The Journal of FINANCE
The Journal of THE AMERICAN FINANCE ASSOCIATION

THE JOURNAL OF FINANCE • VOL. , NO. 00 • MAY 2020

Declining Labor and Capital Shares

SIMCHA BARKAI*

ABSTRACT

This paper presents direct measures of capital costs, equal to the product of the required rate of return on capital and the value of the capital stock. The capital share, equal to the ratio of capital costs and gross value added, does not offset the decline in the labor share. Instead, a large increase in the share of pure profits offsets declines in the shares of both labor and capital. Industry data show that increases in concentration are associated with declines in the labor share.

SINCE THE EARLY 1980S WE HAVE witnessed a large decline in the labor share of gross value added (Elsby, Hobijn, and Şahin (2013), Karabarbounis and Neiman (2014)). Many existing explanations for the decline in the labor share, such as technological change, mechanization, capital accumulation, and a change in the relative price of capital, focus on tradeoffs between labor and physical capital. These explanations argue that firms have substituted expenditures on labor inputs into production with expenditures on physical capital inputs into production and each of these explanations offers a different rationale for this substitution. In this paper, I show that the shares of both labor and capital are declining and are jointly offset by a large increase in the share of pure profits.

In this paper, I draw a distinction between capital costs and pure profits and show that this distinction is critical for understanding the decline in the labor

*Simcha Barkai is with London Business School. I thank my advisers Amir Sufi, Stavros Panageas, Hugo Sonnenschein, and Luigi Zingales for all their support. I also wish to thank Olivier Blanchard, Tony Fan, Austan Goolsbee, Evgenii Gorbatikov, Lars Hansen, Joram Mayshar, Larry Schmidt, Amit Seru, John Shea, Robert Solow, Willem van Vliet, Tony Zhang, Eric Zwick, and seminar participants at the American Economic Association Meeting, Columbia University (INET), Federal Reserve Bank of Cleveland, Growth, Stagnation and Inequality Conference (Bank of England), Haifa University, Hebrew University, Kent University, London Business School, MFM Summer Session for Young Scholars, Norges Bank, Northwestern University Kellogg, Stanford GSB, Tel Aviv University, UCLA Anderson, University of Chicago, University of Maryland, University of Pennsylvania Wharton, and the World Bank for their comments and feedback. I acknowledge financial support from the Stigler Center for the Study of the Economy and the State. I have read *The Journal of Finance*'s disclosure policy and have no conflicts of interest to disclose.

Correspondence: Simcha Barkai, Department of Finance, London Business School, Regent's Park, London NW1 4SA, United Kingdom; e-mail: sbarkai@london.edu.

DOI: 10.1111/jofi.12909

share. *Capital costs* are the annual costs of using all capital inputs in production. In a world in which firms lease all of their capital inputs, constructing capital costs would be simple: we would sum all annual leasing expenses. *Pure profits* are what a firm earns in excess of all production costs (material inputs, labor costs, and capital costs). Firms that use a lot of expensive equipment have high capital costs. Firms that charge consumers high prices relative to the cost of production have high pure profits. An increase in the capital share, equal to the ratio of capital costs to gross value added, at the expense of the labor share is indicative of a substitution from labor to capital inputs into production. By contrast, an increase in the pure profit share, equal to the ratio of pure profits to gross value added, is indicative of an increase in market power and a decline in competition.

Measuring capital costs presents an empirical challenge. Most of the physical capital stock is owned by firms rather than leased. When firms own physical capital, they do not report an annual line item that approximates annual leasing costs and these costs cannot be backed out from accounting measures of profits. Moreover, there are forms of productive capital that are not physical, such as software, research and development (R&D), and product designs. These forms of intangible capital are at times firm-specific and therefore cannot easily be leased. To overcome these challenges, for each type of capital, I compute a *required rate of return*, which approximates the annual leasing cost of one dollar's worth of this type of capital. This approach is grounded in economic theory, supported by past research, and is similar to approximating a wage bill for an unincorporated business. Given a required rate of return, it is straightforward to aggregate across the various types of capital to come up with an aggregate measure of capital costs.

Following Hall and Jorgenson (1967), I compute a series of capital costs for the U.S. nonfinancial corporate sector over the period 1984 to 2014, equal to the product of the required rate of return on capital and the value of the capital stock. The required rate of return is a function of the cost of borrowing in financial markets (henceforth, *cost of capital*), depreciation rates, expected price inflation of capital, and the tax treatment of both capital and debt. In simplified models, this required rate of return is the familiar $r + \delta$. Over this time period, the cost of capital shows a large decline and tracks the decline in the risk-free rate. At the same time, measures of expected and realized inflation show no trend. The required rate of return on capital declines sharply, due to the large decline in the cost of capital.

The large decline in the required rate of return does not necessarily imply a decline in the capital share. In a typical model of firm production, firms respond to the decline in the required rate of return by increasing their use of capital inputs. If firms respond strongly enough, the increase in capital inputs is larger than the decline in the required rate of return, and as a result, the capital share increases. Indeed, this is the common prediction of all the explanations for the decline in the labor share that focus on trade-offs between labor and physical capital.

However, the U.S. nonfinancial corporate sector does not sufficiently increase its use of capital inputs to offset the decline in the required rate of return, and as a result, the capital share declines. The decline in the risk-free rate and the lack of capital accumulation have been noted by Furman and Orszag (2015). Measured in percentage terms, the decline in the capital share (22%) is much more dramatic than the decline in the labor share (11%). Back in 1984, every dollar of labor costs was accompanied by approximately 49¢ of capital costs. By 2014, a dollar of labor costs was accompanied by only 42¢ of capital costs. Thus, despite the decline in the labor share, labor costs have increased faster than capital costs.

As a share of gross value added, since the early 1980s, firms have reduced both labor and capital costs and increased pure profits. Consistent with earlier research, I find that pure profits were very small in the early 1980s. However, pure profits have increased dramatically since the early 1980s. In the main specification, the pure profit share (equal to the ratio of pure profits to gross value added) increases by 13.5 percentage points (pp). To offer a sense of the magnitude, the value of this increase in pure profits amounts to over $1.2 trillion in 2014, or $14.6 thousand for each of the approximately 81 million employees of the nonfinancial corporate sector.

One concern with the measurement of capital costs and pure profits is the possibility of omitted or unobserved capital. Past research has considered several forms of intangible capital that are not currently capitalized by the Bureau of Economic Analysis (BEA) and has argued that these are important for explaining asset valuations and cash flows. The inclusion of additional capital likely increases the capital share and decreases the pure profit share. At the same time, the effects of including additional capital on the time trends of the capital and pure profit shares are less clear. The large decline in the cost of capital equally affects the required rate of return on any additional form of capital. As a result, if this additional capital grows only at the rate of output, then the additional capital costs will grow far slower than output. Thus, in order for this additional capital to have a mitigating effect on the measured trends of the shares of capital and pure profits, the stock of additional capital would need to grow significantly faster than output.

I take two approaches to assessing the contribution of omitted intangible capital to the measured increase in pure profits. First, I incorporate the most comprehensive existing measures of omitted intangible capital into the analysis. Second, I construct a large number of scenarios for omitted intangible capital. Each scenario is a parameterization of investment, depreciation, and capital inflation of intangible capital. For each scenario, I compute capital costs and pure profits that fully incorporate the unobserved investment. I find that existing measures of intangible capital are unable to explain the increase in pure profits. Of the large number of scenarios that I consider, none can fully account for the increase in pure profits. There are scenarios that can account for most of the increase in pure profits, but in all such scenarios, the value of missing intangible capital in 2014 would need to be much larger than all capital measured by the BEA (structures, equipment, and intellectual property products [IPPs]).

An increase in the importance of omitted intangible capital and an increase in pure profits are not mutually exclusive. Of the many scenarios of omitted intangible capital that I consider, many feature a simultaneous increase in intangible capital and a large increase in pure profits. In this sense, the measured increase in pure profits is consistent with many scenarios that feature rapidly increasing intangible capital.

I provide reduced-form empirical evidence that a decline in competition and an increase in pure profits have played a significant role in the decline in the labor share. I show that those industries that experience a larger increase in concentration also experience a larger decline in the labor share. Based on the estimated correlations and the observed increase in industry concentration, the predicted decline in the labor share is of the same magnitude as the observed decline in the labor share. In this sense, the increase in industry concentration can account for most of the decline in the labor share. These results complement the aggregate findings, as (i) they rely on cross-sectional rather than time-series variation, and (ii) they do not rely on capital data and therefore are not subject to concerns about the measurement of capital. Taken as a whole, my results suggest that the decline in the shares of labor and capital are due to a decline in competition.

The remainder of this paper proceeds as follows. Section I presents a basic framework for measuring capital costs and pure profits. Section II describes the data. Section III presents the main results. Section IV presents evidence on the robustness of the results. Section V presents cross-sectional industry correlations between increases in concentration and declines in the labor share. Section VI provides a discussion of the results and a review of the related literature. Section VII concludes.

Internet Appendix Section I presents a standard general equilibrium model with monopolistic competition to study the declines in the shares of labor and capital.[1] Internet Appendix Section II presents a model of monopolistic competition with quadratic adjustment costs to assess the potential contribution of adjustment costs to the measured trends in the labor share, capital share, and pure profit share.

I. Basic Framework

This section presents the construction of capital costs and pure profits. Following Hall and Jorgenson (1967), capital costs are denoted by $RP^K K$ and are equal to the product of the required rate of return on capital and the value of the capital stock. Pure profits are denoted by Π and are equal to gross value added less the sum of compensation of employees, capital costs, and indirect taxes.

[1] The Internet Appendix is available in the online version of the article on *The Journal of Finance* website.

A. Capital Costs: By Asset

Given an asset-specific specification of the required rate of return, R_s, capital costs for capital of type s are

$$E_s = R_s P_s^K K_s, \tag{1}$$

where K_s is the quantity of capital of type s, P_s^K is the price of capital of type s, and $P_s^K K_s$ is the nominal value of the stock of capital of type s. Note that capital costs are measured in nominal dollars.

Following Hall and Jorgenson (1967), the required rate of return on capital of type s is[2]

$$R_s = \left(\left(\frac{D}{D+E} i^D (1-\tau) + \frac{E}{D+E} i^E \right) - \mathbb{E}[\pi_s] + \delta_s \right) \frac{1 - z_s \tau}{1-\tau}, \tag{2}$$

where D is the market value of debt, i^D is the debt cost of capital, E is the market value of equity, i^E is the equity cost of capital, τ is the corporate income tax rate, $(\frac{D}{D+E} i^D (1-\tau) + \frac{E}{D+E} i^E)$ is the weighted average cost of capital, π_s is the inflation rate of capital of type s, δ_s is the depreciation rate of capital of type s, and z_s is the net present value of depreciation allowances for capital of type s. This required rate of return accounts for both debt and equity financing as well as the tax treatment of debt and capital.[3] Unlike compensation of employees, firms are unable to fully expense investment in capital, and as a result, the corporate tax rate increases the firm's capital costs.

