The WWII Production Effort and Changes in Labor Demand for Women

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Abstract

World War II saw an unprecedented influx of women onto factory floors. While most previous literature focuses on the effects on female labor supply via geographical variation in military mobilization, Rose (2018) highlights the importance of wartime production demand in driving female wartime employment. Using data on the wartime employment of women from Rose (2018), I revisit the framework in Acemoglu, Autor and Lyle (2004), and estimate the impact on relative wages for women, due to both state-wide and industry-wide changes in production demand during WWII. I find that wages increased for women in 1950 compared to 1940 in Durable Manufacturing by 35.4-35.9% in the industry with the largest change in the relative demand for women during WWII whereas impacts of state-level changes in demand are not significant. Impacts on wages in Non-Durable manufacturing are statistically insignificant and negative. The relative wage gains are highest for women with 12 or more years of education, suggesting that the increased demand during WWII allowed some women a "foot in the door" into prized manufacturing jobs.

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1 Introduction

The 1940s saw the largest proportional change in female labor force participation (FLFP) in the United States since the nineteenth century, with the influx of nearly 7 million women into the labor force during World War II (Acemoglu, Autor and Lyle, 2004; Rose, 2018).

Previous papers have extensively studied the role of World War II in increasing female employment (Goldin, 1991*b*; Acemoglu, Autor and Lyle, 2004; Goldin and Olivetti, 2013) and impacting other sectors of a woman's life such as fertility and marriage (Goldin, 1991*a*; Fernández, Fogli and Olivetti, 2004; Fernández, 2013; Doepke, Hazan and Maoz, 2015; Larsen et al., 2015). Crucially, however, most prior work interprets the impact of World War II (WWII) on female labor force participation as a story of changing female labor supply rather than changes in the relative labor demand for women. However, there is no clear rationale to do so.

Many cultural and institutional barriers to women's work were lowered during World War II (such as segregation into low-wage occupations, marriage bars that legally prevented women from working in most occupations, and cultural norms viewing married women working unfavorably (Goldin, 1991*a*)). The lack of these barriers could translate to women finding it easier to supply their labor, but it could also make it easier for industries to now employ women.

Furthermore, the monumental inflow of women into the workforce during World War II was due to the rising demand for workers in the American war production effort, and the prime reason for lowering the aforementioned barriers to women's work in the first place. During WWII, American industry provided more than two-thirds of all Allied military equipment, outstripping production levels of not only other nations but also the US's own pre-World War II capacities (Burns, 2007). As the war progressed and the need for workers intensified, nearly a quarter of the prime-age male labor typically used to fill such needs was drafted by the military and taken out of the available workforce. Consequently, women were needed in large numbers to keep up with production demands and urged to join the workforce via a nationwide public campaign (Hartmann, 1982; Milkman, 1987).

A recent string of literature highlights the importance of production demand on increases in FLFP during World War II. Rose (2018) shows that the spatial distribution of female employment in WWII was not impacted by men being drafted out of the workforce for the military as in Acemoglu, Autor and Lyle (2004) but rather by geographical variation in wartime production and the need for labor. Shatnawi and Fishback (2018) focus on Pennsylvania and find that the relative demand for female production workers rose by more than 40% during World War II and hypothesize that part of the increase could come from women learning new skills during the war, adjustments in production technology to maximize women's output and employers revising their perceptions of female productivity.

Not only did the exigencies of the production effort draw millions of women onto factory floors, but it also drastically changed the industrial composition of the female workforce. Less than a quarter of women worked in manufacturing in 1940; even within manufacturing, approximately 70% of all women worked in Non-Durable Industries, primarily in Food, Textiles, and Apparel (see Figure 1). The war production effort rapidly placed women in new industries like Machinery, Electrical Machinery, and Transport Equipment (Warm, 2002), where women only formed a small proportion of the workforce in 1940. The proportion of women in Durable Manufacturing, for instance, went from 8.6% in the 1940 Census to a peak of nearly 25% in October 1944, rising by 188.4%. In comparison, Non-Durable Manufacturing (which also contained war-critical industries like Chemicals and Rubber) went from being 39.5% female in 1940 to a high of 45.3% female in Oct 1944, a change of only 14.7% (Pidgeon, 1947).

Given this background, it is not unreasonable to expect that in industries where the relative wartime demand for women rose most disproportionately, relative wages for women could stay elevated even after World War II ended. A large proportion of war-critical industries did not employ many women before WWII and had to invest in changing physical capital and training to make production jobs easier for women, changes that could permanently increase the relative productivity of women in these industries.

In their seminal paper, Acemoglu, Autor and Lyle (2004) assert that state-wide differences in drafting men into the military during World War II drove increases in female employment and changed their relative wages. Rose (2018) demonstrates instead, that the spatial distribution of wartime production was the main driver of female employment during World War II, and not military mobilization as per Acemoglu, Autor and Lyle (2004) and subsequent literature.[1] However, Rose (2018) stops short of estimating the impact of wartime production on women's relative wages post WWII. Additionally, none of the previous literature linking FLFP and World War II considers the impacts of industrial variation in female employment during World War II, apart from the recent paper by Shatnawi and Fishback (2018) who focus on Pennsylvania.[2]

In this chapter, I extend the analysis from Rose (2018) to measure the impact of changes in the relative wartime employment of women on their relative earnings between 1940 and 1950. I use the framework outlined in Acemoglu, Autor and Lyle (2004), and incorporate industry variation in wartime production alongside the state-level variation that is used to study effects on female employment by Rose (2018), and test the impacts on relative wages for women compared to men. A relative rise in female earnings, combined with the increase in female employment between 1940 and 1950 found by Rose (2018) in Durable Manufacturing, would indicate a net increase in the relative demand for women

[1] Rose (2018) also points out how the dependent variable of "Weeks Worked" used by Acemoglu, Autor and Lyle (2004) to measure employment might be flawed due to changing definitions between the 1940 and 1950 Censuses that might artificially inflate women's employment in 1950. For more see Section 4.

[2] Even though Rose (2018) highlights the importance of production demand in his paper, he uses the geographical variation in military contracts, grouping all industries together for most of his analysis. He does split them in Table 6 (p.25) to look at the lasting impacts of female wartime work on employment in 1950 and finds that state-economic areas with higher female employment during World War II did have increased employment of women in 1950, but only in Durable Manufacturing industries.

post World War II in Durable Manufacturing.

I use new data from Rose (2018) on the placements of job seekers to available openings by the United States Employment Service (USES) between 1944 and 1946 across states and industries, and define two new measures of relative female demand during World War II. The first is a change in the number of women relative to the change in total workers in an industry (or state) during World War II due to USES assignments. The second is a change in the relative proportion of women in an industry (or state) during World War II due to USES assignments. Both measures are intended to capture the combination of high wartime overall labor demand and a drastic rise in the demand for women specifically. I restrict my focus to workers in manufacturing since more than 50% of all wartime labor assignments in the data are in manufacturing, and this allows me to consider finer sub-industry detail within manufacturing industries.

In Durable Industries, I find that working in the industry with the highest increase in the relative demand for women (Transport Equipment) during World War II compared to the industry with the lowest increase in the relative demand for women (Fabricated Metal, or Lumber and Wood) increased wages for women (relative to men) between 1940 and 1950 by 35.4–35.9% according to my preferred specification using either measure of relative demand for women. In contrast, in Non-Durables, I do not find statistically significant impacts of changes in the relative demand for women during World War II on relative wages for women. The magnitudes of the impacts, in addition to being statistically insignificant, are also smaller.[3]

Taken in conjunction with the results of Rose (2018), who finds gains in the employment of women in Durable Manufacturing in 1950 (compared to 1940) in state-economic-areas of high wartime demand for women, my results indicate a rise in the relative demand for women in Durable Manufacturing that persisted until 1950 in the form of both

[3]In my preferred specification, they range from an insignificant decrease of 1.6% to an insignificant increase of 4.4% in the relative wages for women working in the industry with the highest rise in the relative demand for women (Leather and Footwear, or Rubber) relative to the industry with the lowest rise in the relative demand for women (Tobacco) in Non-Durable Manufacturing.

employment and relative wage gains for women compared to men, in magnitudes similar to that found in Pennsylvania by Shatnawi and Fishback (2018). The fact that I find significant positive impacts on relative wages for women in Durable Manufacturing industries (where women formed a very small minority of workers before World War II) and not in Non-Durable Manufacturing industries (which held more than 60% of all women in manufacturing in 1940), even after using measures that account for the prior industrial composition of women in the industry, highlights how wartime employment and demand for workers evolved differently across these two manufacturing sectors.

In Non-Durable Manufacturing industries that were considered war-critical such as Chemicals or Rubber, the workforces were on average, about 20% female before World War II. As production needs mounted, and the available male labor force shrank, new women hired were likely placed into roles that were not drastically different from the roles that women had been in before. For example, women already worked as organic and inorganic chemists before World War II. They could easily and quickly be trained to work as foundry chemists as part of the war effort, according to a report published in 1942 by the United States Employment Service (USES, 1942). In contrast, war-critical industries in Durable Manufacturing like Transport Equipment, had workforces that were only on average 10% female in 1940, who worked almost entirely in clerical and communication positions (USES, 1942). The urgent need for riveters, machinists, and welders in these industries had to be filled at least in part by women during World War II, who had to either be trained in new skills or placed into revised production processes where employers made adjustments to physical capital in favor of women (USES, 1942; Joiner and Welner, 1942). Anecdotal evidence points out that this may have even changed or updated employer perceptions of female productivity (Hartmann, 1982; Milkman, 1987; Encyclopedia.com, 2021). Hence, drastic increases in the number of women in Durable Manufacturing industries during World War II could have raised real or perceived female productivity, leading to a permanent rise in relative wages, in contrast to women in

Non-Durable Manufacturing.

Interestingly, I find no statistically significant impacts of the overall WWII industrial demand on the wage growth between 1940 and 1950 either for men or women. In addition, changes in the relative female demand or overall demand for workers by state also do not impact male or female wage growth between 1940 and 1950 in a statistically significant way. Even after accounting for possible state-wide variation in military mobilization, only industry-wide variation in the relative wartime demand for women is a significant driver of wage growth for women in manufacturing. This is notable since nearly all previous literature focuses on state-level variations in female employment during World War II.

Although I do not have data on USES placements by different demographic characteristics, I test if the impact of shocks in the relative demand for all women on the wages of women in 1950 differs by worker characteristics. I find that the largest increases in relative wage growth between 1940 and 1950 are for women with 12 or more years of education (compared to similar men). This is similar to the subgroup of women that Goldin and Olivetti (2013) find to have the largest employment gains as a consequence of World War II, albeit via variation in military mobilization. Consistent with an employer demand story, this group could be likeliest to see relative wages increase due to changes in the "perceived productivity" of women lowering the non-pecuniary Beckerian costs of employers hiring such women (Becker, 1962), or via specific training developed during the war that changed the real relative productivity of women (USES, 1942).

The remainder of this chapter is organized as follows: Section 2 reconciles the historical background and previous literature, and Section 3 details a simple model to test my theories. I discuss the sources of my data and the construction of samples in Section 4. Section 5 outlines my empirical strategy, and Section 6 discusses the results. I conclude in Section 7.

2 Historical Context

2.1 The War Production Effort

When the U.S. officially entered World War II in December 1941, the armed forces took many prime-aged men out of the civilian workforce. At the peak of the war in 1945, more than a third of men aged 18–44 were in active duty service due to a mix of the draft and voluntary enlistment (Hartmann, 1982). This produced a sudden void in the U.S. labor force.

Around the same time, the war production effort on the home front began in earnest in January 1942 with the establishment of the War Production Board. The American War Production Effort led to an unprecedented rise in the demand for workers to make products considered essential to the war such as tanks, munitions, and airplanes (Warm, 2002). President Roosevelt set staggering production goals for factories across America, and in four years, U.S. production of defense materials, already the largest in the world in 1941, doubled in size (Burns, 2007).

The War Production Board reported in November 1944, "... in 1940, the average monthly production rate of airplanes was 500; in 1941 it rose to 1,600 and, in 1942, reached the 4,000 level. The value of guns and ammunition increased from an annual rate of $170 million in 1940 to $900 million in 1941, and sky rocketed to over $15 billion in 1942. From 250 in 1940, the building of new ships jumped to 2,000 in 1941, and then shot up to 11,500 in 1942. These spectacular achievements were similarly dwarfed when the output data for 1943 end 1944 *(sic)* became known. Aircraft production, for example, reached a monthly average of almost 8,000." (USES, 1948, p.16).

The combination of the War Production Effort and the military draft led to a rapidly tightening labor market where women were recruited in large numbers and were encouraged by employers and the War Manpower Commission to join non-traditional roles in the labor market, as part of their patriotic duty (Hartmann, 1982; Warm, 2002). Several recruiters compared factory labor with household tasks in an effort to entice women to join the labor force, saying for example "Instead of cutting the lines of a dress, this woman cuts the pattern of aircraft parts. Instead of baking cake, this woman is cooking gears to reduce the tension in the gears after use.... They are taking to welding as if the rod were a needle and the metal a length of cloth to be sewn. After a short apprenticeship, this woman can operate a drill press just as easily as a juice extractor in her own kitchen. And a lathe will hold no more terrors for her than an electric washing machine" (Milkman, 1982, p.341).

Soon, factory floors across the country were filled with female production workers, drawing women from outside the labor force as well from more typically 'female' sectors of the labor market (Hartmann, 1982).

2.2 The United States Employment Service

In September 1939 (when the war began in Europe), the U.S. was still dealing with mass unemployment from the vestiges of the Great Depression. Within three years, this turned into an acute labor shortage as the War Production Effort surged (Brennan, 1973). In this new labor market, the United States Employment Service (USES) played an instrumental role in matching jobs to available workers (Rose, 2018).

The USES was created prior to World War I and reinstated in 1933 by the Wagner-Peyser Act to help employers and job seekers in the immediate aftermath of the Great Depression (Brennan, 1973). In April 1941, the national and state employment service offices put together a large-scale registration of occupational skills to measure the availability of key craftsmen and production workers needed for the burgeoning defense production. (USES, 1948)[4] This database helped analyze the suitability of workers at hand for high-demand occupations. It also provided a new strategy of "job dilution" to fill the outstanding demand for skilled workers — dividing skilled occupations into several sim-

[4] Prior to WWII, the USES had also compiled the first edition of the "Dictionary of Occupational Titles" in 1935, which collected information about skills required across different occupations and helped streamline hiring across industries.

pler operations that could be performed by workers with a minimum of experience and skill (USES, 1948).

As job seekers applied to state and national employment services offices, the USES worked as a national unified labor clearing house. Rose (2018) states that “in 1944 alone, the USES was responsible for filling 11.4 million vacancies, including 3.8 million with women. About 6.8 million of these jobs were in manufacturing industries" (Rose, 2018, p.7).

USES placements were highly concentrated in manufacturing industries, with assignments to manufacturing making up 54.8% of all USES assignments in the available data (see Appendix Figure A.1). Durable Manufacturing alone made up 31.68% of all USES assignments in the data, more than double the fraction of placements in the next largest non-manufacturing industry (Personal Services, 12.12% of all assignments). Therefore, I focus my attention on variations in wartime demand within manufacturing.

Table 1 shows the distribution of employment by industry and sex in the 1940 and 1950 Decennial Censuses as well as for the USES job placements between 1944-46 accessed from Rose (2018). The number of USES placements in manufacturing represents a significant proportion of the 1940 workforce. Moreover, the data on USES placements are from the last 2 years of WWII (from the third quarter of 1944 to the second quarter of 1946), implying that the total numbers placed during the entirety of World War II including assignments from 1942 and 1943 are almost definitely higher than the numbers reported in Table 1.

The proportion of female workers in the USES assignments represents higher proportions female of manufacturing industries than seen in 1940 or 1950 (consistent with the idea that more women were employed in the war effort across all industries than before the war or after). However, the relative influx of women was more drastic in some industries than others. For example, the USES placed 237,574 women in Food and Beverages between 1944–1946 (see Table 1), which represented a 7% change in the total number of women from 1940. In contrast, the USES placed fewer overall women in Transport Equipment (179,947), but that represented a 15.6% change in the total number of women from 1940, more than twice the change in Food and Beverages (see Table 2).

2.3 Changes in Female Productivity

In the first half of the twentieth century, professions tended to be segregated by sex (Bergmann and Adelman, 1973). Of all women working in non-agricultural industries in the 1940 Census, nearly half worked in Retail Trade, Professional and Personal Services (Ruggles et al., 2020). When breaking down the proportions of women within manufacturing industries (as seen in Figure 1), Food, Textiles, and Apparel contained more than half of all the women employed in manufacturing in 1940.

During World War II, women flooded new industries, where they were often hired for the very first time as production workers. Within Durable Manufacturing, a large number of industries that now employed women as welders, machine operators, riveters, solderers, or grinders, had previously only employed them in clerical capacities as bookkeepers, typists, receptionists, or clerks (USES, 1942). For the first time, women were allowed a 'foot in the door' into new (and lucrative) factory work.

A possible channel through which the relative productivity of women may have permanently increased could be the investment in physical capital and vocational training for women during World War II. Confronted with a shortage of skilled male workers, the USES released a report in February 1942 redefining several occupations that did not typically hire women into smaller occupations and officially designated their "suitability" for women, as well as the time it would require to train them in said occupations in an effort to utilize the available numbers of women to fulfill production demands (USES, 1942). In this report, the USES gave an example of such a practice: "For example, it usually takes years of training to become efficient in all the aspects of the occupation of Precision Lens Grinder. Certain phases such as blocking, cementing, inspecting, however, can be taught within a comparatively short time, and women have been found to be very adaptable to these tasks" (USES, 1942, p.VIII). In 1943, The National Industrial Conference Board reported that a large majority of manufacturing plants had broken down complex assembly jobs into simpler operations with lower training required to accommodate female workers (Hartmann, 1982). Opportunities for pre-employment vocational training for women increased, and employers made capital investments into technology to more easily integrate women into the production process (Joiner and Welner, 1942; Hartmann, 1982). All these measures taken to utilize women more effectively within manufacturing may have increased their real relative productivity leading to relative wage growth.

