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Are Manufacturing Jobs Still "Good" Jobs? An Exploration of the Manufacturing Wage Premium*

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Maria D. Tito¶

September 3, 2024

Abstract

This paper explores the factors behind the disappearance of the manufacturing wage premium—the additional pay a manufacturing worker earns relative to a comparable nonmanufacturing worker. With substantially larger declines across union members, we quantify the role of unionization by exploiting the heterogeneity in membership status across manufacturing industries. We find that the decline in union membership explains more than 70 percent of the decline in the wage premium since the 1990s for union members but does not affect nonunion premia. Our findings suggest that the erosion of "good" manufacturing jobs has contributed to the increase in overall wage inequality.

Keywords: Wage Inequality, Wage Premia, Manufacturing, Production Workers, Union Membership.

JEL classification: E24, J31, J51.

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There is a long-standing conventional wisdom that manufacturing jobs are "good" jobs.[1] These perceptions reflect the historical role of the manufacturing sector in offering higher wages and benefits than elsewhere in the private sector. In contrast to these perceptions, the manufacturing wage premium—the additional pay a manufacturing worker earns relative to a comparable nonmanufacturing worker—disappeared several years ago, and manufacturing wages currently rank in the bottom half of the wage distribution across all industries in the United States. Though the hourly earnings of manufacturing workers rose 2.3 percent per year, on average, between 2006 and 2019, overall private sector earnings increased 2.6 percent per year over the same period. After the levels of the two series converged in April 2018, manufacturing wages remained below those in the private sector.[2] The erosion of the manufacturing wage premium has primarily affected workers employed in production occupations, as also recently noted by Elvery and Dunn [2021]: we find that the wage premium in production occupations—which account for about 70 percent of all manufacturing employment—disappeared in 2006, while nonproduction workers in manufacturing have typically suffered a wage discount which further increased only in very recent years.

This paper explores the factors that contributed to the disappearance of the manufacturing wage premium. First, we rely on worker-level data from the Current Population Survey (CPS) to address the role of worker observable characteristics and the decline in unionization rates on the wage premium. We find that changes in the demographic characteristics of the manufacturing workforce over time have been broadly similar to changes in the demographic characteristics in

[1] According to 2017 poll conducted by Deloitte for the Manufacturing Institute, Americans perceived manufacturing jobs as "good jobs." See Ruckelshaus and Leberstein [2014], Giffi et al. [2017], and Langdon and Lehrman [2012].

[2] Recent anecdotes suggest that, with continued differential gains in wage growth, even relatively lower paying jobs in the leisure and hospitality sector have been offering competitive wages and have been able to attract workers previously employed in factories. See, for example, Hufford and Naughton [2021].

other sectors and do not materially affect the trend in the manufacturing wage premium. After controlling for demographic characteristics, we estimate that the manufacturing wage premium declined 2.5 percentage points (pp) between the 1990s and the 2010s, which is similar to our raw estimate without those controls. Next, we explore the role of unionization rates, which have declined dramatically over the past few decades across most sectors, but the decline has been much more pronounced for manufacturing. In our analysis, we decompose the residual premia—that is, the wage premium that exists after controlling for worker observable characteristics—across unionized and non-unionized workers. We find that, although premia declined significantly in both groups, the decline was much larger across unionized workers: the wage premium for unionized workers in manufacturing moved down 5.5 pp relative to unionized workers in other sectors, while wages for non-unionized manufacturing workers declined only 2.5 pp relative to similar groups outside of manufacturing. Because these estimates could still be affected by changes in sectoral composition and unobservable worker characteristics, we also look at the relationship between changes in the wage premium and changes in union memberships within manufacturing. Overall, changes in premia associated with workers joining or leaving a union account for about 70 percent of the decline in the premium. These effects, however, are identified from a very small number of observations and tend to be marginally significant.

In the second main empirical exercise, we look within the manufacturing sector and explore the variation in premia across different manufacturing industries to quantify the role of unionization conditional on other industry characteristics—such as productivity, trade exposure, firm size and age distributions, and capital intensity. This is our core empirical strategy, and it relies on lagged union membership rates to address concerns of endogeneity and wage-stickiness. We find that the decline in unionization rates is the most important factor for changes in

wage premia; in particular, a one standard deviation (sd) decline in unionization rates—which corresponds to a decrease of 13 pp—is associated with a decline in the wage premium of 1.4 pp. Our analysis is also robust to the impact of other factors, such as the increasing adoption of temporary help services, the presence of exporters, and the imputations in the CPS sample. To put our quantification exercise in historical context, the decline in unionization rates since the 1990s explains more than 70 percent of the decline in premia across industries within manufacturing. In addition, looking at the effect on wage premia separately for unionized and non-unionized workers, we find that changes in unionization rates tend to be positively associated with changes in premia for worker groups, as in the literature pioneered by Freeman and Medoff [1981], but the effect is significant only for unionized workers. For non-union members, capital intensity appears to drive the variation in (residual) wage differences.

Finally, our paper connects the trends in manufacturing wages to the dispersion in wages across sectors and occupations. Borrowing the methodology on decomposing wage dispersion from Davis and Haltiwanger [1991], we find that the declines in manufacturing wages have contributed to the increase in wage inequality between sectors and occupations and, ultimately, have affected overall wage inequality. Furthermore, while the decline in relative wages could lower labor costs all else equal, manufacturing firms have been also facing increasing competition from other—particularly low-wage—sectors in attracting and retaining workers. Thus, with a limited pool of available talent, the decline in the wage premium could presage an additional channel for the secular decline of the manufacturing sector, complementary to what has been proposed by Gould [2019].

This paper builds on the evidence on wage differentials across manufacturing and other industries documented by Harris and McCall [2019], Levinson [2019], and Elvery and Dunn [2021]. Our work contributes to the literature on wage

inequality—specifically to the work that relies on the identification of worker- and firm-level characteristics in the spirit of Abowd et al. [1999]—and on the role of de-unionization.[3] As in the work by Langdon and Lehrman [2012] and Mishel [2018], we first investigate the role of worker observables on changes in the manufacturing premium. While we also lack firm-level data, we improve upon those papers as we leverage sector-level controls to capture the impact of the average firm; as a result, our estimates are robust to the variation in worker wages due to sectoral characteristics.

1 Data

Our analysis relies on the Bureau of Labor Statistics' (BLS) Current Population Survey (CPS) basic monthly data, a household survey with worker-level characteristics that allows us to disentangle the impact of demographic trends and other observables from other factors in driving the trajectory of wages across sectors over time. Indeed, we rely on (log) hourly wages as the main dependent variable of our analysis, which we construct following the CEPR methodology.[4]

We restrict our sample to workers employed in the business sector (NAICS 11–81); while we do not apply further restrictions, our analysis controls for full-time status—that is, for workers who are employed for at least 35 hours per week—and age, two important determinants of hourly wages. Furthermore, as industry and occupation classifications have been revised over time, we construct consistent industry and occupation codes. We primarily follow Pollard [2019] to build our concordance.[5]

[3] For a more comprehensive literature review on trends in wage inequality, see Katz and Autor [1999] and Goldin and Katz [2001]. For the role of de-unionization, see Freeman [1992], DiNardo et al. [1996], Card [1996], and Fortin and Lemieux [1997]

[4] Details on the methodology are available at https://ceprdata.org/cps-uniform-data-extracts/cps-outgoing-rotation-group/.

[5] For the mapping of manufacturing industries between CPS and NAICS codes, we introduce

Our analysis of long-term trends in hourly wages covers the period between 1983 and 2019, while our main empirical strategy, presented in section 3, covers the years from 1990 to 2019.[6]

Finally, we match the CPS industry aggregates to different (3-digit NAICS) industry-level data sources—BLS data on labor productivity, Federal Reserve Board data on capital expenditures, and the Census Bureau's international trade data and Quarterly Workforce Indicators—to account for the effect of industry-level characteristics on wages.

2 The Manufacturing Wage Premium: Descriptive Analysis

Drawing on the CPS data, we construct the percent difference in average hourly wages between workers in the manufacturing sector vs. workers in the rest of the economy—the so-called *manufacturing wage premium*—shown in figure 1. Specifically, we construct the manufacturing wage premium using the coefficients on the interaction between the manufacturing dummy and the year dummy. As shown in figure 1, manufacturing average hourly wages for all employees were about 14 percent above wages in the overall private sector in the mid-1980s, but the difference gradually declined over time, reaching 7 percent in 2019, thus pointing to the

three main modifications. First, we split the *Electrical Product Manufacturing* aggregate (NAICS 334-335) into two separate industries, *Computers and Electronic Products Manufacturing* (NAICS 334) and *Electrical Equipment, Appliance, and Component Manufacturing* (NAICS 335), using the post-2002 average employment shares across those 3-digit NAICS industries. Second, we group *Printing and Related Support Activities* (NAICS 323), which is classified under NAICS 511 in the Pollard [2019] classification, with *Paper Manufacturing* (NAICS 322). Third, we exclude from the *Miscellaneous and not Specified Manufacturing* grouping (NAICS 339,31-33) those industries with unspecified manufacturing NAICS codes (NAICS 31-33) to separately identify *Miscellaneous Manufacturing*, (NAICS 339).

[6]While BLS data are available from 1979 through mid-2023, we exclude earlier years, when individual and firm-level information are more limited, and the most recent years, when fluctuations in wages and worker flows might be heavily influenced by the COVID-19 pandemic.

erosion of the manufacturing premium, consistent with the aggregate trends.[7]

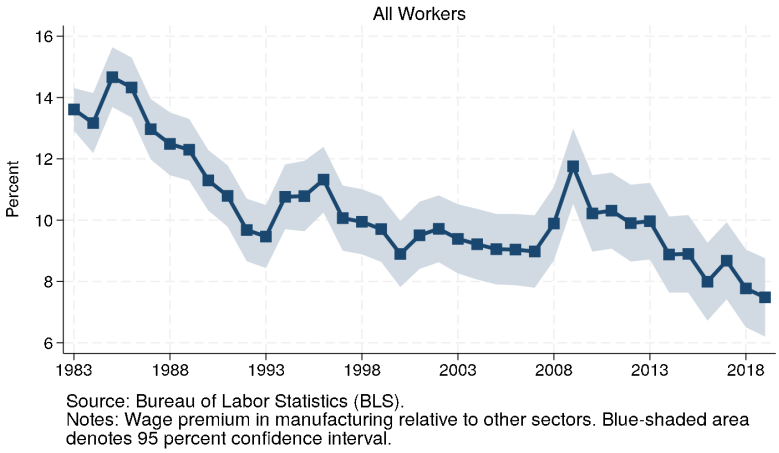

Figure 1: Manufacturing Wage Premium

Figures 2 and 3 show, respectively, the manufacturing wage premia for both production and nonproduction occupations in the CPS data. The premia estimates shown in the charts are based on the coefficients of interactions between time indicators and a dummy for the manufacturing sector. To easily identify long-time trends, our baseline estimates look at changes in average premia over four decades, from the 1980s to the 2010s.[8] The manufacturing premium for nonproduction workers has been little changed in recent decades, fluctuating around 25 percent. Production workers employed in the manufacturing sector, instead, have experienced a significant decline in wages relative to similar occupations in other sectors; since the 1990s, the manufacturing wage premium for production workers has declined 2.5 pp to 1$^1/_4$ percent in the 2010s, a point estimate that has remained significantly different from zero. Thus, the CPS data show that the *manufacturing premium* across production occupations has declined, but it has not yet disappeared.[9]

[7]The aggregate trends described in the introduction are characterized in more details in section B.1.