B. Capital Costs: Aggregation

Aggregate capital costs are the sum of the asset-specific capital costs

$$E = \sum_s R_s P_s^K K_s. \tag{3}$$

We can decompose aggregate capital costs into an aggregate required rate of return on capital and the nominal value of the capital stock:

$$\sum_s R_s P_s^K K_s = \underbrace{\sum_s \frac{P_s^K K_s}{\sum_j P_j^K K_j} R_s}_{R} \times \underbrace{\sum_s P_s^K K_s}_{P^K K}. \tag{4}$$

[2] Negative values of the required rate of return on capital can and do appear in the data. There are periods in which the cost of capital is low and expected capital inflation is sufficiently high so that the required rate of return is negative. This occurs for real estate (valued at market prices) in part of the 2000s when we calculate expected capital inflation as a three-year moving average of realized capital inflation. I set the negative required rate of return to zero. All results are robust to allowing for negative required rates of return.

[3] For the tax treatment of capital and debt, see Hall and Jorgenson (1967), King and Fullerton (1984), Jorgenson and Yun (1991), and Gilchrist and Zakrajsek (2007). Past research has included an investment tax credit in the calculation of the required rate of return on capital; the investment tax credit expired in 1986. The results are robust to including the investment tax credit.

The first term is the weighted average of the asset-specific required rates of return, where the weight on asset s is proportional to the nominal value of the stock of capital of type s. The second term is the nominal value of the aggregate capital stock. The capital share of gross value added is

$$S^K = \frac{\sum_s R_s P_s^K K_s}{P^Y Y}, \tag{5}$$

where $\sum_s R_s P_s^K K_s$ are aggregate capital costs and $P^Y Y$ is nominal gross value added.

C. Pure Profits

Pure profits are constructed as[4]

$$\Pi = P^Y Y - wL - RP^K K - \text{indirect taxes}, \tag{6}$$

where $P^Y Y$ is nominal gross value added, wL is compensation of employees, and $RP^K K$ are capital costs. The pure profit share of gross value added is

$$S^\Pi = \frac{\Pi}{P^Y Y}. \tag{7}$$

Example: To clarify the terminology and units, consider a firm that uses 2,000 square feet of office space and 100 laptops. The sale value of the office space is \$880,000 at the start of the year. If the required rate of return on the office space is 5%, then the capital costs of the office space are $\$44{,}000 = 0.05 \times \$880{,}000$ (or \$22 per square foot). The sale value of the 100 laptops is \$70,000 at the start of the year. If the required rate of return on the laptops is 41%, then capital costs of the laptops are $\$28{,}700 = 0.41 \times \$70{,}000$ (or \$287 per laptop). Aggregate capital costs are \$72,700 and the value of the aggregate capital stock is \$950,000. The aggregate required rate of return on capital is $R = \frac{\$72{,}700}{\$950{,}000} \approx 0.08$. If we further assume that the firm's gross value added for the year is \$500,000 and compensation of employees is \$360,000, then pure profits are \$67,300, the firm's capital share is $S^K = \frac{\$72{,}700}{\$500{,}000} \approx 0.15$, and the pure profit share is $S^\Pi = \frac{\$67{,}300}{\$500{,}000} \approx 0.13$.

[4] Unlike taxes on corporate income, it is unclear how to allocate indirect taxes on production across capital, labor, and pure profits. As a share of gross value added, these taxes on production are nearly constant throughout the sample period. Consistent with previous research, I study the shares of labor, capital, and profits without allocating the taxes. Allocating these taxes across labor, capital, and pure profits yields similar results.

II. Data

A. National Accounts

Data for the U.S. nonfinancial corporate sector cover the geographic area that comprises the 50 states and the District of Columbia. As an example, all economic activity by the foreign-owned Kia Motors automobile manufacturing plant in West Point, Georgia, is included in the data and is reflected in the measures of gross value added, investment, capital, and compensation of employees. By contrast, all economic activity by the U.S.-owned Ford automobile manufacturing plant in Almussafes, Spain, is not included in the data and is not reflected in the measures of gross value added, investment, capital, and compensation of employees.

The data are taken from the following sources.

Gross Value Added, Compensation of Employees, and Capital: Data on nominal gross value added are taken from the National Income and Productivity Accounts (NIPA) Table 1.14 (line 17). Data on compensation of employees are taken from the NIPA Table 1.14 (line 20). Compensation of employees includes all wages in salaries, whether paid in cash or in kind and includes employer costs of health insurance and pension contributions. Compensation of employees also includes the exercising of most stock options;[5] stock options are recorded when exercised (the time at which the employee incurs a tax liability) and are valued at their recorded tax value (the difference between the market price and the exercise price). Compensation of employees further includes compensation of corporate officers. Data on taxes on production and imports less subsidies are taken from the NIPA Table 1.14 (line 23).

Capital data are taken from the BEA Fixed Asset Table 4.1. The BEA capital data provide measures of the capital stock, the depreciation rate of capital, and inflation for three categories of capital (nonresidential structures, equipment, and IPPs), as well as a capital aggregate. The 14th comprehensive revision of NIPA in 2013 expanded its recognition of intangible capital beyond software to include expenditures for R&D and for entertainment, literary, and artistic originals as fixed investments. Asset-specific expected capital inflation is constructed as a three-year moving average of realized capital inflation. The results are robust to using realized capital inflation instead of expected capital inflation. In addition to the BEA capital data, the main specification includes

[5] There are two major types of employee stock options: incentive stock options (ISO) and nonqualified stock options (NSO). An ISO cannot exceed 10 years, and options for no more than $100,000 worth of stock may become exercisable in any year. When the stock is sold, the difference between the market price and the exercise price of the stock options is reported as a capital gain on the employee' s income tax return. The more common stock option used is the NSO. When the option is exercised, the employee incurs a tax liability equal to the difference between the market price and the exercise price (reported as wages); the company receives a tax deduction for the difference between the market price and the exercise price, which reduces the amount of taxes paid. Compensation of employees includes the exercising of NSO, but not the exercising of ISO. For further details, see Moylan (2008).

inventories. Data on inventories are taken from the Integrated Macroeconomic Accounts for the United States Table S.5.a.

The output and capital data do not include any residential housing. BEA Fixed Asset Table 5.1 indicates that, in addition to nonresidential fixed assets (nonresidential structures, equipment, and IPPs), the corporate sector owns a small amount of residential housing. In all years, residential housing makes up a very small fraction of the value of the fixed assets owned by the U.S. nonfinancial corporate sector. In 2014, the corporate sector owned $0.19 trillion of residential housing. In the same year, the nonfinancial corporate sector owned $14.62 trillion of nonresidential fixed assets (nonresidential structures, equipment, and IPPs). In addition, corporate-owned residential housing makes up a very small fraction of total U.S. residential housing. In 2014, the value of residential housing in the private economy was $18.5 trillion. I have not included this stock of residential housing in the calculations. Similarly, the measure of gross value added does not include the $1.66 trillion contribution of residential housing to the gross value added of the private sector. The results are robust to including the corporate-owned residential housing.

Corporate Tax Rate and Capital Allowances: Data on the corporate tax rate are taken from the Organisation for Economic Cooperation and Development (OECD) Tax Database and data on the capital allowance are taken from the Tax Foundation.

B. The Cost of Capital

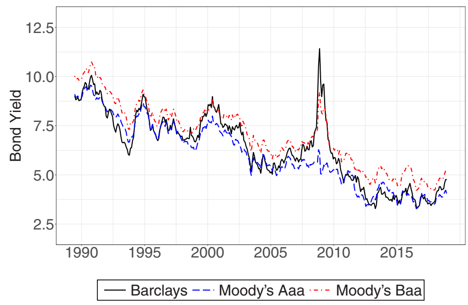
B.1. Debt Cost of Capital

I combine data on rates and market values of bonds, commercial paper, and loans in order to construct a representative debt cost of capital.

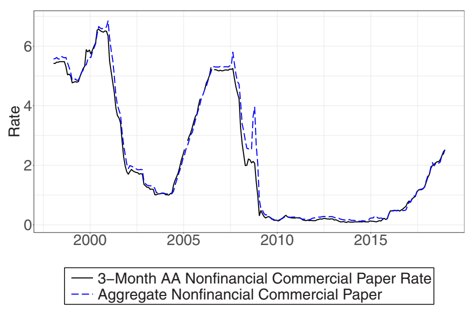
To compute the representative cost of debt for corporate bonds, I use nine Barclays indices.[6] For these indices, Bloomberg provides data on market values outstanding, maturity, and option-adjusted spread (OAS). I construct the option-adjusted yield as the sum of the OAS and the (interpolated) yield on a U.S. treasury of the same maturity. I then construct the aggregate option-adjusted yield as the weighted average of the individual indices, where the weights are propositional to market values.

Unfortunately, the indices do not cover a long enough time period to use in the analysis. Figure 1, Panel A, compares the aggregate option-adjusted yield to Moody's Aaa and Baa Corporate Bond Yields. In the overlapping period, Moody's Aaa bond portfolio is very similar to the aggregate option-adjusted yield in both level and trend. While Moody's Aaa has a higher grade than

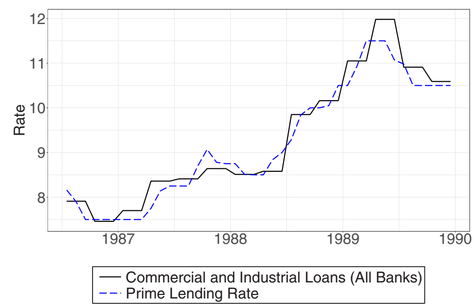
[6] These extend earlier data compiled by Lehman Brothers. The indices (Ticker) are: Corporate Investment Grade (LUACTRUU), Corporate High Yield (LF98TRUU), 144A Ex Aggregate (I02720US), Commercial Mortgage-Backed Securities Investment Grade (LC09TRUU), Commercial Mortgage-Backed Securities High Yield (LC36TRUU), Fixed Rate Asset-Backed Securities (LUABTRUU), Asset-Backed Securities Floating Rate (LD09TRUU), Floating Rate Notes (BFRN-TRUU), and Floating Rate Notes High Yield (I13477US).



Panel A. Bond Indices



Panel B. Commercial Paper



Panel C. Loans

Figure 1. Bond indices, commercial paper, and loans. Panel A (Bond Indices) shows the aggregate option-adjusted yield on the Barclays indices and Moody's Aaa and Baa Corporate Bond Yields. Panel B (Commercial Paper) shows the aggregate rate of the 12 types of nonfinancial commercial paper and the 3-Month AA Nonfinancial Commercial Paper Rate. Panel C (Loans) shows the aggregate rate on commercial and industrial loans made by all commercial banks and the prime lending rate. See Section II.B for further details. (Color figure can be viewed at wileyonlinelibrary.com)

the representative portfolio, it also has a longer maturity and this can help explain why the two portfolios have similar yields throughout the sample. Moody's Baa bond portfolio is very similar in trend, but not in level. I therefore approximate the representative portfolio with Moody's Aaa.