Another channel through which the relative demand for women could have changed is employer perceptions of productivity, in contrast to (or alongside) changes in the real productivity of women. Purportedly, attitudes of some employers did change with regards to the ability of women to perform tasks involving greater motor skills and technical precision (Hartmann, 1982; Encyclopedia.com, 2021). Milkman (1987) quotes the trade journal Automotive War Production saying in their October 1943 issue, "..on certain kinds of operations—the very ones requiring high manipulative skill—women were found to be a whole lot quicker and more efficient than men" (Milkman, 1987, p.59). General Motors president Charles E. Wilson found women "more enthusiastic and showing much better spirit" (Hartmann, 1982, p.63).

3 Theory

I start with a standard Cobb-Douglas production function of the following form:

$$Y_{jst} = K_{jst}^{\alpha} L_{jst}^{(1-\alpha)} \tag{1}$$

and consider labor input to have male labor and female labor as imperfect substitutes in a constant elasticity of substitution (CES) function, borrowing a workhorse model from

Autor, Katz and Krueger (1998), also used by Acemoglu, Autor and Lyle (2004) in their paper.[5]

$$Y_{jst} = K_{jst}^{\alpha}\left(\left((A_{jst}^{M}M_{jst})^{\rho} + (A_{jst}^{F}F_{jst})^{\rho}\right)^{(1/\rho)}\right)^{(1-\alpha)} \tag{2}$$

Using this production function, the output produced in an industry j in state s at time t is a function of capital (K_{jst}), male labor (M_{jst}) and female labor (F_{jst}) in a constant elasticity of substitution function, with respective 'labor-augmenting' productivity terms—A_{jst}^{M} and A_{jst}^{F}. Jobs within manufacturing were largely sex-segregated pre-World War II (Bergmann and Adelman, 1973), and it seems plausible that men and women were imperfect substitutes in manufacturing industries, with their relative contribution to output not just impacted by their rate of substitutability ρ, but also the relative gender-specific labor-augmenting productivity terms A_{jst}^{M}, and A_{jst}^{F}.

Changes in the relative labor-augmenting productivity across time could represent several ways in which the effectiveness of gender-specific labor input is impacted during WWII via investments in physical capital, changes in the access and quality of vocational training available, or the perceptions of employers regarding the group-specific productivity of each gender in an industry or state.

If I assume that capital does not respond to changes in the availability or demand for labor between 1940-1950, then while taking the marginal product of Y_{jst} with respect to labor, the capital term will float outside.[6] Therefore to simplify, I, like Acemoglu, Autor and Lyle (2004), drop capital from my production function and have it as

$$Y_{jst} = \left((A_{jst}^{M}M_{jst})^{\rho} + (A_{jst}^{F}F_{jst})^{\rho}\right)^{(1/\rho)} \tag{3}$$

[5]Although Acemoglu, Autor and Lyle (2004) use a production function with CES between male and female labor, they only consider markets at the state-year (st) level rather than the industry-state-year level (jst) that I do in this chapter.

[6]While this may seem restrictive, the labor-augmenting productivity terms help to capture any changes in capital investment across time that might improve labor output. The possibility I rule out by making the above assumption is simply that capital input is not a function of contemporaneous labor input in the period that I measure my outcomes in (1940-1950).

In a competitive market, factors would be paid their marginal product. Deriving the marginal products of each type of labor gives me:

$$f_{Fjst} = \left((A^M_{jst}M_{jst})^\rho + (A^F_{jst}F_{jst})^\rho\right)^{\frac{1-\rho}{\rho}} \times \left(A^{M\rho}_{jst}M^{\rho-1}_{jst}\frac{\partial M_{jst}}{\partial F_{jst}} + A^{M\rho-1}_{jst}M^{\rho}_{jst}\frac{\partial A^M_{jst}}{\partial F_{jst}} + A^{F\rho}_{jst}F^{\rho-1}_{jst} + A^{F\rho-1}_{jst}F^{\rho}_{jst}\frac{\partial A^F_{jst}}{\partial F_{jst}}\right) \quad (4)$$

$$f_{Mjst} = \left((A^M_{jst}M_{jst})^\rho + (A^F_{jst}F_{jst})^\rho\right)^{\frac{1-\rho}{\rho}} \times \left(A^{M\rho}_{jst}M^{\rho-1}_{jst} + A^{M\rho-1}_{jst}M^{\rho}_{jst}\frac{\partial A^M_{jst}}{\partial M_{jst}} + A^{F\rho}_{jst}F^{\rho-1}_{jst}\frac{\partial F_{jst}}{\partial M_{jst}} + A^{F\rho-1}_{jst}F^{\rho}_{jst}\frac{\partial A^F_{jst}}{\partial M_{jst}}\right) \quad (5)$$

I follow the lead of Acemoglu, Autor and Lyle (2004) and make some more restrictive simplifying assumptions. First, I assume that in any given period where we are measuring wages, the demand for male labor does not endogenously vary with the demand for female labor, and vice-versa, which means that $\frac{\partial M_{jst}}{\partial F_{jst}} = \frac{\partial F_{jst}}{\partial M_{jst}} = 0$. Secondly, I assume that in any given time period, the relative labor productivity is not an endogenous function of labor input in that period t, i.e. $\frac{\partial A^M_{jst}}{\partial F_{jst}} = \frac{\partial A^F_{jst}}{\partial F_{jst}} = \frac{\partial A^F_{jst}}{\partial M_{jst}} = \frac{\partial A^M_{jst}}{\partial M_{jst}} = 0$.[7] These assumptions help in simplifying our marginal products with respect to each type of labor as

$$f_{Fjst} = \left((A^M_{jst}M_{jst})^\rho + (A^F_{jst}F_{jst})^\rho\right)^{\frac{1-\rho}{\rho}} \cdot \left(A^{F\rho}_{jst}F^{\rho-1}_{jst}\right) \quad (6)$$

$$f_{Mjst} = \left((A^M_{jst}M_{jst})^\rho + (A^F_{jst}F_{jst})^\rho\right)^{\frac{1-\rho}{\rho}} \cdot \left(A^{M\rho}_{jst}M^{\rho-1}_{jst}\right) \quad (7)$$

However, wages are not likely to be set competitively in the labor market that I study between 1940 and 1950. Despite the growing demands of war production, and the War Manpower Commission exhorting employers to hire workers from different industries, there were still roadblocks to a fully competitive national labor market with wage-taking

[7] This assumption does not mean that I do not allow relative labor-augmenting productivities to vary across time, rather that the elasticities of labor-augmenting productivity with respect to current period employment is zero.

behavior across industries, due to variation in skills, training, sex-typing of certain jobs in industries and gendered cultural norms.

Therefore, I adapt a wage-setting model from Card et al. (2018) to include frictions in wage-setting at the industry level that might lead to upward sloping supply curves. In this model, two types of workers (men M and women W), observe an industry-state-year specific wage pair (w_{Msjt}, w_{Fsjt}) posted across J manufacturing industries in state s and year t, and choose where to work based on their indirect utility function

$$v_{iGjst} = \beta_{Gst}\ln(w_{Gjst}) - \alpha_{Gjt} + \varepsilon_{iGjst} \tag{8}$$

where w_{Gjst} are the wages posted for gender G, by an identical representative firm in an industry j in state s and year t, and α_{Gjt} is an industry-specific preference (or cost) for all workers of gender G and ε_{iGjst} captures idiosyncratic preferences for working in an industry j in a state s in the year t. α_{Gjt} is intended to capture costs that may be incurred by individuals due to their gender for the industry they work in, ranging from more tangible costs (such as say childcare services making an industry a more accessible/less costly for women than an industry b that does not provide them) to less tangible costs (such as the sociocultural norms around working in a certain industry as a woman). β_{Gst} denotes the labor-supply responsiveness of each gender G to the posted wages and can change across state and time (since they could be impacted by rental costs in a state-year, availability of childcare in a state-year, etc.).

Although wages can be posted differently for state-industry-year markets in my model, I only consider the access costs α_{Gjt} to differ across industry-year markets for each gender G. There may still be costs or preferences that prohibit workers from working across different state markets (for example, the costs of migration or living across states), but I assume that they are either captured in the labor-supply responsiveness of the worker (β_{Gst}) or eliminated in my context of World War II, where notably workers did migrate to different states for work in large numbers and wartime rations tried to keep costs of living stationary. Thus, in this model, I account for frictions that might cause upward-sloping supply curves at both the state and the industry-level markets via α_{Gjt} (costs of working in a particular industry j), and β_{Gst} (costs or benefits of working across different states s) incorporated into the indirect utility function of a representative worker.

Then, the labor supply function for each type of worker can be derived from the model as a linear combination of the log effective wages posted by an industry-state, gender-specific parameters, and industry-by-gender-specific parameters.[8] The cost-minimizing wages posted by industries in the presence of those supply functions look like:

$$w_{Fjst} = \left(\frac{\beta_{Fst}}{1+\beta_{Fst}}\right)\mu_j f_{Fjst} \tag{9}$$

$$w_{Mjst} = \left(\frac{\beta_{Mst}}{1+\beta_{Mst}}\right)\mu_j f_{Mjst} \tag{10}$$

where f_{Gjst} is the marginal product of labor of gender G and μ_j represents the marginal cost of production.

Substituting the marginal products from our CES production function in Equations (6) and (7) into the wage equations above and taking log we get the individual wage equations:

$$ln(w^F_{jst}) = ln\left(\frac{\beta_{Fst}}{1+\beta_{Fst}}\right) + ln\mu_j + \left(\frac{1-\rho}{\rho}\right) ln\left((A^M_{jst}M_{jst})^\rho + (A^F_{jst}F_{jst})^\rho\right) + ln\left(A^{F\rho}_{jst}F^{\rho-1}_{jst}\right) \tag{11}$$

[8]An additional assumption I need to reach these labor supply functions is that industries are not using strategic pricing models, i.e. their optimal wage setting functions are set to minimize their own costs, and not responsive to wages set by other industries. Given the context of maximizing production during World War II, and the fact that I have a large enough number of industries within manufacturing (20), I feel justified in assuming away strategic price-setting across industries.

$$ln(w_{jst}^M) = ln\left(\frac{\beta_{Mst}}{1+\beta_{Mst}}\right) + ln\mu_j + \left(\frac{1-\rho}{\rho}\right) ln\left((A_{jst}^M M_{jst})^\rho + (A_{jst}^F F_{jst})^\rho\right) + ln\left(A_{jst}^{M\rho} M_{jst}^{\rho-1}\right) \tag{12}$$

If I convert this into a wage premium equation by subtracting Equation 12 from Equation 11 (as per Acemoglu, Autor and Lyle (2004)), we get the following:

$$ln\pi_{jst} = ln\left(\frac{w_{jst}^F}{w_{jst}^M}\right) = ln\left(\frac{\beta_{Fst}}{1+\beta_{Fst}}\right) - ln\left(\frac{\beta_{Mst}}{1+\beta_{Mst}}\right) + +ln\left(A_t^{F\rho} F_t^{\rho-1}\right) - ln\left(A_t^{M\rho} M_t^{\rho-1}\right) \tag{13}$$

which can be simplified to

$$ln\pi_{jst} = \underbrace{\rho ln\left(\frac{A_{jst}^F}{A_{jst}^M}\right) + (\rho-1)ln\left(\frac{F_{jst}}{M_{jst}}\right)}_{\text{Terms from the classical CES wage premium equation used by AAL (2004)}} + \underbrace{ln\left(\frac{\frac{\beta_{Fst}}{1+\beta_{Fst}}}{\frac{\beta_{Mst}}{1+\beta_{Mst}}}\right)}_{\text{Added term from CCK (2018) model}} \tag{14}$$

where the log wage premium is a linear combination of the log relative labor-augmenting productivity for women and men in a state s, industry j and time t, the log relative employment of women to men in an industry j, state s and year t, and the log of a function of β_{Gst} i.e. the indirect utilities from wages in state s in year t for a gender $G \in \{M, F\}$.

The relative labor-augmenting productivity for women and men are not observable, and past papers have typically used linear time trends to approximate for changes in the relative labor-augmenting productivity across time to calculate the structural parameters from the wage premium equation (Katz and Murphy, 1992; Acemoglu, Autor and Lyle, 2004). However, as I discuss in Section 2.3, the labor-augmenting productivity during World War II might be changing not only across time but differently across industries and states as well due to the War Production Effort. Thus, I want to explicitly allow for industry-state-level changes in labor augmenting productivity. Due to data restrictions, I assume that it changes additively in state-time and industry-time for each gender, rather than within an industry-state-year.

The unobservable labor supply elasticities β_{Gst}, that change by state s and time t can be captured by state-by-gender-by-time fixed effects that I plan to incorporate in my empirical specification. These effects will also capture any state-by-gender-by-time changes in wages. Therefore, I can only separately estimate the linear industry-by-time effects of relative productivity change on relative wages in my model.[9]

4 Data

4.1 Decennial Census Data

I use the Integrated Public Use Microdata Series (IPUMS) of the US Decennial Censuses from 1940 and 1950 (Ruggles et al., 2020). I use the 1% sample for both decennial censuses which is a 1-in-100 random sample of the population.

I use the sample restrictions imposed by Acemoglu, Autor and Lyle (2004), Goldin and Olivetti (2013), and Shatnawi and Fishback (2018) in their papers. I limit the sample to working-age persons (aged 15–64) and for the sake of uniformity across censuses, I drop those who live in group quarters or are foreign-born. I drop those individuals born or residing in Alaska, Hawaii, and D.C. since these states were established after World War II and did not exist in the 1940 and 1950 censuses. I also follow Acemoglu, Autor and Lyle (2004) and Goldin and Olivetti (2013) and drop Nevada since it was by far the least populous state in 1940 and underwent several demographic changes in the period that I focus on. I restrict the sample to individuals working in non-farm occupations. I therefore also drop those who do not have an industry of work defined or are classified as 'not within the labor force'.

[9] If I change my assumption regarding labor-supply elasticities such that they only differ by gender and year but not across states (the original Card et al. (2018) model only has them vary by gender), then they can be estimated via gender-by-time fixed effects only, and I can try to estimate the impact of relative demand shifts during World War II impacting relative wages both by state and industry. Other factors could also impact labor supply responsiveness to wages such as education, marital status, age, and number of children. I include these in my final estimation specification, and let their impact on wages differ by gender and year.

I focus on manufacturing industries for my main analysis since they saw by far the largest increase in labor demand during World War II (see Appendix Figure A.1). When I limit my sample to just those working in manufacturing industries, I also drop Montana, New Mexico, and Wyoming since they either do not have any female workers in manufacturing surveyed in 1940, 1950, or both. I end up with a final sample of 44 states and 20 industries within manufacturing.

For the final sample of workers, I consider only those who are actively in the labor force, not unpaid family workers or self-employed or in the armed forces at the time of the Decennial Census survey. Wages are inflation-adjusted in 1950 to be comparable to 1940 U.S. Dollars. I also follow Acemoglu, Autor and Lyle (2004) and drop workers who report implausibly high or implausibly low (compared to the full population) hourly wages and impute top-coded wages as 1.5 times the maximum wage. I use annual wages as my primary dependent variable (due to flaws in the reporting of "weeks worked" between censuses). I discuss robustness checks with hourly wages in Section 6.4.

The labor input measure I use to capture $\left(\frac{F_{jst}}{M_{jst}}\right)$ in Equation 14 is the log of all (population-weighted) women who work full-time in an industry-state-year, divided by all (population-weighted) men who work full-time in that industry-state-year. I prefer the relative log worker count specification for measuring employment rather than relative average weeks worked in a year or average hours worked last week due to data discrepancies between the 1940 and 1950 Decennial Censuses.

As Rose (2018) details in his paper, in 1940, the Census asked respondents to report only their full-time equivalent weeks worked whereas in 1950, any week where the respondent worked was considered a full-time week. For example, if a part-time teacher taught two days a week, they would report having the same number of work weeks in the 1950 Census as another woman who taught full-time (five days a week). This implies that part-time weeks were more likely to be counted as full-time in 1950. Combined with the propensity of women to be working part-time, this error might artificially inflate relative female employment compared to male employment in 1950. The 'hours worked last week' measure might be considered an improvement, but it also has two major problems. First, the question asks respondents to report the number of hours they worked in the past week, which may or may not be the worker's usual hours worked in an average week in the year. Second, the passage of the Fair Labor Standards Act standardizing the 'regular' workweek to 40 hours was passed in 1940 after the Decennial Census was recorded. Workers in 1950 may be more likely to incorrectly report 40-hour workweeks than in 1940, artificially inflating employment in 1950. When I plot this measure in Appendix Figure A.2, I do see bunching at 40 hours in the 1950 data for both men and women as compared to the 1940 data. The combination of measurement error in the hours worked and the weeks worked measures would compound the noise in an hourly wage measure created by dividing annual wages by weeks times hours worked. I discuss this further in Section 6.4.

Lastly, the data on USES placements (that I discuss in the next subsection) are only available as the total number of workers in an industry (or state) by gender, and not the weeks or hours worked by a worker. Using my relative employment measure in terms of the total number of workers is therefore symmetric with measuring relative demand shocks using workers from the USES data.

4.2 United States Employment Service Data

I use data on the placements of the United States Employment Service (USES), made available by Rose (2018). The data comes from "The Labor Market" reports of the War Manpower Commission's Bureau of Program Planning and Review from 1942–1945, and reports of the same name from the Labor Department after 1945.

The data details the number of women and men placed between 1944–1946 across different industries and states (the numbers within an industry-state are not reported). I use these values as a proxy for measuring the relative wartime employment demand across different industries and states.

