In Search of Dynamism: Gender Inequality in Changing Geographically-Bound Occupation and Industry Labor Markets

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Progress in reducing the gender pay gap has slowed or even stalled (England 2010; Blau and Kahn 2016). Researchers have offered three prominent explanations for this lack of progress: (1) continued high levels of gender segregation across occupations (Blau and Kahn 2006, 2016) and establishments (Peteson and Morgan 1995; Bayerd et al 2003), (2) the motherhood wage penalty (Waldfogel 1997; Abendroth, Huffman, and Treas 2014; Jee, Misra, and Murray-Close 2018) and the rise of overwork (50+ hours a week) in certain white-collar occupations (Cha and Weeden 2014)

Gender segregation, the motherhood penalty, and overwork explanations for the gender pay gap are interrelated. Occupational and industry segregation account for about half of the gender pay gap (Blau and Kahn 2016). When establishment and job title segregation are accounted for most (Biebly and Baron 1986; Petersen and Morgan 1995) or at least a large portion (Bayerd et al 2003) of the remaining gender pay gap goes away. In addition, Waldfogel (1998) estimates that 45% and of the gender pay gap comes from the lower earnings of mothers relative to childless women. A substantial portion of the motherhood wage penalty's effect on the gender pay gap operates through occupational sex segregation, particularly the movement of mothers to part-time work (Budig and England 2001; Gangl and Ziefle 2009) and for mothers taking longer leaves and returning to different jobs (Baum 2002). Mothers are also more segregated than childless women across occupations and establishments (Glauber 2012; Hook and Petit 2016; Fuller 2018). Similarly, overwork operates through occupational segregation. Overwork is a feature of only part of the occupational structure, mainly high-paying managerial and professional occupations. Mothers are more likely to move out of occupations with high levels of overwork (Cha 2013), influencing the measurement of the motherhood penalty. Importantly, overwork's effect on the gender pay gap operates through the differential returns to overwork vs full-time work within the same occupation and the lower percentage of women in overwork.

A challenge for the literature is the lack of a methodological approach that allows researchers to test the relative importance of all three hypotheses in the same analysis. The common approach of using decomposition analysis for the effect of occupational sex segregation and overwork in cross-sectional (Blau and Kahn 2016, Cha and Weeden 2014) is at odds with the standard within-person measurement of the motherhood penalty using longitudinal data (Budig and England 2001; Gangl and Ziefle 2009). We start to address these methodological concerns by modeling the movement of men and women between pairs of occupation-industry jobs using a conditional logit. The conditional logit allows us to model characteristics of the origin and possible destination occupation-industry jobs and test the effects of the motherhood penalty and overwork hypotheses on the between occupation-industry job gender pay gap.

Dynamism in occupational labor markets

In contrast to the stalling narrative, a handful of studies point towards as much change as stability for women in the labor market during the recent period (Weeden 2004; Cha and Weeden 2014; Levanon and Grusky 2016; Cohen and Huffman 2003a; Cohen and Huffman 2003b; Huffman and Cohen 2004). The common link between these studies is a smaller unit of analysis, using detailed occupations (Weeden 2004) or characteristics of detailed occupation (Cha and Weeden 2014, Levanon and Grusky 2016), but also geography (e.g. Cohen and Huffman 2003a). This makes these studies reminiscent of the seminal work by Reskin and Roos (1990) on the process of occupational feminization and the papers by Baron, Biebly, and co-authors on gender inequality in and across establishments using unique data from California (Biebly and Baron 1986; Baron, Davis-Blake, and Biebly 1986; Baron and Newman 1990).

The purpose of this paper is to build on these studies in an attempt to document and explain how dynamic changes in the experience of women in the labor market are resulting in the aggregate picture of

stalled progress in the U.S. In the conclusion of her 2004 paper, Weeden writes, ""aggregate level analyses may obscure important developments at the level of specific occupations" (152). This observation is the starting point for this paper and we begin by pinpointing the places in the labor market where we expect dynamic change in gender inequality to occur.

