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Declining Worker Power and American Economic Performance

Anna Stansbury, Harvard University
Lawrence Summers, Harvard University

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Anna Stansbury and Lawrence H. Summers
Harvard University

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Abstract:

Rising profitability and market valuations of US businesses, sluggish wage growth, and reduced unemployment and inflation, have defined the macroeconomic environment of the last generation – especially the period of recovery from the financial crisis. This paper offers a unified explanation for these phenomena based on reduced worker power, and argues that the declining worker power exploration is both most compelling on scientific grounds and is most usefully prescriptive for policy. In particular we present a variety of evidence that declining worker power explains more than increases in monopoly or monopsony power.

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Since the early 1980s in the U.S., the share of income going to labor has fallen, measures of corporate valuations like Tobin's Q have risen, average profitability has risen even as interest rates have declined, and measured markups have risen. In addition, investment appears weak, particularly relative to corporate profits and Q. A growing body of work argues that a rise in monopoly power in product markets, or monopsony power in labor markets, can account for these trends. Yet over the same time period average unemployment has fallen very substantially, even as inflation has stayed low with no sign of accelerating – suggesting a decline in the NAIRU. This evidence is difficult to reconcile with a rise in monopoly power: normal economic reasoning would suggest that an increase in monopoly power would tend to increase inflation and, by encouraging firms to restrict output, increase unemployment.

In this paper, we argue that a *decline in worker power*, not a rise in monopoly or monopsony power, nor technological developments, has been the major structural change responsible for these phenomena. This is in line with the progressive institutionalist narrative exemplified by Bivens, Mishel, and Schmitt (2018). A decline in worker power can *both* explain the changes in capital incomes that have been attributed to rising monopoly power (falling labor income share, rising corporate profitability and measured markups), *and* can also explain the fall in the steady-state rate of unemployment without a corresponding rise in inflation.

The basic framework for our analysis is an imperfectly competitive economy, featuring three types of power to varying degrees: monopoly power, monopsony power, and worker power. We use *monopoly power* to refer to firms' market power in the product market, created by a combination of monopolistic competition and restrictions to entry. Firms set their price at a markup above marginal cost, and make some 'pure profits' or rents which are not fully competed away by new entrants. These rents may arise as a result of explicit barriers to entry, regulatory or otherwise. But they may also arise from heterogeneous production technologies, with new entrants unable to perfectly replicate incumbents' products or production techniques. And in the short run, there may be rents because of the presence of fixed costs due to previously installed capital, and prices in excess of variable costs. Note that in the latter two cases the existence of rents does not necessarily signal a market imperfection which can be corrected through antitrust or competition policy. In our framework the presence of rents is therefore, to some extent, an innate feature of the structure of particular product markets.

We use *monopsony power* to refer to firms' market power in the labor market, both conventional monopsony power arising from employers' size in their local labor market, and dynamic monopsony power arising from labor market search frictions, switching costs, or different worker preferences for different employers.[2]

Finally, by *worker power* we mean workers' ability to increase their pay above the level that would prevail in the absence of such bargaining power[3] -- and therefore, to refer to workers' ability to receive a share of the rents generated by companies operating in imperfectly competitive product markets. We use worker power as synonymous with worker bargaining power, worker rent-sharing power, and insider-outsider power of the kind that was used in earlier work to explain increases in unemployment.

In this paper, we consider the implications of changes in each of these three types of power: a decline in worker power (due to a decline in unions or other forms of insider power, an increase in the ruthlessness of corporate management, or other changes in wage-setting arrangements), an increase in monopoly power, and an increase in monopsony power, in each case holding the other types of power constant. Monopoly and monopsony power, perhaps because they represent textbook market failures, have received the most attention as explanations for recent trends in the capital share, corporate profitability and valuations, and measured markups (see e.g. Barkai 2017, Gutiérrez and Philippon 2017, 2019; Eggertsson. Mehrotra and Wold 2019, Farhi and Gourio 2018, De Loecker, Eeckhout, and Unger 2019). But we show that a decline in worker power can explain these phenomena equally well. Moreover, there is substantially more *direct* evidence of the decline in worker power than there is of a rise in monopoly or monopsony power. Declining worker power can explain the *industry-level* evidence on factor shares and profitability better than changes in monopoly or monopsony power. The decline in worker power is much more consistent with the substantial reductions in *unemployment and inflationary pressures* over recent decades than a rise in monopoly or monopsony power would be. And it is possible to reconcile the decline in worker power with the apparent weakness of *investment*.

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[2] The academic literature refers to both types of power as "monopsony" power because they both generate upward-sloping labor supply curves to the firm. However, their welfare and policy implications are different, as highlighted by Manning (2003) among others. Media and policy documents on "monopsony power" are typically about conventional monopsony, arising from employer size.
[3] The competitive level in a competitive market; the monopsonistically competitive level in a frictional labor market.

In **Section I**, we examine the evidence of a decline in worker power. Most notable is the decline of the private sector union membership rate, from over one third at its peak in the 1950s to 6% today. In addition, the private sector union wage premium has declined, suggesting that unionized workers are less able to share in the rents created by firms than they were in the past.

A different type of evidence of the importance of labor power comes from the fact that even without unions, workers may receive wage premia in other settings. Workers in larger firms, and in certain industries (like manufacturing, mining, telecommunications, and utilities), receive substantial wage premia relative to observably equivalent workers in smaller firms or in other industries, and evidence suggests that these large firm wage premia and industry wage differentials to a large extent reflect rents. But workers' ability to receive rents in large firms, or in high-rent industries, appears to have declined. Using the CPS, we show that since the 1980s there has been a decline of about one third in the large firm wage premium, and a decline of about one third in the dispersion of industry wage premia.

A further source of evidence that worker power has been attenuated is the apparent decline in the relationship between workers' pay and the profitability, revenues, and/or product market power of their firm or industry. In a classically competitive labor market, workers' pay is determined by the marginal product of labor within their labor market, and there should be no correlation between a worker's pay and their firm's or industry's performance. In practice however, there is a positive relationship (suggesting a degree of rent-sharing). We show that the strength of this relationship has diminished over time: in manufacturing industries, the degree to which increases in revenue productivity translate into higher pay has declined since the 1960s,[4] and we find suggestive evidence of a broad-based weakening in the relationship between industrial concentration and pay across sectors.

Three broad shifts are behind this decline in worker power. First, institutional changes, as the policy environment has become less supportive of worker power by reducing the incidence of

[4] Notice that this is a different issue than we investigate in Stansbury and Summers (2019). In Stansbury and Summers (2019), we investigate the degree to which there is a relationship between changes in productivity and changes in compensation at the level of the *whole economy*. We find a close to one-for-one relationship between changes in productivity and pay at the level of the whole economy over the postwar period, which has not attenuated since the 1970s/80s. This finding could be consistent either with competitive or with imperfectly competitive labor markets, and is not inconsistent with our finding that the relationship between productivity and pay at the *industry level* has weakened (which indicates a decline in the degree of rent-sharing within different industries).

unionism and the credibility of unionism or other organized labor threats, and as the real value of the minimum wage has fallen. Second, changes within firms, as the increase in shareholder power and shareholder activism has led to pressures on companies to cut labor costs, resulting in wage reductions within firms and the "fissuring" of the workplace as companies increasingly outsource and subcontract labor (Weil 2014). And third, changes in economic conditions, as increased competition for labor from technology or from low-wage countries has reduced workers' relative bargaining power.

So, a large body of evidence points to a decline in worker power. But how big is this decline, in macroeconomic terms? In **Section II**, we use our estimates of the union wage premium, large firm wage premium, and industry wage premia to quantify the magnitude of the decline in total rents going to labor since the 1980s. We find that labor rents declined by about half, from 11% of net value added in the nonfinancial corporate business sector in 1987 to 6% in 2016. This is primarily due to changes that have taken place within industries, rather than changes that have taken place across industries as employment has shifted from manufacturing to services.

In **Section III**, we show that at the aggregate level, trends in factor shares, profitability, Tobin's Q, and measured markups, can be explained equally well by rising monopoly power, rising monopsony power, or falling worker power – but that at the industry level, falling worker power has substantially more explanatory power. We begin by replicating the recent decomposition exercise of Farhi and Gourio (2018). They suggest that trends in factor shares, the profitability of capital, the investment-capital ratio, the risk-free rate, and other macroeconomic variables, can be explained by an increase in average markups – alongside rising risk premia and increased unmeasured intangibles. In this framework, they estimate that average markups in the U.S. rose from 7% to 15% over the 1980s to the 2000s. While their framework makes it clear that there are changes that cannot be explained by a perfectly competitive model, we note that there is essentially no way in their framework to distinguish between the rise in markups they posit (indicating a rise in monopoly and/or monopsony power), and a fall in worker power. Modifying their decomposition, we show that our hypothesis of declining worker power – holding markups constant – can explain the macro facts in the model equally well.

Next, we take our measure of the magnitude of lost labor rents (calculated in section II from union wage premia, large firm wage premia, and industry wage premia) to the aggregate data on the nonfinancial corporate sector. We show that our estimate of the decline in labor rents – at roughly 5% of nonfinancial corporate sector value added – is big enough to explain the *entire* decline in the net labor share from 1987 until 2016.

We then compare trends in labor rents, labor shares, profitability, and measures of Q for 53 industries (at roughly the NAICS 3-digit level). We show that industries with larger declines in labor rents over 1987-2016 had much larger declines in their labor shares and increases in their average profitability. In horserace regressions, industry-level labor rents have substantially more power to explain changes in labor shares, profitability, and Q, than measures of product market concentration. And we note that the fall in the labor share has been concentrated in manufacturing, which – given increasing globalization – seems unlikely to be a sector with large increases in market power.

In **Section IV**, we focus on another highly salient aspect of the macro experience of recent decades: the substantial decline in both average unemployment and average inflation. The unemployment rate has been below 5%, the level previously thought to have been the NAIRU, for four years (and was also below 5% from 1997-2001 and from 2005-2008); it has been below 4% since the spring of 2018, at levels not reached since the 1960s. At the same time, inflation has been low and has shown little sign of accelerating. These facts suggest that there has been a quite substantial decline in the NAIRU, and/or a flattening of the Phillips Curve. An increase in monopoly power offers no explanation for this phenomenon, and certainly does not predict a decline in unemployment or inflation. If anything, it has usually been thought to act in the other direction: rising monopoly power would tend to predict rising prices (as firms transition to a new equilibrium of higher markups and higher prices) alongside a rise in unemployment (as the rise in monopoly power leads to a restriction in output).

In contrast, almost all models of declining worker power predict a fall in the NAIRU, as the decline in insider power increases firms' hiring, and as wait unemployment falls. In keeping with these predictions, we show that industries with bigger falls in worker power over the last four decades saw bigger falls in their unemployment rate and bigger increases in labor market tightness – and that industries with bigger increases in concentration, if anything, saw increasing unemployment rates. Using a number of back-of-the-envelope calculations we show that the decline in worker power is, under plausible assumptions, big enough to explain a large fraction of the decline in the NAIRU.

In **Section V**, we assess the evidence on investment. The weakness of investment relative to fundamentals has been a major motivator of the monopoly power argument, since rising monopoly power would predict falling investment relative to profitability, fixed assets, and value added. On the other hand, the predictions of declining worker power for investment are ambiguous. First, we note that declining worker power, by reducing labor costs, could lead to a reduction in investment as firms have less incentive to substitute capital for labor. Second, we show that in an efficient bargain framework (where the decline in worker power has no effect on investment), falling worker power can fully explain the apparent weakness of investment relative to corporate profits. While investment relative to net operating surplus has declined, investment relative to net *total* profits generated by firms – the sum of profits paid to capital and profits paid to labor (labor rents) – has stayed constant since the 1980s. Third, we note that there has been a substantial decline in the relative price of investment goods in recent decades. Thus, while there has been a decline in net investment relative to net value added in *nominal terms*, there has been no decline in net *real* investment relative to net real value added in the nonfinancial corporate sector. Fourth, we note that Crouzet and Eberly (2019, 2020) show that a rise in intangible investment can account for much of the decline in investment relative to fixed assets without invoking a rise in monopoly power.

While we have highlighted the strengths of the evidence for the worker power hypothesis, we also note that there are weaknesses in the direct evidence for the rise of monopoly and monopsony power, principally changes in product market and labor market concentration. This suggests that these hypotheses can be discounted somewhat – in light of the fact that our worker power hypothesis can explain the primary facts they were adduced to explain equally well.

Taken together, we believe that the evidence we have presented in this paper suggests that the decline in worker power is one of the most important structural changes to have taken place in the U.S. economy in recent decades. It can explain changes in capital incomes and profitability equally convincingly or more convincingly than a rise in monopoly power – including explaining the entirety of the change in the functional distribution of income between labor and capital in the U.S. over recent decades – and is far more consistent with the fall in the

NAIRU. To understand the changes in the U.S. economy over recent decades, it is vital to understand changes in power – but the most important changes to understand are changes in the power of workers, not of firms.

This raises important challenges for policy. If a major feature of the U.S. economy were a rise in monopoly or monopsony power, reducing restrictiveness and increasing competition in markets could improve *both* efficiency and equity. But if, as we argue, the major explanation of the decline in the labor share and rise in corporate profitability is a decline in worker power, then measures to restrict monopoly or monopsony power may do little to reverse this trend.

More profoundly, if markets are innately characterized by some degree of firm monopoly power, imperfect competition, and rents, then completely eliminating market power may be neither desirable nor feasible. Instead, the presence of countervailing power for workers is likely necessary to enable workers to share in those rents. This would suggest significantly greater support for labor unions or other collective bargaining institutions. It would also strengthen the arguments for companies to focus less on the maximization of shareholder value and more on the maximization of stakeholder value.

I. Evidence of declining rent-sharing in U.S. labor markets

Why do firms share rents with workers? There are three groups of reasons. First, workers may be able to lay claim to rents directly, either as a result of explicit bargaining power through unions, implicit bargaining power through the threat of union organizing (Freeman and Medoff 1984), or another ability to wield power within the firm. Second, some firms may be run partly in the interests of workers as stakeholders, rather than solely in the interests of shareholders. Third, it may be in firms' interests to share rents with workers for efficiency wage reasons – where workers are paid an above-market wage to incentivize effort (e.g. Yellen 1984) – or to maintain morale (perhaps as a result of fairness norms, as in Akerlof and Yellen (1986)).[5] Efficiency wages may also play a role in reducing the cost to firms of paying above-market wages: if

[5] The rents captured by workers may be 'true' rents or pure profits generated by a firm's monopolistic power in the product market -- or, they may be 'quasi' rents generated by sunk investments (Grout 1984, Caballero and Hammour 2005), or by the cost of recruiting new workers either in a frictional labor market or in a setting where job-specific training is required (e.g. Mortensen and Pissarides 1999, Manning 2003).

worker productivity increases when wages rise, then some of the extra cost of sharing rents with workers is offset by productivity benefits (Bulow and Summers 1986, Summers 1988).

Evidence from a wide range of sources has demonstrated the existence of rent-sharing in the U.S. labor market. Unionized workers, workers at large firms, and workers in specific industries receive substantial wage premia relative to observably equivalent workers. Similar wage premia also exist for workers who switch jobs, suggesting they do not reflect unobserved worker characteristics. These wage premia tend to be positively correlated with indicators of rents at the firm and industry level, including profits and concentration (suggestive of rent-sharing, as the existence of rents would imply higher wage premia), and inversely correlated with quit rates (also suggestive of rent-sharing, as rents would make workers reluctant to leave their jobs). In addition, there is evidence of sizeable passthrough of industry- or firm-level shocks to productivity and profits into workers' compensation. And there is a large body of work documenting persistent wage losses for displaced workers, which partly reflect lost rents.[6]

Over the last four decades, however, the U.S. has experienced an institutional and economic context where a number of forces have likely reduced labor rents, particularly for lower-wage workers. Most obvious has been the decline in unionization and union bargaining power. In addition, the increase in shareholder activism and the rise of the shareholder value maximization doctrine increased the power of shareholders relative to managers and workers, likely increasing pressure on firms to cut labor costs and, in particular, to redistribute rents from workers to shareholders.[7] The increased `fissuring' of the workplace, with outsourcing of non-core business functions, may be an outgrowth of this phenomenon (Weil 2014). In the rest of this section, we present a range of empirical evidence of this decline in rent-sharing.

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[6] We review some of the evidence on union, firm size, and industry wage premia, and on the passthrough of productivity and profits to pay, in Sections I.A. through I.E. Evidence that exogenously displaced workers suffer large and persistent earnings losses can be found in Jacobson, Lalonde, and Sullivan (1993), Von Wachter, Song, and Manchester (2011), Schmieder and Von Wachter (2010), and Davis and Von Wachter (2012), and Lachowska, Mas, and Woodbury (2018), among others.

[7] Some evidence of this can be found in Davis, Haltiwanger, Handley, Lipsius, Lerner, and Miranda (2019), who are the first to conduct a large-scale empirical study of the effects of private equity buyouts on firms. Consistent with private equity buyouts reducing rents to workers, they find that target firms, pre-buyout, had wage premia (relative to controls) of roughly 2.5%, and that average earnings per worker fell by 1.7% on average after buyouts -- largely erasing the pre-buyout wage premium. And consistent with an increase in outsourcing of labor as a result of active shareholder pressure, they also find a decline in employment on average of 13% after buyouts of publicly-listed firms (but note that they find an increase in employment after buyouts of privately-held firms).

I.A. Declining unionization and union wage premia

Unions are the clearest-cut example of workers having rent-sharing power. Unionized workers receive significantly higher wages than observationally equivalent nonunion workers, with most estimates of the private sector union wage premium between 15% and 25% (Rosenfeld 2014). But the ability of workers to share in rents through unions has declined substantially in recent decades. Private sector union membership slowly declined from a peak of around one third in the 1950s to 24% in 1973, and then declined more rapidly, reaching 6% in 2019 (Fig.1, see also Rosenfeld 2014, Hirsch and Macpherson 2019). In addition, estimates of the union wage premium suggest that it has declined by about 6 log points (around 29%) since the early 1980s.[8] The decline in unionization rates and union bargaining power has been driven by a combination of institutional factors which have weakened labor law and its enforcement, and economic factors which have increased the elasticity of demand for labor and so weakened workers' ability to bargain for higher wages. Institutional factors included the breakdown of pattern bargaining in the 1980s, the expansion of the number of right-to-work states, and decreasing political support for and enforcement of labor laws. Economic factors that reduced worker bargaining power included increased import competition for manufactured goods and deregulation of transportation and telecoms, both of which reduced firms' abilities to compete while paying high wages (Peoples 1998, Rosenfeld 2014, Levy and Temin 2007).

When union coverage was high, the impact of unions on workers' ability to receive rents likely extended beyond the workers who were unionized. In industries where pattern bargaining was common, non-unionized firms would match the wage increases in union contracts (with the most famous example being the 1950 "Treaty of Detroit"). In addition, evidence suggests that the "threat effect" of unionization of workers in nonunion firms likely incentivized firms to offer better wages and benefits than they otherwise would have (e.g. Leicht 1989, Farber 2005, Denice and Rosenfeld 2018).[9] And alongside the decline in institutional bargaining power may have come a decline in norms supporting equity in pay structures (Western and Rosenfeld 2011).

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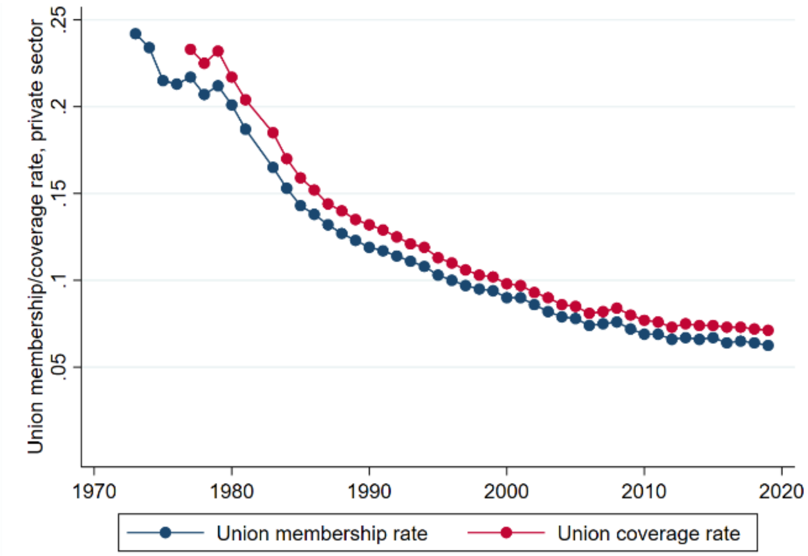
[8] We estimate the union log wage premium for private sector workers in the CPS-ORG, regressing the log hourly wage on a dummy variable for union membership or coverage and controls for education, demographics, geography, occupation, and industry. Our estimate of the union log wage premium is 21 log points in 1982, falling to 15 log points by 2019. More details are available in Appendix Section A.1.

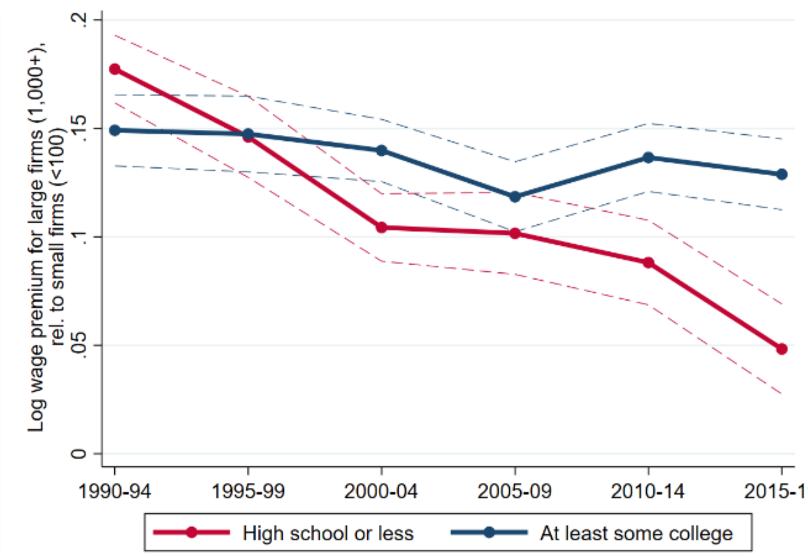
[9] Union power may also raise non-union wages in frictional labor markets as employers raise wages to retain the ability to hire easily (Manning 2003). On the other hand, unions may have negative spillovers on the wages of

Figure 1: Union membership and coverage rates, private sector



Note: Union membership and coverage rate are from UnionStats.com, calculated from the CPS by Hirsch and Macpherson.

Figure 2: Large firm wage effect by education, private sector



Notes: Large firm wage premium is calculated as the log wage fixed effect for workers at large firms (1,000+ workers) relative to small firms (less than 100 workers), estimated with five-yearly (pooled) log wage regressions from the CPS ASEC over 1990-2019, controlling for education, demographics, geography, occupation, industry, and union status. More details on estimation procedures are in the text and in Appendix section A2
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nonunion workers if the union raises wages but restricts employment in the union sector, leading more workers to work in the nonunion sector than would otherwise have been the case (e.g. Oswald 1982). Overall, though, evidence suggests a positive correlation between industry and/or locality unionization rates and non-union wages (Farber 2005, Leicht 1989, Neumark and Wachter 1995, Denice and Rosenfeld 2018).

I.B. Declining large firm wage premium

A large body of literature across industries, time periods, and countries, shows that large firms pay workers higher wages than their otherwise equivalent counterparts at smaller firms.[10] While this firm size effect could be driven by a number of different causes – workers with higher unobserved productivity, compensating differentials, a greater "threat effect" of unionization, a greater propensity to pay efficiency wages, a decision to pay higher wages to fill vacancies faster – several studies have found that even when attempting to account for these possibilities a large unexplained firm size premium often remains (Brown and Medoff 1989). This implies that some substantial portion of the large firm wage premium reflects rents to labor.[11]

Over recent decades, however, the large firm wage premium has fallen (Hollister 2004, Even and Macpherson 2014, Cobb and Lin 2017, Song et al 2019).[12] Estimating the large firm wage effect for observably equivalent private sector workers over 1990-2019 from the CPS-ASEC, we find a substantial decline in the large firm wage premium, concentrated on workers without a college education (Fig. 2).[13] This decline may indicate a decline in rent-sharing. (To interpret it as something *other than* a decline in rent-sharing, there must have been either a substantial reduction in compensating differentials (small firms become relatively worse to work at over the period), or a reduction in the sorting of highly productive workers into large firms.) Note that if large firms' monopoly power had systematically increased over recent decades without any change in worker rent-sharing power, the large firm wage premium would have been expected to increase rather than decrease.

I.C. Declining variance of industry wage differentials

A large body of work on the inter-industry wage structure, over several decades, has found substantial and persistent dispersion of wages across industries for observably similar workers.

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[10] See e.g. Brown and Medoff (1989), Bulow and Summers (1986), Freeman and Medoff (1984). The firm size wage effect is large relative to incomes: for example, Davis and Haltiwanger (1996) show that mean wage differentials between establishments of different sizes accounted for about 1/4 of total between-plant wage variation.

[11] And is consistent with the fact that large firms will be more likely to have product market power – and so, rents.

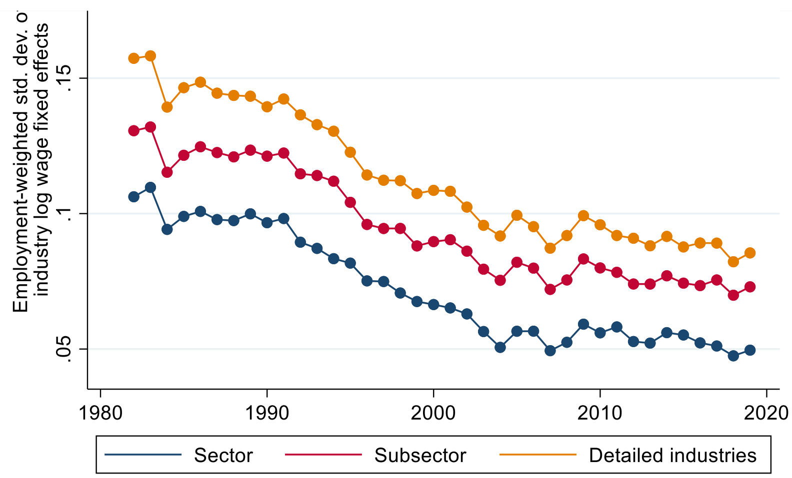
[12] The firm size wage effect rose over the 1960s and 1970s (Davis and Haltiwanger 1991, Brown and Medoff 1979).

[13] We run log wage regressions on dummies for firm size and various demographic, occupation, and location controls. We obtain estimated for the firm size wage effects for workers at firms of 1000+, 500-999, and 100-499 workers, relative to firms with <100 workers. We regress on 5-year pooled samples as the sample size is too small for precise annual estimates. For our full sample of workers, we find that workers at firms with 500+ employees earned 16 log points more than observably equivalent workers in firms with less than 100 workers in 1990-94, but only 10 log points more in 2015-19 See Appendix A.2. for more details.

Evidence suggests that industry wage differentials to a large extent reflect rent-sharing with workers: the wage differentials persist even when accounting for worker productivity differences and compensating differentials, and are correlated with industry-level profitability, concentration, and capital-labor ratios (see for example Dickens and Katz 1987, Krueger and Summers 1988, Katz and Summers 1989, Gibbons and Katz 1992, Abowd et al 2012).[14]

Using the CPS-ORG, we estimate industry wage differentials for private sector workers in each year over 1982-2019. We regress log wages on a set of industry dummies at different levels of industrial aggregation (9 sectors, 77 subsectors, or 250 detailed industries) alongside controls for education, demographics, geography, occupation, and union membership/coverage.[15] This gives us a set of estimated wage fixed effects for each industry. If rent-sharing with labor has declined in recent decades, we would expect the variance of industry wage premia to have declined. As Fig. 3 shows, this is the case, at all levels of industry aggregation.[16]

Figure 3: Standard deviation of industry wage effects



Notes: Industry fixed effects are calculated as the fixed effect on industry dummies in annual log wage regressions from the CPS-ORG over 1982-2019, with demographic, location, and occupation controls. "Sector" refers to 14 aggregated SIC sectors, "Subsector" to 77 industries (roughly NAICS 3-digit level), and "Detailed industries" to 250 SIC industries. More details on estimation procedures are in the text and in Appendix section A3.

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[14] Further evidence that these premia indicated the presence of rents included the fact that wage premia for workers in different occupations in the same industry were highly correlated, and that industries with higher wage premia tended to have lower quit rates, and higher ratios of applicants to job openings (as shown in the previously mentioned studies, as well as Slichter (1950), Ulman (1965) and Holzer, Katz, and Krueger (1991)). More recently, Abowd et al (2012) found that industry wage differentials were strongly correlated with "firm effects" in an AKM decomposition, strengthening the case that they are at least partly a function of differential rents by industry.

[15] Sectors correspond to SIC divisions, subsectors to BEA industry codes (roughly, NAICS 3-digit), and detailed industries to SIC industries. More details on estimation, including full list of controls, in Appendix Section A.3.

[16] Kim and Sakamoto (2008) also find evidence of a decline in inter-industry wage dispersion using the CPS-ORG, albeit with a different methodology.

