Working Paper 54

MATHEMATICA Policy Research

Working PAPER

BY NAN L. MAXWELL AND NATHAN WOZNY

Gender Gaps in Time Use and Earnings: What's Norms Got to Do With It?

March 2017

ABSTRACT

Researchers have speculated that some portion of the gender differences in earnings lies in societal norms. This research assesses the extent to which norms related to behaviors at home and work and to parenting might affect gender differences in time allocation, earnings, and employment. It estimates the influence of norms using data from the American Community Survey and American Time Use Survey and four groups of demographically matched individuals with relatively homogeneous within-group need for production: singles without children, single parents, married couples without children, and married parents. Our results provide evidence that norms might be an important component of gender gaps in time use, earnings, and employment. Their importance suggests that policies designed to reduce the gender gaps in time use and in earnings might not be successful unless they address the norms that govern how women and men should behave at home and work.

Keywords: norms, earnings, employment, time use, gender differentials, gender disparities

This research was inspired by work performed by Mathematica Policy Research under contract to the U.S. Department of Labor (DOL), Office of the Assistant Secretary for Policy, Chief Evaluation Office. The views expressed are those of the authors and should not be attributed to Mathematica, DOL, the United States Air Force Academy, the Air Force, the Department of Defense, or any part of the U.S. Government, nor does any mention of trade names, commercial products, or organizations imply the endorsement of same by the U.S. Government. The authors would like to acknowledge the outstanding research assistance of Alex Lu, discussions with and comments from Paul Burkander, Ronald D'Amico, Jed DeVaro, Dana Rotz, and seminar participants at the Colorado School of Mines, Mathematica Policy Research, and California State University, East Bay.

I. INTRODUCTION

Women and men spend their time in different ways (Bureau of Labor Statistics, no date). In 2015, women age 15 or older spent an average of 2.3 hours a day caring for and helping others in their household, and 7.6 hours working, whereas men spent 1.6 and 8.4 hours on these activities, respectively. These differences could underlie at least part of the male-female gap in labor market earnings, which were about 25 percent higher for men than for women among full-time, full-year workers in 2005. This gap that has remained relatively stable since the 1990s (Blau and Kahn 2016; Cha and Weeden 2014).

All of these gaps could be linked by norms, the implicit and explicit rules and expectations that govern behavior and underlie economic outcomes (Akerlof and Kranton 2000, 2010). The norms that dictate women as the primary producer in the home and men as the primary producer in the labor market might explain the three sets of research findings:

1. a persistent drop in women's earnings after they become parents (Waldfogel 1998);
2. labor contract structures for women with lower earnings and effort than for men (Albanesi and Olivetti 2009) that lead to a large gender gap in earnings in jobs that require long hours (Cortes and Pan 2016; Goldin 2014; Cha and Wheeden 2014; Gicheva 2013); and
3. a persistent gender gap in earnings over time (Blau and Kahn 2016; Cha and Weeden 2014) because norms are slow to change, and they often resist economic forces.

Researchers are increasingly implying that the link between norms and the persistent gender earnings gap could be important. For example, Juhn and McCue (2017, page 201) state that:

> *The persistent nature of the motherhood gap—particularly among professional women poised for high-paying careers and among women who have access to generous leave benefits and child care subsidies—brings home the point that women still devote much more time to child-rearing over the course of their careers than do men with similar human capital characteristics. One set of explanations put forward revolve around social norms. . .*

And Blau and Kahn (2016, page 43) state that "explorations of gender norms and identity by economists would be fruitful in understanding the gender wage gap and other gender differences in outcomes."

This study estimated the influence of norms on gender differences in time use and earnings. We used data from the American Community Survey (ACS) and the American Time Use Survey (ATUS) to construct and compare time use and earnings outcomes between four household types, each of which contains individuals with similar production needs: singles without children, single parents, married couples without children, and married parents. The relative within-group similarity in production needs allows us to isolate the influence of norms on time use and earnings. The results of the study suggest that norms play a potentially strong role in explaining gender gaps. More specifically, our estimates, although approximate, suggest that norms explain a majority of the gap in time devoted to work, household production, and earnings, and over 40 percent of the gap in employment. The importance of norms in explaining gender disparities suggests that policies such as universal access to quality child care or greater

flexibility in workplace structures might—even if they have other merits—be ineffective or even counterproductive in reducing disparities, as they could perpetuate norms if women use them without reducing their household responsibilities.

II. FRAMEWORK

The concept of norms, as we use it in this paper, refers to how society thinks that individuals in a group should or should not behave (Michaeli and Spiro 2017). Stated another way, norms prescribe the implicit and explicit rules and expectations that dictate behavior. Deviating from them comes at a cost to individuals in the form of discomfort and anxiety about oneself and creates discomfort in others because someone is not behaving as others expect them to behave (Akerlof and Kranton 2000, 2010). The cost to individuals of violating norms, or to individuals who bear the resulting discomfort, leads individuals to behave in ways that are consistent with societal views and expectations (Brines 1994; South and Spitze 1994).

Survey research suggests that norms prescribe behaviors about parenting and other household activities, especially as they relate to employment. About half (51 percent) of the respondents to a 2013 Pew Research Center survey said children are better off if a mother is home and does not hold a job, whereas just 8 percent said that about a father (Wang, Parker, and Taylor 2013). In 2012, a plurality of adults (42 percent) said that having a mother who works part time is ideal for young children, whereas 33 percent said that having a mother who does not work outside the home is ideal (Parker and Wang 2014). In contrast, 75 percent of fathers who have children younger than 18 said they believe working full time is ideal. Furthermore, research suggests that within a marriage, norms lead to differences in how women and men use their time: women do routine chores like cooking and cleaning, whereas men do nonroutine chores like home repairs (Lachance-Grzela and Bou 2010). About half of the respondents to the 2013 Pew Research Center survey said that the trend in women working for pay makes it harder for a marriage to succeed (Wang, Parker, and Taylor 2013).

Other studies support the importance of norms in determining behavior. For example, Bertrand, Pan, and Kamencia (2015) found that households that deviate from the norm with wives earning more than their husbands are less likely to form than more gender-typical households with husbands earning more than their wives, and if they do form, they are less likely to remain intact. If they do remain intact, men compensate for the violation in norms by engaging less in household production (Bittman et al. 2003), and women spend more time on housework than other similarly employed women (Greenstein 2000). [1]

Norms would also produce lower earnings for women by creating gender-based behaviors in the workplace. Employers would favor men when hiring workers (Goldin and Rouse 2000; Neumark, Bank, and Van Nort 1996), and male workers would behave in ways that are

[1] This paper focuses on the *relative* level of production (household and work) and not the absolute level. When income increases (for example) the absolute level of household production might decrease as the household substitutes market services for household production (Baxter and Rotz 2009) and when a women's earnings increases her time in household production might decrease (Gupta and Ash 2008). Because our focus on relative levels of production implicitly addresses absolute influences empirically through matching, we do not discuss them in the framework.

consistent with a weak prejudice against working with females (Pan 2015). Employers would use occupational segregation to construct an efficient wage structure by lowering earnings of women (Goldin 1986), and women would select more flexible jobs that facilitate child raising (Goldin 2014) at the cost of lower earnings (Albrecht et al. 1999), thus creating the glass ceiling (Albrecht, Bjorklund, and Vroman 2003). Both norms and lower earnings of women, for which the norms may be partly responsible, produce a feedback loop between work and household production. Female youth expect a future in which they engage heavily in household production, which leads them to invest in human capital leading to jobs that enable the level of household production to fluctuate over their life cycle (Goldin and Mitchell 2017). Employers who expect women to devote more time to household production than do men not only offer women and men different labor contracts (Albanesi and Olivetti 2009); they also create a flexible workplace for women but at a cost of lower earnings (Goldin 2014; Goldin and Katz 2010, 2011).

III. EMPIRICAL FRAMEWORK AND MODEL

Estimating the influence of norms on time use and earnings is complicated by two factors. First, it is difficult to disentangle norms and gains from efficiency from the allocation of time to work and to household production because, on average, both incentivize women to allocate more time than men to household production. All individuals have 24 hours per day to allocate to work and household production[2] and to do so by maximizing the time- and income-constrained utility that is gained from the goods and services obtained through production. Lower earnings for women make it more efficient for them than men to produce goods and services at home and to use wages to purchase them in the market. Gains from efficiency are greater when households act as if they jointly maximize utility—predominantly married couples. The lower earnings of wives in these households lead them to specialize in home production, and their husbands to specialize in market production (Becker 1965), which we call work. These gains from efficiency occur even when both a husband and a wife work, and they increase in the presence of a child when household production increases (Angelov, Johansson, and Lindahl 2016).