The U.S. labor market is comprised of not one, but many geographically-bound labor markets that occur within and across occupational, industry, and firm boundaries (Kalleberg and Berg 1987). Occupational and industry labor markets can be geographically-dispersed or clustered (Benson 2014) and a part of national or local labor markets (Huffman and Cohen 2004). They respond differently in response localized economic growth or decline (Bartik 2014) and localized social norms, for example from unions (Brady, Baker, and Finnegan 2013). Cohen and Huffman (2003a, 2003b) find that the gender pay gap varies across U.S. metropolitan areas suggesting differences in the social norms of different labor markets, but also possibly differences in the labor supply and demand for female work (Cotter et al 1998; Cotter et al 2001).

Occupations and industries themselves grow and decline in response to changing technology and the demand for service (Wyatt and Hecker 2006; Wren 2013). In response, occupations engage in boundary maintenance to sustain the demand for their services, and increase their wages and social standing (Abbott 1988; Weeden 2002). Cha (2013) finds that mothers are more likely to move out of occupations with more overwork (50+ hours a week) because they find overwork incompatible with their desired work-family arrangements. In a related article, Cha and Weeden (2014) find that the growth of overwork and the wage returns to overwork, mostly-clustered in high-paying managerial and professional occupations, explains 10 percent of the gender pay gap. Occupations with greater public sector employment and with higher percentage of college graduates have a smaller gender pay gap (Mandel 2016). This suggests differences in normative environments and, in the case of occupations with a high percent of college graduates, labor supply.

Occupational and industry shifts are expected to occur unevenly across geographically-defined labor markets. Queuing theory predicts that employers will face different pressures in the context of changing labor supply and demand (Resin and Roos 1990; see also Cotter et al 1998; Cotter et al 2001). When needing to retain skilled workers in a declining occupation, then employers are more likely to conform to the desires of those skilled workers. In a growing occupation, employers may need to utilize new groups of labors and may respond with efforts to make the workplace friendlier to them. Occupational skills can be defined in terms of occupational labor markets utilizing the movement of workers between occupations (Mouw and Kalleberg 2018). Or, in utilizing a task approach using detailed skill classification systems like that of O*Net (Gathmann and Schönberg 2010; Yamaguchi 2012; Levanon and Grusky 2016). Levanon and Grusky (2016) find that the gender typing of job tasks (e.g. strength, problem-solving, sociability) explains a significant portion of gender segregation between occupations. If demand for these skills is changing, then the gender typing and consequent gender pay gaps, may change as well.

The place of an occupation in the occupational hierarchy in terms of pay and skills and the related level of occupational feminization (Busch 2018; Levanon, England, and Allison 2009) are likely important for the occupation and associated employers' strategies for retaining and hiring workers. For example, a middle-wage occupation that is experiencing de-skilling may be more likely to undergo feminization and subsequent declining wages. However, occupational and industry norms influenced by the composition of each group likely limit the available strategies. Occupations in the health care industry, even those remaining predominantly-male, may have become friendlier to women and mothers because of the shift towards women in the industry as a whole.

While the gender composition of the occupation if often used as a proxy for gender friendliness (e.g. Budig and England 2001; Shauman 2006), Glauber (2012) find that motherhood penalties are larger in predominately-female occupations. Previous attempts to measure the friendliness of an occupation to women and mothers beyond its gender composition rely on a compensating differentials framework, including part-time work (Budig and England 2001; Weeden, Cha, and Bucca 2016), overwork (Cha 2013, Cha and Weeden 2014), occupations in care fields (Budig and England 2001; Moore 2017), work in

the public and nonprofit sectors (Budig and England 2001; Fuller 2018), temporal and spatial flexibility (Glass 1990; Fuller 2018; Fuller and Hirsch 2018), and fringe benefits (Glass 1992; Lowen and Sicilian 2009). Some researchers, like Begall and Mills (2013) estimation of occupation-specific fertility rates , are moving away from the compensating differentials framework in attempt to measure on occupation's overall motherhood friendliness. We build on this approach in order to capture the social norms of gender and mother friendliness in occupational labor markets using occupation-specific gender pay gaps, occupation-specific motherhood penalties, occupation-specific fertility rates, in addition to classic measures of gender and mother composition, and work hours.

