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## Job polarization in the United States in the 21st century studying shifts in employment structures using occupations and sectors

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# Job Polarization in the United States in the 21st Century

## Studying Shifts in Employment Structures Using Occupations and Sectors

JRC Working Papers Series on  
Labour, Education and Technology  
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R. E. Dwyer

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# Job Polarization in the United States in the 21st Century

## Studying Shifts in Employment Structures Using Occupations and Sectors

Rachel E. Dwyer (The Ohio State University)

### Abstract

Job polarization was first identified in the US in the 1990s, when employment growth concentrated in the highest and lowest wages jobs with much less growth in middle wage jobs. Research since then has identified continuing polarizing pressures in the US and Europe, but also evidence of job upgrading in some periods even in the US. Prior research on job polarization often focuses on the relationship between individual wage inequality and inequality between jobs defined as occupations. I argue for the value of a focus on the structure of job inequality as distinct from individual wage inequality and, furthermore, argue for the inclusion of sectoral divisions in a jobs-based approach. With that conceptual underpinning, I analyse Current Population Survey data and build on prior work to study the first two decades of the 2000s, up to the first pandemic year of 2020. I disaggregate job growth by sector, employment contract, and sociodemographic groups. I find that job polarization persisted in the 2000s, particularly when examining the full period from 2000 to 2019. Sub-periods within that period show more diversity in results. For example, economic recessions—especially the Great Recession and the COVID-19 recession—became increasingly crucial in shaping changes in the job structure.

**Keywords:** Employment growth, job quality, sectoral change, gender and work.

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## **Executive summary**

Job polarization was first identified in the 1990s in the United States, with research soon extended to European countries as well. Polarizing pressures combine with job upgrading in many places including the US. Yet studies differ in their conceptualization and measurement of job polarization and the degree to which scholars link inequality in jobs to wage inequality between individuals. My approach developed with Erik Olin Wright define jobs as positions in both sectoral and occupational structures. This approach thus highlights the role of industrial sector changes in addition to occupational change.

### ***Policy context***

While changes in the returns to skills and job tasks have received significantly more attention in prior research on job polarization, industrial sectors organize the work of the economy and perhaps more directly reflect policy decisions about economic investment and institutional responses to changes in technology, global competition, and the makeup of national workforces. I highlight the opportunities of policies focused on both physical and human infrastructure investments, which provide particularly strong opportunities for equitable growth and growth in middle-wage jobs. Notably, infrastructure investment opportunities occur at a high level of aggregation rather than focusing on individual sectors or skills. Aggregated sectoral investments may be more protected from the shorter-term demand swings.

### ***Key conclusions***

I find that job polarization persisted in the 2000s, particularly when examining the full period from 2000 to 2019. Sub-periods within that period show more diversity in results. For example, economic recessions—especially the Great Recession and the COVID-19 recession—became increasingly crucial in shaping changes in the job structure. I find that men and women in the US experienced quite similar overall patterns of job growth, even with continued inequality in wages and hours work in the US. The similar pattern contrasts to other nations globally where women’s increased labor force participation has occurred more recently than in the US. Underlying that overall similarity in job growth, however, there were pronounced gender differences in the sectoral composition of growth.

### ***Main findings***

Job polarization continued into the 2000s in the United States. Jobs grew particularly slowly in the middle quintiles of the job median wage structure during the 2002-2007 expansion. Those same quintiles suffered large declines in the Great Recession and the COVID-19 pandemic. Growth in the middle quintiles during the long 2009-2019 expansion was just making up the losses of the prior decade when the pandemic hit.

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## **1 Introduction**

Labor market inequality increased significantly in affluent capitalist economies from the late 1970s into the 2000s (Howell and Kalleberg 2019; Eurofound 2015, 2021). Inequalities rose particularly steeply in the United States, where the state provides fewer supports to buffer market inequality and workers had lower and decreasing bargaining power relative to other countries (Howell 2013). Growing wage inequality in the US was first characterized in the 1980s. Bluestone and Harrison (1982) early on linked wage inequality to declining jobs in manufacturing, a sector that had provided access to middle-class wages in the preceding decades. State reduction in union rights combined with technologies that increased worker productivity combined to reduce demand for those middle-wage jobs (Gittleman and Howell 1995; Howell et al. 2001). Scholars in the 1990s and early 2000s identified a broader pattern of job polarization in the US labor market, where the highest-wage and lowest-wage jobs grew fastest while middle-wage jobs grew slowest. Similar patterns emerged internationally, especially Anglo countries, though also with evidence of job upgrading in other countries (Goos and Manning 2007; Goos et al. 2009; Oesch and Menes 2011; Fernández-Macías 2012; Fernández-Macías et al. 2012; Fernández-Macías and Hurley 2016; Kalleberg et al. 2022).

While scholars broadly agreed on key features of job polarization, they pursued distinct explanatory goals, which entailed distinct measurement strategies. One set of scholars, mainly economists, argued that job polarization was a major cause of rising wage inequality through the mechanism of skill-biased technological change. According to this theory, computerization created polarized demand for skills. Tests of skill-biased technological change identified differential employment growth across occupations with skills differentiated by likelihood of being replaced versus enhanced versus largely unchanged by computerization. Another set of scholars, mainly sociologists along with some labor economists, argued that job polarization was distinct from wage inequality and reflected changing employment structures through heterogeneous mechanisms. They typically studied differential employment growth as a distinct phenomenon from wage inequality and understood to be driven by institutional conditions related to deunionization, professionalization of service work, and expansion of higher education (Wright and Dwyer 2003; Goos and Manning 2007; Goos et al. 2014; Dwyer 2013; Fernandez 2001) Institutional research on job polarization often highlights sectors in addition to (or instead of) occupations, tracking employment growth across jobs defined as occupation by sector cells or analyzing occupational change across distinct sectors.

In the 2000s, the trend in job polarization continued, but in patterns that increasingly diverged from trends in wage inequality. Evidence for skill-biased change faded as returns to education slowed, with evidence that declining worker power appeared to extend to even high skill jobs (Beaudry et al. 2016). And at the same time, the pace of growth in some low-skill jobs stayed so strong that wages grew to some extent though at a much slower pace and without catching up to the pace before the period of polarization (Dwyer and Wright 2019).

In this report, I argue that the development of trends in the 2000s supports the institutionalist approaches to job polarization. I focus on employment growth as distinct from wage inequality, but also note connections to recent work on individual wage trends and polarization (Hunt and Nunn 2022). I develop the conceptual underpinning of approaches to job polarization that incorporate sectors and critique approaches that rely most heavily on occupations. Sectors capture important sources of within-occupation heterogeneity, reduce the confounding influence of changes in occupational coding, and integrate the functional divisions in economic production along with the task and skill divisions captured by occupations. With that conceptual underpinning, I analyze Current Population Survey data to extend prior work on polarization in jobs as defined as cells in an occupation-by-sector matrix. I build on prior

work to include the expansion that ended in 2019 as well as an early look at the first pandemic year of 2020. I disaggregate job growth by sector and demographic groups to highlight the inequalities between sectors that significantly affect labor market disparities.

I find that job polarization persisted in the 2000s, particularly when examining the full period from 2000 to 2019. Sub-periods within that period show more diversity in results. For example, economic recessions—especially the Great Recession and the COVID-19 recession—became increasingly crucial in shaping changes in the job structure. I find that men and women in the US experienced quite similar overall patterns of job growth, even with continued inequality in wages and hours work in the US. The similar pattern contrasts to other nations globally where women’s increased labor force participation has occurred more recently than in the US. Underlying that overall similarity in job growth, however, there were pronounced gender differences in the sectoral composition of growth. I close with considerations for policy recommendations for supporting equitable job growth in the United States with implications for similar political economies in the global system.

## **2 Job Polarization in the United States in the 2000s**

Job polarization emerged in pronounced form in the US economy during the 1990s, a period of strong economic growth. Polarization in the 1990s was weighted to the top, with the strongest growth in the highest-wage jobs, the next fastest growth at the bottom, and slowest growth in the middle (Wright and Dwyer 2003). This empirical pattern of asymmetric polarized job growth was consistent with a number of mechanisms, including both institutional changes affecting worker power and technological change shifting the returns to skill. Institutional change reduced worker power in middle-wage jobs, including deunionization, declining internal labor markets in corporations, and informalizing employment contracts (Gaggl and Kaufmann 2015). Higher-wage workers fared better in these conditions, with growing managerial power and winner-take-all markets where those at the top could extract greater rents from organizations (Kalleberg 2011; Böhm et al. 2018). With the informalization of employment contracts keeping wages low, service jobs at the bottom continued to grow robustly. Alternative explanations weighted the role of technological change and changing returns to skill more heavily than institutional change in the balance of power. In the skill-biased technological change model, computerization replaced or deskilled many previously middle-wage jobs, while increasing the demand for highly skilled work, and enhancing the productivity of highly educated workers. In this theory job polarization manifested changes in the demand for skill that also drove growing wage inequality.