The second confounding factor is that it is empirically difficult to disentangle norms and gains from efficiency from selection into marriage and parenthood (Juhn and McCue 2017; Neuman and Oaxaca 2004; Manski 1989). This selection effect is likely to be strong when we consider earnings outcomes that are conditional on employment, and it is especially strong for married mothers because the composition of the group of married mothers who work full-time differs systematically from the other groups, even after adjusting for observable demographic differences (Heckman 1976, 1979). In particular, married mothers who work full time may have greater earnings potential than others because they have chosen to work full time in a situation in which norms and gains from efficiency would typically motivate them to work less (i.e., higher earnings offset the cost of working associated with the norms).

In our study, we used the differing production needs of households to estimate the influence of norms on gender differences in time use and earnings. Although we cannot cleanly separate norms and gains from efficiency, we based our analysis on two assumptions that help us provide

[2] Individuals can also allocate time to leisure activities and building human capita (for example)l. Because this study focuses only on work and household production, we do not discuss these aspects of time allocation.

a sense of the value in adding norms explicitly to the explanation of gender difference in time and earnings. First, norms influence the allocation of time and earnings for individuals in all types of households, and marriage and children strengthen gender-based behaviors. This assumption implies that the same social expectations that influence time spent in work and household production for the population as a whole have their strongest influence on how wives and husbands behave and on parents. Second, gains from efficiency have their strongest influence on the allocation of time and on earnings for individuals that are in married couple households because they act as if they maximize joint utility. This assumption implies that gains from efficiency primarily start with household formation (i.e., marriage) and increase after the birth of a child because production in a household with a child not only *includes* general household management responsibilities but also includes *added* responsibilities in the form of cleaning, for example, along with parenting and child care.

Given these assumptions, the variation in gender gaps across household types can help to isolate the influence of norms about work and household production, parenting, and marriage from the influence of gains from efficiency because the influences affect households in different ways (Table 1). The gender gaps in time use and earnings among *singles without children* reflects the norms about household production and work because individuals in such households are not influenced by children or marriage. Women in these households might also experience gains from efficiency (compared to men): the lower earnings or women would lead them to substitute household production for work, whereas men would substitute market production for household production. We expect such gains to be small compared with the gains from efficiency realized by parenting in households who act as if they jointly maximize utility. As a result, single women without children will earn less and allocate more time to household production and less time to work than would single men without children because of norms.

Table 1. Expected influence of norms and gains from efficiency

	Single no children	Single parents	Married no children	Married parents
Panel A. Norms				
Work and household	X	X	X	X
Parenting	0	X	0	X
Marriage norms	0	0	X	X
Parenting norms within marriage	0	0	0	X
Panel B. Efficiency				
Adult	X	X	X	X
Child	0	X	0	X
Marriage	0	0	X	X
Marriage with children	0	0	0	X

X = expected influence, 0 = no expected influence

Gender gaps between individuals who are non-cohabitating *single parents* reflect both norms about household production and work, and norms about parenting. Although the presence of children could also increase the gains from efficiency that are associated with the lower

earnings or women (discussed above), we expect such gains to be small compared with the gains from efficiency realized by parenting in households who act as if they jointly maximize utility. As a result, single mothers will earn less and allocate more time to household production and less time to work than would single fathers; this gap will be larger than it is for singles without children because of the additional influence of parenting norms.

The gender gaps between individuals who are *married without children* reflect the norms about household, work, and marriage as well as gains from efficiency in production for adults. As a result, married women without children will earn less, devote less time to work, and allocate more time to the household than would married men without children. This gap is larger than it is for singles without children because of the additional influence of norms about marriage and gains from efficiency.

Finally, the gender gaps between individuals who are *married parents* reflect the norms about work, home, marriage, parenting, and parenting within marriage as well as the gains from efficiency in production that are created when the household was formed upon marriage and that intensified with children. As a result, married mothers would earn less, devote less time to work, and allocate more time to household production than would married fathers. These gender gaps also reflect the norms that influence the other three households.

Modeling the influence of norms on gender gaps

The unique combination of the influences of norms and gains from efficiency on time allocation and earnings for individuals in each of the four household types helps us to isolate and disentangle the influence of different forms that norms take. Gender gaps (γ) in time or earnings among those who are single with no children (sn) can be attributed primarily to norms about work and home (N_{wh}) with small levels of gains from efficiency (E_a) in household production because women earn less than men. Relative to single adults with no children, the additional gaps among single parents (sp) can be attributed to norms about parenting (N_p) and additional gains from efficiency when children are present (E_c); we suspect that these gains are small relative to norms. Relative to single adults with no children, the additional gaps among married couples with no children (mn) can be attributed either to gains from efficiency that result from the specialization in production among adults that occurs after marriage (E_m) or to norms that dictate how one is supposed to act once married (N_m). Any remaining gaps (after all of the above influences are removed) for married parents (mp) can be attributed either to the gains from efficiency in household production when the household consists of married parents and when a child is present (E_{cm}) or to norms about parenting in a marriage (N_{pm}).

Although we can distinguish between norms and gains from efficiency conceptually, we cannot do so empirically. We posit that norms are most relevant in explaining the influences on single adults, so single adults without children have a gap $N'_{wh} = N_{wh} + E_a$, and single parents have an additional gap $N'_p = N_p + E_c$. Both terms overstate the respective effects of norms N_{wh} and N_p. By contrast, we suppose that gains from efficiency dominate any increase in gaps associated with marriage, defining $E'_m = E_m + N_m$ and $E'_{cm} = E_{cm} + N_{pm}$. We expect E' to overestimate the respective gains from efficiency, E_m and E_{cm}.

More succinctly, we can isolate the influence of different forms of norms because:

(1a) $\gamma_{sn} = N'_{wh}$

(1b) $\gamma_{sp} = N'_{wh} + N'_{p}$

(1c) $\gamma_{mn} = N'_{wh} + E'_{m}$

(1d) $\gamma_{mp} = N'_{wh} + N'_{p} + E'_{m} + E'_{cm}$.

By simply rearranging the terms in equation (1), we can estimate the influence of each form of norms and gains from efficiency based on differences in the gaps across household types:

(2a) $N'_{wh} = \gamma_{sn}$

(2b) $N'_{p} = \gamma_{sp} - \gamma_{sn}$

(2c) $E'_{m} = \gamma_{mn} - \gamma_{sn}$

(2d) $E'_{cm} = \gamma_{mp} - N'_{wh} - N'_{p} - E'_{m}$.

Estimates based on these equations only approximate the influences. As noted above, our estimates of norms are overstated because $N'_{wh} > N_{wh}$ and $N'_{p} > N_{p}$ and they are understated because E'_{m} and E'_{cm} both include norms.[3] Still, the estimates from equation (2) can provide a sense of whether norms play a role in gender differences, and if they do, the estimates would underscore the ramifications for policies that attempt to close the gender gap.

Adjusting for demographic differences through matching

Gender gaps in time use and earnings likely reflect differences in norms or efficiencies as specified by equation (2) as well as differences in characteristics that also affect time use and earnings (for example, education, age, or race/ethnicity). Such characteristics are different for women and men *within a household type* and between individuals who self-select into a household type, that is, *across household* types. For example, within all household types, women in all race-ethnic categories are more likely than men to have a bachelor's degree (Ryan and Bauman 2016). Cross-household differences exist for three reasons:

1. A higher percentage of women than men marry over the course of their lives (Aughinbaugh, Robles, and Sun 2013);
2. Women marry when they are younger (Aughinbaugh, Robles, and Sun 2013)

[3] We cannot improve estimates by restricting the sample to same-sex couples. Although individuals in same-sex marriages face the same broad influences from Nwh and, if applicable, from Np, norms that prescribe behavior within marriage, both Nm and Npm, are based on heterosexual marriages and do not apply to same-sex couples. Furthermore, although both heterosexual and same sex couples benefit from specialization in production, the resulting gains from efficiency do not affect gender gaps for same-sex couples because production decisions are made with a partner of the same sex. Half of all women (men) will, for example, reduce household production, and half will increase it. As a result, gender gaps in time use or earnings are not changed. Because Nm, Npm, Em, and Ecm do not affect gender gaps in same sex households, we excluded such households from our estimations.

3. A higher proportion (73 percent) of married couples with children are white (non-Hispanic), compared with single mothers (44 percent) and single fathers (61 percent) (Vespa et al. 2013).

Such differences require us to control for differences in demographic characteristics when estimating equation (2) gender gaps. Other researchers have used techniques such as regression adjustment or Blinder-Oaxaca decompositions (Blinder 1973; Oaxaca 1973) to control for observable differences between females and males. These solutions posit that outcomes (Y) for individuals (i) are a function of being female (F), human capital, and other characteristics (**X**)—which could include household type—and an error term (u):

(3) $Y_i = \alpha + \gamma F_i + \boldsymbol{\beta}'\mathbf{X}_i + u_i$.