We expect to find dynamic changes in the labor market when analyzing changes in the (1) growth and demand for occupations and industries across geographic areas, (2) gendered supply of labor for specific occupations and industries in geographic areas, (3) the friendliness of the occupation and industry to women, and (4) economic conditions and social norms in these areas. Weeden (2004) finds that detailed occupations continue to integrate and segregate along gender lines that are not easily explained. We hypothesize that these changes in the occupational sex segregation of detailed occupations and their associated occupation-specific gender pay gaps and motherhood penalties are due to the occupational and industry dynamics of supply, demand, and social norms at the level of geographically-bound labor markets.

The analytical approach we use is the movement of workers between pairs of occupations. In his seminal book, *Revolving Doors*, Jacobs (1989) draws attention to the movement of women into and out of predominantly-male occupations, typically defined as greater than 70 percent male. A subsequent literature has followed Jacobs approach analyzing the movement of women using the same approach (Jacobs 1993; Jacobs 1995; Sheridan 1997; Li et al 1998; Chan 1999; Tanner, et al 1999; Kumlin 2010; Cha 2013; Torre 2014), while several researchers have studied the occupational mobility of women more broadly (Rosenfeld and Spenner 1992; Maume 1999; Krymkowski and Mintz 2008; Mandel 2012. Dex and Bukodi 2012).

We move this literature ahead by utilizing conditional logit models (see Mouw and Kalleberg 2018 for a recent usage in sociology and a more thorough explanation). The value of conditional logit is to the ability to account for characteristics of both the origin and all possible destination occupations. For example, the conditional logit allows us to test of whether women are leaving a declining occupation predominantly-male occupations at faster rates then men and whether they are choosing to moving to similarly-skilled predominantly-female occupations at faster rates than men. Importantly, the conditional logit moves us beyond only modeling one characteristic of an occupation as part of sample selection (e.g. only female workers in predominantly-male occupations in much of the *Revolving Doors* literature) and the characteristics of the destination occupation (predominantly-female). Instead, we are able to model the behavior of workers in all origin occupation types in different geographically-bound occupational and industry labor markets at the same time as all possible destination occupations. The ability to analyze origin and destination characteristics simultaneously results in a more complex, and in our view realistic, modeling of the choices a worker faces when moving occupations within the context of geographically-bound occupational and industry labor markets.

The relationship of gender pay gap to the motherhood penalty

Another contribution of this paper is to address the relationship between the gender pay gap and the motherhood penalty. Arguably the gender pay gap and the motherhood penalty, along with occupation sex segregation, are the largest and most-developed metrics of gender inequality in the labor market in the literature. Despite this, there are surprisingly few studies that seek to directly connect and examine the effects of the gender pay gap and the motherhood penalty in parallel (Sigle-Ruhston and Waldfogel 2007; Aisenbrey and Bruckner 2008; Petersen, Penner, and Hodges 2014; Dotti Sani 2015; Angelov, Johansson, Lindahl 2016; Weeden, Cha, and Bucca 2016). The relationship between the gender pay gap and the motherhood penalty and their joint-relationship to occupational sex segregation remains unclear.

The different methodological choices of researchers in these different literatures is the primary reason for lack of clarity. A difficulty for researchers is that motherhood is a life course phenomenon. In the U.S. today, over 80% of women become have a child by age 40. As a result, most studies of the motherhood penalty utilize a within-person fixed effects approach which compares a woman to herself before and after the birth of her first child (Budig and England 2001; Gangl and Ziefle 2009; Staff and Mortimer 2012). The importance of analyzing the motherhood penalty using longitudinal data and within-person effects is shown by recent competing papers of the motherhood penalty over time. Jee, Misra, and Murray-Close (2018) use the longitudinal Panel Study of Income Dynamics and find a substantial and stable motherhood penalty over time. In contrast, Pal and Waldfogel (2016) use the cross-sectional Current Population Survey and find the motherhood penalty has disappeared in the 2000s.