This decline could be a result of falling rent-sharing. But it could alternatively be a result of changing compensating differentials (if high-wage industries used to have worse amenities, but have improved over time), and/or less sorting of highly productive workers into high-wage industries. We can test the sorting explanation by estimating industry fixed effects using the longitudinal component of the CPS, which enables us to control for worker-level unobserved productivity. The proportional decline in the variance of industry fixed effects is as large or larger, suggesting that the decline we observe is *not* driven by a change in the degree of sorting of highly productive workers into high-wage industries.[17,18,19]

I.D. Declining variance of firm-specific wage effects

The wage distribution is characterized by substantial dispersion of wages at the level of individual firms and establishments, beyond the variation that can be explained by industry, union status, and firm size.[20] A large literature starting with Abowd, Kramarz, and Margolis (1999) ("AKM") uses matched employer-employee data to decompose the variance of wages into firm effects, worker effects, and the covariance of the two. The firm effects indicate the firm-specific pay premium, holding worker "quality" constant: this firm effect can therefore be interpreted as some combination of rent-sharing and compensating differentials (Sorkin 2018, Card, Cardoso, Heining, and Kline 2018). Studies using the AKM method on U.S. data have found a substantial role for firm effects in explaining the variance of wages.[21]

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[17] We also show that there is a correlation of 0.89 between the longitudinal estimates and the cross-sectional estimates of industry fixed effects at the sector level. More details are available in Appendix Section A.4.

[18] Note also that even to the extent that industry fixed effects *do* represent rents, a decline in the dispersion of industry fixed effects could be a result of a decline in the dispersion of industry-level rents, holding constant the degree of rent-sharing. This does not appear to be the case: the cross-industry dispersion of various measures of profitability has either stayed constant or risen over the period. Another possibility is that the fall in the employment-weighted standard deviation of industry fixed effects simply represents a reallocation of workers from high-rent to low-rent industries. This also does not appear to be driving the result: the non-employment-weighted standard deviation of industry fixed effects has fallen by roughly the same amount as the employment-weighted standard deviation. For more details, see Appendix Sections A.6. and A.7.

[19] One further indication that our measure of industry labor rents *is* picking up rents: As noted by Katz and Summers (1988) industries with higher wage premia should see lower quit rates. Using JOLTS data (over 2000-2019), we find that industries with higher wage premia have substantially and significantly lower quit rates. Note, however, that a decline in labor rent sharing *does not* imply that there should have been a rise in quit rates over the period, because the effect of labor rents on quits should be relative not absolute: when the wage a worker can earn is very different at different firms, workers in low wage industries should quit often to try to find a high wage job, whereas workers in high wage industries should quit only rarely, but when the wage a worker can earn becomes more similar across different firms, the quit rates for workers in lower and higher wage industries should converge.

[20] See, for example, Groshen (1991), and Davis and Haltiwanger (1991).

[21] Estimates suggest that firm effects and the covariance of worker and firm effects can explain 17-20% of the variance of wages (Abowd, Lengermann, and McKinney 2003, Abowd, McKinney, and Zhao 2017, Song et al

Most implementations of the AKM method on U.S. data focus on single, relatively short time periods, but two papers – Song et al (2019), estimated on data for the entire U.S., and Lachowska et al (2020), estimated on data for Washington state –suggest that the dispersion of firm effects has declined somewhat over recent decades.[22,23] Note that if an increase in monopoly power had caused total rents to increase, holding constant the initial degree of rent-sharing with workers, one might have expected firm effects to become more dispersed (if rents increased more for already high-rent firms). So, this evidence is more consistent with a decline in rent-sharing than an increase in rents for high-rent firms.

I.E. Decreased passthrough of productivity and profit shocks

A different source of evidence that worker power has been attenuated is the apparent decline in the relationship between workers' pay and the profitability, revenues, and/or product market power of their firm or industry. A perfectly competitive labor market would imply no relationship between firm- or industry-level performance and workers' pay, but in practice there is substantial evidence that firms and industries with higher productivity or profitability do pay more to observably equivalent workers (as reviewed in Card et al 2018).[24]

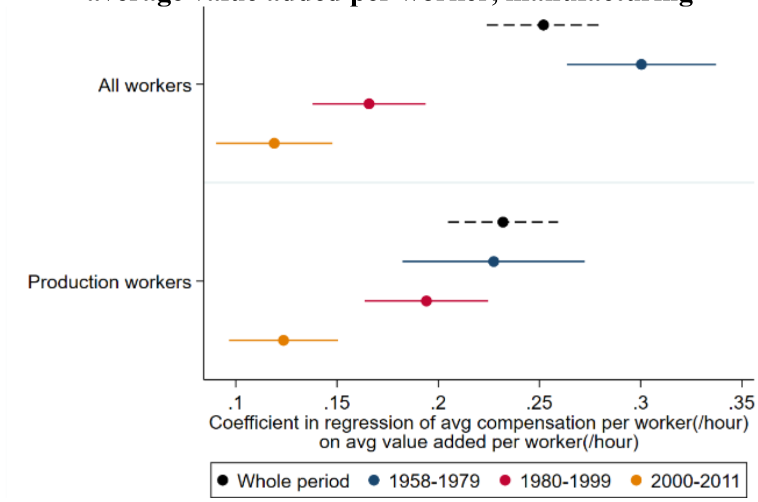
2019). Sorkin (2018) estimates that 30% of the variance of firm effects can be explained by firm-specific rents (and therefore that firm rents make up a little under 7% of the overall variance of U.S. wages).

[22] Song et al (2019) find that over 1980-87 to 2007-13 there was a decline of about 3.5% in the variance of firm fixed effects. There are two reasons to believe that this is an underestimate of the true secular decline in the variance of firm fixed effects over the period. First, it is calculated on annual earnings not hourly wages, and so does not directly estimate the degree to which the dispersion of firm effects has declined for a given quantity of work. Lachowska et al (2020) use administrative data on both hourly wages and annual earnings from Washington State, and find a much larger decline of 10-14% in the variance of firm effects for *hourly wages* over a shorter time period, 2002-2014 (while they find a comparable decline to that identified in Song et al (2019) for annual earnings). Second, Lachowska et al (2020) find large countercyclicality in the variance of firm fixed effects, and their estimates suggest that the variance of firm fixed effects will have been particularly high during the Great Recession and early parts of the recovery – which is the exact period, 2007-2013, used for the endpoint of the comparison in Song et al (2019).

[23] This decline in the dispersion of firm effects may appear to be in conflict with the empirical fact that there has been an increase in the dispersion of average firm-level wages (Barth et al 2016). In fact, these two trends can be reconciled. Song et al (2019), Lachowska et al (2020), and others find that the increase in the variance of firm-level average wages is entirely due to an increase in the *sorting* of high-wage workers into high-wage firms – and not an increase in the dispersion of the firm *premia* paid to equivalent workers. As they note, this would be consistent with an increasing skew in the distribution of rents, with lower-wage workers now less likely to work at the types of firms which generate high rents.

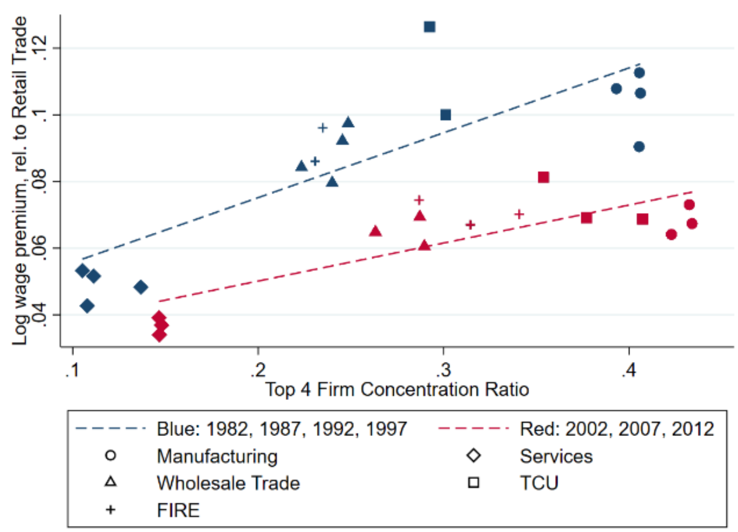
[24] Blanchflower, Oswald, and Sanfey (1996) found an elasticity of 0.01-0.06 for the transmission of industry-level profits per worker into wages in U.S. manufacturing industries. Estevao and Tevlin (2003) also studied U.S. manufacturing industries, instrumenting for shocks to industry demand using increases in output of large downstream sectors: they found a rent-sharing elasticity of 0.29 for value added per worker and 0.14 for profits per worker (as reported in Card et al 2018). Barth, Bryson, Davis, and Freeman (2016) use the Longitudinal Business Database, instrumenting for demand shocks using output of the same industry in other regions, and find an elasticity of wages with respect to sales per worker of 0.16. Kline, Petkova, Williams, and Zidar (2019) use the granting of patents to firms as an instrument for a profit/rent shock, and estimate an average rent-sharing parameter of 0.3, but

Figure 4: NAICS 6-digit industry-level regression of average compensation per worker on average value added per worker, manufacturing



Notes: Coefficients in NBER CES Manufacturing industry regressions: 1958-2011. "All workers" regresses the change in log compensation per employee on the change in log value added per employee, 3-year moving averages (following the specification in Stansbury and Summers 2019). "Production workers" regresses the change in log average hourly production worker pay on the change in log value added per production worker hour, 3-year moving averages. Regressions have NAICS 6-digit industry and year fixed effects. Standard errors are clustered at the NAICS 6-digit industry level. Dot represents point estimate and line represents 95% confidence interval. Each line/dot is from a separate regression.

Figure 5: Sector-level relationship between concentration and wage premium



Notes: Each point is the sector average log wage premium relative to Retail Trade, calculated from the CPS-ORG, plotted against the average top 4 sales concentration ratio in the sub-industries of each major sector, calculated from Economic Census data by Autor et al (2019).

concentrated on workers in the top half of the income distribution (particularly inventors and company officers). Lamadon, Mogstad, and Setzler (2019) find that a 10% increase in firm value added results in 1.4% higher wages.

There is some evidence to suggest, however, that this relationship has weakened over time. Using the NBER CES Manufacturing data, which covers 473 NAICS 6-digit manufacturing industries over 1958-2011, we regress the annual change in log value added per worker on the annual change in log compensation per worker.[25] We find evidence of rent-sharing over the period: in years with 10 log points higher value added per worker, average pay in a given industry was 2.5 log points higher. But the strength of that relationship fell by about half from the 1960s-70s to the present (Fig 4.). In similar work, Bell, Bukowski, and Machin (2019) find a declining relationship between profits per worker and compensation per worker in U.S. manufacturing industries, also using the NBER CES data. Benmelech, Bergman, and Kim (2019) report a decline in the relationship between output per hour and compensation per hour at the plant level in U.S. manufacturing over 1978-2007. Together, this evidence is strongly suggestive of a decline in rent-sharing in U.S. manufacturing: workers in firms and industries with higher revenue productivity and higher profits appear to share in this less than they used to.

We also examine evidence on the relationship between product market concentration and wages. At the very aggregated sector level, there is a positive relationship between average product market concentration and the sector wage premium (as estimated in section I.C.)[26] – but the strength of that relationship has declined from 1982-1997 to 2002-2012 (Fig. 5).[27] In regressions of product market concentration on wage premia at the level of 55 industries (NAICS 3-digit), the general trend suggests a weakening of the relationship between average industry concentration and the wage premium, but the change over time is not statistically significant.[28,29]

[25] Following Stansbury and Summers (2019) we use a 3-year moving average of each variable in the regression. Our results are robust to the choice of moving average length. Note that NAICS 6-digit manufacturing industries are very narrowly defined: for example, NAICS 337110 "Wood kitchen cabinet and countertop manufacturing".

[26] The sector wage premium is calculated as half of the sector log wage fixed effect which we estimate from the CPS-ORG as detailed in Section I.C. Average concentration in the sector is defined as the (sales-weighted) average Top 4 Sales Concentration Ratio across SIC industries within each sector, 5-yearly from 1982 to 2012. The concentration data is calculated by Autor et al (2019) from Census data; we obtain the numbers from their Figure 4.

[27] Note, though, that if product market concentration became a noisier measure of monopoly power over time, we might expect to see a weakening relationship between concentration and pay *even if* the underlying relationship between monopoly power and pay remained constant.

[28] In these regressions we use data on concentration from Covarrubias, Gutiérrez, and Philippon (2019), calculated from Compustat data for 1982-2016 and from Census data for 1997, 2002, 2007, and 2012. Running a similar regression for the NBER CES manufacturing industries (NAICS 6-digit level) over 1997-2012 – regressing the level of top 20 sales concentration (import adjusted) on log average compensation per worker – we find that the coefficient also falls, but the change is once again not statistically significant.

[29] Note that if there had been a major rise in aggregate monopoly power over this period, we might have expected the industry wage premium increase by more in industries which experienced larger rises in concentration. While there is a positive correlation between changes in industry concentration and industry wage premia over 1988-2016

I.F. Increased use of domestic outsourcing

A final indicator that rent-sharing has declined is the increase in the use of domestic outsourcing of business functions and business services, the "fissuring" of the workplace, and the decline in internal labor markets (see Weil 2014, Bernhardt, Batt, Houseman, and Applebaum 2016, and Bidwell, Briscoe, Fernandez-Mateo, and Sterling 2013). If workers' ability to share in firm-level rents depends on them being employed within the firm, then one would expect that outsourcing would lead to wage decreases, particularly for workers at high-rent firms.[30] There is increasing evidence that outsourced workers in food, cleaning, security, and logistics receive wage penalties, and that this is related to a loss of rents.[31] While the scale of outsourcing and fissuring is difficult to measure with existing data (Bernhardt et al 2016), evidence suggests that it is widespread: for example, the share of workers in security, cleaning, and logistics occupations who work in business services industries rose from less than 10% in 1970 to 35%, 25%, and 20% respectively in 2015 (Dorn, Schmieder, and Spletzer 2018).

II. Estimating the magnitude of the decline in labor rents

The evidence in Section I paints a picture of declining rent-sharing with labor – but was it big enough to explain the macro trends we have seen? To understand the magnitude of the decline in rent-sharing with labor, we use a back-of-the-envelope approach to estimate the total quantity of labor rents and their decline over time. We estimate total labor rents for each year from 1987-2016,[32] for the non-financial corporate sector, as follows:

$$\textit{Total labor rents} = \textit{Industry rents} + \textit{Union rents} + \textit{Firm size rents}$$

(industries with bigger increases in concentration saw smaller falls in their wage premia), it is extremely small in magnitude and not statistically significant by any conventional levels.

[30] For example, if workers' rent-sharing ability depends on unionization or the threat of unionization, or if it depends on a sense of pay equity or internal labor markets within the firm

[31] Dube and Kaplan (2010) find wage penalties for outsourced janitors and guards in the CPS, and show that industries with higher initial wage premia were more likely to outsource, suggesting that the outsourcing may have been a way to reduce rents to workers. Dorn, Schmieder, and Spletzer (2018) use administrative data to show preliminary evidence of wage penalties of around 5% for "on-site" outsourced workers in food, cleaning, security, and logistics. Handwerker (2018) uses administrative data from the Occupational Employment Statistics to show that occupational concentration within firms has been increasing over time, and that for many occupations, including janitors, guards, and food service occupations, wages are lower in firms with more concentrated occupational employment. Song et al (2019) use an AKM model on Social Security Administration data to demonstrate that there has been a large increase in the degree of sorting of high fixed effect workers into high fixed effect firms.

[32] The years for which industry compensation and value added data is available for consistently defined industries.

where "Industry rents" refers to rents arising from industry wage premia, "union rents" refers to rents arising from union wage premia (for unionized workers only), and "firm size rents" refers to rents arising from large firm wage premia. We calculate industry rents, union rents, and firm size rents from our estimates of industry, union, and firm size wage premia as outlined below.

Union rents: For each year *t*, we estimate the share of total compensation in the non-financial corporate sector which was union rents, using our union log wage premium estimates uwp_t, the union coverage rate in each year ucr_t, and total compensation in the non-financial corporate sector (obtained from BEA NIPA Table 1.14), as follows:

$$\text{Union rents} = \text{compensation}_t \left(1 - \frac{1}{1 + ucr_t(e^{uwp_t} - 1)}\right)$$

Industry rents: For each industry *j* and year *t*, we estimate the share of total compensation in that industry which was rents, using our estimated industry log wage fixed effects at the most aggregated level of 9 sectors.[33] To calculate the industry wage *premia* from the estimated fixed effects, we first rescale the estimated industry fixed effects relative to the lowest-fixed-effect industry: Retail Trade. This calculation assumes that there are zero labor rents, on average, for workers in Retail Trade. We then treat *half* of the positive deviation of the industry fixed effect from the Retail Trade fixed effect as an industry wage premium ("rents"). We only consider half of the industry wage differentials to represent rents because, even though we have controlled for as many person-level characteristics as we can, there may still be worker sorting into industries on unobserved productivity differences, and because part of the estimated inter-industry wage differentials may reflect compensating differentials. While we choose to simply cut industry wage effects in half for transparency, benchmarking our estimates against estimates of industry wage premia and the degree of rent-sharing from AKM estimation gives us some confidence that this is a reasonable procedure.[34] This gives us industry wage premium $iwp_{j,t}$, and allows us to calculate industry rents as:

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[33] These are: Agriculture, forestry, and fishing; Construction; Finance, insurance, and real estate; Manufacturing; Mining; Retail trade; Services; Transportation and utilities, and Wholesale trade.

[34] A brief summary of our benchmarking procedure is as follows. Abowd et al (2012) estimate the average firm fixed effect across different U.S. industries in an AKM model on U.S. administrative data over 1990-2001. We take a simple average of these estimates across industries within each of the 9 sectors we use to calculate industry rents, rescale each of these relative to Retail Trade (for which the fixed effect is set to zero), and then divide each resulting value by three (reflecting Sorkin's (2018) calculation that one third of firm fixed effects estimated from a U.S. AKM model are due to rents, while two thirds are due to compensating differentials). This gives us a rough estimate of the average log wage component in each sector which was due to rents, over 1990-2001, according to the AKM decomposition. We compare this to our estimate of industry wage premia (i.e. wage fixed effects calculated from the

$$\text{Industry rents} = \sum_{j}^{\text{industries}} \text{compensation}_{j,t}\left(1 - \frac{1}{e^{iwp_{j,t}}}\right)$$

where *compensation* refers to our estimate of total nonfinancial corporate sector compensation for each industry.[35]

Firm size rents: For each firm size class *s* and year *t* we estimate the share of total nonfinancial corporate compensation which was firm size rents using our firm size wage fixed effect estimates. As with the industry wage fixed effects, we halve the firm size (log) wage fixed effects to get our estimate of the firm size premium $fsp_{s,t}$ (to account for possible compensating differentials and/or unobserved productivity differences). The firm size premium is estimated for firms of 500+ workers or 100-499 workers, relative to firms with 1-99 workers (to match the payroll data by firm size class from the Census Bureau SUSB database). Note that we impute firm size rents for the years 1987-1989 by assuming that firm size rents as a share of value added was the same in these years as it was in 1990, since payroll data by firm size is only available from 1990 onwards.[36] This gives us the following expression for firm size rents:

$$\text{Firm size rents} = \sum_{s}^{\text{firm size classes}} \text{compensation}_{s,t}\left(1 - \frac{1}{e^{fsp_{s,t}}}\right)$$

where *compensation* refers to our estimate of total nonfinancial corporate sector compensation by firm size class.[37]

CPS, rescaled relative to Retail Trade, then cut in half). The two line up extremely closely, with a correlation coefficient of 0.95 and a regression coefficient of 0.87 (with no constant). This gives us confidence that our estimate of industry rents mostly does reflect rents, rather than unobserved productivity or compensating differentials. More details on this benchmarking exercise are in Appendix Section A.5.

[35] This is calculated as compensation in industry j $* \frac{\text{total compensation in nonfinancial corporate sector}}{\text{total compensation in private industries}}$, the compensation in each industry (as given by the BEA NIPA GDP by industry tables), multiplied by the ratio of total compensation in corporate business to the total compensation in all private industries. We make this adjustment because we want to estimate only the labor rents going to workers in the nonfinancial corporate sector, but we do not have data on compensation by industry broken down by corporate form (corporate vs. noncorporate). Note that since we are only calculating aggregate labor rents for the nonfinancial corporate sector, we do not include any estimated labor rents for the industry "Finance, Insurance, and Real Estate".

[36] Given the general decline in the firm size premium over the period 1990-2019, this likely leads us to underestimate firm size rents for 1987-1989.

[37] This is estimated as $\text{compensation}_s = \text{totalcompensation} * \text{shareofpayroll}_s$. That is, our estimated compensation for firm size class *s* is total compensation in the nonfinancial corporate sector, multiplied by the share of total payroll accounted for by firms of size class *s*. Note that this calculation assumes that large firms give the same share of total compensation in non-wage benefits as small firms, which is not the case empirically. Our estimate of the total firm size rents will be too low to the extent that (1) large firms give more of their compensation in non-wage benefits, relative to small firms, and (2) the large firm wage premium is as large, or larger, for non-wage benefits than for wages.

In some ways, our calculation of total labor rents may be an overestimate. First, while we cut our estimated industry wage fixed effects and firm size fixed effects in half to account for unobserved productivity or compensating differentials, it is possible that they remain overestimates of the degree of rents (though our benchmarking exercise should assuage this concern). Second, in each calculation we assume that there is a benchmark zero-rent sector in which workers receive the competitive wage that would prevail in the absence of any worker power: for industry rents this is Retail Trade, for firm size rents this is firms of under 100 employees, and for union rents this is non-unionized firms. In some models worker power in one sector will lower pay in other sectors (since, if it restricts employment in the high worker power sector, workers spill over into the low worker power sector, reducing wages there). If this is the case, our measure of labor rents is an overestimate.[38]

On the other hand, it is plausible that there are on average positive labor rents in each of these three baseline sectors (nonunion firms, small firms, and the Retail Trade industry). In particular, if union power raises pay in the non-union sector through a threat effect, then our measure of union rents is an underestimate. In addition, because each of our measures of rents are estimated relative to a baseline group, our calculation of total labor rents is likely to miss any decline in rent-sharing which has occurred commonly across industries, firm size classes, and/or union status. This could include a generalized increase in the use of domestic outsourcing, a generalized increase in shareholder activism and more “ruthless" corporate management practices, or a generalized decrease in the threat effect of unions.[39]

Our measure of labor rents, as a share of net value added in the nonfinancial corporate business sector, declined from 10.8% in 1987 to 5.9% in 2016 (Fig. 6, Table 1). Industry rents fell by 2.5 pp as industry wage premia fell and employment fell in high-rent industries. Union rents fell by 1.5 pp as the unionization rate and union wage premia fell.[40] Firm size rents fell by 1.0 pp as firm size premia fell.

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[38] A further concern might be that we estimate union and industry wage effects in the CPS-ORG without controlling for firm size (which is not available in the CPS-ORG). As a robustness check, we estimate the union wage premium, firm size wage premium, and industry wage premia all together in the CPS ASEC. These estimates are on 5-yearly pooled data, only run from 1990-2019, and are substantially noisier than our estimates of the union and industry wage premia from the CPS-ORG – but the estimated falls in the size of the union wage premium and industry wage premia are very close to (and in fact, slightly greater than) those estimated from the CPS-ORG data.

[39] Our estimates are based on *wage* premia, but total rents are estimated using *compensation*. We will underestimate total labor rents if the industry, firm size, and/or union premium for non-wage benefits is greater than for wages.

[40] Falling industry and firm size rents may however also reflect *indirect* effects of the fall in union power over the period, as the “threat effect" of unionization in large firms, and in certain industries, diminished.

Figure 6: Estimated labor rents as share of value added, nonfinancial corporate sector

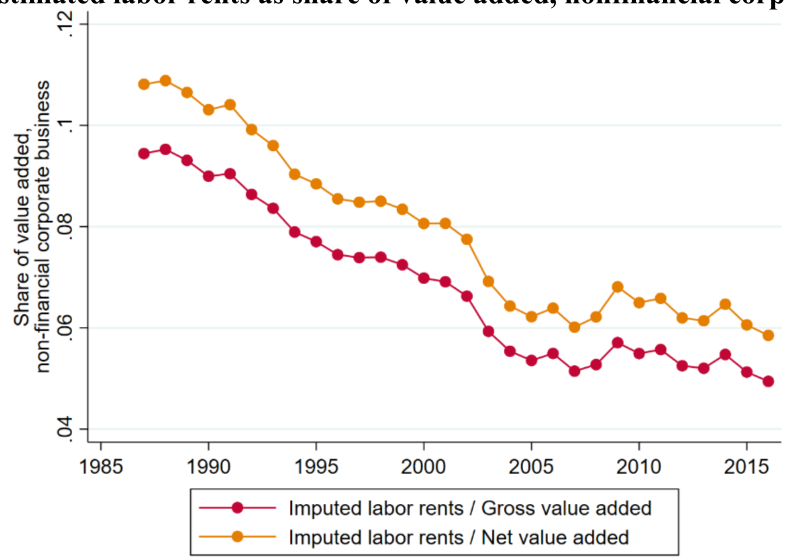

Table 1: Estimated labor rents as share of value added, nonfinancial corporate sector

	1987	1997	2007	2016
Shares of net value added, nonfinancial corporate sector				
Total labor rent share	10.8%	8.5%	6.0%	5.9%
Union rent share	2.3%	1.5%	1.1%	0.8%
Firm size rent share	3.3%	2.9%	2.4%	2.3%
Industry rent share	5.2%	4.1%	2.5%	2.7%
Shares of gross value added, nonfinancial corporate sector				
Total labor rent share	9.4%	7.4%	5.1%	4.9%
Union rent share	2.0%	1.3%	1.0%	0.7%
Firm size rent share	2.9%	2.5%	2.0%	2.0%
Industry rent share	4.6%	3.6%	2.2%	2.3%

A set of simple counterfactuals illustrates that the decline in total labor rents is primarily due to changes in the ability of workers to lay claim to rents within any given industry, rather than changes in sectoral composition of the economy. For the industry rents, if industry wage premia had not declined but the sectoral composition of production had still changed, the industry rent share would have declined by less than a tenth of a percentage point, from 5.23% to 5.16% of net value added over 1987 to 2016. If industry wage premia had fallen but sectoral composition had stayed the same, the industry rent share of total value added would have fallen from 5.2% to 3.5%, rather than from 5.2% to 2.7%.

For union rents, similarly, the majority of the decline is driven by within-sector changes. If union wage premia and within-sector unionization rates had not fallen, even as the sectoral composition of production changed, union rents would have fallen from 2.3% to 1.7% over 1987 to 2016 (rather than falling from 2.3% to 0.8%); if the sectoral composition of production had not changed, but union wage premia and within-sector unionization rates had fallen to the levels they were at in 2016, union rents would have fallen from 2.3% to 0.9% over 1987 to 2016.[41]

Finally, for firm size rents, the share of workers in large firms has actually grown over the period, both in aggregate and within almost every sector, such that the decline in firm size rents reflects exclusively the decline in the firm size premium rather than compositional shifts.

In sum, the fall in labor rents is large in aggregate terms, and can be explained primarily by declines in union, firm size, and industry wage premia. In the next section, we ask: to what extent can this decline in labor rents explain trends in factor shares, profits, and markups?

III. Factor shares, profits, and measured markups

The labor share of income has declined since the 1980s, with a corresponding rise in the capital share.[42] The Tobin's Q of publicly listed corporations – the ratio of their stock market value to the replacement cost of their capital stock -- has risen from around 1 in 1970 to 1.75 by 2015, alongside an increase in the value of financial assets relative to the value of productive capital. (Eggertsson et al 2019). The average profitability of capital has risen, even as the risk-free rate has declined. And, by a range of measures, several authors have found that markups have risen (e.g. De Loecker et al 2019, Eggertsson et al 2019, Covarrubias et al 2019).[43]

A growing body of research argues that the majority of these trends can be explained by a rise in the market power of corporations. Rising monopoly power in product markets would lead firms to increase their markups, reducing the labor share of income and increasing corporate

[41] This is because the major sectoral shift over this period was from Manufacturing to Services, and by 2016 the unionization rate in Manufacturing had fallen to almost the level that it was in Services. So, shifting the sectoral composition from Services back to Manufacturing would have made little difference to aggregate unionization.
[42] As documented by, for example, Karabarbounis and Neiman (2014), Elsby, Hobijn, and Sahin (2013), and others.
[43] The magnitude of the rise in measured markups depends significantly on the method used – in particular, which costs should be considered variable, and whether to weight firm-level markups by costs or sales when calculating aggregate markups. See Traina (2018), Karabarbounis and Neiman (2018), and Edmond, Midrigan, and Xu (2018).

profitability, and so increasing Tobin's Q and the value of financial assets relative to physical capital. Different aspects of this argument have been made by (in alphabetical order) Barkai (2017), Barkai and Benzell (2018), Brun and Gonzalez (2017), Covarrubias, Gutiérrez , and Philippon (2019), De Loecker and Eeckhout (2019), De Loecker, Eeckhout, and Unger (2019), Eggertsson, Robbins, and Wold (2019), Farhi and Gourio (2018), Gonzalez and Trivin (2017), Grullon, Larkin, and Michaely (2019), Gutiérrez and Philippon (2017,2019), Hall (2018), Philippon (2020).[44] Some authors have also argued that these trends could be rationalized by a rise in companies' monopsony power in labor markets (e.g. CEA 2016, Furman and Krueger 2016, Benmelech, Bergman, and Kim 2019, Philippon 2020).

