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Article

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Michelle Rendall

The Link between Gender Gaps and Employment Polarization



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The increase in employment shares both at the bottom and at the top of the skill distribution, combined with a decline in the middle, has been extensively documented for the US and many OECD economies since the 1980s. This observed employment polarization has become a well-known stylized fact (Autor et al. 2006; Acemoglu and Autor 2011; Autor and Dorn 2013; Goos and Manning 2007; Michaels et al. 2014; Goos et al. 2014). Less well known are the characteristics of employment polarization by gender, as polarization

is usually studied at an aggregate level. Nonetheless, when studying employment polarization, in Cerina et al. (2021) we also consider one of the most important and dramatic social phenomena of the 20th century: the rise in female labor force participation, coupled with a rise in broad college attainment and a closing of the gender wage gap.

Let us start with the gender wage gap. The closing of the gender wage gap has been accelerating since the 1980s in most OECD countries. Figure 1(a) shows the closing wage gap between the average male and female worker for Australia, Germany, Great Britain, New Zealand, Sweden, the US, and the OECD. While wage gaps persist, all countries pictured, with the exception of Sweden,¹ have seen a convergence in male-to-female wages. Within this set of countries, Germany, Great Britain, and the US had the biggest initial gaps and also the largest convergence. Interestingly, the timing of the gender wage convergence coincides with the rise in aggregate employment polarization.

Next, looking at the gender education gap shows even more remarkable gains by women. The share of female tertiary (i.e., university) graduates now outnumber male graduates in all six countries shown (Figure 1(b)). However, note that the closing pay gap from Figure 1(a) is not due to rising female college attainment, as the gender pay gap, irrespective of education, converged during this time (Güvenen and Rendall 2015).

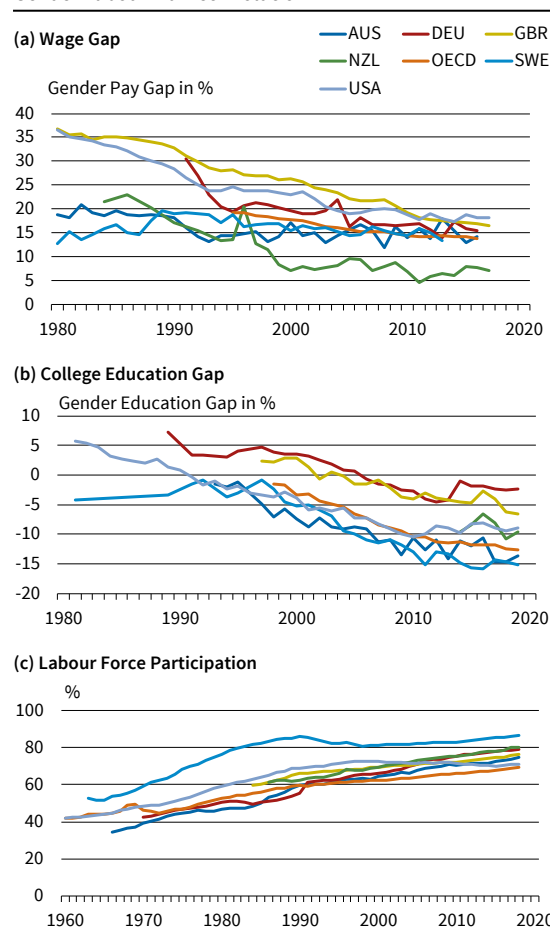
Moving on to labor force participation shows women entering the labor market at a basically constant rate since World War II (see labor force partici-

pation rates in Figure 1(c)). In contrast to the convergence of the gender pay and gender education gaps, this figure shows no marked trend-change around 1980 or thereafter.

Having detailed women's relative position in the labor market over time, I will highlight a number of novel facts on gender employment polarization for the US from joint research (Cerina et al. 2021).² Note, the change in aggregate hours worked at a given percentile

² We follow Acemoglu and Autor (2011); and Autor and Dorn (2013) in constructing employment polarization statistics for the US. First, we sort the population of occupations by their mean wage in 1980, which can be interpreted as a proxy for skills. We then construct occupation percentiles by weighting each occupation by hours worked in 1980. Next, we calculate, for each percentile, the change in the employment share in total working hours in the economy.

Figure 1
Gender Labour Market Evolution



Note: Panel 1(a) displays average male-to-female earnings over time. Panel 1(b) displays male minus female shares of college graduates in the population. A value of zero means men and women have equal shares of tertiary graduates, while a negative value shows that the percent of university educated women is above the male share. Panel 1(c) displays labour force participation rates of women. Source: OECD.