The USES was an important agent in matching employers and workers during the wartime production effort, particularly as the needs for war production grew more acute (Rose, 2018). The assignments data shows the industry or state that a job seeker was placed into when applying for a job with the USES itself, or with state or local Employment Offices (which worked in collaboration with the USES). The USES was particularly key in classifying high-priority jobs in war-critical industries into combinations of different occupations that could be performed by workers with the minimum possible amount of experience and training, via "job-dilution and upgrading" programs (USES, 1948). By 1944, the USES was "responsible for filling seven out of ten jobs in manufacturing" (War Manpower Commission, 1944, p. 40).

The available data on the USES assignments are from placements in the last quarter of 1944 to the third quarter of 1946. The timing of these records has both advantages and drawbacks. One major drawback is that I capture demand from the end of World War II when the bulk of the war production effort had slowed down. If this is indeed the case, then any effects I manage to see of this increase in demand are likely an underestimate of the total effects.

On the other hand, we may be worried about the exogeneity of the USES placements across industries, particularly for women. There could certainly be some industries more ready to hire women or Black workers, who also are more responsive in updating their wages.[10] As the war went on and traditional white male labor kept getting drafted into the military, the tightening labor market improved employment prospects of many minority and non-traditional groups including black men, women, older workers who would have otherwise retired, the physically handicapped and teenage youth (USES, 1945). Thus, wartime industrial demand in the later years of World War II may be less influenced by

[10] In an anecdote in her paper, Anderson (1982) cites the story of "Samella Banks, a black woman who along with five other white women was told to apply to the Cadillac Motor Company in November 1942 by the USES. She was told that there might be a janitress opening in a day or two while the white women were hired as welder trainees" (Anderson, 1982, p.8).

employer discrimination based on gender (and other factors), and the USES data from 1944-1946 are better estimates of a true demand shock for women.

The distribution of average employment by industry and state across manufacturing industries in 1940, 1950, and between 1944–1946 from USES assignments are shown in Table 1. The final numbers for 1940 and 1950 count only full-time employed workers and are weighted by population-level weights aggregated from the Census samples.[11]

5 Empirical Strategy

Equation 14 that I derive in Section 3 to estimate changes in relative wage premia for men and women between 1940 and 1950 establishes that the log relative wages for women (as compared to men) across time are a function of the change in the log unobservable (female to male) relative labor-augmenting productivity across time $\Delta_t ln\left(\frac{A^F_{js}}{A^M_{js}}\right)$, the change in the log relative employment of women to men across time $\Delta_t ln\left(\frac{F_{js}}{M_{js}}\right)$ and the change in the log ratio of (female to male) relative labor supply elasticities across time $\Delta_t ln\left(\frac{\frac{\beta_{Fs}}{1+\beta_{Fs}}}{\frac{\beta_{Ms}}{1+\beta_{Ms}}}\right)$. Thus, any equation trying to estimate log individual wages must be consistent with the wage premium equation in Equation 14 when taking the difference between women and men across time.

I assume the USES placements represent a plausibly exogenous shock to the relative labor-augmenting productivity for women in the wage premium equation by changing the relative labor demand for women. I utilize the USES placements to construct measures of changes in the industry and state-wide demand and specifically, the relative industry and state-wide demand for women during World War II, and test the impacts on relative wages for women (compared to men) in 1950 (as compared to 1940).

I revisit the empirical specification used by Acemoglu, Autor and Lyle (2004) and allow for industrial variation using a very saturated difference-in-differences style model

[11]Full-time workers are defined as those who report working more than 35 hours a week and more than 40 weeks a year in 1940, and more than 40 weeks a year in 1950 since all weeks reported are supposed to be full-time equivalent weeks in 1950.

of wages as follows:[12]

$$lnw_{ijst} = \alpha_1 f_i + \alpha_2 d_{1950} + \alpha_3 (f_i \times d_{1950}) + \alpha_4 \textbf{industry}_j + \alpha_5 \textbf{state}_s + \alpha_6 (f_i \times \textbf{industry}_j) + \alpha_7 (f_i \times \textbf{state}_s)$$
$$\alpha_8 (\textbf{state}_s \times d_{1950}) + \alpha_9 (f_i \times \textbf{state}_s \times d_{1950}) + \mathbf{X}_i' \nu_t^g + \chi ln\left(\frac{F_{jst}}{M_{jst}}\right) + \eta \left(f_i \times ln\left(\frac{F_{jst}}{M_{jst}}\right)\right)$$
$$+\gamma_1 (\text{Total Ind. Demand Shock}_j \times d_{1950}) + \gamma_2 (f_i \times \text{Relative Female Industry Demand Shock}_j \times d_{1950})$$
$$+ u_{ijst} \quad (15)$$

where the dependent variable lnw_{ijst} is the natural log of an individual i's total annual wages in industry group j, in state s in year $t = \{1940, 1950\}$.[13] f_i is a dummy $= 1$ if the individual i is female, d_{1950} is a dummy $= 1$ if the year $= 1950$, and $\textbf{industry}_j$ and $\textbf{state}_s$ are vectors of industry and state fixed effects respectively.[14]

I allow wages to be different by gender-by-state-by-year, as well as industry-by-year. For example, if we believe that military manpower mobilization caused differential impacts on wages for women compared to men across states between 1940 and 1950 as per Acemoglu, Autor and Lyle (2004), including state-by-year-by-gender fixed effects would

[12]In comparison, the estimating equation used by Acemoglu, Autor and Lyle (2004) is:

$$lnw_{ist} = \alpha_1 f_i + \alpha_2 d_{1950} + \alpha_5 \textbf{state}_s + \mathbf{X}_i' \nu_t^g + \chi ln\left(\frac{F_{st}}{M_{st}}\right) + \eta \left(f_i \times ln\left(\frac{F_{st}}{M_{st}}\right)\right)$$

where they calculate F_{st} as the average weeks worked by a woman in state s and year t, and M_{st} as the average weeks worked by a man in state s and year t.

They instrument for $ln\left(\frac{F_{st}}{M_{st}}\right)$ using the military mobilization rate times a dummy for 1950 (d_{1950}), and for $\left(f_i \times ln\left(\frac{F_{st}}{M_{st}}\right)\right)$ using the military mobilization rate times d_{1950}, interacted with the female dummy (f_i).

Thus, compared to Acemoglu, Autor and Lyle (2004), my difference-in-differences specification is more flexible, and allows for variation in wages at the gender-by-industry level, gender-by-year level and gender-by-state-by-year level. It also notably does not use military mobilization as the instrumental variable due to the findings in Rose (2018), and corrects for the flaws in the weeks worked measure by using employment in number of women and men, and wages in annual wages.

[13]I also re-estimate my specifications with the hourly wage rate instead of annual wages, but that measure is also imperfect. Other than the flawed definition of the weeks worked measure, the hours worked may also be flawed since the 40-hour workweek was passed by the Congress in June 1940. I also estimate my results with and without including employment. For more, see subsection 6.4

[14]The baseline state is Pennsylvania and the baseline industry is Machinery for Durable Manufacturing and Paper for Non-Durable Manufacturing.

account for these changes.

$\mathbf{X}_i'$ is a vector of individual-level controls that include marital status, race, years of completed education, number of children in the household under age 5, and a fourth-degree polynomial in potential experience. The coefficients on these individual controls are allowed to vary by both gender and year.[15]

The coefficient χ on $ln\left(\frac{F_{jst}}{M_{jst}}\right)$ measures the impact of contemporaneous relative employment in an industry-state-year on both male and female wages. The coefficient η on $\left(f_i \times ln\left(\frac{F_{jst}}{M_{jst}}\right)\right)$ measures the additional impact of contemporaneous relative employment in an industry-state-year on female wages relative to male wages. Employment is measured as the natural log of the ratio of the total number of women in an industry j in state s in year t to the total number of men in an industry j in state s in year t.

Although I use a very saturated model to estimate the wage changes in Equation (15), we might be worried about simultaneity bias from having contemporaneous relative employment as an explanatory variable in an equation with wages as the dependent variable. To correct for this, I instrument for contemporaneous employment using the relative employment in an industry-state in 1930 as per the 1930 Decennial Census. Since I want to estimate changes in relative labor-augmenting productivity between 1940 and 1950, I want to use instruments for employment that predate 1940. I instrument for contemporaneous log relative employment, $ln\left(\frac{F_{jst}}{M_{jst}}\right)$, with $ln\left(\frac{F_{js,1930}}{M_{js,1930}}\right)$, i.e. the natural log of the ratio of the total number of women in an industry j in state s in 1930 to the total number of men in an industry j in state s in year 1930. I also control for the interaction of contemporaneous log relative employment and the female dummy, $\left(f_i \times ln\left(\frac{F_{jst}}{M_{jst}}\right)\right)$, with the log relative employment in 1930 interacted with the female dummy $\left(f_i \times ln\left(\frac{F_{js,1930}}{M_{js,1930}}\right)\right)$. This is my preferred final specification, but I also report estimates without including employment at all in Section 6.4.

When I take the difference of my specification for log wages in Equation 15 between

[15]The baseline person is a white, married man with no children in the household below the age 5, no potential experience and 12 or more years of education.

women and men and between 1950 and 1940, I have a resulting wage premium equation that looks like

$$\Delta_{1940-50} ln\left(\frac{w^F_{js}}{w^M_{js}}\right) = \hat{\alpha_3} + \hat{\alpha_9}(\textbf{state}_s) + \mathbf{X}_i' \left(\Delta_{1940-50}\hat{\nu^F} - \Delta_{1940-50}\hat{\nu^M}\right)$$
$$+ \hat{\eta}\Delta_{1940-50}\left(ln\left(\frac{F_{js}}{M_{js}}\right)\right) + \hat{\gamma_2}(\text{Relative Female Industry Demand Shock}_j) \quad (16)$$

Comparing this to our wage premium in Equation 14, we can see that $\hat{\alpha_3}$ and $\hat{\alpha_9}$ estimate the differential impact on relative wages by gender-across-time and gender-by-state-across-time respectively, accounting for changes in the relative labor supply elasticities β^G_{st} across time due to factors like inter-state migration costs or housing availability that are different by gender. The difference in the coefficients of individual X's $\left(\Delta_{1940-50}\hat{\nu^F} - \Delta_{1940-50}\hat{\nu^M}\right)$ also capture some of the impacts of changing relative labor-supply elasticities.

The coefficient $\hat{\eta}$, if we are assured is estimated accurately, can help us recover the CES rate of substitution ρ as $\rho = 1 + \hat{\eta}$.

Finally, I capture some of the impacts of changes in industry-level relative labor-augmenting productivity across time via $\hat{\gamma_2}$, which is my main coefficient of interest. This means that given my assumption that relative changes in labor augmenting productivity are linearly additive in state-year and industry-year separately, I am only able to observe the impact on wages via industrial variation.

If I make a stricter assumption restricting the labor-responsiveness of individuals to wages to just differ across gender as β^G (instead of varying across time and state as β^G_{st}), then I only need gender-by-year fixed effects to capture these changes and can use state-level measures of relative and absolute demand changes during World War II to capture the state-level impact of labor-augmenting productivity changes on wages. This would be a slight variation of the first specification as

$$lnw_{ijst} = \alpha_1 f_i + \alpha_2 d_{1950} + \alpha_3 (f_i \times d_{1950}) + \alpha_4 \textbf{industry}_j + \alpha_5 \textbf{state}_s + \alpha_6 (f_i \times \textbf{industry}_j) + \alpha_7 (f_i \times \textbf{state}_s)$$
$$\mathbf{X}_i' \nu_t^g + \chi ln\left(\frac{F_{jst}}{M_{jst}}\right) + \eta \left(f_i \times ln\left(\frac{F_{jst}}{M_{jst}}\right)\right) + \gamma_1 (\text{Total Industry Demand Shock}_j \times d_{1950})$$
$$+ \gamma_2 (f_i \times \text{Relative Female Ind. Demand Shock}_j \times d_{1950}) + \gamma_3 (\text{Total State Demand Shock}_s \times d_{1950})$$
$$+ \gamma_4 (f_i \times \text{Relative Female State Demand Shock}_s \times d_{1950}) + u_{ijst} \quad (17)$$

which translates to the wage premium equation

$$\Delta_{1940-50} ln\left(\frac{w_{js}^F}{w_{js}^M}\right) = \hat{\alpha_3} + \mathbf{X}_i' \left(\Delta_{1940-50} \hat{\nu^F} - \Delta_{1940-50} \hat{\nu^M}\right) + \hat{\eta} \Delta_{1940-50} \left(ln\left(\frac{F_{js}}{M_{js}}\right)\right)$$
$$+ \hat{\gamma_2} (\text{Relative Female Ind. Demand Shock}_j) + \hat{\gamma_4} (\text{Relative Female State Demand Shock}_s) \quad (18)$$

This specification allows me to test the impact of relative state-level shocks in the labor demand for women during World War II on relative wages for women in 1950 via $\hat{\gamma_4}$ and therefore I can capture both state-level and industry-level evolution in the relative labor augmenting productivities. In this specification, the labor-supply responsiveness is only captured by gender-across-time effects via $\hat{\alpha_3}$ and $\left(\Delta_{1940-50} \hat{\nu^F} - \Delta_{1940-50} \hat{\nu^M}\right)$.

Finally, I can also make my initial specification in Equation 15 more flexible, in case there are other industry-wide trends in wages between 1940 and 1950 that are not fully captured by just changes in industrial wartime demand. So, I also estimate the specification

$$lnw_{ijst} = \alpha_1 f_i + \alpha_2 d_{1950} + \alpha_3 (f_i \times d_{1950}) + \alpha_4 \textbf{industry}_j + \alpha_5 \textbf{state}_s + \alpha_6 (f_i \times \textbf{industry}_j) + \alpha_7 (f_i \times \textbf{state}_s)$$
$$\alpha_8(\textbf{state}_s \times d_{1950}) + \alpha_9(f_i \times \textbf{state}_s \times d_{1950}) + \mathbf{X}_i' \nu_t^g + \chi ln\left(\frac{F_{js}}{M_{js}}\right) + \eta\left(f_i \times ln\left(\frac{F_{jst}}{M_{jst}}\right)\right)$$
$$+ \alpha_{10}(\textbf{industry}_j \times d_{1950}) + \gamma_2(f_i \times \text{Relative Female Ind. Demand Shock}_j \times d_{1950}) + u_{ijst} \tag{19}$$

which gives me the effective wage premium equation

$$\Delta_{1940-50} ln\left(\frac{w_{js}^F}{w_{js}^M}\right) = \hat{\alpha_3} + \hat{\alpha_9}(\textbf{state}_s) + \hat{\alpha_{10}}(\textbf{industry}_j) + \mathbf{X}_i'\left(\Delta_{1940-50}\hat{\nu^F} - \Delta_{1940-50}\hat{\nu^M}\right)$$
$$+ \hat{\eta}\Delta_{1940-50}\left(ln\left(\frac{F_{js}}{M_{js}}\right)\right) + \hat{\gamma_2}(\text{Relative Female Ind. Demand Shock}_j) \tag{20}$$

where once again I am only able to isolate the industrial impact of changes in relative labor-augmenting productivities through the relative changes in the demand for women in an industry via $\hat{\gamma_2}$. I present all three specifications in my main tables, and prefer the final most flexible specification outlined above in Equation 19 as the most accurate.

I estimate the equations separately for workers in Durable Manufacturing and Non-Durable Manufacturing since past literature shows that they evolved differently during World War II (Shatnawi and Fishback, 2018). Rose (2018) finds gains in employment in Durable Manufacturing industries in 1950 but losses in Non-Durable Manufacturing industries because of increased wartime female employment, suggesting Durables could have experienced a persistent increase in the relative demand for women, while Non-Durables did not.

I define the total shock in the demand for workers to be the percent change in total employment in an industry (or state) between 1940 and 1946, assuming that the only increases in employment come from the USES assignments that we are able to observe. Thus, if we denote total workers in an industry (or state) in 1940 as L_{40}, and the USES assignments of workers in an industry (or state) as L_{USES}, then the 'Total Shock' measure is equal to the total number of workers assigned to an industry (or state) by the USES, divided by the number of workers in that industry (or state) in the 1940 Census:

$$\text{Total Shock} = \frac{(L_{46} - L_{40})}{L_{40}} = \frac{L_{USES}}{L_{40}} \tag{21}$$

There is no pre-established way to define the 'Relative Demand Shock for Women'. Given that I want to measure the relative change in employment of women induced by the war effort compared to the overall change in labor demand due to the war effort, I define the 'Relative Demand Shock for Women' using two different measures. I want both measures to reflect the impact of a relative change in the demand for women during the war, which affects relative labor-augmenting productivity specifically for women and impacts wages beyond any overall industry-level shift in labor-augmenting productivity for all workers that might come from wartime capital investment, for example. I define both measures explicitly for all manufacturing industries in Table 2.

The first measure I define is the relative percent change in female employment between 1940 and 1946 in an industry (or state), assuming that the only increases in employment come from the USES assignments that we are able to observe. This means that I divide the percent change in female employment in an industry (or state) from USES assignments in WWII with the percent change in overall employment from USES assignments in an industry (or state). Defining the number of women in an industry (or state) in 1940 as W_{40} and the number of female assignments in an industry (or state) in the USES data as W_{USES}, this measure is operationalized as

$$\text{Measure 1} : \%\Delta_{WWII}\text{Relative Number of Women} = \frac{\frac{(W_{46} - W_{40})}{W_{40}}}{\frac{(L_{46} - L_{40})}{L_{40}}} = \frac{\left(\frac{W_{USES}}{W_{40}}\right)}{\left(\frac{L_{USES}}{L_{40}}\right)} \tag{22}$$

In words, this translates to the percent change in the number of women due to USES assignments, divided by the percent change in the number of all workers due to USES assignments in an industry (or state) between 1940 and 1946.