[8]See figures B4 and B5 for yearly estimates of the premium.

[9]Looking at sectors more connected with manufacturing—specifically, *Construction* (NAICS

Differences between manufacturing workers and workers in other sectors along other dimensions—such as weekly wages and benefits—have also been narrowing in recent years.[10]

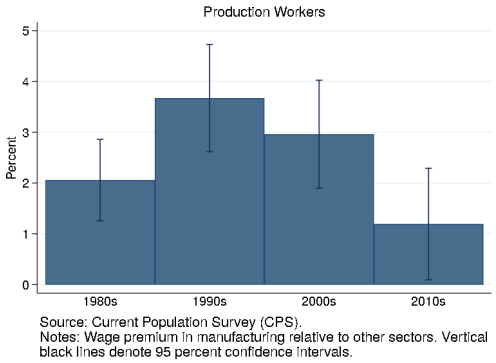

Figure 2: Manufacturing Wage Premium, Production Occupations

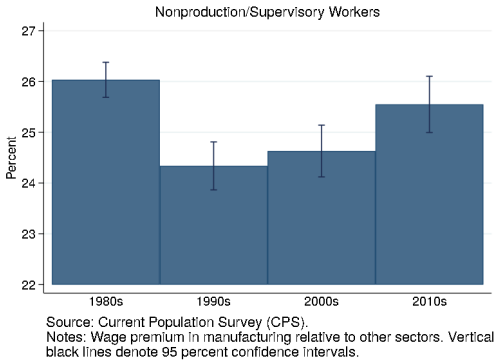

Figure 3: Manufacturing Wage Premium, Nonproduction Occupations

2.1 The Role of Worker Observables

This section explores the role of worker observables on wage differences between manufacturing and other sectors. First, we control for demographic trends and other observable characteristics; then, we explore in more details how trends in unionization rates have shaped the manufacturing premium.

Demographic Trends and Other Observables

The presence of a manufacturing wage premium appears even more remarkable after considering that manufacturing has historically employed worker groups

23), *Wholesale Trade* (NAICS 42), *Retail Trade* (NAICS 44-45), *Professional, Scientific, and Technical Services* (NAICS 54), *Administrative and Support and Waste Management and Remediation Services* (NAICS 56), and *Accommodation and Food Services* (NAICS 72), which altogether represent about 60 percent of the worker inflows and about 50 percent of the worker outflows for the manufacturing sector—we continue to find declines in the wage premium, but our analysis reveals differences in levels and timing patterns. In fact, as shown in figure B6, the wage premium of manufacturing production workers is higher relative to more connected sectors, but started declining since the 1980s and partially recovered in the 2010s. The decline in the premium is significant after controlling for demographic characteristics and other worker observables, as shown by red bars.

[10]The online appendix examines, in details, the patterns for weekly wages and benefits; these data, however, are available only at the aggregate level, and we are unable to pursue a detailed analysis similar to what we do with hourly wages.

that typically receive lower wages, such as less educated workers. In particular, in the 1980s, the average manufacturing production worker was white, male, between the ages of 25 and 34, and had a high school diploma.[11] All told, the demographic characteristics of production worker employment exhibit only small differences in comparison with other sectors, with manufacturing production workers slightly more likely to be older, less educated, and less likely to be male.

Since the early 1990s, demographic trends within manufacturing have led to an increase in the shares of workers who are aged 35 or older, and who are male; over the same time, there has been a corresponding decline in the share of workers who are high school graduates and who are white. Changes in demographics for manufacturing have been very similar to changes elsewhere in the economy; the modest differences in demographic trends—with a relatively larger increase in the share of male employment and of older workers and a relatively larger decrease in the share of high school graduates—actually suggest that the manufacturing premium should have increased since the 1990s, a prediction that is not consistent with our estimates. Figure 4 compares the raw production worker premium with the *residual premium*, an estimate that controls for demographic characteristics—such as, race and etnicity, sex, age, and education—as well as several other observables—that is, union membership, marital status, tenure, metropolitan area, and state-year dummies, which absorb all the variation at the state-year level, such as income and migration flows.

Two main findings emerge from our analysis. First, controlling for demographics, we find that residual premia in the 1980s were significantly higher than raw estimates, consistent with the disproportionately higher employment of lower-wage workers in manufacturing at that time. Indeed, we find a premium of 3.5 percent after controlling for demographics, 1.5 pp higher than the raw estimate. Second,

[11] See figures B10-B13 in the online appendix.

controlling for demographics does not affect the magnitude of the overall decline in the manufacturing wage premium; adjusting for level differences, the residual manufacturing premium still declined 2.5 pp, from a peak of 4 percent in the 1990s to 1 1/2 percent in the 2010s. Thus, trends in demographics and other worker observables cannot account for the decline of the manufacturing wage premium.

Source: CPS.
Notes: Residual wage premium in manufacturing relative to other sectors, after controlling for age variables, sex, union membership, marital status, education, race, tenure, metro area, and state-year dummies. Vertical black lines denote 95 percent confidence intervals.

Figure 4: Manufacturing Wage Premium, Production Occupations: Comparing Premia with and without Worker Observables

Unionization and the Premium

So far, our analysis has included information on union membership among worker observables and has identified average differences in hourly wages between manufacturing and other sectors controlling for union memberships status as well as other observable characteristics. However, union membership deserves a more detailed analysis, as it has undergone significant changes over time and has been typically associated with large differences in wages across workers. In fact, in manufacturing, union membership rates dropped almost 20 pp since the mid-1980s, a significantly larger decline compared to what happened in the rest of the

economy—as shown in figure 5. In addition, while unionized production workers continue to enjoy higher wages than non-unionized workers, the raw wage premia of the unionized production group—that is, without controlling for observables—summarized in figure 6, also experienced significant declines, moving down from 17 percent in the 1980s to 12 percent in the 2010s.

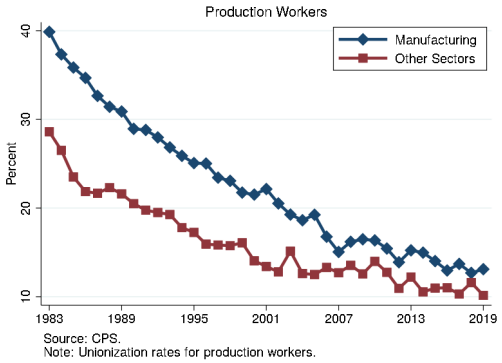

Figure 5: Unionization Rates, Production Workers

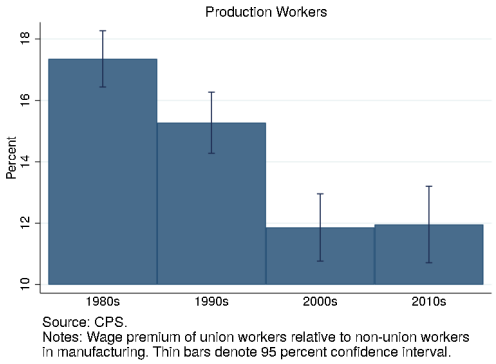

Figure 6: Union Premium, Manufacturing, Production Occupations

The timing of those declines and the relative movements in unionization rates seems consistent with the evolution of the manufacturing wage premium. To quantify the implications of the changes in the union premium on the manufacturing wage premium, we rely on a model à la Mincer [1974] that directly compares wages by union status between manufacturing and other sectors across the four decades of our analysis, $j \in \{1980s, 1990s, 2000s, 2010s\}$,

$$\ln w_{it} = \alpha_0 + \alpha_{1,j}\text{Mfg}_{it} + \alpha_{2,j}\text{Union}_{it} + \alpha_{3,j}Mfg_{it} \cdot \text{Union}_{it} + \gamma X_{it} + \epsilon_{it} \qquad (1)$$

In our model, $\alpha_{1,j}$ represents the percent difference in wages between manufacturing non-union workers relative to non-union workers in other sectors in decade j (Mfg Nonunion Premium), $\alpha_{2,j}$ denotes the union premium outside of manufacturing (Non-Mfg Union Premium), while $\alpha_{1,j} + \alpha_{2,j} + \alpha_{3,j}$ identifies the percent difference in wages between manufacturing union workers relative to the same

Table 1: Decomposing the Residual Average Manufacturing Wage Premium

	Mfg Nonunion Premium	Non-Mfg Union Premium	Mfg Union Premium	Mfg Union Share	Non-Mfg Union Share	Res. Avg Mfg Premium
1980s	6.2%	30.3%	23.6%	34%	21%	4.3%
1990s	5.7%	24.7%	21.0%	25%	16%	6.5%
2000s	3.2%	18.4%	15.1%	18%	12%	3.1%
2010s	2.4%	18.2%	14.4%	14%	11%	2.1%
$\Delta_{2010s,1990s}$	-3.3 pp	-6.5 pp	-6.6 pp	-11 pp	-5pp	-4.4 pp

Source: CPS.
Notes: Wage differences are estimated from worker-level regressions that control for age variables, sex, marital status, education, race, tenure, metro-area, and state-year dummies, 1983-2019.

comparison group in decade j (Mfg Union Premium)—controlling for demographics and other worker observables, X_{it}, as in the previous part of our analysis.

Using these estimates, the residual manufacturing wage premium—that is, the premium that conditions on worker observables—can be proxied by a weighted average of the residual premia across unionized and non-unionized workers,

$$\begin{aligned}\text{Res. Avg. Mfg Premium}_j =& \alpha_{1,j} + \alpha_{2,j}\left(\textit{Mfg Union Share}_{it} - \textit{Non-Mfg Union Share}_{it}\right) \\ &+ \alpha_{3,j}\textit{Mfg Union Share}_{it}\end{aligned}$$

Table 1 summarizes the estimates from our decomposition. Two main findings emerge from this analysis. First, the decline in relative wages across union workers has been twofold that across non-unionized members.[12] Second, the decline in the share of unionized workers in manufacturing—which dropped 11 pp since the 1990s—has partly offset the change in the manufacturing union premium: If manufacturing union shares had remained at the same average level as in the 1990s, average premia in the 2010s would have been 1.4 percent, translating into an additional decline in the residual premium of 0.7 pp.

Our premia estimates, however, include the effect of sectoral composition and

[12]The faster decline of relative union wages compared to relative nonunion wages in manufacturing is consistent with the evidence documented by, among others, Macpherson and Hirsch [2021], which find a decline in the ratio of union wages to nonunion wages for the whole economy and within manufacturing.

other time-invariant worker unobservable characteristics. To isolate the impact of changes in union memberships from those factors, we separately looked at flows of manufacturing workers into or out of unions by using longitudinally linked observations in the CPS microdata; the results from this analysis are shown in figure 7. Overall, the flows associated with changes in union membership are linked to a significant decline in the manufacturing premium of about 4 pp between the 1990s and the 2010s. This decline combines two effects. First, workers joining unions in the 2010s tend to have lower wage premia than in the previous decades. Second, workers leaving unions in the 2010s seem not to suffer much of a wage discount; in contrast, workers who left unions in the 1990s were offered (significantly, although marginally so) lower wages.[13] This analysis, however, relies on very few observations and, thus, the associated estimates tend to be estimated with very large standard errors.