While the skill-biased technological change explanation has been widely influential, in the 2000s the empirical trends in job growth and wage inequality were more consistent with explanations that highlight institutional changes that reduced worker power and limited capacities to demand decent jobs. Several important shifts developed in the 2000s that challenged explanations of job structure change that prioritize changing demand for skill. First, wage inequality and job growth trends became increasingly decoupled over time (Beaudry et al. 2016; Hunt and Nunn 2022). This pattern is consistent with institutionalist approaches that understand changes in the job structure as distinct from wage trends. Second, growth in jobs and wages slowed at the top of the wage structure and even among the highly educated workers that had made gains in the 1990s. Third, the returns to education and skill slowed significantly in the 2000s. Some scholars interpret these findings as a result of slowing technological innovation and the completion of computer adoption across industries (Beaudry et al. 2016). This pattern is also consistent, however, with ongoing institutional changes that reduced worker power even among highly educated workers (Howell 2013). The result is there is less consensus around skill-biased technological change, a growing awareness of multiple factors shaping employment change,



and, especially since the Great Recession, greater appreciation of the consequences of decades of reduction of worker protections in the US economy.

Along with challenges to the skill-biased technological change argument have come even more fundamental challenges to the underlying job polarization empirical claim. Cross-nationally, there are countries where there has been more occupational upgrading than polarization (Fernández-Macías 2012; Fernández-Macías et al 2012; Oesch and Menes 2011). Recently, labor economists have argued that there is also substantial evidence for occupational upgrading even in the United States (Mishel et al. 2013; Hunt and Nunn 2022). Using an approach that aggregates individual wages and tracks change in job growth over wage bins instead of occupations, Hunt and Nunn find much less evidence of polarized growth and more evidence of upgrading over time. The polarization they do find with their measures concentrates in the 2000s with much less polarization in the 1990s.

Adjudicating between alternative perspectives on job polarization both in the US and in other countries is complicated by distinct measurement strategies used across studies. Crucially, studies vary in the degree to which they are studying jobs as distinct and meaningful social positions and as distinct from individual wage inequality. As discussed above, economists tend to try to draw a closer line between individual wage inequality and employment polarization. Hunt and Nunn represent one end of the spectrum in focusing on individual wages bins in their main analysis and examining absolute wage change since 1979. They prioritize the individual distribution as more valid than occupational wage inequality, for example by noting that there is substantial wage inequality within occupations. Even prior work that does focus on occupational growth conflates change in jobs as defined by occupations with changes in the returns to individual attributes, giving short shrift to changes in the employment structure as a distinct process (Autor et al. 2003; Autor et. al. 2006; Autor et al. 2008; Autor 2010, 2015).

Yet institutionalist approaches explicitly separate individual wage inequality from job inequality and argue that both objects of explanation are valuable. The structure of employment is the explicit object of explanation in Wright and Dwyer's (2003) approach and other studies using similar measures. Hunt and Nunn (2022) do analyze occupations in supplemental analyses and yet even there they minimize the extent to which occupations convey information about economic structure and focus on their (limited) value for capturing the individual wage distribution, again consistent with prior work on skill-biased technological change. For example, Hunt and Nunn argue that prior findings of occupational polarization in the 1990s were an artefact of changes in the occupational classification. Even if we accept that they have definitively shown that employment polarization shows up more with changes in occupational coding (but see Howell and Kalleberg 2019 for one critique), Hunt and Nunn's approach treats changes in the occupational classification as entirely artefactual rather than as representing likely real changes in the underlying economy. In fact, the US Census classification codes develop at least in part in response to structural economic change and even if there is noise in that translation, shifts in codes cannot be dismissed as entirely artefactual.

There are significant measurement differences even between analyses that do operationalize jobs (as against those focusing on individual wages distributions). Some operationalize jobs as occupations only, and among those many use 3-digit occupation, which is a highly disaggregated measure of over 300 distinct job types in the United States. Others (notably Wright and Dwyer 2003; Milkman and Dwyer 2002; and Eurofound 2015, 2019, 2021) treat jobs as occupation by industry positions, with a far more aggregated occupational coding, typically at the 2-digit level. The inclusion of sectors represents a significant shift towards the macro employment structure of the economy rather than the individual distribution of wages.

### **3 Conceptual Elaboration of Jobs as Occupation-by-Sector Locations**

Wright and Dwyer and Eurofound approaches pursue a distinct conceptualization of jobs and therefore a distinct measurement of job polarization: they include sectors in job definitions. This more structural approach keeps the focus on the types of positions available in an economy as distinct from the individual characteristic of those holding the jobs. A focus on individuals inevitably privileges micro-characteristics such as educational attainment over larger structural changes in the economy. Similarly, defining jobs as occupations emphasizes task differences. Including sectors at any level of aggregation incorporates the economic structure and better reflects institutional developments.

#### **3.1 Jobs as Occupations**

Occupations attempt to capture the division of labor across an economy. The current measurement strategy (in the US and internationally) was developed in the 1950s and 1960s during the expansion of social surveys and national population census monitoring systems that came with the invention of computers. Survey questions ask workers who are employed to describe the tasks they perform in their jobs, the skills required, and the degree of authority over others they hold. The very first occupational coding schemes identified clusters of tasks, skills, and authority that cohered into jobs held by groups of people. Survey staff then code individual answers about actual jobs held into the coding schemes that capture clusters of tasks, skills and authority. Occupations vary significantly, however, in the degree to which they are socially meaningful categories.

The most socially meaningful occupations have boundaries defined by formal rules regulating who can perform the tasks assigned to that occupation, regulations that can be developed by the state or trade associations or other organizations. Access to the professions such as law, medicine, and teaching requires credentials that are certified by the state in law or policy (Weeden 2002). Yet credentials are just one mechanism that forms occupational boundaries. Occupations less defined by formal educational credentials such as in construction or manufacturing get defined by trade associations or union contracts (Weeden 2002; Grusky and Sorensen 1998). Thus, occupations such as “carpenter” can be as socially meaningful as professions such as “doctor”.

Other occupations are much more socially ambiguous and fluid. When occupations lack formal regulation by professional bodies, the state, or trade and union organizations, convention and market forces define who gets access. For example, many occupations involve management tasks, but the characteristics of managerial occupations vary tremendously, and authority structures get incompletely captured in surveys that focus on occupational tasks more than power within organizations (Wright 1997; Wodtke 2016). Occupations such as file clerk, dispatcher, and door-to-door salesperson are recognizable but less socially structured (at least in the United States), for example, than the professions and trades. These occupations may be particularly likely to be changed over time as interested parties lack clear avenues to bargain, make claims and set terms. Market forces and the social relations of the production process of course also affect the occupations defined by social exclusion processes such as credentials and trade associations discussed above as particularly socially meaningful categories (Dickens and Katz 1987). Occupations thus are probably best conceptualized to vary along a continuum with more or less defined boundaries depending on the institutionalization of social closure.

Measures of occupational prestige suggest that all occupations are at least to some extent socially meaningful even if that meaningfulness varies. Occupational prestige measures are developed from questions that present survey respondents with occupation pairs and ask respondents to rank them. Occupational prestige scores then calculate average rankings of those jobs. Because occupational prestige rankings are relatively consistent over time and across countries, they have contributed to an

understanding of occupations as highly socially meaningful categories. However, as Lauren Valentino shows (2021), some occupations have much wider prestige rankings across respondents than others. The prestige scores therefore in part simply reflect different levels of uncertainty in prestige rankings in addition to differences in perceptions of prestige.

Studies of job polarization focus on the quality of jobs rather than prestige, but the problematic of the variability and meaningfulness of occupational categories matters here as well. The focus on occupations elevates issues of skill and task over issues of power, including both worker bargaining power and market power. To be sure, skills and position in the technological division of labor affect worker bargaining power. Yet institutionalist theories argue that the social organization of the economy also affects which skills and tasks are valued (Liu and Grusky 2013).

Most importantly for studies of job polarization, the significant within occupation variability matters for capturing inequality in job quality. Indeed, there is evidence that inequality has grown significantly within occupational categories as well as between them (Hunt and Nunn 2022). Sectors capture some of that within occupational variability in ways that produce distinct advantages for studying job polarization because they still concentrate attention on the macro structures of the economy rather than individual characteristics (Goos et al. 2022).

### **3.2 The Value of Sectors in Defining Jobs**

Sectors capture additional dimensions of jobs that go beyond the information captured in occupational classifications. The survey questions about sectors ask about the characteristics of organizations that employ workers and the markets those organizations operate within. Sectors get defined along the major technical and market divisions that determine resource flows in the economy (Goos et al. 2022). Those divisions determine how open to market competition versus protected an area of the economy is, as well as levels of productivity, profit, and worker power (Kristal 2013; Tomaskovic-Devey 2017). Production processes may also be more or less vertically integrated versus horizontally fragmented across distinct sectors (Rothstein 2022). In the United States, for example, some industries such as educational services are significantly organized and funded by the state, with a smaller private sector component. Other industries such as banks have both significant market power and a large state backstop in times of crisis. And there are industries such as retail are very significantly open to market volatility albeit with state regulation and structuring.