This measure utilizes the absolute shock felt by the wartime assignment of women to different industries but moderates it via both the number of women pre-existing in the industry in 1940 as well as the size of the wartime assignment shock of all workers relative to their 1940 level. For example, if we look at Table 1, we can see that the most women assigned by USES during WWII are the 237,574 women assigned to Food and Beverages. The third highest number is the 179,947 women assigned to Transport Equipment. However, we expect the impact of these extra women to be very different in Food and Beverages, which already was comprised of nearly 20% women in 1940 versus Transport Equipment, which had previously been less than 10% female in 1940. The size of the relative wartime demand shock seen by Transport Equipment is nearly twice the size of the shock to Food and Beverages, even though the absolute increase in women in Transport and Equipment was marginally smaller than Food and Beverages. When looking at actual values in Table 2, we see that the female employment shock only translated to a 7% increase in the number of women in Food and Beverages in column (5), as opposed to the 15.6% increase in the number of women in Transport Equipment. When further moderating by the size of the shock for all workers in column (6), we find that the relative shock in the number of women in Food and Beverages was 1.2 compared to 2.1 for Transport Equipment.

The second measure I use to operationalize the relative demand change for women is the percent change in the proportion of an industry (or state) that is female between 1940 and 1946, assuming that any changes in employment happened due to the observable USES assignments. Defining the proportion of women in an industry (or state) in 1940 and 1946 as

$$P_{40} = \frac{W_{40}}{L_{40}}; P_{46} = \frac{W_{40} + W_{USES}}{L_{40} + L_{USES}}$$

this measure is operationalized as

$$\text{Measure 2}: \%\Delta_{WWII}\text{Relative Proportion of Women} = \frac{(P_{46} - P_{40})}{P_{40}} \tag{23}$$

This may be the more relevant relative demand shock if we think that relative wages for women changed (and relative labor-augmenting productivity was updated) through changes in the industry gender composition as a consequence of the war effort. Therefore, it is not about industries that saw the largest number of women join the industry but rather how the new women fit into the gender composition of an industry. Again, looking at Table 2, this means that although Food and Beverages saw the largest number of women assigned to the industry by USES, it only made the industry go from being 19.4% female in 1940 (in column (2)) to 19.7% female in 1946 (in column (4)), a change of 1.1% (in column (7)). In contrast, Transport Equipment, which saw a smaller number of women assigned by USES, went from being 9.9% female in 1940 (in column (2)) to being 15.6% female in 1946 (in column (4)), nearly a seven times larger difference in composition of 7.5% (in column (7)).

I compare both measures in Figure 3. Both measures show little variation in the Non-Durable Manufacturing industries. This reflects that while some of the Non-Durable Manufacturing industries saw large absolute numbers of assignments by USES during WWII both in terms of total employment as well as female employment, they did not see significantly different impacts on relative female demand. On the other hand, among Durable industries, there is significant variation in relative female demand. Some industries like Electrical Machinery and Transport Equipment see large increases in the relative demand for women, while others like Fabricated Metals, Instruments, and Lumber see much smaller increases. Notably, both Fabricated Metals and Transport Equipment saw large increases in overall demand due to World War II in Table 1, but only Transport Equipment saw a large increase in the relative demand for women. This is indicative of the differences in the utilization of women across different industries even within manufacturing sectors.

6 Results

6.1 Prior Findings

Before diving into my results, I want to briefly outline the main findings of the two papers that most informed my analysis — Acemoglu, Autor and Lyle (2004) and Rose (2018).

Acemoglu, Autor and Lyle (2004) use state-wide variation in the military mobilization of men during World War II to test impacts on female employment and relative wages. Setting up a difference-in-differences model across states between 1940 and 1950, they find that states with higher military mobilization of men saw increased female labor force participation (using weeks worked) in 1950 as compared to 1940, but they did not find any statistically significant impact on the labor force participation of men.

Thus, utilizing military mobilization as an instrument for changes in the relative employment of men and women between 1940 and 1950, they estimate a relative wage equation for a pooled sample of male and female workers in 1940 and 1950, accounting for differences by gender, state, year, and individual characteristics. They find that both male and female wages fell in response to military mobilization, hypothesizing that men and women were imperfect substitutes during this time.

Rose (2018) points out two important flaws in Acemoglu, Autor and Lyle (2004). First, he points out that the main outcome variable used to measure employment effects in Acemoglu, Autor and Lyle (2004) ('weeks worked') changed definitions between the 1940 and 1950 censuses in a way that could artificially inflate employment for women in 1950 compared to 1940. Second, using new data from World War II, he notes that military mobilization does not have any impact on female employment during the war, thereby casting doubt on the link found in Acemoglu, Autor and Lyle (2004) between military mobilization and the employment of women in 1950. Rose (2018) highlights instead the relevance of state-economic-level World War II production demand intensities in shifting female wartime employment.

Despite having data on the wartime employment of women and men by industry, Rose (2018) only chooses to construct and use state-wide (or state-economic-area wide) measures of wartime employment.[16] Additionally, while he disproves the findings of Acemoglu, Autor and Lyle (2004) on employment of women in 1950, Rose (2018) stops short of estimating the impact of female employment during World War II on relative wages in 1950. However, if the story behind the increase in female employment during World War II is that of an increase in demand in war-critical industries, then we might also expect to find the relative wages rise for women, in contrast to Acemoglu, Autor and Lyle (2004)'s findings.

Thus, in this chapter, I attempt to close the gap between these two works and test for the impacts of World War II demand for women on the relative wages of women in 1950. As well as testing the impacts on relative wages, I also introduce a dimension of demand changes previously unexplored at the national level in the literature — the variation of wartime demand by industry. State markets may not have been as binding during World War II in the face of increased national migration and hiring of workers across states for war-critical industries. Hence, industrial variation in demand for workers may be the more relevant driver of employment (and relative wage) shifts.

6.2 Impacts of Changes in the Relative Demand for Women

6.2.1 Using Measure 1: A Change in the Relative Number of Women

In Table 4, I present results for the impact of World War II employment shocks on wages for women (and men) in 1950 (compared to 1940) using my first constructed measure

[16] In Table 6 of his paper, Rose (2018) delves into a little cross-industry variation. While looking at the persistence of impacts of state-economic-area wide female employment during World War II on female employment in 1950, he finds no statistically significant impacts. However, when testing these same impacts separately by industry, he finds that there are persistent gains in employment for women in Durable Manufacturing in 1950 and declines for women in Non-Durable Manufacturing.

of relative female demand—the percent change in the number of women due to USES assignments relative to the percent change in the number of all workers.[17] In columns (1) and (4) of this table, I present the results of Equation 17 from Section 5 for Durables and Non-Durables respectively. In this specification, I do not allow for industry, state, or state-by-gender trends. Therefore, I can measure the impact of relative demand shocks in the USES data at the state level as well as the industry level. I find that in column (1), there is a statistically significant and positive increase of 0.176 in the wages for women (compared to men) in 1950 in Durable Manufacturing due to a unit increase in the relative female demand measure.

To interpret my point estimates from Table 4, I use the range of values this relative demand measure can take, listed in column (6) of Table 2. This relative demand measure ranges from 0.783 in Lumber and Wood to 2.062 in Transport Equipment for women in Durable Manufacturing (Panel B). Consequently, moving from the industry with the lowest change in the relative demand for women to the industry with the highest change in the relative demand for women is a shift of 1.279 ($= 2.062 - 0.783$); and a move from the industry with the median change in the relative demand for women (Stone, Clay, and Glass, with a value of 1.440) to the highest change industry, is a shift of 0.622 ($= 2.062 - 1.440$).

Returning to Table 4, this implies that moving from the industry with the lowest change in relative female demand to the industry with the highest change in relative female demand in Durable Manufacturing increased wages for women (relative to men) by 0.225 ($= 0.176 \times 1.279$), or 22.5% in 1950 according to column (1). Being in the highest change industry compared to the median change industry in Durables saw wages

[17] From section 5, if we define the number of women in an industry (or state) in year t as W_t, the number of all workers in an industry (or state) in year t as L_t, the number of female assignments in an industry (or state) in the USES data as W_{USES}, and the number of all assignments in an industry (or state) in the USES data as L_{USES}, this measure is equal to

$$\text{Measure 1} : \%\Delta_{WWII}\text{Relative Number of Women} = \frac{\frac{(W_{1946} - W_{1940})}{W_{1940}}}{\frac{(L_{1946} - L_{1940})}{L_{1940}}} = \frac{\left(\frac{W_{USES}}{W_{1940}}\right)}{\left(\frac{L_{USES}}{L_{40}}\right)}$$

increase by 0.109 ($= 0.176 \times 0.622$), or 10.9% for women in 1950 (relative to men).

The impact of an increase in relative female demand on wages for women in Non-Durable Manufacturing in column (4) on the other hand, is negative and not statistically significant. There are also no statistically significant impacts of changes in the relative demand or absolute demand at the state level on wages for men or women in Durable or Non-Durable Manufacturing. This is notable since most prior literature focuses on state-wide variation in employment during World War II to measure the impacts on labor market outcomes of women. From my findings, it appears that industrial variation is the more relevant channel when looking at wages as an outcome.

One last thing we want to note from columns (1) and (4) of Table 4 is that there are no statistically significant impacts of changes in the overall industry-wide demand.[18] We might have expected changes to production efficiency in industries that saw large increases in overall labor, and perhaps a subsequent impact on relative wages. But if these did occur, I do not find that the impacts persisted through to relative wages in 1950.

Next in columns (2) and (5), I present results from Equation 15 for Durable and Non-Durable industries respectively, in which I include fixed effects by state-year and state-by-gender-by-year.

If we believe the results from Acemoglu, Autor and Lyle (2004), and think that military mobilization increased relative female labor supply in highly mobilized states, we want to also account for possible impacts on wages for women. By including state-by-gender effects, I control for any channels affecting female wages differently by state. I now find that the impact of a unit increase in the relative demand for women during World War II increases wages for women by a slightly larger magnitude of 0.191, which is still statistically significant. Therefore, going from the Durable Manufacturing indus-

[18] To repeat, this measure is defined as

$$\text{Total Shock} = \frac{(L_{46} - L_{40})}{L_{40}} = \frac{L_{USES}}{L_{40}}$$

try with the lowest change in relative female demand to the industry with the highest change in relative female demand increases wages for women (relative to men) by 0.244 ($= 0.191 \times 1.279$), or 24.4% in 1950. Being in the highest change industry compared to the median change industry in Durables now sees a rise of 0.119 ($= 0.176 \times 0.622$), or 11.9% in female wages in 1950 (relative to men).

The impact of an increase in relative female demand on wages for women in Non-Durables in column (5) is negative and now also statistically significant at the 5% level. Wages decrease by 0.262 in 1950 (relative to men) for a unit increase in relative female demand. Referring to Table 2 once again, this translates to a drop in wages of women (relative to men) in 1950 of 0.147 (or 14.7%) when going from the Non-Durables industry with the lowest change in the relative demand for women (Tobacco, with 1.017) to the industry with the highest change in the relative demand for women (Leather and Footwear, with 1.577).

After controlling for state trends, the overall industry-wide demand during World War II is still not statistically significant in changing male or female wages in Durables or Non-Durables.

Finally, results from the most flexible specification of my estimating equation 19, where I control for state trends, state-by-gender trends as well as industry trends, are reported in columns (3) and (6) of Table 4 for Durable and Non-Durable Manufacturing industries respectively. In column (3), I find that a unit increase in the relative demand for women increases female wages by 0.277 in 1950. This translates to a change of 0.354 ($= 0.277 \times 1.279$) or 35.4% when going from the Durable Manufacturing industry with the lowest change in relative female demand to the Durable Manufacturing industry with the highest change in relative female demand during World War II. Being in the highest change industry compared to the median change industry in Durables now sees a rise of 0.172 ($= 0.277 \times 0.622$), or 17.2% in female wages in 1950 (relative to men). The impact of changes in relative female demand on female wages in Non-Durable Manufacturing in column (6) is a very small and statistically insignificant point estimate of -0.030.

6.2.2 Using Measure 2: A Change in the Proportion of Women

In Table 5, I repeat the exercise from the previous subsection using my second constructed measure of relative female demand — the percent change in the proportion of women.[19]

In columns (1) and (4), I present the results of estimating Equation 17 from Section 5 for Durables and Non-Durables respectively, using this new measure of relative demand. Before discussing the results, I once again refer back to Table 2 to make sense of the magnitudes.

In column (7) of Table 2, I report the range of changes in the relative proportion of women. In Durable Manufacturing Industries (Panel B), it ranges from -0.011 (or -1.1%) in Fabricated Metal to 0.075 (or 7.5%) in Transport Equipment. Thus, moving from the industry with the lowest change in the relative proportion of women to the industry with the highest change in the relative proportion of women is a shift of 0.086 ($= 0.075 - (-0.011)$); and a move from the median change industry (Machinery with a change of 0.021) to the highest change industry is a shift of 0.054 ($= 0.075 - 0.021$).

Once again returning to our Table 5, the statistically significant and positive increase of 3.174 we see in column (1) implies an increase by 0.273 ($= 3.174 \times 0.086$), or 27.3% in the wages for women (compared to men) in 1950 when going from the Durable Manufacturing industry with the lowest change in the relative proportion of women during World War II to the Durable Manufacturing industry with the highest change. Being in the highest change industry compared to the median change industry in Durable Manufacturing

[19]Defining the proportion of women in an industry (or state) in 1940 and 1946 as

$$P_{40} = \frac{W_{40}}{L_{40}}; P_{46} = \frac{W_{40} + W_{USES}}{L_{40} + L_{USES}}$$

this measure is operationalized as

$$\text{Measure 2 : } \%\Delta_{WWII}\text{Relative Proportion of Women} = \frac{(P_{46} - P_{40})}{P_{40}}$$

has relative wages for women rise by 0.171 $(= 3.174 \times 0.054)$, or 17.1% in 1950 (relative to men).

Just like we saw with our previous measure of relative demand, the impact of an increase in relative female demand on wages for women in Non-Durable Manufacturing in column (4) is still negative and not statistically significant.

In this specification, I do not have industry, state, or state-by-gender trends which means I can test the impact of relative demand shocks in the USES data at the state level as well. As with our previous demand measure, there are no statistically significant impacts of changes in the relative demand for women or the absolute demand for workers at the state level on wages for men or women in Durable or Non-Durable manufacturing, as well as no statistically significant impacts of changes in the overall industry-wide demand for workers on wages for men or women in either manufacturing sector.

Next, in columns (2) and (5), I present results from estimating Equation 15 for Durable and Non-Durable Manufacturing industries respectively, using my second measure of relative demand change. In this specification compared to those in columns (1) and (4), I include fixed effects by state-by-gender-by-year. I now find the impact of a unit increase in the relative female proportion on relative wages for women in 1950 in Durable Manufacturing is still statistically significant and positive, while slightly larger, at a magnitude of 3.395; which translates to 0.292 $(= 3.395 \times 0.086)$ or a 29.2% increase in wages for women (relative to men) in 1950 going from the Durable Manufacturing industry with the lowest change in the relative proportion of women during World War II to the industry that saw the highest change. Being in the highest change industry compared to the median change industry in Durables now sees a rise of 0.183 $(= 3.395 \times 0.054)$, or 18.3% in female wages in 1950 (relative to men).

The impact of an increase in relative female demand on wages for women in Non-Durables in column (5), is negative and statistically insignificant. Once again, the impact of changes in the overall industry-wide demand during World War II is still not statistically significant for either Durables or Non-Durables in columns (2) and (4) respectively.

Finally, I report results from my preferred specification of the estimating equation 19, where I control for state trends, state-by-gender trends as well as industry trends, in columns (3) and (6) of Table 5 for Durable and Non-Durable Manufacturing industries respectively. In column (3), I now find that a unit change in the relative proportion of women increases female wages by a statistically significant magnitude of 4.178 relative to men in 1950. This translates to an increase of 0.359 ($= 4.178 \times 0.086$) or 35.9% in relative female wages in 1950 when going from the Durable Manufacturing industry with the lowest change in the relative proportion of women to the industry with the highest change in the relative proportion of women during World War II. Being in the highest change industry compared to the median change industry in Durables now sees a rise of 0.226 ($= 4.178 \times 0.054$), or 22.6% in female wages in 1950 (relative to men). The impact of relative female demand changes on female wages in Non-Durable Manufacturing in column (6) is now positive in magnitude, but still statistically insignificant.

Overall, these results show that changes in the relative demand for women by industry during World War II (as measured by USES assignments) increased wages for women relative to men in 1950 by 35.4–35.9% in my final preferred specification, in Durable Manufacturing, when going from the industry least impacted by relative female demand changes to the industry most changed. In contrast, there seem to be no statistically significant impacts of changes in relative female demand by industry during World War II for women in Non-Durable Manufacturing. Total changes in demand for all workers by state or industry, or state-wide variation in the relative demand for women, do not seem to be a significant driver of wage changes.

6.2.3 Heterogeneous Impacts By Demographics in Durable Manufacturing Industries

Goldin and Olivetti (2013) conclude in their paper that the largest gains in female employment in 1950 from World War II military mobilization accrued to white, married women with 12 or more years of education. They hypothesize that less-educated women might have been disproportionately pulled into manufacturing which saw many jobs disappear post-war, but more-educated women were able to enter sectors that allowed them to stay in the labor force post World War II. Although they frame this as a change in female labor supply across the two groups, this would not be inconsistent with female demand increasing more for white, married, and more-educated women than less-educated women.

I do not have USES assignments by race, marital status, or level of education, so I cannot check which subgroups of women (and men) were pulled into different manufacturing industries during the war effort. However, I can estimate the impacts of changes in wages for different subgroups of workers in 1950 as a result of relative demand changes for all women during World War II across industries in Durable Manufacturing.

In Table 6, I present results of Equation 19 (my preferred specification including state trends, state-by-gender trends, and industry trends) separately for different sub-populations of workers in Durable Manufacturing. In columns (1)–(4), I use my first measure of a change in the relative demand for women: the change in the number of women in an industry relative to all workers, and in columns (5)–(8) I use my second measure: a relative change in the proportion of women.