To compute the representative cost of debt for corporate commercial paper, I use data for 12 types of nonfinancial commercial paper,[7] taken from the Federal Reserve. The data contain daily information on rates and issuance. I calculate monthly rates as the weighted average of the daily weights, where the weights are proportional issuance.[8]

Unfortunately, the detailed data on commercial paper do not cover a long enough time period to use in the analysis. Figure 1, Panel B, compares the

[7] The 12 types of commercial paper correspond to six maturities, ranging from one night to 90 days, and two grades (AA nonfinancial and A2/P2 nonfinancial).

[8] When issuance is missing, I use the average weights over the sample.

aggregate rate on 12 types of nonfinancial commercial paper to the 3-Month AA Nonfinancial Commercial Paper Rate. The two series are very similar in both level and trend. I therefore approximate the rate on commercial paper with the 3-Month AA Nonfinancial Commercial Paper Rate.[9]

To compute the representative cost of debt for corporate loans, I use data on commercial and industrial loans made by all commercial banks, taken from the Federal Reserve Table E.2 (Survey of Terms of Business Lending). The table provides quarterly rates for three types of loans (classified by size) as well as an aggregate rate. I assume that the rate is constant within each quarter.

To ensure that the data properly account for large loans made to corporations, I compare the rate on large commercial and industrial loans to the rates on drawn syndicated loans available through DealScan. The average difference between the rate on large commercial and industrial loans and an aggregated rate on drawn syndicated loans is one basis point.

The data are available for 1986Q2 to 2017Q2. To extend the data to the start of the sample, I compare the aggregate rate to a wide range of publicly available rates. The prime lending rate provides a good match to the level and trend during the late 1980s. Figure 1, Panel C, compares the rate on commercial and industrial loans made by all commercial banks to the prime lending rate. The two series are very similar in level and trend. I approximate the rate on loans using the rate for commercial and industrial loans made by all commercial banks together with the prime lending rate for the period prior to 1986Q2.

I compute the debt cost of capital as the weighted average of the yield on Moody's Aaa (Bonds), the 3-Month AA Nonfinancial Commercial Paper Rate (Commercial Paper), and the rate for commercial and industrial loans made by all commercial banks (Loans). The weights are proportional to the market values. Data on market values are taken from the Integrated Macroeconomic Accounts for the United States Table S.5.a (Bonds is the sum of lines 132 and 133, Commercial Paper is line 131, and Loans is line 134).

Ideally, we would adjust the debt cost of capital to account for expected default losses. Moody's (2018) shows that over the sample period, the rate of default on bonds slightly increases and recovery upon default is stable and has no trend, suggesting that expected default losses remain constant or slightly increase. Therefore, it seems likely that the measure of the debt cost of capital slightly overstates the true value, and therefore, slightly understates the decline.

B.2. Equity Cost of Capital

Unlike the debt cost of capital, which can be constructed from observed market data, the equity cost of capital is unobserved and requires a model. I

[9] The 3-Month AA Nonfinancial Commercial Paper Rate (CPN3M) is only available starting in January of 1997. The discontinued series 3-Month Commercial Paper Rate (CP3M) is available through August 1997 and in the overlapping period, the two are very similar, though 12 basis points apart. Prior to 1997, I use the 3-Month Commercial Paper Rate after adjusting by 12 basis points to ensure close overlap.

approximate the equity cost of capital as the sum of the yield on the 10-year U.S. treasury and a constant 5% equity risk premium. Typical constructions of the equity cost of capital measure an equity risk premium relative to the yield on a one-year treasury bill. An equity risk premium of 5% relative to a 10-year treasury bond implies an average risk premium of 6.5%, relative to the one-year treasury bill, that has increased since 2008 to 7.4%.

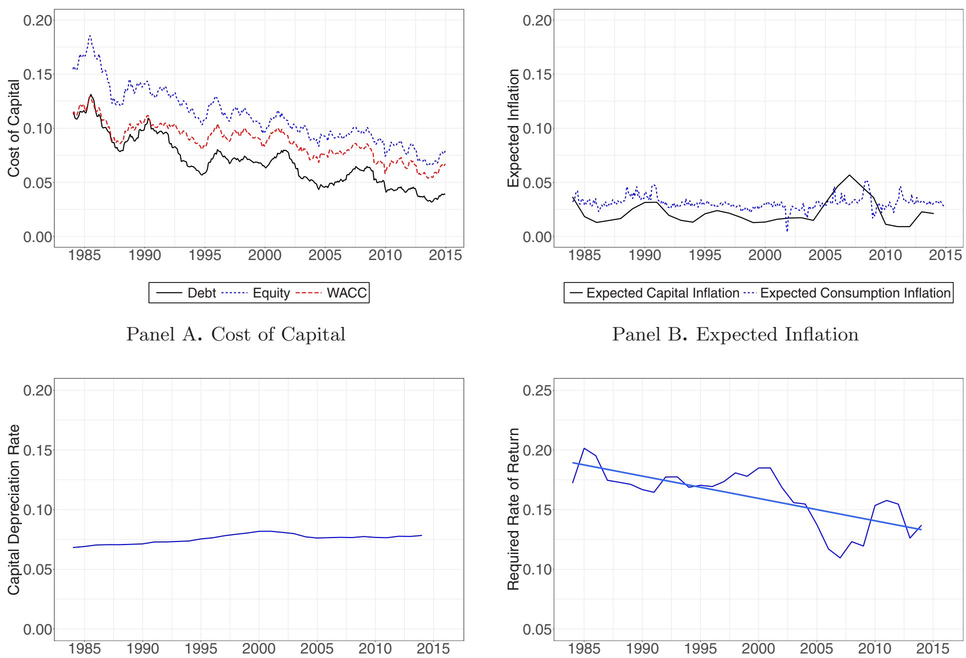
There is a large literature on measuring the equity risk premium. This literature tends to find an equity risk premium that has been either constant or declining since the 1980s and often finds values of the equity risk premium that are significantly lower than 6.5% relative to the one-year treasury bill. If the true equity risk premium is declining, then my estimates of pure profits will understate the true increase. Conversely, if the true equity premium is increasing, then my estimates of pure profits will overstate the true increase. If the true equity risk premium is lower than 6.5% relative to the one-year treasury bill, then my estimates of pure profits are understated in all years.

Campbell and Thompson (2008) present many predictive time-series regressions of excess stock returns that outperform the historical average return. The paper provides evidence that imposing parameter restrictions leads to superior out-of-sample forecasts. Across predictive regressions, the equity risk premium has been either constant or declining since the 1980s. The paper uses data over for period 1927 to 2005. Martin (2017) provides updated estimates through 2011 that show a slight decline in the equity risk premium through 2011.

Lettau, Ludvigson, and Wachter (2008) document a strong correlation between low-frequency movements in macrovolatility and corporate valuation ratios. The paper calibrates a consumption-based asset-pricing model that incorporates regimes of macrovolatility and finds that the model successfully matches the observed increase in valuation ratios. The model estimates show a significant decline in the equity risk premium since the early 1980s due to the persistently low output and consumption volatility.

Avdis and Wachter (2017) incorporate information in the time series of prices and dividends in a maximum likelihood estimation framework. Using data from January 1953 to December 2011, the paper finds a long-run decline in the equity risk premium. Importantly, the estimated equity risk premium declines from the early 1980s through the end of the sample. The paper further presents estimates that allow for possible structural breaks in the data and this does not alter the conclusions. The authors further confirm that the results are not due to unusual characteristics of the dividend series by considering other valuation ratios such as book-to-market or earnings-to-price.

Martin (2017) combines options data with assumptions on the stochastic discount factor to construct a lower bound on the equity risk premium from January 1996 to January 2012. The paper finds short-lived episodes of increases in the equity risk premium, but no trend increase. The paper further presents evidence that the lower bound that is estimated is approximately tight.



Panel A. Cost of Capital

Panel B. Expected Inflation

Panel C. Depreciation Rate

Panel D. Required Rate of Return

Figure 2. The required rate of return on capital. The figure shows the components of the required rate of return on capital for the U.S. nonfinancial corporate sector over the period 1984 to 2014. Panel A: the debt cost of capital, the equity cost of capital, and the weighted average cost of capital. Panel B: expected capital inflation is calculated as a three-year moving average of realized capital inflation and expected consumption inflation is the median expected 12-month price change from the University of Michigan's Survey of Consumers. Panel C: the depreciation rate of capital is taken from the BEA Fixed Asset Tables. Panel D: the required rate of return on capital with a linear trend. See Section III for further details. (Color figure can be viewed at wileyonlinelibrary.com)

III. Results

This section presents the capital and pure profit shares of gross value added for the U.S. nonfinancial corporate sector over the period 1984 to 2014.

Throughout this section, several time series are approximated by a linear time trend. For a variable X, the fitted pp change in X is $\hat{X_{2014}} - \hat{X_{1984}}$, and the fitted percent (%) change in X is $\frac{\hat{X_{2014}} - \hat{X_{1984}}}{\hat{X_{1984}}}$.

A. The Required Rate of Return

Figure 2 shows the components of the required rate of return on capital for the U.S. nonfinancial corporate sector over the period 1984 to 2014. Panel A shows the debt cost of capital, the equity cost of capital, and the weighted average cost of capital. All three measures of the cost of capital show a large decline over the period 1984 to 2014. The decline in the cost of capital tracks the decline in the risk-free rate. Approximating the weighted average cost of capital by a linear time trend shows that the cost of capital declines from 11.3% in 1984 to 6.3% in 2014.

Panel B shows two measures of expected inflation: expected capital inflation, equal to a three-year moving average of realized capital inflation; and expected consumption inflation, equal to the median expected 12-month price change taken from the University of Michigan's Survey of Consumers. Both measures of expected inflation show no trend over the period 1984 to 2014. While realized inflation is more volatile than expected inflation, realized capital inflation and realized consumption inflation also show no trend over this period. Panel C shows the depreciation rate of capital. There is variation over time in the depreciation rate, but this variation is very small compared to the decline in the cost of capital.

Panel D shows the required rate of return on capital, which was presented in equation (2). The figure shows a clear and dramatic decline in the required rate of return on capital. The decline in the required rate of return tracks the decline in the cost of capital. Approximating the required rate of return by a linear time trend shows that the required rate of return declines from 18.9% in 1984 to 13.3% in 2014, a decline of 5.6pp.

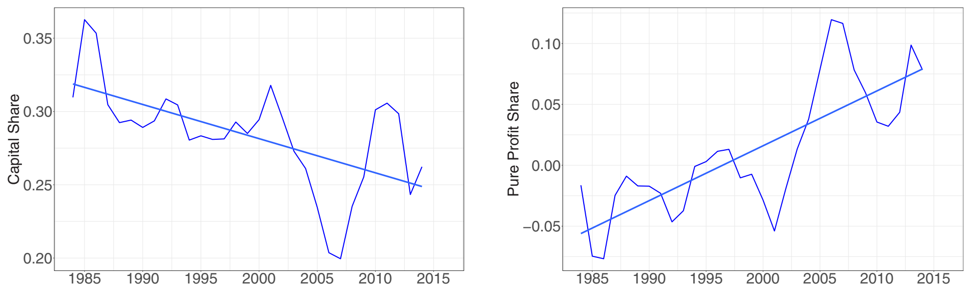
B. Capital Costs and Pure Profits

The large decline in the required rate of return does not necessarily imply a decline in the capital share. In a typical model of firm production, firms respond to the decline in the required rate of return by increasing their use of capital inputs. If firms respond strongly enough, the increase in capital inputs is larger than the decline in the required rate of return, and as a result, the capital share increases.