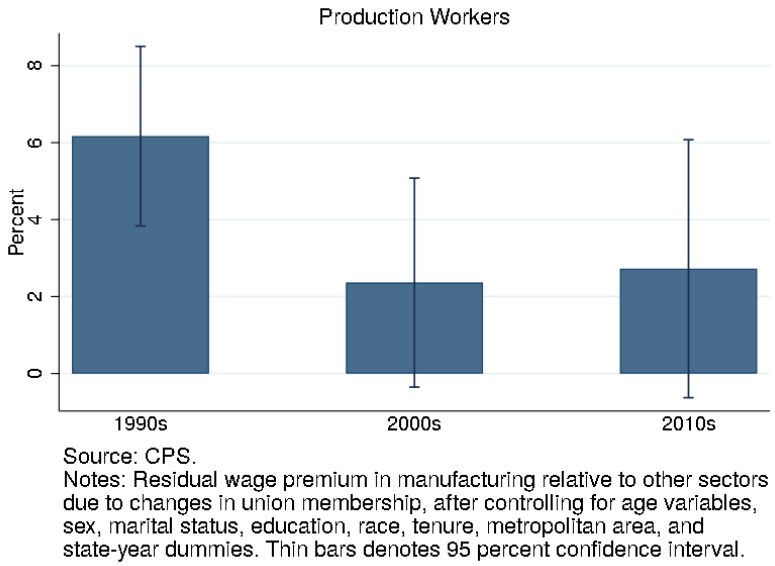

Figure 7: Changes in Wage Premia of Unionized Workers in Manufacturing, Production Occupations

The drop in unionization rates and the wage outcomes observed after workers

[13] Figure B18 shows a decomposition of the "inflow" and "outflow" effects.

join or leave a union point to a decline in the bargaining power of manufacturing workers as the underlying cause of trends in wages. However, without direct measures on bargaining power, our analysis focuses on a quantifiable dimension, the pattern of unionization rates.

3 Empirical Strategy

Our analyses so far have relied on the variation across individuals and over time to identify differences in wages between manufacturing production workers and production workers in other sectors of the economy. We view that part of the investigation, however, as mostly descriptive since it lacks controls on firm or sector characteristics, which the literature has shown to be important determinants of wage premia. Furthermore, an economy-wide analysis of the patterns of wages would not be an ideal setting for further investigations since sector premia are calculated relative to aggregate wages; in fact, while manufacturing wages have declined relative to the rest of the economy, wage gains in some other sectors have been rising faster than in the aggregate.[14] To make progress on the factors behind the secular decline of manufacturing wages and to be able to control for various proxies of firm-level characteristics, we will look at industries within manufacturing, leverage differences in wage premia across those industries, and relate those trends to changes in union membership.

Since the relative decline in manufacturing wages started in the 1990s, this section focuses on the period from the 1990s to the 2010s, a period also covered by all the main controls included in our analysis.

While manufacturing production workers have enjoyed, on average, a 4 percent wage premium since the 1990s, there have been large differences in premia

[14] See section B.4 in the online appendix for the aggregate results.

across manufacturing industries. In the 1990s, average wage differences ranged from a 25 percent premium for the *Petroleum and Coal Products Manufacturing* industry (NAICS 324) to a 15 percent *penalty* for *Textile, Apparel, and Leather Manufacturing* (NAICS 313-316). By the 2010s, the range of the average premia had contracted, with wages declining in industries that enjoyed higher premia and increasing in industries that suffered wage discounts. The negative relationship between initial wage differences and subsequent changes, shown in figure 8, points to convergence in premia across industries.[15]

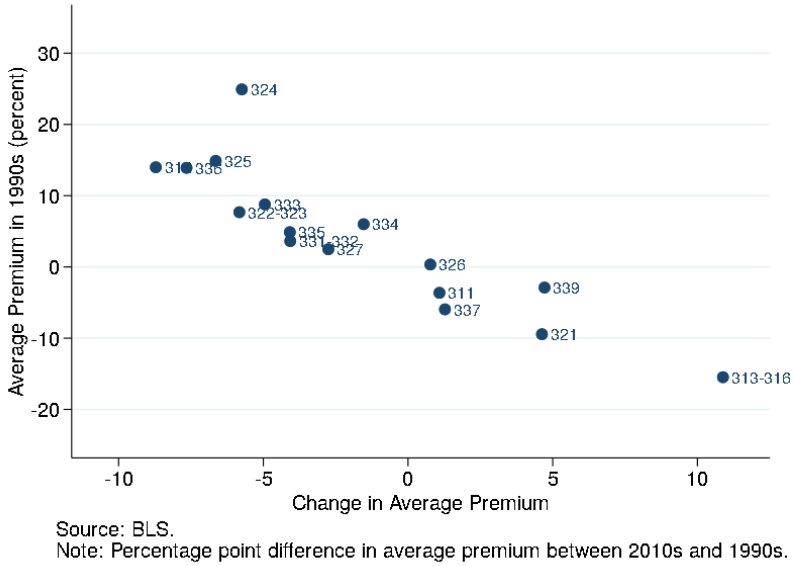

Figure 8: Convergence in Wage Premia across Manufacturing Industries

The differential trends across industries have been positively correlated with the magnitude of the decline in union memberships. Although unionization rates declined across all manufacturing industries, figure 9 shows that those industries that experienced the largest declines in union memberships between the 1990s and the 2010s—such as, *Beverage and Tobacco Product Manufacturing* (NAICS 312) and *Transportation Equipment Manufacturing* (NAICS 336)—also displayed the largest

[15]Convergence trends are qualitatively similar if comparing the 2010s to the 1980s.

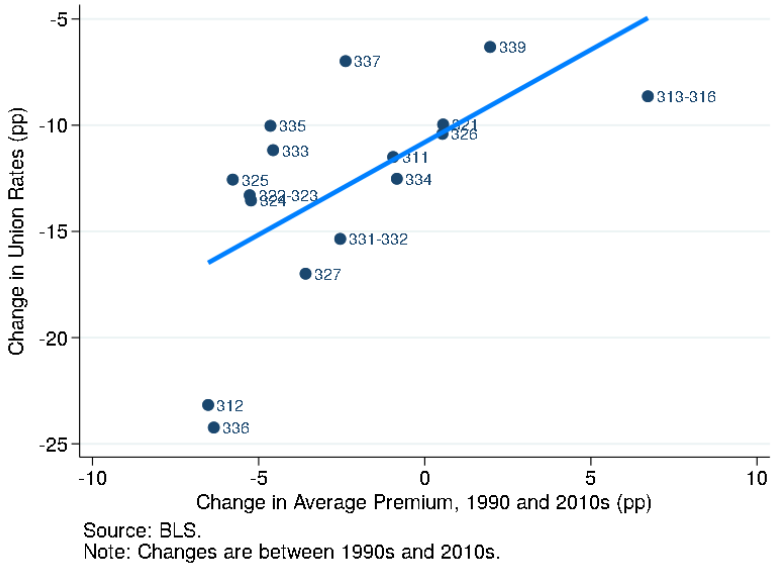

Figure 9: Wage Premia and Unionization Rates across Manufacturing Industries

declines in wages relative to the rest of the economy.[16]

The large heterogeneity in premia and unionization rates within manufacturing industries and reduced-form evidence on long-term trends suggest that those industries provide a natural setting to extend our investigation. Thus, our main empirical strategy will exploit the variation in the declines in wages and unionization rates across manufacturing industries. In particular, our baseline equation relates the industry-level residual wage premium—that is, the estimate of wage differences relative to sectors outside of manufacturing that controls for demographic characteristics and other available worker observables—to the unionization rates, conditional on a variety of other factors,

$$\text{Res. Premium}_{st} = \beta_0 + \beta_1 \text{Union Rate}_{s,t-1} + \gamma X_{st} + d_s + d_t + \varepsilon_{st} \tag{2}$$

where s indicates a 3-digit NAICS industry within manufacturing, Res. Premium denotes the residual wage premium of an industry, and Union Rate represent the

[16] As with the premia convergence, the relationship between changes in premia and changes in unionization rates is qualitatively similar if looking relative to the 1980s.

unionization rate of production workers within the same industry.[17] β_1 is our coefficient of interest: We exploit within-industry variation in union membership to identify average changes in wages across manufacturing industries relative to other sectors. To address concerns of endogeneity as well as possible time lags between changes in union membership status and effects on wages, we rely on a 1-year lagged union membership rates as our main regressor.[18]

In addition, our specification includes industry fixed effects, time dummies, the industry employment share relative to total manufacturing employment—to control for the dynamics introduced by shrinking industries that could depress wage and unionization membership—and various other industry-level controls that capture average firm-level differences across manufacturing industries. In particular, following the trends in wage premia at large firms documented by Bloom et al. [2018], we control for the share of large (500+ employees) firms across manufacturing industries. Similarly, Haltiwanger et al. [2012] point to an increase in the employer-age premium; therefore, we include the share of young (5 years or less) firms within an industry in our model.

Furthermore, recent strands of the trade literature have advocated for a simultaneous role of export exposure and technology in determining labor demand patterns and have highlighted the importance of outsourcing and import competition on wage conditions.[19] Thus, (2) includes the share of exports out of total production and the import share in domestic absorption–that is, the share of imports out of domestic consumption.

[17] See section B.3 for more details on how *Res. Premium* is estimated.

[18] With contract negotiations occurring less frequently than every year in some industries, we also considered a specification that relies on longer lags for the union membership rate—specifically, a 3-year lag. The results with the 3-year lagged main regressor, reported in table B1 in the online appendix, are not statistically different from our baseline results shown in table 2.

[19] See, for example, Verhoogen [2008] and Bustos [2011] on the impact of exporting on labor demand and Feenstra and Hanson [1996] and Autor et al. [2013] on the channels for the impact of imports.

Finally, we control for labor productivity and capital intensity, "traditional" labor market features that tend to drive wage differences across manufacturing industries.

4 Results

Table 2 presents our main results. We find that the lagged unionized share of employment is strongly positively associated with the manufacturing wage premium. Adding industry-level controls to our basic specification lowers only modestly our estimated effect of the unionized share and keeps it statistically significant. The effect of changes in unionization on wages is also economically significant: Using the coefficient from column (7)—our preferred specification—reducing the share of union members in an industry from 100 percent to 0 would lead to a 10 percent decline in the wage premium. While this hypothetical shock may not be considered realistic, expressing it in terms of standard deviations of the explanatory variables—a common approach to quantify results—still points to economically meaningful magnitudes. A one-standard-deviation decrease in the (lagged) unionization rate—which correspond to a decline of almost 13 pp—implies that the dependent variable would move down 1.4 pp. To convert this result in terms of standard deviations, we divide this effect by the standard deviation of the dependent variable, Res. Premium, implying a decline of 0.17 (or 17 percent) standard deviation. As a final quantification exercise, we looked at how our results map into historical trends. Between 1990 and 2019, unionization rates declined, on average, almost 18 pp. Our preferred estimate implies a decline in the wage premium of 1.9 pp, thus explaining more than 70 percent of the observed decline in the premium over the same period.