I find that the largest relative wage gains accrue to women with a high school education or more, irrespective of marital status. In column (1) of Panel A, married women with a high school education or more gain a statistically significant magnitude of 0.436 in relative wages, which translates to a 55.8% ($= 0.436 \times 1.279$) increase in relative wages when going from the lowest change industry to the highest change industry in Durable Manufacturing. Unmarried women with a high school education gain a slightly larger magnitude of 0.487 in relative wages, which translates to an increase of 62.3% ($= 0.487 \times 1.279$) when going from the lowest change industry to the highest change industry in Durable Manufacturing in column (2) of Panel A. While they seem very similar, the magnitudes in columns (1) and (2) of Panel A are statistically significantly different from one another.

Columns (5) and (6) provide similar estimates using my second measure of relative demand: a change in the relative proportion of women. Married women with a high school education gain 6.511 in wages in column (5), which translates to a 56% (6.511×0.086) increase in wages when going from the lowest demand industry to the highest demand industry in Durable Manufacturing. Unmarried women with a high school education in column (6) gain 6.020 in wages, which translates to an increase of 51.2% in relative wages when going from the lowest demand industry to the highest demand industry in Durable Manufacturing. Once again, albeit similar, the impacts in columns (5) and (6) are statistically significantly distinct from one another.

When looking at the impacts of changing relative demand for women on those with less than a high school education in columns (3) and (4) and (7) and (8), the relative wage gains are smaller than for women with a high school education and no longer statistically significant using either measure of relative demand.

Similar patterns hold when restricting my sample to white women in Panel B. Gains seen by women with a high school education or higher range from 42.7-43.7% for married women in columns (1) and (5), and from 50.2-59.8% for unmarried women in columns (2) and (6). All of these gains are significantly larger than the gains estimated in the full sample in Tables 4 and 5 of approximately 35%.

Thus, relative wages in 1950 rise more sharply for women with a high school education or more than women with less education as a result of being in high-demand industries during World War II, perhaps suggesting a larger increase in their relative labor-augmenting productivity across industries. Many new jobs for women created within manufacturing industries during World War II required training prospective employees in smaller "unit skills" to be done in an assembly line rather than invest in a longer period of training to replace a fully skilled worker (USES, 1942). It is plausible that women with a high school education or higher were easier to train, and thus saw the greatest rise in demand reflecting in relative wage gains. It could also be that the Beckerian employer costs of hiring women were lower for more educated women and so employer notions of perceived productivity were revised faster for these women, increasing their wage gains, and changing their relative demand in Durable Manufacturing by giving them a "foot in the door".

On the other hand, in contrast to Goldin and Olivetti (2013), I find that white married women did not see larger gains in wages in 1950 than unmarried white women, irrespective of their education level. This might be because many married women left the workforce soon after the war ended (Goldin, 1991*b*), and possible relative wage gains did not persist until 1950. Marriage bars were legally abolished during World War II for employers to avail themselves of a larger available female workforce for the war effort but may have been informally re-instated post-war(Goldin, 1991*a*). When the war ended, cultural norms encouraging married women to return to the household may have driven married women out of the workforce permanently post-war (Campbell, 1984; Doepke, Hazan and Maoz, 2015; Larsen et al., 2015).

These results help to reframe the results from Goldin and Olivetti (2013) who find that white, married women with high school education or higher saw the strongest persistent gains in employment as a result of World War II military manpower mobilization, and attribute it to a change in the female labor supply of these women. By finding that wages changed more significantly for high-school-educated women, I think that it is likely a shift in the relative labor demand for these women that increased, particularly within Durable Manufacturing industries.

Apart from the difference in persistent impacts of changes in the relative demand for women during World War II on relative wages in 1950 between Durable and Non-Durable Manufacturing, there are possibly other differences in the way the two sectors developed between 1940 and 1950. One advantage of estimating such a saturated wage growth equation in Section 5 is that I can use it to note other interesting deviations in the evolution of wages of women and men between 1940 and 1950 across Durable and

Non-Durable Manufacturing industries.

6.3 Differences Between Durable and Non-Durable Manufacturing Industries

Before looking at the wage growth equations once again, I note some important differences between Durable and Non-Durable Manufacturing Industries in the raw data. In Table 3, we see very few distinct differences between workers in Durable and Non-Durable manufacturing when pooling workers from 1940 and 1950. Workers in Durable Manufacturing tend to have marginally higher wages (whether measured annually or hourly) but strikingly, the one noticeable difference is that half as many women are working in Durables compared to Non-Durable Manufacturing industries.

In Figure A.3, I plot the changes in log average annual wages in an industry between 1940 and 1950 for women (by diamonds) and men (by circles) on the y-axis, plotted against the differences in the log total number of women employed (by the diamonds) and men employed (by the circles) by industry on the y-axis between 1940 and 1950, with the size of each diamond and dot weighted by the number of workers of that gender in that industry across the two years. The top panel represents Durable Manufacturing Industries, and the bottom figure represents Non-Durable Manufacturing Industries. We see even in the raw data that the Durable and Non-Durable Manufacturing industries changed very differently between 1940 and 1950. The first thing we can note is industries within Durable Manufacturing experienced much wider changes in employment (movements along the x-axis), for both men and women between 1940 and 1950 than industries in Non-Durable Manufacturing. Although some industries in Non-Durable Manufacturing see relative wages for women rise by more than for men (the diamonds lie above the circles of the same color), these industries do not also see gains in relative employment for women significantly outstrip that of men. On the other hand, within Durable Manufacturing, in Transport Equipment (in gold) and Electrical Machinery (in light brown), the relative gains in both employment and wages are larger for women than for men (the diamonds lie clearly to the top-right of the dots of the same color), strongly suggesting that these industries saw a significant change in the relative demand for women. Finally, Fabricated Metals (in brown) sees the relative demand increase for men, even though both men and women see gains in employment and wages, suggesting variation even within Durable Manufacturing industries in relative wage gains for women versus men. Stricter sex-typing of jobs within different industries in Durable Manufacturing, and sharp increases in demand in "masculine" industries during World War II could perhaps explain the variability of industrial change within Durable Manufacturing in the growth of employment and wages for men and women. Therefore, by not allowing for final industry-level variation, an important part of the wage premium puzzle is missed. This also reassures us about the separate specification of the wage premia equations across Durable and Non-Durable Manufacturing industries.

From the results in Tables 4 and 5, I focus on my strictest specification 19 in columns (3) and (6) across both tables, where I control for state-by-gender trends as well as industry trends between 1940 and 1950.[20]

To start, I note the difference in the coefficient on the female dummy variable f_i in the wage estimation equations between columns (4) and (6) of Tables 4 and 5. I find that the small proportion of women who work in Durable Manufacturing industries see a much larger 'female penalty' to their wages at baseline in 1940 (ranging from 60-62.35%) as compared to women in Non-Durable Manufacturing, where the women see a smaller penalty to wages of 40.6–40.8%. Hence, women start off at a more disadvantaged position in Durables in 1940, not simply in terms of the relative proportion of women employed, but also in terms of their relative wages. The α_{Gjt} that I include to account for industry and sex-specific barriers to working in different industries in my model in Section 3, is likely to be much higher for women in Durable Manufacturing industries compared

[20]The coefficients on the parameters I discuss do not vary widely across the other specification columns in Table 4 or Table 5.

to Non-Durable Manufacturing industries prior to World War II. According to my results from Section 6.2, being in the industry that sees the greatest increase in demand within Durable Manufacturing during WWII (relative to the industry that sees the lowest change), increases women's wages relative to men in 1950 by 35.4–35.9%. This decreases their initial 'female penalty' seen prior to World War II to nearly half the magnitude.

A quick back-of-the-envelope calculation shows that although women in Durable Manufacturing start off at a higher disadvantage in 1940 than women in Non-Durable Manufacturing in terms of relative wages, working in Durable Manufacturing industries with the largest increases in demand during World War II such as Transport Equipment or Electrical Machinery in 1950 could see their wages converge to (or even surpass) the relative wages for women in Non-Durable manufacturing.

Next, we see that although neither industry sees a statistically significantly different change in wages for women between 1940 and 1950 (the coefficient on the female time trend: $f_i \times d_{1950}$ is not statistically significant), both men and women in Durables see their wages increase by 29.9–30.7%, nearly twice the increase seen by workers in Non-Durables of 14.8–14.9%, which is also only marginally statistically significant at the 10% level.

6.4 Robustness

6.4.1 Robustness to Other Industry-Wide Trends

Even in the strictest specification I use in Equation 19 (including industry and state trends as well as differential state trends by gender), we might still worry that the wage impacts of changes in relative female demand are picking up a spurious correlation in industry-level changes in relative wages for women. This is especially true since I do not have USES assignments data that differs at the state-industry cell level to allow me to control for industry-by-gender trends in wages.

To check if this is the case, I rerun my specification in Equation 19 to allow for differential trends in the wages of women by different 1940 industry-level characteristics and present these results in Table A.1. I calculate the share of workers in the industry that have 12 or more years of education in 1940, the share of workers that are non-white in an industry in 1940 and the share of female workers in an industry that are married in 1940, and allow them to impact female wages differently in 1950.

I find that within Durable Manufacturing, my estimates of the increase in relative wages for women in 1950 as a result of an increase in the relative female demand by industry during World War II are robust to the inclusion of other industry-level trends for women. The coefficients for the impact of changes in relative female demand on wages are very stable across columns (1)- (5) using either of the measures of constructed demand in Panel A and Panel B.

Once again in columns (5) - (8), we see that the impacts of relative female demand changes during World War II on the relative wages for women are limited to Durable Manufacturing industries. Within Non-Durables, my estimates are much noisier although largely not statistically significant at the 10% level.

6.4.2 Robustness With and Without Employment

I re-estimate my results with and without employment and report the results in Table A.2 for Durable Manufacturing and in Table A.3 for Non-Durable Manufacturing. Employment is measured as the log relative total number of all full-time female workers in an industry-state-year divided by the total number of all full-time male workers in an industry-state-year. I do not include employment in columns (1), (3), and (5); and I include and instrument employment with 1930 levels in columns (2), (4), and (6). The latter columns are the same as the ones presented in my main tables 4 and 5.

I present the results for specification 17 in columns (1) and (2) of both tables, for specification 15 in columns (3) and (4) of both tables, where I include state trends by gender; and for specification 19 in columns (5) and (6) of both Tables, where I also include industry trends.

For Durables in Table A.2, I find that the increases in relative female wages in 1950 of changing relative demand are lower when not including employment across each of the three specifications, but they are not significantly different upon including employment.[21]

In Table A.3, where I present estimates for Non-Durables, I find that not accounting for employment makes the impact of relative female demand change on wages larger and more negative on wages for women (compared to men) in 1950. In Panel A, the impacts of changes in the relative number of women employed by USES on relative female wages are negative and statistically significant in columns (1) and (3) when not including employment, but become smaller and less significant upon accounting for employment. In Panel B, the same pattern is true but the results are not statistically significant at the 10% level even when not accounting for employment.

6.4.3 Robustness Using Hourly Wages

In setting up my motivating model for estimation in Section 3, my main dependent variable is meant to capture returns to marginal productivity in a market with frictions. Thus typically, this would be better measured by the wage rate rather than the annual wage measure I use for my results.

I do this because of several data constraints mentioned earlier. The hourly wage rate is calculated by dividing annual wages by the product of weeks an individual reports working and the hours they report working in the last week. The change in the definition of weeks worked between 1940 and 1950 (weeks worked were only expected to be full-time in 1940), could lead to over-reporting of weeks worked in 1950 by part-time workers. If we think that women or specifically women in manufacturing may be more likely to work part-time, then this would artificially deflate hourly wage rates for women compared to men by inflating the denominator of weeks worked.

[21] I also estimate these specifications including employment but not instrumenting for it. The results are not presented here but my estimates of impacts on wages due to relative female demand changes are similar to the other columns presented here.

The hours worked variable only reports hours worked last week and is not always representative of the typical hours worked by an individual, thus papers estimating employment changes choose to focus on the weeks worked measure. Dividing my main dependent variable by two uncertain measures could increase measurement error in the hourly wage rates. Also, due to the changed definition of workweeks between the 1940 and 1950 censuses, to get the hourly wage rate in 1940, we would divide the annual wages by the weeks reported to be worked times 35 hours (which was considered full-time equivalent). In 1950, to get the hourly wage rate, we divide by weeks worked times hours reported worked last week. As previously discussed, the 40-hour week was legislated after the 1940 Census and may have primed respondents to list their hours worked as 40 in the 1950 Census rather than their real hours worked.

Lastly, as discussed in Section 4, the measures for relative demand I construct also use USES data on the number of workers, I do not have hours or weeks reported for them. Therefore the USES measures are more symmetric when I estimate employment in terms of the total number of workers rather than in weeks worked.

With all the caveats out of the way, I do estimate my main specifications with hourly wage rates (constructed as mentioned above) as the main dependent variable, and the log of the average weeks worked per woman in an industry-state-year divided by the average weeks worked per man in an industry-state-year as my measure of labor input, which I instrument for with 1930 levels in Tables A.4 and A.5.[22]

Across both measures of relative female demand I use, I do find a marginally significant positive impact on female wages in 1950 (compared to male wages) in Durable Manufacturing in column (3) with my strictest specification after accounting for industry and state-by-gender trends, but the magnitude of the impact is much smaller and less statistically significant than my estimates using annual wages and the number of workers,

[22]The 1930 Census does not have weeks worked reported for workers. Therefore, I can only instrument with the actual number of workers in an industry-state-year relative by gender as I do for my other specifications.

which is consistent with measurement error attenuating estimates towards zero. In Non-Durable Manufacturing in column (6) of my preferred specification, I find negative (and statistically insignificant impacts on wages using the change in the relative number of women (Measure 1 in Table A.4), and positive and statistically significant impacts using the change in the relative proportion of women (Measure 2 in Table A.5). The noisiness of the estimates of impacts on Non-Durables leads me to be skeptical of all results in Tables A.4 and A.5 (including those on Durables).

7 Conclusion

Given the new findings and data available from Rose (2018), I revisit the framework of Acemoglu, Autor and Lyle (2004) and introduce a new dimension along which we should measure the differential evolution of relative wages for women—industry. This is an important change since despite plenty of anecdotal evidence on the boom in workers employed in shipbuilding and airplane building or the inundation of women workers into munitions factories, this is the first study, to my knowledge, to measure the separate impacts of the wartime production effort as changes in the relative industrial demand for women at the national level. Rose (2018) only exploits variations in industrial demand at the state-economic-area level in his paper, and while Shatnawi and Fishback (2018) do explore industry-level variation in relative wages for men and women, they restrict their analysis to Pennsylvania.

I focus on manufacturing industries in my analysis since they saw the bulk of the increase in wartime employment due to the war effort on the home front, and by so doing, I allow for consideration of finer sub-industry-level variation in wartime demand as compared to previous studies.

Utilizing a simple model of wage setting with labor-supply frictions in a market with imperfect labor substitutes, I show how the relevant channel through which relative wages for women increase can be changed in the relative female-male labor-augmenting productivities. I use the USES assignments data across states and industries to operationalize two relative demand measures for women—the change in the number of women relative to the change in all labor in an industry, and a change in the relative proportion of women in an industry. I measure their impacts on wages for women relative to men, in 1940 and 1950 using a saturated model that accounts for state trends, industry trends, and state-by-gender trends. Thus, even if we believe that military mobilization might have had differential impacts on wages for women across states (due to changes in their employment as per Acemoglu, Autor and Lyle (2004)), I account for these changes in my specification.

I find that within Durable Manufacturing, the impact of increased relative wartime demand for women persisted after the war, raising women's relative wages. Scaling the results I find, this translates to a 35.4–35.9% increase in the wages of women in 1950 as compared to men if they worked in the industry that saw the highest change in the relative demand for women (Transport and Equipment) compared to the industry that saw the lowest change in the relative demand for women (Fabricated Metal, or Stone, Clay and Glass) during World War II. Non-Durable Manufacturing, on the other hand, did not see gains in wages accrue to women.

In addition, wages did not increase for men or women in response to total wartime employment shocks, either by state or industry. These results both enrich and reframe the literature on the impact of World War II on women in several ways:

First, it partly answers the question posed by Campbell (1984) on whether World War II caused a "watershed" change in the employment of women. While prior literature has said it does not (Goldin, 1991*b*; Goldin and Olivetti, 2013), I find that there were large increases in the relative wages for women in Durable Manufacturing, which when reconciled with prior literature on increases in employment in Durable Manufacturing (Rose, 2018; Shatnawi and Fishback, 2018), suggests a substantial increase in the relative demand for women that persists post-war until 1950, despite a substantial exodus of women from the workforce in the immediate post-war period.

Second, nearly all previous literature has exploited state-level shocks in female wartime employment (or manpower mobilization) to find impacts on future female employment. While Rose (2018) does break down workers into different industry groups while comparing employment in 1950 to wartime employment, he still uses a state-economic-level variation to find that the impact persists for women in Durable Manufacturing and sees declines for women in Non-Durable Manufacturing. However, I find that when accounting for both state-level variation and industry-level variation in wartime demand, only industry-level variation is significant in increasing the relative wages for women compared to men in 1950, and it only impacts women in Durable Manufacturing. Despite many descriptive accounts of the drastic industrial composition shift of women during World War II (Pidgeon, 1947; Milkman, 1987; Hartmann, 1982), this is the first addition to the quantitative literature in explicitly measuring the impacts of changing relative industrial demand for women at the national level.

Third, my results suggest that the impacts on female relative wages are higher for women with 12 or more years of education, a subgroup that Goldin and Olivetti (2013) also find to have the most significant positive impacts of manpower mobilization on employment in 1950 (and in 1960) compared to 1940. While they attribute this to a change in the labor supply for these groups of women, I show that this group also experiences a rise in their demand for Durable Manufacturing (as reflected by an increase in their wage premium). Thus, the benefits to educated women seem to have come from increased employer demand relative to shifting supply, perhaps via a change in the pecuniary costs of employing women.