The organizational and markets divisions that sectors capture may drive inequalities—including unequal growth—above and beyond the tasks that individual workers perform within occupations. For example, it is well understood that the same occupation, such as receptionist, will be remunerated quite differently depending on the profitability level of the industry even if the basic tasks performed remain relatively similar across industries. Indeed, enterprise-level measures show that between-organizational inequality rose substantially over the same period that job polarization developed (Wilmers and Aeppli 2021). Most datasets include little if any detail on organizations, however, and thus sectors represent the most widely available proxy for organizational dynamics. Sectors also change more slowly than occupations and thus may capture more enduring inequalities that affect the resources distributed to workers.

Sectoral dynamics shape worker outcomes to such a degree that they end up being integrated into occupational categorizations to some degree. Some occupational divisions get defined explicitly around the sector where they occur. For example, the occupational categories of managers in the US often include reference to the sector within which the manager works. For example, there are separate occupational categories for “supervisors of food preparation” and “supervisors of protective services workers.” These occupation-sector hybrids tend to occur when occupational tasks and compensation

are highly disparate across sectors, which is the case for the heterogeneous category of “manager.” Manufacturing jobs too are often defined by the goods in production (textiles versus durable goods for example). Of course, some jobs are highly correlated with a sector even without an explicit designation in the occupational category; teachers fall overwhelmingly within the educational services sector for example. Other occupations have essentially no sectoral designation or correlation, however. For example, “information security analysts” and “payroll and timekeeping clerks” include no sectoral reference and exist within a diversity of sectors. In sum, sectoral variation in jobs is reflected in some occupational categories but not others. One virtue of defining jobs as occupation-by-sector locations is that the sectoral dimensions of all jobs rather than only some jobs get captured.

Sectors may also help capture spatial variation in job quality both within countries and in comparative research. Sectoral divisions indicate the functional specialization of an economy which captures economic change from agriculture, growing industrialization, and shifts to a service basis. Approaches that utilize only occupations become harder to compare cross-nationally. In short, while occupations attempt to capture microlevel variation in skills and tasks, sectors do more to capture the macrolevel structures of a national economy.

### **3.3 Research Questions: Occupation by Sector in Job Quality Upgrading, Downgrading, and Inequality**

When we include sectors, it also becomes clear that job quality changes develop as a result of the relative power of sectors and the effectiveness of market development in addition to and in interaction with the ebb and flow of demand for skills and tasks in occupations. This approach therefore centers inequality in the conversation more effectively and explicitly.

Sectors may be particularly important to capture the economic creation and destruction that occurs during times of crisis. Different levels of state sheltering and back-stopping affects the trajectory of different sectors during economic shocks. The COVID-19 pandemic presented distinctive reasons to value including sectors. For example, state policies during the COVID-19 pandemic targeted some types of “essential work,” which was typically defined by sector, affecting what workers continued to be employed, and which switched to remote work versus returning quickly to in person work (Dingel and Neiman 2020).

In this paper I ask, what was the pattern of net job growth in the United States in the first two decades of the 2000s with jobs defined as occupation by sector location? Was this period defined by job polarization or by a pattern of upgrading or downgrading or another pattern? After evaluating the overall pattern of job growth and decline, I then ask whether and how those patterns varied along major status inequalities in American society, including by gender and nativity.

Most of my analysis focuses on trends from 2000 to 2019, capturing the longer-term trend of job growth in the 2000s. Prior work demonstrates that patterns of job growth do vary over shorter-term expansionary and recessionary periods (Autor 2010; Dwyer and Wright 2019). I examine the full period in order to capture the longer term trend in the 2000s after the emergence of job polarization in the 1990s. Then I analyze job growth from 2019 to the first pandemic year of 2020. The COVID-19 pandemic represents a turning point moment in world history in many respects. It is as yet unclear the full implications for economic restructuring that may shape the development of employment structures into the 2020s. However, the shifts in the early pandemic year of 2020 indicate both the short-term consequences and the baseline for longer-term implications of that watershed moment.

## **4 Data and Methods**

I use the *Current Population Survey* (CPS) collected by the US Bureau of Labor Statistics to study job growth in the first two decades of the 2000s (NBER 2022; Flood et al. 2022). I start the series in 2000 and end in 2019, the last year of the longest expansion on record in the US (2009-2019). Then I conduct an additional analysis for 2019-2020 to understand the pattern of employment change in the first year of the COVID-19 pandemic. Given that the pandemic started in quarter 2 of 2020, I compare quarters 2-4 of 2019 to quarters 2-4 of 2020 (i.e., March through December) to compare the equivalent periods before and after the onset of the pandemic and associated economic closures. The CPS is a nationally representative sample of US households, conducted monthly since the 1940s, with an expanded set of employment information starting in 1979. It is the main source of data on the US job structure. The basic monthly survey includes core demographic and labor force participation questions, which are used to track the US unemployment rate. The CPS collects expanded questions on earnings and employment every month from a sub-set of the sample, those in their fourth and either of a total eight months of participation in the survey, called the “outgoing rotation group” sample because the fourth month is the last before a four-month break in participation and the eighth month is the final month of participation. I combine all months of data in the Outgoing Rotation Group Earner Study to produce annual estimates of employment growth (NBER 2022). In all samples across years, I include all full- and part-time civilian workers aged 18 to 65. I exclude self-employed workers as do most analyses using the CPS earner study because self-employed workers are excluded from the large sample (called the outgoing rotation group) from which the detailed employment variables are collected. The result is a much smaller sample size of self-employed workers and the wage data collected for these workers are incompatible with the wage data on employees.<sup>1</sup>

### **4.1 Jobs Defined by Occupation and Sector**

The CPS coding of occupation and industry follows the U.S. Census Bureau codes, which are revised after each decennial Census. These coding changes reflect changes in the economy, but also produce discontinuities in our data series. CPS implemented the new, and again in 2002 after a significant revision following the 2000 Census. The Census made more minor changes in the periods in between the bigger revisions. The original classifications provided by the Census are three-digit and I aggregate to two-digit level. The two-digit level is required to maintain sufficient samples sizes for the sector by occupation matrix. It also is more effective for comparative purposes (Fernandez-Macias et al. 2012).

*Sector.* I create a consistent set of twenty-three industrial sector codes over all periods of analysis. The CPS provides data on sector with several hundred three-digit codes. The coding of the more disaggregated sector changes over time and results in some shifting of jobs across two-digit categories, but for the most part these categories remain stable.

*Occupation.* I create forty-five occupation codes that I use in all analyses. The underlying occupational coding scheme changes more than the sectors do, reflecting shifts in skills and tasks. There was a significant change in the classification scheme after the 2000 Census. I use codes based on the 1990 occupational coding scheme in order to ensure that my findings for the 2000s are comparable with the

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<sup>1</sup> The lack of inclusion of self-employed workers in most analyses of labor market inequality in the United States may be missing an increasingly important component of the labor force. Given the increasing precarity of employment and the rise of gig economy, more workers may identify as self-employed at least some of the time. Though this is beyond the scope of this paper, it will be important in future work to develop and test approaches to incorporate the self-employed population.

job polarization analyses from the 1990s.<sup>2</sup> I use a crosswalk developed by the Bureau of Labor Statistics to make a consistent set of codes across the 1990s and 2000s (Meyer and Osborne 2005). In basing my occupational codes on the 1990s classification, I follow a similar approach to other analyses of job polarization and change in the US job structure. I find similar results, however, in supplemental analyses (available upon request) using the 2000s occupation classifications.

*Jobs.* Jobs are locations in the occupation within sector matrix. The theoretical maximum of the matrix is 1,035 jobs (23 sectors times 45 occupations). I include all jobs that contain workers in any year in the data for a given period.

## **4.2 Job Quality**

I index job quality by median hourly wages, averaged over the period under analysis. Wages are an imperfect but valuable proxy for other measures of job quality. This is particularly true in the United States context, which has a relatively low social wage and where employer-provided benefits are correlated with pay rates (Warhurst et al. 2022). I use the median instead of mean for each job because the CPS top-codes wages, which skews calculations of the average wage.<sup>3</sup> The basic measure is hourly wage. I convert salaries and other forms of non-hourly pay into an hourly wage by dividing usual weekly earnings by usual hours worked per week. I adjust all dollar amounts to consistent 2019 dollars using the CPI-U adjustment. I follow Hirsch and Schumacher (2004) and exclude imputed wage data, which are calculated in the CPS using very highly aggregated occupational categories and thus obscures wage inequality between occupations.

## **4.3 Job Growth by Sub-Group**

I decompose job growth by sub-groups defined by employment contract, large sector groupings, and sociodemographic inequality.

*Full-time/part-time status.* I analyze job growth as differentiated between full-time and part-time jobs as in the US many benefits and some aspects of job conditions vary depending on typical hours worked. US labor law provides protections and benefits to full-time workers that are restricted for part-time workers. This means that firms can avoid labor costs and maintain greater flexibility by keeping positions part-time. Full-time/part-time status thus serves as a partial proxy for more temporary versus more secure employment contracts. The Outgoing Rotation Group data lack direct measures of more versus less secure employment contracts. While some supplemental modules of the CPS do provide greater insight into contract type, they cannot be tracked annually.