Among explanatory variables that we control for, we find that capital intensity

Table 2: Sector-Level Regressions: Wage Premia and Unionization in Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	Residual Wage Premium$_t$						
Union Share$_{t-1}$	0.211***	0.158**	0.157**	0.128**	0.148**	0.118**	0.110**
	(0.065)	(0.055)	(0.054)	(0.056)	(0.054)	(0.044)	(0.043)
Empl Share$_t$	-0.399	-0.332	-0.329	-0.246	-0.284	-0.167	-0.190
	(0.442)	(0.328)	(0.330)	(0.253)	(0.296)	(0.236)	(0.232)
Top Share$_t$		0.109	0.108	0.119	0.109	0.121	0.128
		(0.162)	(0.162)	(0.146)	(0.159)	(0.131)	(0.125)
Young Share$_t$		-0.220	-0.220	-0.161	-0.202	-0.155	-0.134
		(0.240)	(0.242)	(0.209)	(0.229)	(0.194)	(0.193)
G Lab Prod$_t$			-0.012				-0.013
			(0.050)				(0.044)
Exp/Prod$_t$				0.090			0.101*
				(0.054)			(0.051)
Imp/Abs$_t$					0.035		-0.070
					(0.059)		(0.043)
Cap Int						0.066***	0.055**
						(0.021)	(0.020)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.237	0.272	0.272	0.289	0.274	0.304	0.313
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Wage Premium: wage premium after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

and the export share of production have a positive effect on the manufacturing wage premium. While the export share is only marginally statistically significant, capital intensity appears to be an important factor driving the variation in residual premia: with a calculation similar to what we have outlined in the case of our main regressor, a one-standard-deviation decline in capital intensity is associated with a decline in wages of 23 percent of a standard deviation. The effect of capital intensity appears slightly larger than that of our baseline regressor; however, capital intensity has remained roughly unchanged between 1990 and 2019 and, thus, cannot explain the dynamics in the wage premia across manufacturing industries.

Union vs. Non-union Premia: Decomposing the Impact of Unionization

The estimates in table 2 combine the effects on wages for union and non-union members. In the analysis that follows, we estimate equation (2) separately for each group. In particular, in table 3, we show results for the manufacturing wage premium of unionized workers. The lagged unionized share of employment has even stronger effects on the manufacturing wage premium for this group, with the point estimates in the specification with all controls included being about twice as large as the point estimate in table 2. In terms of magnitudes, a one-standard-deviation decline in union membership is associated with a 26 percent of a standard deviation (sd) decline in the wage premium of unionized workers, a larger decline compared with our baseline regressions, but not twice as large since the variability of residual wages across union members tends to be higher. The explanatory power of the change in unionization rates over time appears to be particularly important for union members: the almost 18 pp drop in membership rates is able to explain about 40 percent of the reduction in the residual wages of union members.[20] Interestingly, the effect of capital intensity is negative for unionized workers—in contrast with our expectation and earlier results—but the effect is only marginally

[20] Between 1990 and 2019, residual wage premia of unionized workers declined about 10 pp.

Table 3: The Impact of Unionization on Union Wage Premia

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Residual Union Premium$_t$						
Union Share$_{t-1}$	0.230***	0.216***	0.226***	0.225***	0.242***	0.249***	0.263***
	(0.057)	(0.057)	(0.058)	(0.062)	(0.050)	(0.070)	(0.059)
Empl Share$_t$	-0.456	-0.486	-0.519	-0.512	-0.604*	-0.618*	-0.726**
	(0.280)	(0.318)	(0.297)	(0.301)	(0.291)	(0.332)	(0.309)
Top Share$_t$		0.056	0.068	0.053	0.055	0.047	0.064
		(0.152)	(0.151)	(0.154)	(0.160)	(0.148)	(0.143)
Young Share$_t$		-0.009	-0.012	-0.027	-0.053	-0.062	-0.066
		(0.216)	(0.213)	(0.210)	(0.245)	(0.223)	(0.221)
G Lab Prod$_t$			0.128				0.102
			(0.100)				(0.106)
Exp/Prod$_t$				-0.027			0.093
				(0.049)			(0.068)
Imp/Abs$_t$					-0.087		-0.120
					(0.059)		(0.094)
Cap Int						-0.053*	-0.055*
						(0.028)	(0.028)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.227	0.228	0.231	0.228	0.231	0.233	0.239
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Union Premium: wage premium for unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
Import Ratio: ratio of imports to revenues.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

significant. Beyond changes in employment shares, which display a somewhat non-intuitive negative correlation with the dependent variable, no other control appears to have a meaningful impact on the residual wage premium across unionized members.

The falling rate of unionization may have lowered wages not only because workers may lose higher wages after leaving the union, but also because there is less pressure on nonunion employers to raise wages.

Table 4 contains results for the manufacturing wage premium of non-unionized workers. While the basic specification shown in column 1 finds similar results as in the case of overall manufacturing and unionized workers, the effect of the lagged unionized share of employment remains positive but becomes statistically insignificant after including most other controls.

Among other variables, capital intensity emerges as the most relevant factor influencing wages for non-union members. A one-standard-deviation decline in capital intensity is associated with a 35 percent standard deviation decline in the wage premium of non-union members. However, the historical trend in capital intensity is not consistent with the dynamics in the wage premium; indeed, over the period of analysis, the nonunion wage premium moved down, while capital intensity edged up.

Robustness Checks

Our specification includes several sector-specific factors that tend to affect wage patterns. In this section, we show that our results are robust to three additional characteristics.

First, as documented in figure 8, wage premia converged across industries within manufacturing. To account for possibility that the declines in wage premia are due to this convergence dynamics, we have added the lagged premium to our baseline model; the results are shown in table A1. Columns (2), (4), and (6) report

Table 4: The Impact of Unionization on Nonunion Wage Premia

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Residual Nonunion Premium$_t$						
Union Share$_{t-1}$	0.182**	0.110	0.109	0.077	0.089	0.046	0.039
	(0.068)	(0.069)	(0.068)	(0.071)	(0.075)	(0.053)	(0.055)
Empl Share$_t$	-0.287	-0.240	-0.238	-0.145	-0.145	0.020	0.030
	(0.510)	(0.370)	(0.374)	(0.289)	(0.315)	(0.245)	(0.248)
Top Share$_t$		0.173	0.173	0.184	0.174	0.192	0.196
		(0.204)	(0.206)	(0.186)	(0.199)	(0.147)	(0.143)
Young Share$_t$		-0.255	-0.255	-0.189	-0.220	-0.152	-0.134
		(0.253)	(0.254)	(0.219)	(0.233)	(0.181)	(0.181)
G Lab Prod$_t$			-0.007				0.004
			(0.052)				(0.046)
Exp/Prod$_t$				0.100			0.047
				(0.064)			(0.073)
Imp/Abs$_t$					0.070		-0.011
					(0.072)		(0.065)
Cap Int						0.103***	0.096***
						(0.028)	(0.031)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.234	0.280	0.281	0.296	0.287	0.337	0.339
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Non-Union Premium: wage premium for non-unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

the specification that controls for the lagged premium; we also report comparable estimates in columns (1), (3), and (5), respectively. The impact of unionization on wage premia is little changed in the augmented specification compared with our baseline estimates. The impact of other covariates is also little changed in the new specification. Interestingly, after including our large set of controls, past premia are positively related to the current premium, in contrast with a story of convergence, but only for the nonunion group.

Second, the trade literature since the seminal contribution by Bernard et al. [1995] has highlighted that exporters are not only larger, more productive, and more capital intensive compared to non-exporting establishments, but also pay higher wages and benefits. Thus, while we control for the export share of production in our baseline specification, cross-sector differences in the prevalence of exporters could account for further differences in wages. Table A2 addresses this concern by controlling for the (log-) number of exporters as well as the average export value across exporters.[21] Since those variables are available only since 1996, the first column across all tables replicates the baseline results for the shorter sample and can be directly compared to the magnitudes of estimates in columns (2)-(4), which includes the export-related controls. After including those controls, the impact of unionization on the wage premium is not significantly different from the results in column (1).

Among other controls, table A2 points to a role for trade variables and for the share of young firms in the sector; these results, however, are not robust to estimating the premia separately for unionized and non-unionized workers.

A third factor we consider in our robustness exercises is the role of temporary help workers. In fact, a shift in the number of jobs that are filled through temporary help workers could affect the wage premia of other workers in the sector; the im-

[21] The online appendix also includes additional results, decomposing between union and nonunion premia in tables B2 and B3.

pact on wages largely depends on which types of occupations are filled with those workers. To understand the effect of temporary help workers on wages, we rely on yearly data from the Quarterly Survey of Plant Capacity (QSPC), which collects the share of temporary help workers across manufacturing industries since 2013.[22] Figure A1 plots the share of temporary help workers in each 3-digit NAICS industry against the industry-specific residual wage premia. As highlighted by the fitted line, the correlation between temporary help employment and wage premia is positive: intuitively, firms are likely to fill the least skill-intensive–and likely least well-paying–occupation with outside help, implying that the wage premia for other workers in the sectors would raise. As a result, the increasing reliance of the manufacturing sector on temporary help workers since the 1990s is unlikely to account for the decline in the manufacturing wage premium over the period of our analysis.

We perform a final robustness check following the work by Hirsch and Schumacher [2004] and Bollinger and Hirsch [2006], which point to biased estimates for union wage gaps when imputed CPS wage data are included in the estimation. Following Bollinger and Hirsch [2006], we restrict our analysis to the respondent sample with observations weighted by (the inverse of) the probability of response. Tables A3 and present our results.[23] The decline in unionization continues to be the most important factor for the decline in the wage premium for union workers across manufacturing industries; looking at column (7), the coefficient estimates is only marginally significantly different from our baseline estimates shown in table 3. Reweighted regressions highlight a more prominent role of international trade, but the historical movements in import and export shares–with import and export shares rising over time–are counterfactual to the patterns in manufacturing wages.

[22] We exclude 2013q2–2013q4 data from our analysis since they do not cover a full year.

[23] See table B4 in the online appendix for the estimate on the nonunion premium.

5 Implications for Wage Inequality

The trends in unionization and the resulting patterns in wages have also important implications in terms of wage inequality, the focus of this section. In fact, the patterns that we document imply that, within the manufacturing sector, there has been a widening of the gap between the higher-paid nonproduction workers and the relatively lower-paid production workers and point to rising inequality across occupations. Furthermore, the declines in the wages of manufacturing production workers relative to workers in other sectors point to rising inequality between manufacturing and the rest of the economy. All told, those results point to rising wage inequality between sectors and occupations.

The data confirm these conjectures. Looking first at general trends, shown in figure 10, measures of aggregate inequality have increased since the 1980s, while inequality within sectors and for a given occupation—hereafter, *within inequality*—has moved down.[24] As a result, the inequality between sectors and occupations—or *between inequality*, defined as the difference between aggregate inequality and the within sector-occupation measure—rose 0.12 log point (or about 12 percent). Measures of inequality that control for demographic characteristics reveal similar patterns, as shown in figure 11, with an increase in between inequality of about 4.5 percent.