I conclude that the cataclysmic changes in the industrial composition of manufacturing industries during World War II did increase the relative wages for women in Durable Manufacturing industries that are seen in data after the war ended in 1950, despite the rapid exodus of women from the workforce post-war (Goldin, 1991*b*; Rose, 2018). Although I do not have USES wartime assignments by race or educational status, in measuring the differential impacts on wages in 1950 in different groups of Durable Manufacturing workers, I find the relative wage gains accrued were larger for educated women, who, in principle, could have been most easily placed in the high skill male manufacturing industries during wartime. These results help reinforce the importance of industrial demand as a mechanism for changing female labor force outcomes post World War II.

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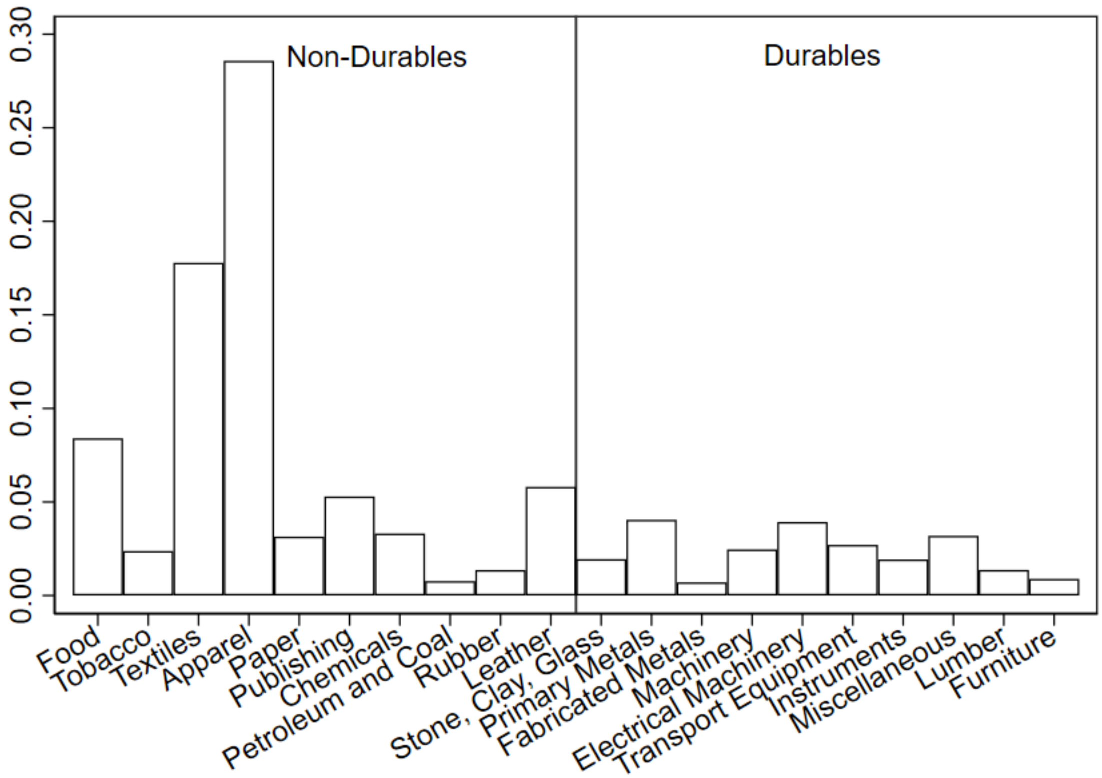
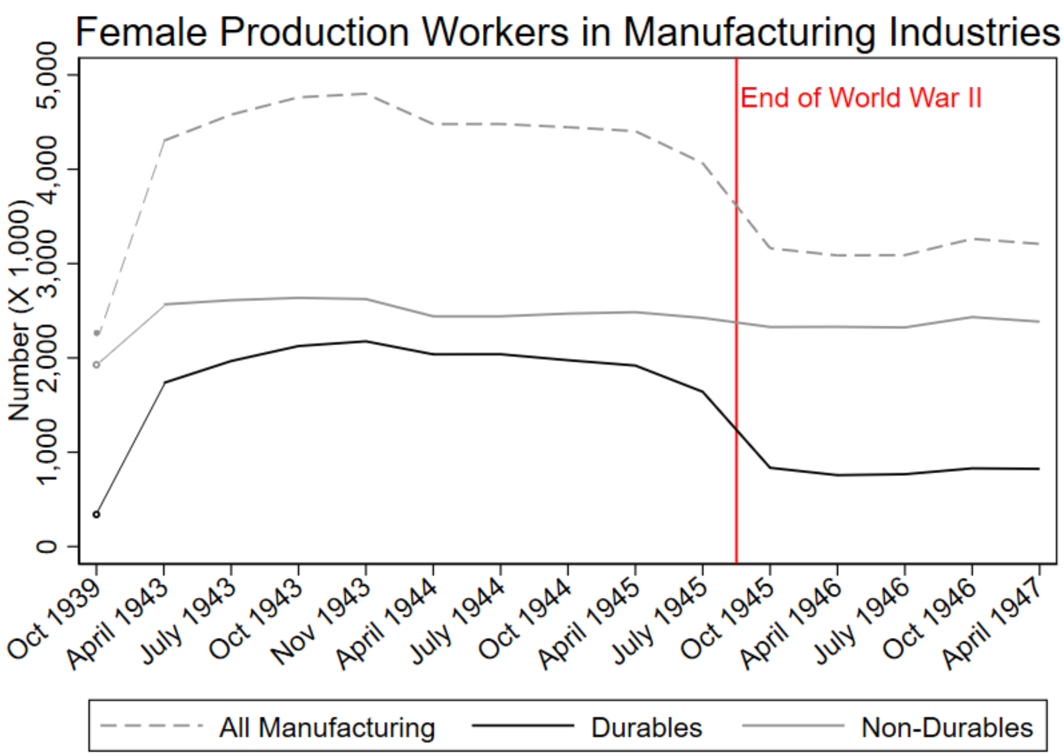
Figures

Figure 1: Distribution of Women Within Manufacturing in 1940



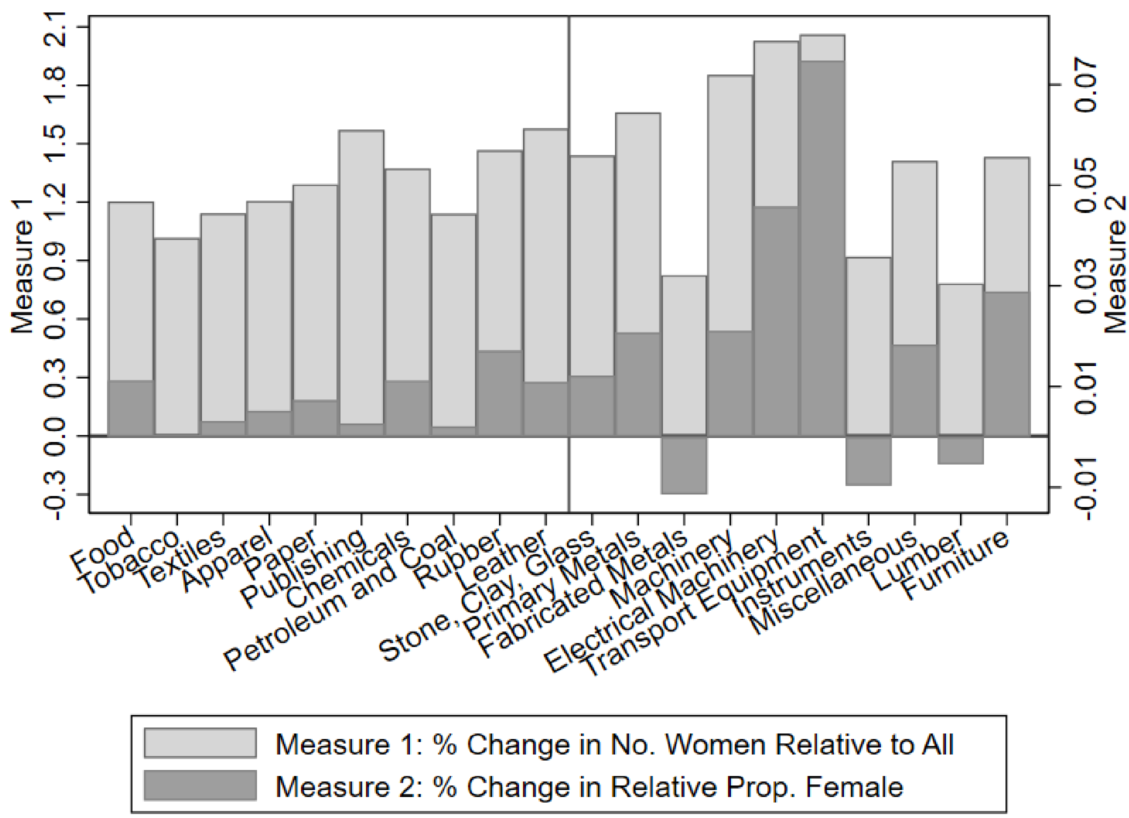
Notes: This figure shows the composition of female workers within Manufacturing. Of the 20 industries that 34,772,100 women work in within Manufacturing in the 1940 Decennial Census, industries on the left up until Leather represent Non-Durables Manufacturing and industries on the right, starting with Stone, Clay and Glass represent Durable Manufacturing.

Figure 2: Evolution of Female Employment in Manufacturing During World War II



Notes: This figure shows the number of female workers in Manufacturing and by the two main manufacturing sub-industries during World War II from Pidgeon (1947), compiled from Monthly Labor Reviews posted by the Bureau of Labor Statistics. The values for 1939 come from the 1940 Decennial Census.

Figure 3: Comparing Two Measures of Relative Female Demand



Notes: This figure plots two measures I use to capture the industry-specific increase in the relative demand for women during WWII using assignments made by the United States Employment Service (USES) between 1944-46 and the Decennial Census in 1940 across all Manufacturing Industries. The first measure "Female Change Relative to All" is the percent change in the number of women between 1940 and 1946 divided by the percent change in all labor between 1940 and 1946. The second measure "Change in Relative Prop. Female" measures the percent change in the proportion of an industry that was female between 1940 and 1946. To calculate values for 1946, I add the numbers from 1940 and USES assignments (hence, making the assumption that the only change in employment the 1940 Census and the numbers from the USES assignments). The process is also detailed in the Table 2 and in Section 5.

Tables

Table 1: Employment by Year and Industry

	1940		1950		1944-1946	
	No. Total	No. Women	No. Total	No. Women	No. Total	No. Women
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Non-Durable Manufacturing						
Food & Beverages	17,375,900	3,378,800	26,392,100	5,541,700	1,015,840	237,574
Tobacco	1,418,200	774,000	1,638,900	832,000	28, 639	15,892
Textiles	14,195,800	5,690,600	18,724,800	6,981,800	318,725	146,016
Apparel	9,387,200	6,053,800	12,654,900	8,882,500	241,196	187,584
Paper	5,697,300	1,289,100	10,104,900	2,553,000	145,529	42,524
Printing	11,842,200	3,018,700	15,588,200	4,596,200	54,586	21,853
Chemicals	7,903,300	1,540,500	12,446,900	2,823,800	243,581	65,193
Petroleum & Coal	3,922,000	400,000	6,300,100	926,600	58,489	6,807
Rubber	2,536,500	575,400	4,185,900	1,091,300	96,245	32,044
Leather & Footwear	4,592,700	1,566,900	5,677,000	2,573,000	88,442	47,598
Total	78,871,100	24,287,800	113,713,700	36,801,900	2,291,272	803,085
Panel B: Durable Manufacturing						
Lumber and Wood	5,691,800	566,300	9,279,200	688,600	148,214	11,550
Furniture	2,145,100	350,000	4,709,500	1,055,600	152,985	35,766
Stone, Clay & Glass	4,504,800	828,700	6,948,000	1,438,300	127,914	33,884
Primary Metal	19,952,700	2,234,100	18,579,600	1,677,300	646,185	120,149
Fabricated Metal	1,302,800	302,800	16,059,800	3,139,900	91,606	17,582
Machinery	10,930,200	1,270,000	24,473,100	3,804,800	276,369	59,541
Electrical Machinery	6,081,300	1,653,400	16,210,900	5,627,000	283,278	156,236
Transport Equipment	11,593,800	1,152,100	25,917,600	3,859,300	878,269	179,947
Instruments	2,762,300	1,085,300	4,292,800	1,686,600	384,898	139,238
Miscellaneous	3,095,700	1,041,600	7,319,400	2,847,100	144,367	68,563
Total	58,060,500	10,484,300	133,789,900	25,824,500	3,134,085	822,456

Notes: The sample-weighted total number of people employed in each manufacturing industry by year. Numbers for 1940 and 1950 are sample-weighted, full-time workers from the 1940 and 1950 Decennial Censuses respectively. 'Full-time employed' workers are considered those who worked more than 40 weeks in a year and more than 35 hours a week in 1950, and those who worked more than 40 weeks in a year in 1940, since all reported weeks are considered to be full-time equivalent in 1940. Numbers from 1944-1946 are all the assignments made by the USES (United States Employment Service) to wartime industries from 'The Labor Market' reports of the War Manpower Commission's Bureau of Program Planning and Review prior to 1945, and 'The Labor Market' reports from the Labor Department since 1945. Data on USES assignments made available by Rose (2018). AK, HI, NV DC, NM, MT and WY are dropped.

Table 2: Measures of Relative Demand for Women During World War II

	1940 Levels		1946 Levels		Percent Change from 1940 to 1946		
	No. Women	Prop. Female	No. Women	Prop. Female	No. Women	$\frac{\text{No. Women}}{\text{No. Total}}$	Prop. Female
	(W_{40})	$P_{40} = \left(\frac{W_{40}}{L_{40}}\right)$	(W_{46})	$P_{46} = \left(\frac{W_{46}}{L_{46}}\right)$	$\left(\frac{W_{46}-W_{40}}{W_{40}}\right)$	$\frac{\left(\frac{W_{46}-W_{40}}{W_{40}}\right)}{\left(\frac{L_{46}-L_{40}}{L_{40}}\right)}$	$\left(\frac{P_{46}-P_{40}}{P_{40}}\right)$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Non-Durable Manufacturing							
Food & Beverages	3,378,800	0.194	3,616,374	0.197	0.070	1.203	0.011
Tobacco	774,000	0.546	789,892	0.546	0.021	1.017	0.000
Textiles	5,690,600	0.401	5,836,616	0.402	0.026	1.143	0.003
Apparel	6,053,800	0.645	6,241,384	0.648	0.031	1.206	0.005
Paper	1,289,100	0.226	1,331,624	0.228	0.033	1.291	0.007
Printing	3,018,700	0.255	3,040,553	0.256	0.007	1.571	0.003
Chemicals	1,540,500	0.195	1,605,693	0.197	0.042	1.373	0.011
Petroleum & Coal	400,000	0.102	406,807	0.102	0.017	1.141	0.002
Rubber	575,400	0.227	607,444	0.231	0.056	1.468	0.017
Leather & Footwear	1,566,900	0.341	1,614,498	0.345	0.030	1.577	0.011
Panel B: Durable Manufacturing							
Lumber & Wood	566,300	0.099	577,850	0.099	0.020	0.783	-0.005
Furniture	350,000	0.163	385,766	0.168	0.102	1.433	0.029
Stone, Clay & Glass	828,700	0.184	862,584	0.186	0.041	1.440	0.012
Primary Metal	2,234,100	0.112	2,354,249	0.114	0.054	1.661	0.021
Fabricated Metal	302,800	0.232	320,382	0.230	0.058	0.823	-0.011
Machinery	1,270,000	0.116	1,329,541	0.119	0.047	1.854	0.021
Electrical Machinery	1,653,400	0.272	1,809,636	0.284	0.094	2.029	0.046
Transport Equipment	1,152,100	0.099	1,332,047	0.107	0.156	2.062	0.075
Instruments	1,085,300	0.393	1,224,538	0.389	0.128	0.921	-0.010
Miscellaneous	1,041,600	0.336	1,110,163	0.343	0.066	1.411	0.018

Notes: This table details the creation of two measures I use to calculate the industry-specific increase in the relative demand for women during WWII using assignments made by the USES between 1944-46 and the Decennial Census in 1940 across all Manufacturing Industries. The first measure "% Female Change Relative to All" shown in column (6), is the % change in the number of women between 1940 and 1946 divided by the % change in all labor between 1940 and 1946 . The second measure "% Change in Relative Prop. Female" shown in column (7), measures the % change in the prop. of an industry that was female between 1940 and 1946. To calculate values for 1946 in columns (3) and (4), I add up workers from 1940 and USES assignments (hence making the assumption that the only change in employment in 1946 is from the USES assignments). For more, see Section 5.

Table 3: Summary Statistics by Industry

	Durables	Non-Durables
	(1)	(2)
Panel A: Employment Characteristics		
Log Annual Wage	7.091	6.898
	(0.770)	(0.853)
Log Hourly Wage	-0.290	-0.444
	(0.574)	(0.625)
Weeks Worked Last Year	44.704	44.511
	(11.590)	(12.077)
Hours Worked Last Week	39.388	37.881
	(9.805)	(12.520)
Production Workers	0.756	0.738
	(0.430)	(0.440)
Professional/Clerical Workers	0.210	0.202
	(0.407)	(0.401)
Panel B: Demographic Characteristics		
Female	0.171	0.364
	(0.376)	(0.481)
Married	0.720	0.669
	(0.449)	(0.471)
12 or More Years of Education	0.351	0.325
	(0.477)	(0.469)
Non-White	0.068	0.058
	(0.252)	(0.234)
No. of Children under Age 5	0.289	0.229
	(0.611)	(0.546)
N	27,745	27,642

Notes: Sample-weighted means (and standard deviations in parentheses) for demographic and employment characteristics of individuals from the 1% samples of the 1940 and 1950 Decennial Censuses. The final sample contains U.S. born workers employed in manufacturing industries, aged 15-64. States: AK, HI, and DC, are dropped from my sample since they did not exist in 1945. MT, NV, NM, and WY are dropped from my final sample due to the inavailability of data on manufacturing workers.