However, the U.S. nonfinancial corporate sector does not sufficiently increase its use of capital inputs to offset the decline in the required rate of return, and as a result, the capital share declines.

Figure 3 shows the capital and pure profit shares of gross value added for the U.S. nonfinancial corporate sector over the period 1984 to 2014. Recall from Section I that capital costs are the product of the required rate of return on capital and the value of the capital stock, pure profits are gross value added less compensation of employees less capital costs less taxes on production and imports plus subsidies, the capital share is the ratio of capital costs to gross value added, and the pure profit share is the ratio of pure profits to gross value added.

Panel A shows the capital share of gross value added. The capital share shows a clear and dramatic decline. Approximating the capital share by a linear time trend shows that the capital share declines from 32% of gross value added in 1984 to 25% of gross value added in 2014, a decline of 7pp or 22%. Measured in percentage terms, the decline in the capital share (22%) is significantly larger than the decline in the labor share (11%).



Panel A. Capital Share

Panel B. Pure Profit Share

Figure 3. Capital and pure profit shares. The figure shows the capital share and pure profit share of gross value added for the U.S. nonfinancial corporate sector over the period 1984 to 2014. Capital costs are the product of the required rate of return on capital and the value of the capital stock. Pure profits are gross value added less compensation of employees less capital costs less taxes on production and imports plus subsidies. Panel A: the capital share is the ratio of capital costs to gross value added. Panel B: the pure profit share is the ratio of pure profits to gross value added. Both figures include a fitted linear trend. See Section III for further details. (Color figure can be viewed at wileyonlinelibrary.com)

Panel B shows the pure profit share of gross value added. The pure profit share shows a clear and dramatic increase. Consistent with the previous research,[10] I find that pure profits were very small in the early 1980s. However, pure profits have increased dramatically over the past since the early 1980s. The fitted linear trend shows that pure profits increased from approximately −5.6% of gross value added in 1984 to 7.9% of gross value added in 2014, an increase of 13.5pp.

C. Magnitude

The labor share measures the ratio of compensation of employees to labor productivity:

$$\frac{wL}{P^Y Y} = \frac{w}{P^Y Y L}.$$

Over the period 1984 to 2014, labor productivity grew faster than labor compensation. The growing gap between labor productivity and labor compensation is not explained by an increase in capital costs. Back in 1984, every dollar of labor costs was accompanied by 49¢ of capital costs. By 2014, every dollar of labor costs was accompanied by only 42¢ of capital costs. Thus, despite the decline in the labor share, labor costs have increased faster than capital costs.

Since the early 1980s firms have dramatically reduced both labor costs and capital costs and increased pure profits (all measured as a share of gross value added). To offer a sense of the magnitude, the value of this

[10] See, for example, Rotemberg and Woodford (1995) and Basu and Fernald (1997).

increase in pure profits amounts to $1.2 trillion in 2014, or $14.6 thousand for each of the approximately 81 million employees of the nonfinancial corporate sector.

IV. Robustness

This section considers the robustness of the decline in the capital share and the increase in the pure profit share to potentially mismeasured inputs into the BEA construction of capital, alternative measures of capital, potentially omitted or unobserved intangible capital, and alternative assumptions on the equity risk premium.

A. Alternative Rates of Depreciation and Capital Inflation

The BEA measures of depreciation rates are based on the work of Hulten and Wykoff (1981).[11] While the BEA provides measures for the rates of depreciation for assets that were not considered by Hulten and Wykoff (1981), there are assets included in the original study for which available data were incomplete and therefore estimated rates of depreciation required strong assumptions. Furthermore, with few exceptions, asset-specific rates of depreciation are assumed to have remained constant over time. Asset-specific capital inflation measures are primarily calculated using the Bureau of Labor Statistics (BLS) producer price index (PPI) and import price index (IPI), which attempt to incorporate adjustments for changes in quality.[12] Measurement error, changes over time in rates of depreciation, and unmeasured quality adjustment to capital could have important implications for the measurement of capital costs and pure profits.

Construction of the nominal value of the capital stock and the required rate of return on capital relies heavily on the BEA measures of depreciation rates and capital inflation. As a result, mismeasured values of the rate of depreciation and capital inflation could have implications for the level and the trend in capital costs and pure profits. A higher rate of depreciation would lead us to estimate a lower value of the capital stock and at the same time a higher required rate of return on capital. Similarly, higher capital inflation would lead us to estimate a higher value of the capital stock and at the same time a lower required rate of return.

I construct hypothetical fixed asset tables for a wide range of alternative values of the rate of depreciation and capital inflation. I consider specifications in which these adjustments are simultaneously made to all BEA categories of assets (structures, equipment, and IPPs) as well as specifications in which

[11] For a detailed description of the methodology used by the BEA to estimate depreciation rates, see Fraumeni (1997) and https://bea.gov/national/pdf/BEA_depreciation_rates.pdf.

[12] For a detailed description of the BLS quality adjustments, see U.S. Department of Commerce, Bureau of Economic Analysis, 2003, *Fixed Assets and Consumer Durable Goods in the United States*, 1925 to 1999 (U.S. Government Printing Office, Washington, DC).

these adjustments are made to any combination of the BEA categories of assets.

For every given time series of asset-specific values of the rate of depreciation ($\tilde{\delta}_{s,t}$) and capital inflation ($\tilde{\pi}_{s,t}$), I construct an asset-specific series of the nominal value of capital using the perpetual inventory method $\tilde{P}_{s,t}\tilde{K}_{s,t+1} = (1-\tilde{\delta}_{s,t})\tilde{P}_{s,t}\tilde{K}_{s,t} + I_{s,t}$ assuming an initial nominal value of capital at the end of 1974 equal to the BEA reported nominal value of capital. Given the newly computed series of capital and the new values of the required rate of return, I compute capital costs and pure profits.

First, I use values of capital inflation that are between -2pp and $+2$pp of the BEA measures of capital inflation. The considered variation in capital inflation is large, given that average aggregate capital inflation over the sample period is 2.4%.

Second, I consider alternative values of the rate of depreciation that are between half and two times the value of the BEA measures of the rate of depreciation. This adjustment allows for the possibility that the BEA measures of depreciation are off by a constant multiplicative factor.

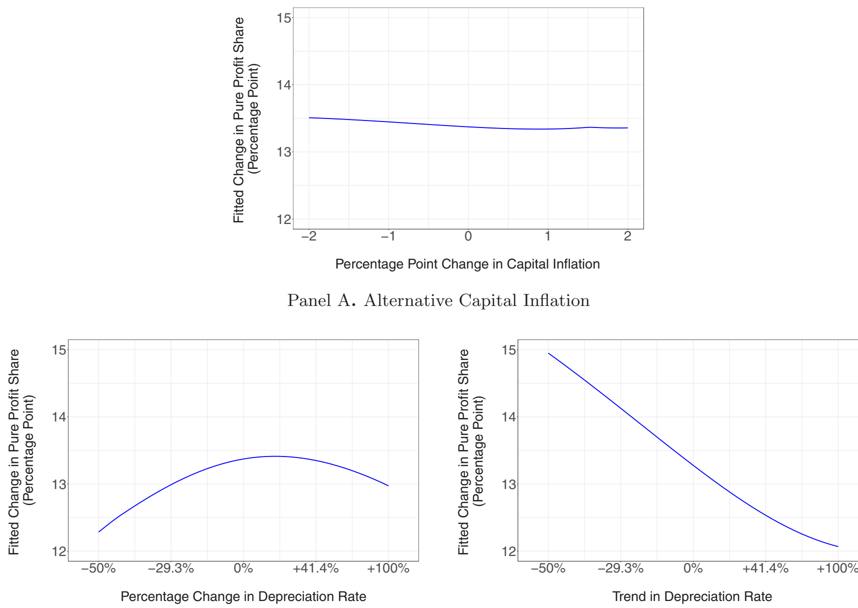
Third, I consider a possible unmeasured trend in the rate of depreciation. Specifically, I assume that each new vintage of capital (e.g., structures built in 1990) has a potentially different depreciation rate. I parameterize the depreciation rate of capital of type s as $\delta_{s,t,v} = \delta_{s,t} \times (1 + \frac{v-1984}{2014-1984} b_s)$, where s indexes the category of capital, t indexes time, $\delta_{s,t}$ is the BEA rate of depreciation of capital of type s in year t, and v indexes vintage. I consider a range of parameters for the trend in the rate of depreciation that results in a range of values for depreciation in 2014 that are between half and two times the value of the BEA measures of depreciation. To calculate capital costs and pure profits, I separately construct the required rate of return and capital costs for each category$\times$vintage of capital in each year.

Figure 4 shows the trend in the pure profit share for the range of alternative values of capital inflation and the rate of depreciation. For the purposes of this figure, I have simultaneously adjusted the rates of depreciation and capital inflation for all BEA categories of assets. In all cases, the results are similar and even closer to the baseline results when I apply the adjustments to any subset of the BEA categories of assets.

Panel A presents the fitted change in the pure profit share for a range of adjustments to capital inflation. The figure shows that the trend in the pure profit share varies by less than half a pp across a wide range of alternative values of capital inflation.

Panels B presents the fitted change in the pure profit share for a range of constant adjustments to the rate of depreciation. The figure shows that across a wide range of alternative values of the rate of depreciation, the fitted change in the pure profit share ranges from 12.3pp to 13.4pp. There is almost no change to the fitted change of the pure profit share for higher rates of depreciation.

Panel C presents the fitted change in the pure profit share for a range of adjustments to the trend in the rate of depreciation. The figure shows that



Panel A. Alternative Capital Inflation

Panel B. Alternative δ

Panel C. Trend in δ

Figure 4. Alternative values of capital inflation and the rate of depreciation. The figure shows the fitted change in the pure profit share for a range of adjustments to capital inflation and the rate of depreciation. Panel A: adjustments to capital inflation. Panel B: constant multiplicative adjustments to the rate of depreciation. Panel C: adjustments to the trend in the rate of depreciation. See Section IV.A for further details. (Color figure can be viewed at wileyonlinelibrary.com)

across a wide range of possible trends in the rate of depreciation, the fitted change in the pure profit share ranges from 12.1pp to 15pp.[13]

B. Alternative Measures of Capital

In the main specification, capital consists of BEA capital (structures, equipment, and IPPs) as well as inventories. I now consider two alternative specifications of capital. The first alternative specification uses only the BEA measures of capital. This first specification is widely used in practice and thus allows for a better comparison of the results to existing research. The second alternative specification includes the BEA measures of capital, inventories, and real estate valued at market prices instead of at replacement cost (the difference is often thought of as the value of land). Data on the market value of real estate are taken from the Integrated Macroeconomic Accounts for the United States Table S.5.a.