But these trends would be equally consistent with a fall in worker power. If workers' ability to receive some of the rents generated by their firms has fallen over time, holding constant the total quantity of rents generated, we would expect to see a decline in the labor share as rents going to workers fall and rents going to shareholders rise. We would also expect to see a divergence between the average profitability of capital and the risk-free rate, as profits to shareholders rise, and a rise in Tobin's Q and the ratio of financial wealth to physical capital, as the rise in profits to shareholders increases the net present value of the claim shareholders have over corporate profits (even as the asset value of firms does not change).

In addition, while a fall in worker rent-sharing power should not have any implication for firms' underlying markups (which are determined by their product market power), it does have implications for *measured* markups. This is because measures of aggregate markups used in recent literature depend on firms' costs, including firms' labor costs – even if the labor costs partly represent rents or 'pure profits' accruing to labor rather than a true marginal cost of production.[45] This implies that markups as they have been measured in recent papers *cannot* be

[44] On the other hand Autor et al (2019) argue that the rise in concentration and fall in the labor share is a result of the rise of highly productive superstar firms. Karabarbounis and Neiman (2018) argue that the rise in "factorless income" is most likely due to an increase in the opportunity cost of capital.
[45] The production function approach used by De Loecker, Eeckhout, and Unger (2019) estimates markups as a function of the (estimated) elasticity of output with respect to variable inputs, and the ratio of sales to variable costs – which include some labor costs. The rise in measured markups is mostly due to an increasing ratio of sales to variable costs, which could be a result of falling labor costs as labor rents fall. The user cost approach of Gutiérrez and Philippon (2017) estimates markups as the ratio of sales to costs, which are calculated as operating expenses plus an imputed cost of capital. Operating expenses include labor costs. Again, this means that changes in measured markups could be due to changes in labor costs as a result of falling labor rents. It would in theory be feasible to take these approaches and apply them only to non-labor costs to estimate markups, but there is no publicly-available data of sufficiently good quality to do this across the entire set of industries. We note that Anderson, Rebelo, and Wong

used to distinguish between a story of rising product market power and a story of falling worker power: a rise in measured markups could reflect a fall in worker rent-sharing power just as much as it could reflect a rise in true markups and firms' monopoly power.

So: rising monopoly power, rising monopsony power, and falling worker power could in theory each account for the changes in factor shares, profits, and markups. But is the magnitude of the decline in labor rents plausibly consistent with these trends?

III.A. Accounting decomposition, based on Farhi and Gourio (2018)

To calibrate the plausibility of declining labor rents as an explanation for trends in factor shares and profits – alongside the trends in other macro variables – we build on the accounting decomposition in Farhi and Gourio (2018). Farhi and Gourio extend the neoclassical growth model to account for six major recent macroeconomic trends, including the decline in the labor share, increases in valuation ratios, and moderate increases in profitability alongside a declining risk-free rate. Using this model, they identify a role for rising monopoly power in explaining these macro trends (alongside roles for unmeasured intangibles and rising risk premia). They estimate that average economy-wide markups rose from 8% to 15% over 1984-2016.

Their model, however, assumes competitive labor markets with no rent-sharing with workers. We replicate their accounting decomposition, with one alteration: we hold the degree of monopoly power (markups) fixed, and instead introduce a rent-sharing parameter to allow workers to share in monopoly profits. We incorporate this in the simplest way possible: the monopolistic representative firm maximizes profits as before, but then shares the rents or 'pure profits', with share π_L going to labor. This reduced-form approach is similar to that adopted in much of the literature on rent-sharing (see for example Card et al 2018). It can be micro-founded with a strongly efficient bargaining model where workers, seeking to maximize total pay to labor, and shareholders, seeking to maximize their profits, jointly bargain over the firm's production decisions (e.g. Solow and MacDonald 1981).

Farhi and Gourio carry out their decomposition targeting nine empirical moments for the U.S. private sector over 1984-2016: gross profitability, the gross capital share, the investment-

(2019) estimate markups across the U.S. in retail trade, using the markup of the price of each good sold over its replacement cost (i.e. *not* including labor costs), and find no secular increase in markups over 1979-2014.

capital ratio, the risk-free rate, the price-dividend ratio, population growth, TFP growth, the growth rate of investment prices, and the employment-population ratio. They estimate nine parameters: the discount factor, the probability of a disaster, the depreciation rate of capital, the Cobb-Douglas parameter in the aggregate production function, population growth rate, TFP growth, the growth rate of investment-specific productivity, labor supply, and the markup.

We target the same nine moments and estimate eight of the same nine parameters – but, instead of estimating the markup, we estimate the rent-sharing parameter with labor, holding the markup fixed at the level that Farhi and Gourio estimate for the period 2001-2016 (1.15). Identification is nearly recursive in the Farhi/Gourio decomposition, with many parameters estimated tightly by their near-equivalent moments. Identification in our approach is therefore nearly identical to that in Farhi and Gourio: it has different implications for only two of the nine empirical moments – the gross capital share $\frac{\Pi}{Y}$ and gross profitability $\frac{\Pi}{K}$ (equivalent in the Farhi/Gourio model to the marginal product of capital). The equations below show the difference between the two approaches: in the Farhi/Gourio model, rent-sharing parameter π_L is implicitly set to be constant at zero, and markup μ is allowed to vary. In contrast in our model, markup μ is set to be constant at 1.15, and π_L is allowed to vary.

$$\text{Capital share} \qquad \frac{\Pi}{Y} = \frac{\alpha + (1 - \pi_L)(\mu - 1)}{\mu}$$

$$\text{Profitability of capital} \qquad \frac{\Pi}{K} = \frac{\alpha + (1 - \pi_L)(\mu - 1)}{\alpha}\left(r^* + \delta + g_Q\right)$$

By construction of the recursive identification process in the decomposition, our model returns exactly the same parameter estimates as Farhi/Gourio for 6 of the 9 parameters estimated. Table 2 below shows only the parameter estimates which differ between the Farhi/Gourio model ("FG") and our model ("SS"). To fit the data best, Farhi/Gourio estimate a rise in the average economy-wide markup from 1.08 to 1.15 over the period. When we hold the markup constant at 1.15, but allow the rent-sharing parameter to vary, we estimate instead that the rent-sharing parameter fell from 0.44 to 0.02 over the period.[46] Our model also has slightly different

[46] How plausible is an estimated rent-sharing parameter of 0.44 for the 1980s-1990s? To compare this to estimates from the literature, we need to translate it into the rent-sharing elasticities estimated in the empirical literature. Following Card et al (2018), note that the elasticity of wages with respect to an increase in total rents (pure profits),

implications for the Cobb-Douglas parameter α and TFP growth g_Z: our model suggests a somewhat smaller slowdown in TFP growth over the period, and a slight fall in the Cobb-Douglas parameter α (which implies a small degree of labor-complementing technological change over the period).

Table 2: Estimated parameters and changes over time

Parameter		Model	First sample (1984-2000)	Second sample (2001-2016)	Difference
Markup	μ	FG	1.079	1.146	0.067
		SS	*Fixed: 1.15*	*Fixed: 1.15*	--
Rent-sharing with labor	π_L	FG	*Fixed: 0*	*Fixed: 0*	--
		SS	0.441	0.022	-0.419
Cobb-Douglas parameter	α	FG	0.244	0.243	-0.001
		SS	0.260	0.244	-0.016
TFP growth	g_Z	FG	1.298	1.012	-0.286
		SS	1.233	1.010	-0.223

Note: in the "SS" estimation, markup μ *is held constant at 1.15. In the "FG" estimation, rent-sharing parameter* π_L *is implicitly held constant at 0. The "FG" estimates in this table correspond to the baseline parameter estimates in Table 2 of Farhi and Gourio (2018).*

What does the estimated fall in the rent-sharing parameter imply for total labor rents? The rise in markups estimated by Farhi and Gourio, from 1.08 to 1.15, imply a rise in the "pure profit" share of output from 7.3% in the 1980s-90s to 12.8% in the 2000s-10s. Since we hold the markup at 1.15 throughout the 1980s-2010s in our estimation, the pure profit share of our economy is 12.8% throughout 1982-2016. The estimated fall in the rent-sharing parameter, from 0.44 to 0.02, therefore implies that the share of gross private sector output which was labor rents fell by 5.3 percentage points, from 5.6% to 0.3%, over the period.

How plausible is this decline in total labor rents? The accounting decomposition implies that, to reconcile the macro facts with a fall in rent-sharing holding markups constant, the share of private sector value added which was labor rents must have fallen by 5.3 percentage points. This is quite similar to our estimate of the decline of labor rents constructed from estimates of industry wage premia, firm size wage premia, and union wage premia: we estimated that labor

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ξ_R, is equivalent to the share of labor rents in wages. Then, the elasticity of wages with respect to *value added* is $\xi_{VA} = \xi_R \cdot \frac{VA}{Rents}$. In our accounting decomposition, the equilibrium share of rents in wages in the first period (1984-2000) is 0.09, implying an elasticity of wages with respect to rents of $\xi_R = 0.09$ and an elasticity of wages with respect to value added of $\xi_{VA} = 0.44$. These estimates are not implausibly high compared to the (few) well-identified empirical estimates of rent-sharing elasticities in the US. Estevao and Tevlin (2003) for example find an elasticity of wages to value added per worker of 0.29 and an elasticity of wages to profit of 0.14.

rents fell by 4.9 percentage points of gross value added in the nonfinancial corporate sector over 1987-2016. Carrying out our same calculation for the *entire* private sector led us to estimate that labor rents fell by about 3.5 percentage points.[47] There is no necessary reason why these would line up: the estimate of the fall in labor rents from the Farhi/Gourio model comes from the best fit of 9 parameters to 9 moments in each of the two periods, while our estimate of the fall in labor rents comes from our estimated union, industry, and firm size wage premia using CPS data. We therefore see this accounting exercise as suggesting that, (1) the degree of the fall in rent-sharing with labor which is required to be consistent with a number of key macro moments over 1982-2016 is both relatively consistent with our empirical estimates of the actual fall in rent-sharing with labor, and relatively consistent with estimates of rent-sharing elasticities from the micro literature; and (2) despite the differential implications for investment of a rise in monopoly power vs. a fall in rent-sharing, when incorporated into a full GE model it is possible to reconcile a fall in labor rent-sharing (in an efficient-bargain type framework) with the data on capital and investment, without implausible implications for other macro variables.

III.B. Aggregate evidence: factor shares

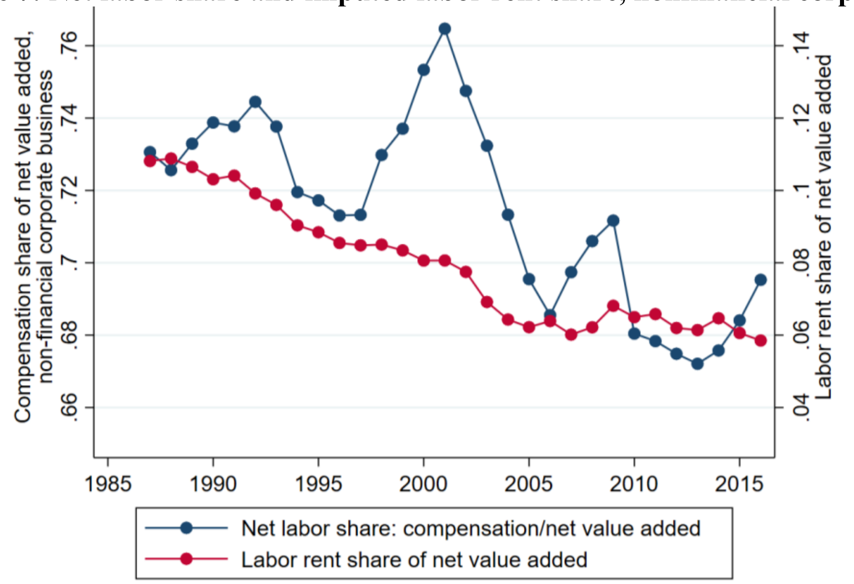
Next, we compare our estimates of the decline in the labor rent share of value added with aggregate changes in factor shares. The net labor share in the nonfinancial corporate sector (compensation over net value added) fell by 3.5 percentage points over 1987-2016. Our measure of the labor rent share of net value added in the nonfinancial corporate sector fell by 4.9 percentage points over the same period. This suggests that, as shown in Fig. 7, the decline in imputed labor rents as estimated from industry, union, and firm size wage premia can more than fully explain the decline in the net labor share over the period. That is, the entirety of the shift in the functional income distribution over recent decades could be explained by a redistribution of rents from labor to capital.

The other side of the coin of the fall in the labor share is the rise in the capital share. Since our measure of labor rents can be interpreted as a measure of the firm's profits which go to labor, with the rest of the firm's profits going to capital, we can define the “Total profit share" of value added as the share of value added accounted for by capital income *plus* labor rents. While the capital share of net value added has risen over 1987-2016, our imputed measure of the *total*

[47] For the calculation for the private sector, see Appendix Section A.9.

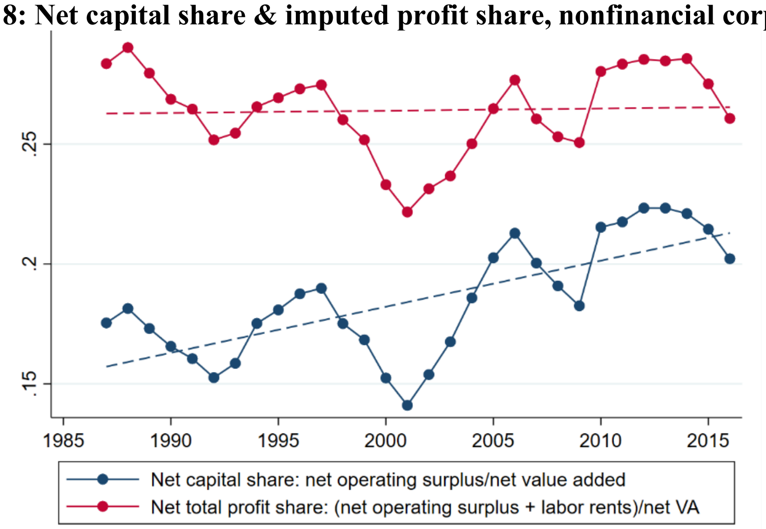
profit share has stayed roughly constant – consistent with the interpretation that the total profitability of firms (and their monopoly power) has not risen over the period, but that these profits have partly been redistributed from labor to capital.

Figure 7: Net labor share and imputed labor rent share, nonfinancial corporate



Notes: Net labor share in the nonfinancial corporate sector is calculated as compensation over net value added, using BEA NIPA data. Our measure of the imputed labor rent share of net value added is calculated as described in Section II.

Figure 8: Net capital share & imputed profit share, nonfinancial corporate



Notes: Net capital share in the nonfinancial corporate sector is calculated as net operating surplus over net value added, using BEA NIPA data. Our measure of the net total profit share is calculated as the net operating surplus plus our measure of imputed labor rents (explained in Section II), divided by net value added. Dashed lines are lines of best fit.

III.C. Industry-level evidence

The aggregate evidence suggests that the magnitude of the decline in labor rents for the aggregate private sector is consistent with the magnitude of the decline in the labor share over 1987-2016. Does this conclusion also hold at the industry level? We analyze 53 industries over 1987-2016, comparing their trends in labor shares and profitability to our measure of imputed labor rents.[48] We also compare these trends to changes in industries' product market concentration, using measures of industry level top 20 import-adjusted sales concentration calculated from Compustat data and from Census data by Covarrubias, Gutiérrez, and Philippon (2019).[49] Concentration is, of course, a highly imperfect measure of firms' market power.[50] We use concentration in this paper not because it is a failsafe measure of monopoly power, but rather because recent literature has noted the increases in both concentration and markups, and has (often) interpreted this co-movement as indicative of rising monopoly power.

First, we analyze factor shares. There is a strong relationship between the labor share and our measure of the imputed industry labor rent share over the period: industries with larger falls in their imputed labor rent share also had larger falls in their labor share (Fig. 10). A similar relationship exists between changes in the industry labor share and unionization rate. There is a negative, though somewhat weaker, relationship between changes in the labor share and average top 20 import-adjusted sales concentration (Fig. 11).

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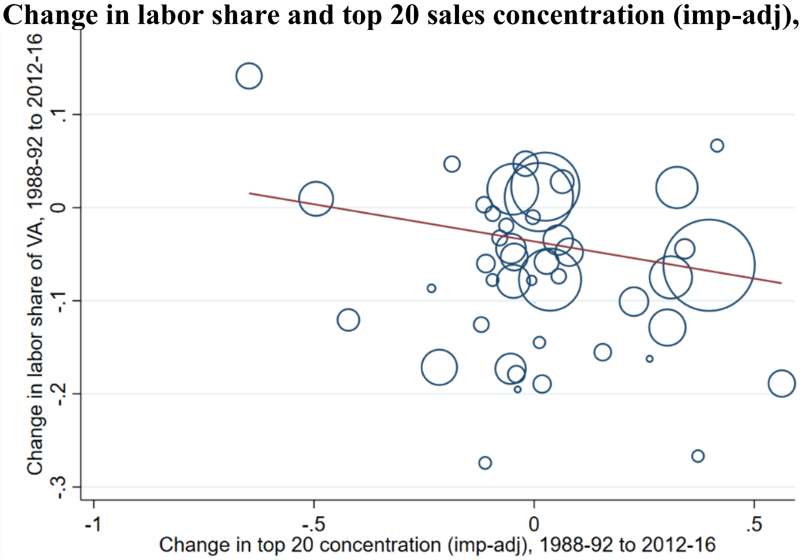
[48] We use the same industry codes used by Covarrubias, Gutiérrez, and Philippon (2019). These correspond almost identically to the BEA industry codes (roughly NAICS 3 digit). See Appendix Section A.15. for the correspondence of our industry codes to BEA industry codes. For each of these 53 industries, we estimate labor rents for each year from 1987-2016 with a similar method to our method for aggregate labor rents. There are only two differences from the method for aggregate rents outlined in Section II. First, since we do not have data on compensation by firm size by industry, we only use our estimates of *industry* and *union* rents for the industry-by-industry calculation. Second, we calculate labor rents for each industry based on the estimated industry wage premium relative to the lowest-wage large industry, which is Food Services and Drinking Places. This industry had 12.3 million employees as of February 2020, and average hourly earnings of $15.25 as of October 2019 (the latest data available from the BLS).

[49] We are grateful to Germán Gutiérrez and Thomas Philippon for sharing with us the measures of concentration they constructed for Covarrubias, Gutiérrez, and Philippon (2019). Covarrubias et al (2019) construct top 4, 8, 20, and 50 import-adjusted sales concentration ratios for each of the 53 BEA industries. They use two data sources: Compustat data on publicly-listed companies, re-weighted to reflect the composition of the underlying economy, and Census data on all firms. The Compustat concentration ratios are available annually for our whole sample period (1987-2016). The Census concentration ratios are available for the years 1997, 2002, 2007, and 2012. They adjust for imports by multiplying the domestic sales concentration ratio by the share of U.S. produced goods in total domestic sales in that industry. See Appendix Section A.11. for more details.

[50] The field of industrial organization largely rejected the "structure-conduct-performance" paradigm in the 1980s-1990s, due to concerns that a positive correlation between concentration and markups does not necessarily imply a welfare-reducing increase in monopoly power (see, for example, Berry, Gaynor and Scott Morton 2019 and Syverson 2019 for a discussion of this). We share these concerns.

Figure 10: Change in labor share and imputed labor rent share, by industry

Figure 11: Change in labor share and top 20 sales concentration (imp-adj), by industry



Notes to Figs 10-11: Each bubble is an industry (at BEA industry code level). Bubble size represents industry average employment over 2012-2016. The red line is an employment-weighted line of best fit. Concentration data calculated from Compustat by Covarrubias et al (2019). Imputed labor rent share is our calculation.

We regress the gross and net labor share on the imputed labor rent share of industry value added, and on our measures of product market concentration, at the annual level over 1988-2016 including different combinations of year and industry fixed effects (Table 3, panels A and C). Coefficients on the labor rent share are large, negative, and highly significant, and coefficients on concentration are positive and mostly significant. What is the explanatory power of the decline in labor rents relative to the rise in concentration? Over 1997-2012 (the period for which we have the more accurate Census-based concentration data, and in which Covarrubias et al

(2019) argue concentration has led to rising monopoly power) the average industry saw a fall in its labor share of 4.3 percentage points. Using the coefficient from the regression with industry and year fixed effects, the average industry's fall in their labor rent share over 1997-2012 was associated with 4.7 percentage points fall in the labor share. The average industry-level increase in import-adjusted top-20 sales concentration was associated with a 0.6 percentage point fall in the labor share. This suggests that declining labor rents can fully explain (or even *over*-explain) falling labor shares at the industry level, whereas the average increase in concentration can explain only around 15% of the average fall in the labor share at the industry level.[51]

These conclusions fit with the observation that much of the decline in the aggregate labor share has occurred in the manufacturing sector (Gutiérrez and Piton 2019, Elsby, et al 2013). Given the increases in international trade driven by the opening of low-wage economies to international markets, and reductions in transport costs and trade barriers, it seems unlikely that U.S. manufacturing has seen a substantial increase in product market power over recent decades – and so, unlikely that rising monopoly power can explain the fall in the labor share.

Next, we analyze our measures of labor power alongside three measures of profitability at the industry level over 1987-2016: the gross profit rate (defined as gross operating surplus over fixed assets), as well as two measures of Tobin's Q calculated from firm-level Compustat data by Covarrubias et al (2019): the weighted average Tobin's Q across publicly-listed firms within an industry, and the median firm Q.[52] Figures 12 and 13 illustrate that over the whole period, falling labor rent shares were strongly associated with rising gross profitability, while rising concentration was weakly associated with rising profitability. In horse-race regressions of profitability measures on our measure of imputed labor rents and measures of industrial concentration (Table 3, Panels B and D), coefficients on the imputed labor rent share are almost all negative and, for the 1987-2016 regressions, mostly statistically significant.[53] Coefficients on the concentration measures on the other hand are mostly not significant, and often negative (the

[51] The relative explanatory power of the worker power measures vs. concentration measures is similar if we use other measures of concentration (top 4, 8, or 50 sales ratios, and using measures from Census vs. Compustat). The comparison of coefficient magnitudes is even starker over 1987-2016: the average increase in top 20 concentration over this period (from Compustat) was associated with 0.1pp fall in the gross labor share at the industry level. The average fall in the labor rent share was associated with 10.7pp fall in the gross labor share.

[52] Results are very similar when we use the simple average Q across firms, rather than the weighted average.

[53] This is consistent with Salinger (1984), who argued that in the 1980s, Q was low in industries with high monopoly power because unionized workers received the monopoly rents.

opposite sign than would be predicted if rising monopoly power was causing higher profitability). The coefficient from the regression over 1997-2012 with industry and year fixed effects suggests that the average increase in top-20 import-adjusted sales concentration over 1997-2012 was associated with 1.0 percentage points increase in the gross profit rate at the industry level, while the average fall in the labor rent share was associated with 4.8 percentage points increase in the gross profit rate. The actual average increase in the gross profit rate over that period was 6.3pp – suggesting that the decline in worker power has more explanatory power than the rise in concentration for changes in industry-level profitability.

Figure 12: Change in gross profitability and imputed labor rent share, by industry

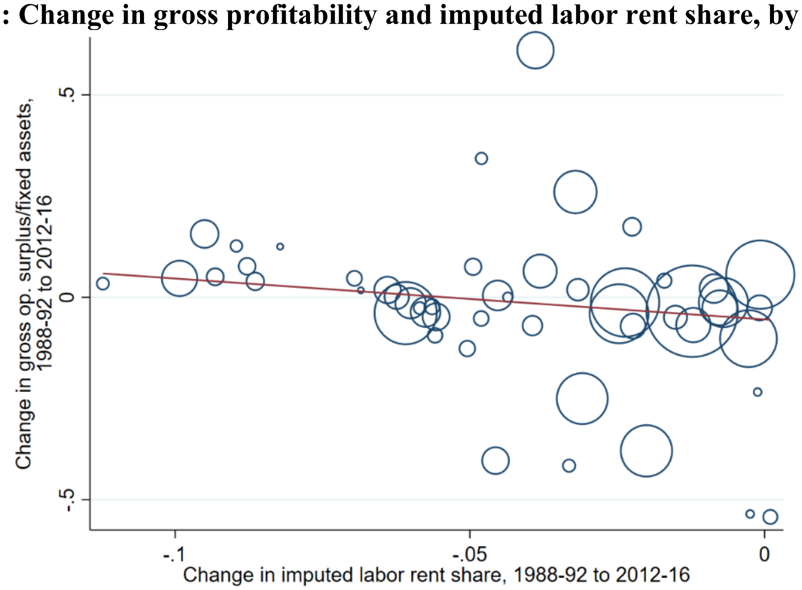
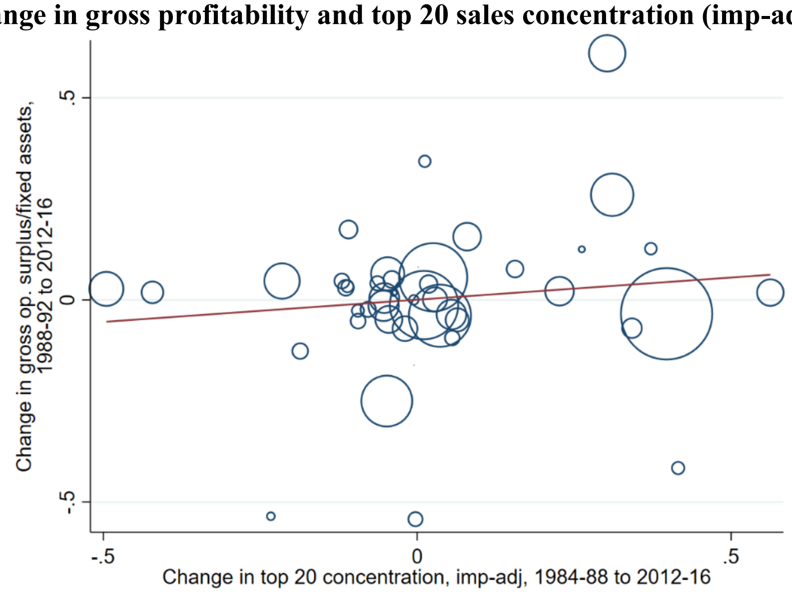


Figure 13: Change in gross profitability and top 20 sales concentration (imp-adj), by industry



Notes to Figs 12-13: Each bubble is an industry (at BEA industry code level). Bubble size represents industry average employment over 2012-2016. The red line is an employment-weighted line of best fit. Concentration data calculated from Compustat by Covarrubias et al (2019). Imputed labor rent share is our calculation.

Table 3: Industry-Level Regressions – Labor shares, profitability, and investment-to-profits

Panel A: Regressions of labor shares and investment-profit on labor rent share and Compustat concentration. N = 1,271 (45 industries, 1987-2016)

Dependent variable:	**Labor share of gross value added**				**Labor share of net value added**				**Investment to profit ratio**			
Imputed labor rent share of gross* value added	2.63** (0.56)	2.92** (0.69)	1.88** (0.20)	2.54** (0.48)	3.81** (0.99)	4.17** (1.06)	3.81** (0.98)	5.15** (1.01)	4.75* (2.08)	5.55* (2.35)	1.46 (0.97)	1.60 (3.57)
Avg top 20 sales concentration, imp-adj (Compustat)	-0.20** (0.06)	-0.21** (0.06)	-0.06 (0.06)	-0.07 (0.06)	-0.21* (0.08)	-0.23* (0.09)	-0.01 (0.10)	-0.11 (0.09)	0.30 (0.21)	0.27 (0.22)	0.22 (0.35)	0.27 (0.41)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel B: Regressions of profitability on labor rent share and Compustat concentration. N=1,213 (gross profit rate) N = 1,256 (Q) (43 ind., 1987-2016)

Dependent variable:	**Gross profit rate**				**Aggregate Q**				**Median Q**			
Imputed labor rent share of gross value added	-1.04^{+} (0.54)	-1.30^{+} (0.69)	-0.77** (0.28)	-2.20** (0.57)	-3.15** (0.97)	-2.48* (1.12)	-3.18** (0.91)	1.70 (1.71)	-3.37** (0.81)	-2.62** (0.93)	-3.93** (0.80)	-0.55 (1.38)
Avg top 20 sales concentration, imp-adj (Compustat)	-0.06 (0.10)	-0.05 (0.11)	0.07 (0.16)	0.12 (0.15)	-0.02 (0.12)	-0.03 (0.13)	-0.43 (0.36)	-0.48 (0.34)	0.14 (0.12)	0.13 (0.13)	0.13 (0.23)	0.08 (0.24)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel C: Regressions of labor shares and investment-profit on labor rent share and Census concentration. N = 186 (49 ind. for 1997, 2002, '07, '12)

Dependent variable:	**Labor share of gross value added**				**Labor share of net value added**				**Investment to profit ratio**			
Imputed labor rent share of gross* value added	2.57** (0.73)	2.71** (0.79)	2.34** (0.39)	2.99** (0.51)	3.58** (0.80)	3.76** (0.83)	3.40** (0.51)	4.11** (0.61)	5.72* (2.48)	5.93* (2.56)	2.00 (4.27)	2.60 (6.20)
Avg top 20 sales concentration, imp-adj (Census)	-0.53** (0.09)	-0.54** (0.09)	-0.21* (0.09)	-0.28** (0.10)	-0.50** (0.11)	-0.52** (0.11)	-0.33* (0.16)	-0.44** (0.15)	0.55 (0.41)	0.54 (0.41)	-1.68 (1.40)	-1.75 (1.50)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel D: Regressions of profitability measures on labor rent share and Census concentration. N = 175 (47 ind. for 1997, 2002, '07, '12)

Dependent variable:	**Gross profit rate**				**Aggregate Q**				**Median Q**			
Imputed labor rent share of gross value added	-0.80 (0.78)	-0.92 (0.82)	-1.43* (0.57)	-3.05** (0.58)	-1.21 (1.44)	-1.42 (1.51)	0.79 (2.13)	-1.52 (2.85)	-1.52 (0.99)	-0.95 (0.98)	-3.07^{+} (1.63)	-0.89 (1.92)
Avg top 20 sales concentration, imp-adj (Census)	-0.39 (0.32)	-0.38 (0.33)	0.30 (0.29)	0.46 (0.32)	-0.53* (0.22)	-0.49* (0.22)	-1.60^{+} (0.92)	-0.98 (0.76)	-0.06 (0.16)	-0.07 (0.16)	-0.65 (0.46)	-0.20 (0.46)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Robust standard errors, clustered at industry level, in parentheses. $^{+}p<0.10$, $*p<0.05$, $**p<0.01$.