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can be decomposed into the change in the employment share (in total employment) of females and the change in the employment share (in total employment) of males. Using this gender decomposition, we show that employment polarization in the US is mainly driven by women during the 1980–2008 period. Furthermore, while married women are mostly responsible for the increase at the top of the distribution, single women are mostly responsible for the increase at the bottom. Finally, we document that employment polarization is absent in the 1960–1980 period: the positive change in employment shares of women is homogeneous along the whole skill distribution, while that of men is increasing along the distribution. That is, prior to 1980 women enter the labor market equally across all occupation types, while men shift hours monotonically from low-paying to high-paying occupations.

What forces can reconcile the three converging gender gaps in education, employment, and wages with the aggregate-/gender-specific polarization trends between the pre- and post-1980 time periods? In providing an answer, I will show that technical change, favoring women's comparative advantage, incentivizes highly educated women to shift from working at home ("homework") to market work, setting off the forces to both generate employment polarization and converging gender gaps.

THE WORK WE DO, PAST AND PRESENT

I will begin by analyzing the evolution of the labor market across time, occupations, and sectors in greater detail, focusing on the US. Splitting the US employment distribution into sector-specific groups, from lowest to highest wage terciles by occupation in 1980, a distinct pattern of polarization across sectors emerges.³ Employment at the bottom and top terciles has been driven by growth in service occupation, while the de-

cline in the middle has been driven by manufacturing occupations. More precisely, in the bottom tercile, the ten occupations with the biggest employment growth from 1980 to 2008 are all in services, except construction laborers (see Table 1 for a list of top and bottom employment growth occupations by tercile). In the second tercile, seven out of the ten occupations with the largest decline are in manufacturing. Lastly, nine out of ten occupations with the largest employment growth in the highest wage tercile are in services. The exception are managers and administrators in manufacturing, which are similar to many high-wage, service-oriented occupations in terms of tasks and skills.

In the academic literature, the mainstream explanation for the decline of employment shares in the middle of the skill distribution is due to routine-biased technical change (Acemoglu and Autor 2011; Acemoglu and Autor 2012; Autor and Dorn 2013). The process of routinization makes workers employed in occupations containing a large share of routine tasks redundant, as the latter are taken up by computers and machines. The evidence provided in the literature suggests that these types of occupations are in the middle of the skill distribution in 1980. However, one less obvious observation to emerge from the list of occupations is that the service sector encompasses a large variety of occupations which require very different skill sets and education levels.

One particular type of low-wage, low-skilled service occupation is performing tasks easily done at home (highlighted in green text in Table 1). For the purpose of this article, we denote these services as substitutable or home services and refer to the remaining as (modern) services. In separating services by these two categories, and continuing with the sorting of occupations by 1980 wage terciles, a striking pattern emerges: only home services show positive growth in the lowest tercile, while all the growth in the highest wage tercile is driven by modern services (see Figure 2).

³ For details on the construction of wage terciles, see the note in Figure 2.

Table 1

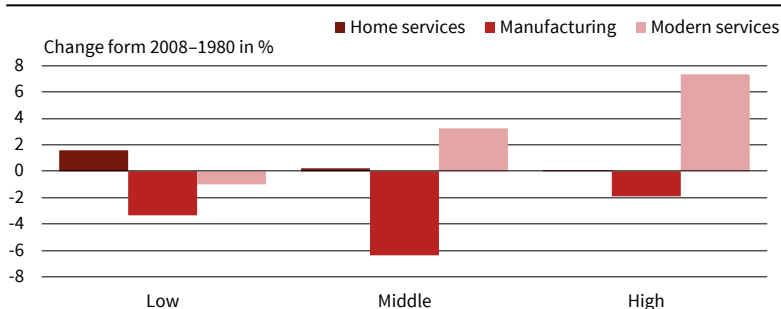
Top-10 and Bottom-10 Occupations by Employment Growth

Tercile 1 (Growing Occupations)	Tercile 2 (Shrinking Occupations)	Tercile 3 (Growing Occupations)
Health aides	Polishing workers	Computer analysts/scientists
Construction laborers	Telephone operators	Managers/administrators
Health aides	Printing machine operators	Managers/administrators
Child care workers	Welders and metal cutters	Primary school teachers
Cooks	Automobile mechanics	Financial managers
Kitchen workers	Laborers (not construction)	Other financial specialists
Teacher's aides	Truck/tractor drivers	Legislators
Guards, doorkeepers	Production inspectors	Software developers
Welfare service aides	Administrative support jobs	Accountants and auditors
Stock/inventory clerks	Machine operators	Management analysts

Note: Top 10 list of occupations by wage tercile. Occupations in Tercile 1 and 3 are occupations with highest employment growth from 1980 to 2008. Occupation in Tercile 2 are occupations with the largest fall in aggregate employment from 1980 to 2008. Occupations listed in blue are typical modern service sector occupations, occupations in green are home service occupations, and occupations in red are manufacturing occupations.