[24]Our wage inequality decomposition largely follows Davis and Haltiwanger [1991].

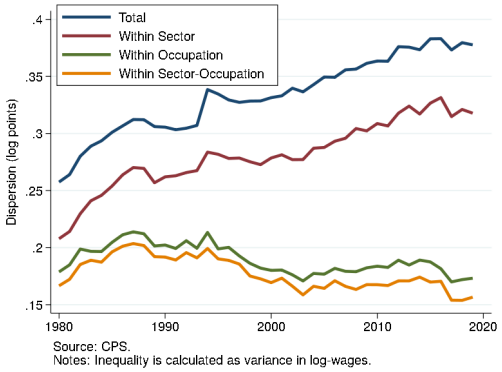

Figure 10: Wage Inequality

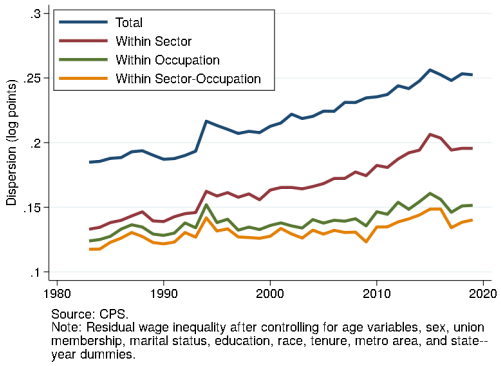

Figure 11: Residual Wage Inequality

Beyond consistent trends, changes in wage premia have quantitatively contributed to the recent trends in wage inequality. Results from table 5 quantify the impact of changes in the premium by occupation group on the increase in aggregate and *between* wage inequality,

$$\text{Ineq}_t = \delta_0 + \delta_1 \text{Mfg Prod. Premium}_t + \delta_2 \text{Mfg Nonprod. Premium}_t + d_t + u_t \quad (3)$$

where Ineq_t denotes a measure of wage inequality, Mfg Prod. Premium_t represents the wage premium for manufacturing production workers, and Mfg Nonprod. Premium_t is the wage premium for manufacturing nonproduction workers. While the impact of premia for nonproduction workers on inequality is not robust across specifications, we find that a one-standard-deviation decline in the premium for production workers is associated with an increase in overall inequality of about 10 percent of a sd and an increase in between inequality of about 15 percent of a sd. The fact that only changes in production worker premia matter for inequality is consistent with the findings from the previous sections.

Tying these effects to historical trends, the decline in manufacturing production worker wages since the 1990s explains 10 percent—or about 0.5 pp—of the increase in (between and overall) wage inequality over the same period, after con-

trolling for changes in demographics characteristics. In turn, the effect of the wage premium on inequality is primarily driven by the dynamics in unionization rates; in fact, changes in unionization rates ultimately account for about 0.35 pp of the changes in wage inequality.

While changes in unionization rates and manufacturing wages explain only a small part of the total increase in wage inequality, the fact that a similar mechanism might be at play also in some other sectors suggest that our estimate should be interpreted as a lower bound.

Table 5: Inequality and Wage Premia

	(1)	(2)	(3)	(4)
			Inequality	
Variables	Total		Between Sectors-Occupations	
Premium, Production	-0.102***		-0.099**	
	(0.038)		(0.047)	
Premium, Nonproduction	0.124*		0.075	
	(0.065)		(0.097)	
Residual Premium, Production		-0.125***		-0.180***
		(0.044)		(0.059)
Residual Premium, Nonproduction		0.025		-0.191*
		(0.077)		(0.110)
Month Dummies	y	y	y	y
Obs.	432	432	432	432
R^2	0.218	0.224	0.226	0.243

Source: Bureau of Labor Statistics.
Premium, Production: wage premium for production workers.
Premium, Nonproduction: wage premium for nonproduction workers.
Residual Premium, Production: wage premium for production workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Residual Premium, Nonproduction: wage premium for nonproduction workers after controlling for age variables, sex, education, race, tenure, union status, marital status, state and metropolitan area.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Time-series regressions, 1980m1-2019m12. Robust standard errors are reported in parenthesis.

6 Conclusions

The conventional wisdom that manufacturing jobs are "good jobs" is less accurate than it used to be. While manufacturing workers used to receive a premium relative to workers in other sectors, that premium has significantly declined in recent years for most manufacturing jobs. Our results indicate that the decline in unionization rates is responsible for more than 70 percent of the drop in the manufacturing wage premium. Notably, the unionization effect remains significant even after accounting for a large set of worker and sectoral characteristics.

Our findings also point to a widening of wage inequality across occupations within manufacturing and with respect to the private sector. In particular, we find that, after controlling for demographics characteristics, the decline in manufacturing production worker wages since the 1990s explains 10 percent—or about 0.5 pp—of the increase in wage inequality over the same period, with the largest portion of this effect attributable to the decline in unionization rates. Our estimates of the impact on wage inequality, however, are likely only a lower bound, as while the wages of manufacturing production workers were above the median of the distribution of all production worker wages, they remained typically below that of nonproduction workers. Beyond suggestive evidence that a similar relationship between unionization and wages could be at play in other sectors, the decline in unionization rates and in the wage premium might exacerbate the structural decline of the manufacturing sector—one of the sectors that made the middle class—and further raise wage inequality.

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A Appendix

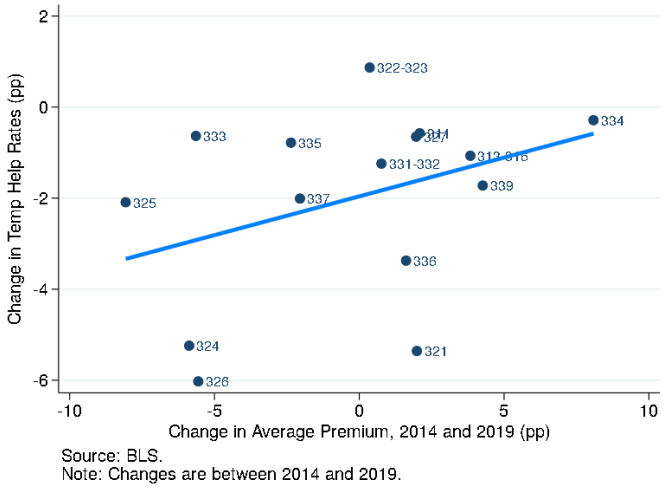

Figure A1: Temporary Help Services and Wage Premia across Manufacturing Industries

Table A1: Wage Premia and Unionization in Manufacturing, Controlling for Convergence in Premia

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Residual Premium$_t$		Res. Union Premium$_t$		Res. Nonunion Premium$_t$	
Union Share$_{t-1}$	0.110**	0.089**	0.263***	0.271***	0.039	0.002
	(0.043)	(0.033)	(0.059)	(0.060)	(0.055)	(0.042)
Empl Share$_t$	-0.190	-0.178	-0.726**	-0.773**	0.030	-0.030
	(0.232)	(0.196)	(0.309)	(0.330)	(0.248)	(0.201)
Top Share$_t$	0.128	0.117	0.064	0.071	0.196	0.192
	(0.125)	(0.114)	(0.143)	(0.147)	(0.143)	(0.138)
Young Share$_t$	-0.134	-0.103	-0.066	-0.053	-0.134	-0.080
	(0.193)	(0.163)	(0.221)	(0.225)	(0.181)	(0.135)
G Lab Prod$_t$	-0.013	-0.018	0.102	0.111	0.004	-0.004
	(0.044)	(0.042)	(0.106)	(0.106)	(0.046)	(0.041)
Exp/Prod$_t$	0.101*	0.094**	0.093	0.096	0.047	0.055
	(0.051)	(0.043)	(0.068)	(0.073)	(0.073)	(0.057)
Imp/Abs$_t$	-0.070	-0.064*	-0.120	-0.124	-0.011	-0.018
	(0.043)	(0.036)	(0.094)	(0.104)	(0.065)	(0.048)
Cap Int	0.055**	0.037*	-0.055*	-0.055*	0.096***	0.071**
	(0.020)	(0.019)	(0.028)	(0.030)	(0.031)	(0.027)
Residual Premium$_{t-1}$		0.195**				
		(0.076)				
Residual Union Premium$_{t-1}$				-0.074		
				(0.063)		
Residual Nonunion Premium$_{t-1}$						0.194***
						(0.055)
Year	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y
Obs.	464	464	464	464	464	464
R^2	0.313	0.336	0.239	0.243	0.339	0.361
Number of sectors	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Premium: wage premium after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Res. Union Premium: wage premium for unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Res. Non-Union Premium: wage premium for non-unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1996-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

Table A2: Wage Premia and Unionization in Manufacturing, Additional Exporters' Controls

Variables	(1)	(2)	(3)	(4)
	Residual Wage Premium$_t$			
Union Share$_{t-1}$	0.075**	0.072**	0.075**	0.069**
	(0.032)	(0.029)	(0.032)	(0.026)
Empl Share$_t$	-0.033	-0.039	-0.021	-0.004
	(0.204)	(0.202)	(0.207)	(0.212)
Top Share$_t$	0.096	0.103	0.098	0.116
	(0.130)	(0.131)	(0.130)	(0.135)
Young Share$_t$	-0.318**	-0.319**	-0.319**	-0.321**
	(0.141)	(0.140)	(0.142)	(0.141)
G Lab Prod$_t$	-0.014	-0.015	-0.016	-0.024
	(0.045)	(0.048)	(0.049)	(0.057)
Exp/Prod$_t$	0.137**	0.139**	0.138**	0.144**
	(0.050)	(0.052)	(0.051)	(0.054)
Imp/Abs$_t$	-0.156***	-0.146**	-0.159***	-0.149**
	(0.051)	(0.056)	(0.054)	(0.058)
Cap Int	0.043**	0.038	0.042**	0.036
	(0.019)	(0.023)	(0.019)	(0.025)
ln Num Exporters		-0.257		-0.401
		(0.406)		(0.592)
ln Avg. Export Value			-0.067	-0.219
			(0.179)	(0.359)
Year	y	y	y	y
Sector FE	y	y	y	y
Obs.	384	384	384	384
R^2	0.210	0.211	0.210	0.212
Number of Sectors	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Wage Premium: wage premium after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
ln Num Exporters: log number of exporters in the sector; because of data availability, before 2008, the number of exporters for each sector is the number for overall manufacturing.
ln Avg. Export Value: log average export value per exporter within the sector; because of data availability, before 2008, the export value and the number of exporters for each sector are set to the values for overall manufacturing.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1996-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

Table A3: Unionization and Union Wage Premia in Manufacturing, Re-weighted Observable Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	Residual Union Premium$_t$						
Union Share$_{t-1}$	0.160*	0.140**	0.147**	0.135**	0.165***	0.160***	0.170***
	(0.078)	(0.054)	(0.056)	(0.058)	(0.054)	(0.051)	(0.048)
Empl Share$_t$	-0.024	-0.174	-0.202	-0.159	-0.299	-0.264	-0.412
	(0.341)	(0.476)	(0.454)	(0.460)	(0.453)	(0.476)	(0.454)
Top Share$_t$		0.147	0.157	0.149	0.146	0.141	0.163
		(0.142)	(0.139)	(0.141)	(0.150)	(0.148)	(0.138)
Young Share$_t$		0.092	0.090	0.103	0.046	0.057	0.064
		(0.457)	(0.455)	(0.470)	(0.456)	(0.470)	(0.456)
G Lab Prod$_t$			0.104				0.067
			(0.084)				(0.085)
Exp/Prod$_t$				0.016			0.183**
				(0.061)			(0.068)
Imp/Abs$_t$					-0.091		-0.203**
					(0.076)		(0.093)
Cap Int						-0.036	-0.045
						(0.034)	(0.037)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.148	0.150	0.153	0.151	0.154	0.153	0.165
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Union Premium: wage premium for unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
ln Num Exporters: log number of exporters in the sector; because of data availability, before 2008, the number of exporters for each sector is the number for overall manufacturing.
ln Avg. Export Value: log average export value per exporter within the sector; because of data availability, before 2008, the export value and the number of exporters for each sector are set to the values for overall manufacturing.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing, on the respondent sample only, with observation weighted by the probability of response. Standard errors are clustered at the sector level.