Regression adjustments allow researchers to estimate the gender gap (γ) by adjusting mean outcomes for characteristics, and Blinder-Oaxaca decompositions allow researchers to stratify estimations by gender (with $\gamma = 0$) and to simulate outcomes for women as if they had, for example, male characteristics by substituting **X** for men in the estimated equation for women. Both techniques allow researchers to estimate gender gaps in outcomes while controlling for observable characteristics, but they also assume a linear specification that may not be appropriate for extrapolating the characteristics associated with one household type to the characteristics of another household type. [4] For example, time use among stay-at-home mothers varies by race and education (Cohen, Parker, Livingston, and Rohal 2014). In addition, views of the ideal work situation for women vary with income (Parker and Wang 2014). By contrast, matching techniques allow the estimated gaps to vary across household types while controlling for observable characteristic in gender differences without imposing a functional form assumption.

Our matching technique identifies a group of women or men in a given household type who are demographically comparable to the overall sample (that is, women and men in all household types). As a result, gender differences in any matched household type have netted out the differences in observable characteristics. Specifically, we adopted a reweighting technique that matches individuals exactly within each of three key characteristics: three categories of age at the time of the survey (24–29, 30–39, or 40–50); three categories of the highest level of educational achievement (no college, some college, or a bachelor's degree or higher); and four categories of race (white, black, Asian including Hawaiian/Pacific Islander, and other). We used a series of robustness checks to ensure that our results were not driven by the categories of the matching weights we used (see the appendix).

Our reweighting is analogous to that of DiNardo, Fortin, and Lemieux (1996) except that we matched exactly on demographic groups. We separated individuals into eight mutually exclusive matching groups, g, defined by gender and household type. Separately, we divided individuals into 36 mutually exclusive demographic groups d defined by membership in one of the age, education, and race categories. Within each demographic group, we matched the individuals to all observably identical individuals in the overall sample by scaling their weights. Given

[4] Using alternate functional forms in a regression adjustment may alleviate this problem, but this approach requires choosing an appropriate functional form.

sampling weights w_{igd} for each individual i in matching group g and demographic group d, we calculated the analytic weight as:

$$(4)\ \tilde{w}_{igd} = w_{igd} \cdot \frac{\sum_{i'g'} w_{i'g'd}}{\sum_{i'} w_{i'gd}} \cdot \frac{\sum_{i'd'} w_{i'gd'}}{\sum_{i'g'd'} w_{i'g'd'}}.$$

The technique ensures that the analytic weights have three properties. First, they are proportional to the survey sampling weights within each demographic group. Second, the sum of the analytic weights for any demographic group and a matching group is proportional to the sum of the sampling weights of that same demographic group in the overall sample. Accordingly, the weighted average of any demographic characteristic is identical across matching groups (and equal to the weighted average for the overall sample). Finally, the sum of the analytic weights across individuals in a matching group is equal to the sum of the sampling weights of that same group. Accordingly, the proportions of individuals in each matching group are identical when applying sampling weights or analytic weights.

We applied the analytic weights to the comparisons in equation (2). If the demographic variables used in the matching technique capture the relevant differences in characteristics across gender and household type, equation (2) will isolate the influence of norms and gains from efficiency as defined above. Like any matching method, our reweighting strategy has limitations. First, matching only guarantees that groups are identical on the specific categories included in the matching process. Even after the analytic weights are applied, the matched groups may differ in observable or unobservable characteristics not included in the matching process. Second, matching requires demographic groups to overlap across matching groups. For example, if a specific demographic group is not represented in all eight matching groups, then the individuals in this group are removed from analysis so that any matching group can be rescaled to match the remaining population. The appendix presents evidence that matching on more observable characteristics would reduce the support of the match with little effect on its quality. Nonetheless, we recognize that disentangling selection into household type is especially challenging for outcomes that are conditional on employment. Accordingly, we consider our analysis of earnings outcomes to be exploratory.

Adjusting influences by decomposing gender gaps

The influences identified in equation (2) only apply to specific household types. Equation (2a) identifies the influence of work and household norms on gender gaps in time use and earnings for the overall sample because norms about work and household production affect all individuals, but equations (2b) through (2d) identify norms that apply only to specific household types. For example, equation (2b) identifies the influence of norms about parenting on time use and earnings, but these norms affect only individuals who are parents. The demographically adjusted gender gap for the overall sample therefore depends not only on the influence of norms, but also on the proportion of the sample for whom any given norm applies.

We used a modified Blinder-Oaxaca decomposition (Blinder 1973; Oaxaca 1973) to split each demographically adjusted gender gap into the influences identified in equation (2). Although the Blinder-Oaxaca decomposition is frequently used to account for differences in observable characteristics, we used it to isolate the effects of norms and gains from efficiency,

which vary across household type, after adjusting for observable characteristics through the matching technique.

We began by applying the decomposition to each gap, using household type as the only objective characteristic, so that the each gap has within-household type components and across-household type components. Let $\overline{Y}_f$ and $\overline{Y}_m$ be the demographically adjusted average of an outcome Y for females and males, respectively, and let $\overline{Y}_{fh}$ and $\overline{Y}_{mh}$ be these same averages for household type h. Let s_{fh} and s_{mh} be the proportion of females and males, respectively, in household type h. The Blinder-Oaxaca decomposition is:

$$(5)\ \overline{Y}_f - \overline{Y}_m = \sum_h (\overline{Y}_{fh} - \overline{Y}_{mh}) s_{fh} + \sum_h \overline{Y}_{mh} (s_{fh} - s_{mh}).$$

We note that each within-household gender gap $\overline{Y}_{fh} - \overline{Y}_{mh}$ is identical to the corresponding gap γ from equation (1), the first summation in equation (5) can be rewritten:

$$(6)\ \overline{Y}_f - \overline{Y}_m = \left[\gamma_{sn} s_{f,sn} + \gamma_{sp} s_{f,sp} + \gamma_{mn} s_{f,mn} + \gamma_{mp} s_{f,mp}\right] + \sum_h \overline{Y}_{mh} (s_{fh} - s_{mh}).$$

Substituting each gender gap in equation (6) with the sum of the appropriate influences from equation (1) yields the following, after simplifying and noting that the four household type proportions sum to one:

$$(7)\ \overline{Y}_f - \overline{Y}_m = \left[N'_{wh} + N'_p (s_{f,sp} + s_{f,mp}) + E'_m (s_{f,mn} + s_{f,mp}) + E'_{cm} s_{f,mp}\right] + \sum_h \overline{Y}_{mh} (s_{fh} - s_{mh})$$

The sum in brackets in equation (7) reflects the need to scale each influence to reflect that not all household types are subject to each gap. For example, parenting norms, N'_p, is multiplied by the share of women in households that have a single parent and that have married parents because parenting norms affect only these household types.[5] The final summation reflects that gender differences in the distribution of the sample in each household type also affect the overall gender gap in time use and earnings.

IV. DATA

We used the Bureau of Labor Statistics 2003 to 2014 ATUS to compute the influence of norms on gender gaps in time devoted to work and household production.[6] The 12 years of information ensures that the sample in each of the four household types is large enough. Each year, the ATUS randomly selects a group of individuals from a subset of households that have completed their eighth and final month of interviews for the Current Population Survey to provide nationally representative estimates of how people spend their time. These respondents

[5] The Blinder-Oaxaca decomposition could alternatively use the proportion of males in each household type, but then the final summation would depend on the average outcome of females in each household type.

[6] Although it has been speculated that women and men might report time use differently, evidence suggests that these differences do not differ systematically by subgroup (Carrasco and Dominguez 2015). Because our focus is on differences in gaps across subgroups, we minimize any such potential bias by reporting subgroup differences.

are interviewed one time to gather detailed information about how they spent their time on the previous day. We used the data to estimate the minutes per day devoted to the following:

- Household management, defined as time spent caring for and helping household members who are not children; caring for and helping people who are not members of the household; making consumer purchases and providing household and government services, including travel related to these activities [7]
- Parenting, defined as time spent caring for and helping children in the household, activities related to the education or health of children in the household, and travel related to these activities)[8]
- Work, defined as all work and work-related activities, including travel related to work

To compare time spent in work and household production, we summed the minutes per day spent in household management and parenting as a measure of total household production. The ATUS also collects demographic information for each respondent, which allowed us to construct the four household types and to match women and men within household type.

We used the 2014 ACS to compute each influence on gender gaps in employment and earnings. The ACS housing unit sample is designed to provide relatively current information on the characteristics and housing of the U.S. population by annually collecting socioeconomic data from a sample of households across the country. We used these data to construct binary variables for employment (whether employed at time of the survey) and employed full time (worked at least 35 hours per week and at least 50 weeks in the past 12 months, conditional on employment) and to construct continuous variables (conditional on employment during the past 12 months) for hourly earnings in 2013 dollars (earned income divided by the product of usual weekly hours worked and number of weeks worked, using midpoint of ranges for categorical responses); and earnings in 2013 dollars (earned income).[9] Like the ATUS, the ACS contains the demographic information needed to construct household type and to use in matching.