**Imputed labor rent share of gross value added is used for gross labor share and investment-profit regressions. Imputed labor rent share of net value added is used for net labor share regressions.*

III.D. Labor shares and markups: within- and between-firm dynamics

How can we reconcile these results with the firm-level evidence? Autor et al (2019) study the fall in the labor share using firm-level data from the U.S Economic Census since 1982, and find that two-thirds of the decline in the labor share can be explained by between-firm reallocation, with one-third explained by within-firm falls in the labor share. They show that the median firm saw *no* decline in their labor share, whereas firms with initially low labor shares did see falls in their labor shares. Kehrig and Vincent (2020) find similar dynamics in manufacturing, showing that the decline in the labor share is driven by establishments which are growing in size and at the same time see falling labor shares. De Loecker, Eeckhout and Unger (2019) find that the rise in the aggregate markup results largely from a reallocation of activity to high-markup firms, that the median markup did not change, and that markups for already high markup firms increased.

It is clear that our proposed mechanism – a fall in labor rent-sharing power – could explain *within-firm* declines in labor shares and increases in measured markups. It may be initially less clear how to reconcile our proposed mechanism with the portion of the decline in the labor share (or rise in markups) that results from the reallocation of economic activity across firms. It could simply be the case that firms which experienced bigger falls in worker power also grew faster for some exogenous reason. It is also possible, however, that this faster growth itself is at least partly a result of falling worker power. If workers receive a competitive wage plus some portion of a firm's rents, then unit labor costs are higher at high-markup firms than at low-markup firms. As workers' rent-sharing power declines, unit labor costs fall disproportionately more at high-markup firms than at low-markup firms, creating an incentive for high-markup firms (whether highly productive, or simply highly profitable) to expand.

III.E. Were labor rents redistributed or destroyed?

We have shown that a redistribution of rents from labor to capital could account for aggregate and industry-level trends in the labor share and corporate profitability and valuations. It is possible, however, that the decline in labor rents which we measure in Section II occurred not because rents were *redistributed* from labor to capital but because rents were *destroyed* – perhaps as a result of increased competition or other adverse demand shocks. We investigate this here.

For manufacturing industries, we use low-wage import competition as a proxy for the extent to which labor rents may have been destroyed. We compare changes in import penetration from low-wage countries, defined as countries with less than 5% of U.S. GDP per capita, (using

Figure 14: Profitability and import penetration, manufacturing, changes 1989-2007

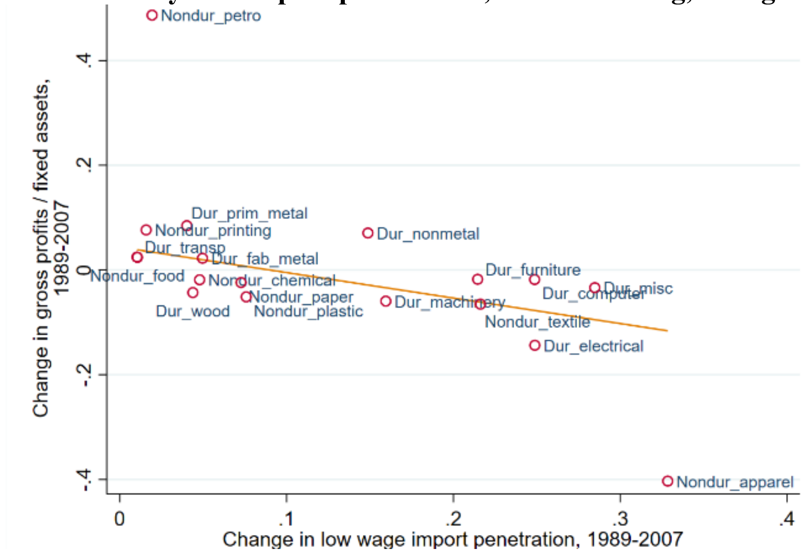


Figure 15: Industry wage premium and import penetration, manufacturing, changes 1989-2007

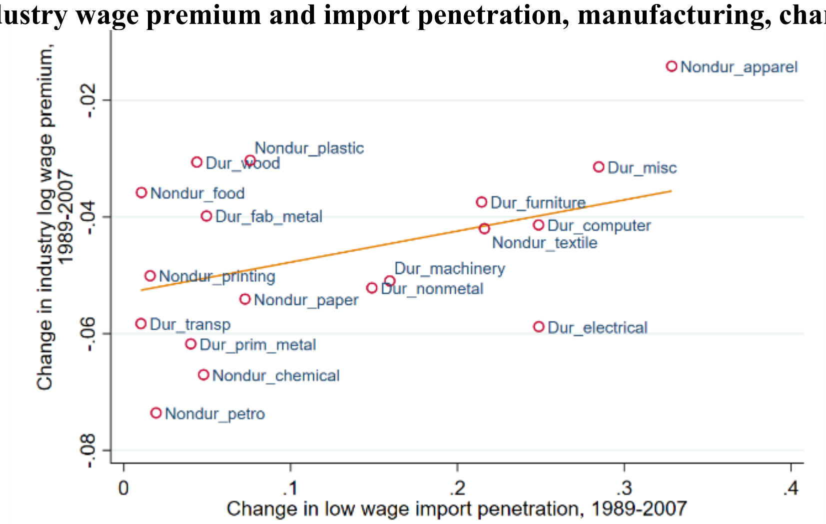
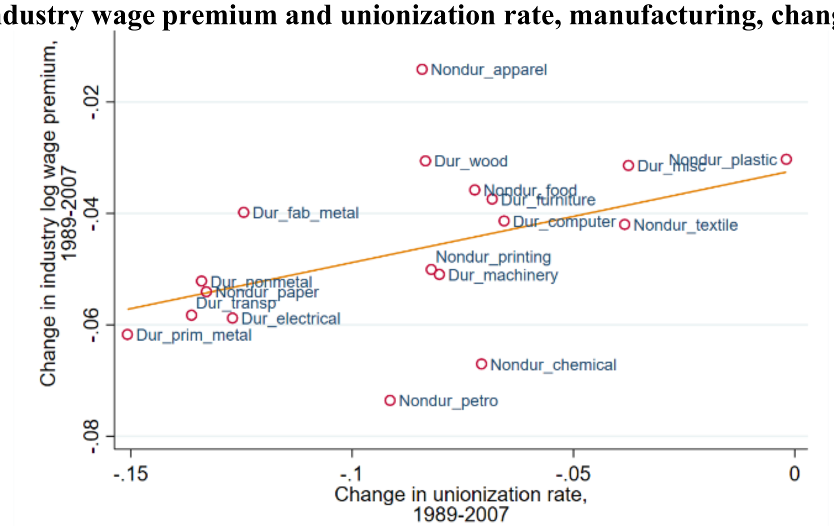


Figure 16: Industry wage premium and unionization rate, manufacturing, changes 1989-2007



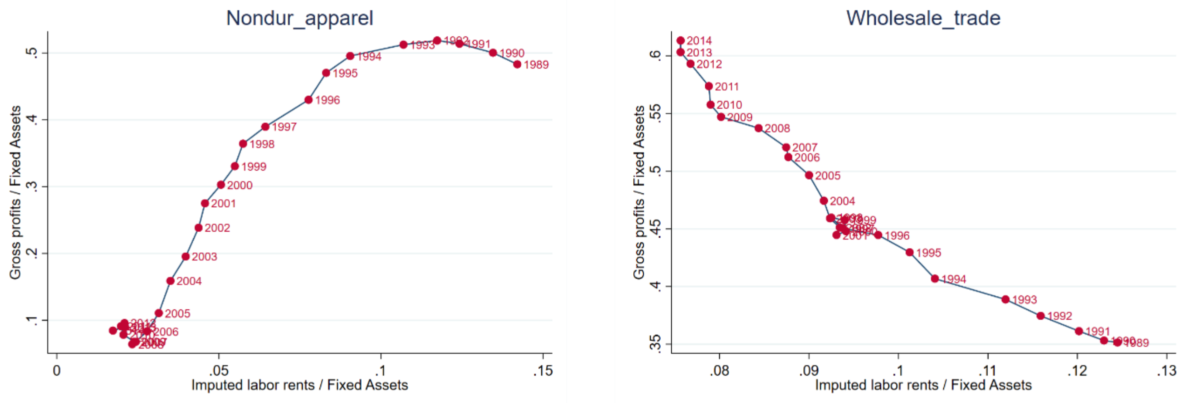
Notes to Figs 14-16: Each dot represents a manufacturing industry at the BEA industry code level. Import penetration data is from Bernard et al (2006); log industry wage premium is our estimate from the CPS.

data from Bernard, Jensen, and Schott (2006), updated by Peter Schott in 2011) with changes in profitability and the log industry wage premium, for 18 manufacturing industries over 1989-2007.[54] As one would expect, the industries which saw bigger increases in import competition saw declining profitability (Fig 14). However, wage premia declined the most in the industries with the smallest increases in import competition (Fig 15). It appears that the industries which were hit hardest by low-wage import competition over the period were those with the smallest wage premia to start off with, and therefore there was not much scope for the wage premia to fall further.[55] Still, even when controlling for the level of industry wage premia in 1989 there is no significant relationship between the increase in import penetration and the change in industry wage premia over the period (and the coefficient is in fact positive). There is, however, evidence that industries with larger falls in their unionization rate saw larger falls in their wage premia over the period (Fig 16).[56] This evidence, while not dispositive, does not tend to support the argument that the decline in labor rents in manufacturing was a result of the destruction of rents due to globalization.

What about non-manufacturing industries? While there is no obvious analog to the change in low-wage import penetration, one illustrative comparison is the change in profitability and labor rents over the period. If the fall in labor rents was caused by an overall destruction of rents – perhaps, as an industry became more competitive – one likely implication is that profitability (profits/fixed assets) and industry labor rents should move in the same direction. This indeed happened in some industries. Figure 17 for example shows the case of Apparel Manufacturing, where profitability and labor rents both fell steadily as a share of fixed assets over 1989-2016. If the fall in labor rents was instead primarily caused by a reallocation of rents from labor to capital, profitability should rise as labor rents fall. This appears to be the case for Wholesale Trade: as the profitability of capital rose, labor rents fell.

[54] Import penetration is calculated as the share of domestic sales within each industry represented by imports from low-wage countries, defined as countries with GDP per capita less than 5% of the U.S. level. We study 1989-2007 as this is the period for which we have consistently-defined data on low-wage import penetration.
[55] The 1989 level of the industry wage premium explains 70% of the fall in the wage premium over 1989-2007.
[56] A regression of the change in the industry log wage premium on the initial wage premium in 1989, the change in the unionization rate, and the change in low-wage import penetration over 1989-2007, across these 18 manufacturing industries, finds a positive relationship between the change in unionization and change in log wage premium. The coefficient is significant at the 10% level.

Figure 17: Imputed labor rents and profitability, Apparel manufacturing and Wholesale trade



We can study this more systematically across industries as follows. Define industries' underlying profitability as the sum of profits to capital and labor rents, relative to assets:

$$\text{Underlying profitability} = \frac{\text{Gross operating surplus} + \text{imputed labor rents}}{\text{Fixed assets}}$$

We define a redistribution of rents from labor to capital as occurring if either (1) rents rise for capital but fall for labor, or (2) rents fall for both groups, but fall by more for labor than for capital, relative to their initial shares in total underlying profitability, or (3) if rents rise for both groups, but rise by less for labor than for capital, relative to their initial shares in total underlying profitability. The analogous definitions apply for a redistribution of rents from capital to labor. By this metric, 46 out of 53 industries (employing 90 million workers in 2012-16) saw rent redistribution from labor to capital over 1987 to 2016.[57]

IV. Unemployment, inflation, and the Phillips Curve

Recent decades in the U.S. have seen a substantial decline in the trend unemployment rate, without inflationary pressure. The unemployment rate has been below 5%, the level previously thought to have been the NAIRU, for four years (and was also below 5% from 1997-2001 and from 2005-2008); it has been below 4% since the spring of 2018, at levels not reached since the

[57]In 23 of these 46 industries, profits to capital increased while labor rents fell. In 22 industries, profits to capital and rents to labor both fell as a share of fixed assets, but the fall in labor rents was disproportionately greater than the fall in profits to capital. In one industry, profits to capital and rents to labor both rose as a share of fixed assets, but the rise in labor rents was disproportionately smaller than the rise in profits to capital. For a more detailed breakdown, see Appendix A.16.

1960s. At the same time, inflation has been low and has shown little sign of accelerating. These facts suggest that there has been a fall in the NAIRU, and/or a flattening of the Phillips Curve.[58] This section examines the relative ability of rising monopoly power vs. falling worker power to account for these broad features of the unemployment and inflation experience.

First, we note that the substantial fall in the NAIRU is difficult to reconcile with a substantial increase in aggregate monopoly power. Theoretical models differ on whether rising monopoly power should increase unemployment or leave it constant – several models of monopoly and monopolistic competition do suggest that rising monopoly power leads to rising unemployment[59] – but there is no a priori reason to believe that rising monopoly power would *lower* the unemployment rate. At the same time, an increase in monopoly power would be a source of inflationary pressure: greater monopoly power would imply a higher price level, and therefore an increase in the inflation rate during the transition from one steady state to a new, higher-markup steady state. Neither of these appear obviously compatible with the trends of falling unemployment and low and stable inflation that have characterized the last three to four decades (as noted by Basu 2019 and Syverson 2019).

On the other hand, the trends in unemployment and inflation are easily explained by a fall in worker power. Almost all models of worker insider power or rent-sharing power would predict that as worker bargaining power falls, the NAIRU would also fall. The mechanisms – and their welfare implications – vary according to the model. First, a fall in insider power may reduce the marginal cost to a firm of increasing its employment, reducing unemployment (see e.g. Mortensen and Pissarides 1999, Figura and Ratner 2015). Blanchard and Giavazzi (2003) model the implications of worker power *and* monopoly power jointly: in their model falling worker power leads to lower unemployment as the incentive for firms to hire rises, while rising monopoly power leads to higher unemployment as firms reduce their output.[60] Second, falling insider power in wage setting can reduce any upward pressure on the NAIRU arising through

[58] See Crump et al (2019), Tuzemen (2017), Barnichon and Matthes (2017), Blanchard et al (2015).

[59] Manning (1990), for example, shows that rising monopoly power combined with increasing returns to scale can lead to higher unemployment. Blanchard and Giavazzi (2003), Geroski, Gregg and Van Reenen (1996), and Ebell and Haefke (2009) show that monopoly power plus worker bargaining power can lead to higher unemployment.

[60] More specifically, their model predicts that in the short run (with no entry of firms), falling worker power reduces the labor share with no effect on unemployment, but in the long run (where all firms pay entry costs and there are no positive rents), falling worker power reduces unemployment with no effect on the labor share. If the world is always somewhere between the pure short run and pure long run – there is some entry, but there are still some positive rents – then falling worker power in their model would predict a falling labor share *and* falling unemployment.

hysteresis effects (e.g. Blanchard and Summers 1986, Calmfors and Driffil 1988, Gali 2016). Third, a reduction in the availability of high wage jobs at, for example, unionized firms may reduce the incentives for "wait unemployment", where unemployed workers search for longer to try to get a high wage job, or "rest unemployment", where unemployed workers in high-rent sectors with temporary downturns wait for jobs to return (e.g. Hall 1975, Bulow and Summers 1986, Alvarez and Veracierto 1999, Alvarez and Shimer 2011).[61] On the other hand, in frictional labor markets where monopsonistic competition is present, and there is a relatively high degree of firm monopsony power relative to the size of the increase in wages by unions or worker power, aggregate unemployment could fall as worker bargaining power rises (Manning 2003).

Past empirical evidence is consistent with the idea that higher worker power is associated with higher equilibrium unemployment: areas and industries with higher rates of unionization have tended to have higher unemployment rates, and unionized firms have tended to see lower employment growth.[62] More recently, Figura and Ratner (2015) and Krueger (2018) have argued that the fall in labor power would lower the NAIRU, and Leduc and Wilson (2015) have suggested that a fall in worker bargaining power could be consistent with the flattening of the Phillips Curve.

IV.A Industry-level evidence

The theory discussed above suggests that a reduction in worker power could explain the aggregate decline in unemployment seen in the U.S. in recent decades. In this subsection, we test the worker power hypothesis at the level of industries, examining the industry-level relationship between unemployment, our measure of the labor rent share, and the industry-level unionization rate. We measure industry unemployment in the CPS, defining it as the unemployment rate amongst all workers who reported having worked in a given industry in their current job (if employed) or most recent job (if unemployed).

We find that industries which saw larger declines in their imputed labor rent share, or unionization rate, saw larger declines in their industry-level unemployment rate (Figs. 18 and 19). Regressions of the annual industry-level unemployment rate on the unionization rate and on

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[61] In addition, reduced worker power, by reducing wage growth, may reduce labor force participation. It is theoretically ambiguous whether the extensive margin elasticity of labor supply is positive or negative, but evidence from the U.S. over recent decades tends to suggest it is positive. See, e.g., Autor (2010), Meghir and Phillips (2010), Moffitt (2012). If increased worker power either reduces or does not affect total jobs, this increases unemployment.
[62] For some of this evidence, see for example Freeman and Medoff (1984), Summers (1986), Montgomery (1989), Blanchflower, Millward, and Oswald (1991), Leonard (1992).

the imputed labor rent share, with industry and year fixed effects, have positive and significant coefficients (Table 4), with the magnitude suggesting that a 4 percentage point lower imputed labor rent share is associated with a 0.4 percentage point decline in industry unemployment. (In contrast, regressions of the annual industry-level unemployment rate on measures of industrial concentration show no significant relationship, and the coefficients are positive.)

Figure 18: Change in unemployment and the unionization rate, by industry

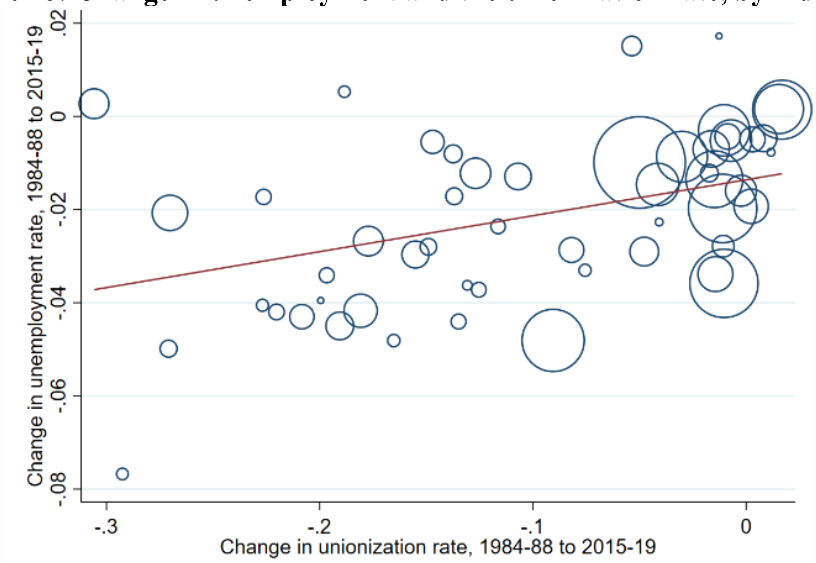
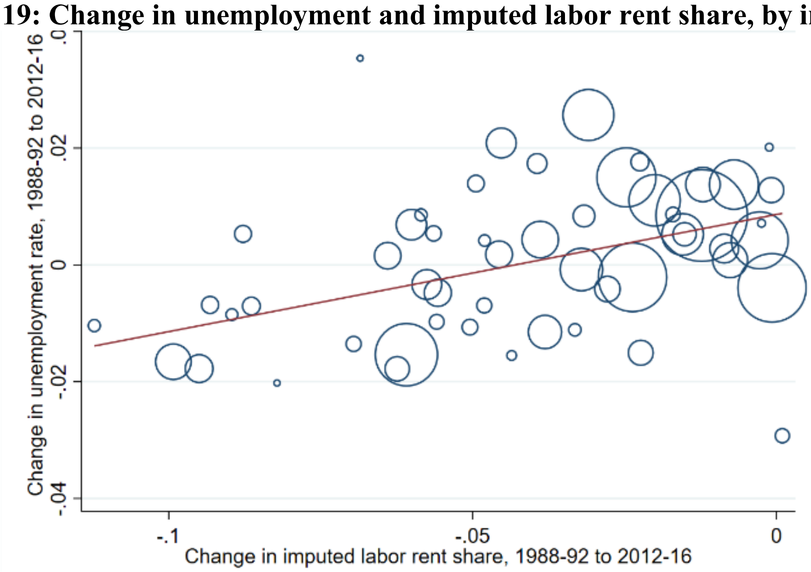


Figure 19: Change in unemployment and imputed labor rent share, by industry



Notes to Figs 18 and 19: Each bubble is an industry (at the BEA industry code level), where the size of the bubble represents industry average employment over 2012-2016. The red line is an employment-weighted line of best fit.

Table 4: Regressions of unemployment on measures of labor power

Panel A: Regression of unemployment on imputed labor rent share, 1987-2016				
Imputed labor rent share of gross value added	-0.14** (0.05)	-0.15** (0.05)	-0.02 (0.03)	0.10** (0.03)
Fixed effects	*None*	*Year*	*Ind*	*Year, Ind*
Observations	*1,613*	*1,613*	*1,613*	*1,613*
Panel B: Regression of unemployment on unionization, 1982-2019				
Unionization rate	-0.01 (0.02)	-0.02 (0.02)	0.05** (0.02)	0.04+ (0.02)
Fixed effects	*None*	*Year*	*Ind*	*Year, Ind*
Observations	*1,970*	*1,970*	*1,970*	*1,970*

*Robust standard errors, clustered at industry level, in parentheses. + p<0.10, * p<0.05, ** p<0.01.*

Following Figura and Ratner (2015), we can also use JOLTS data on vacancy rates over 2000-2019 to test whether sectors with bigger falls in our measures of labor power saw bigger increases in labor market tightness. The JOLTS data only reports data on relatively aggregated industries – 15 in total. The industries with the biggest falls in unionization rates over 2000/01-2018/19, or biggest falls in labor rent shares over 2000/01-2015/16, also saw the biggest increases in labor market tightness (Figs. 20 and 21). (Note that 2000/01 and 2018/19 are particularly appropriate years to compare because aggregate V/U and unemployment was very similar in the two periods.)[63]

IV.B. Quantitative implications for the NAIRU

Can we say anything about whether the magnitude of the decline in worker power is big enough to account for the decline in the NAIRU? One recent study on this topic is Figura and Ratner (2015), who study the decline in worker power as proxied for by the decline in the labor share of income. They show that industries and states with bigger falls in their labor share over 2001-2014 saw bigger increases in their vacancy/unemployment ratio (labor market tightness). They argue that this is consistent with a decline in worker bargaining power increasing the incentive for firms to create jobs, increasing equilibrium labor market tightness. They estimate that the decline in the labor share of income could have led to a two-thirds of a percentage point fall in

[63] In regressions of labor market tightness on measures of worker power over 2000-2016, holding industry constant, we similarly find that lower unionization rates or labor rent shares are significantly associated with higher vacancy-unemployment ratios. The coefficients suggest that the median fall in unionization was associated with a 1.75pp higher VU ratio, and the median fall in imputed labor rent share was associated with an 11.5pp higher VU ratio.

Figure 20: Change in labor market tightness and the unionization rate, 2000-2019, by industry

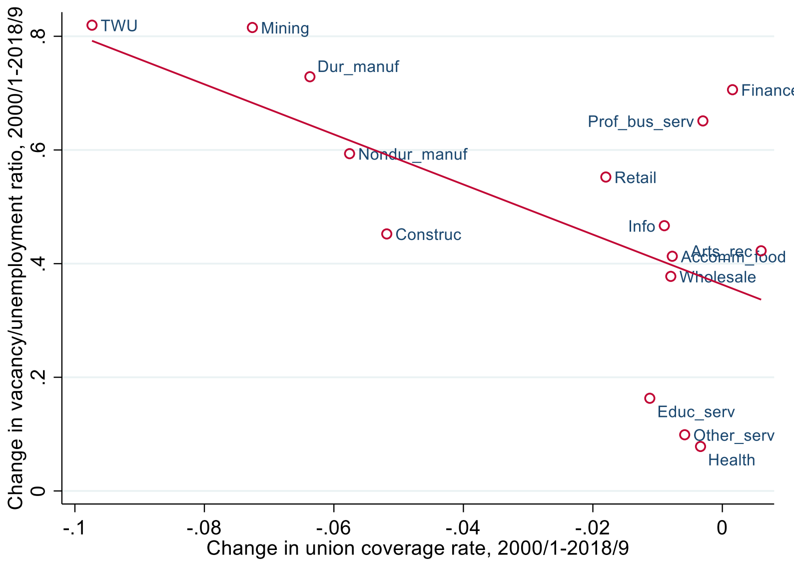
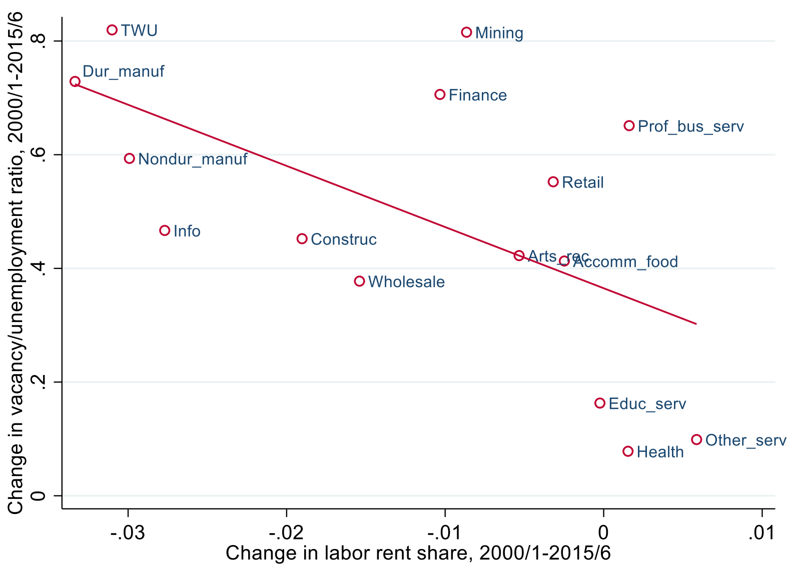


Figure 21: Change in labor market tightness and imputed labor rent share, by industry



Notes to Figs 20 and 21: Each dot is an industry (at the level of 15 JOLTS industry categories). Note that the observations for 2000-2001 are averages of monthly data from December 2000-December 2001 inclusive, as the JOLTS data only starts in December 2000. The observations for 2018-2019 are averages of monthly data from January 2018 to October 2019 inclusive. Red line is an employment-weighted line of best fit.

the NAIRU.[64] We believe this estimate is likely to be an underestimate of the magnitude of the effect for two reasons. First, it is based on coefficients relating the labor share to the vacancy-unemployment ratio which are estimated from state- or industry-level variation, and these coefficients may miss some dimension of the aggregate relationship between the two. Second, measurement error will likely attenuate the estimated coefficients.