B Online Appendix

B.1 The Manufactuing Wage Premium in the Current Employment Statistics (CES) Data

While our main empirical analysis draws on the Current Population Survey (CPS), this section presents the manufacturing wage premium using the Current Employment Statistics (CES) survey, which is based on establishment-level data and is designed to measure broad patterns in sector-level employment and earnings.

As measured in the CES data, manufacturing average hourly wages for all employees were 3 percent above wages in the overall private sector in 2006, a difference commonly known as the *manufacturing wage premium*. Since then, manufacturing wages have averaged gains of 2.3 percent per year, while wages in the private sector have risen 2.6 percent per year. Because of this differential growth, the level of wages in the private economy caught up with manufacturing wages in April 2018 and has been higher ever since (figure B1).

Figure B1: Manufacturing Wage Premium

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Notably, the erosion of the manufacturing wage premium has been a phenomenon that has affected production workers, which, in 2019, accounted for about 70 percent of manufacturing employment. Figures B2 and B3 report data

on the manufacturing premium as a percent difference relative to private-sector wages by major occupation groups: figure B2 shows the manufacturing wage premium for production workers, and figure B3 shows the premium for nonproduction/supervisory workers. While nonsupervisory workers in manufacturing have traditionally suffered a wage discount, that difference has increased only in recent years. In contrast, the manufacturing wage premium across production occupations declined steadily beginning in the late 1990s, and it had disappeared by the mid-2000s. In 2019, manufacturing wages for production workers were 5 percent below those of production workers in the rest of the private sector.

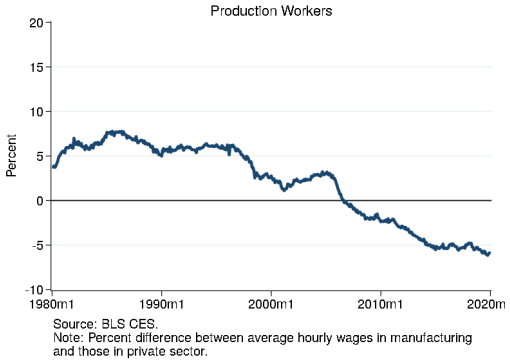


Figure B2: Manufacturing Wage Premium, Production Occupations

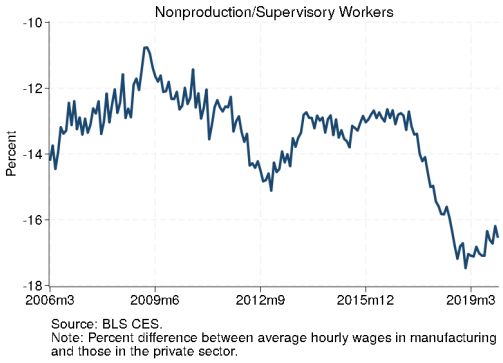


Figure B3: Manufacturing Wage Premium, Supervisory Occupations

The patterns for production worker premia in the CES data are roughly consistent with our findings for CPS, while the empirical evidence for supervisory workers is different across the two datasets. There are two main reasons for such differences. First, the CPS analysis focuses on production occupations, a smaller set than the group of nonsupervisory occupations in the CES sample. Second, the CPS comparison are relative to other sectors outside of manufacturing, while the CES total wage measures include manufacturing. All told, the restriction to production occupations explains most of the different patterns.

B.2 The Manufacturing Premium: Weekly Wages and Nonwage Compensation

Differences between manufacturing and other sectors have also been narrowing in weekly wages. Figure B7 shows the percent difference in average weekly wages between manufacturing production workers and production occupations in other

sectors as measured in CES data. After rising in the 1980s, differences in production worker weekly wages gradually declined in subsequent decades but still averaged 18.6 percent in the 2010s. While the weekly manufacturing premium remains sizeable, the declining trend appears to be the result of the behavior of average hourly wages rather than the number of hours worked in a week. Indeed, differences in average weekly hours between manufacturing and other sectors, as shown in figure B8, have increased over time. In the 1980s, a production worker in manufacturing worked an average of 40.4 hours per week versus 36.2 hours for production workers in other sectors. The workweek difference rose to 8.1 hours in the 2010s, with average weekly hours increasing for manufacturing production workers but decreasing for production workers in other sectors. The increase in hours has partly offset the decline in average hourly wages, resulting in weekly wages in manufacturing remaining still above those of other sectors.

Wages, however, represent only one dimension of manufacturing compensation. Other characteristics—such as job security and benefits (the nonwage component of compensation)—have historically been higher for manufacturing workers and, thus, have contributed to the view of a *manufacturing premium*. However, while separation rates for manufacturers remained significantly below those of other sectors through the 2010s, differences in nonwage compensation between manufacturing and other sectors have been narrowing in recent years.[25]

Figure B9 reports the percent difference in the monetary value of benefits between manufacturing and the private sector; these data, drawn from the Employer Cost of Employee Compensation survey, are available only since 2004 and provide some separate details for full-time and production workers.[26] The relative decline in benefits is particularly striking for full-time workers: While in the mid-2000s full-time manufacturing workers—a group that includes both production and supervisory occupations—received 20 percent higher benefits (by value) relative to full-time employees in other sectors of the economy, that premium declined to 10 percent by 2019 and continued to moved down in the following years. Production workers in manufacturing, instead, have continued to receive benefits that are 10 percent higher than those in other sectors since the mid-2000s. The trend in the

[25]Using CPS data, we find that separation rates within manufacturing are 5 pp below those of other sectors.

[26]Data on benefits are available only either for full-time status or by occupation (production vs. non-production workers), and thus, are not fully comparable for the more refined cells that we use in our wage analysis. Furthermore, data for production workers are only available since 2006Q4.

benefits for manufacturing production (full- and part-time) workers has partly offset the declines in wages and salaries still implying a 5 percent premium in total compensation relative to production workers in other sectors. All told, as we focus on full-time production workers in manufacturing, these findings still suggest mildly declining patterns in the benefits and total compensation for manufacturing workers relative to other sectors.

All told, several characteristics of manufacturing jobs have deteriorated over time relative to other sectors.

B.3 Estimating Residual Industry-Level Wage Premia

Residual industry-level wage premia are estimated from a wage equation that includes a manufacturing industry dummies, worker demographics, and other observables. In particular, we estimate the following model for each manufacturing industry,

$$\ln w_{ist} = \alpha_0 + \alpha_{1,st}\text{Mfg Ind}_{ist} + \delta X_{ist} + d_t + \varepsilon_{it},$$

where w_{ist} denotes the hourly wage for worker i in industry s at time t and Mfg Ind_{ist} is a dummy indicator for an industry within manufacturing, and $\text{Res. Premium}_{st} \equiv \alpha_{1,st}$.[27] In each regression, we include a dummy for a single manufacturing industry and drop the observations for all other manufacturing industries in order to keep the same comparison group (private sector outside of manufacturing). As in the descriptive analysis, X_{ist} includes demographics and other worker observables; specifically, we control for full-time status, union membership, gender, education—with the return to education allowed to vary across economic regions, age group, race and ethnicity, marital status, tenure—using a second-order polynomial—metropolitan statistical area dummies, and state-year fixed effects.[28] Finally, our residual premia estimates vary not only by sector but also by year.

B.4 Aggregate Effects

While the patterns in wages and unionization within the manufacturing sector and the related data availability suggest that manufacturing industries are an ideal setting to study the importance of unionization trends on the wage premium, this

[27] Specifically, $s \in \{311, 312, 313-316, 321, 322-323, 324, 325, 326, 327, 331-332, 333, 334, 335, 336, 337, 339\}$.

[28] In robustness analysis, we have also adopted a specification that allows the returns to demographic characteristics to vary over time–that is, we estimate δ_t for each demographic characteristics. The results, available upon request, are insignificantly different from our baseline.

section extends our empirical analysis to the entire private sector and evaluate whether similar dynamics occurred in sectors outside of manufacturing. Table B5 presents the estimates from our baseline model when the unit of observation is a 2-digit NAICS sector. In this setting, our model includes a more restricted set of control; in fact, we exclude controls on exports and import penetration because data on those characteristics for most service sectors are extremely limited. The first three columns include all sectors.[29] Our results continue to point to a positive correlation between the lagged unionization rate and the wage premium within sectors, but the coefficients are much less precisely estimated. Indeed, while unionization rates have been largely declining across most sectors—with few cases where rates have remained little changed—many service sectors have, instead, experienced a relative rise in their wage premium. Furthermore, the sample of union workers in most sectors outside of manufacturing appears fairly small, leading to large variability in the estimates of unionization rates from one year to the next. If limiting the analysis to the sectors that have experienced above-the-median declines in unionization over time and smoothing through the volatility in unionization rates—as shown in columns (3)-(6)—we find that the magnitude of the effect of unionization on wage premia is notably higher—suggesting that declines in unionization rates could explain around 70 percent of the decline in the wage premia even across those sectors—although significant only at the 10 percent confidence level.[30]

Among other factors, only labor productivity emerges as a significant determinant of wage differences across 2-digit NAICS sectors.

[29]Specifically, our regression includes 18 sectors: *Agriculture, Forestry, Fishing, and Hunting* (NAICS 11), *Mining* (NAICS 21), *Utilities* (NAICS 22), *Construction* (NAICS 23), *Manufacturing* (NAICS 31-33), *Wholesale Trade* (NAICS 42), *Retail Trade* (NAICS 44-45), *Transportation and Warehousing* (NAICS 48-49), *Information* (NAICS 51), *Finance* (NAICS 52), *Real Estate* (NAICS 53), *Professional, Scientific, and Technical Services* (NAICS 54), *Administrative and Support and Waste Management and Remediation Services* (NAICS 56), *Education Services* (NAICS 61), *Health Care and Social Assistance* (NAICS 62), *Arts, Entertainment, and Recreation* (NAICS 71), *Accommodation and Food Services* (NAICS 72), and *Other Services* (NAICS 81).