We limited the sample in each survey in several ways. We excluded military members and individuals under age 24 or over 50 to focus on the civilian, prime-age working population. We also excluded unmarried individuals living with a partner or a same sex partner. These restrictions are identical for ATUS and ACS, although the ATUS sampling frame excludes military member and institutionalized populations. We included only the reference person in each ACS household and that person's spouse if they were married. In both data sets, we define a married individual as one who is married to the spouse living in the household, and we defined a single individual as one who is not living with a partner regardless of whether the individual is married to the partner. We defined a parent as having biological children, adopted children, or

[7] Household services include receiving services not done by the respondent such as cleaning, meal preparation, lawn and garden care, and maintenance. Government services include obtaining licenses and paying taxes.

[8] Secondary childcare is not included in our measures. All time use outcomes are calculated using only the primary activity at a given time.

[9] Results for unconditional full-time employment, hourly earnings, and annual earnings lead to similar broad conclusions.

stepchildren younger than 18 and living in the same household reported in the ACS and as having their "own" child younger than 18 in the household reported in the ATUS. Even with these restrictions, our analytic samples are large (Table 2), with a minimum cell size of 1,624 (unmarried fathers in the ATUS) and a maximum of 194,854 (married mothers in the ACS).

Table 2. Sample sizes

	ACS			ATUS		
	Total	Female	Male	Total	Female	Male
Total	699,753	380,051	319,702	75,106	42,019	33,087
Single, no children	123,857	57,470	66,387	16,887	7,383	9,504
Single parents	58,046	48,054	9,992	9,958	8,334	1,624
Married, no children	145,962	79,673	66,289	8,342	4,646	3,696
Married parents	371,888	194,854	177,034	39,919	21,656	18,263

ACS = American Community Survey; ATUS =American Time Use Survey

We also used the ACS and the ATUS to construct matching weights. For the ACS data, we constructed weights for each of three samples: (1) all prime-age civilian adults (age 24 to 50) for an analysis of employment, (2) the subset of those employed, for an analysis of full-time, full-year employment and hourly earnings, and (3) the subset of those who are working full-time and full-year for an analysis of annual earnings. For the ATUS data, we constructed weights for the full sample of prime-age civilian adults. Our algorithm matched the groups with minimal excluded observations. In the ACS data, the match has full support, meaning that all demographic groups represented in each matching group were also represented in the reference group and vice versa. In the ATUS, we excluded 1,259 observations before all of our analyses (analytic sample sizes shown in Table 2) whose demographic characteristics were not represented in all combinations of household type and gender. A maximum of 2.2 percent of observations was excluded in any combination of household type and gender.

V. FINDINGS

The presence of gender gaps in time use and labor market outcomes is well-documented, and our analysis of the ATUS and ACS data confirms that these gaps exist across household types for working-age civilian adults (Table 3). Women spend 113 minutes more per day than men on household production (301 versus 188 minutes) and 97 minutes less than men in the workplace (184 versus 282 minutes). Fewer women are employed (71 versus 89 percent) or working full time and full year if they are employed (70 versus 86 percent). Employed women earn, on average, 22 percent less than employed men per hour, $23.06 versus $29.38. Among full-time, full-year workers, women earn about 27 percent less per year, $51,124 versus $70,311. Adjusting for differences in household composition between men and women does little to change the gap in time use but increases the gap in full-time employment and earnings.

Table 3. Estimated gender gaps in time, employment, and earnings

	Values		Gaps	
	Female	Male	Raw	Adjusted
Panel A: Household production				
All (minutes/day)	301	188	113	111
Panel B: Employment				
Work (minutes/day)	184	282	-97	-96
Employed	71%	89%	-18%	-18%
Full time (if employed)	70%	86%	-16%	-16%
Panel C: Earnings				
Hourly earnings (if employed)	$23.06	$29.38	-$6.32	-$6.77
Annual earnings (if full time)	$51,124	$70,311	-$19,187	-$20,060

Sources: Panel A and Panel B (work outcome only): American Time Use Survey, 2003-2014; Panel B (employed and full time only); and Panel C: American Community Survey, 2014

Notes: The sample consists of civilians age 24 to 50, excluding both the 2.5 percent of women and men whose partner is in the household but to whom they are not married and the less than one percent of individuals in a same-sex marriage. The adjusted gap uses the reweighting technique described in Section II to ensure demographic similarity between females and males.

Gender gaps by household type

The model presented in Section II shows how the gender gaps within each household type can be used to estimate the influence of norms in structuring time spent in household production, employment, and earnings across household types. By using the reweighting technique, we ensured that only demographically similar groups were compared. We discuss our findings for each outcome below.

Household production

Gender gaps exist across household types in the time spent in household production—both time devoted to managing a household and child care (Table 4). As expected, gaps are smallest for singles without children and largest for married parents. For example, Panel A shows that single women without children spend 181 minutes per day on household management, compared with 137 minutes per day for single men without children. Married mothers spend 253 minutes per day, compared to 155 minutes for married fathers.

These gaps persist after adjusting for demographic differences across groups: the female-male gap in time spent on household management is 42 minutes for single adults without children and 98 minutes for married parents. Similar patterns hold for child care, although it is not surprising that adults without children in the household spend little time caring for children. Gaps and actual time use in household management increase for married parents, compared with married individuals without children, perhaps suggesting that the presence of children increases complementary in household activities not explicitly related to child care. Similarly, the time spent caring for children—and its related gender gap—(Panel B) increases for married parents, compared with single parents, suggesting that specialization promotes a more efficient use of

time. Subsequent analysis focuses on all household production (Panel C), which similarly shows larger gaps with marriage or the presence of children.

Table 4. Household time use by gender and household type (minutes/day)

	Unadjusted			Adjusted across composition of households		
	Female	Male	Raw gap	Female	Male	Adjusted gap
Panel A: Household management						
Single, no children	181	137	44	187	144	42
Single parents	213	169	44	221	167	54
Married, no children	238	165	73	230	162	68
Married parents	253	155	97	252	154	98
Panel B: Child care						
Single, no children	3	1	2	3	1	2
Single parents	86	54	32	88	59	29
Married, no children	2	1	1	2	1	1
Married parents	116	67	49	112	67	45
Panel C: All household production (management and child care)						
Single, no children	184	139	45	190	146	44
Single parents	299	223	76	309	226	83
Married, no children	241	166	75	232	163	69
Married parents	368	222	146	364	221	143

Source: American Time Use Survey, 2003–2014

Notes: The sample consists of civilians age 24 to 50, excluding unmarried partners and the less than one percent of individuals in a same-sex marriage. Children are "own" children under age 18 who live in the household. Adjusted values use a reweighting technique described in Section II to create groups that are demographically similar to the full sample.

Employment

Women lag behind men in employment in all household types, but the gap is greatest for married parents (Table 5). Panel A shows that married mothers work 137 minutes per day less than demographically comparable married fathers, whereas this gap is only 36 minutes for singles without children. Married mothers are 27 percentage points less likely to work than demographically similar married fathers (Panel B), and working married mothers are 24 percentage points less likely to be working full time than demographically similar working married fathers (Panel C). By contrast, these gaps for singles without children are 4 to 5 percentage points. For each of these employment outcomes, gaps for single parents and married couples without children fall in between those of married parents and singles without children.

Table 5. Employment by gender and household type

	Unadjusted			Adjusted across composition		
Household type	Female	Male	Raw gap	Female	Male	Adjusted gap
Panel A: Work (minutes per day)						
Single, no children	229	259	-30	228	263	-36
Single parents	193	261	-68	202	262	-60
Married, no children	215	293	-79	218	291	-73
Married parents	154	293	-139	154	291	-137
Panel B: Employed						
Single, no children	80.3%	83.1%	-2.7%	79.6%	83.7%	-4.0%
Single parents	73.2%	85.6%	-12.4%	76.7%	86.9%	-10.2%
Married, no children	76.3%	89.0%	-12.7%	76.0%	89.2%	-13.2%
Married parents	64.6%	91.5%	-26.9%	63.7%	91.1%	-27.4%
Panel C: Full-time, if employed						
Single, no children	78.2%	81.6%	-3.4%	77.6%	82.3%	-4.7%
Single parents	69.1%	84.2%	-15.2%	70.7%	83.8%	-13.1%
Married, no children	75.7%	86.4%	-10.7%	75.0%	86.1%	-11.1%
Married parents	65.1%	88.3%	-23.2%	64.5%	88.0%	-23.5%

Sources: Panel A: American Time Use Survey, 2003–2014; Panel B and Panel C: American Community Survey, 2014

Notes: The sample consists of civilians age 24–50, excluding unmarried partners and the less than one percent of individuals in a same-sex marriages. Children are "own" children under age 18 who live in the household. Adjusted values use a reweighting technique described in Section II to create groups that are demographically similar to the full sample.

Earnings

The gender gap in earnings is notably larger when children are present in the household and, to a lesser extent, when individuals are married (Table 6). The hourly earnings of working single mothers are $6.82 per hour less than the earnings of demographically comparable single fathers, and this gap is only slightly larger ($7.55 per hour) for married parents (Panel A). The gap is smaller for married couples without children ($6.16 per hour) and smaller still for singles without children ($3.99 per hour). Among full-time workers, the gap in annual earnings exceeds $20,000 for single and married parents, compared with about $17,000 for married couples without children and $11,000 for singles without children (Panel B).