*Sectors.* I decompose job growth by eight large sectors. I aggregate the twenty-three basic sectors into the following eight categories in order to analyze larger-scale sectoral trends: 1) extractive and manufacturing; 2) construction, transport, and repair; 3) communications, utilities, and sanitary service; 4) wholesale trade; 5) retail trade, private and personal services, and entertainment and recreational service; 6) business service, other professional service and finance, insurance and real estate (FIRE); 7) health services; and 8) educational service, social services, and public administration.

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<sup>2</sup> The 1990s occupation coding is a slight modification of the coding system developed after the 1980 Census, which was the previous largest change in classifications before 2000.

<sup>3</sup> Using the CPS Outgoing Rotation Group data analyzed here, Mishel et al. (2013) tested the ranking of jobs (defined as occupations) using median compared to mean hourly wage and found little difference in results.

*Sociodemographic Inequality.* I analyze job growth for women compared to men, overall and then broken down by sector. The CPS collect only a binary identifier for gender over the period studied. Then I analyze job growth for US-born compared to immigrant workers.

#### **4.4 Analytic Strategy**

I follow the analytic strategy developed in Wright and Dwyer 2003 and as further developed in European Foundation projects (Eurofound 2015, 2019, 2021). I tailored the approach here to the US labor market and most salient dimensions of inequality as well as the data available in the *Current Population Survey*.

First, I rank-order jobs from the lowest to the highest median hourly wage in the first year of the time period, which is 2000 for the main analysis, and 2019 for the covid period. I then group the ranked jobs into quintiles, i.e., five ordered-categories each containing about one-fifth of the employment at the beginning of the time period.<sup>4</sup> The bottom quintile contains the roughly one-fifth of employment in year one that are in the jobs with the lowest median wages. The highest quintile contains the roughly one-fifth of the employment in jobs with the highest median weekly wages, with three middle quintiles.

Second, I calculate net change in the number of jobs in each quintile from 2000 to 2020. This measure of net job change represents the outcome of the creation of new jobs and the destruction of old jobs and therefore captures the leading edge of change in the job structure. In other words, net job change differs from measures of job openings, as turnover and retirements can produce openings even when there is no overall growth in numbers of jobs.

I present the results in a series of figures reporting the pattern of net job change over quintiles of job quality. The bars on the left-most side of each figure show net job change for the lowest-wage jobs, and the bars on the right-most-side show net job change for the highest-wage jobs. A pattern of *job quality polarization* appears when employment grows (over a given period) most in the lowest and highest wage jobs, and least in middle-wage jobs. A pattern of *job quality upgrading* appears when employment grows most in the highest-wage jobs; the opposite pattern of *job quality downgrading* appears when the employment grows most in the lowest-wage jobs. Of course, it could also be that employment grows relatively evenly across quintiles, indicating a pattern *job quality stability*.

In addition to presenting the results for the full period for all workers, I also divided the analysis by time period and sub-groups. For all workers, I examine net job change across all economic expansions and recessions in the first two decades of the 2000s and compare to the 1990s expansion when job polarization was first identified. Then, for the full period I decompose net job growth by sectors, employment contract and sociodemographic groups.

I close with an analysis of the early COVID-19 pandemic, comparing net job change in quarters 2 through 4 in 2019 to quarters 2 through 4 in 2020. Because the pandemic and associated economic closures and contractions began in quarter 2 of 2020, I drop the first quarter from both years to focus the comparison across equivalent periods. Here too I decompose net job change by sectors, employment contract and sociodemographic groups.

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<sup>4</sup> The quintiles are roughly (rather than exactly) one-fifth because any given job can be ranked into only one quintile. In other words, there is no splitting of jobs across quintile boundaries.

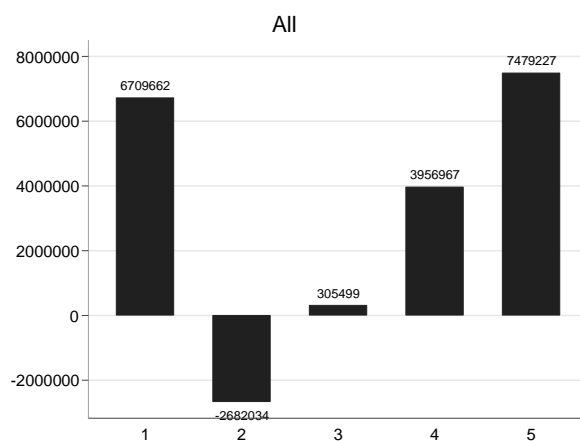
## 5 Results

The results for the first two decades of the 21<sup>st</sup> century show that job polarization persisted past the particular conditions of the 1990s in the United States. The COVID-19 pandemic prompted job losses that at least in the first year of the pandemic hit workers in the lowest-wage jobs particularly hard.

### 5.1 Job Polarization in the US in the 2000s

Figure 1 shows the results for all employees (excluding the self-employed), with the strongest growth in the top and bottom quintiles of the job median wage structure from 2000 to 2019. Table 1 reports the three largest jobs and their median wages for each quintile in 2000. Growth was more heavily weighted to the top because there was relatively strong growth in the fourth quintile as well, but net job loss in the second quintile and almost no employment growth in the middle quintile. The pattern in the 2000s represents a striking contrast to the more evenly shared employment growth from the 1960s to the 1980s and a continuation of the polarization in the 1990s (Wright and Dwyer 2003). These results show a striking degree of continuity with trends in the 1990s at least for the full first two decades combined.

**Figure 1. Net Job Change Across Quintiles of Job Median Wage**



Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.



**Table 1. Largest Jobs in Quintiles of Job Median Wages in 2000**

Quintile	Median wage	Occupation	Sector
Lowest	\$10.45	Retail sales workers	Retail trade
	\$10.35	Food services	Retail trade
	\$12.50	Health services	Other medical service
2 <sup>nd</sup>	\$14.64	Operators	Nondurable manufacturing
	\$16.13	Assemblers	Durable manufacturing
	\$16.55	Clerical and admin support	FIRE
3 <sup>rd</sup>	\$17.19	Sales supervisors	Retail trade
	\$19.48	Construction trades	Construction
	\$18.08	Clerical and admin support	Durable manufacturing
4 <sup>th</sup>	\$22.29	Teachers except college	Educational service
	\$25.03	Protective services	Public administration
	\$25.66	Sales reps	FIRE
Top	\$33.03	Health treating	Hospital service
	\$29.94	Other executives, managers	FIRE
	\$38.78	Other executives, managers	Durable manufacturing

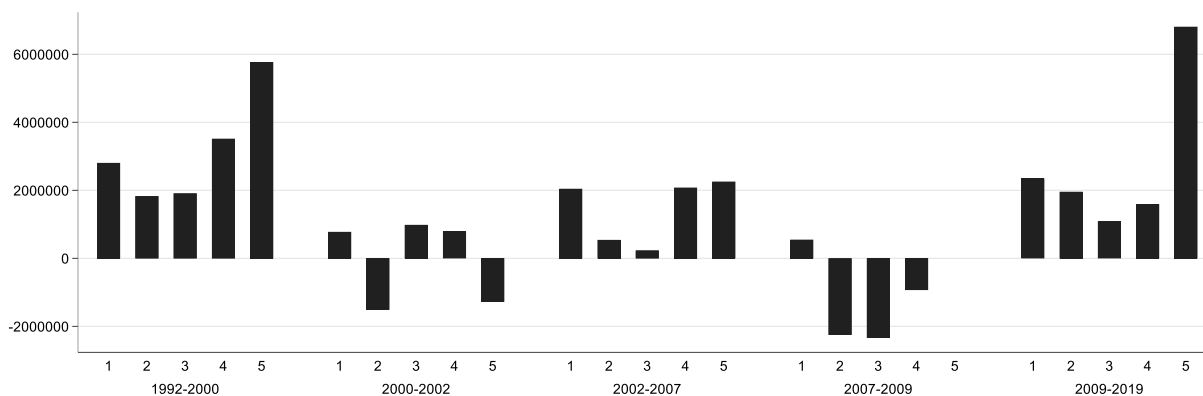
(1) Wages reported in 2019 dollars, adjusted using the Consumer Price Index- Urban Consumers.

Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022).

The pattern varied across specific expansionary and recessionary periods across these two decades. Figure 2 reports net job change across the two recessions and two expansions in the 2000s as well as comparing to the 1990s expansion. The figure shows that the pattern varied across specific expansionary and recessionary periods across these two decades, with the first decade of the 2000s and the Great Recession showing a more polarized pattern of job growth, that the long expansion after the Great Recession (dated in the United States from 2009-2019) exhibited a less polarized pattern that was more consistent with job upgrading than the 1990s expansion. Both show asymmetric growth, but the shape of growth was somewhat different. The dip in the middle shifted up a quintile in the 20-teens expansion relative to the 1990s and growth in the bottom and second quintile were more similar. Growth in the top quintile in the 20-teens was even stronger relative to the other quintiles.

However, the less polarized growth in the 2000s occurred after two periods that strikingly reinforced polarization, in the weak recovery after the 2001 recession and the devastating job losses of the Great Recession which were centered in the middle of job structure. The second and third quintiles in those periods lost even more ground than in the 1990s, with very little growth 2002-2007 and then massive job losses in 2007-2009. Indeed, there were larger job losses in those middle quintiles in just the two years of the recession than there was job growth in the eight years of the 1990s expansion. The stronger growth in the 20-teens then was just recovering from the anemic US job market in the first decade of the 2000s when the COVID-19 pandemic hit.