[30]Above-the-median declines in unionization rates occurred in the following sectors: *Agriculture, Forestry, Fishing, and Hunting* (NAICS 11), *Mining* (NAICS 21), *Utilities* (NAICS 22), *Construction* (NAICS 23), *Manufacturing* (NAICS 31-33), *Wholesale Trade* (NAICS 42), *Retail Trade* (NAICS 44-45), *Transportation and Warehousing* (NAICS 48-49), and *Information* (NAICS 51).

B.5 Additional Results

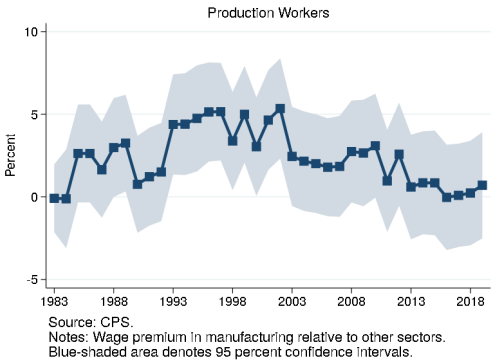


Figure B4: Manufacturing Wage Premium, Yearly, Production Occupations

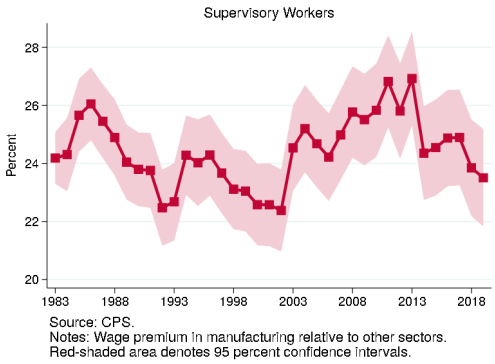


Figure B5: Manufacturing Wage Premium, Yearly, Nonproduction Occupations

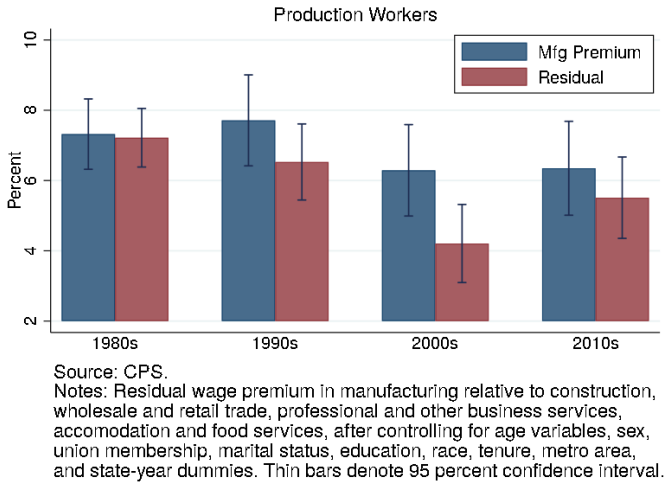


Figure B6: Manufacturing Wage Premium relative to Connected Sectors

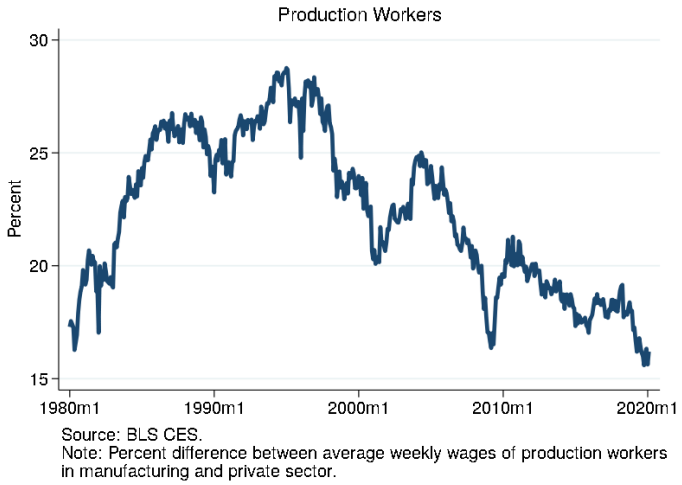


Figure B7: Manufacturing Wage Premium, Weekly Wages

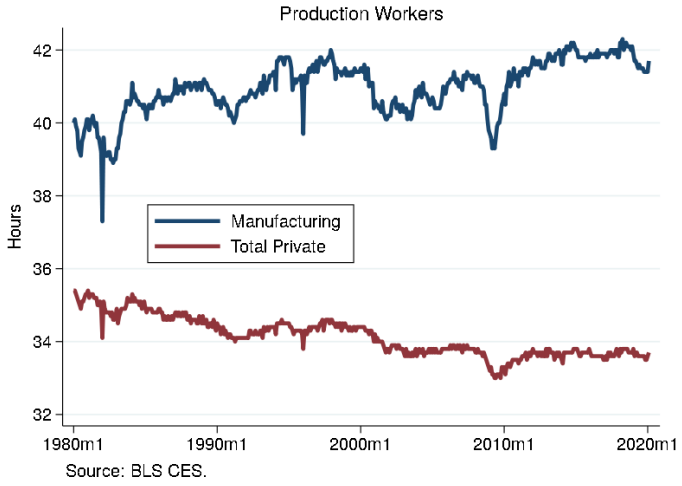


Figure B8: Average Weekly Production Worker Hours

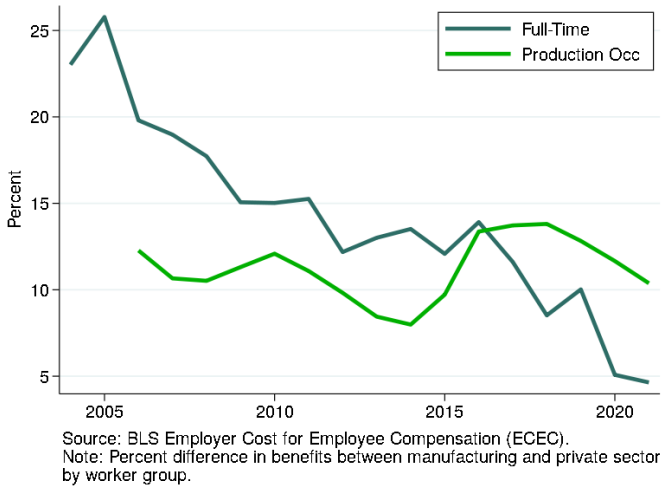


Figure B9: Manufacturing Benefit Premium by Worker Groups

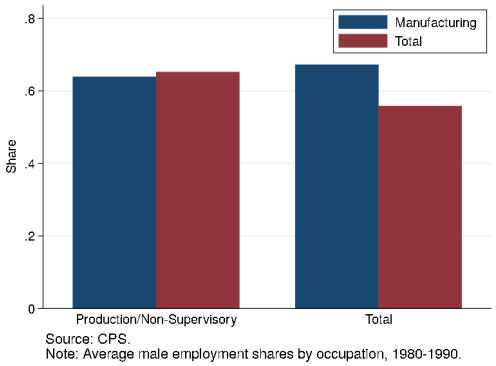


Figure B10: Employment by Gender

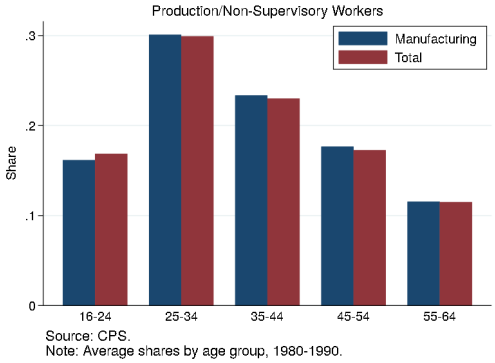


Figure B11: Production Worker Employment by Age

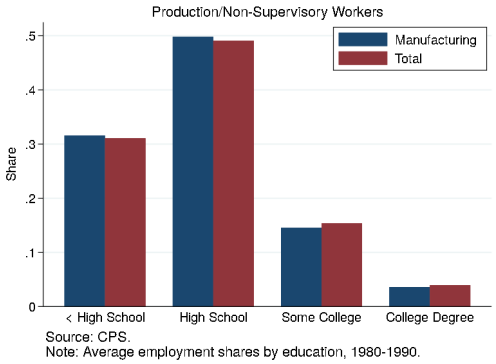


Figure B12: Production Worker Employment by Education

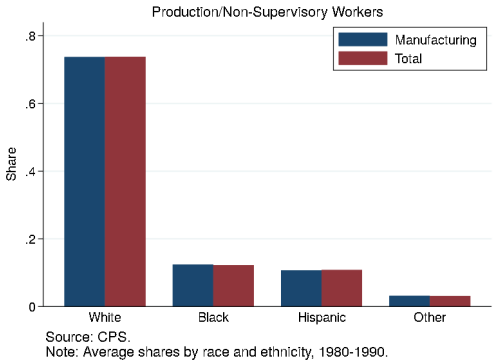


Figure B13: Production Worker Employment by Race and Ethnicity

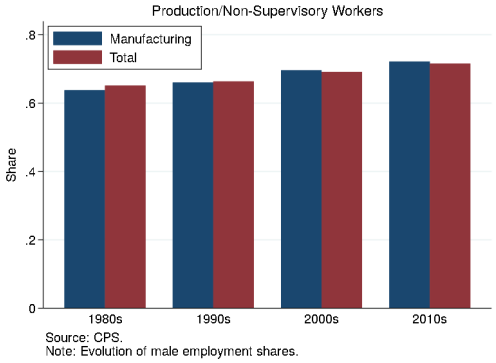


Figure B14: Evolution of Production Worker Employment by Gender

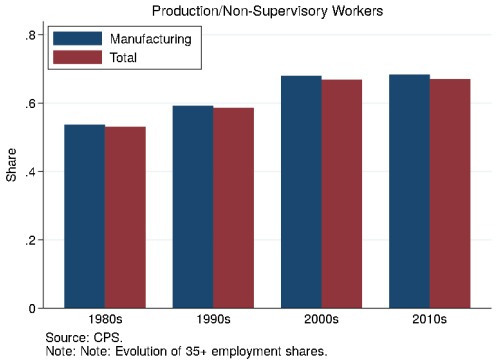


Figure B15: Evolution of Production Worker Employment by Age

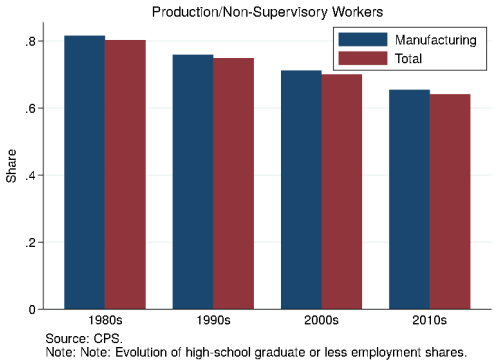


Figure B16: Evolution of Production Worker Employment by Education

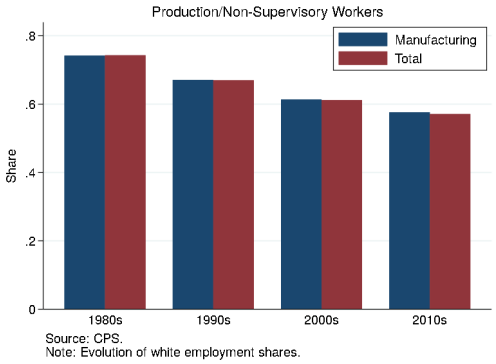
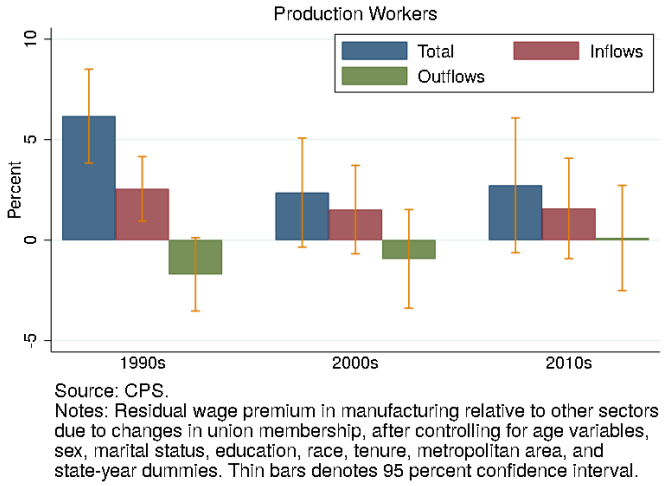


Figure B17: Evolution of Production Worker Employment by Race and Ethnicity



Source: CPS.
Notes: Residual wage premium in manufacturing relative to other sectors due to changes in union membership, after controlling for age variables, sex, marital status, education, race, tenure, metropolitan area, and state-year dummies. Thin bars denotes 95 percent confidence interval.