[13] The figure shows that the trend in pure profits is declining in the trend in depreciation. When I greatly expand the range of parameterizations of the time trend in the rate of depreciation (up to a 700% increase—at which point some assets reach the maximum depreciation rate of 1), the fitted change in the pure profit share is always above 12pp.

Table I

Time Trends of Labor, Capital, and Pure Profit Shares

The table reports time trends for the U.S. nonfinancial corporate sector over the period 1984 to 2014. This table considers alternative measures of capital. BEA capital data are taken from BEA Fixed Asset Table 4.1 and include structures, equipment, and intellectual property products. Data on inventories and real estate valued at market prices are taken from the Integrated Macroeconomic Accounts for the United States, Table S.5.a. Capital data in column (1) consist of BEA capital and inventories. Capital data in column (2) consist of BEA capital. Capital data in column (3) consist of BEA capital and inventories and real estate is valued at market prices. Capital costs are the product of the required rate of return on capital and the value of the capital stock. Expected capital inflation is calculated as a three-year moving average of realized capital inflation. Pure profits are gross value added less compensation of employees less capital costs less taxes on production and imports plus subsidies. The labor share is the ratio of compensation of employees to gross value added. The capital share is the ratio of capital costs to gross value added. The pure profit share is the ratio of pure profits to gross value added. For a variable X, the fitted percentage point (pp) change in X is $\hat{X_{2014}} - \hat{X_{1984}}$, and the fitted percent (%) change in X is $\frac{\hat{X_{2014}}-\hat{X_{1984}}}{\hat{X_{1984}}}$. The increase in pure profits per employee is the fitted percentage point change in the pure profit share multiplied by gross value added in 2014 and divided by the number of employees in 2014. See Sections III and IV.B for further details.

		Measure of Capital	
	(1 – Main)	(2)	(3)
Decline in Labor Share	11%	11%	11%
Decline in Capital Share	22%	17%	28%
Increase in Pure Profit Share	13.5pp	11.5pp	16.2pp
Increase in Pure Profits Per Employee	\$14.6 (thousand)	\$12.4 (thousand)	\$17.5 (thousand)

(1) BEA Measures of Capital and Inventories.
(2) BEA Measures of Capital.
(3) BEA Measures of Capital, Inventories, and Real Estate Valued at Market Prices.

Table I presents the results of the analysis. Each column of Table I uses a different measure of capital. Column (1) uses the BEA measures of capital as well as inventories. Column (2) uses BEA measures of capital and excludes inventories. Column (3) uses the BEA measures of capital, inventories, and real estate valued at market prices instead of at replacement cost. It is easily noticeable from this table that more inclusive measures of capital lead to larger measured declines in the capital share and larger increases in the pure profit share. The reason for this is straightforward: over the period 1984 to 2014, the required rate of return on all forms of capital declines sharply. Since the value of the additional capital does not grow sufficiently fast relative to output, inclusion of this additional capital results in an even greater decline in the capital share and increase in the pure profit share.

C. Potentially Omitted or Unobserved Intangible Capital

The BEA measures of capital include physical capital, such as structures and equipment, as well as measures of intangible capital, such as R&D, software, and artistic designs. Despite the BEA's efforts to account for intangible capital, it is possible that there are forms of intangible capital that are not included in the existing BEA measures. Indeed, past research has considered several forms of intangible capital that are not currently capitalized by the BEA and has argued that these are important for explaining asset valuations and cash flows.[14] These additional forms of intangible capital include organizational capital, market research, branding, and training of employees. Might the high level of pure profits and the large increase in the pure profit share measured in Section III reflect large and increasing cash flows that are the return to missing or unobserved capital?

The effect of including an additional form of capital unambiguously increases capital costs. Since the required rate of return on this additional capital is positive (or at least nonnegative), the user of this capital incurs positive annual capital costs. Next, the inclusion of additional capital very likely increases gross value added. Current measures of gross value added exclude firm investment in this additional capital and therefore underestimate gross value added by the value of the investment. As long as investment in this capital is positive, gross value added is understated. The effect on pure profits is ambiguous: on the one hand, capital costs are now a larger portion of observed gross value added and, on the other hand, observed gross value added understates true gross value added. The inclusion of this additional capital will reduce pure profits if capital costs are larger than the value of the investment. A few lines of simple algebra show that as long as the capital costs of this additional capital are larger than the value of the investment, accounting for this additional capital increases the capital share and decreases the pure profit share.

While it is easy to work out the effect of including an additional form of capital on the *level* of the capital and pure profit shares, its effect on the *trend* in the capital and pure profit shares is less clear. Since the early 1980s the required rate of return on all forms of capital has declined sharply, due to a large decline in the cost of capital. This decline in the cost of capital equally affects the required rate of return on any additional form of capital. As a result, if the stock of additional capital grows only at the rate of output, then the additional capital costs will grow far slower than output. This will have the effect of further reducing the trend of the capital share and further increasing the trend in the pure profit share. As we saw in Section IV.B, the inclusion of additional forms of capital often leads to an even greater decline in the capital share and increase in the pure profit share. In order for this additional capital to have any mitigating effect on the trend in the capital and pure profit shares, the stock of additional capital would need to grow significantly faster than output. In order for this additional capital to completely offset the observed trend in capital and pure profit shares, the stock of additional capital would need to grow far faster than output.

[14] See, for example, Hall (2001), Atkeson and Kehoe (2005), Hansen, Heaton, and Li (2005), Hulten and Hao (2008), Corrado, Hulten, and Sichel (2009), McGrattan and Prescott (2010), and Eisfeldt and Papanikolaou (2013).

I take two approaches to assessing the contribution of omitted intangible capital to the measured increase in pure profits. First, I incorporate the most comprehensive existing measures of omitted intangible capital into the analysis. Second, I construct a large number of scenarios for omitted intangible capital. Each scenario is a parameterization of investment, depreciation, and capital inflation of intangible capital. For each scenario, I compute capital costs and pure profits that fully incorporate the unobserved investment. I find that existing measures of intangible capital are unable to explain the increase in pure profits. Of the large number of scenarios that I consider, none can fully account for the increase in pure profits. There are scenarios that can account for most of the increase in pure profits, but in all such scenarios, the value of missing intangible capital in 2014 would need to be larger than all capital measured by the BEA (structures, equipment, and IPPs).

An increase in the importance of omitted intangible capital and an increase in pure profits are not mutually exclusive. Of the many scenarios of omitted intangible capital that I consider, many feature a simultaneous increase in intangible capital as well as a large increase in pure profits. In this sense, the increase in pure profits is consistent with many scenarios that feature rapidly increasing intangible capital.

C.1. Setup

The conceptual framework for incorporating unobserved intangible capital follows Corrado, Hulten, and Sichel (2009) and McGrattan and Prescott (2010).

- The additional capital costs are equal to $R^X P^X X$, where $P^X X$ is the nominal value of the unobserved stock of capital and $R^X = ((\frac{D}{D+E} i^D(1-\tau) + \frac{E}{D+E} i^E)\text{-}\mathbb{E}[\pi^X] + \delta^X)\frac{1-z^X\times\tau}{1-\tau}$ is the required rate of return on the unobserved capital.[15] True capital costs are the sum of observed capital costs and unobserved capital costs: $R^K P^K K + R^X P^X X$.
- True gross value added is the sum of observed gross value added $P^Y Y$ and unobserved investment I^X.
- True pure profits are observed pure profits, Π, less unobserved capital costs plus unobserved investment:

$$\Pi^{TRUE} = \Bigg(\underbrace{P^Y Y + I^X}_{\text{true gross value added}}\Bigg) - \Bigg(\underbrace{R^K P^K K + R^X P^X X}_{\text{true capital costs}}\Bigg) - wL \tag{8}$$

$$= \Pi - R^X P^X X + I^X. \tag{9}$$

[15] Since firms can expense all investment in this intangible capital, the tax system does not distort the accumulation of such capital other than through the tax shield of debt. Put differently, the depreciation allowance of intangible capital is one.

C.2. Approach #1: Existing Measures

The first approach that I take to assessing the potential contribution of unmeasured intangible capital to the measured increase in pure profits is to explicitly incorporate existing measures of intangible capital. Much of the intangible capital considered by Corrado et al. (2016) is already included in the BEA Fixed Asset Tables and is therefore already accounted for in the baseline measures of capital costs and pure profits that appear in Section III. The category of intangible capital that is measured by Corrado et al. (2016) but is not included in the BEA data is called "Economic Competencies" and includes the value of all market research, advertising, training, and organizational capital. The data on investment in intangible capital for the U.S. nonfinancial business sector are taken from IntanInvest.

Using the data on nominal investment, price deflators, and depreciation rates of "Economic Competencies," I construct a nominal stock of capital using the perpetual inventory method.[16] I then construct corrected measures of capital costs, gross value added, and pure profits for each year in which the intangible capital data are available (1996 to 2014).[17] I find that the inclusion of economic competencies has modest effects on the level of pure profits. The inclusion of economic competencies accounts for pure profits that are on average equal to 0.3% of gross value added and that never exceed 1.52% of gross value added. I further find that the inclusion of economic competencies has modest effects on the trend in pure profits. I approximate the annual contribution of economic competencies to the pure profit share by a linear time trend and find that the inclusion of economic competencies can explain an annual increase of 0.033pp. This annual estimate implies that economic competencies can account for a 1pp increase in the pure profit share over the period 1984 to 2014. This amounts to 7.5% of the measured increase in the pure profit share presented in Section III.

C.3. Approach #2: Scenario Analysis

The second approach that I take to assessing the potential contribution of unmeasured intangible capital to the measured increase in pure profits is to construct a wide range of scenarios. Each scenario is a hypothetical account of unmeasured intangible capital. For each scenario, I construct a hypothetical aggregate series of pure profits that fully accounts for the contribution of the hypothetical fixed asset.

[16] For each type of capital, I initialize the nominal value of the stock of capital using the equation $P^K_{-1}K_0 = \frac{P^I_0 I_0/(1+\bar{\pi})}{g+\delta}$, where $P^I_0 I_0$ is the nominal value of investment, $\bar{\pi}$ is the average rate of capital inflation over the sample period, g is the growth rate of real investment estimated using the first five years of data, and δ is the rate of depreciation. Given the high rates of depreciation, the estimated initial nominal value of the capital stock is not very sensitive to the method for estimating growth rates of real investment.

[17] Due to the limited time series, I construct expected capital inflation as realized capital inflation.

Table II summarizes the functional form assumptions and the range of parameter values that I use in construction of unmeasured intangible capital. Construction of a scenario requires assumptions on investment (I_t^X), capital inflation (π_t^X), the depreciation rate (δ^X) of unmeasured intangible capital, and an initial stock of unmeasured intangible capital ($P_{t_0}^X X_{t_0}$). Allowing for, but not requiring, investment that is growing faster than output, I assume a rate of investment of the form $\frac{I_t^X}{P_t^Y Y_t} = a + b \times (t - 1984)$, where $P_t^Y Y_t$ is measured gross value added. Allowing for, but not requiring, a time trend in the relative price of unmeasured intangible capital, I assume a path of capital inflation of the form $\pi_t^X = \pi_t^Y + c$, where π_t^Y is the percentage change in the price deflator for the nonfinancial corporate sector (calculated from NIPA Table 1.14). I assume a fixed depreciation rate d and an initial stock of unmeasured intangible capital in 1975. The nominal value of unmeasured capital at the end of period t is constructed by the perpetual inventory method and is given by the equation $P_t^X X_{t+1} = (1 - \delta^X) P_t^X X_t + I_t^X$.