We highlight two potential reasons for the pattern of earnings gaps across household types. Consistent with our framework, the large difference in gaps between single parents and singles without children suggests that norms about parenting may play a large role in determining earnings. The fact that the earnings gap for married parents is only slightly larger than the gap for single parents is consistent with the fact that the gains from efficiency associated with specialization play a role in determining earnings, albeit one that is smaller than norms. The second reason lies in sample selection. Like other studies of gender gaps in earnings, our

estimates are probably confounded by unobservable factors that influence the decision to work full time and hence are included in our earnings estimations.

Table 6. Earnings by gender and household type

	Unadjusted			Adjusted across composition		
	Female	Male	Raw gap	Female	Male	Adjusted gap
Panel A: Hourly earnings (if employed)						
Single, no children	$22.37	$24.48	-$2.11	$21.76	$25.75	-$3.99
Single parents	$18.17	$25.41	-$7.23	$20.31	$27.14	-$6.82
Married, no children	$22.66	$27.96	-$5.30	$21.88	$28.04	-$6.16
Married parents	$25.22	$32.09	-$6.87	$22.98	$30.53	-$7.55
Panel B: Annual earnings (if full time)						
Single, no children	$51,083	$57,602	-$6,519	$49,733	$60,815	-$11,081
Single parents	$40,446	$60,035	-$19,590	$44,901	$65,663	-$20,762
Married, no children	$50,558	$65,604	-$15,047	$48,685	$66,072	-$17,387
Married parents	$55,360	$77,239	-$21,879	$50,199	$73,265	-$23,066

Source: American Community Survey, 2014

Notes: Sample consists of civilians age 24–50, excluding unmarried partners and the less than one percent of individuals in a same-sex marriage. Children are "own" children under age 18 who are living in the household. Adjusted values use a reweighting technique described in Section II to create groups that are demographically similar to the full sample.

Sources of gender gaps

Differences in gender gaps across household type allow us to identify the sources of these gaps. For example, the presence of noteworthy gaps in time use and employment among single parents suggests that gains from efficiency within marriage fail to fully explain gender differences. In Table 7, we used the gender gaps in time use from Tables 4 to 6 to estimate the sources of gender gaps based on equation (2). We assume that norms are primarily responsible for gaps in households composed of unmarried individual, whereas gains from efficiency apply primarily to households in which the adults are married, as discussed in Section II.

Norms contribute more than gains from efficiency to the gender gap in household time (Panel A). We estimated that household and work norms contribute 44 minutes to the female-male gap in household production time, norms related to child care contribute an additional 39 minutes. The gains in efficiency contribute 25 minutes to this gap, and the presence of children contributes an additional 35 minutes.

Norms make a smaller but still sizable contribution to employment outcomes (Panel B). Of the shorter time that women spend working, our analysis attributes 36 minutes per day to norms related to household management, and norms related to child care contribute an additional 25 minutes. Gains from efficiency contribute 37 minutes to this gap; with 40 minutes additional gains from efficiency when children are present. Similarly, household and work norms make noteworthy contributions to the gap in employment (4.0 percentage points) and gap in full-time

work among employed women and men (4.7 percentage points). The influence of child care norms is larger (6.2 and 8.4 percentage points, respectively).

Table 7. Sources of gender gaps estimated within household types

	Norms		Efficiencies with marriage	
	Household and work norms	Parenting norms	Adult	Child
Panel A: Household production				
All (minutes/day)	44	39	25	35
Panel B: Employment				
Work (minutes/day)	-36	-25	-37	-40
Employed	-4.0%	-6.2%	-9.2%	-8.0%
Full time (if employed)	-4.7%	-8.4%	-9.2%	-5.1%
Panel C: Earnings				
Hourly earnings (if employed)	-$3.99	-$2.83	-$2.17	$1.44
Annual earnings (if full time)	-$11,081	-$9,681	-$6,306	$4,002

Note: Numbers were computed from the adjusted gender gaps shown in Tables 4 to 6 and using equation (2) in Section II. They reflect gaps estimated within a household type.

Identifying sources of gender gaps in earnings is more difficult. First, the sample selection issues will overstate the role of parenting norms in earnings gaps. Second, earnings gaps are likely to arise not only from present-day time constraints but also from work histories, which in turn depend on time constraints imposed by household structures in the past. Disentangling the effects of selection into employment or the history of time constraints is beyond the scope of our analysis, so we remind readers to consider applications of our framework to earnings gaps as exploratory.

Our estimates attribute a noteworthy earnings gap to norms (Panel C). We estimated that household and work norms account for $3.99 per hour of the gap in hourly wages, which is more than the estimated contributions of parenting norms ($2.83 per hour) or gains from efficiency when children are not present ($2.17 per hour). The results are similar for annual earnings of full-time workers; household, work, and child care norms contribute almost $11,081 each to the gap, compared with $6,306 for gains from efficiency that arise from specialization when children are not present. We also estimated that the presence of children slightly dilutes the influence of gains from efficiency in the gap (that closes the gap by about $4,002). We believe that this unlikely result is best explained by the selection issues that we cannot control for, also giving a sense of how much our framework may overstate the role of child care norms when applied to outcomes that are conditional on employment.

Decomposing gender gaps

The estimates in Table 7 reflect the influence of norms on gender gaps for households, but do not measure how they influence gender gaps for the overall sample. We used the decomposition described in Section II to separate the gender gap in each outcome for the overall

sample into each of the two types of norms and gains from efficiency, and into a term that reflects gender differences in the distribution of household types. In particular, each influence was multiplied by the share of women in household types to which that influence applies.

Norms make a sizable contribution to time use and earnings gaps (Table 8). Out of a demographically adjusted 111-minute overall gap in time spent in household production, we attributed 44 minutes to household and work norms—the same as in Table 7—because these norms affect all household types. We scaled the influence of parenting norms from 39 minutes (Table 7) to 24 minutes because only 61 percent of women in the sample are parents. Similarly, the influence of gains from efficiency within marriage for adults falls from 25 minutes to 18 minutes when we account for the fact that only 70 percent of the individuals are married, and the gains from efficiency from specialization within marriage once children are present fall from 35 to 17 when we account for the fact that only 50 percent of women are married parents. The adjustment for differences across household types is generally small.

Table 8. Decomposing gender gaps

		Norms		Efficiencies with marriage due to		
	Total gap	Household and work norms	Parenting norms	Adult	Child	Across household type gap
Panel A: Household production						
All (minutes/day)	111	44	24	18	17	8
Panel B: Employment						
Work (minutes/day)	-96	-36	-15	-26	-20	0
Employed	-18%	-4.0%	-4.0%	-6.3%	-3.9%	0.0%
Full time (if employed)	-16%	-4.7%	-5.1%	-4.2%	-1.8%	-0.4%
Panel C: Earnings						
Hourly earnings (if employed)	-$6.77	-$3.99	-$1.71	-$1.43	$0.65	-$0.29
Annual earnings (if full time)	-$20,060	-$11,081	-$5,483	-$4,035	$1,659	-$1,121

Notes: Numbers for norms and efficiency gains were computed by adjusting the sources of the gaps shown in Table 7 by the proportion of the sample in each household type that is affected by the influence. The across-household-type gap shows the gap created by the differences in gender distributions across households.

Table 9 presents this same decomposition expressed as a percentage of the adjusted gaps. Norms about work and household production are estimated to be the strongest influence on gender gaps in time spent in household production (40 percent) and on minutes worked (37 percent), wages (59 percent), and earnings (55 percent). For employment and full-time employment (conditional on being employed), household and work norms are a less dominant, but still sizable, influence (22 and 29 percent, respectively). After we adjusted for demographic differences, gender differences in the proportion of individuals in each household type account for no more than 7 percent of the overall gap for any outcome.

Table 9. Percentage of adjusted gender gaps explained by each influence

:	Norms		Efficiencies with marriage		
	Household and work norms	Parenting norms	Adult	Child	Across household type gap
Panel A: Household production					
All (minutes/day)	40%	22%	16%	16%	7%
Panel B: Employment					
Work in minutes per day	37%	16%	27%	20%	0%
Employed	22%	22%	35%	22%	0%
Full time (if employed)	29%	31%	26%	11%	2%
Panel C: Earnings					
Hourly earnings (if employed)	59%	25%	21%	-10%	4%
Annual earnings (if full time)	55%	27%	20%	-8%	6%

Note: Numbers are the percentage of the adjusted gap shown, which is explained by the average influence of each source (Table 8).