Figure B18: Manufacturing Premia: Decomposition of Union Inflows and Outflows

Table B1: Sector-Level Regressions: Wage Premia and 3-Period Lagged Unionization in Manufacturing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	Residual Wage Premium$_t$						
Union Share$_{t-3}$	0.202***	0.153**	0.152**	0.124**	0.143**	0.111**	0.104**
	(0.052)	(0.056)	(0.056)	(0.056)	(0.054)	(0.047)	(0.045)
Empl Share$_t$	-0.419	-0.378	-0.374	-0.282	-0.324	-0.201	-0.219
	(0.436)	(0.323)	(0.324)	(0.244)	(0.287)	(0.232)	(0.226)
Top Share$_t$		0.134	0.132	0.139	0.132	0.139	0.145
		(0.164)	(0.163)	(0.147)	(0.160)	(0.135)	(0.128)
Young Share$_t$		-0.191	-0.191	-0.136	-0.174	-0.134	-0.113
		(0.232)	(0.234)	(0.201)	(0.221)	(0.189)	(0.187)
G Lab Prod$_t$			-0.016				-0.016
			(0.051)				(0.044)
Exp/Prod$_t$				0.092			0.101*
				(0.054)			(0.051)
Imp/Abs$_t$					0.038		-0.069
					(0.058)		(0.041)
Cap Int						0.066***	0.055**
						(0.021)	(0.020)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.232	0.270	0.270	0.288	0.273	0.302	0.312
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Wage Premium: wage premium after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-3}$: unionized share of employment, 3-period lag.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

Table B2: Unionization and Union Wage Premia in Manufacturing, Additional Exporters' Controls

Variables	(1)	(2)	(3)	(4)
	Residual Union Premium$_t$			
Union Share$_{t-1}$	0.296***	0.288***	0.297***	0.290***
	(0.070)	(0.073)	(0.072)	(0.074)
Empl Share$_t$	-0.517	-0.533	-0.588	-0.567
	(0.406)	(0.396)	(0.429)	(0.452)
Top Share$_t$	-0.127	-0.108	-0.143	-0.121
	(0.278)	(0.271)	(0.278)	(0.262)
Young Share$_t$	-0.423	-0.426	-0.421	-0.425
	(0.355)	(0.354)	(0.355)	(0.357)
G Lab Prod$_t$	0.073	0.070	0.088	0.079
	(0.123)	(0.126)	(0.130)	(0.139)
Exp/Prod$_t$	0.121	0.126	0.114	0.121
	(0.075)	(0.074)	(0.072)	(0.073)
Imp/Abs$_t$	-0.201	-0.175	-0.185	-0.172
	(0.162)	(0.146)	(0.157)	(0.147)
Cap Int	-0.096**	-0.106***	-0.095**	-0.103***
	(0.041)	(0.035)	(0.041)	(0.031)
ln Num Exporters		-0.636		-0.495
		(0.763)		(1.001)
ln Avg. Export Value			0.402	0.214
			(0.519)	(0.685)
Year	y	y	y	y
Sector FE	y	y	y	y
Obs.	384	384	384	384
R^2	0.161	0.162	0.162	0.162
Number of Sectors	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Union Premium: wage premium for unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
ln Num Exporters: log number of exporters in the sector; because of data availability, before 2008, the number of exporters for each sector is the number for overall manufacturing.
ln Avg. Export Value: log average export value per exporter within the sector; because of data availability, before 2008, the export value and the number of exporters for each sector are set to the values for overall manufacturing.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1996-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

Table B3: Unionization and Non-Union Wage Premia in Manufacturing, Additional Exporters' Controls

Variables	(1)	(2)	(3)	(4)
	Residual Non-Union Premium$_t$			
Union Share$_{t-1}$	-0.036	-0.035	-0.037	-0.039
	(0.034)	(0.031)	(0.031)	(0.028)
Empl Share$_t$	0.028	0.030	0.076	0.083
	(0.222)	(0.229)	(0.220)	(0.210)
Top Share$_t$	0.278	0.276	0.289	0.296
	(0.170)	(0.172)	(0.174)	(0.183)
Young Share$_t$	-0.157	-0.157	-0.158	-0.159
	(0.179)	(0.179)	(0.181)	(0.179)
G Lab Prod$_t$	0.012	0.012	0.002	-0.001
	(0.043)	(0.044)	(0.042)	(0.049)
Exp/Prod$_t$	0.093	0.093	0.098	0.100
	(0.075)	(0.076)	(0.072)	(0.078)
Imp/Abs$_t$	-0.086	-0.089	-0.097	-0.093
	(0.066)	(0.059)	(0.057)	(0.056)
Cap Int	0.095***	0.096**	0.094**	0.092**
	(0.032)	(0.039)	(0.033)	(0.042)
ln Num Exporters		0.062		-0.155
		(0.604)		(0.784)
ln Avg. Export Value			-0.271	-0.330
			(0.163)	(0.398)
Year	y	y	y	y
Sector FE	y	y	y	y
Obs.	384	384	384	384
R^2	0.261	0.261	0.263	0.263
Number of Sectors	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Non-Union Premium: wage premium for non-unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
ln Num Exporters: log number of exporters in the sector; because of data availability, before 2008, the number of exporters for each sector is the number for overall manufacturing.
ln Avg. Export Value: log average export value per exporter within the sector; because of data availability, before 2008, the export value and the number of exporters for each sector are set to the values for overall manufacturing.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1996-2019, across 3-digit NAICS sectors within manufacturing. Standard errors are clustered at the sector level.

Table B4: Unionization and Non-Union Wage Premia in Manufacturing, Reweighted Observable Sample

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables	Residual Union Premium$_t$						
Union Share$_{t-1}$	0.119	0.056	0.049	0.013	0.045	0.022	0.004
	(0.097)	(0.070)	(0.071)	(0.065)	(0.055)	(0.065)	(0.063)
Empl Share$_t$	0.086	-0.152	-0.127	-0.028	-0.098	-0.005	-0.041
	(0.328)	(0.256)	(0.256)	(0.182)	(0.248)	(0.180)	(0.247)
Top Share$_t$		0.323	0.314	0.338*	0.323	0.333*	0.340*
		(0.197)	(0.203)	(0.171)	(0.192)	(0.164)	(0.162)
Young Share$_t$		0.052	0.055	0.141	0.072	0.111	0.151
		(0.171)	(0.179)	(0.134)	(0.148)	(0.121)	(0.118)
G Lab Prod$_t$			-0.096**				-0.106**
			(0.036)				(0.038)
Exp/Prod$_t$				0.132**			0.199**
				(0.047)			(0.077)
Imp/Abs$_t$					0.040		-0.146
					(0.065)		(0.089)
Cap Int						0.058**	0.038*
						(0.020)	(0.021)
Year	y	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y	y
Obs.	464	464	464	464	464	464	464
R^2	0.250	0.295	0.299	0.320	0.297	0.312	0.342
Number of Sectors	16	16	16	16	16	16	16

Source: Bureau of Labor Statistics and Census Bureau.
Residual Non-Union Premium: wage premium for non-unionized workers after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of manufacturing employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Exp/Prod: export share of production.
Imp/Abs: import share of domestic absorption.
Cap Int: log ratio of capital stock to shipments.
ln Num Exporters: log number of exporters in the sector; because of data availability, before 2008, the number of exporters for each sector is the number for overall manufacturing.
ln Avg. Export Value: log average export value per exporter within the sector; because of data availability, before 2008, the export value and the number of exporters for each sector are set to the values for overall manufacturing.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019, across 3-digit NAICS sectors within manufacturing, on the respondent sample only, with observation weighted by the probability of response. Standard errors are clustered at the sector level.

Table B5: Sector-Level Regressions: Wage Premia and Lagged Unionization, Economy-wide Effects

	(1)	(2)	(3)	(4)	(5)	(6)
	Residual Wage Premium$_t$					
Variables	All Sectors			Sectors with Largest Declines		
Union Share$_{t-1}$	0.075	0.066	0.048	0.717	0.759*	0.749*
	(0.110)	(0.110)	(0.102)	(0.478)	(0.394)	(0.398)
Empl Share$_t$	0.236	0.307	0.315	-0.198	-0.033	-0.047
	(0.474)	(0.712)	(0.711)	(0.430)	(0.777)	(0.755)
Top Share$_t$		-0.082	-0.097		-0.153	-0.148
		(0.372)	(0.367)		(0.462)	(0.454)
Young Share$_t$		-0.273	-0.315		0.020	-0.031
		(0.375)	(0.350)		(0.577)	(0.556)
G Lab Prod$_t$			0.168**			0.148*
			(0.075)			(0.068)
Year	y	y	y	y	y	y
Sector FE	y	y	y	y	y	y
Obs.	440	440	440	239	239	239
R^2	0.049	0.053	0.060	0.135	0.140	0.150
Number of Sectors	18	18	18	9	9	9

Source: Bureau of Labor Statistics and Census Bureau.
Residual Wage Premium: wage premium after controlling for age variables, sex, education, race, tenure, marital status, state and metropolitan area.
Union Share$_{t-1}$: unionized share of employment, lagged.
Empl Share: sector share of private employment.
Top Share: share of large (500+ employees) firms in the sector.
Young Share: share of young (less than 5 years old) firms in the sector.
G Lab Prod: labor productivity, growth rate.
Legend: *** significant at 1%, ** at 5%, * at 10%.
Notes: Sector-level FE regressions, 1990-2019. The first three columns include all 2-digit NAICS sectors; columns (3)-(6) include only 2-digit NAICS sectors that have experienced above-the-median declines in their unionization rates. Standard errors are clustered at the sector level.