For a given scenario, I make the following adjustments to gross value added, capital costs, and pure profits. Adjusted gross value added is the sum of measured gross value added and investment in unmeasured intangible capital. Adjusted capital costs are the sum of measured capital costs and unmeasured capital costs. Adjusted pure profits are adjusted gross value added less adjusted capital costs. To facilitate comparison, the outcome that I measure is the ratio of adjusted pure profits to measured gross value added. The results are similar when I consider the ratio of adjusted pure profits to adjusted gross value added.

Of the large number of scenarios that I consider, none can fully account for the increase in the share of pure profits. Some scenarios can account for most of the increase (up to 60%). All of the scenarios that manage to account for at least half of the increase in the share of pure profits have the following features. First, the value of missing intangible capital in 2014 needs to be at least \$22 trillion, which is 250% of observed gross value added and is more than 50% larger than all capital measured by the BEA (structures, equipment, and IPPs). Second, the rate of depreciation needs to be very low (no larger than 10%).

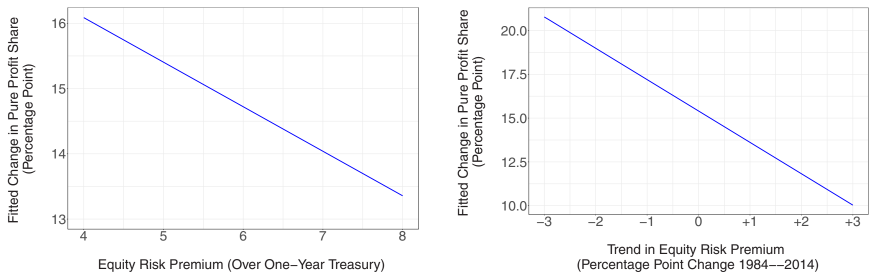
We can compare these scenarios to the BEA measures of IPPs and economic competencies, which is the class of intangible capital that is measured by Corrado, Hulten, and Sichel (2009), but is not capitalized by the BEA. The value of the stock of IPPs in 2014 is only 24% of observed gross value added and the value of the stock of economic competencies in 2014 is only 17% of observed gross value added. Furthermore, the fitted rate of depreciation of IPPs is 22% and that of economic competencies is 44%. If we restrict attention to those scenarios that feature a rate of depreciation of at least 10%, then no such scenario can explain more than 38% of the increase in pure profits and in order to explain even one-third of the increase in pure profits the value of missing intangible capital in 2014 needs to be at least \$15.7 trillion, which is 180% of observed gross value added.

Table II

Parameter Inputs into Missing Capital Scenarios

The table reports the functional form assumptions and the range of parameter values for the construction of unmeasured intangible capital. I^X is nominal investment in unmeasured intangible capital. π^X is inflation of unmeasured intangible capital. δ^X is the rate of depreciation of unmeasured intangible capital. $P^X X$ is the nominal value of unmeasured intangible capital. $P^Y Y$ is measured gross value added and π^Y is the percent change in the price deflator of gross value added for the nonfinancial corporate sector (taken from NIPA Table 1.14). The nominal value of unmeasured capital at the end of period t is constructed by the perpetual inventory method and is given by the equation $P_t^X X_{t+1} = (1-\delta^X)P_t^X X_t + I_t^X$. Data on Economic Competencies are taken from IntanInvest. Data on Intellectual Property Products are taken from the BEA Fixed Asset Table 4.1. See Section IV.C for further details.

			Fitted Values	
Input	Assumed Form	Range of Values	Economic Competencies	Intellectual Property Products
Investment	$\frac{I_t^X}{P_t^Y Y_t} = a + b \times (t - 1984)$	$a \in [0, 0.2]$	$a = 0.067$	$a = 0.036$
		$b \in [0, 0.01]$	$b = 0.0005$	$b = 0.0009$
Inflation	$\pi_t^X = \pi_t^Y + c$	$c \in [-0.02, 0.02]$	$c = 0.008$	$c = 0.002$
Depreciation	$\delta^X = d$	$d \in [0.05, 0.6]$	$d = 0.44$	$d = 0.22$
Initial Stock	$P_{1975}^X X_{1975} = e \times P_{1975}^Y Y_{1975}$	$e \in [0, 2]$		$e = 0.117$



Panel A. Constant Equity Risk Premium

Panel B. Trend in the Equity Risk Premium

Figure 5. Alternative values of the equity risk premium. The figure shows the fitted change in the pure profit share for a range of adjustments to the equity risk premium. The equity cost of capital is the sum of the yield on a one-year U.S. treasury and the equity risk premium. Panel A: adjustments to the level of the equity risk premium. This panel assumes a constant equity risk premium. Panel B: adjustments to the trend in the equity risk premium. This panel calculates the equity risk premium in year t as $5\% + \text{Trend} \times \frac{t-1984}{2014-1984}$. See Section IV.D for further details. (Color figure can be viewed at wileyonlinelibrary.com)

D. Alternative Values of the Equity Risk Premium

The baseline specification assumes an equity cost of capital equal to sum of the yield on the 10-year U.S. treasury and 5%. I now consider other values of the equity risk premium. To match the estimates reported in the literature, in this exercise, I construct the equity cost of capital as the sum of the yield on the one-year U.S. treasury and an equity risk premium.

First, I consider fixed values of the equity risk premium that range from 4% to 8%. Second, I consider a possible trend in the equity risk premium. In this case, I calculate the equity risk premium in year t as $5\% + \text{Trend} \times \frac{t-1984}{2014-1984}$ and consider trends in the equity risk premium between -3pp and $+3$pp.

Figure 5 shows the trend in the pure profit share for the range of alternative values of the equity risk premium. Panel A presents the fitted change in the pure profit share for a range of constant equity risk premiums. A 5% equity risk premium implies a 15.4pp increase in the share of pure profits. A 7% equity risk premium implies a 14pp increase in the share of pure profits.

Panel B presents the fitted change in the pure profit share for a range of time trends in the equity risk premium. A trend increase in the equity risk premium reduces the trend increase in the share of pure profits. A trend increase of 3pp in the equity risk premium implies a 10pp increase in the share of pure profits. Conversely (and in line with much of the research on the decline in the equity risk premium), a trend decline of3pp in the equity risk premium implies a 20.8pp increase in the share of pure profits.

V. Labor Share and Industry Concentration

In this section, I provide reduced-form empirical evidence to support the hypothesis that a decline in competition plays a significant role in the decline in the labor share. At the industry level, I am unable to directly measure competition and pure profits. Instead, I assume that an increase in concentration captures declines in competition and increases in pure profits. This assumption is true in standard models of imperfect competition and is supported by Salinger (1990) and Rotemberg and Woodford (1991). Using cross-sectional variation, I show that those industries that experience larger increases in concentration also experience larger declines in the labor share. Univariate regressions suggest that the increase in industry concentration can account for most of the decline in the labor share.

A. Data

I use census data on industry payroll, sales, and concentration. Payroll includes all wages and salaries in cash and in kind, as well as all supplements to wages and salaries. The data provide four measures of industry concentrations, namely, the share of sales by the 4, 8, 20, and 50 largest firms. The data are available for the years 1997, 2002, 2007, and 2012 and cover all sectors of the private economy, with the exceptions of agriculture, mining, construction, management of companies, and public administration.

To construct changes in the labor share and concentration, I match industries across census years.[18] I construct a sample of all industries that are consistently defined over time and that have data on sales, payroll, and at least one measure of concentration. In several sectors, the census separately reports data for tax-exempt firms and it is not possible to construct an industry measure of concentration. Instead, I consider only firms subject to federal income tax. The results are robust to dropping these sectors. In total, the sample consists of 750 six-digit North American Industry Classification System (NAICS) industries. As a share of the sectors covered by the census, the matched sample covers 76% of sales receipts in 1997 and 86% of sales receipts in 2012. As a share of the U.S. private economy,[19] the matched sample covers 66% of sales receipts in 1997 and 76% of sales receipts in 2012.

The assignment of firms to industries often includes a large amount of measurement error. When firms operate in multiple industries, the assignment of the firm to any one industry leads to measurement error in the sales, payroll, and concentration of all of the industries in which the firm operates. It is therefore difficult to compute industry-level outcomes in firm-level data sets such as Compustat. Unlike firm-level data sets, the census does not assign

[18] There have been minor revisions to the NAICS industry classification in each census since 1997. I map NAICS industries across censuses using the census-provided concordances, which are available at https://www.census.gov/eos/www/naics/concordances/concordances.html.

[19] The data on sales and payroll for the U.S. private economy are taken from Statistics of U.S. Businesses. All U.S. business establishments with paid employees are included in the Statistics of U.S. Businesses reports and tables. All NAICS industries are covered, except crop and animal production; rail transportation; National Postal Service; pension, health, welfare, and vacation funds; trusts, estates, and agency accounts; private households; and public administration. Most government establishments are excluded.

Table III

Descriptive Statistics

The table reports descriptive statistics of the matched sample of census industries. Data on industry payroll, sales, and concentration are taken from the economic census. The unit of observation is a six-digit NAICS industry. See Section V for further details.

	N	Median	Mean	*SD*
Value in 1997				
Labor Share	750	19.80	21.47	11.87
Sales Share of 4 Largest Firms	748	25.95	30.57	20.87
Sales Share of 8 Largest Firms	747	37.40	40.09	24.62
Sales Share of 20 Largest Firms	750	52.15	52.13	27.31
Sales Share of 50 Largest Firms	749	67.00	63.02	27.85
Value in 2012				
Labor Share	750	17.70	20.28	12.88
Sales Share of 4 Largest Firms	748	32.50	35.85	21.78
Sales Share of 8 Largest Firms	747	44.10	45.86	24.72
Sales Share of 20 Largest Firms	750	60.05	57.84	26.47
Sales Share of 50 Largest Firms	749	75.50	68.22	26.42
Change in Value (1997 to 2012)				
Labor Share	750	−1.41	−1.19	5.90
Sales Share of 4 Largest Firms	748	4.15	5.28	12.10
Sales Share of 8 Largest Firms	747	4.70	5.77	11.80
Sales Share of 20 Largest Firms	750	4.10	5.71	10.93
Sales Share of 50 Largest Firms	749	3.20	5.20	9.86
Log-Change in Value (1997 to 2012)				
Labor Share	750	−0.08	−0.10	0.28
Sales Share of 4 Largest Firms	748	0.17	0.21	0.46
Sales Share of 8 Largest Firms	747	0.13	0.18	0.38
Sales Share of 20 Largest Firms	750	0.09	0.14	0.30
Sales Share of 50 Largest Firms	749	0.05	0.11	0.23

each firm to a single industry. Instead, the census separately assigns each and every establishment to a potentially separate industry. As an example, based on its 10k filing, Compustat assigns Apple to the manufacturing industry Electronic Computers (SIC code 3571) despite the fact that Apple does not own or operate a single U.S. manufacturing establishment.[20] By contrast, the census separately assigns Apple's offices, retail stores, and data centers to their respective industry. By classifying establishments rather than firms, the census reduces measurement error of industry variables.