VI. DISCUSSION AND POLICY IMPLICATIONS

Our findings broadly support the conclusion that norms play an important role in gender gaps. We note that our estimates of the influence of norms include efficiencies from women devoting more hours than men to household production even if they are not married. Our overstatement of their influence is potentially offset by the fact that our estimates of the influence of gains from efficiency include norms about marriage and parenthood within marriage. Because of this noise, we urge readers to be cautious in attributing exactness to our results. In addition, because our analysis may not account for factors—unobservable and observable—that underlie the decision to work or to work full time, we encourage readers to interpret the estimates of the influences on gaps for working individuals (full-time employment and hourly or annual earnings) as exploratory and in need of an investigation into how the decision to work (or to work full time) might affect estimates. Nonetheless, the large estimated influence of norms—around household and work as well as parenting—on gender gaps in time use and earnings suggests that the recent work of Akerlof and Kranton (2010, 2000) on norms should be integrated into research that examines gender gaps in time use and earnings.

We used the lens of gender norms to consider the consequences of four types of policy proposals intended to narrow gender gaps: (1) policies that promote work-life balance in the workplace, (2) policies that allow workers to more easily shift time from household production to work, (3) structural changes in institutions that affect time use, and (4) policies that break down gender-based views of work and household production. We note that although each of the policies discussed might afford benefits other than narrowing gender gaps, our discussion does not include these benefits.

First, our results suggest that policies that promote work-life balance or reduce the burden of working might produce unanticipated consequences. For example, Goldin (2014) suggested that more flexible workplace structures might promote gender equality, which could benefit women to the extent that, because of norms, they bear a higher cost from current workplace structures. However, workplace structures would probably need to offer this flexibility universally and reduce the labor market cost of devoting time to household production in order to reduce gender disparities. If workplace flexibility were offered only in certain occupations, industries, or firms, norms might exacerbate gender segregation that, in part, leads to these disparities. Indeed, a majority of workers appear not to value this flexibility; the average willingness to pay for such benefits is low, but women value flexible work schedules more highly than do men (Mas and Pallais 2016).

Norms might, for example, lead women to gravitate toward occupations in which employers provide workplace flexibility at the cost of lower wages, and men would gravitate toward occupations with less flexibility and higher wages. Research on two policies designed to increase workplace flexibility support this potential: parental leave and a gender-neutral tenure clock. Some countries with liberal parental leave policies have wider gender-based gaps in pay (Livingston 2013),[10] and a gender-neutral tenure clock that gives new mothers and fathers time to spend with a newborn child exacerbated the gender gaps in tenure (Antecol, Bedard, and Sterns 2016).[11]

Second, norms-driven choices might increase gender disparities as a result of policies that allow workers to shift time from household production to work. For example, making high-quality, subsidized child care universally available is expected to increase the labor supply of women. However, such support might produce incentives to participate in the labor force but not necessarily to increase a woman's commitment to a career and advancing wages. Such incentives could compress the female wage distribution and leave a glass ceiling and more gender disparities at the top of the distribution (Arulampalam, Booth, and Bryan 2007; Albrecht, Bjorklund, Vroman 2003) without a concurrent change in attitudes toward child care (Haas 2003 1992). Furthermore, strong norms would imply that women pay a higher social cost than men for using child care services, so such policies may benefit career outcomes for men but not for women.

Third, the norms could work with structural changes in institutions to narrow gender gaps. For example, school hours that coincide with work hours would reduce the conflict parents experience between work and child care, and the strong parenting norms suggest that women experience higher costs in this area than men. These higher costs would cause the conflict to increase gender gaps in (full-time) employment and earnings as women structure their employment to coincide with school scheduling. A structural change that, for example, lengthens school days would reduce the costs of working without affecting norms because women

[10] In a survey of literature on family policies in high-income countries, Olivetti and Petstrongolo (2017) find that cross-country studies suggest that family-leave policies reduce gender gaps, while individual-level studies within a country that implicitly control for a country's norms are less likely to show such reductions.

[11] The gender neutral clock at U.S. research universities reduced female tenure rates while substantially increasing male rates at least in part because men used the additional time to increase the number of top-5 journal publications with no such increase by women.

(primarily) would no longer have to choose between reducing household production and work. As a result, such policies might narrow gender disparities. We emphasize that such structural shifts may be viewed as similar in nature to policies that allow workers to shift time from household production to work. The key difference is that structural shifts do not involve choice: parents do not choose the timing of school days, but they do, for example, choose whether to use subsidized child care.

Finally, our results suggest that policies that successfully break down gender-based views of work and household production might be essential to reducing gender disparities. The strength of norms shown in our findings suggests that narrowing gender gaps may depend on the continued change in attitudes toward women, work, and motherhood. These changes in attitude have been great: in 2012, 23 percent of married mothers and 49 percent of unmarried mothers thought that full-time work would be ideal, compared with 17 percent of married mothers and 26 percent of unmarried mothers who thought it ideal in 2007 (Parker and Wang 2014).

Two sets of strategies could change attitudes. One set of strategies centers on information (Pope, Price, and Wolfers 2014) that helps individuals see beyond gender-based opportunities for work and household production. These strategies might encourage women to prepare for high-paying careers typically viewed as being "for men" (for example, police officers and architects), and they might encourage men to consider careers viewed as being "for women" (for example, make-up artists and interpreters/translators). The U.S. Department of Labor uses such a strategy in highlighting nontraditional occupations for women (https://www.dol.gov/wb/factsheets/nontra2008.htm) as does research that highlights the dearth of women in the economics profession (Bayer and Rouse 2016). Another set of strategies centers on changing behaviors (Soll, Milkman, and Payne 2014). This approach is demonstrated by Goldin and Rouse's (2000) work that shows how auditions for an orchestra that masked the gender of the applicant led to the hiring of more women. Other behaviorally based strategies might focus on reducing hostile behaviors in the workplace not only toward women who work in nontraditional fields (Ginther and Kahn 2004) or in high-powered professions (Stone 2007), but also toward men who take paternity leave (Weisberg and Galinsky 2014).

In conclusion, findings from our research suggest that if policymakers are to better understand the barriers they confront when trying to close gender gaps in time use and earnings, they should look at this issue through the lens of social norms. This might be especially important if norms are unlikely to change, such as those that stem from biological differences (for example, child bearing) or from strong beliefs that have persisted over time. In this respect, research that shows how strongly norms influence gender disparities is akin to the research that shows the detrimental effect on achievement of blacks "acting white" (Fryer and Torelli 2010; Austen-Smith and Fryer 2005; Cook and Ludwig 1997). Both lines of research can help policymakers and program leaders to better understand behaviors and the behavior-related barriers they will face when trying to close gaps.

REFERENCES

Akerlof, George A., and Rachel E. Kranton. *Identity Economics: How Our Identities Affect Our Work, Wages, and Well-being*. Princeton, NJ: Princeton University Press, 2010.

Akerlof, George A., and Rachel E. Kranton. "Economics and Identity." *Quarterly Journal of Economics*, vol. 115, 2000, pp. 715–753.

Albanesi, Stefania, and Olivetti, Claudia. "Home Production, Market Production, and the Gender Wage Gap: Incentives and Expectations." *Review of Economic Dynamics*, vol. 12, no.1, 2009, pp. 80–107.

Albrecht, James, Anders Bjorklund, and Susan Vroman. "Is There a Glass Ceiling in Sweden?" *Journal of Labor Economics*, vol. 21, 2003, pp. 145–177.

Albrecht, James, Per-Anders Edin, Marianne Sundstrom, and Susan Vroman. "Career Interruptions and Subsequent Earnings: A Reexamination Using Swedish Data." *Journal of Human Resources*, vol. 34, no. 2, 1999, pp. 294–311.

Angelov, Nikolay, Per Johansson, and Erica Lindahl. "Parenthood and the Gender Gap in Pay." *Journal of Labor Economics*, vol. 34, no. 3, 2016, pp. 545–579.

Antecol, Heather, Kelly Bedard, and Jenna Stearns. "Equal but Inequitable: Who Benefits from Gender-Neutral Tenure Clock Stopping Policies?" Discussion paper no. 9904. Bonn, Germany: Institute for the Study of Labor (IZA), April 2016.

Arulampalam, Wiji, Alison L. Booth, and Mark L. Bryan. "Is There a Glass Ceiling Across Europe? The Gender Pay Gap Across the Wage Distribution." *Industrial and Labor Relations Review*, vol. 60, no. 2, January 2007, pp. 163–186.

Aughinbaugh, Alison, Omar Robles, and Hugette Sun. "Marriage and Divorce: Patterns by Gender, Race, and Educational Attainment." *Monthly Labor Review*, October, 2013, pp. 1–19.

Austen-Smith, David, and Roland Fryer. "An economic analysis of 'acting white'." *Quarterly Journal of Economics*, vol. 102, no. 2, 2005, pp. 551–583.

Bayer, Amanda, and Cecilia Elena Rouse. "Diversity in the Economics Profession: A New Attack on an Old Problem." *Journal of Economics Perspectives*, vol. 30, no. 4, fall 2016, pp. 221–242.

Baxter, Marianne and Dana Rotz. 2009. "Detecting Household Production." Available at https://199.169.201.73/research/conferences/research-events---conferences-and-programs/~/media/files/research/events/2009_11_19/papers/Baxter_paper.pdf. Accessed March 7 2017.