We can similarly use our industry-level estimates to back out a naïve extrapolation of the aggregate relationship between worker power and unemployment. Applying the coefficients from Table 4 to the aggregate fall in the imputed labor rent share in the nonfinancial corporate sector (of 4.9pp) or unionization rate in the private sector (of 10pp) over 1984 to 2019 would have predicted a 0.4-0.5pp fall in the NAIRU. Once again, we would expect that this is an underestimate of the true effect, since it is based on industry-level variation and since the imperfection of our imputed labor rent share variable as a proxy for the decline in worker power is likely to cause attenuation bias.[65]

V. Investment

Investment has been falling relative to measures of corporate profitability (operating surplus, and Tobin's Q), and relative to fixed assets.[66] The weakness of investment relative to fundamentals has been a major motivator of the monopoly power argument, as rising monopoly power would predict falling investment relative to profitability, fixed assets, and value added (see for example Gutiérrez and Philippon 2017, Eggertsson et al 2019). On the other hand, one might argue that a decline in worker power would be expected to *increase* investment – a decline in worker rent-sharing power may lead to an increase in output, increasing the desired capital stock and so increasing investment. In this case, the trends in investment might be hard to reconcile with our

[64] More formally, they argue that the negative relationship they find between the labor share and the V/U ratio is consistent with a counter-clockwise rotation in the Job Creation curve in a standard DMP search model. After estimating the slope of the Beveridge curve, they can then estimate the degree to which a decline in worker bargaining power may affect equilibrium unemployment.
[65] While a full model-based investigation of the degree to which the decline in worker power may have affected the NAIRU is beyond the scope of this paper, we carry out four back-of-the-envelope exercises in Appendix Section A.14. These illustrate that, in simple models with plausible parameter values, it is possible for the decline in worker power that we have seen to generate very large changes in the NAIRU.
[66] Alexander and Eberly (2018) and Gutiérrez and Philippon (2017) show that the investment rate (investment/fixed assets) has – since the 1990s or 2000s – been lower than one would have expected given the rise in Tobin's Q and operating surplus. Crouzet and Eberly (2019) document that investment has been falling as a share of fixed assets.

argument that there has been a substantial decline in worker power.[67] To what extent are the facts on investment compatible with our argument of declining worker power?

First, we note that the theoretical predictions of declining worker power for investment are actually ambiguous. It is possible that a decline in worker power actually leads to less investment: by reducing the marginal cost of labor to firms, declining worker power may lead to the substitution of labor for capital (or at least, less substitution of capital for labor), reducing investment relative to a scenario where worker power had not declined.

Second, in strongly efficient bargain models of worker rent-sharing (our model for the accounting decomposition in section III.A., for example) the degree of worker rent-sharing power does not affect the firm's investment decision. The firm optimally maximizes profits, then distributes the rents between labor and capital. In this model, therefore, to understand if investment has fallen relative to the underlying profitability of firms, we must measure both profits to capital and profits to labor. In this spirit, define the ratio of investment to total profits as follows:

$$\frac{\text{Investment}}{\text{Total profits}} = \frac{\text{Investment}}{\text{Net operating surplus} + \text{imputed labor rents}}$$

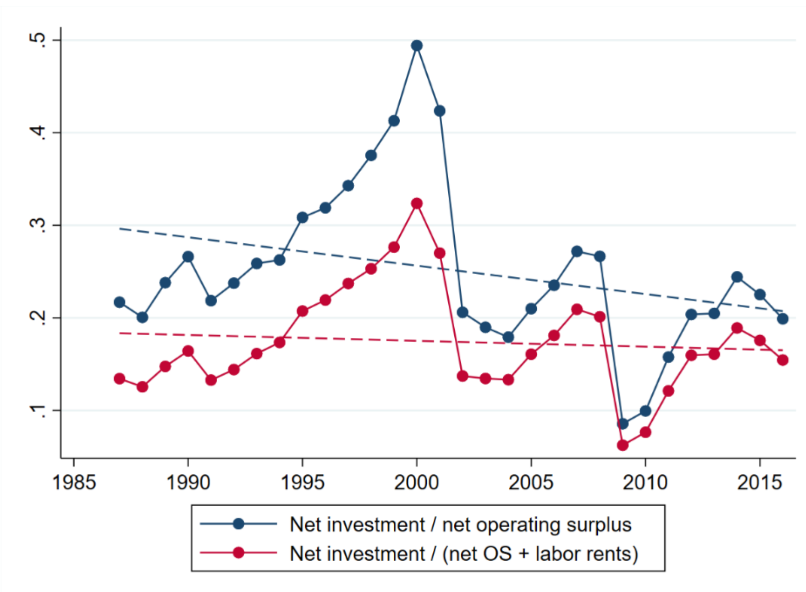
where imputed labor rents is our measure calculated in Section II.[68]

In Figure 22, we show that while net investment over net operating surplus (profits *to capital*) has fallen substantially over the last thirty years in the nonfinancial corporate sector, net investment over our measure of net *total profits* has remained roughly constant. That is, investment has *not* weakened relative to our measure of firms' total profitability.[69]

The relationship between labor power and investment-to-profits also holds at the industry level. We compare changes in the industry-level ratio of investment to profits on our industry-

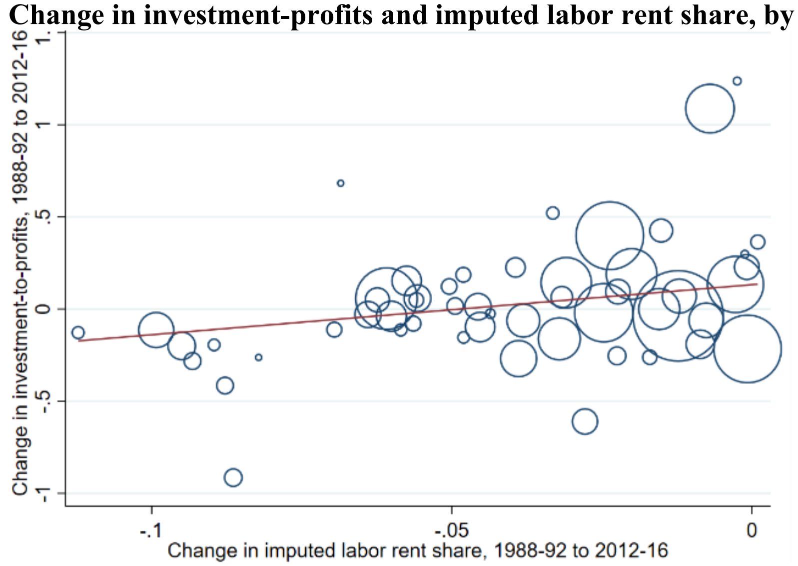
[67] As argued by Eggertsson et al (2019), for example.
[68] Investment is gross fixed investment in nonresidential structures, equipment, and intellectual property products for nonfinancial corporate business, from Federal Reserve Z.1 Flow of Funds Account. We obtain net investment by subtracting consumption of fixed capital for private domestic nonfinancial corporate business, from BEA NIPA.
[69] Crouzet and Eberly (2020) attribute a share of the growing weakness of investment relative to Q to product market rents. Our explanation could be compatible with this: instead of the product market rents arising from increased monopoly power, they may have been rents that were previously paid to labor so did not show up in Q.

Figure 22: Net investment to profits, and imputed, nonfinancial corporate



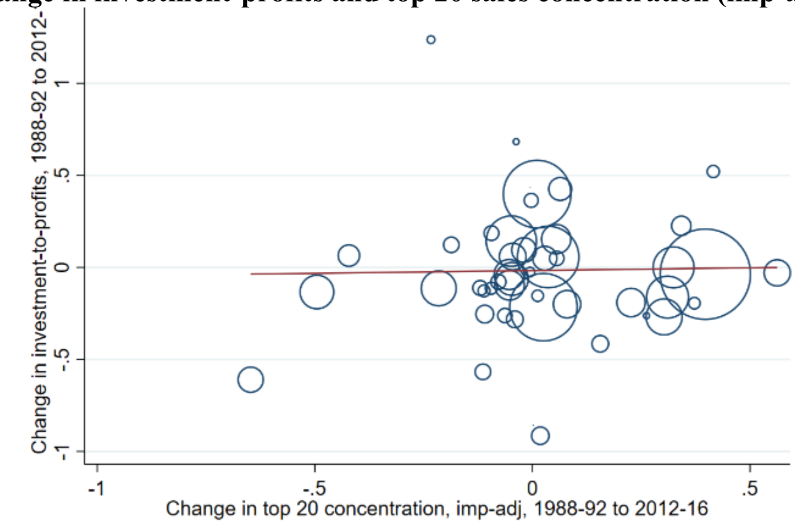
Notes: Gross nonresidential investment and consumption of fixed capital for nonfinancial corporate sector are from Fed Z1 accounts. Gross operating surplus for nonfinancial corporate business is from BEA NIPA. Labor rents measure is constructed as described in Section III.

Figure 23: Change in investment-profits and imputed labor rent share, by industry



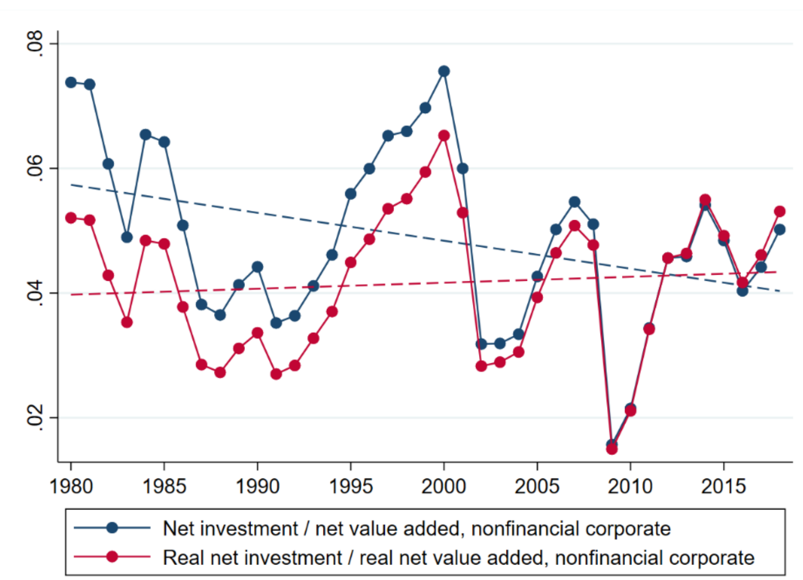
Notes: Each bubble is an industry (at the BEA industry code level), where the size of the bubble represents industry average employment over 2012-2016. The red line is an employment-weighted line of best fit.

Figure 24: Change in investment-profits and top 20 sales concentration (imp-adj), by industry



Notes: Each bubble is an industry (at the BEA industry code level), where the size of the bubble represents industry average employment over 2012-2016. The red line is an employment-weighted line of best fit.

Figure 25: Real and nominal net investment over net value added, nonfinancial corporate sector



Notes: Gross nonresidential investment and consumption of fixed capital for nonfinancial corporate sector are from Fed Z1 accounts. Gross value added for nonfinancial corporate business is from BEA NIPA. Deflator for investment is implicit price deflator for nonresidential fixed private sector domestic investment from BEA; deflator for value added is implicit price deflator for nonfinancial corporate business from BLS.

level measures of labor power and sales concentration.[70] Over 1988-2016, there is a strongly significant positive relationship between the imputed labor rent share and the investment-to-profit ratio (Fig. 23), but no apparent relationship between the average top 20 sales concentration ratio and the investment-to-profit ratio (Fig. 24). In horserace regressions of the investment-profit ratio on the imputed labor rent share and concentration measures, the results are mostly quite noisy, with no coefficients significantly different from zero once industry fixed effects are controlled for (see Table 3).

Third, we note that the relative price of investment goods has declined substantially over the time period in question. Thus, while there has been a decline in net investment relative to net value added in *nominal terms*, there has been no decline in net *real* fixed investment relative to net real value added in the nonfinancial corporate sector (red line in Fig. 25).[71]

Fourth, we note that Crouzet and Eberly (2019, 2020) show that a rise in intangible investment can account for the majority of the apparent decline in investment relative to fixed assets without invoking a rise in monopoly power.

Overall, then, there are several ways to reconcile the evidence on the apparent weakness of investment with our hypothesis of falling worker power.

VI. Concluding Remarks

The evidence in this paper suggests that declining unionization, increasingly demanding and empowered shareholders, decreasing real minimum wages, reduced worker protections, and the increases in outsourcing domestically and abroad have disempowered workers – with profound consequences for the labor market and the broader economy.

We argue that a major factor explaining changes in the functional distribution of income in the United States has been a reduction in workers' ability to lay claim to rents within

[70] We use gross operating surplus not net operating surplus here, as net operating surplus is very volatile

[71] Net investment to net value added is calculated using data on gross nonresidential investment and the consumption of nonresidential fixed capital by nonfinancial corporate business, from the Fed Z1 accounts, and gross value added in the nonfinancial corporate business sector from BEA NIPA. For the ratio of real net investment to real net value added, investment is deflated by the implicit price deflator for nonresidential fixed private sector domestic investment from the BEA, and value added is deflated by the implicit price deflator for nonfinancial corporate business, from the BLS.

firms, and that that reduced labor rents can explain the time series and cross industry patterns in profits more convincingly than stories centered on rising concentration in product and labor markets.In addition, our "declining worker power" hypothesis has the virtue of explaining the decline over time in the NAIRU and perhaps changes in the slope of the Phillips curve. Both empirical evidence on unions and theory confirm the idea that reducing the insider power of workers is likely to reduce the NAIRU.

The rising *monopoly* power hypothesis rests principally on three arguments: that the rise in monopoly power can explain the rise in the capital share, profitability, and Q; that it can explain the decline in investment relative to fundamentals; and that it is consistent with the aggregate rise in product market concentration in the U.S. in recent decades. We have focused in the paper on showing that the decline in worker power can explain the first two of these factors. We also note that the direct evidence on the rise in product market concentration, and its link to rising monopoly power, is somewhat ambiguous. For manufacturing industries, import-adjusted measures of concentration have fallen or risen only marginally since the 1980s (Covarrubias et al 2019). In many service industries, where the relevant market is often smaller than the entire U.S. market, local-level concentration is falling (Rossi-Hansberg et al 2019). In addition, a rise in concentration in and of itself does not necessarily indicate a rise in monopoly power. Several authors have noted a relationship between rising product market concentration and rising productivity in different sectors (Peltzman 2018, Autor et al 2019, Ganapati 2019, Crouzet and Eberly 2019). This, of course, does not imply that some sectors have not experienced a rise in monopoly power.[72] Equally, however, it does not provide strong support for the argument that a rise in monopoly power is a major factor at the level of the aggregate U.S. economy.

Similarly, there is little direct evidence to indicate a rise in labor market *monopsony* power. While worker's bargaining power in labor markets is defined to some extent relative to firm bargaining power, meaning that in many contexts one might consider a fall in worker power to be isomorphic to a rise in monopsony power, the *source* of the change in labor market power

[72] There is certainly evidence consistent with a rise in monopoly power in at least some industries. Covarrubias, Gutiérrez , and Philippon (2019) and Philippon (2020) for example document that since 2000, rising concentration has been associated with slower turnover of lead firms and rising prices, particularly in Telecoms, Airlines, and Banking, and present case studies of several products where prices are substantially higher in the U.S. than Europe (despite similar underlying technologies and so, presumably, similar underlying cost structures).

matters for policy implications.[73] First, as argued by Bivens, Mishel, and Schmitt (2018), it does not seem likely that an increase in conventional monopsony power has been a major trend over recent decades: local labor market concentration has been falling for most workers, not rising (Rinz 2018), and most workers do not face highly concentrated local labor markets when considering the full range of occupations they might work in (Schubert, Stansbury, and Taska 2020).[74] Second, while there is a large body of evidence of the existence of some degree of “dynamic" monopsony power (reviewed in Sokolova and Sorensen 2020), there is little evidence to suggest that dynamic monopsony power has increased over time: while the proliferation of non-compete clauses and occupational licensing requirements may have increased switching costs for some workers,[75] the rise of the internet should at the same time have substantially reduced the costs of job search for workers and employers.[76]

A fair question about the labor rents hypothesis regards what it says about the secular stagnation hypothesis that one of us has put forward (Summers 2013). We believe that the shift towards more corporate income, that occurs as labor rents decline, operates to raise saving and reduce demand. The impact on investment of reduced labor power seems to us ambiguous, with lower labor costs on the one hand encouraging expanded output and on the other encouraging more labor-intensive production.

In future research it would be valuable to more explicitly consider alternative bargaining models and their implications for wages and employment, and for total output and investment. A further promising avenue is distinguishing between the degree of product market monopoly power vs. labor market power in the U.S. economy by estimating markups on different types of inputs. With sufficiently detailed data on input costs, markups could be estimated on non-labor

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[73] As defined earlier in the paper, labor market monopsony power refers to the power of employers to pay a wage lower than workers' marginal product, because the employer faces an upward-sloping supply curve. This wage-setting power can be a result of firm size and employer concentration (“conventional monopsony", Robinson 1933) or a result of search frictions and employer heterogeneity (“dynamic monopsony", Manning 2003).

[74] This does not imply that labor market concentration is not an issue for some workers. Azar et al (2018) and Benmelech et al (2018), among others, find negative relationships between labor market concentration in the cross-section. Schubert et al (2020) and Arnold (2020) find that the average degree of employer concentration in the U.S. is associated with a wage markdown of about 5% from the level that would occur in the complete absence of employer concentration. Berger et al (2019) suggest welfare losses of 3%-8% arising from employer concentration.

[75] See Kleiner and Krueger 2013, Krueger and Ashenfelter 2016, Furman and Krueger 2016, Starr et al 2019**.**

[76] For empirical evidence on this, see for example Stevenson (2008), Kuhn and Mansour (2014), and Bhuller, Kostol, and Vigtel (2019). Note that while there has been a decline in the job-switching rate over time, this may either suggest an increase in the costs of job switching, consistent with higher monopsony power, or a decrease in the dispersion of job-specific rents, reducing workers' incentive to switch jobs (Molloy et al 2011).

inputs and on labor inputs separately. Markups over labor and non-labor inputs following the same path would be consistent with a rise in monopoly power; markups over non-labor inputs staying constant while markups over labor rise would be more consistent with a fall in worker power.[77]

Another important set of issues which we do not explore in detail relate to inequality in labor income. It seems plausible that the same kinds of situations which encourage rent-sharing also encourage the compression of compensation relative to productivity: unions, generous benefit structures, formalized wage-setting processes and so forth. We note that the decline in rent-sharing has been much greater for workers with less formal education more than for those with college degrees: the decline in unionization was much larger for workers without a college education than for workers with a college education – and, since the union wage premium is higher for workers without a college education, they also had more to lose; the decline in the large firm premium was concentrated on workers without a college education; the decline in the variance of industry wage premia was slightly larger for workers without a college education than for workers with some college; and the rise in domestic outsourcing has been concentrated primarily in occupations which do not require college educations, particularly food services, security, janitorial work, and logistics. The disproportionate decline in the labor rents going to non-college educated workers does not seem to have been driven primarily by compositional effects between industries.[78]

It is also possible that the decline in worker rent-sharing power may have enabled managers, as well as capital owners, to claim an increasing share of rents in high-rent industries. Note that our estimate of the decline in labor rents – based on the CPS – does *not* capture this phenomenon, since the CPS earnings data is top-coded and since non-response is high for people in the top tail of the income distribution. Therefore, our estimate of the decline in labor rents should be considered to be the decline in rents for the *majority of workers*, but not including top-level executives. The striking rise in compensation for top executives over recent decades means that it is certainly plausible that some of the lost labor rents were redistributed from workers to

[77] Though, finding differential trends in markups on labor inputs vs. non-labor inputs would not be conclusive evidence, because it is difficult to distinguish a change in true markups from the effects of technological change (Baqaee and Farhi 2020).
[78] See Appendix Sections A.8. and A.13. for more details.

CEOs and other executives. There has been roughly a doubling of the share of national income accruing to executives, managers, and supervisors in non-financial firms since 1979 (Bakija, Cole, and Heim 2012). Note, though, that while the increases in pay for individual executives and managers at typical corporations were large, the aggregate implications of this rise were relatively small: Bakija et al (2012) estimate that the increase in the income share of managers and executives at typical corporations was around 0.4 percentage points over 1979 to 2005. On the other hand, there was a large increase in the share of national income accruing to executives and managers who receive self-employment, S-corporation, or partnership income.[79] Since it is ambiguous whether income from these sources should be considered capital or labor income, it is possible the rising income of executives and managers of S-corporations and partnerships represents a redistribution of rents from labor to capital.[80]

Finally, we note two broad implications of our arguments. One of the puzzles highlighted by a number of observers is that technological change and globalization are ubiquitous but the extent of increases in inequality – both between capital and labor incomes, and within labor incomes – differ substantially across countries.[81] Our hypothesis which emphasizes the relative power of labor and capital fits this fact, given far more empowered shareholders and weaker unions in the U.S. than in the rest of the industrial world. Further study of the cross-country trends in labor shares, profitability and valuation, the NAIRU, and worker power would be valuable.

It is also worth highlighting that our hypothesis is perhaps more deeply threatening to existing thinking than the recently fashionable concentration view. The monopsony and monopoly perspectives allow economists to be in the congenial place of arguing for policies that simultaneously perfect markets, increase efficiency and promote fairness. In contrast preserving

[79] See Bakija, Cole, and Heim (2012), Smith, Yagan, Zidar, and Zwick (2019a, 2019b) for evidence on the role of executives in passthrough enterprises in rising income shares of the top 1%.

[80] Smith et al (2019b) argue that the decline in the labor share has been overstated because of the increase in top 1% income in passthrough enterprises, which is booked as capital income but should actually be considered to be labor income. While the degree of the decline in the aggregate labor income share may be ambiguous as a result of the difficulties of imputing passthrough income to labor or capital (and imputing self-employment income), what is *not* ambiguous is that the share of total income going to the vast majority of workers has declined since the 1980s. For the bottom 99% of people, for example, the share of total national income accounted for by labor compensation declined from 69% in 1978 to 59% in 2014 (Piketty, Saez, and Zucman 2018).

[81] See for example Gutiérrez and Piton (2019), who argue that the labor share has declined far more substantially in the U.S. than other countries

rent-sharing interferes with pure markets – and may not enhance efficiency on at least some measures.

More profoundly, if declines in worker power have been major causes of increases in inequality and lack of progress in labor incomes, and these problems cannot be addressed by making markets more competitive, it raises questions about capitalist institutions. In particular, it raises issues about the extent to which corporations should be run solely for the benefit of their shareholders – a constantly simmering debate that has gained new prominence with the Business Roundtable's embrace of shareholder capitalism. And it suggests that institutions which share rents with workers are likely to be necessary as a form of countervailing power (of the sort initially proposed by Galbraith (1952)). This would suggest that policy should tip the balance more in the direction of supporting union organizing activities and empowering unions (in response to the diminution of worker power alongside the existence of firms' monopoly power).

Overall, then, this paper suggests that the decline in worker power is one of the most important structural changes to have taken place in the U.S. economy in recent decades. If seeking to reverse the decline in the share of income going to workers, a focus on reducing firms' monopoly power or monopsony power is unlikely to be sufficient. Rather, policy solutions should focus on the decline in worker power.

References

Abowd, John M, H Finer, and Francis Kramarz (1999). “Individual and Firm Heterogeneity in Compensation: An analysis of matched longitudinal employer-employee data for the state of Washington." In: Haltiwanger J, Lane J, Theeuwes P (eds) The *Creation and Analysis of Employer-Employee Matched Data*, pp. 3–24. Elsevier-North Holland, Amsterdam

Abowd, John M., Francis Kramarz, and David N. Margolis (1999). “High wage workers and high wage firms." Econometrica 67.2 (1999): 251-333.

Abowd, John M, Francis Kramarz, Paul Lengermann, Kevin L McKinney, and Sebastien Roux (2012). “Persistent inter-industry wage differences: rent sharing and opportunity costs". IZA Journal of Labor Economics 1:7.

Akerlof, George A., and Janet L. Yellen (1986), eds. “Efficiency wage models of the labor market." Cambridge University Press.

Akerlof, George A., William T. Dickens, and George L. Perry (1996). "The macroeconomics of low inflation." *Brookings papers on economic activity* 1996, no. 1: 1-76.

Alexander, Lewis, and Janice C. Eberly (2018). “Investment Hollowing Out”. IMF Economic Review.

Alvarez, Fernando, and Robert Shimer (2011). “Unions and Unemployment". mimeo.

Alvarez, Fernando, and Marcelo Veracierto (1999). “Labor-Market Policies in an Equilibrium Search Model". NBER Macroeconomics Annual, Vol. 14 (1999), pp. 265-304.

Anderson, Eric, Sergio Rebelo, and Arlene Wong (2019). “Markups Across Space and Time”. Working Paper.

Applebaum, Eileen (2017). “Domestic Outsourcing, Rent Seeking, and Increasing Inequality". Review of Radical Political Economics, Vol 49(4), pp. 513-528.

Arnold, David (2020). "Mergers and Acquisitions, Local Labor Market Concentration, and Worker Outcomes." Working Paper.

Autor, David, David Dorn, Lawrence F. Katz, Christina Patterson, and John Van Reenen (2019). “The Fall of the Labor Share and the Rise of Superstar Firms". Quarterly Journal of Economics, forthcoming.

Azar, Jose, Ioana Marinescu, Marshall Steinbaum, and Bledi Taska (2018). “Concentration in US Labor Markets: Evidence from Online Vacancy Data". NBER Working Paper No. 24395.

Baqaee, David Rezza, and Emmanuel Farhi (2020). “Productivity and Misallocation in General Equilibrium". Mimeo.

Bakija, Jon, Adam Cole, and Bradley T. Heim (2012). "Jobs and income growth of top earners and the causes of changing income inequality: Evidence from US tax return data." Working Paper.

Barkai, Simcha (2017). “Declining Labor and Capital Shares". Journal of Finance, forthcoming.

Barkai, Simcha, and Seth G. Benzell (2018). “70 Years of U.S. Corporate Profits". Stigler Center for the Study of the Economy and the State, New Working Paper Series No. 22, April 2018.

Barnichon, Regis, and Christian Matthes (2017). “The NAIRU over the Past 100 Years". FRBSF Economic Letter 2017-23.

Barth, Erling, Alex Bryson, James C. Davis, and Richard Freeman (2016). “It’s Where You Work: Increases in the Dispersion of Earnings across Establishments and Individuals in the United States". Journal of Labor Economics, 34(2).

Basu, Susanto (2019). “Are Price-Cost Markups Rising in the United States? A Discussion of the Evidence". Journal of Economic Perspectives 33(3), Summer 2019.

Bell, Brian, Pawel Bukowski, and Stephen Machin (2019). “Rent Sharing and Inclusive Growth". London School of Economics International Inequalities Institute, Working paper 29, February 2019.

Benmelech, Efraim, Nittai K. Bergman, and Hyunseob Kim (2019). “Strong Employers and Weak Employees: How Does Employer Concentration Affect Wages?". Working Paper.

Berger, David, Kyle Herkenhoff, and Simon Mongey (2019). “Labor Market Power". Working Paper.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott (2006). “Survival of the best fit: Exposure to low-wage countries and the (uneven) growth of US manufacturing plants." Journal of International Economics 68(1): 219-237.

Bernhardt, Annette, Rosemary Batt, Susan Houseman, and Eileen Appelbaum (2016). “Domestic Outsourcing in the U.S.: A Research Agenda to Assess Trends and Effects on Job Quality". Institute for Research on Labor and Employment Working Paper 102-16, February 2016.

Berry, Steven T., Martin Gaynor, and Fiona Scott Morton (2019). “Do Increasing Markups Matter? Lessons from Empirical Industrial Organization”. Journal of Economic Perspectives 33 (3): 44-68.

Bhuller, Manudeep, Andreas Kostol, and Trond Vigtel (2019). "How Broadband Internet Affects Labor Market Matching." Working Paper, Available at SSRN 3507360.

Bidwell, Matthew, Forrest Briscoe, Isabel Fernandez-Mateo, and Adina Sterling (2013). “The Employment Relationship and Inequality: How and Why Changes in Employment Practices are Reshaping Rewards in Organizations". The Academy of Management Annals, vol. 7.

Bivens, Josh, Lawrence Mishel, and John Schmitt (2018). “It's not just monopoly and monopsony: How market power has affected American wages". Economic Policy Institute report, April 25, 2018.

Blanchard, Olivier, and Francesco Giavazzi (2003). “Macroeconomics of Regulation and Deregulation in Goods and Labor Markets". Quarterly Journal of Economics, August 2003.

Blanchard, Olivier J., and Lawrence H. Summers (1986). “Hysteresis and the European unemployment problem." NBER Macroeconomics Annual (1986): 15-78.

Blanchflower, David G., and Alex Bryson (2004). “Union Relative Wage Effects in the United States and the United Kingdom". The Industrial Relations Research Association Proceedings 2004.

Blanchflower, David G., Neil Millward, and Andrew J. Oswald (1991). “Unionism and employment behaviour." The Economic Journal 101 (407): 815-834.

Blanchflower, David G., Andrew J. Oswald, and Peter Sanfey (1996). “Wages, Profits, and Rent-Sharing". Quarterly Journal of Economics, 111(1), Feb. 1996, pp. 227-251.

Bollinger, Christopher R., and Barry T. Hirsch (2006). "Match bias from earnings imputation in the Current Population Survey: The case of imperfect matching." Journal of Labor Economics 24 (3): 483-519.

Brown, Charles, and James Medoff (1989). “The Employer Size Wage Effect". Journal of Political Economy, 97(5), pp. 1027-1059.

Brun, Lidia, and Ignacio Gonzalez (2017). “Aggregate Tobin's Q and Inequality: The Role of Capital Taxation and Rents". Working Paper.

Bulow, Jeremy I., and Lawrence H. Summers (1986). “A theory of dual labor markets with application to industrial policy, discrimination, and Keynesian unemployment." Journal of labor Economics 4.3, Part 1 (1986): 376-414.

Caballero, Ricardo J., and Mohamad L. Hammour (2005). “The cost of recessions revisited: A reverse-liquidationist view." The Review of Economic Studies 72.2 (2005): 313-341.

Calmfors, Lars, and John Driffill (1988). “Bargaining structure, corporatism and macroeconomic performance." Economic Policy 3 (6): 13-61.

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline (2018). “Firms and Labor Market Inequality: Evidence and Some Theory". Journal of Labor Economics, vol 36.