Table III provides descriptive statistics of the labor share (the payroll share of sales) and the four census measures of industry concentration for the matched sample. The labor share of sales declines on average by 1.19pp, or 10%. The sales share of the four largest firms increases on average by 5.28pp, or 21%. Almost all of the increase in the share of the 50 largest firms is due to the increase of the four largest firms: the shares of the largest 4, 8, 20, and 50 firms all show similar increases when measured in pp. Since the share of the

[20] The only Apple-owned manufacturing facility is in Cork, Ireland.

50 largest firms in 1997 is more than double that of the four largest firms, the percentage increase in the share of the 50 largest firms is less than half of the percentage increase in the share of the four largest firms.

B. Empirical Specification

I consider two reduced-form empirical specifications that relate the increase in concentration to the decline in the labor share.[21] The first empirical specification is a regression in first differences

$$S^L_{j,t} - S^L_{j,t-5} = \alpha_t + \beta\left(C^{(n)}_{j,t} - C^{(n)}_{j,t-5}\right) + \varepsilon_{j,t}, \tag{10}$$

where $S^L_{j,t} - S^L_{j,t-5}$ is the change in the labor share of sales in industry j from year $t-5$ to year t, and $C^{(n)}_{j,t} - C^{(n)}_{j,t-5}$ is the change in the concentration of sales in industry j from year $t-k$ to year t, measured as the change in the share of sales by the 4, 8, 20, and 50 largest firms. The second empirical specification is a regression in log differences

$$\log S^L_{j,t} - \log S^L_{j,t-5} = \alpha_t + \beta\left(\log C^{(n)}_{j,t} - \log C^{(n)}_{j,t-5}\right) + \varepsilon_{j,t}. \tag{11}$$

In both specifications, I weight each observation by its share of sales in year t and standard errors are clustered by three-digit NAICS industry.

To provide a sense of the magnitude of the decline in the labor share that is predicted by the increase in concentration, I report the observed and predicted decline in the labor share. In the first difference specification, the observed decline is the sales-weighted average change in the labor share $\sum_j w_{j,2012}(S^L_{j,2012} - S^L_{j,1997})$, where $w_{j,t} = \frac{\text{sales}_{j,t}}{\sum_j \text{sales}_{j,t}}$ is industry j's share of sales in year t and $S^L_{j,t} = \frac{\text{payroll}_{j,t}}{\text{sales}_{j,t}}$ is the labor share of sales in industry j in year t. Note that this is the within-industry decline in the labor share in the standard variance decomposition.[22] The predicted decline is the sales-weighted average predicted change in the labor share, namely, $\sum_j w_{j,2012}\beta(C^{(n)}_{j,t} - C^{(n)}_{j,t-5})$. In the

[21] A previous version of this paper reported results of regressions of changes in the labor share on changes in industry concentration using a single cross section (changes from 1997 to 2012). There was a mistake in the calculation of standard errors: once the standard errors were corrected, several of the regression coefficients were statistically insignificant. To increase power, I now use all of the five-year changes in the labor share and concentration. As reported in the previous version, the estimated coefficients are similar across the two specifications. Therefore, the results and their interpretation remain the same. I want to thank Tony Fan and Austan Goolsbee for pointing out the error.

[22] The decline in the labor share is the sum of the between-industry decline and the within-industry decline $S^L_{2012} - S^L_{1997} = \sum_j (w_{j,2012} - w_{j,1997})S^L_{j,1997} + \sum_j w_{j,2012}(S^L_{j,2012} - S^L_{j,1997})$. In the data, The within-industry term accounts for 72% of the aggregate decline in the labor share of sales. A similar decomposition of industry concentration finds that the within-industry term accounts for the entire increase in industry concentration.

Table IV

Labor Share and Industry Concentration—Regression in First Differences

The table reports results of regressions of changes in the labor share on changes in industry concentration. The unit of observation is a six-digit NAICS industry. Observations are weighted by an industry's share of sales. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales, and concentration are taken from the economic census. The observed decline is the sales-weighted average change in the labor share. The predicted decline is the sales-weighted average predicted change in the labor share. See Section V for further details. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: $S^L_{j,t} - S^L_{j,t-5}$			
	(1)	(2)	(3)	(4)
$C^{(4)}_{j,t} - C^{(4)}_{j,t-5}$	−0.113***			
	(0.029)			
$C^{(8)}_{j,t} - C^{(8)}_{j,t-5}$		−0.108***		
		(0.028)		
$C^{(20)}_{j,t} - C^{(20)}_{j,t-5}$			−0.125***	
			(0.031)	
$C^{(50)}_{j,t} - C^{(50)}_{j,t-5}$				−0.133***
				(0.036)
Year FE	Yes	Yes	Yes	Yes
R^2 (Within)	0.07	0.06	0.07	0.06
Observations	2,224	2,232	2,229	2,235
Observed decline	−0.81	−0.84	−0.81	−0.80
Predicted decline	−0.84	−0.98	−1.25	−1.24

log-difference specification, the observed decline is the sales-weighted average change in the log-labor share and the predicted decline is the sales-weighted average predicted change in the log-labor share.

C. Results

Table IV presents the results of regressions of the change in the labor share on the change in industry concentration, as specified in equation (10). Columns (1) to (4) show the results of weighted regressions of the change in the labor share on the change in industry concentration, measured as the share of sales by the 4, 8, 20, and 50 largest firms. The table shows that those industries that experience larger increases in concentration also experience larger declines in the labor share. The slope coefficient is negative and statistically significant in each of the regressions. Based on the estimated coefficient and the observed increase in concentration, the predicted decline in the labor share is similar in magnitude to the observed decline in the labor share. The slope coefficient remains stable across the specifications; this is expected since almost all of the increase in the share of the 50 largest firms is due to the increase of the four largest firms. Table V presents the results of the log specification.

Table V

Labor Share and Industry Concentration—Regression in Log Differences

The table reports results of regressions of log-changes in the labor share on log-changes in industry concentration. The unit of observation is a six-digit industry. Observations are weighted by an industry's share of sales. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales, and concentration are taken from the economic census. The observed decline is the sales-weighted average change in the log-labor share. The predicted decline is the sales-weighted average change in the predicted change in the log-labor share. See Section V for further details. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: $\log S^L_{j,t} - \log S^L_{j,t-5}$			
	(1)	(2)	(3)	(4)
$\log C^{(4)}_{j,t} - \log C^{(4)}_{j,t-5}$	-0.215^{***}			
	(0.079)			
$\log C^{(8)}_{j,t} - \log C^{(8)}_{j,t-5}$		-0.242^{**}		
		(0.110)		
$\log C^{(20)}_{j,t} - \log C^{(20)}_{j,t-5}$			-0.318^{**}	
			(0.151)	
$\log C^{(50)}_{j,t} - \log C^{(50)}_{j,t-5}$				-0.424^{**}
				(0.197)
Year FE	Yes	Yes	Yes	Yes
R^2 (Within)	0.07	0.06	0.06	0.06
Observations	2,224	2,232	2,229	2,235
Observed decline	−0.22	−0.22	−0.22	−0.22
Predicted decline	−0.07	−0.08	−0.08	−0.09

The slope coefficient is negative and statistically significant in each of the regressions. In this specification, the predicted decline is between 33% and 40% of the observed decline in the log-labor share. In the log specification, the slope coefficient is increasing in absolute value across the specifications: the percentage increase in the share of the 50 largest firms is less than half of the percentage increase in the share of the four largest firms and the slope coefficient of the 50 largest firms is close to double that of the four largest firms. Taken together, the results suggest that the increase in concentration can account for most of the decline in the labor share.

D. Robustness

The census data do not properly capture foreign competition and likely overestimate concentration in product markets for tradable goods. To the extent that foreign competition has increased over time, the census data likely overestimate increases in concentration in product markets for tradable goods. To address this concern, I repeat the analysis excluding all tradable industries.[23] I find that excluding tradable industries does not alter the

[23] I use the industry classification provided by Mian and Sufi (2014).

Table VI

Labor Share and Industry Concentration—By Subsample

The table reports results of regressions of changes in the labor share on changes in industry concentration. The unit of observation is a six-digit NAICS industry. Observations are weighted by an industry's share of sales. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales, and concentration are taken from the economic census. The observed decline is the sales-weighted average change in the labor share. The predicted decline is the sales-weighted average predicted change in the labor share. The classification of tradable industries is taken from Mian and Sufi (2014). Column (4) excludes Health Care and Social Assistance (NAICS 62) and Other Services (NAICS 81). The classification on R&D industries is based on the NSF R&D survey. See Section V for further details. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Dependent variable: $S^L_{j,t} - S^L_{j,t-5}$				
	Full Sample (1)	Excluding Tradable Industries (2)	Tradable Industries (3)	Excluding Sectors with Tax-Exempt Firms (4)	Excluding R&D Industries (5)
$C^{(4)}_{j,t} - C^{(4)}_{j,t-5}$	−0.113***	−0.131***	−0.036*	−0.119***	−0.125***
	(0.029)	(0.033)	(0.022)	(0.029)	(0.031)
Year FE	Yes	Yes	Yes	Yes	Yes
R^2 (Within)	0.07	0.08	0.02	0.08	0.09
Observations	2,224	1,503	721	2,008	2,011
Observed decline	−0.81	−0.48	−2.30	−0.75	−0.72
Predicted decline	−0.84	−1.04	−0.18	−0.93	−1.01

results. Furthermore, in the sample of tradable industries, there is only a very small cross-sectional relationship between changes in measured concentration and changes in the labor share. In the sample of tradable industries, the regressions predict almost no decline in the labor share. These results are reported in columns (2) and (3) of Table VI.

Hartman-Glaser, Lustig, and Xiaolan (2019) and Autor et al. (2017) provide micro evidence on the source of the decline in the labor share. The authors offer explanations for the decline in the labor share that focus on productivity (Autor et al. (2017)) and insurance and intangible capital (Hartman-Glaser, Lustig, and Xiaolan (2019)). These (and other) explanations that focus on factors other than competition predict equally sized correlations between increased concentration and declining labor share in both tradable and nontradable industries; the data show almost no correlation in tradable industries.

Second, in several sectors, the census measures concentration separately for tax-exempt firms. This introduces measurement error in the concentration variable. Column (4) of Table VI repeats the analysis after excluding sectors in which tax-exempt firms make up a large fraction of sales (Health Care and Social Assistance and Other Services). I find that excluding these sectors does not alter the results.

Finally, an increase in the importance of intangible capital could cause a decline in the labor share and an increase in concentration that is unrelated to a decline in competition. Column (5) of Table VI repeats the analysis after excluding R&D intensive industries.[24] I find that excluding these industries does not alter the results.

VI. Discussion and Literature Review

This section provides a discussion of the results and a review of the related literature.

