: The Impact of Contraceptive Freedom on Women's Life Cycle Labor Supply*', *The Quarterly Journal of Economics* **121**(1), 289–320.
URL: *http://dx.doi.org/10.1093/qje/121.1.289*

Bailey, M. J., Hershbein, B. & Miller, A. R. (2012), 'The Opt-In Revolution? Contraception and the Gender Gap in Wages', *American Economic Journal: Applied Economics* **4**(3), 225–254.
URL: *http://www.aeaweb.org/articles?id=10.1257/app.4.3.225*

Bayard, K., Hellerstein, J., Neumark, D. & Troske, K. (2003), 'New Evidence on Sex Segregation and Sex Differences in Wages from Matched EmployeeEmployer Data', *Journal of Labor Economics* **21**(4), 887–922.
URL: *http://www.jstor.org/stable/10.1086/377026 http://www.jstor.org/stable/10.1086/377026*

Bertrand, M., Goldin, C. & Katz, L. F. (2010), 'Dynamics of the gender gap for young professionals in the financial and corporate sectors', *American Economic Journal: Applied Economics* **2**, 228–255.

Blau, F. D. & Kahn, L. M. (2017), 'The Gender Wage Gap: Extent, Trends, and Explanations', *Journal of Economic Literature* **55**(3), 789–865.

Goldin, C. & Katz, L. F. (2002), 'The Power of the Pill: Oral Contraceptives and Womens Career and Marriage Decisions', *Journal of Political Economy* .

Herr, J. L. (2012), Measuring the Effect of the Timing of First Birth.

Hotchkiss, J. L., Pitts, M. M. & Walker, M. B. (2017), 'Impact of first birth career interruption on earnings: evidence from administrative data', *Applied Economics* **49**(35), 3509–3522.
URL: *http://dx.doi.org/10.1080/00036846.2016.1262523*

Juhn, C. & McCue, K. (2017), 'Specialization Then and Now: Marriage, Children, and the Gender Earnings Gap across Cohorts', *Journal of Economic Perspectives* **31**(1), 183–204.
URL: *http://www.aeaweb.org/articles?id=10.1257/jep.31.1.183*

Lundberg, S., Pollak, R. A. & Stearns, J. E. (2016), 'Family Inequality: Diverging Patterns in Marriage, Cohabitation, and Childbearing', *NBER Working Paper Series* (22078).
URL: *http://www.nber.org/papers/w22078*

Mathews, T. J. & Hamilton, B. E. (2016), 'Mean Age of Mothers is on the Rise: United States, 2000-2014.', *NCHS data brief* (232), 1–8.

Miller, A. R. (2011), 'The effects of motherhood timing on career path', *Journal of Population Economics* **24**(3), 1071–1100.
URL: *http://dx.doi.org/10.1007/s00148-009-0296-x*

Schaller, J. (2016), 'Booms, Busts, and Fertility: Testing the Becker Model Using Gender-Specific Labor Demand', *Journal of Human Resources* **51**(1), 1–29.

U.S. Bureau of Labor Statistics (2016), Highlights of women's earnings in 2016, Technical report, U.S. Bureau of Labor Statistics.
URL: *https://www.bls.gov/opub/reports/womens-earnings/2016/pdf/home.pdf*

U.S. Census Bureau (2017), 'SIPP Synthetic Beta: Version 6.0.2'.