In contrast, decomposition analysis is the standard approach used in analyzes of the gender pay gap (Blau and Kahn 2006; Cha and Weeden 2014; Blau and Kahn 2016). This approach requires the assumption that covariates are the same across groups. As this is not the case for parental and marital statuses these variables are typically excluded from the analysis (Blau and Kahn 2006). An alternative route used by some researchers is to present gender pay gaps by marital status and children, for example comparing married men to married women, men with children to women with children etc. (Waldfogel 1998; Sigle-Rushton and Waldfogel 2007; Petersen, Penner, and Hodges 2014; Weeden, Cha, and Bucca 2016), or comparing partnered men and women in the same household to each other (Dotti Sani 2015; Angelov, Johansson, Lindahl 2016). The within-couple approach has the appeal of calculating the gap longitudinally following the motherhood penalty and getting at the gender pay gap.

The results from these analysis are unsatisfying in understanding how much of the overall gender pay gap is due to motherhood. Results have to be calculated separately for each group at each age and life stage. For example, in one of the first analyses of the motherhood penalty, Waldfogel (1998) estimates that 45 percent of the gender pay gap is attributed to different returns to parental and marital status for men and women at age 30. In a more recent analysis, Aisenbrey and Bruckner (2008) find that 25 percent of the gender pay gap at age 27 in Britain is attributable to the motherhood penalty.

In this paper, we analyze the movement of men and women between pairs of detailed occupations embedded within industries and geographies. This approach allows for an estimation of the portion of the overall gender wage gap explained by the differential movement of mothers through the occupational structure. Previous research suggests that much or all of the gender pay gap is captured when accounting for occupation, establishment, and within establishment job titles (Biebly and Baron 1986; Petersen and Morgan 1995; Bayerd et al 2003). Occupation and establishment segregation have also been found to explain substantial portions of the motherhood penalty (Glauber 2012; Hook and Petit 2016; Fuller 2018). While we do not have access to data of establishment or firm, we proxy establishments utilizing industry and U.S. states. We estimate the effect of the motherhood penalty on the gender pay gap by simulating the gender pay gap if mothers made the same occupation and industry movement choices as childless women. Since the segregation of childless women and mothers occurs primarily through occupational and industry movement, we expect to capture most of the effect of the motherhood penalty on the gender pay gap.

Data and Methods

The primary data to analyze the movement of workers through occupational labor markets comes from the 1996, 2001, 2004, and 2008 longitudinal panels of the Survey of Income and Program Participation (SIPP). SIPP respondents in each panel are representative sample of the U.S. population and were surveyed three times a year from three to five years depending on the panel (twelve waves for 1996 and 2004, nine for 2001, and sixteen for 2008). Each panel consists of about 50,000 households which provides a large enough sample of workers to model the movement work workers between pairs of detailed occupations, industries, and U.S. states.

Individual-level variables come from the SIPP and include gender, race (white, black, Hispanic, other), marital status (single, married, previously married), number of children in the household, children under age 5, recent or future birth (child age -1 to 1), age, education (less than high school, high school,

some college, college degree, advanced degree), hourly wages, work hours (part-time, full-time, overwork), occupation, occupational tenure, industry, and state.

Characteristics of occupational and industry labor markets in each state come from the Current Population Survey (CPS) and the American Community Survey (ACS). In our analysis, occupations are embedded within industries and states. We operationalize occupational by industry labor markets using a measure of occupational-industry skill similarity from Mouw and Kalleberg (2018) derived from the movement of workers between occupations in the CPS. This measure performed better than another measure of skill similarity utilizing the task-approach and data from O*Net (Mouw and Kalleberg 2018).