Becker, Gary S. "A Theory of the Allocation of Time". *The Economic Journal*, vol. 75, no. 299, September 1965, pp. 493–517.

Bertrand, Marianne, Jessica Pan, and Emir Kamenica. "Gender Identity and Relative Income within households." *Quarterly Journal of Economics*, vol. 130, no. 2, 2015, pp. 571–614.

Bittman, Michael, Paula England, Nancy Folbre, Liana Sayer, and George Matheson. "When Does Gender Trump Money? Bargaining and Time Use in Household Work." *American Journal of Sociology*, vol. 109, no. 1, July 2003, pp. 186–214.

Blau, Francine D., and Lawrence M. Kahn. "The Gender Wage Gap: Extent, Trends, and Explanations." NBER working paper. Cambridge, MA: National Bureau of Economic Research, 2016. Available at http://www.nber.org/papers/w21913.pdf. Accessed February 1, 2017.

Blinder, Alan S. "Wage Discrimination: Reduced Form and Structural Estimates." *Journal of Human Resources*, vol. 8, no. 4, fall 1973, pp. 436–455.

Brines, Julie. "Economic Dependency, Gender, and the Division of Labor at Home." *American Journal of Sociology*, vol. 100, no. 3, November 1994, pp. 652–688.

Bureau of Labor Statistics. American Time Use Survey. Washington, DC. Tables available at http://www.bls.gov/tus/tables.htm.

Carrasco, Cristina, and Marius Dominguez. "Measured Time, Perceived Time: A Gender Bias." *Time & Society*, 2013, vol. 24, no. 3, pp. 326–347.

Cha, Youngjoo, and Kim A. Wheeden. "Overwork and the Slow Convergence in the Gender Gap in Wages." *American Sociological Review,* vol. 79, no. 3, 2014, pp. 457–484.

Cohen, D'Vera, Kim Parker, Gretchen Livingston, and Molly Rohal. "A Rise in Stay at Home Mothers." Washington DC: Pew Research Center, April 8, 2014. Available at http://www.pewsocialtrends.org/2014/04/08/after-decades-of-decline-a-rise-in-stay-at-home-mothers/. Accessed December 2, 2016.

Cook, Phillip J., and Jens Ludwig. "Weighing the 'Burden of 'Acting White': Are There Race Differences in Attitudes Toward Education?" *Journal of Policy Analysis and Management*, vol. 16, no. 2, spring 1997, pp. 256-278.

Cortex, Patricia, and Jessica Pan. "When Time Binds: Returns to Working Long Hours and the Gender Wage Hap Among the Highly Skilled." IZA discussion paper 9846. Bonn, Germany, 2016. Available at http://ftp.iza.org/dp9846.pdf. Accessed February 1, 2017.

DiNardo, John, Nicole M. Fortin, and Thomas Lemieux. "Labor Market Institutions and the Distribution of Wages, 1973–1992: A Semiparametric Approach." *Econometrica*, vol. 64, no. 5, 1996, pp. 1001–1044.

Fryer, Roland, and Paul Torelli. "An Economic Analysis of 'Acting White'." *Journal of Public Economics*, vol. 94, 2010, pp. 380–396.

Giacheva, Dora. "Working Long Hours and Early Career Outcomes in the high-end labor market." *Journal of Labor Economics*, vol. 31, no. 4, 2013, pp. 785–824.

Ginther, Donna K., and Shulamit Kahn. "Women in Economics: Moving Up or Falling Off the Academic Career Ladder?" *Journal of Economics Perspectives*, vol. 18, no. 3, summer 2004, pp. 193–214.

Goldin, Claudia. "A Grand Gender Convergence: Its Last Chapter." *American Economic Review,* vol. 104, no. 4, 2014, pp. 1091–1119.

Goldin, Claudia. "Monitoring Costs and Occupational Segregation by Sex: A Historical Analysis." *Journal of Labor Economics*, 1986. vol. 4, pp. 1–7.

Goldin, Claudia, and Lawrence F. Katz. "The Cost of Workplace Flexibility for High-Powered Professionals." *The Annals of the American Academy of Political and Social Science*, vol. 638, no. 1, November 2011, pp. 45–67.

Goldin, Claudia, and Lawrence F. Katz. "The Career Cost of Family." Prepared for the Sloan Conference Focus on Flexibility. Washington, DC: November 29–30, 2010. Available at http://workplaceflexibility.org/images/uploads/program_papers/goldin_-_the_career_cost_of_family.pdf. Accessed April 15, 2015.

Goldin, Claudia, and Joshua Mitchell. "The New Life Cycle of Women's Employment: Disappearing Humps, Sagging Middles, Expanding Tops." *Journal of Economic Perspectives*, vol. 31, no. 4, winter 2017, pp. 161–182.

Goldin, Claudia, and Cecilia Rouse. "Orchestrating Impartiality: The Impact of 'Blind' Auditions on Female Musicians." *American Economic Review*, vol. 90, no. 4, September 2000, pp. 715–741.

Greenstein, Theodore. "Economic Dependence, Gender, and the Division of Labor in the Home: A Replication and Extension. *Journal of Marriage and the Family*, vol. 62, no. 2, 2000, pp. 322–335.

Gupta, Sanjiv, and Michael Ash. "Whose Money, Whose Time? A Nonparametric Approach to Modeling the Time Spent on Housework in the United States." *Feminist Economics*, vol. 14, no. 1, January 2008, pp. 95–120.

Haas, Linda. "Parental Leave and Gender Equality: Lessons from the European Union." *Review of Policy Research*, vol. 20, no. 1, March 2003, pp. 89–114.

Haas, Linda. *Equal Parenthood and Social Policy*. Albany, NY: State University of New York Press, 1992.

Heckman, James J. "Sample Selection Bias as a Specification Error." *Econometrica*, vol. 47, no. 1, 1979, pp. 153–161.

Heckman, James J. "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simple Estimator for Such Models." *Annals of Economic and Social Measurement*, vol. 5, no. 4, 1976, pp. 475–492.

Juhn, Chinhui, and Kristin McCue. 2017. "Specialization Then and Now: Marriage, Children, and the Gender Earnings Gap Across Cohorts." *Journal of Economic Perspectives*, vol. 31, no. 4, winter, pp. 183-204.

Lachance-Grzelam, Mylène, and Geneviève Bouchard. 2010. "Why Do Women Do the Lion's Share of Housework? A Decade of Research." *Sex Roles*, vol. 63, pp. 767–780.

Livingston, Gretchen. "The Link Between Parental Leave and the Gender Pay Gap." Washington DC: Pew Research Center, December 20, 2013. Available at http://www.pewresearch.org/fact-tank/2013/12/20/the-link-between-parental-leave-and-the-gender-pay-gap/. Accessed December 1, 2016,

Manski, Charles. "Anatomy of the Selection Problem." *Journal of Human Resources,* vol. 24, 1989, pp. 343-360.

Mas, Alexandre, and Amanda Pallais. "Valuing Alternative Work Arrangements." NBER Working Paper 22708. Cambridge, MA: September, 2016. Available at http://www.nber.org/papers/w22708. Accessed October 30, 2016.

Michaeli, Moti, and Daniel Spiro. "From Peer Pressure to Biased Norms." *American Economic Journal: Microeconomics*, vol. 9, no. 1, February 2017, pp. 152–216.

Neuman, Shoshana, and Ronald Oaxaca. "Wage Decompositions with Selectivity-Corrected Wage Equations: A Methodological Not." *Journal of Economic Inequality*, vol. 2, no.1, April 2004, pp. 3–10.

Neumark, David, Roy Bank, and Kyle D. Van Nort. "Sex Discrimination in Restaurant Hiring: An Audit Study." *Quarterly Journal of Economics*, vol. 111, no. 3, August 1996, pp. 915–941.

Olivetti, Claudia, and Barbara Petrongolo. "The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries." *Journal of Economic Perspectives*, vol. 31, no. 1, winter 2017, pp. 205-230.

Oaxaca, Ronald. "Male-female Differentials in Urban Labor Markets." *International Economic Review*, vol. 14, no. 3, October 1973, pp. 693–709.

Pan, Jessica. "Gender Segregation in Occupations: The Role of Tipping and Social Interactions." *Journal of Labor Economics*, April 2015, vol. 33, no. 2, pp. 365–408.

Parker, Kim, and Wendy Wang. "Modern Parenthood." Washington DC: Pew Research Center, March 14, 2014. Available at http://www.pewsocialtrends.org/files/2013/03/FINAL_modern_parenthood_03-2013.pdf. Accessed July 26, 2016.

Pope, Devin G., Joseph Price, and Justin Wolfers. 2014. "Awareness Reduces Racial Bias." Brookings Economics Studies Working Paper Series. Washington, DC: Brookings Institution, February 2014. Available at https://www.brookings.edu/wp-content/uploads/2016/06/awareness_reduces_racial_bias_wolfers.pdf. Accessed October 29, 2016.