Table 4: Impact of Industry-Level and State-Level WWII Employment Shocks on Wages in Manufacturing 1940-1950, Using Measure 1

	Durables			Non-Durables		
	(1)	(2)	(3)	(4)	(5)	(6)
$\%\Delta$ No. Women by Industry$\times d_{1950} \times f_i$	0.176***	0.191***	0.277***	-0.180	-0.262**	-0.030
	(0.059)	(0.064)	(0.093)	(0.130)	(0.131)	(0.136)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	0.059	0.480		0.085	0.218	
	(0.483)	(0.434)		(0.716)	(0.536)	
$\%\Delta$ No. Women by State$\times d_{1950} \times f_i$	-0.094			0.045		
	(0.085)			(0.063)		
$\%\Delta$ Total Demand by State$\times d_{1950}$	-0.002			0.000		
	(0.003)			(0.000)		
$ln(\frac{F_{sjt}}{M_{sjt}})$	0.143**	0.162**	0.173*	-0.037	-0.039	-0.035
	(0.070)	(0.083)	(0.090)	(0.042)	(0.041)	(0.041)
$ln(\frac{F_{sjt}}{M_{sjt}}) \times f_i$	-0.157	-0.190	-0.199	-0.048	-0.034	-0.035
	(0.104)	(0.116)	(0.121)	(0.058)	(0.056)	(0.056)
d_{1950}	0.296***	0.344***	0.299***	0.086	0.112	0.149*
	(0.071)	(0.067)	(0.084)	(0.083)	(0.091)	(0.082)
f_i	-0.929***	-0.951***	-0.977***	-0.486***	-0.427***	-0.406***
	(0.279)	(0.308)	(0.323)	(0.118)	(0.116)	(0.117)
$f_i \times d_{1950}$	0.190	-0.037	-0.178	0.340	0.421**	0.082
	(0.185)	(0.155)	(0.179)	(0.219)	(0.215)	(0.215)
Gender-by-State-by-Year FE		✓	✓		✓	✓
Industry-by-Year FE			✓			✓
Individual-Level Controls	✓	✓	✓	✓	✓	✓
N	26,676	26,676	26,676	25,984	25,990	25,990
R^2	0.36	0.36	0.36	0.43	0.43	0.43

Notes: Results from the wage premium equation in Section 5 for Eqn. (17) in columns (1) and (4), Eqn. (15) in columns (2) and (5), and Eqn. (19) in columns (3) and (6) for Durable and Non-Durable Manufacturing industries. The main dependent variable is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE, as well as the log of relative female-male employment in their industry-state-year and its interaction with the female dummy, instrumented with the log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. Columns (2) and (5) include state-by-year FE and its interaction with the female dummy, and columns (3) and (6) include those as well as industry-by-year FE. The main coefficients of interest are on the % change in relative no. of women in an industry (compared to the % change in no. workers in an industry), times the dummies for female and 1950, the % change in relative no. of women in a state (compared to the % change in no. workers in an state), times the dummies for female and 1950, and the total % change in no. workers in a state and industry, times the 1950 dummy. Definitions of shocks are in Section 5. Individual covariates include being married, no. of children under age 5 in the household, 12 or more years of education, race and a 4th-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.

Table 5: Impact of Industry-Level and State-Level WWII Employment Shocks on Wages in Manufacturing 1940-1950, Using Measure 2

	Durables			Non-Durables		
	(1)	(2)	(3)	(4)	(5)	(6)
$\%\Delta$ Female Prop. of Industry$\times d_{1950} \times f_i$	3.174***	3.395***	4.178***	-1.274	-3.138	2.586
	(0.989)	(1.040)	(1.439)	(5.112)	(5.141)	(5.092)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	-0.078	0.323		0.307	0.611	
	(0.469)	(0.412)		(0.759)	(0.576)	
$\%\Delta$ Female Prop. of State$\times d_{1950} \times f_i$	-0.113			0.044		
	(0.090)			(0.068)		
$\%\Delta$ Total Demand by State$\times d_{1950}$	-0.002			0.000		
	(0.003)			(0.001)		
$ln(\frac{F_{sjt}}{M_{sjt}})$	0.143**	0.163**	0.174*	-0.037	-0.039	-0.035
	(0.070)	(0.083)	(0.090)	(0.042)	(0.041)	(0.041)
$ln(\frac{F_{sjt}}{M_{sjt}}) \times f_i$	-0.161	-0.193*	-0.199*	-0.049	-0.036	-0.036
	(0.104)	(0.116)	(0.120)	(0.058)	(0.056)	(0.056)
d_{1950}	0.302***	0.351***	0.307***	0.080	0.102	0.148*
	(0.071)	(0.067)	(0.084)	(0.083)	(0.091)	(0.082)
f_i	-0.891***	-0.912***	-0.913***	-0.486***	-0.432***	-0.408***
	(0.274)	(0.302)	(0.307)	(0.118)	(0.116)	(0.117)
$f_i \times d_{1950}$	0.299**	0.189	0.167	0.161	0.109	0.027
	(0.122)	(0.129)	(0.129)	(0.107)	(0.118)	(0.117)
Gender-by-State-by-Year FE		✓	✓		✓	✓
Industry-by-Year FE			✓			✓
Individual-Level Controls	✓	✓	✓	✓	✓	✓
N	26,676	26,676	26,676	25,984	25,990	25,990
R^2	0.36	0.36	0.36	0.43	0.43	0.43

Notes: Results from the wage premium equation in Section 5 for Eqn. (17) in columns (1) and (4), Eqn. (15) in columns (2) and (5), and Eqn. (19) in columns (3) and (6) for Durable and Non-Durable Manufacturing industries. The main dependent variable is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE, as well as the log of relative female-male employment in their industry-state-year and its interaction with the female dummy, instrumented with the log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. Columns (2) and (5) include state-by-year FE and its interaction with the female dummy, and columns (3) and (6) include those as well as industry-by-year FE. The main coefficients of interest are on the % change in proportion of women in an industry (compared to the % change in no. workers in an industry), times the dummies for female and 1950, the % change in relative no. of women in a state (compared to the % change in no. workers in an state), times the dummies for female and 1950, and the total % change in no. workers in a state and industry, times the 1950 dummy. Definitions of shocks are in Section 5. Individual covariates include being married, no. of children under age 5 in the household, 12 or more years of education, race and a 4th-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.

Table 6: Heterogeneity in the Impact of the Industry-Level Employment Shock of WWII on Wages in Durable Manufacturing, 1940-1950

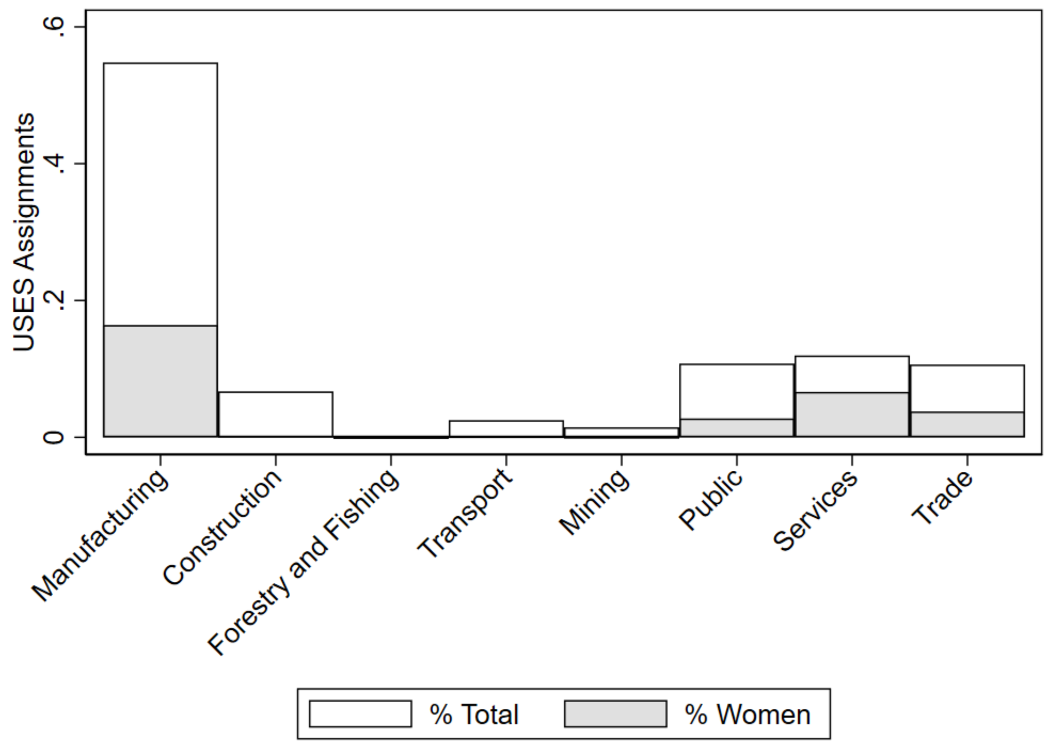
	Relative Demand Measure 1				Relative Demand Measure 2			
	HS or Higher		Less Than HS		HS or Higher		Less Than HS	
	Married	Unmarried	Married	Unmarried	Married	Unmarried	Married	Unmarried
Panel A: All Women								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
%Δ Rel. Female Demand by Ind. $\times d_{1950} \times f_i$	0.436**	0.487***	0.013	0.276	6.511**	6.020***	1.999	2.292
	(0.220)	(0.168)	(0.117)	(0.173)	(3.230)	(2.323)	(2.071)	(2.724)
d_{1950}	0.132	0.337**	0.246	0.108	0.138	0.375**	0.247	0.122
	(0.146)	(0.170)	(0.168)	(0.213)	(0.146)	(0.164)	(0.168)	(0.208)
f_i	-2.170***	0.107	-0.740	-0.679	-2.089***	0.198	-0.750	-0.596
	(0.740)	(0.394)	(0.614)	(0.687)	(0.716)	(0.372)	(0.611)	(0.657)
$f_i \times d_{1950}$	0.769	-0.861**	-0.144	0.101	1.353***	-0.212	-0.173	0.478
	(0.513)	(0.372)	(0.511)	(0.392)	(0.383)	(0.263)	(0.447)	(0.330)
N	6,343	3,124	13,014	4,195	6,343	3,124	13,014	4,195
R^2	0.26	0.34	0.33	0.35	0.26	0.33	0.33	0.35
Panel B: White Women								
%Δ Rel. Female Demand by Ind. $\times d_{1950} \times f_i$	0.334*	0.468***	-0.020	0.256	5.087*	5.837**	1.335	1.736
	(0.200)	(0.169)	(0.113)	(0.168)	(2.897)	(2.344)	(2.019)	(2.677)
d_{1950}	0.110	0.356**	0.147	0.139	0.115	0.393**	0.148	0.151
	(0.153)	(0.173)	(0.178)	(0.212)	(0.153)	(0.166)	(0.178)	(0.209)
f_i	-1.787***	0.185	-0.628	-0.617	-1.726***	0.272	-0.640	-0.548
	(0.659)	(0.397)	(0.630)	(0.653)	(0.639)	(0.375)	(0.630)	(0.631)
$f_i \times d_{1950}$	0.937*	-0.848**	-0.003	0.081	1.383***	-0.227	-0.069	0.440
	(0.507)	(0.371)	(0.520)	(0.390)	(0.393)	(0.262)	(0.457)	(0.327)
N	6,194	3,055	11,821	3,774	6,194	3,055	11,821	3,774
R^2	0.26	0.33	0.28	0.33	0.26	0.33	0.28	0.33

Notes: Results from the wage premium estimation equation (19) in Section 5. Measure 1 is the % change in no. women compared to the % change in total workers due to USES assignments in an industry. Measure 2 is the % change in the proportion women in an industry due to USES assignments. Detailed definitions in section 5. The main dependent variable is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All specifications include gender, year, gender-by-year, gender-by-state, gender-by-industry, state-by-year, industry-by-year and state-by-gender-by -year FE, as well as the log levels of relative female- male employment in their industry-state-year and its interaction with the female dummy, instrumented with log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. Individual covariates incl. being married, no. of children under age 5 in the household, 12 or more yrs. of educ., race and a 4th-degree polynomial in potential experience. Robust std. errors are clustered by state and industry, and sample-line weights are used. Final sample contains U.S. born workers in manufacturing, aged 15-64 and excl. states: AK, HI, DC, MT, NV, NM, and WY.

Appendix A

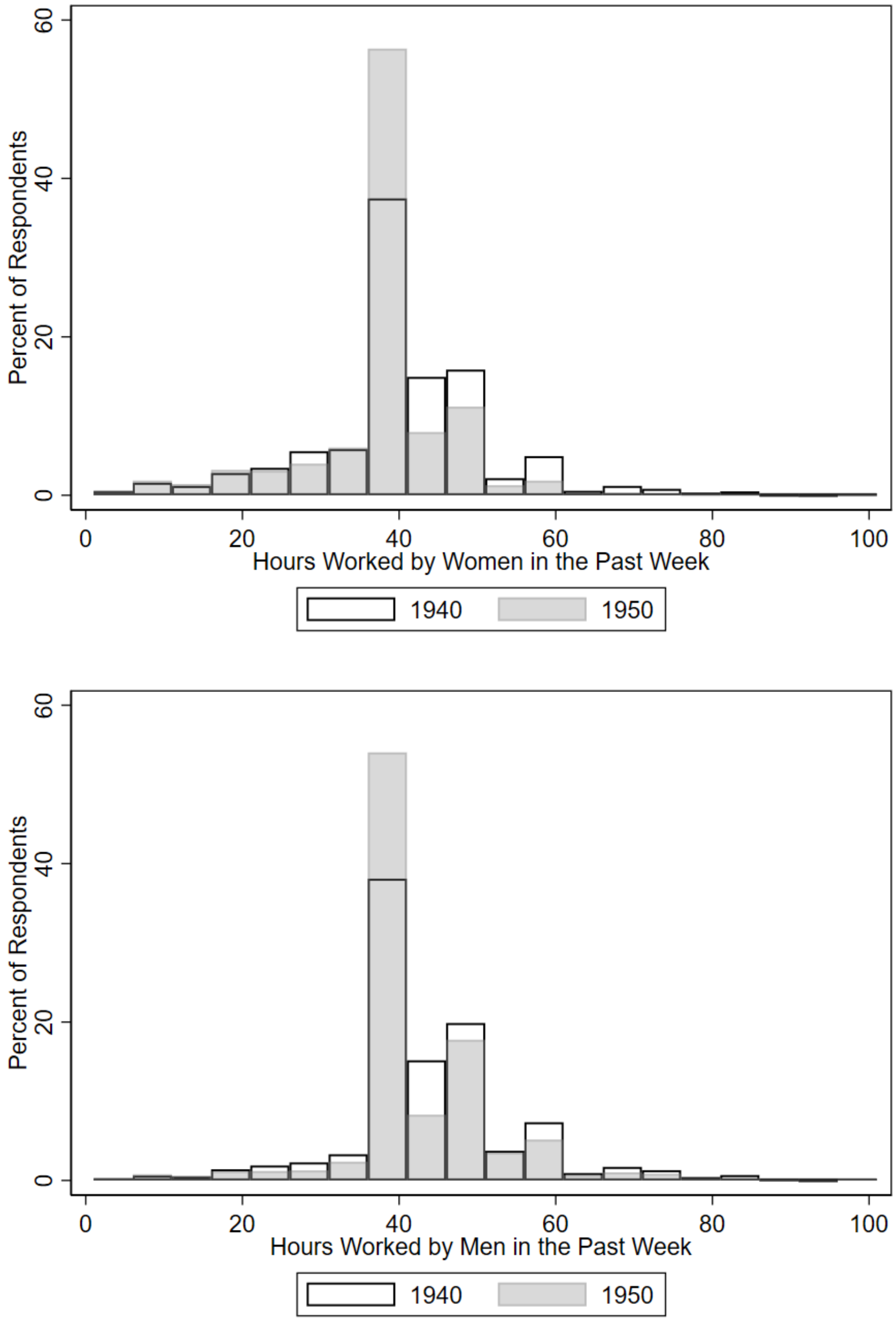
Appendix A Figures

Figure A.1: Distribution of USES Assignments across All Industries



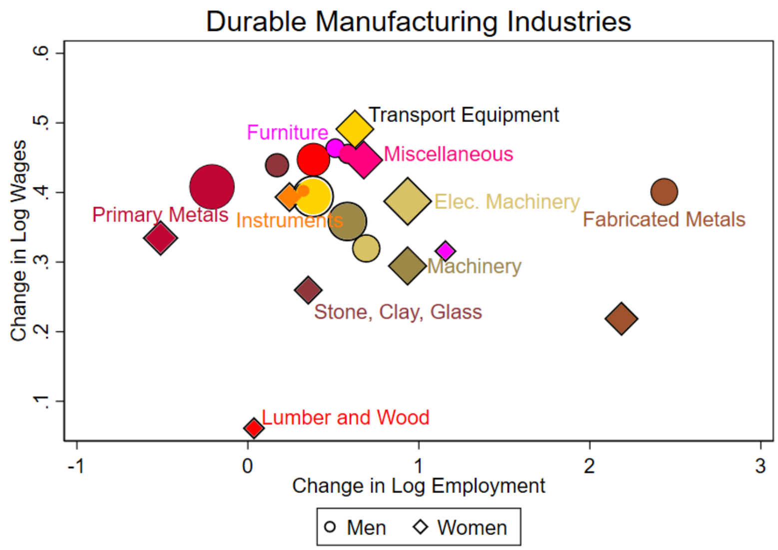
Notes: This figure represents the distribution of workers assigned to industries across all industry groups by the United States Employment Service between the third quarter of 1944 and the last quarter of 1946, as in Rose (2018), compiled from "The Labor Market" reports of the War Manpower Commission's Bureau of Program Planning and Review prior to 1945, and reports of the same name from the Labor Department since 1945. "% Total" bars represents the share of all USES assignments in our data that are in each industry group. "% Women" bars in grey represent the share of all female USES assignments in the data that belong to each industry group.