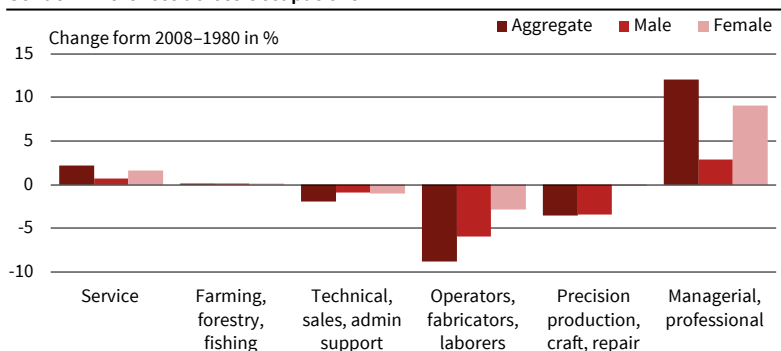
Source: US Census data 1980 and American Community Survey 2008.

Figure 2
Employment Polarisation across 1980 Wage Terciles (3-Sectors)



Note: Change in aggregate hours worked from 1980 to 2008 by 1980 wage terciles from US data. To compute wage terciles, occupations are sorted by their 1980 average wage rate and grouped into the three bins: bottom 33rd percentile wage occupations, middle 33rd percentile, and top 33rd percentile. The grouping of occupations is fixed over time, such that the set of occupations in each tercile remains unchanged between 1980 and 2008.
Source: US Census data 1980; American Community Survey 2008. © ifo Institute

Figure 3
Gender Differences across Occupations



Note: Occupations are assigned to one of ten broad occupations shown in the figure. Occupations are sorted left to right from lowest to highest 1980 wage rate.
Source: US Census data 1980; American Community Survey 2008. © ifo Institut

The aggregate trend of employment polarization is also confirmed across broad US Census occupation groups (ordered by their mean log hourly wage in 1980).⁴ The highest paid occupations (managerial, professional specialty occupations) are associated with the largest increase in the employment share (from 24 percent to 36 percent, a 50 percent increase). These occupations tend to require higher levels of cognitive, abstract, creative, problem solving, and social interaction skills. On the other hand, even the employment share of the lowest paid occupations (services) increases from 10.3 percent to 12.5 percent. This category includes jobs that involve assisting or caring for others.⁵ Service occupations are also those where manual tasks are more concentrated, which cannot be easily automated. At the same time, the remaining middle-wage occupation groups' employment shares decline between 1980 and 2008. This is particularly evident for the two groups of precision production craft and repair occupations (from

13.8 percent to 10.2 percent) and operators, fabricators, and laborers (from 21.8 percent to 13.0 percent), where routine tasks are highly concentrated and are, therefore, highly substitutable with computers. Thus, as extensively reported in the literature, the data by broad occupation groups is consistent with the routinization hypothesis.

CHANGES IN EMPLOYMENT OF MEN AND WOMEN

However, the broad occupation evidence shown in Figure 3 is also consistent with the mechanisms proposed in my recent work (Rendall 2017; Cerina et al. 2021). More specifically, the increase in labor force participation by high-skilled women after 1980, due to skill-biased technological change, plays a key role in driving employment polarization. The first element to emphasize is the remarkable differences between men and women in the dynamics of the employment shares among different occupational groups. Such differences can only partly be captured by a general level effect, where women increase their total employment share by 6.7 percentage points (with a corresponding decrease for men), as the changes in the employment shares are highly asymmetric along the skill distribution. In particular, women more than double their employment share in occupations at the upper tail of the distribution (from 8.2 percent to 17.3 percent), while the male share increases by less than 20 percent (from 15.8 percent to 18.7 percent). On the other extreme, the only other group of occupations where women increase their employment share is in low-wage services. Here the female employment share grows by almost 30 percent (from 5.4 percent to almost 7 percent) compared to only 13 percent for males (from 4.9 percent to 5.6 percent). These service occupations are concentrated in sectors producing services, which are highly substitutable to household production (especially childcare workers, gardeners, cleaners, home health aides). Additionally, some of these jobs (especially food service workers, security guards, janitors) also support the jobs of high-skilled workers, making them complementary to the highest paid occupations. In summary, occupations requiring predominately cognitive and manual skills have grown mostly from increased participation by women at the extremes of the skill (wage) distribution.