Ryan, Camille L., and Kurt Bauman. "Educational Attainment in the United States: 2015." *Current Population Reports*, P20-578. Washington, DC: U.S. Bureau of the Census, 2016. Available at http://www.census.gov/content/dam/Census/library/publications/2016/demo/p20-578.pdf. Accessed October 22, 2016.

Soll, Jack B., Katherine L. Milkman, and John W. Payne. "A User's Guide to Debiasing." In *Handbook of Judgement and Decision Making*, volume 2, chapter 33, edited by Gideon Keren and George Wu. Hoboken, NJ: Wiley-Blackwell, 2014.

South, Scott, and Glenna Spitze. "Housework in Marital and Nonmarital Households." *American Sociological Review,* vol. 59, no. 3, June 1994, pp. 327–347.

Stone, Pamela. *Opting Out? Why Women Really Quit Careers and Head Home*. Berkeley, CA: University of California Press, 2008.

Vespa, Jonathan, Jamie M. Lewis, and Rose M. Kreider. "American's Families and Living Arrangements: 2012." *Population Characteristics*, P20–S70. August 2013. Available at https://www.census.gov/prod/2013pubs/p20-570.pdf. Accessed November 9, 2016.

Waldfogel, Jane. "Understanding the 'Family Gap' in Pay for Women with Children." *The Journal of Economic Perspectives*, vol. 12, no. 1, winter 1998, pp. 137–156.

Wang, Wendy, Kim Parker, and Paul Taylor. *Breadwinner Moms*. Washington DC: Pew Research Center, May 29, 2013. Available at http://www.pewsocialtrends.org/2013/05/29/breadwinner-moms/. Accessed July 26, 2016.

Weisberg, Anne, and Ellen Galinsky. "Changing Families, Changing Work." In *A Paper Series Celebrating the 50th Anniversary of American Women: Report of the President's Commission on the Status of Women*, Chapter 4. Washington DC: U.S. Department of Labor, 2014, pp. 56–87. https://www.dol.gov/wb/resources/american_women_paper_series.pdf. Accessed October 30, 2016.

This page has been left blank for double-sided copying.

APPENDIX A. ROBUSTNESS CHECKS

This page has been left blank for double-sided copying.

We checked the robustness of our results against alternative methods of adjusting for demographic differences across household types. First, we considered alternative sets of demographic variables on which to match. Second, we used regression adjustments as an alternative to the matching algorithm. Both alternatives produced results that do not differ substantively from our primary specification. We discuss each in turn.

Alternate matching variables. We analyzed gender gaps in outcomes by using alternative weights based on different matching variables. We found that matching on finer categories of demographic variables had limited effect but sharply reduced the support of the match. For the four outcomes from the American Community Survey (ACS) data, we considered five alternative matching specifications. Our base specification had three education categories (no college, some college, and bachelor's degree), three age categories (24–29, 30–39, and 40–50), and four race categories (white, black, Asian, and other). Alternative specifications include six education categories (less than high school, high school diploma, some college, associate's degree, bachelor's degree, and advanced degree), five age categories (24–29, 30–34, 35–39, 40–44, and 45-50), and either five race categories (white, black, Asian, American Indian/Alaska Native, and other) or six race/ethnicity categories (Hispanic or non-Hispanic and one of the above five races). We also added four region categories (Northeast, Midwest, South, and West) in one alternative specification. The alternative matching specifications were:

1. Education (6 categories), age (3 categories), and race (4 categories)
2. Education (6 categories), age (5 categories), and race (4 categories)
3. Education (6 categories), age (5 categories), and race (5 categories)
4. Education (6 categories), age (5 categories), and race/ethnicity (6 categories)
5. Education (3 categories), age (3 categories), race (4 categories), and region (4 categories)

We measured the adjusted gender gap for each of the four ACS outcomes, four household types, and five sets of weights based on each of the alternative matching specification. The estimated gap differed from the base specification by no more than 7.2 percent in magnitude across any of these 80 comparisons. These differences translate into changes in the relative share of each influence (from Table 9) of no more than 2.9 percentage points. In contrast to our base specification, every alternative matching specification resulted in some sample members being excluded because of a lack of support.

For the two primary outcomes in the American Time Use Survey (ATUS) data, minutes per day on household production and working, we considered eigh alternative matching specifications. Our base specification included the same education, age, and race categories as the ACS, and we considered the same alternative demographic groups. We also examined alternative specifications that match on year or on groups of years but otherwise use the base specification. The alternative matching specifications were:

1. Education (6 categories), age (3 categories), and race (4 categories)
2. Education (6 categories), age (5 categories), and race (4 categories)
3. Education (6 categories), age (5 categories), and race (5 categories)

4. Education (6 categories), age (5 categories), and race/ethnicity (6 categories)
5. Education (3 categories), age (3 categories), race (4 categories), and region (4 categories)
6. Education (3 categories), age (3 categories), race (4 categories), and year (4 categories: 2003–2005, 2006–2008, 2009–2011, 2012–2014)
7. Education (3 categories), age (3 categories), race (4 categories), and year (6 categories: 20032004, 2005–2006, 2007–2008, 2009–2010, 2011–2012, 2013–2014)
8. Education (3 categories), age (3 categories), race (4 categories), and year (12 individual years, 2003–2014)

We measured the adjusted gender gap for each of the two primary ATUS outcomes, four household types, and seven sets of weights based on each of the alternative matching specification. These alternative specifications substantially reduced the sample size with support in the matching algorithm. Accordingly, we compared each of the adjusted gender gaps in the 64 alternative specifications with the adjusted gender gap by using our base specification estimated on the same sample. The estimated gap differed from the base specification by no more than 9.9 percent in magnitude across any of the 64 comparisons, with the largest differences in specifications with alternative demographic categories rather than matching on year. These differences translate into changes in the relative share of each influence (from Table 9) of no more than 5.5 percentage points.

Regression adjustment as an alternative to matching. We used regression adjustment as an alternative to matching for adjusting for demographic differences across household types. Our method adjusts the outcomes for demographic differences between each combination of household type and gender, and the overall sample. We used a regression model that allows the relationships between each outcome and demographic characteristics to vary with the household type and gender. We estimated the regression model:

$$Y_{ij} = \alpha_j + \gamma_j F_{ij} + \left(\beta_j + \delta_j F_{ij}\right) X_{ij} + u_{ij},$$

where Y_{ij} is the outcome of individual i in household type j, F_{ij} equals 1 if the individual is female, and X_{ij} is a vector of characteristics. Similar to a Blinder-Oaxaca decomposition, the average gender gap for household type j can be written as:

$$\bar{Y}_{j,f} - \bar{Y}_{j,m} = \hat{\gamma}_j + \hat{\beta}_j\left(\bar{X}_{j,f} - \bar{X}_{j,m}\right) + \hat{\delta}_j \bar{X}_{j,f},$$

where the j,f and j,m subscripts indicate female and male averages, respectively, in household type j. Our matching strategy adjusts for differences in characteristics by assigning all groups the demographic characteristics of the overall sample. Similarly, replacing each set of average characteristics with those of the overall sample yields an adjusted gap of $\hat{\gamma}_j + \hat{\delta}_j \bar{X}$.

We compared the regression-adjusted gap for each outcome and each household type with the analogous adjusted gap by using our baseline weighting specification. We used the same set of characteristics in the regression adjustment as in the baseline weighting specification. Across the six primary outcomes and four household types, the regression-adjusted gap differed from the gap estimated with our baseline weights by up to 14.5 percent. The largest differences between

the matching and regression techniques were in hourly earnings and earned income, with the next largest discrepancy being 9.7 percent. These differences translate into changes in the relative share of each influence (from Table 9) of no more than 7.2 percentage points, or 3.9 percentage points if the two earnings outcomes are excluded. We hypothesized that the larger discrepancies for earnings outcomes are a result of the selection of women into employment. Although neither weighting nor regression adjustment fully addressed the selection problem, we are inclined to believe that the weighting method is superior to regression adjustment because it does not require the linearity assumption, which may over- or under-adjust outcomes for each group.

This page has been left blank for double-sided copying.

.

ABOUT THE SERIES

Policymakers and researchers require timely, accurate, evidence-based research as soon as it's available. Further, statistical agencies need information about statistical techniques and survey practices that yield valid and reliable data. To meet these needs, Mathematica's working paper series offers access to our most current work.

For more information about this paper, contact Nan L. Maxwell, Researcher, at NMaxwell@mathematica-mpr.com.

Suggested citation: Maxwell, Nan L. and Wozny, Nathan. "Gender gaps in time use and earnings: What's norms got to do with it?" Working Paper 54. Oakland, CA: Mathematica Policy Research, March 2017.

www.mathematica-mpr.com

Improving public well-being by conducting high quality, objective research and data collection

PRINCETON, NJ ■ ANN ARBOR, MI ■ CAMBRIDGE, MA ■ CHICAGO, IL ■ OAKLAND, CA ■ TUCSON, AZ ■ WASHINGTON, DC

MATHEMATICA
Policy Research