Cobb, J. Adam, and Ken-Hou Lin (2017). "Growing Apart: The Changing Firm-Size Wage Premium, and its Inequality Consequences". Organization Science 28(3):429-446.

Couch, Kenneth A., and Dana W. Placzek (2010). "Earnings losses of displaced workers revisited." American Economic Review 100.1 (2010): 572-89.

Council of Economic Advisers (2016). "Labor Market Monopsony: Trends, consequences, and policy responses". White House Council of Economic Advisers Issue Brief October 2016.

Covarrubias, Mattias, Germán Gutiérrez, and Thomas Philippon (2019). "From Good to Bad Concentration? U.S. Industries over the past 30 years". NBER Macroeconomics Annual 2019.

Crouzet, Nicolas, and Janice C. Eberly (2020). "Rents and Intangible Capital: A "Q+" Approach". Working Paper.

Crouzet, Nicolas, and Janice C. Eberly (2019). "Understanding Weak Capital Investment: The Role of Market Concentration and Intangibles." NBER Working Paper No. 25869.

Crump, Richard K., Stefano Eusepi, Marc Giannoni, and Aysegul Sahin (2019). "A Unified Approach to Measuring U*". Brookings Papers on Economic Activity, Spring 2019.

Davis, Steven J., and John Haltiwanger (1991). "Wage Dispersion Between and Within U.S. Manufacturing Plants, 1963-86". Brookings Papers on Economic Activity, 1991.

Davis, Steven J, and John Haltiwanger (1996). "Employer Size and the Wage Structure in U.S. Manufacturing," Annales D'Economie et de Statistique, January/June 1996.

Davis, Steven J., John Haltiwanger, Kyle Handley, Ben Lipsius, Josh Lerner, and Javier Miranda (2019). "The Economic Effects of Private Equity Buyouts". NBER Working Paper No. 26371.

Davis, Steven J. and Till von Wachter (2012). "Recessions and the Cost of Job Loss". Brookings Papers on Economic Activity, 2012.

De Loecker, Jan, and Jan Eeckhout (2019). "Global Market Power". Working Paper.

De Loecker, Jan, Jan Eeckhout, and Gabriel Unger (2019). "The Rise of Market Power and the Macroeconomic Implications". Quarterly Journal of Economics, forthcoming.

Denice, Patrick, and Jake Rosenfeld (2018). "Unions and Nonunion Pay in the United States, 1977–2015". Sociological Science 5: 541-561.

Dickens, William T., and Lawrence F. Katz (1987). "Interindustry Wage Differences and Industry Characteristics". In: Lang K, Leonard J Unemployment and the Structure of Labor Markets. Blackwell, pp. 48-89.

Doeringer, Peter B., and Michael J. Piore (1971). “Internal labor markets and manpower analysis." ME Sharpe.

Dorn, David, Johannes F. Schmieder, and James R. Spletzer (2018). “Domestic Outsourcing in the United States". Working Paper.

Dube, Arindrajit, and Ethan Kaplan (2010). “Does Outsourcing Reduce Wages in the Low-Wage Service Occupations? Evidence from Janitors and Guards". Industrial and Labor Relations Review, 63(2).

Ebell, Monique, and Christian Haefke (2009). “Product market deregulation and the US employment miracle". Review of Economic Dynamics 12: 479-504.

Edmond, Chris, Virgiliu Midrigan, and Daniel Yi Xu (2018). “How costly are markups?”. Working Paper No. w24800. National Bureau of Economic Research.

Eggertsson, Gauti B., Jacob A. Robbins, and Ella Getz Wold (2018). “Kaldor and Piketty's Facts: The Rise of Monopoly Power in the United States". Working Paper.

Elsby, Michael WL, Bart Hobijn, and Ayşegül Şahin (2013). "The decline of the US labor share." Brookings Papers on Economic Activity 2013.2: 1-63.

Estevao, Marcello, and Stacey Tevlin (2003). “Do Firms Share Their Success with Workers? The Response of Wages to Product Market Conditions". Economica 70(280): 597-617.

Even, William E., and David A. Macpherson (2012). “Is Bigger Still Better? The Decline of the Wage Premium at Large Firms". Southern Economic Journal 78(4): 1181–1201.

Farber, Henry (2005). “Nonunion wage rates and the threat of unionization." ILR Review 58(3): 335-352.

Farhi, Emmanuel, and Francois Gourio (2018). “Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia". Brookings Papers on Economic Activity, Fall 2018.

Figura, Andrew, and David Ratner (2015). “The Labor Share of Income and Equilibrium Unemployment". FEDS Notes, June 8, 2015.

Freeman, Richard B., and James L. Medoff (1984). “What Do Unions Do?" Basic Books Inc.: New York.

Furman, Jason, and Alan Krueger (2016). “Why aren’t workers getting raises? Blame the monopsony”. Wall Street Journal, November 3rd, 2016.

Gali, Jordi (2016). “Insider-outsider labor markets, hysteresis and monetary policy." Working Paper

Geroski, Paul, Paul Gregg, and John Van Reenen (1995). “Market imperfections and employment."

Gibbons, Robert, and Lawrence Katz (1992). “Does Unmeasured Ability Explain Inter-Industry Wage Differentials?". Review of Economic Studies 59: 515-535.

Gonzalez, Ignacio, and Pedro Trivin (2017). “The Global Rise of Asset Prices and the Decline of the Labor Share". Working Paper.

Groshen, Erica L. (1991). “Source of Intra-Industry Wage Dispersion: How Much Do Employers Matter?". Quarterly Journal of Economics, August 1991.

Grout, Paul A (1984). “Investment and wages in the absence of binding contracts: A Nash bargaining approach." Econometrica (1984): 449-460.

Grullon, Gustavo, Yelena Larkin, and Roni Michaely (2019). “Are US industries becoming more concentrated?" Review of Finance 23.4: 697-743.

Gutiérrez, Germán, and Thomas Philippon (2017). “Investmentless Growth: An Empirical Investigation". Brookings Papers on Economic Activity, Fall 2017.

Hall, Robert E. (2018). “Using Empirical Marginal Cost to Measure Market Power in the US Economy". Working Paper.

Hirsch, Barry, and David Macpherson (2019). UnionStats.com database.

Hollister, Matissa N. (2004). “Does Firm Size Matter Anymore? The New Economy and Firm Size Wage Effects". American Sociological Review Vol 69: 659-676.

Holzer H, Lawrence F. Katz, and Alan B. Krueger (1991). “Job Queues and wages". Quarterly Journal of Economics 106 (3) :739-68.

Jacobson, Louis S., Robert J. LaLonde, and Daniel G. Sullivan (1993). “Earnings losses of displaced workers." The American Economic Review (1993): 685-709.

Johnson, George E., and P. Richard G. Layard (1986). "The natural rate of unemployment: explanation and policy." Handbook of labor economics 2: 921-999.

Karabarbounis, Loukas, and Brent Neiman (2018). “Accounting for Factorless Income". NBER Macroeconomics Annual, 33, 167-228, April 2018.

Karabarbounis, Loukas, and Brent Neiman (2014). “The Global Decline of the Labor Share”. Quarterly Journal of Economics, 129(1): 61-103.

Katz, Lawrence F., and Lawrence H. Summers (1989). “Industry Rents: Evidence and Implications". Brookings Papers on Economic Activity: Microeconomics, 1989.

Kehrig, Matthias, and Nicolas Vincent (2020). “The Micro-Level Anatomy of the Labor Share Decline". Working Paper.

Kim, Changhwan, and Arthur Sakamoto (2008). “Declining Inter-Industry Wage Dispersion in the U.S.". Social Science Research 37.4 (2008): 1081-1101.

Kleiner, Morris M., and Alan B. Krueger (2013). "Analyzing the extent and influence of occupational licensing on the labor market." *Journal of Labor Economics* 31.S1: S173-S202.

Kline, Patrick, Neviana Petkova, Heidi Williams, and Owen Zidar (2019). “Who Profits from Patents? Rent-Sharing and Innovative Firms". Quarterly Journal of Economics, 2019: 1343-1404.

Kodrzycki, Yolanda K. (2007). “Using Unexpected Recalls to Examine the Long-Term Earnings Effects of Job Displacement". Federal Reserve Bank of Boston Working Paper No. 07-2.

Krueger, Alan B. (2018). “Reflections on Dwindling Worker Bargaining Power and Monetary Policy”. Luncheon Address at the Jackson Hole Economic Symposium, August 24, 2018.

Krueger, Alan B., and Orley Ashenfelter (2018). “Theory and evidence on employer collusion in the franchise sector” NBER Working Paper No. w24831.

Krueger, Alan B., and Lawrence H. Summers (1986). “Efficiency Wages and the Inter-Industry Wage Structure". Econometrica 56(2): 259-293.

Kuhn, Peter, and Hani Mansour (2014). "Is internet job search still ineffective?" The Economic Journal 124.581: 1213-1233.

Lachowska, Marta, Alexandre Mas, and Stephen A. Woodbury (2018). “Sources of displaced workers’ long-term earnings losses." NBER Working Paper No. w24217.

Leduc, Sylvain, and Daniel J. Wilson (2017). “Has the Wage Phillips Curve Gone Dormant?" FRBSF Economic Letter 30.

Leicht, Kevin T (1989). “On the estimation of union threat effects." American Sociological Review (1989): 1035-1047.

Leonard, Jonathan S (1992). “Unions and employment growth." Industrial Relations: A Journal of Economy and Society 31(1): 80-94.

Levy, Frank, and Peter Temin (2007). “Inequality and Institutions in 20th Century America". NBER Working Paper No. 13106.

Macaluso, Claudia (2019). “Skill Remoteness and Post-Layoff Labor Market Outcomes". Working Paper.

Manning, Alan (2003). “Monopsony in Motion: Imperfect Competition in Labor Markets". Princeton University Press.

Molloy, Raven, Riccardo Trezzi, Christopher L. Smith, and Abigail Wozniak (2016). “Understanding declining fluidity in the US labor market." Brookings Papers on Economic Activity 2016, no. 1: 183-259.

Montgomery, Edward (1989). “Employment and unemployment effects of unions." Journal of Labor Economics 7 (2)): 170-190.

Mortensen, Dale T., and Christopher A. Pissarides (1999). “Job reallocation, employment fluctuations and unemployment." Handbook of macroeconomics 1 (1999): 1171-1228.

Neumark, David, and Michael L. Wachter (1995). “Union effects on nonunion wages: Evidence from panel data on industries and cities." ILR Review 49(1): 20-38.

Oswald, Andrew J (1982). “Trade unions, wages and unemployment: What can simple models tell us?" Oxford economic papers 34.3 (1982): 526-545.

Peoples, James (1998). “Deregulation and the labor market." Journal of Economic Perspectives 12.3 (1998): 111-130.

Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman (2018). "Distributional national accounts: methods and estimates for the United States." *The Quarterly Journal of Economics* 133.2 : 553-609.

Rinz, Kevin (2018). “Labor Market Concentration, Earnings Inequality, and Earnings Mobility". CARRA Working Paper 2018-10.

Robinson, Joan (1933). “The Economics of Imperfect Competition".

Rosenfeld, Jake (2014). “What Unions No Longer Do". Harvard University Press.

Salinger, Michael A. (1984). “Tobin's Q, Unionization, and the Concentration-Profits Relationship". RAND Journal of Economics 15(2).

Schmieder, Johannes, and Till von Wachter (2010). “Does Wage Persistence Matter for Employment Fluctuations? Evidence from Displaced Workers” American Economic Journal: Applied Economics.

Schubert, Gregor, Anna Stansbury, and Bledi Taska (2020). “Mitigating Monopsony: Occupational Mobility and Outside Options". Working Paper.

Slichter, Sumner H (1950). “Notes on the Structure of Wages." The Review of Economics and Statistics (1950): 80-91.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick (2019a). "Capitalists in the Twenty-first Century." The Quarterly Journal of Economics 134 (4): 1675-1745.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick (2019b). "The Rise of Pass-Throughs and the Decline of the Labor Share". Working Paper.

Sokolova, Anna, and Todd Sorensen (2020). “Monopsony in Labor Markets: A Meta-Analysis". Washington Center for Equitable Growth Working Paper, February 2020.

McDonald, Ian M., and Robert M. Solow (1981). “Wage bargaining and employment." The American Economic Review 71(5): 896-908.

Song, Jae, David J. Price, Fatih Guvenen, Nicholas Bloom, and Till von Wachter (2019). “Firming Up Inequality". Quarterly Journal of Economics 134(1).

Sorkin, Isaac (2018). “Ranking Firms Using Revealed Preference". Quarterly Journal of Economics 2018: 1331-1393.

Stansbury, Anna, and Lawrence H. Summers (2019). “Productivity and Pay: Is the Link Broken?". Chapter 8 in Adam S. Posen and Jeromin Zettelmeyer eds., Facing Up to Low Productivity Growth, Peterson Institute for International Economics.

Starr, Evan, James J. Prescott, and Norman Bishara (2019). "Noncompetes in the US labor force." U of Michigan Law & Econ Research Paper 18-013.

Stevenson, Betsey (2008). “The Internet and job search”. No. w13886. National Bureau of Economic Research.

Summers, Lawrence H. (1988) “Relative wages, efficiency wages, and Keynesian unemployment.” NBER Working Paper w2590.

Summers, Lawrence H. (1986). “Why is the Unemployment Rate So Very High Near Full Employment?". Brookings Papers on Economic Activity, 2:1986.

Summers, Lawrence H. (2013). “Remarks at IMF Fourteenth Annual Research Conference in Honor of Stanley Fischer".

Syverson, Chad (2019). “Macroeconomics and Market Power: Context, Implications, and Open Questions". Journal of Economic Perspectives 33(3), Summer 2019.

Traina, James (2018). “Is Aggregate Market Power Increasing? Production Trends Using Financial Statements”. Stigler Center for the Study of the Economy and the State, New Working Paper Series No. 17.

Tuzemen, Didem (2017). “A New Estimate of the NAIRU." Federal Reserve Bank of Kansas City Macro Bulletin (2017): 1-4.

Ulman, Lloyd (1965). “Labor mobility and the industrial wage structure in the postwar United States." The Quarterly Journal of Economics 79.1 (1965): 73-97.

Von Wachter, Till, Jae Song, and Joyce Manchester (2011). “Long-term earnings losses due to mass layoffs during the 1982 recession: An analysis using US administrative data from 1974 to 2004." Working Paper.

Weber Handwerker, Elizabeth (2018). “Increased Concentration of Occupations, Outsourcing, and Growing Wage Inequality in the United States". Working Paper.

Weil, David (2014). “The Fissured Workplace". Harvard University Press.

Western, Bruce, and Jake Rosenfeld (2011). “Unions, Norms, and the Rise in U.S. Wage Inequality". American Sociological Review 2011 76: 513.

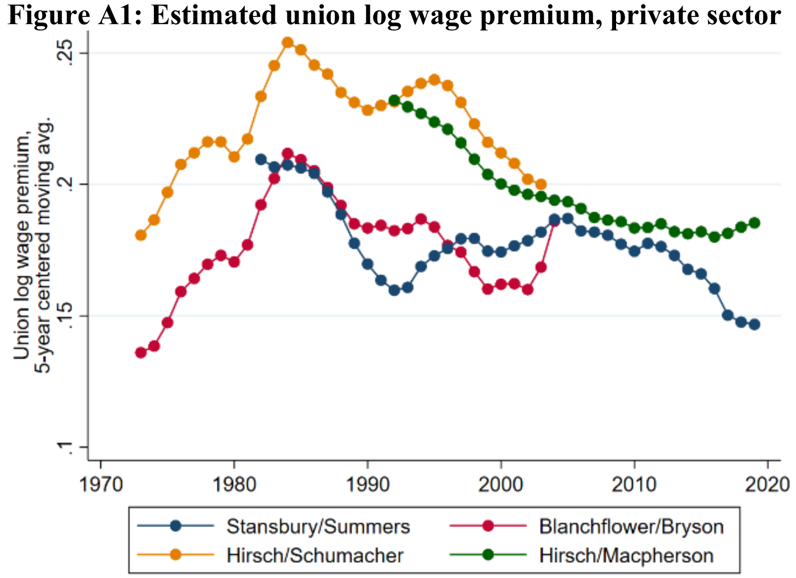
Yellen, Janet (1984). “Efficiency Wage Models of Unemployment”. *American Economic Review* 24 (2): 200-2005.

Appendix

A.1. Estimating the union wage premium in the CPS-ORG

Following Hirsch and Macpherson (2019) (and others), we estimate the union wage premium using the CPS-ORG over 1984-2019 (the years for which the CPS-ORG collected respondents' union status). We restrict the sample to private sector workers, and we also drop workers for whom wages were imputed in the CPS, since the wage imputation procedure does not take union status into account and therefore biases estimates of the union wage premium downwards (see Bollinger and Hirsch 2006). Our key variable of interest – union status – is a dummy variable which takes the value 1 if the worker was either a member of a union or covered by a collective bargaining agreement. We construct our dependent variable – hourly wage – as either the hourly wage reported by the worker, or the weekly earnings divided by usual hours worked at the respondent's main job (if hourly wage was not reported). We then regress the log hourly wage on union status and a large set of control variables: age, age squared, male dummy, 6 race categories, Hispanic dummy, age # male, age squared # male, married dummy, married # male, state, dummy for central city, 6 education categories, education # age, education # age squared, education # male, dummy for full-time workers, 383 occupation categories, and 250 industry categories (where # denotes an interaction). We run our regressions separately for each year, and so estimate a separate union wage premium for each year. Our estimates are shown in Figure A1 alongside estimates from Hirsch and Schumacher (2004), Blanchflower and Bryson (2004), and Hirsch and Macpherson (2019).

Figure A1: Estimated union log wage premium, private sector



A.2. Estimating firm size premia in the CPS ASEC

Following Song et al (2019) (and others), we estimate the firm size wage premium using the CPS-ASEC sample over 1990-2019 (the years for which the CPS-ASEC collected respondents' employer size). We restrict the sample to private sector workers. Our key independent variable is the size of workers' employer in the last year (variable *FIRMSIZE* in the IPUMS database, which indicates "the total number of persons who worked for the respondent's employer during the preceding calendar year, counting all locations where the employer operated"). We use four size classes: fewer than 100 employees, 100 to 499 employees, 500 to 999 employees, or 1000+ employees. The ASEC only collects workers' annual earnings, weeks worked last year, and usual hours worked per week last year, so we construct our dependent variable – hourly wage – from these variables (likely introducing measurement error if workers misremember or misreport any of these variables).

We then regress the log hourly wage on separate categorical variables for the different firm size classes, and a large set of control variables (the same as in the union wage premium regression, but also including union status): age, age squared, male dummy, 6 race categories, Hispanic dummy, age # male, age squared# male, married dummy, married # male, state, dummy for central city, 6 education categories, education # age, education # age squared, education # male, dummy for full-time workers, 383 occupation categories, 250 industry categories, and a dummy for union membership or coverage (where # denotes an interaction).

The union membership/coverage variable is only available for one quarter of the ASEC sample each year, which makes our estimates of the firm size premium relatively noisy if we run them separately for each year (as the sample size is relatively small). We therefore run our regressions over pooled 5-year periods: 1990-1994, 1995-1999, 2000-2004, 2005-2009, 2010-2014, 2015-2019.

A.3. Estimating industry wage premia in the CPS-ORG

Following Katz and Summers (1989), we estimate industry wage premia from the CPS-ORG over 1982-2019. We restrict the sample to private sector workers, which gives us between 120,000 and 150,000 observations per year (for a total of 5.3 million observations over 1982-2019). Our independent variable of interest is the industry the worker is employed in. We estimate industry wage premia in separate regressions at three different levels of industry aggregation: 9 sectors, which correspond to SIC divisions and are aggregated from the *ind1990* variable in CPS-IPUMS, 77 subsectors, which correspond to BEA industry codes (roughly, NAICS 3-digit industries), and 250 detailed industries, which correspond to SIC industries (at the level of the ind1990 codes in CPS-IPUMS).

Our dependent variable is the hourly wage. As in the union wage premium regressions, this is either the hourly wage reported by the worker, or the weekly earnings divided by usual hours worked at the respondent's main job (if hourly wage was not reported).

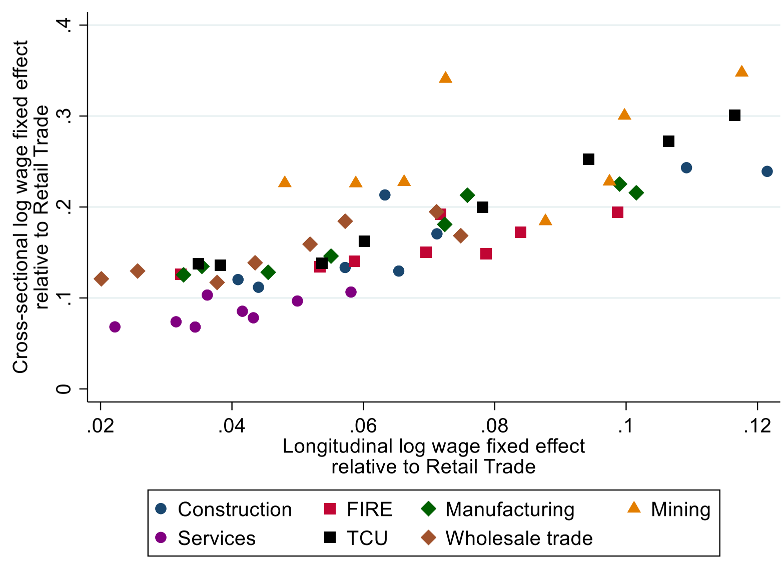
We then regress the log hourly wage on separate categorical variables for each industry, and a large set of control variables (the same as in the firm size regression): age, age squared, male dummy, 6 race categories, Hispanic dummy, age # male, age squared # male, married dummy, married # male, state, dummy for central city, 6 education categories, education # age, education # age squared, education # male, dummy for full-time workers, 383 occupation categories, and a dummy for union membership or coverage (where # denotes an interaction). We run the regressions separately for each year over 1984-2019, and separately for each level of industry aggregation.

A.4. Estimating industry wage premia in the CPS-ORG: longitudinal estimates

Our baseline estimates of industry wage premia are estimated cross-sectionally, as described in sections I.C. and A.3. We also estimate industry wage premia in the CPS-ORG longitudinally, as a robustness check. Restricting our sample only to the individuals who are observed and can be matched from one year to the next year (using the *cpsidp* variable available at CPS IPUMS), we have between 15,000 and 45,000 unique observations in each year. The industry fixed effects in a longitudinal regression, however, are estimated only from people who move jobs from one sector to another during the 12-month period between our two observations: this means that the industry fixed effects are estimated from a sample of only 2,600-10,000 observations per year (with a median number of industry switchers of 7,803 per year). The small sample size implies that, even when estimating the industry fixed effects only for our sample of 9 large sectors, estimates of the industry fixed effects are rather noisy. Measurement error of industry coding, which is well-documented in the CPS (see e.g. Kambourov and Manovskii 2008), may then lead to concerns of relatively serious attenuation bias.

Nonetheless, we find that there is a strong and highly statistically significant correlation (r=0.89) between the log wage fixed effects we estimate from the large cross-sectional samples, and the log wage fixed effects we estimate from the smaller longitudinal sample of industry movers. Figure A2 below shows the estimated log wage fixed effects for each of the seven large sectors, relative to Retail Trade (set to zero in each period), where each point on the plot represents the average log wage fixed effect over a five year period (1982-1984, 1985-1989, 1990-1994, 1995-1999, etc.). As can be seen, there is an extremely close relationship between the estimated fixed effects from the cross-sectional data vs. from the longitudinal data, which holds within sectors. In addition, the decline in the variance of the longitudinal industry log wage fixed effects is proportionally as large or larger than the decline in the variance of the cross-sectional industry log wage fixed effects.

Figure A2: Correlation between cross-sectional and longitudinal industry log wage fixed effects



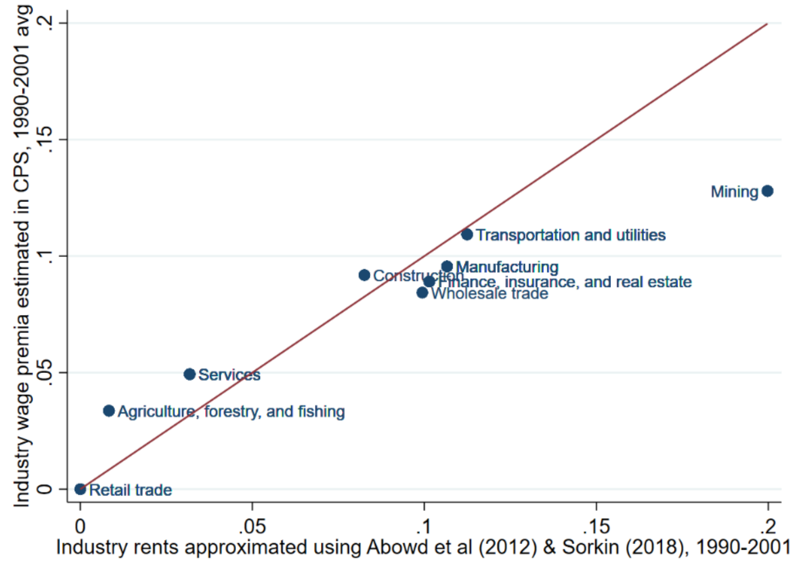
A.5. Benchmarking our estimates of industry wage premia against the literature

Our estimates of industry wage premia involve (1) estimating industry log wage fixed effects cross-sectionally in the CPS across 9 different sectors, controlling for a large number of person- and job-level covariates; (2) rescaling these fixed effects relative to Retail Trade (which is set to have a wage premium of zero); and (3) cutting these estimates in half. There may be concerns, however, that our procedure of cutting the coefficients in half does too little – or too much – to account for unobserved productivity or for compensating differentials. Either unobserved productivity or compensating differentials could generate variation in industry fixed effects without rents being the underlying cause.

We therefore benchmark our estimates against estimates from Abowd et al (2012) and Sorkin (2018), two papers which use employer-employee matched administrative data in the U.S. to study, respectively, the role of firm fixed effects in industry wage differences, and the role of rents in firm fixed effects. Abowd et al (2012) use an AKM decomposition to estimate firm and worker effects in different industries and provide data on the average firm fixed effect within each SIC 1987 industry for the period 1990-2001. Sorkin (2018) decomposes the degree to which the estimated firm fixed effects in an AKM model are due to rents versus compensating differentials and finds that around 1/3 of firm fixed effects are due to rents while 2/3 are due to compensating differentials.

We use these two papers to generate approximate estimates of industry wage premia which are due to rents, for each of our 9 aggregated sectors. First, we take the Abowd et al (2012) estimates of the average firm effect across SIC industries, and aggregate these up to the level of 9 sectors using a simple average. We then rescale these sector-level average firm effects relative to Retail Trade, setting the average firm effect for Retail Trade to be zero. We finally divide these estimates by three, reflecting Sorkin's (2018) finding that only 1/3 of estimated firm fixed effects reflect rents. We compare our estimates of industry wage premia due to rents, approximated using Abowd et al (2012) and Sorkin (2018), with our baseline estimates of industry wage premia estimated in the CPS over the same time period of 1990-2001. The comparison can be seen in Figure A3. There is a strikingly close relationship between the two estimates: our estimates of industry wage premia from the CPS over 1990-2001 line up well with our back-of-the-envelope estimate of industry rents – estimated using results from papers which explicitly remove the effects of unobserved productivity (through worker fixed effects) and compensating differentials (through the Sorkin (2018) procedure). This can give us some deal of confidence that our estimates of industry wage premia do primarily reflect rents.

Figure A3: Correlation between industry wage premia as estimated from CPS, and industry rents approximated from AKM models

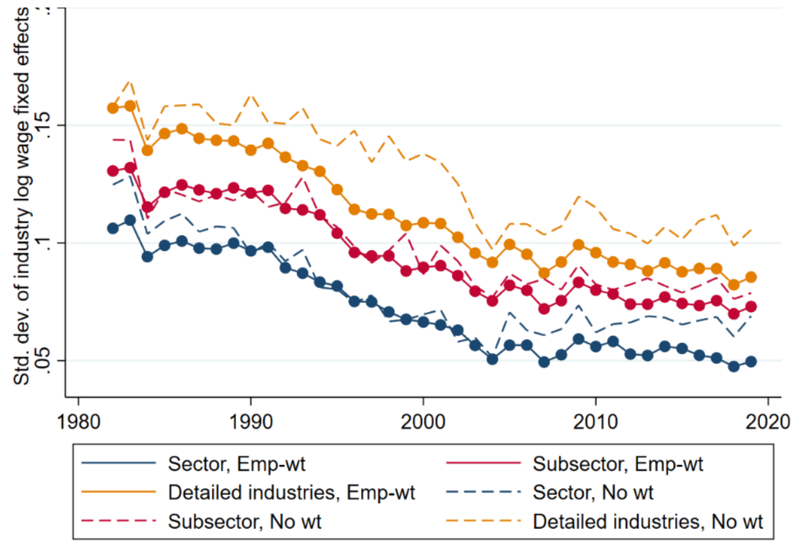


A.6. Decline in the variance of industry wage premia: alternative weighting

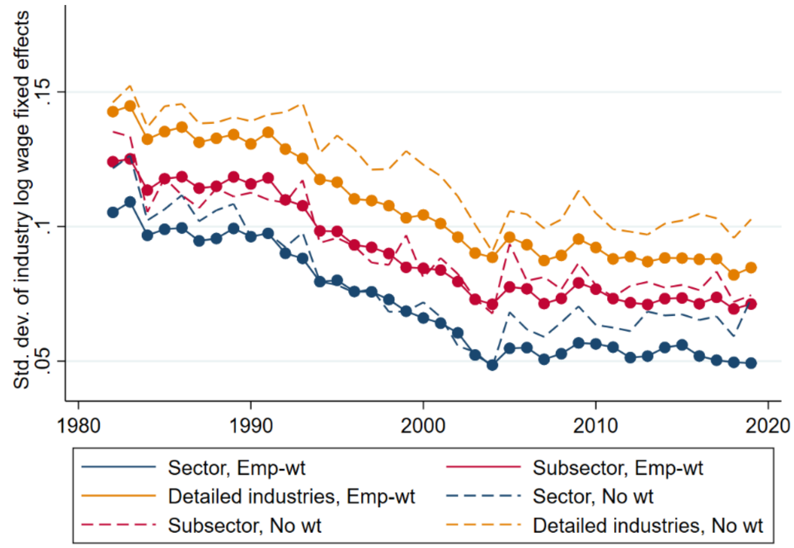
Our estimation of the decline in the variance of industry wage premia may be sensitive to weighting choices we make, both in the estimation of the industry fixed effects in the wage regressions, and in the weighting across industries when constructing the standard deviation of the fixed effects. In our baseline scenario in section I.C. of the paper, we weight each person equally in the estimation of the industry wage fixed effects, and we weight each industry equally when calculating the standard deviation of the fixed effects. Here, we present three figures to show that the weighting decisions do not have a substantial impact on the estimated outcomes.