**Figure 2. Net Job Change Across Quintiles of Job Median Wage for All Workers, 1992-2019 by Economic Expansions and Recessions**



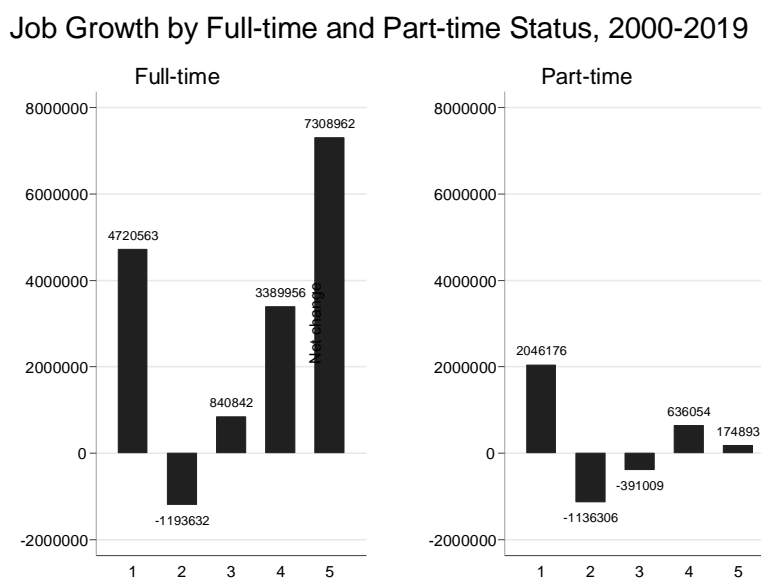
Source: Author’s analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Start and end years defined by the National Bureau of Economic Research recession dating (NBER 2021). Net job change within each period calculated as total employment for all months in year 2 minus total employment for all months in year 1, with job median wage quintiles set in year 1.

## 5.2 Job Polarization by Sub-Groups in the US in the 2000s

In order to capture the full evolution of the US job market after the 1990s, I focus on the entire 2000-2019 period for the next analyses decomposing by full-time/part-time status, sectors, and sociodemographic groups. Within the broad context of a polarizing employment structure, the pattern of job growth varied across workers in different types of jobs and across sociodemographic groups.

Beginning with full-time/part-time status, Figure 3 reports net job change for workers whose main job is at least 35 hours per week versus those whose main job is part-time is less than 35 hours. Polarized job growth concentrated among full-time job positions, in a pattern that quite closely follows the pattern in Figure 1. In contrast, part-time work grew mainly in the bottom quintile. There was a small amount of growth in the fourth and fifth quintiles, but this was quite modest compared to the growth in full-time work. Strikingly, even part-time jobs declined in the second and even the third quintile from 2000 to 2019. Despite the rise of gig work over this period, part-time work grew relatively modestly in the first two decades of the 21<sup>st</sup> century in the United States.

**Figure 3. Net Job Change Across Quintiles of Job Median Wage for Full-time versus Part-time Workers, 2000-2019**

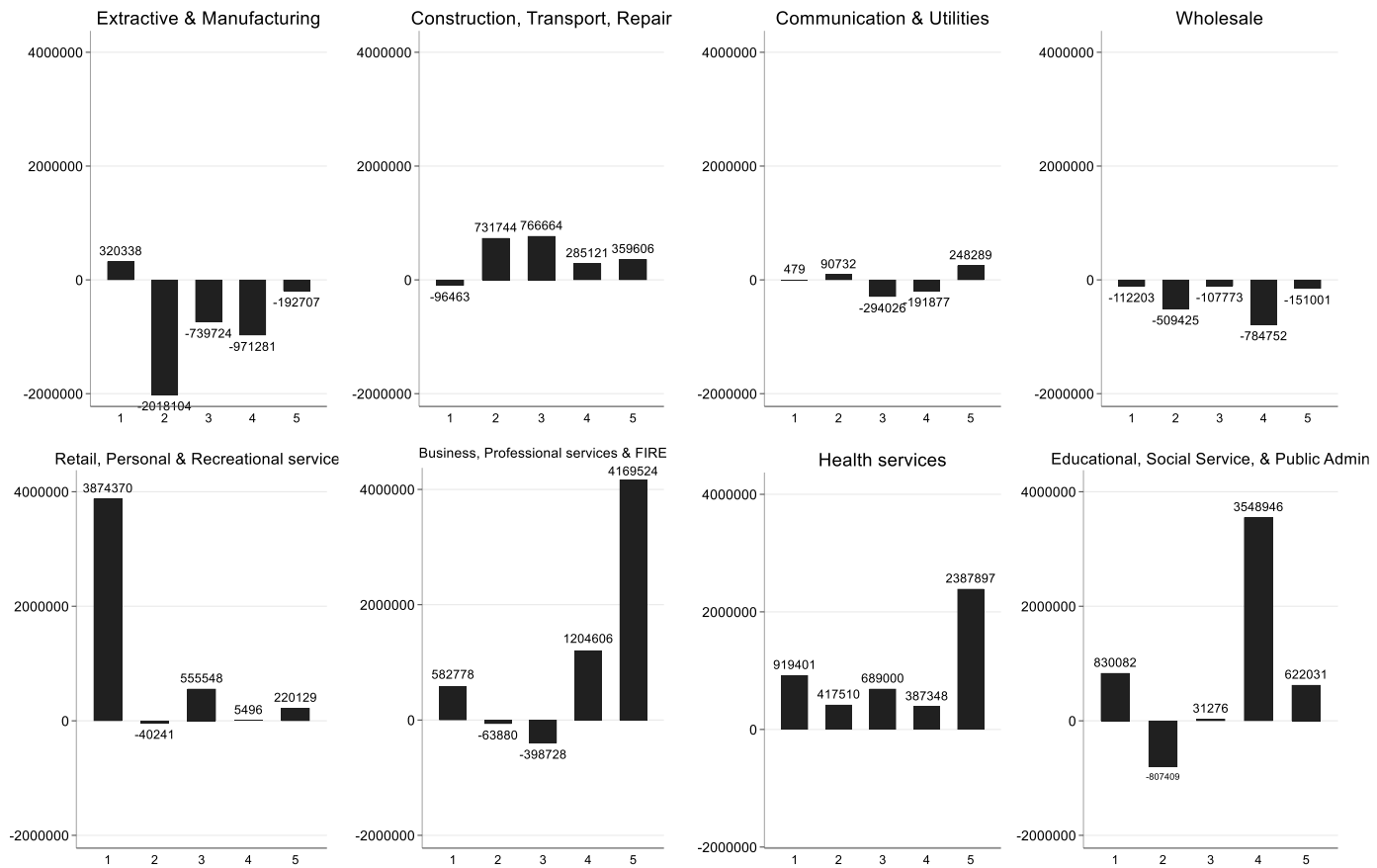


Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.

Jobs grew in quite diverse patterns across the eight big industrial sectors in the US economy. Of course, differences in the size of growth and decline reflect in part differences in the size of the sectors. But the patterns also illustrate the underlying sectoral sources of the pattern of employment growth overall. Figure 4 demonstrates that the long-standing mechanism in which services grow in a strikingly polarized pattern continued into the 2000s. Growth at both the top and bottom was almost entirely in services. The trough in job growth in the middle of the job wage structure was produced by both anemic growth in the retail and service sectors and significant decline in extractive, manufacturing, and wholesale trade. The only places in the US economy that showed any kind of employment growth in the middle quintiles during this period was construction, transport and repair and health services. Investing in the

physical and human infrastructure of the US economy thus appears to be one promising way forward for reviving growth in the middle (Dwyer 2013; Folbre 2002, 2006).

Figure 4. Net Job Change Across Quintiles of Job Median Wage for Aggregated Industries, 2000-2019

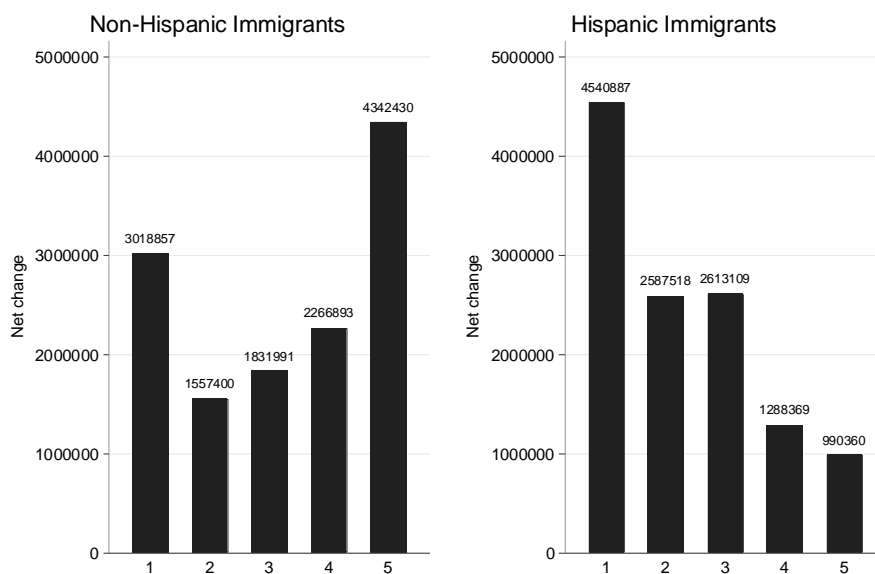


Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022).

Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.

Next, I present results across sociodemographic status, focusing on two groups that are also important in other national contexts: first, immigrant groups, and second, men compared to women. When we examine net job growth by nativity and gender, we see both convergence and divergence in job upgrading versus downgrading versus polarization. Figure 5 shows job growth for US born compared to immigrants to the US, defined as any worker born outside of the United States in any year. The figure reports separately by Hispanic ethnicity. Non-Hispanic immigrants experienced job growth in patterns relatively similar to the overall pattern of US job growth, though with more robust growth in the bottom and middle, reflecting a heterogeneous group by educational and skill as well as by the type of reception they received in the United States. Job growth for Hispanic immigrants, in contrast, was concentrated much more at the bottom of the job wage structure, though with some growth in all quintiles. This pattern of job growth reflects both the lower education and skill of many Hispanic immigrants and also likely discrimination and exclusion in the US labor market. Political populists target Hispanic immigrants with particularly exclusionary rhetoric, which often intersects with racist paranoia of challenges to white dominance.

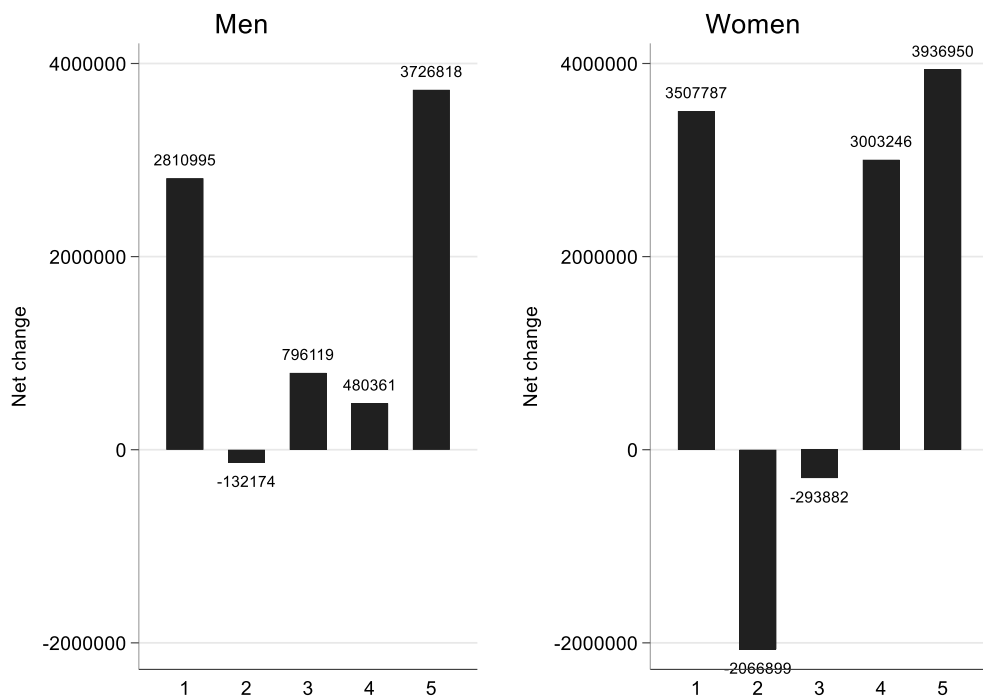
**Figure 5. Net Job Change Across Quintiles of Job Median Wage for Non-Hispanic Compared to Hispanic Immigrants, 2000-2019**



Source: Author’s analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.

The pattern of job growth for men and women is much more similar to each other. Figure 6 shows the pattern for men in the left panel and women in the right panel. The overall shape of polarization from 2000 to 2019 was quite similar for men and women. Job growth for women was significantly more weighted to the top in showing much more robust growth in the 4<sup>th</sup> quintile. However, women also experienced significantly more job decline in the second and third quintiles. This pattern of relatively similarity for men and women in the US contrasts to other places that show more gender divergence. Likely the reason is the earlier and more robust increase in labor force participation among women in the US, and also slowing labor force participation among men (U.S. Federal Reserve 2023).

**Figure 6. Net Job Change Across Quintiles of Job Median Wage for Men Compared to Women, 2000-2019**

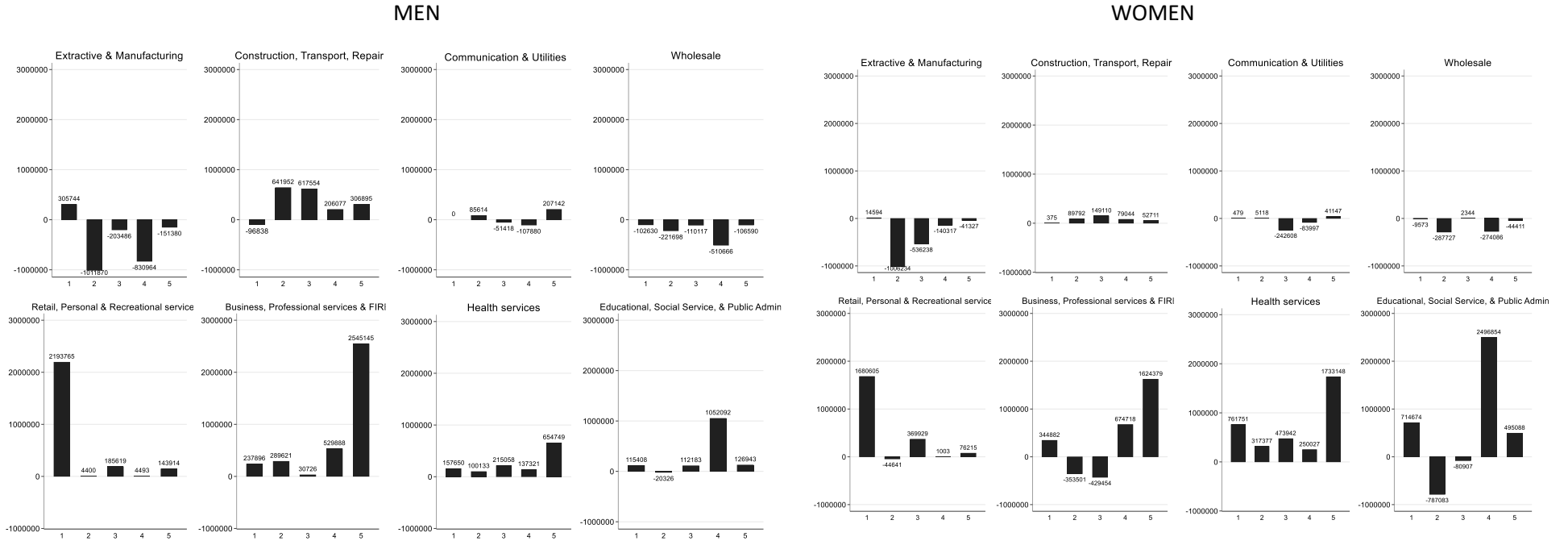


Source: Author’s analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.

The similarities between men and women occur in the context of still significant gender segregation between types of work as well as inequalities in pay and working conditions. Figure 7 again shows the big 8 sectoral divisions in the US economy as in Figure 4 above, but this time separately for men and women. Some sectors, such as retail look quite similar for men compared to women. Others reveal important differences in the character of job growth for men and women. Most strikingly, women show much larger growth than men in health services, and education, social services and public administration, reflecting their greater representation in the care economy (Dwyer 2013). Men, on the other hand, show more significant growth in construction, transportation and repair as well as business and professional services and FIRE.

Job Polarization in the United States in the 21st Century

Figure 7. Net Job Change Across Quintiles of Job Median Wage for Aggregated Industries, for Men Compared to Women, 2000-2019



Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022).

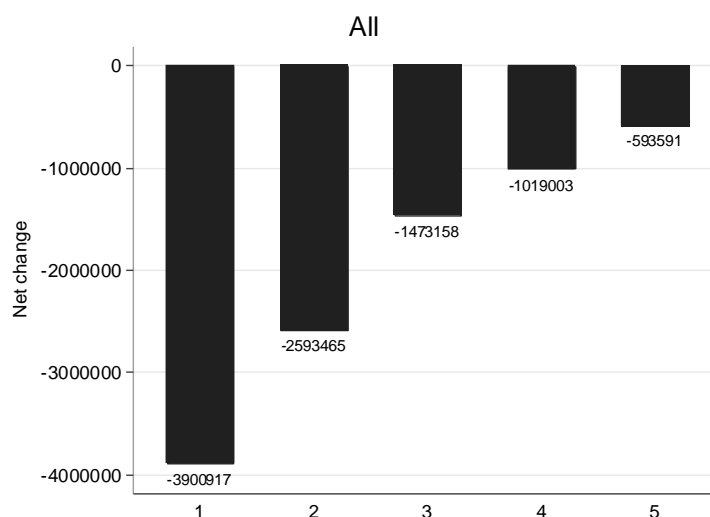
Note: Net job change calculated as total employment for all months in 2019 minus total employment for all months in 2000.