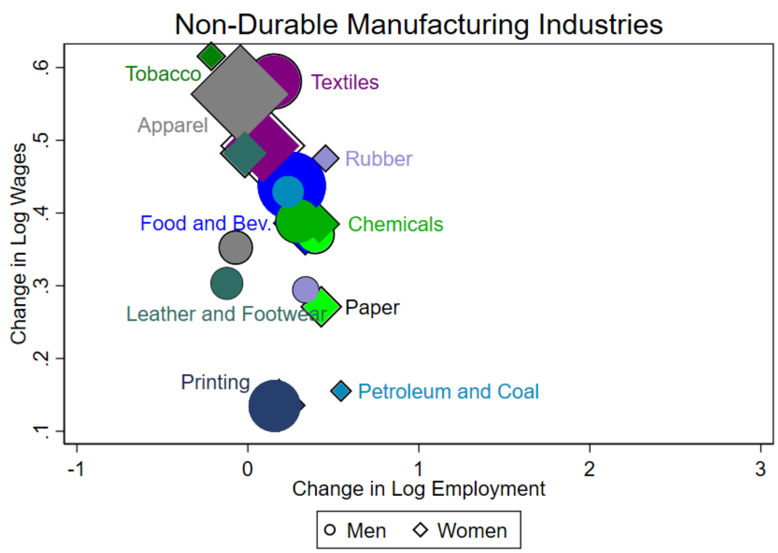
Figure A.2: Distribution of 'Hours Worked Last Week' reported in the 1940 and 1950 Censuses



Notes: This figure represents the distribution of "hours worked last week" reported by workers in the 1940 and 1950 Decennial Censuses, separately for men and women. The sample includes responses from all individuals aged 15-64 who are US-born and excludes the states of AK, HI, NV, and DC.

Figure A.3: Industry-Wide Changes in Relative Female-Male Wages, and Relative Female-Male Employment





Notes: This figure represents the differences in the log average annual wages in a manufacturing industry between 1940 and 1950 on the y-axis, plotted against the differences in the log total annual employment of women (by the diamonds) and men (by the circles) on the y-axis between 1940 and 1950, using the 1% Sample of the Decennial Censuses, excluding the states of AK, HI, NV, DC, NM, MT and WY. The size of each diamond and dot represents the number of workers of that gender in that industry across the two years. Employment is the total number of full-time women (or men) employed in an industry, defined as those who work more than 40 weeks in a year and 35 hours per week in 1950 and those who work more than 40 weeks in 1940 (since all reported weeks are considered full-time equivalent in the 1940 Census). Wages in 1950 are inflation-adjusted to be comparable to 1940 \$. The top figure with warm colors (red, orange, pink and brown) plots Durable Manufacturing Industries and the bottom figure with cool colors (blues, greens and grays) plots Non-Durable Manufacturing Industries.

Appendix A Tables

Table A.1: Impact of Industry-Level Relative Female Employment Shock on Wages in Manufacturing Industries, on Including other Industry Trends for Women

	Durables					Non-Durables				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Using Relative Demand Measure 1										
$\%\Delta$ No. Women by Ind.$\times d_{1950} \times f_i$	0.277***	0.222**	0.218**	0.276***	0.234**	-0.030	0.276*	-0.008	0.104	0.511
	(0.093)	(0.102)	(0.091)	(0.092)	(0.100)	(0.136)	(0.167)	(0.142)	(0.139)	(0.331)
Allowing for different time trends for women by:										
Prop. of Ind with HS Educ.		0.693			-0.471		-0.835***			-1.359
		(0.787)			(1.122)		(0.274)			(1.440)
Prop. of Ind Non-White			-1.454*		-1.940			0.250		1.110*
			(0.838)		(1.187)			(0.612)		(0.575)
Prop. of Women in Ind. Married				3.486	7.864				28.430***	-12.432
				(25.833)	(26.154)				(10.095)	(52.518)
N	26,676	26,676	26,676	26,676	26,676	25,990	25,990	25,990	25,990	25,990
R^2	0.36	0.36	0.36	0.36	0.36	0.43	0.43	0.43	0.43	0.43
Panel B: Using Relative Demand Measure 2										
$\%\Delta$ Female Prop. of Ind.$\times d_{1950} \times f_i$	4.178***	3.423**	3.577**	4.992***	4.159***	2.586	4.270	2.212	2.880	1.242
	(1.439)	(1.437)	(1.419)	(1.578)	(1.564)	(5.092)	(4.900)	(5.209)	(4.918)	(5.352)
Allowing for different time trends for women by:										
Prop. of Ind with HS Educ.		1.176*			-0.072		-0.578***			0.247
		(0.713)			(1.058)		(0.208)			(0.713)
Prop. of Ind Non-White			-1.900**		-1.837			0.221		0.622
			(0.830)		(1.181)			(0.607)		(0.628)
Prop. of Women in Ind. Married				-36.509	-23.134				26.083***	37.671
				(28.111)	(27.997)				(9.337)	(32.199)
N	26,676	26,676	26,676	26,676	26,676	25,990	25,990	25,990	25,990	25,990
R^2	0.36	0.36	0.36	0.36	0.36	0.43	0.43	0.43	0.43	0.43

Notes: Results from the wage premium estimation equation (19) in Section 5. The main dependent var. is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All specifications include gender, year, gender-by-year, gender-by-state, gender-by-industry, state-by-year, industry-by-year and state-by-gender-by-year FE, plus the log levels of relative female-male employment in their industry-state-year and its interaction with the female dummy, instrumented with log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. Individual covariates incl. being married, no. of children under age 5 in the household, 12 or more yrs. of educ., race and a 4th-degree polynomial in potential experience. Robust std. errors are clustered by state and industry, and sample-line weights are used. Final sample: U.S. born workers in manufacturing, aged 15-64 and excl. states: AK, HI, DC, MT, NV, NM, and WY.

Table A.2: Impact of WWII Employment Shocks on Wages in Durable Manufacturing 1940-1950, With and Without Employment

	No Emp	W/ Emp	No Emp	W/ Emp	No Emp	W/ Emp
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using Relative Demand Measure 1						
%Δ No. Women by Industry$\times d_{1950} \times f_i$	0.180***	0.176***	0.184***	0.191***	0.199***	0.277***
	(0.050)	(0.059)	(0.052)	(0.064)	(0.065)	(0.093)
%Δ Total Demand by Industry$\times d_{1950}$	0.295	0.059	0.612*	0.480		
	(0.416)	(0.483)	(0.365)	(0.434)		
%Δ No. Women by State$\times d_{1950} \times f_i$	-0.109	-0.094				
	(0.082)	(0.085)				
%Δ Total Demand by State$\times d_{1950}$	0.000	-0.002				
	(0.002)	(0.003)				
N	26,676	26,676	26,676	26,676	26,676	26,676
R^2	0.37	0.36	0.37	0.36	0.37	0.36
Panel B: Using Relative Demand Measure 2						
%Δ Female Prop. of Industry$\times d_{1950} \times f_i$	3.115***	3.174***	3.204***	3.395***	3.216***	4.178***
	(0.800)	(0.989)	(0.847)	(1.040)	(1.021)	(1.439)
%Δ Total Demand by Industry$\times d_{1950}$	0.151	-0.078	0.460	0.323		
	(0.398)	(0.469)	(0.345)	(0.412)		
%Δ Female Prop. of State $\times d_{1950} \times f_i$	-0.130	-0.113				
	(0.086)	(0.090)				
%Δ Total Demand by State$\times d_{1950}$	0.000	-0.002				
	(0.002)	(0.003)				
N	26,676	26,676	26,676	26,676	26,676	26,676
R^2	0.37	0.36	0.37	0.36	0.37	0.36
Gender-by-State-by-Year FE			✓	✓	✓	✓
Industry-by-Year FE					✓	✓
Individual-Level Controls	✓	✓	✓	✓	✓	✓

Notes: Results from the wage premium eq. outlined in Section 5 for Eq. (17) in col. (1) and (2), Eq. (15) in col. (3) and (4), and Eq. (19) in col. (5) and (6) for Durable Manufacturing industries. The main dependent variable is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE. Columns (2), (4) and (6) also contain the log of relative female-male employment in their industry-state-year and its interaction with the female dummy, instrumented with the log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. The specification in col. (3) and (4) includes state-by-year FE and its interaction with the female dummy, and in col. (5) and (6) include those as well as industry -by-year FE. Individual covariates include being married, no. of children under age 5 in the household, having 12 or more years of education, race and a fourth-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.

Table A.3: Impact of WWII Employment Shocks on Wages in Non-Durable Manufacturing 1940-1950, With and Without Employment

	No Emp	W/ Emp	No Emp	W/ Emp	No Emp	W/ Emp
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Using Relative Demand Measure 1						
$\%\Delta$ No. Women. by Industry$\times d_{1950} \times f_i$	-0.257**	-0.180	-0.312**	-0.262**	-0.053	-0.030
	(0.119)	(0.130)	(0.121)	(0.131)	(0.131)	(0.136)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	0.033	0.085	0.221	0.218		
	(0.718)	(0.716)	(0.529)	(0.536)		
$\%\Delta$ No. Women by State$\times d_{1950} \times f_i$	0.023	0.045				
	(0.059)	(0.063)				
$\%\Delta$ Total Demand by State$\times d_{1950}$	0.000	0.000				
	(0.000)	(0.001)				
N	25,984	25,984	25,990	25,990	25,990	25,990
R^2	0.43	0.43	0.43	0.43	0.43	0.43
Panel B: Using Relative Demand Measure 2						
$\%\Delta$ Female Prop. of Industry$\times d_{1950} \times f_i$	-3.932	-1.274	-5.318	-3.138	1.743	2.586
	(4.759)	(5.112)	(4.883)	(5.141)	(4.978)	(5.092)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	0.438	0.307	0.756	0.611		
	(0.761)	(0.759)	(0.576)	(0.576)		
$\%\Delta$ Female Prop. of State $\times d_{1950} \times f_i$	0.020	0.044				
	(0.064)	(0.068)				
$\%\Delta$ Total Demand by State$\times d_{1950}$	0.000	0.000				
	(0.000)	(0.001)				
N	25,984	25,984	25,990	25,990	25,990	25,990
R^2	0.43	0.43	0.43	0.43	0.43	0.43
Gender-by-State-by-Year FE			✓	✓	✓	✓
Industry-by-Year FE					✓	✓
Individual-Level Controls	✓	✓	✓	✓	✓	✓

Notes: Results from the wage premium eq. outlined in Section 5 for Eq. (17) in col. (1) and (2), Eq. (15) in col. (3) and (4), and Eq. (19) in col. (5) and (6) for Durable Manufacturing industries. The main dependent variable is the log individual annual wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE. Columns (2), (4) and (6) also contain the log of relative female-male employment in their industry-state-year and its interaction with the female dummy, instrumented with the log levels of relative female-male employment in an industry-state-year in 1930 and its interaction with the female dummy. The specification in col. (3) and (4) includes state-by-year FE and its interaction with the female dummy, and in col. (5) and (6) include those as well as industry -by-year FE. Individual covariates include being married, no. of children under age 5 in the household, having 12 or more years of education, race and a fourth-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.

Table A.4: Impact of Industry-Level and State-Level WWII Employment Shocks on Hourly Wages in Manufacturing 1940-1950, Using Measure 1

	Durables			Non-Durables		
	(1)	(2)	(3)	(4)	(5)	(6)
$\%\Delta$ No. Women by Industry$\times d_{1950} \times f_i$	-0.006	-0.023	0.109*	-0.262***	-0.281***	-0.148
	(0.040)	(0.038)	(0.057)	(0.072)	(0.072)	(0.091)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	-0.797*	-0.483		-1.157**	-1.028**	
	(0.419)	(0.314)		(0.565)	(0.440)	
$\%\Delta$ No. Women by State$\times d_{1950} \times f_i$	-0.006			0.078*		
	(0.047)			(0.043)		
$\%\Delta$ Total Demand by State$\times d_{1950}$	0.001			0.000		
	(0.002)			(0.000)		
$ln(\frac{F_{sjt}}{M_{sjt}})$	0.078	0.080	0.090	-0.026	-0.025	-0.022
	(0.053)	(0.057)	(0.060)	(0.033)	(0.033)	(0.033)
$ln(\frac{F_{sjt}}{M_{sjt}}) \times f_i$	-0.067	-0.066	-0.073	-0.064*	-0.062*	-0.063*
	(0.067)	(0.070)	(0.072)	(0.037)	(0.037)	(0.037)
d_{1950}	0.111**	0.127***	0.062	0.248***	0.234***	0.174***
	(0.048)	(0.046)	(0.059)	(0.054)	(0.056)	(0.056)
f_i	-0.532***	-0.476**	-0.499**	-0.403***	-0.391***	-0.379***
	(0.184)	(0.190)	(0.199)	(0.078)	(0.077)	(0.077)
$f_i \times d_{1950}$	0.227*	0.172*	-0.055	0.258**	0.365***	0.166
	(0.118)	(0.102)	(0.113)	(0.130)	(0.111)	(0.132)
N	27,329	27,329	27,329	26,265	26,281	26,281
R^2	0.32	0.32	0.32	0.36	0.36	0.36

Notes: Results from the wage premium equation in Section 5 for Eqn. (17) in columns (1) and (4), Eqn. (15) in columns (2) and (5), and Eqn. (19) in columns (3) and (6) for Durable and Non-Durable Manufacturing industries. The main dependent variable is the log individual hourly wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE, as well as the log of relative female-male employment in average weeks in their industry-state-year and its interaction with the female dummy, instrumented with log levels of relative female-male employment in total numbers in an industry-state-year in 1930 and its interaction with the female dummy. Columns (2) and (5) include state-by-year FE and its interaction with the female dummy, and columns (3) and (6) include those as well as industry-by-year FE. The main coefficients of interest are on the % change in relative no. of women in an industry (compared to the % change in no. workers in an industry), times the dummies for female and 1950, the % change in relative no. of women in a state (compared to the % change in no. workers), times the dummies for female and 1950, and the total % change in no. workers in a state and industry, times the 1950 dummy. Definitions of shocks are in Section 5. Individual covariates include being married, no. of children under age 5 in the household, 12 or more years of education, race and a 4th-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.

Table A.5: Impact of Industry-Level and State-Level WWII Employment Shocks on Hourly Wages in Manufacturing 1940-1950, Using Measure 2

	Durables			Non-Durables		
	(1)	(2)	(3)	(4)	(5)	(6)
$\%\Delta$ Female Prop. of Industry$\times d_{1950} \times f_i$	0.228	0.034	1.551*	1.039	1.605	8.616***
	(0.622)	(0.624)	(0.814)	(2.935)	(2.954)	(3.312)
$\%\Delta$ Total Demand by Industry$\times d_{1950}$	-0.789*	-0.457		-0.977	-0.833*	
	(0.417)	(0.308)		(0.608)	(0.487)	
$\%\Delta$ Female Prop. of State$\times d_{1950} \times f_i$	-0.011			0.077*		
	(0.050)			(0.046)		
$\%\Delta$ Total Demand by State$\times d_{1950}$	0.001			0.000		
	(0.002)			(0.000)		
$ln(\frac{F_{sjt}}{M_{sjt}})$	0.078	0.080	0.091	-0.026	-0.025	-0.021
	(0.053)	(0.057)	(0.060)	(0.033)	(0.033)	(0.033)
$ln(\frac{F_{sjt}}{M_{sjt}}) \times f_i$	-0.068	-0.067	-0.074	-0.065*	-0.064*	-0.066*
	(0.067)	(0.070)	(0.072)	(0.038)	(0.037)	(0.037)
d_{1950}	0.110**	0.126***	0.065	0.244***	0.229***	0.169***
	(0.048)	(0.046)	(0.058)	(0.055)	(0.057)	(0.056)
f_i	-0.535***	-0.484**	-0.475**	-0.408***	-0.406***	-0.389***
	(0.183)	(0.189)	(0.191)	(0.079)	(0.077)	(0.078)
$f_i \times d_{1950}$	0.207***	0.135	0.085	-0.013	-0.000	-0.081
	(0.076)	(0.086)	(0.083)	(0.074)	(0.071)	(0.075)
N	27,329	27,329	27,329	26,265	26,281	26,281
R^2	0.32	0.32	0.32	0.36	0.36	0.36

Notes: Results from the wage premium equation in Section 5 for Eqn. (17) in columns (1) and (4), Eqn. (15) in columns (2) and (5), and Eqn. (19) in columns (3) and (6) for Durable and Non-Durable Manufacturing industries. The main dependent variable is the log individual hourly wages from a pooled 1% Decennial Census sample of 1940 and 1950. All columns include gender, year, gender-by-year, gender-by-state, and gender-by-industry FE, as well as the log of relative female-male employment in average weeks in their industry-state-year and its interaction with the female dummy, instrumented with log levels of relative female-male employment in total numbers in an industry-state-year in 1930 and its interaction with the female dummy. Columns (2) and (5) include state-by-year FE and its interaction with the female dummy, and columns (3) and (6) include those as well as industry-by-year FE. The main coefficients of interest are on the % change in proportion of women in an industry (or state) times the dummies for female and 1950, and the total % change in no. workers in a state (or industry), times the 1950 dummy. Definitions of shocks are in Section 5. Individual covariates include being married, no. of children under age 5 in the household, 12 or more years of education, race and a 4th-degree polynomial in potential experience. Robust standard errors are clustered by state and industry, and sample-line weights are used. Final sample has U.S. born workers aged 15-64 and excludes the states: AK, HI, DC, MT, NV, NM, and WY.