In Figure A4, we show the equal-weighted and employment-weighted standard deviations of the industry log wage effects estimated with equal weights across people. The similar trend in both equal-weighted and employment-weighted standard deviations is another way of illustrating the fact that the majority of the decline in the variance of industry wage premia occurred *within* industries. In Figure A5, we show the equal-weighted and employment-weighted standard deviations of the industry log wage effects, estimated with *log wage* weights across people in the initial regressions using the CPS data. In Figure A6, we show the equal-weighted and employment-weighted standard deviations of the industry log wage effects, but estimated with *wage* weights across people in the initial regressions. While the wage-weighted estimates are noisier than the equal-weighted estimates, the pattern is very similar across all three figures.

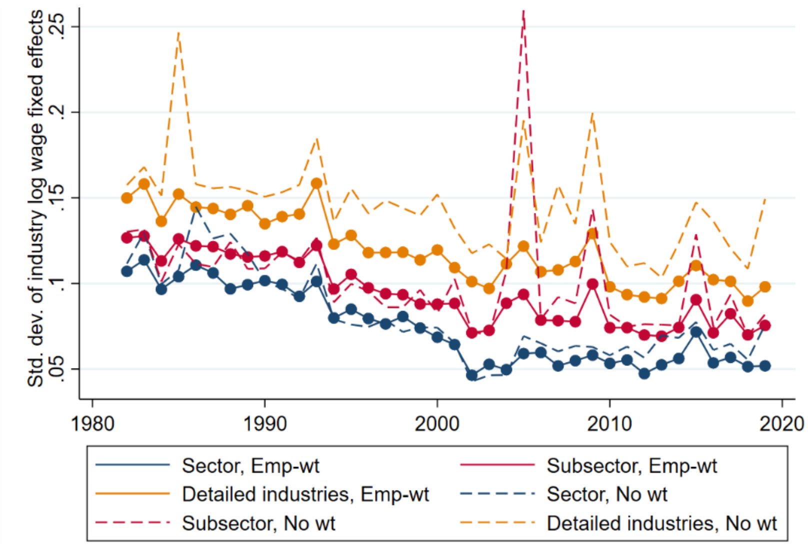
Appendix Figure A4: Decline in standard deviation of industry log wage effects: equal-weighted and employment-weighted



Appendix Figure A5: Decline in standard deviation of industry log wage effects, with log-wage weighting in underlying regressions



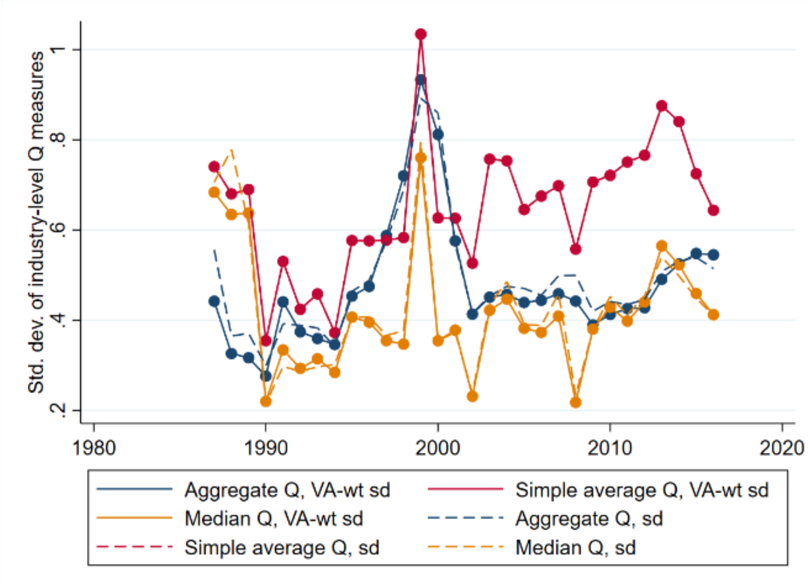
Appendix Figure A6: Decline in standard deviation of industry log wage effects, with wage weighting in underlying regressions



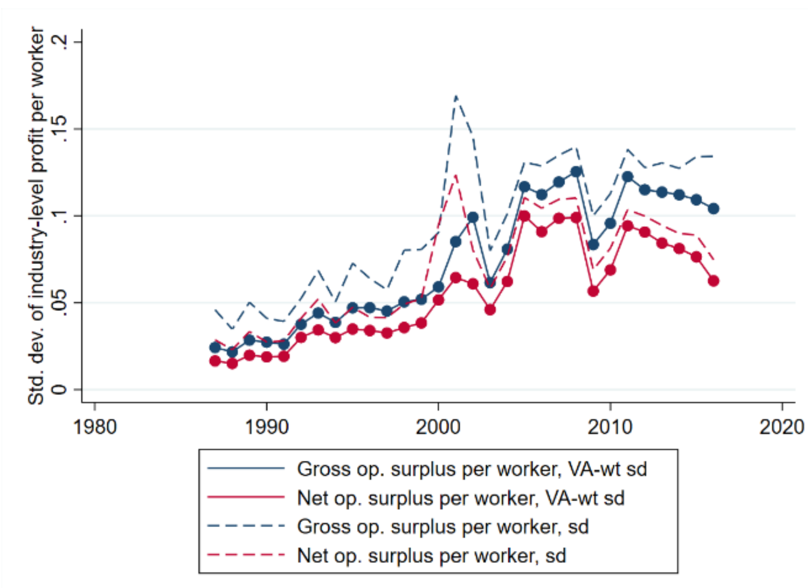
A.7. Increasing variance of industry-level profitability

As we note in section I.C., a decline in the dispersion of industry rents could be a result of (some combination) of three factors: (1) a fall in the rent-sharing coefficient holding total rents constant, meaning total rents to labor fall as workers at high-rent industries no longer do as well as they did before; (2) a reallocation of workers from industries with high labor rents (either because of high rent-sharing or high rents) to industries with low labor rents, which would mean that total rents to labor have fallen, but only because of structural changes in the economy; or (3) a fall in the dispersion of rents across industries, holding the rent-sharing coefficient constant, meaning total rents to labor may not have fallen. In Figures A7 and A8 below, we show that the dispersion of rents does *not* appear to have fallen across industries; in fact, the dispersion of profits per worker and average Q appears to have risen across industries over the period.

Appendix Figure A7: Standard deviation of industry-level measures of Q



Appendix Figure A8: Standard deviation of industry-level profits per worker



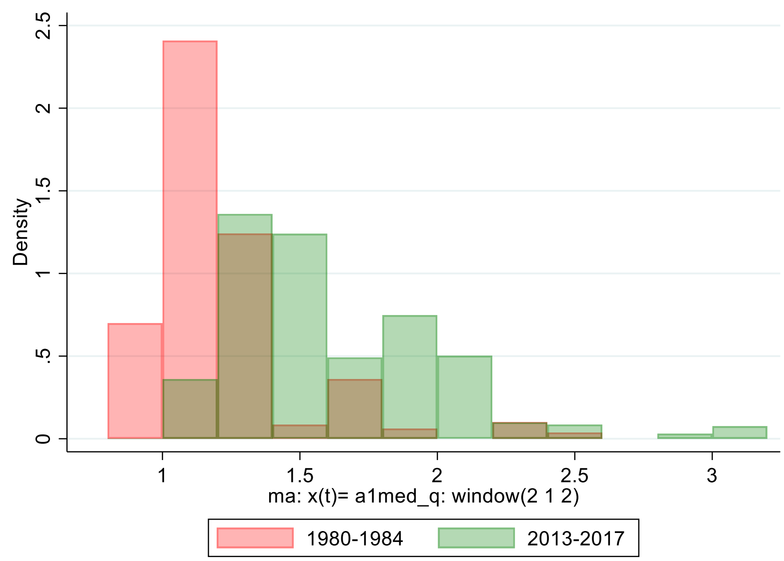
A.8. Allocation of workers to high-rent industries

If labor rents have declined, a natural question is whether workers are no longer working in the industries which produce rents. One way to visualize this is to show the share of workers working in industries with different degrees of profitability.

Figure A9 shows the share of workers in industries with different levels of *median* Tobin's Q (as measured by Covarrubias et al 2019 for publicly-listed companies): there is a noticeable rightward shift, as the average Tobin's Q across industries has increased over the period.[82]

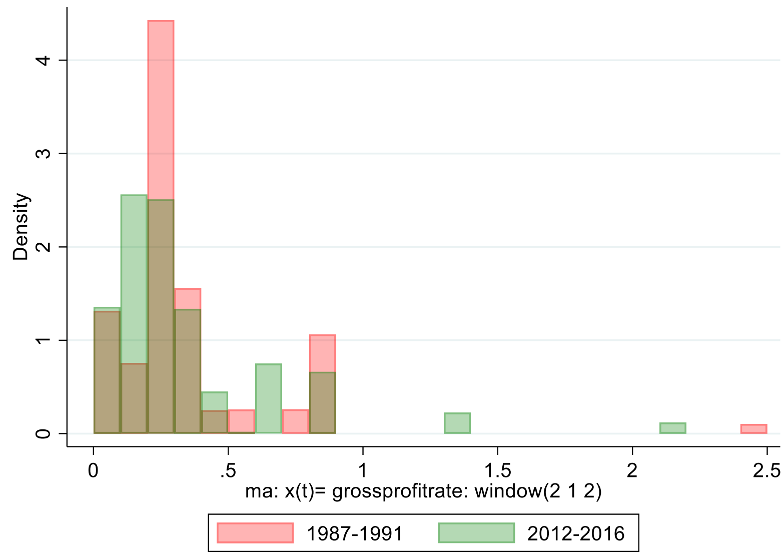
Figure A10 shows the share of workers in industries with different values of gross operating surplus over fixed assets: this shows a slight downward shift, as gross operating surplus / fixed assets was lower in many industries over 2012-2016 than it was in 1987-1991. Both figures show a marked increase in the dispersion of industry profitability across workers.

Figure A9: Allocation of employment by industry median Q, 1980-84 and 2013-17



[82] The pattern is very similar for the equal-weighted and value added-weighted Q across firms within each industry.

Figure A10: Allocation of employment by industry gross profit rate, 1980-84 and 2013-17

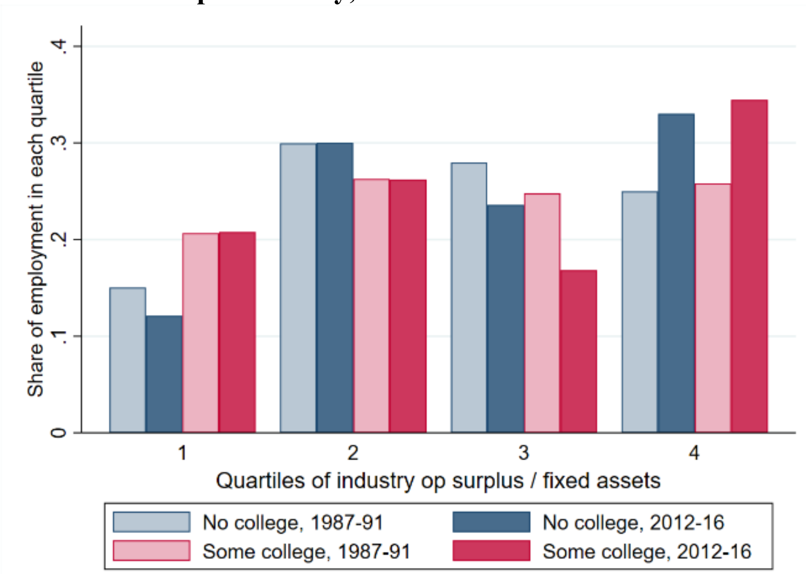


One might think that part of the rise in inequality *within* workers has been the result of a change in the distribution of workers across industries with high/low rents. There is suggestive evidence that workers with less education are more likely to work in firms with low rents, than they used to be (because of the increased evidence of sorting between high fixed effect workers and high fixed effect firms from AKM models such as Song et al 2019). Does this also happen at the industry level?

A preliminary analysis suggests it has not happened at the industry level. Figure A11 shows the share of college-educated or non-college educated workers employed in industries at each quartile of the distribution of median industry Q (as calculated from Compustat by Covarrubias et al 2019). Similarly, Figure A12 shows the share of college-educated or non-college educated workers employed in industries at each quartile of the distribution of profitability (gross operating surplus to fixed assets). By these metrics, it does not appear to be the case that there has been a sorting of lower education workers into lower-rent industries (as discussed briefly in section VI.C).

Figure A11: Employment of non-college and college educated workers, by industry median Q, 1980-84 and 2013-17

Figure A12: Employment of non-college and college educated workers, by industry gross profitability, 1980-84 and 2013-17



A.9. Estimating the decline in labor rents: all private industries

In section II of the paper, we estimate the decline in labor rents for the nonfinancial corporate sector. Here we replicate the same exercise, but for the entirety of private industries. We perform the same calculation as described in section II, but (a) use compensation for all private industries, rather than just the nonfinancial corporate sector, to calculate total rents; and (b) do not exclude financial industries. Figure A13 and Table A1 show the pattern of the decline in labor rents as a share of gross and net value added across all private industries.

Figure A13: Labor rents as share of private industries value added

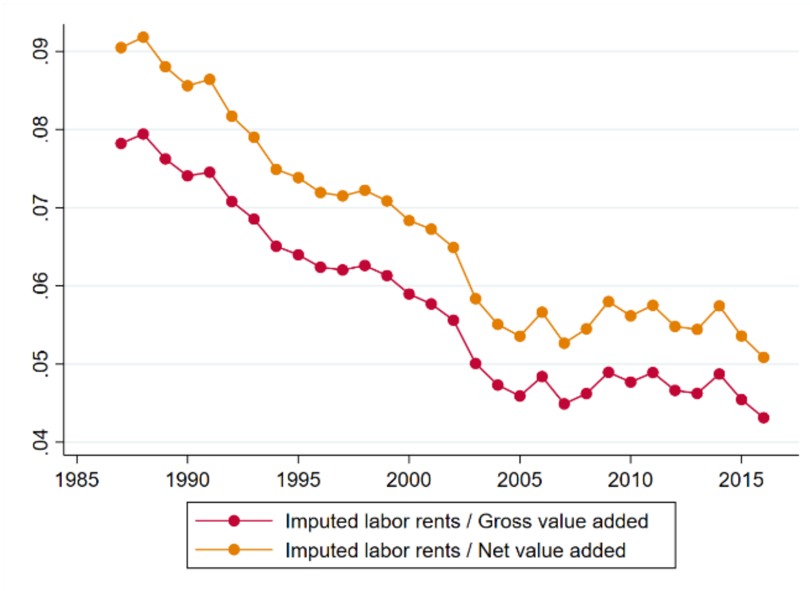


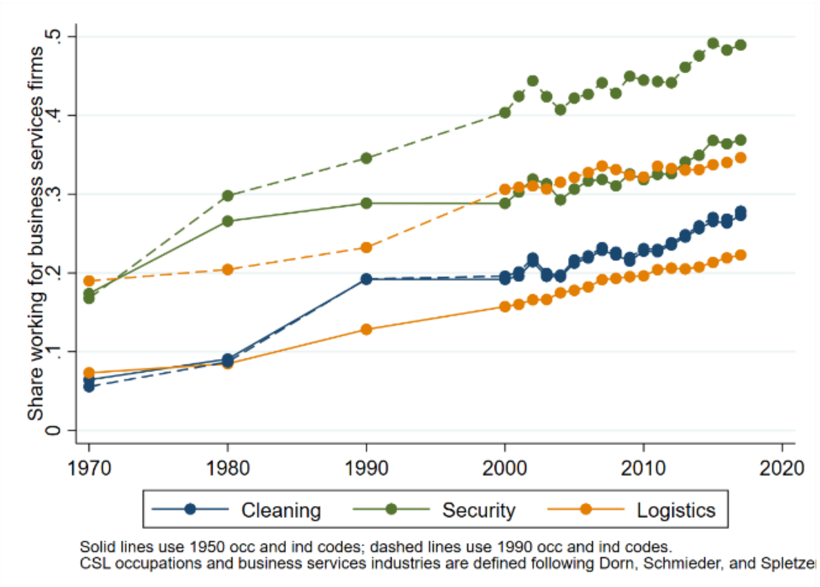
Table A1: Labor rents as share of private industries value added

Shares of gross value added	1987	1997	2007	2016
Total labor rent share	7.8%	6.2%	4.5%	4.3%
Union rent share	1.6%	1.1%	0.8%	0.6%
Firm size rent share	2.3%	2.1%	1.7%	1.7%
Industry rent share	3.9%	3.1%	2.0%	2.1%

A.10. Quantifying the rise in outsourcing of cleaning, security, and logistics work

In Figure A13, we recreate estimates from Dorn, Schmieder, and Spletzer (2018) of the share of workers in cleaning, security, and logistics occupations who were working in the business services sector (an indication of having had their work outsourced). Dorn, Schmieder, and Spletzer (2018) identify occupation and industry codes in the Census data which indicate outsourcing to business services. Note that the series have different levels as they are calculated using 1950 and 1990 industry and occupation codes, but that the time series trend in both is similar).

Figure A14: Share of workers in cleaning, security, and logistics working for business services firms ***(recreation of figure in Dorn, Schmieder, and Spletzer 2018)***



A.11. Concentration measures

We are grateful to Germán Gutiérrez and Thomas Philippon for sharing with us their measures of import-adjusted product market concentration at the industry level, from Covarrubias, Gutiérrez , and Philippon (2019). Concentration ratios are constructed as industry-level average concentration ratios for the top 4, 8, 20, and 50 firms in NAICS 3-digit industries, and mapped to BEA industry codes. They are constructed using firm sales data both from Compustat and from the U.S. Census. They are then adjusted for the share of imports in the domestic market for the industry in question. Full details on the construction of the concentration measures are available in Covarrubias, Gutiérrez, and Philippon (2019).

A.12. Decline in labor share, rise in capital share, and decline in investment-profits: gross measures

In the main paper, we focus on measures of the labor share, capital share, and investment-profit ratio *net* of depreciation, for the nonfinancial corporate sector. Figures A15, A16, and A17 below replicate figures 7, 8, and 22 in the main paper, but for gross measures (without incorporating the effects of depreciation).

Figure A15: Labor rent share and compensation share of gross value added, nonfinancial corporate

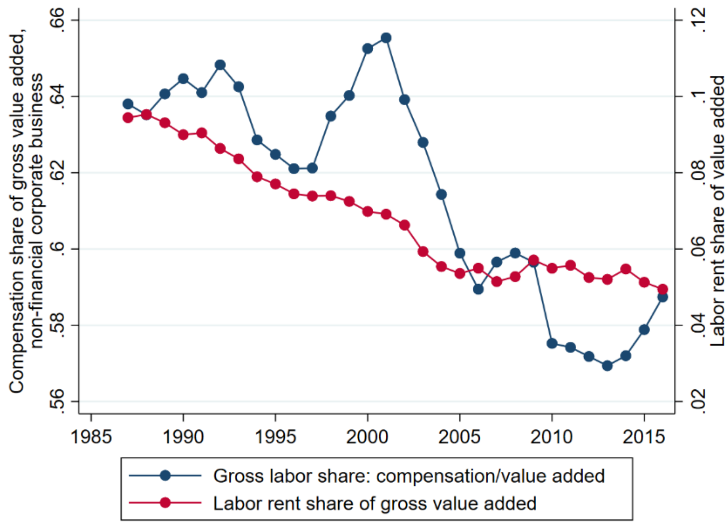


Figure A16: Capital share and "total profit" share of gross VA, nonfinancial corporate

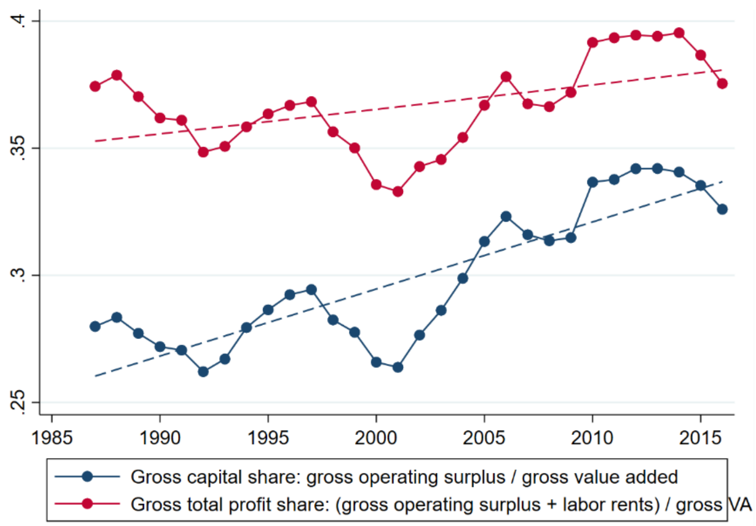
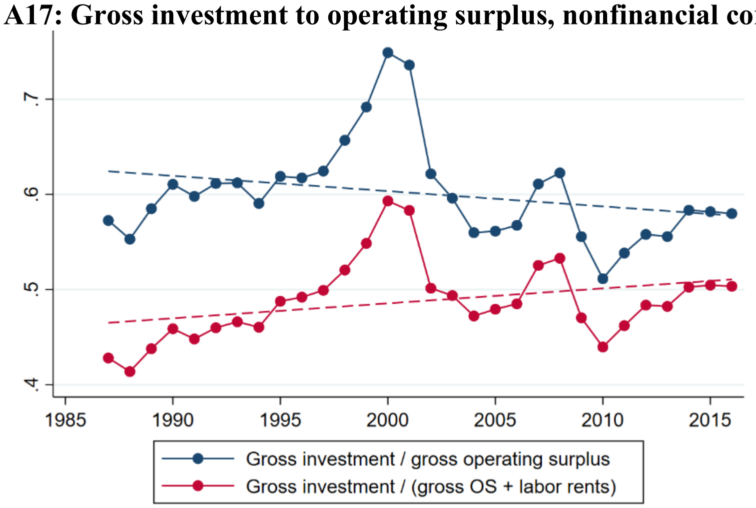


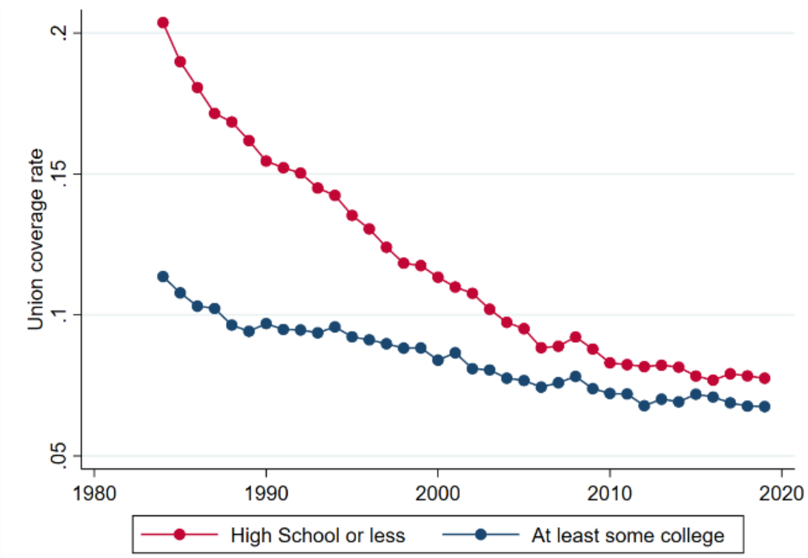
Figure A17: Gross investment to operating surplus, nonfinancial corporate



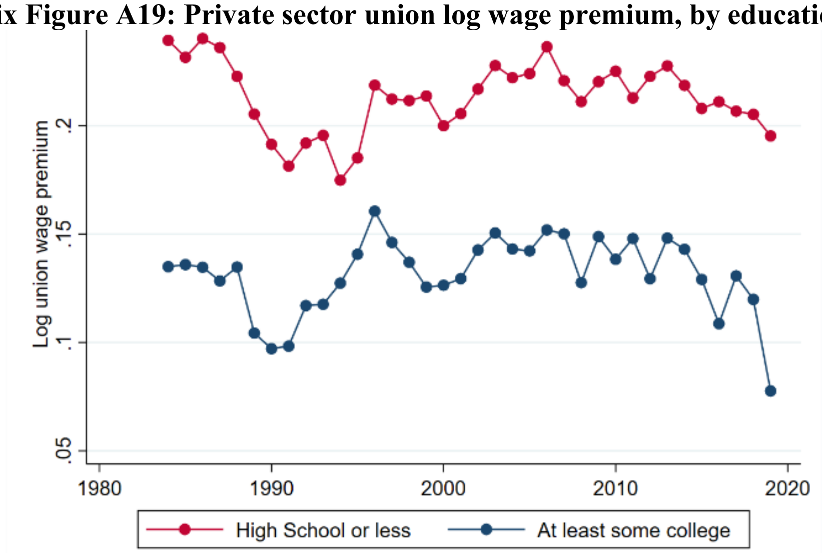
A.13. Unionization rate and union wage premia by college/non-college

As we discuss in our concluding remarks, the decline in rent-sharing has affected non-college workers more than college workers. Figure A18 shows the private sector union coverage rate for workers with high school or less, vs. workers with at least some college. The decline has been much sharper for workers without college education. Figure A19 shows the estimated private sector union log wage premium for workers with no college vs. at least some college (estimated from the CPS-ORG using the methodology described in Appendix section A.1). Non-college workers have substantially higher union wage premia than college-educated workers, which makes the decline in unionization more costly for them.

Appendix Figure A18: Private sector union coverage rates, by education group



Appendix Figure A19: Private sector union log wage premium, by education group



A.14. More detailed writeup of Farhi and Gourio accounting decomposition

This section contains a more detailed writeup of our modified accounting decomposition based on Farhi and Gourio (2018). We are grateful that Farhi and Gourio provided their replication data and code online, such that it was easy to carry out our modified version of their decomposition.

Farhi and Gourio (2018) document six stylized macro-finance facts over recent decades:

1. Falling real risk-free interest rates
2. Rising profitability of private capital
3. Increasing valuation ratios
4. Slight fall in investment/output and investment/capital ratios
5. Slowing TFP and investment-specific productivity growth, and falling employment-population ratio
6. Falling labor share

They then decompose the degree to which these can be explained by five different factors: rising market power, rising unmeasured intangibles, rising risk premia, increased savings supply, and a slowdown of technological progress. Their model is an otherwise standard neoclassical growth model which incorporates macroeconomic risk, monopolistic competition, and the potential for mismeasurement of intangible capital. Their framework, however, does not take into account the possibility that workers may share in some of the rents generated by product market power, and that the degree of rent-sharing may have changed over time.

We incorporate a simple version of rent-sharing into the baseline Farhi/Gourio accounting framework (which does not include intangible capital). Farhi and Gourio find that rising market power plays a role in explaining the macro-finance facts of recent decades, but they implicitly hold the degree of worker rent-sharing constant in their analysis (at zero). We do the opposite: we hold the degree of firm output market power constant in our analysis (setting the average markup at 1.15, the level that Farhi/Gourio estimate for the 2001-2016 period), and allow the degree of worker rent-sharing to vary.

We incorporate rent-sharing between labor and capital in the simplest way possible: the monopolistic firm still maximizes profits as before, hiring labor and capital in a competitive market. It then shares the rents or 'pure profits' between capital and labor, with share π_L going to labor. A decline in rent-sharing is modeled by a decline in π_L. This reduced-form approach can be micro-founded with an efficient bargain type model (Solow and MacDonald 1981) where workers, seeking to maximize total pay to labor, and shareholders, seeking to maximize their profits, jointly bargain over the firm's production decisions. Alternatively, the firm could be considered to be jointly managed in the (weighted average) interests of workers and shareholders.