### 5.3 Asymmetric Job Loss During the Early COVID-19 Pandemic

The first year of the COVID-19 pandemic produced massive job losses in a very short period of time. Figure 8 shows net job loss from 2019 to 2020, comparing the combined net job change of the 2<sup>nd</sup> through the 4<sup>th</sup> quarters of each year (i.e., March through December). The figure shows that those losses were very disproportionately suffered for workers holding the lowest-wage jobs. The losses occurred in an almost linear pattern from the most at the bottom to the least in the top two quintiles. This pattern was the same in Europe and likely other regions as well (Torrejón Pérez et al. 2022).

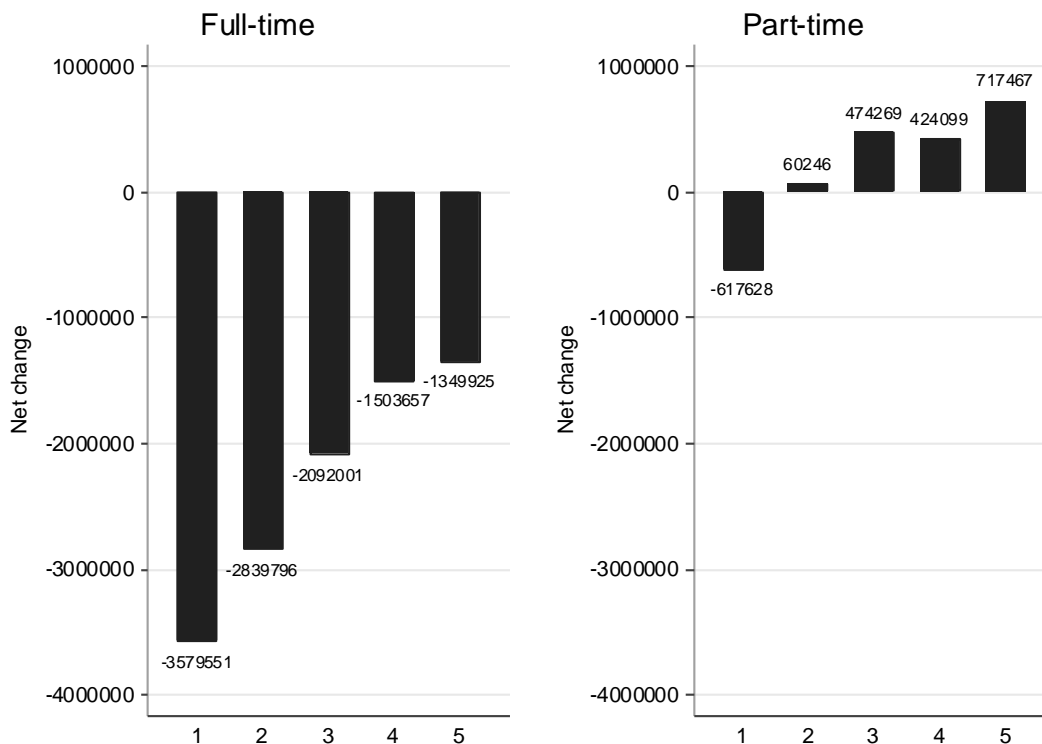
**Figure 8. Net Job Change Across Quintiles of Job Median Wage for All Workers, 2019-2020**



Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Net job change calculated for the sum of employment in all months combined in Quarters 2-4 in 2019 minus the sum of employment in all months combined in Quarters 2-4 in 2020.

Just as the gains in jobs in the first two decades of the 21<sup>st</sup> century concentrated among full-time jobs, so too did the losses concentrate there. Figure 9 shows the net job change for full-time compared to part-time jobs from 2019 to 2020. Notably, part-time jobs grew in a different pattern in the pandemic than in the earlier period, with more growth at the top than the bottom. This likely reflected greater accommodations to maintain part-time work for more highly skilled workers even through the pandemic (Dingel and Neiman 2020).

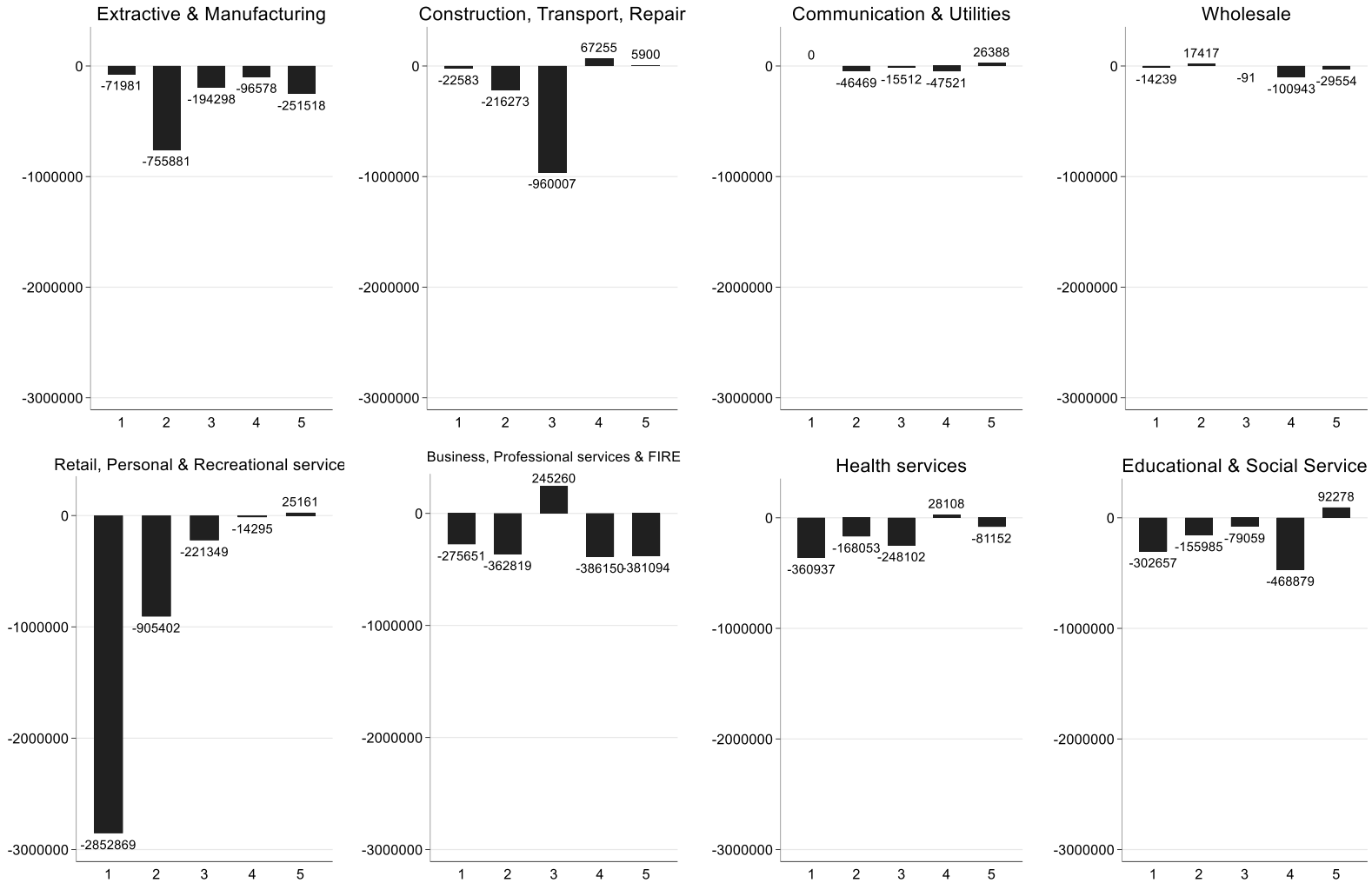
**Figure 9. Net Job Change Across Quintiles of Job Median Wage for Full-time versus Part-time Workers, 2019-2020**



Source: Author’s analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Net job change calculated for the sum of employment in all months combined in Quarters 2-4 in 2019 minus the sum of employment in all months combined in Quarters 2-4 in 2020.

Figure 10 reports the job losses from 2019 to 2020 by the eight aggregated sectors. The Figure puts in sharp relief the devastation wreaked by the pandemic on the lowest-wage retail and service sector jobs. Manufacturing and construction also had very significant declines, including in the top quintile. Business services and FIRE also saw some decline in the top quintile, though overall job loss in that sector was relatively modest compared to the other sectors. Even health and educational services saw losses, despite the tremendous demand for and strain on those sectors during the pandemic. However, the top quintiles were much less affected as most workers in those quintiles shifted to remote work, with the notable exception of manufacturing which requires on-site work (Dingel and Neiman 2020; Sostero et al. 2020). It was the in-person retail and personal services that declined the most. Notably, the fourth quintile grew for health and educational services. Most nurses and teachers hold jobs in the fourth quintile.