TECHNOLOGICAL PROGRESS AND WOMEN'S COMPARATIVE ADVANTAGE

While many studies have shown that increasing human capital demand (and investment) can explain male wage divergence across education groups over the last decades (see, for example, Becker 1994; Juhn et al. 1993; Guvenen and Kuruscu 2010), the same theory has not been applied to the study of time-varying gender gaps. In Cerina et al. (2021), we show that the differential patterns of employment shares of men and

⁴ Details on how occupations are grouped can be found at the web page <https://usa.ipums.org/usaaction/variables/OCC1990#codes> section. Our results can also be compared to Table 1 in Autor and Dorn (2013). The main difference is that we aggregate occupations according to Census classification and add the gender dimension.

⁵ Occupations in this category include the following: food service workers, security guards, janitors and gardeners, cleaners, home health aides, child care workers, hairdressers and beauticians, and recreation occupations.

women can be accounted for by a model of skill-biased technological change (SBTC) in which educated women initially devote a high fraction of their time to home production. In fact, US Census data shows that educated women spent a much higher fraction of their working time at home (51 percent) relative to men (17 percent) in 1980. By fostering an increase in the labor market hours of skilled women, SBTC accounts for most of the increase of employment shares at the top of the skill distribution. This increase indirectly generates additional demand for low-skilled labor and a consequent increase in the lower tail of the distribution through two different channels. First, the reduction in home production generates the need for the household to replace home services with some substitutes provided in the market – a consumption spillover. Second, the increase of high-skilled labor, by production complementarity, generates an additional demand of low-skilled labor within the economy that is needed to support the productivity of the former (see also Eeckhout et al. 2014). As the change in employment shares at the top and the bottom of the skill distribution is positive, the change of employment shares in the middle turns out to be negative. Through these mechanisms, SBTC within a structural change environment is then able to explain both the increase in the upper and lower tails of the skill distribution. Compared to women, men in 1980 already allocate most of their time to the labor market, so the emergence of SBTC does not affect their home/market labor choice.

The importance of the SBTC channel in explaining employment polarization during the 1980–2008 period is further emphasized by out-of-sample counterfactual exercises performed in Cerina et al. (2021). In this work, we tested the predictions of the model running backward from 1980 to 1960. The model accounts for the absence of any polarization pattern, both at the aggregate and at the gender-specific level during this period. Since the only relevant difference between the 1960–1980 and the 1980–2008 periods is the absence of SBTC, this exercise confirms that the latter is a primary driver of employment polarization.

Lastly, returning to wages, recent work shows that the link between employment and wage polarization is substantially weaker than previously thought. For example, Hunt and Nunn (2019) highlight the limitations of the occupation-based approach to measuring rising wage inequality over time. However, in Rendall (2017), I show that women benefit from increasing returns to brain over brawn given their comparative advantage, that is technological change has had a positive effect for women's wages.

POTENTIAL POLICY IMPLICATIONS

Much of the recent political discourse has focused on how to return middle-wage manufacturing jobs to developed economies. However, with every tech-

nological advancement there are winners and losers. The results above suggest that employment polarization in the US is largely generated by a differing gender-specific pattern of employment shares along the skill distribution. This implies that any policy intervention aimed at reducing the overall pattern of employment polarizations should carefully consider the various demographic groups that are contributing to this phenomenon. Reversing employment polarizations could have a negative impact on gender equality in the labor market.

Looking ahead, while technological change has reduced gender inequality, among other impacts, women still earn less than men and work more hours in the home (see Cerina et al. 2021 and references therein). Moreover, it has been shown that the gender gap widens as women become mothers (Kleven et al. 2019). This aligns with decades of research repeatedly showing that the current gap is not primarily due to the popularized idea of discrimination or labor market biases. One remaining obstacle is that many high paying jobs either have long and unpredictable hours (Goldin 2014) or penalize workers for taking extended career breaks (Rendall and Rendall 2015). Both these issues are still hard to reconcile with caring for children or extended family. The pandemic and working from home might help shrink this gender division, but it is too early to determine whether the flexible work trends will remain in place beyond the pandemic.

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