Firm production decisions are the same in our framework as they would be in the Farhi/Gourio model without rent-sharing. This means that only a few equations change relative to the Farhi/Gourio model. We show these below:

Equation (20), the labor share:

$$\mathrm{s_L} = \frac{\mathrm{w_t N_t}}{\mathrm{Y_t}} + \frac{\pi_\mathrm{L}(\mathrm{Y_t} - \mathrm{w_t N_t} - \mathrm{R_t K_t})}{\mathrm{Y_t}} = \frac{1 - \alpha + \pi_L(\mu - 1)}{\mu}$$

Equation (21), the measured capital share:

$$\mathrm{s_K} = 1 - \mathrm{s_L} = \frac{\alpha + (1 - \pi_\mathrm{L})(\mu - 1)}{\mu}$$

The measured capital share can be decomposed into the share representing monopoly rents, s_Π, and the `true' capital share corresponding to remuneration for capital ownership, s_C:

$$s_\Pi = \frac{(1 - \pi L)(\mu - 1)}{\mu}$$

$$s_C = \frac{\alpha}{\mu}$$

Equation (24), Tobin's Q:

$$Tobin'sQ = \frac{\mathrm{P_t}}{\mathrm{K_t/Q_t}} = (1 + \mathrm{g_T})\left(1 + (1 - \pi_\mathrm{L})\frac{\mu - 1}{\alpha}\frac{\mathrm{r}^* + \delta + \mathrm{g_Q}}{\mathrm{r}^* - \mathrm{g_T}}\right)$$

Equation (26), the marginal product of capital:

$$MPK_t = \frac{\Pi_\mathrm{t}}{\mathrm{K_t/Q_t}} = \left(\frac{(1 - \pi_\mathrm{L})(\mu - 1) + \alpha}{\alpha}\right)(\mathrm{r}^* + \delta + \mathrm{g_Q})$$

Equation (27), the spread between the marginal product of capital and the risk-free rate:

$$\mathrm{MPK} - \mathrm{r_f} = \delta + \mathrm{g_Q} + \frac{(1 - \pi_\mathrm{L})(\mu - 1)}{\alpha}(\mathrm{r}^* + \delta + \mathrm{g_Q}) + \mathrm{r}^* - \mathrm{r_f}$$

The implications of our modifications for the comparative statics are shown in Table A2. As can be seen, there are only two differences in *sign* for key measurable moments of the data: lower-rent sharing is not predicted to affect the investment-output or capital-output ratios, whereas higher markups cause them to fall. In the US data, the investment-output ratio has fallen only very slightly and the share of non-residential investment in GDP has not fallen at all over 1984 to 2016. Meanwhile, the capital-output ratio has risen slightly (see Farhi and Gourio Table 1).

Table A2: Different predictions of FG vs. SS

	Higher Markups μ	Lower rent-sharing π_L
Labor share	$\downarrow$	$\downarrow$
'True' capital share	$\downarrow$	no change
Pure profit share	$\uparrow$	$\uparrow$
Investment-output ratio	$\downarrow$	no change
Capital-output ratio	$\downarrow$	no change
Spread between ret. on K and RF rate	$\uparrow$	$\uparrow$
Tobin's Q	$\uparrow$	$\uparrow$

Farhi and Gourio estimate nine key parameters in their model, targeting nine key moments, for the periods 1984-2000 and 2001-2016. We denote their baseline accounting decomposition "FG".

The parameters they estimate are:

1. β, the discount factor
2. p, the probability of an economic crisis or "disaster"
3. δ, the depreciation rate of capital
4. α, the Cobb-Douglas parameter
5. g_P, the growth rate of the population
6. g_Z, the growth rate of TFP
7. g_Q, the growth rate of investment-specific productivity
8. $\bar{N}$, the labor supply parameter
9. μ, the markup

These parameters are estimated targeting nine moments:

1. Gross profitability $\frac{\Pi}{K}$
2. Gross share of income going to capital $\frac{\Pi}{Y}$

3. Investment-capital ratio $\frac{I}{K}$
4. Risk-free rate *RF*
5. Price dividend ratio *PD*
6. Growth rate of population
7. Growth rate of TFP
8. Growth rate of investment prices
9. Employment-population ratio

We replicate the baseline Farhi/Gourio ("FG") decomposition. We then modify the Farhi/Gourio approach to allow for changing rent-sharing between capital and labor, *instead* of changing total rents (monopoly power). To do this, we hold the markup constant at 1.15, which is the level of the markup that Farhi/Gourio estimate for the second period in their study (2001-2016). We instead allow the parameter governing rent-sharing with labor to change (π_{L}), and estimate this alongside the other 8 Farhi/Gourio parameters, targeting the same empirical moments. We denote this approach as "SS" going forward.

Identification in our modified accounting decomposition is nearly identical to that in Farhi/Gourio. As with theirs, the identification is nearly recursive. Some parameters are obtained directly, as their counterparts are assumed to be observed: population growth g_N, investment price growth (the inverse of g_Q), and the employment-population ratio $\bar{N}$. The growth rate g_Z is chosen to roughly match measured TFP (but also depends on α, the estimated Cobb-Douglas parameter). The depreciation rate δ is chosen to match $\frac{I}{K}$ using the balanced growth relation (eq. 18 in F/G), and the Gordon growth formula is then used to infer the expected return on risky assets r^*.

Our approach differs from Farhi/Gourio *only* when we identify the parameters α and π_L, using our modified versions of equations (20) and (27) above. The labor share s_L and the marginal product of capital (approximated by average profitability of capital $\frac{\Pi}{K}$) are the observables, and we set the markup $\mu = 1.15$. Since we have estimates for r^*, δ, g_Q, we can identify α and π_L from this pair of equations.

Identification then continues as in Farhi/Gourio, bringing in data on the risk-free rate to infer the equity premium, and separately inferring the discount factor β, risk aversion θ, and quantity of risk ξ (making assumptions about these variables and the intertemporal elasticity of substitution exactly as in the paper). Note that these choices do not affect inferences about α or π_L.

Table **A3** compares the parameter estimates in the Farhi/Gourio baseline model ("FG) compared to our model ("SS"). *(Table 2 in the main paper is a truncated version of this table. In Table 2, we only show the parameters which were estimated to have changed).* Note that the majority of estimated parameters are identical or very similar across the two specifications, reflecting the recursive identification procedure described above. The only differences are in the rent-sharing parameter and markup parameter (by construction), and in the Cobb-Douglas parameter α and TFP growth parameter g_Z.

Table A3: Estimated parameters and changes between samples

Parameter	Symbol	Model	First Sample (1984-2000)	Second Sample (2001-2016)	Difference
Discount factor	β	FG	0.961	0.972	0.012
		SS	0.961	0.972	0.012
Disaster probability	p	FG	0.034	0.065	0.031
		SS	0.034	0.065	0.031
Depreciation	δ	FG	2.778	3.243	0.465
		SS	2.778	3.243	0.465
Cobb-Douglas	α	FG	0.244	0.243	-0.000
		SS	0.260	0.244	-0.016
Population growth	g_P	FG	1.171	1.101	-0.069
		SS	1.171	1.101	-0.069
TFP growth	g_Z	FG	1.298	1.012	-0.286
		SS	1.233	1.010	-0.223
Investment in technical growth	g_Q	FG	1.769	1.127	-0.643
		SS	1.769	1.127	-0.643
Labor supply	$\bar{N}$	FG	62.344	60.838	-1.507
		SS	62.344	60.838	-1.507
Rent-sharing with labor	π_L	FG	–	–	–
		SS	0.441	0.022	-0.419
Markup	μ	FG	1.079	1.146	0.067
		SS	–	–	–

In the Farhi/Gourio model, the markup is estimated to rise from 1.08 in the period 1984-2000 to 1.15 in the period 2001-2016 (implicitly holding rent-sharing constant at zero in both periods). In our model, holding the markup constant at 1.15 in both periods, rent-sharing with labor is estimated to fall from 0.44 in the period 1984-2000 to 0.02 in the period 2001-2016. In contrast to the Farhi/Gourio model, our model also features a small decline in the Cobb-Douglas parameter α, suggesting a small amount of labor-biased technical change (FG estimates no change in α). Our model estimates a smaller decline in the rate of TFP growth than the FG model. Common to both models are an increase in the discount factor, reflecting higher savings supply; an increase in macroeconomic risk (disaster probability); and an increase in the rate of depreciation. Note that these factors are identical in both exercises by construction of our modification exercise.

In Table **A4** we show the estimated contribution of each parameter to changes in all of the model-implied moments, replicating Table 4 of the Farhi/Gourio paper. For these decompositions we use the method that Farhi and Gourio use to estimate the contributions of each parameter to each change in the key moments. As Farhi/Gourio note: "because our model is non-linear, this is not a completely straightforward task; in particular, when changing a parameter from a first subsample value to a second subsample value, the question is at which value to evaluate the other parameters (for example, the first or second subsample value). If the model were linear, or the changes in parameters were small, this would not matter; but such is not the case here, in particular for the price-dividend ratio". They therefore report the *average contribution* over all possible orders of changing parameters, as we move from the first to the second subsamples.

In both the "FG" and the "SS" case, the decline in the risk free rate is primarily explained by a rise in savings supply (decline in discount factor β) and an increase in disaster risk *p*. This increase in savings supply should, all else equal, decrease average profitability of capital $\frac{\Pi}{K}$ by 2 percentage points. In reality, the average profitability of capital has only risen a little. The baseline Farhi/Gourio model reconciles the rise in savings supply and small rise in average profitability of capital in two ways: (1) higher macroeconomic risk, and (2) higher markups. In the "SS" case, instead, the two are reconciled with higher macroeconomic risk and lower rent-sharing with labor.

In the "FG" case, the change in markups accounts for the bulk of the increase in price-earnings ratios and in Tobin's Q over the period. In the "SS" case, this is instead achieved by the fall in rent-sharing with labor. The "SS" model accounts for the rise in the Price-Dividend ratio slightly differently as compared to the "FG" model, with a slightly larger role for the decline in the Cobb-Douglas parameter α and a slightly smaller role for the decline in TFP growth g_Z.

The increase in the share of income going to capital (the "measured capital share") and its counterpart, the decline in the labor share, is entirely explained by higher markups in the "FG" case: higher markups create a wedge between the marginal product and the return for both labor and capital, pushing down the labor share and "pure" capital share, but increasing the "pure" profit share. In the "SS" case, the increase in the measured capital share/decline in the labor share is primarily explained by lower rent-sharing with labor; at the same time, the decline in the Cobb-Douglas parameter α acts to increase the labor share and reduce the capital share, partly offsetting the decline in the labor share that would have occurred from the estimated decline in rent-sharing alone.

Finally, in the "FG" case the capital-output ratio, investment-output ratio, and growth rates of output and investment are lower than they otherwise would have been if markups had not risen. In contrast in the "SS" case, none of these change, since the degree of rent-sharing between capital and labor in our model does not affect firms' production or investment decisions.

Table A4: Contributions of estimated parameters to model moments

		Model-implied moments			Contributions of each parameter									
	Model	1984-2000	2001-2016	Difference	β	p	δ	α	g_P	g_Z	g_Q	$\bar{N}$	π_L	μ
MPK-RF spread	FG	11.22	15.24	4.02	-0.66	2.39	0.68	0.00	0.00	-0.10	-1.05	0.00		2.76
	SS	11.22	15.24	4.02	-0.66	2.39	0.68	0.26	-0.00	-0.08	-1.05	0.00	2.48	
...of which, depreciation	FG	4.55	4.37	-0.18	0.00	0.00	0.47	0.00	0.00	0.00	-0.64	0.00		0.00
	SS	4.55	4.37	-0.18	0.00	0.00	0.47	0.00	0.00	0.00	-0.64	0.00	0.00	
...of which, market power	FG	3.39	5.55	2.17	-0.59	0.24	0.21	0.00	-0.00	-0.09	-0.35	0.00		2.73
	SS	6.05	5.68	-0.37	-0.76	0.31	0.28	0.34	-0.00	-0.09	-0.45	0.00	0.00	
...of which, risk premium	FG	3.15	5.23	2.08	-0.05	2.14	0.00	-0.00	-0.00	-0.01	-0.00	0.00		0.00
	SS	3.15	5.23	2.08	-0.05	2.14	0.00	-0.00	-0.00	-0.01	-0.00	0.00	0.00	
Equity return	FG	5.85	4.90	-0.96	-1.22	0.56	0.00	-0.00	-0.00	-0.19	-0.10	0.00		0.00
	SS	5.85	4.90	-0.96	-1.22	0.56	0.00	-0.04	-0.00	-0.15	-0.11	0.00	0.00	
Equity premium	FG	3.07	5.25	2.18	0.00	2.18	0.00	0.00	0.00	0.00	0.00	0.00		0.00
	SS	3.07	5.25	2.18	0.00	2.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Risk-free rate	FG	2.79	-0.35	-3.14	-1.22	-1.62	0.00	-0.00	-0.00	-0.19	-0.10	0.00		0.00
	SS	2.79	-0.35	-3.14	-1.22	-1.62	0.00	-0.04	-0.00	-0.15	-0.11	0.00	0.00	
Price-dividend ratio	FG	42.34	50.11	7.78	30.67	-13.19	0.00	-0.02	-1.86	-5.07	-2.76	0.00		0.00
	SS	42.34	50.11	7.78	30.56	-13.13	0.00	-0.96	-1.85	-3.97	-2.87	0.00	0.00	
Price-earnings ratio	FG	17.85	25.79	7.94	10.16	-4.57	-0.35	0.00	-0.59	-1.47	-0.34	0.00		5.08
	SS	17.85	25.79	7.94	10.11	-4.54	-0.35	0.23	-0.58	-1.15	-0.37	0.00	4.58	
Tobin's Q	FG	2.50	3.84	1.34	1.05	-0.48	0.11	0.00	-0.08	-0.28	-0.31	0.00		1.34
	SS	2.50	3.84	1.34	1.03	-0.47	0.11	0.09	-0.08	-0.22	-0.32	0.00	1.20	
Labor share	FG	70.11	66.01	-4.10	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00		-4.13
	SS	70.11	66.01	-4.10	0.00	0.00	0.00	1.35	0.00	0.00	0.00	0.00	-5.46	
'Pure' capital share	FG	22.59	21.24	-1.35	0.00	0.00	0.00	-0.03	0.00	0.00	0.00	0.00		-1.33
	SS	22.59	21.24	-1.35	0.00	0.00	0.00	-1.35	0.00	0.00	0.00	0.00	0.00	
'Pure' profit share	FG	7.30	12.76	5.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		5.46
	SS	7.30	12.76	5.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.46	
K/Y	FG	2.13	2.28	0.15	0.29	-0.12	-0.11	-0.00	-0.00	0.04	0.18	-0.00		-0.13
	SS	2.13	2.28	0.15	0.29	-0.12	-0.11	-0.13	0.00	0.04	0.18	-0.00	0.00	
I/Y	FG	17.28	16.50	-0.78	2.20	-0.90	0.23	-0.02	-0.16	-0.52	-0.59	-0.00		-1.03
	SS	17.28	16.50	-0.78	2.20	-0.90	0.23	-1.15	-0.16	-0.41	-0.61	-0.00	0.00	
Detrended Y (% change)	FG	–	–	-0.30	4.18	-1.70	-1.52	-0.07	-0.00	0.65	2.56	-2.45		-1.95
	SS	–	–	-2.36	4.38	-1.78	-1.59	-4.16	0.00	0.54	2.69	-2.45	0.00	
Detrended I (% change)	FG	–	–	-4.95	17.18	-6.98	-0.12	-0.20	-0.94	-2.45	-0.96	-2.45		-8.02
	SS	–	–	-7.01	17.38	-7.05	-0.19	-10.93	-0.94	-1.91	-0.91	-2.45	0.00	

A.15. Industry-level regressions, using unionization instead of imputed labor rents

Table A5: ***This table is a replica of Table 3 in the main paper, but using the industry unionization rate instead of imputed labor rents as the measure of worker power at the industry level***

Panel A: Regressions of labor shares and investment-profit on unionization and Compustat concentration. N = 1,271 (45 industries, 1987-2016)

Dependent variable:	**Labor share of gross value added**				**Labor share of net value added**				**Investment to profit ratio**			
Industry unionization rate	0.09	0.04	0.41**	0.14	0.10	0.04	0.57**	0.32	-0.11	-0.17	0.49⁺	0.27
	(0.20)	(0.22)	(0.10)	(0.14)	(0.37)	(0.41)	(0.19)	(0.20)	(0.71)	(0.80)	(0.28)	(0.63)
Avg top 20 sales concentration,	-0.17*	-0.16*	-0.11	-0.08	-0.04	-0.03	-0.09	-0.07	0.39	0.41	0.20	0.25
imp-adj (Compustat)	(0.08)	(0.078)	(0.07)	(0.09)	(0.14)	(0.14)	(0.11)	(0.12)	(0.32)	(0.34)	(0.39)	(0.42)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel B: Regressions of profitability measures on unionization and Compustat concentration. N=1,213 (GP) N = 1,256 (Q) (43 industries, 1987-2016)

Dependent variable:	**Gross profit rate**				**Aggregate Q**				**Median Q**			
Industry unionization rate	-0.56*	-0.62*	-0.02	-0.14	-1.20**	-1.07*	-1.27**	0.34	-1.01**	-0.82*	-1.42**	-0.02
	(0.26)	(0.28)	(0.14)	(0.18)	(0.44)	(0.46)	(0.46)	(0.64)	(0.36)	(0.37)	(0.40)	(0.55)
Avg top 20 sales concentration,	0.02	0.03	0.10	0.12	0.12	0.10	-0.36	-0.47	0.24	0.21	0.19	0.06
imp-adj (Compustat)	(0.13)	(0.13)	(0.16)	(0.17)	(0.16)	(0.17)	(0.35)	(0.37)	(0.16)	(0.16)	(0.23)	(0.24)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel C: Regressions of labor shares and investment-profit on unionization and Census concentration. N = 186 (49 ind. for 1997, 2002, '07, '12)

Dependent variable:	**Labor share of gross value added**				**Labor share of net value added**				**Investment to profit ratio**			
Industry unionization rate	0.03	0.02	0.49**	0.59**	0.05	0.04	0.86**	1.20**	-0.19	-0.28	1.55⁺	2.28*
	(0.28)	(0.30)	(0.13)	(0.16)	(0.44)	(0.47)	(0.24)	(0.26)	(1.05)	(1.15)	(0.81)	(0.99)
Avg top 20 sales concentration,	-0.48**	-0.48**	-0.30**	-0.36**	-0.31	-0.30	-0.61**	-0.72**	0.71	0.74	-1.74	-2.00
imp-adj (Compustat)	(0.14)	(0.14)	(0.10)	(0.11)	(0.22)	(0.23)	(0.17)	(0.14)	(0.62)	(0.66)	(1.28)	(1.39)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Panel D: Regressions of profitability measures on unionization and Census concentration. N = 175 (47 ind. for 1997, 2002, '07, '12)

Dependent variable:	**Gross profit rate**				**Aggregate Q**				**Median Q**			
Industry unionization rate	-1.08*	-1.22*	-0.15	-0.69**	-0.47	-0.67	1.12	-0.16	-0.75⁺	-0.68	-0.39	-0.24
	(0.43)	(0.47)	(0.21)	(0.21)	(0.60)	(0.64)	(0.77)	(1.00)	(0.40)	(0.42)	(0.35)	(0.489)
Avg top 20 sales concentration,	-0.16	-0.11	0.37	0.58*	-0.44	-0.36	-1.64⁺	-0.94	0.10	0.08	-0.50	-0.16
imp-adj (Compustat)	(0.29)	(0.29)	(0.28)	(0.28)	(0.27)	(0.29)	(0.89)	(0.78)	(0.21)	(0.22)	(0.42)	(0.45)
Fixed effects	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*	*None*	*Year*	*Ind*	*Yr, Ind*

Robust standard errors, clustered at industry level, in parentheses. $^{+}$ $p<0.10$, * $p<0.05$, ** $p<0.01$.

A.16. Rent destruction and redistribution by industry

In section III.E., we develop a heuristic for whether rents were redistributed from labor to capital within an industry over 1987-2016. Define industries' underlying profitability as the sum of profits to capital and labor rents, relative to assets:

$$\text{Underlying profitability} = \frac{\text{Gross operating surplus} + \text{imputed labor rents}}{\text{Fixed assets}}$$

We define a redistribution of rents from labor to capital as occurring if either (1) rents rise for capital but fall for labor, or (2) rents fall for both groups, but fall by more for labor than for capital, relative to their initial shares in total underlying profitability, or (3) if rents rise for both groups, but rise by less for labor than for capital, relative to their initial shares in total underlying profitability. The analogous definitions apply for a redistribution of rents from capital to labor.

Grouping the 53 industries for which there is consistent data over 1987-2016, we show in Table A6 that 46 out of 53 industries saw redistribution of rents from labor to capital over the period. We also, more tentatively, measure whether rents were on net destroyed or created, by adding up corporate profits + labor rents relative to fixed assets. According to this very simple measure of total rent destruction, 35 out of 53 industries saw rents go down relative to the value of fixed assets. This should not necessarily be interpreted as a net destruction of rents, however: 30 of the 35 industries which saw a fall in the ratio of gross operating surplus to fixed assets also saw their average Q rise over the same period, suggesting that the decline in profitability may be expected to be a temporary phenomenon.

Table A6: Industries featuring rent redistribution from labor (L) to capital (K), or capital to labor, over 1987-2016

		Number of industries	Employment (2012-2016 avg)
Rent redistribution from L to K			
1	Fall in total rents, fall in rents to L disproportionately greater than fall in profits to K:	22	60.1m
2	Rise in total rents, rise in profits to K, fall in rents to L:	17	22.6m
3	Fall in total rents, rise in profits to K, fall in rents to L:	6	6.7m
4	Rise in total rents, rise in rents to L disproportionately lower than rise in profits to K:	1	0.5m
Rent redistribution from K to L			
5	Fall in total rents, fall in profits to K disproportionately greater than fall in rents to L:	6	15.5m
6	Fall in total rents, fall in profits to K, rise in rents to L	1	1.1m

A.17. Quantitative implications of the decline in worker power for the NAIRU

In Section IV of the paper, we show that the decline in worker power should have been expected to reduce the NAIRU. Here, we use a number of simple exercises to illustrate the possible magnitude of the decline in the NAIRU induced by the decline in worker power.

First, we use the model in Summers (1988) which argues that the equilibrium rate of unemployment is a function of the degree of worker rent-sharing power (indexed by the share of workers with power β and the wage premium they receive μ), the level of the value of unemployment relative to the value of work *b*, and the efficiency wage parameter α (the elasticity of worker productivity to the relative wage)**:**

$$u = \frac{\alpha + \mu\beta}{(1 - b)(1 + \mu\beta)}$$

Summers sets $\alpha = 0.06$ and *b*=0. Using these, and plugging in the changes in the unionization rate (for β) and union wage premium (for μ) over 1982 to 2019, would predict a 3.5 percentage point decline in the equilibrium unemployment rate. Using the larger changes in the degree of rent-sharing that we estimate in prior sections – rather than just the decline in unionization, larger values for *b*, the value of unemployment, or smaller values for α*,* the efficiency wage parameter, would predict even larger declines in equilibrium unemployment.

A second exercise uses the model in Johnson and Layard (1986). They lay out a model of wait unemployment, where the availability of high wage union jobs incentivizes workers to search for union jobs rather than accept a lower-paid job in the competitive sector. In their simple model, the NAIRU is determined as follows:

$$U = \frac{1}{\frac{\delta(1 - \rho)}{QmP} + 1}$$

where *P* is the unionization rate, *m* is the union wage premium (markup over the competitive wage), *Q* is the rate at which unionized workers leave their jobs, δ is the discount rate, and ρ is the replacement rate of unemployment benefits (the ratio of the value of being unemployed relative to the competitive wage). Plugging the decline in the unionization rate and union wage premium from 1982 to 2019 into this simple equation, alongside a replacement rate of benefits of 0.5, discount rates of between 3 and 8 percent, and a separation rate of unionized workers of between 2 and 4 percent, would yield a fall in the NAIRU of 0.9-2.2 percentage points. Once again, using the full estimated reduction in labor rents would increase this estimate, whereas a higher replacement rate of benefits would reduce the fall in the NAIRU.

Finally, Akerlof, Dickens, and Perry (1996) specify a Phillips curve equation where inflation π is a product of the expected inflation rate π^E, unemployment *u*, the worker rent-sharing parameter *a* (in a simple bargaining-over-surplus model), firms' product market markup $\frac{\beta-1}{\beta}$, and a function of the degree of downward nominal wage rigidity *S*:

$$\pi_t = \pi_t^E + c - a u_t + \frac{\beta}{\beta - 1} S_t$$

In the absence of downward nominal wage rigidity, this suggests that the slope of the Phillips curve is equivalent to the degree of worker rent-sharing power. The decline in the slope of the Phillips curve estimated by Blanchard, Cerutti, and Summers (2015) was 0.23 from the 1960s until the 2010s. This would be consistent with the magnitude of the decline in worker rent-sharing that we have identified earlier in this paper. The decline in the worker rent-sharing parameter that was estimated to be consistent with changes in other macro variables like the labor share, in our accounting decomposition, was 0.42 over the 1980s to 2010s; and our estimated decline in imputed labor rents would have been consistent with a decline in the worker rent-sharing parameter of between 0.22 and 0.41 over the 1980s to 2010s (under the assumption of a constant aggregate markup of between 1.1 and 1.2 over the period).

What do these exercises suggest? While these models are by design not able to provide precise estimates, they suggest that in very loosely disciplined models with several free parameters it is very easy to obtain very large impacts of a decline in worker power – of the magnitude we have observed – on the NAIRU and the slope of the Phillips Curve.

A.18. Industry codes

For our industry-level analyses, we use the same industry categorizations as Covarrubias, Gutiérrez, and Philippon (2019), whose industry classifications are primarily based on BEA industry codes. Table AX shows the mapping of BEA industry codes into our industry categorization. See also Table 10 in Covarrubias et al (2019).

Data on value added, compensation, gross operating surplus, depreciation, investment, and fixed assets are available from the BEA at the level of these BEA industry codes from 1987-2016. For our industry-level measures of labor rents, and wage premia, which are estimated from the CPS, we map the *ind1990* code (based on Census 1990 industry codes) provided by IPUMS into NAICS 3-digit codes, and then map these NAICS 3-digit codes into BEA industry codes.

Table A5: Mapping of BEA industry codes to our industry codes *(replicating Covarrubias et al 2019)*

BEA industry category	**Our industry category**
Agriculture, forestry, fishing, and hunting	
Farms	Agr_farm
Forestry, fishing, and related activities	Agr_forest
Mining	
Oil and gas extraction	Min_oil_and_gas
Mining, except oil and gas	Min_ex_oil
Support activities for mining	Min_support
Utilities	Utilities
Construction	Construction
Manufacturing	
Durable goods	
Wood products	Dur_wood
Nonmetallic mineral products	Dur_nonmetal
Primary metals	Dur_prim_metal
Fabricated metal products	Dur_fab_metal
Machinery	Dur_machinery
Computer and electronic products	Dur_computer
Electrical equipment, appliances, and components	Dur_electrical
Motor vehicles, bodies and trailers, and parts	Dur_transp
Other transportation equipment	Dur_transp
Furniture and related products	Dur_furniture
Miscellaneous manufacturing	Dur_misc
Nondurable goods	
Food and beverage and tobacco products	Nondur_food
Textile mills and textile product mills	Nondur_textile

Apparel and leather and allied products	Nondur_apparel
Paper products	Nondur_paper
Printing and related support activities	Nondur_printing
Petroleum and coal products	Nondur_petro
Chemical products	Nondur_chemical
Plastics and rubber products	Nondur_plastic
Wholesale trade	Wholesale_trade
Retail trade	Retail_trade
Transportation and warehousing	
Air transportation	Transp_air
Rail transportation	Transp_rail
Water transportation	Transp_water
Truck transportation	Transp_truck
Transit and ground passenger transportation	Transp_passenger
Pipeline transportation	Transp_pipeline
Other transportation and support activities	Transp_other
Warehousing and storage	Transp_storage
Information	
Publishing industries, except internet (includes software)	Inf_publish
Motion picture and sound recording industries	Inf_motion
Broadcasting and telecommunications	Inf_telecom
Data processing, internet publishing, and other information services	Inf_data
Finance, insurance, real estate, rental, and leasing	
Finance and insurance	
Federal Reserve banks, credit intermediation, and related activities	Finance_banks
Securities, commodity contracts, and investments	Finance_securities
Insurance carriers and related activities	Insurance
Funds, trusts, and other financial vehicles	Finance_funds
Real estate and rental and leasing	
Real estate	Omitted
Rental and leasing services and lessors of intangible assets	Rental_leasing
Professional, scientific, and technical services	
Legal services	Legal_serv
Computer systems design and related services	Computer_serv
Miscellaneous professional, scientific, and technical services	Misc_serv
Management of companies and enterprises	Omitted
Administrative and waste management services	
Administrative and support services	Adm_support
Waste management and remediation services	Waste_mgmt
Educational services	Educational
Health care and social assistance	
Ambulatory health care services	Health_ambulatory

Hospitals and nursing and residential care facilities	Health_hospitals
Social assistance	Health_social
Arts, entertainment, and recreation	
Performing arts, spectator sports, museums, and related activities	Arts_performing
Amusements, gambling, and recreation industries	Arts_recreation
Accommodation and food services	
Accommodation	Acc_accomodation
Food services and drinking places	Acc_food
Other services, except government	Other_ex_gov