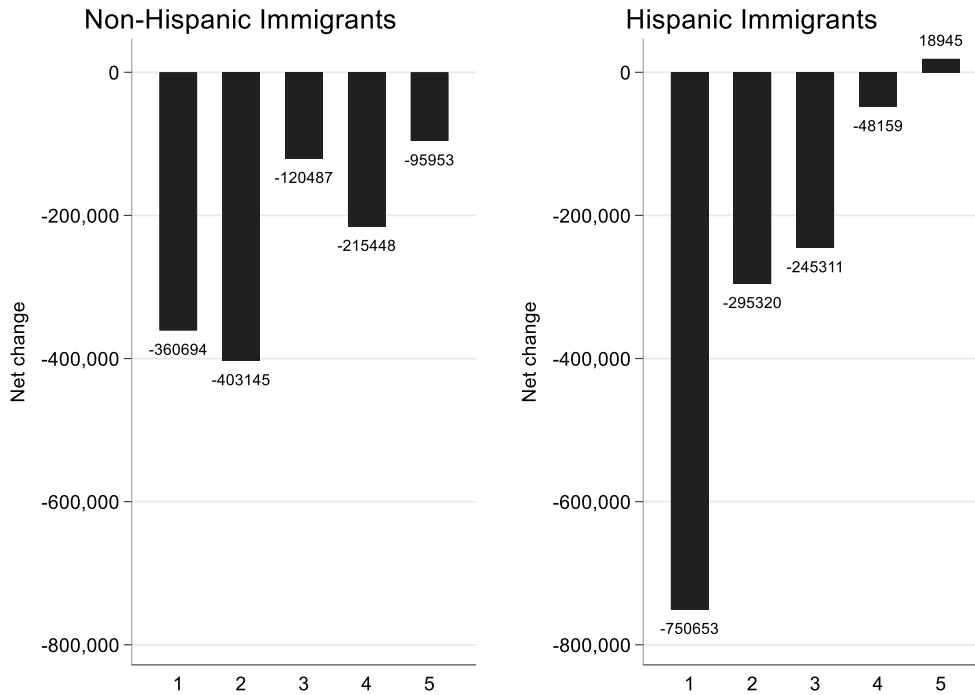
Figure 10. Net Job Change Across Quintiles of Job Median Wage for Aggregated Industries, 2019-2020



Source: Author’s analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated for the sum of employment in all months combined in Quarters 2-4 in 2019 minus the sum of employment in all months combined in Quarters 2-4 in 2020.

Pandemic job losses from quarter 2 through 4 of 2020 were massive across all sociodemographic groups though with deeper losses for groups most affected by the pandemic shutdowns. Figure 11 shows job losses for Non-Hispanic versus Hispanic immigrants. Immigrants were affected by both the recession and by immigration restrictions that reduced entry into the country and increased exit out of the country.

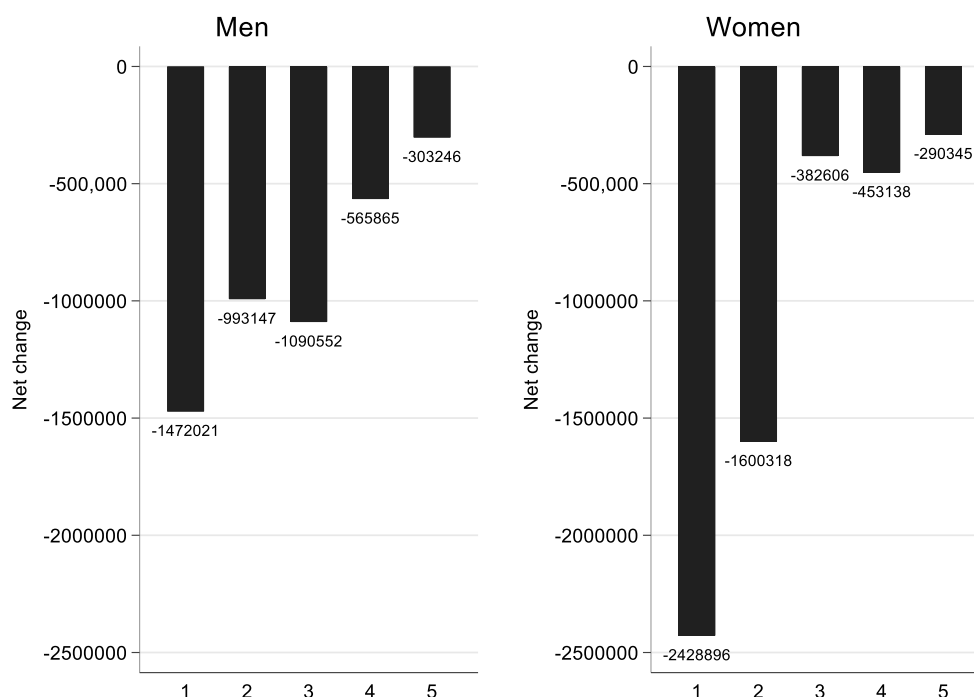
**Figure 11. Net Job Change Across Quintiles of Job Median Wage for Non-Hispanic Compared to Hispanic Immigrants, 2019-2020**



Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated for the sum of employment in all months combined in Quarters 2-4 in 2019 minus the sum of employment in all months combined in Quarters 2-4 in 2020.

Figure 12 shows net job change for men and women. Both experienced massive declines, but the losses were particularly large at the bottom for women. Women who were much more likely to have to care for children experiencing pandemic remote schooling, as well as elderly and ill relatives who were directly or indirectly affected by the health crisis (Dingel and Neiman 2020; Qian and Yu 2021). Higher-wage women were more likely to have family or paid help, and more likely to work in jobs that allowed remote options during the early months of the pandemic.

**Figure 12. Net Job Change Across Quintiles of Job Median Wage for Men Compared to Women, 2019-2020**



Source: Author's analysis of NBER Merged Outgoing Rotation Group Files (NBER 2022). Note: Net job change calculated for the sum of employment in all months combined in Quarters 2-4 in 2019 minus the sum of employment in all months combined in Quarters 2-4 in 2020.

The COVID-19 pandemic recession therefore was similar to the Great Recession in producing profound job loss across the economy but distributed in highly unequal ways. Despite the very different sources of the economic crises and also quite different mechanisms driving job loss, both recessions caused more far-reaching changes in the US employment structure than did the early 2000s recession (depicted in Figure 2) and in the early 1990s recession (Gaggl and Kaufmann 2015; Wright and Dwyer 2003). In the 1990s and early 2000s, in contrast, recessions mainly were a pause between economic expansions where little change in the job structure occurred (Wright and Dwyer 2003; Dwyer and Wright 2019).

## 6 Conclusions

Uneven job growth first appeared in the 1990s and continued into the 2000s, following a distinctive temporal pattern both in timing and in persisting across very distinct economic periods that otherwise affected other trends in inequality. The 1990s was a boom period with high levels of employment growth associated in particular with the expansion of the computer industry (Wright and Dwyer 2003). In contrast, the 2000s began with a period of relatively slow growth. As the variation in the height of the bars in Figure 2 illustrates, the first decade and a half of the 2000s was marked by very slow growth, including a highly anemic recovery after the technology boom which was then followed by the Great Recession, and a very slow recovery afterwards that only picked up steam almost a decade after the recession officially ended (NBER 2021). Slower population growth and declining labor force participation contributed to slower growth as well (BLS 2023). The

persistence of polarized growth from the 1990s into the very different economic conditions of the 2000s suggests a fundamental shift in the underlying conditions of employment change separate from the overall levels of growth in the economy.

As a result of our distinctive approach, we identify a previously overlooked feature of job polarization: the hollowing out of the middle has moved up the job earnings distribution over time so that job growth has become even more concentrated at the bottom than the top. Our inquiry is historical in tracing economic changes over time, but we are fundamentally forward-thinking in undertaking this history with the aim to improve our understanding of the 2000s period of anemic job growth and deepening job polarization. The American economy shuddered under multiple challenges during this period: a modest recovery in the early 2000s from the technological bust that ended the 1990s expansion, followed by the worst economic downturn in generations set off by the financial crisis of 2008, and an even slower recovery in the years after the Great Recession. While economic growth recovered after 2010, a decade and a half of damage was done, and economic anxiety was high and growing in American society. Understanding this period gives insight into the reasons the economy stalled so badly, as well as the prospects for more robust economic growth in the future.

Even with a less polarizing pattern in the 20-teens, there was still much slower growth in the middle quintiles relative to the top. Thus, policy investments in the middle of the job wage structure will still be important to contribute to a shared growth. Investments in physical and human infrastructure—including as related to responding to climate change and related disruptions—would especially support the human services and construction jobs that dominate in those quintiles in the United States (Albelda et al. 2009; Antonopoulos et al. 2010). Supporting public goods thus has beneficial positive feedback cycles for labor market inequality (Folbre 2006). Moreover, shared economic growth may be crucial for fighting racist variants of populism that pit groups against one another (Applebaum et al. 2006). That job growth among minoritized immigrant groups concentrates in the lowest-wage jobs in the physical and human infrastructure further encourages public goods investments as an important route to shared win-win virtuous cycles of economic growth.

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## **List of abbreviations and definitions**

CPS      Current Population Survey (US)

NBER     National Bureau of Economic Research

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