The growth or decline of each occupation-industry is calculated using a three-year rolling average of employment size as well as hourly wages. This measure, and all others below, are calculated at the national and state levels. The state metric is then normalized in reference to the national metric. We include a normalized measure of occupational size and occupational hourly wage. The supply of labor available for an occupation by industry is calculated utilizing the proportion of workers in (or previously in if unemployed) an occupation with a degree of occupational skill similarity. These supply metrics are recalculated for men, women, and mothers to account for the available gendered supply of labor.

We include a number of measures of occupational characteristics and norms, including unionization, percent in the public sector, proportion in self-employment, median work hours, percent with a college or advanced degree, median age and the rate of change, and percent white and rate of change. Economic conditions in each state are measured using data from the Quarterly Workforce Indicators, including average earnings, percent of workers in stable employment, employer hiring rates, and employer separations.

Apart from supply and demand factors of occupational labor markets, occupational norms or the friendliness of occupations to women and mothers are expected to influence the occupational mobility of women and mothers relative to men. We test a number of potential measures of gender friendliness including: the percent of women, the rate of occupational feminization, the percent of mothers, the rate of occupational motherization, the proportion in part-time hours (<35 hours), the proportion in overwork (50+ hours), the occupation specific gender pay gap, the occupation specific motherhood penalty, and the occupation specific fertility rate.

We use conditional logit models to model the mobility of men and women, childless women and mothers through the occupational structure. In our analysis, we seek to answer three questions:

(1) Do women (compared to men) and mothers (compared to childless women) stay in or move between pairs of occupations disproportionally?
(2) What is the contribution of this disproportionate movement of women and mothers through the occupational structure to the gender pay gap and the motherhood penalty?
(3) Do the characteristics of changes in occupational growth and decline, the supply of labor to an occupation, occupational characteristics and gender friendliness, and geographic norms and economics conditions explain away the effects of the differential movement of women and mothers on the gender pay gap and the motherhood penalty?

Analytical Strategy

To answer the first question, we start by presenting separate figures for the movement of men, childless women, and mothers through the occupational structure. The format for the charts would follow the heatmap chart created in Mouw and Kalleberg (2018), except ordered by occupation code and not occupational skill similarity. To test the differences in these movement patterns formally, we present a first baseline conditional logit model of the movement between pairs of occupation based only on the whether the workers is male, a childless woman, or a mother. In a second model, we control for the remaining individual-level variables.

The second question is the equivalent of the raw or unadjusted gender pay gap and motherhood penalty. We start to estimate this by including variables for the wages of the initial and destination occupation interacted by gender and then in a subsequent model distinguishing between childless women

and mothers. The individualized unchosen destination occupation wages are estimated using regressions for wages based on the workers demographic and human capital characteristics from the CPS. The coefficient for women (and in the second model for mothers) would indicate the average wage penalty of occupational moves for women (and mothers). Finally, we calculate the size of this penalty relative to the overall gender pay gap in the SIPP. The remaining residual part of the gap would be differential returns to occupational moves for men and women (and mothers) or the within-occupation penalty.

In the third research question where we make full use of the conditional logit to include all the occupation-industry covariates that might influence the movement of men, women, and mothers between occupations. Our analysis here is not of the overall gender pay gap and motherhood penalties. Instead, we are analyzing the portion of these penalties that operate through differential movement on of men, childless women, and mothers through the occupational structure (identified in the second analysis). The larger the share of the overall gender pay gap and motherhood penalty that operate through differential occupational behavior the more substantively interesting is this analysis. We begin with a series of models at the national-level. We start by including only the occupational skill similarity measure, and then in successive models adding the national-level occupational size and growth variables, the national-level labor supply variables, the national-level occupational characteristics, and the measures of occupational gender and motherhood friendliness. Finally, we turn to the state-based models and repeat the same series of models.

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