A. Discussion

A.1. Adjustment Costs

A common approach to measuring adjustment costs combines parametric assumptions on the functional form of adjustment costs and data on the ratio of investment to capital. To the extent that this approach correctly captures adjustment costs, the data show that the ratio of investment to capital is, in fact, slightly declining over the sample period. This suggests that adjustment costs are declining and the trend in pure profits in excess of adjustment costs is understated.

Another approach to assessing the potential contribution of adjustment costs is to consider model-based results. Using a model, we can ask two different questions. First, for a given calibration of the model, can slow responses on the part of firms explain the observed trends in the data? Second, can a change in the severity of adjustment costs explain the observed trends in the data?

Internet Appendix Section II presents a model of monopolistic competition with quadratic adjustment costs. In the model, firms own the capital stock and choose a path of investment that maximizes their market value. Further, in the model, I mimic the empirical measurement of capital costs and pure profits. I calculate capital costs as $(r + \delta) \times K$ and I calculate pure profits as gross value added less capital costs and compensation of employees.

For a wide range of adjustment cost parameters,[25] I compute the unconditional means and standard deviations of the labor, capital, and pure profit shares. I find that these unconditional means are insensitive to the adjustment cost parameter. In this sense, a change to the adjustment cost parameter should not result in a change to the long-run level of the labor share or pure profit share.

[24] Data on R&D by industry are taken from the NSF R&D survey. I exclude Chemical Manufacturing (NAICS 325), Computer and Electronic Product Manufacturing (NAICS 334), Transportation Equipment Manufacturing (NAICS 336), Software Publishers (NAICS 5112), Computer Systems Design and Related Services (NAICS 5415), and Scientific R&D Services (NAICS 5417).

[25] This range includes implausibly high values of adjustment costs. See Tobin (1981) and Hall (2001) for further details.

In addition, for different values of the adjustment cost parameter, I compute the pairwise correlations of the labor, capital, and pure profit shares. For any positive adjustment cost parameter, the labor and pure profit shares are procyclical and positively correlated. Models with higher values of the adjustment cost parameter feature higher correlations between the labor and pure profit shares. These results suggest that a path of shocks that lead to higher measured pure profits should also lead to a higher labor share.

A.2. Measurements of the Capital Share

The measurement of the capital share in this paper builds on the work of Karabarbounis and Neiman (2014) and Rognlie (2015). Karabarbounis and Neiman (2014) and Rognlie (2015) study the decline in the labor share and additionally provide an estimate of the capital share. In both cases, the authors find that the capital share does not sufficiently increase to offset the decline in labor, and furthermore, the capital share might decrease slightly.

In their measurement, Karabarbounis and Neiman (2014) decompose the capital share into the product of three components,

$$\frac{RP^K K}{P^Y Y} = R \times \frac{P^K K}{P^I I} \times \frac{P^I I}{P^Y Y}, \tag{12}$$

where the first component is the required rate of return, the second component is the ratio of the nominal value of capital to investment, and the third component is the ratio of nominal investment to gross value added. The authors assume that the required rate of return on capital is constant and that the ratio of the nominal value of the capital stock to nominal investment is constant.[26] These assumptions lead the authors to measure the percentage change in the capital share as the percentage change in the ratio of investment to gross value added.

Figure 6 plots the ratio of investment to gross value added in the U.S. corporate sector using the NIPA data. The figure shows that the ratio of investment to gross value added is not declining.[27] Thus, the methodology of Karabarbounis and Neiman (2014), when applied to the U.S. nonfinancial corporate sector, does not suggest a decline in the capital share.

Rognlie (2015) provides two measures of the capital share.[28] In the first measure, the author assumes that the required rate of return on capital is

[26] See Section IV.B of Karabarbounis and Neiman (2014) for their construction of the capital share, as well as for their assumptions of a constant ratio of the nominal value of the capital stock to nominal investment and a constant required rate of return on capital.

[27] These results are not directly comparable to Karabarbounis and Neiman (2014, figure IX). There are two main differences. First, figure IX is constructed using GDP data rather than corporate data. The GDP data include investment in residential housing and the contribution of residential housing to GDP; see Rognlie (2015) for a detailed discussion of the role of residential housing. Second, figure IX is constructed using data for the period 1975 to 2011. The ratio of U.S. nonfinancial corporate investment to gross value added is not declining over the period 1975 to 2011.

[28] See Section II.B of Rognlie (2015) for details on the construction of the capital share.

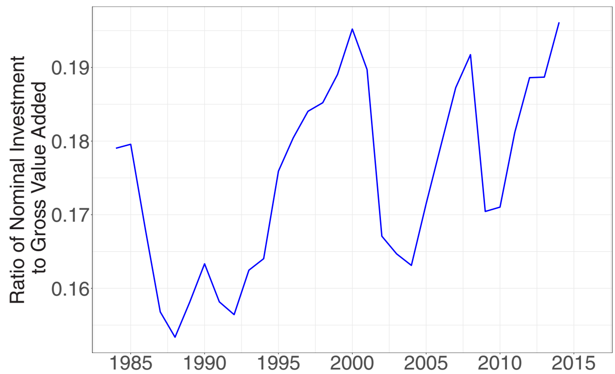


Figure 6. Ratio of investment to gross value added. This figure shows the ratio of investment to gross value added for the U.S. nonfinancial corporate sector over the period 1984 to 2014. See Section VI.A.2 for further details. (Color figure can be viewed at wileyonlinelibrary.com)

constant. This assumption leads the author to measure the percentage change in the capital share as the percentage change in the ratio of the value of the capital stock to gross value added. Using this measure, Rognlie (2015) finds a slight increase in the capital share. These results are consistent with my findings: I find that the ratio of the value of the capital stock to gross value added is increasing slightly over the period 1984 to 2014. In the second measure, the author constructs a time series of the real interest rate from the market and book values of the U.S. corporate sector. This construction of the real cost of capital produces values that are inconsistent with observed market data. Most importantly, the construction does not match the observed decline in market prices. When combining NIPA data with the cost of capital presented in Rognlie (2015), I find no decline in the capital share.[29]

Measures of the capital share that assume a constant required rate of return show no decline; measures of the capital share that incorporate market prices show a large decline.

A.3. Production-Based Estimates of Markups

De Loecker and Eeckhout (2017) present production-based estimates of markups for nonfinancial U.S. public firms. Unlike my estimates of pure profits, the production-based estimates of markups do not impute capital costs, nor do they rely on time-series variation in capital or on assumptions on the required rate of return on capital and its components. Instead, the

[29] The cost of capital is presented in Rognlie (2015, figure 7). The figure shows estimated constant, linear, and quadratic approximations to the cost of capital. The constant and quadratic approximations do not decline over the period 1984 to 2014. Thus, using these approximations leads to a slight increase in the capital share. The linear approximation shows a small decline in the cost of capital, equal to 2pp every 25 years. When I calculate the required rate of return on capital using this linear approximation to the real cost of capital, I find no decline in the capital share.

production-based approach estimates a production function and backs out markups from the firm's first-order conditions. Consistent with my findings, the authors find an increase in markups since the early 1980s. At the same time, our implied series of the pure profit share display notable differences in magnitude.

De Loecker and Eeckhout (2017) find that markups over sales increased from 1.2 in the early 1980s to 1.6 in 2014. I convert these markup estimates into a series of the pure profit share of gross value added as follows.

In the first step, I compute the pure profit share of sales implied by the markup using the equation

$$\text{markup} = \text{scale of production} \times \left(1 - \text{pure profit share of sales}\right)^{-1}. \tag{13}$$

With constant returns to scale, the reported markup of 1.2 implies a pure profit share of sales equal to 17% of sales and a markup of 1.6 implies a pure profit share of sales equal to 38%. If we assume a higher scale of production equal to 1.1, then the authors' markup estimates imply that the pure profit share of sales was 8% in the early 1980s and 31% in 2014.

In the second step, I multiply the pure profit share of sales by the ratio of sales to gross value added. Census data on sales and the BEA data on gross value added for the nonfinancial private sector show that the ratio of sales to gross value added is around 2.6 over this period. Even when we assume a high scale of production (1.1), the authors' markup estimates imply that the pure profit share of gross value added was 22% in the early 1980s and 81% in 2014. Both the level and the trend in these implied values of pure profits are an order of magnitude larger than those that I find.[30]

A.4. Long-Run Trends and Measurement Error

Following the existing literature on the decline in the labor share, this paper focuses on the period starting in the early 1980s. Trying to explain the decline in the labor share over this period, past research has argued that firms have substituted labor for physical capital. As the results of this paper show, the decline in the labor share since the early 1980s was not offset by an increase in the capital share. Despite the decline in the labor share, labor costs have, in fact, increased faster than capital costs. This evidence argues strongly against these existing theories of the decline in the labor share.

Barkai and Benzell (2018) extend the measurement of capital costs and pure profits to the period 1946 to 2015. The authors find that (i) pure profits were declining in the decades following the Second World War, (ii) pure profits have been increasing since the early 1980s, and (iii) the early 1980s are a point of sudden change. As a share of gross value added, pure profits today are higher than they were in 1984, but lower than they were in the late 1940s.

[30] These implied pure profits are implausibly high from a macroeconomic perspective: as long as capital costs are nonnegative, pure profits cannot exceed gross value added less compensation of employees. This bound implies that pure profits in 2014 cannot exceed 42% of gross value added.

After seeing the results of the long-term measurement, several notable features of the data point to a potentially large role for measurement error. The capital share and pure profit share (i) are far more volatile than the labor share, (ii) are highly negatively correlated with each other but not so much with the labor share, and (iii) move a lot over the late 1970s and early 1980s (a period with volatile inflation). Are these features of the data economically meaningful or are they symptoms of noisy and unreliable estimates?

Barkai and Benzell (2018) combine two approaches to addressing the concern of measurement error. First, they measure capital costs and pure profits under a range of assumptions. The main findings are robust to alternative measurement assumptions. At the same time, the level of estimated profits during the late 1970s (a period of high and volatile inflation) is sensitive to alternative specifications. Second, they consider alternative measures of profits that are not likely to be subject to similar concerns of measurement error. Measures of accounting profits and the pure profits implied by the most conservative production-based estimates show trends that are very similar to the baseline results.

A.5. Contribution of BEA Intellectual Property Products

Koh, Santaeulàlia-Llopis, and Zheng (2016) present evidence that the BEA's expanded recognition of IPPs as a fixed asset in 2013 has contributed to the measured decline in the labor share. The authors further argue that the decline in the labor share reflects a transition to a more IPP-intense economy.

In its 14th comprehensive revision of NIPA in 2013, the BEA expanded its recognition of intangible capital beyond software to include expenditures for R&D and for entertainment, literary, and artistic originals as fixed investments. The BEA's expanded recognition of IPP as a fixed asset affects both the level and the trend in the labor share. Any recognition of additional investment in fixed assets increases measured gross value added in each and every year by the nominal value of investment. This, in turn, increases the denominator of the labor share and therefore reduces its level. To the extent that investment in the newly recognized components of IPP has increased faster than output, the expanded recognition of IPP in the national accounts leads to a decline in the labor share.

Unlike most of the existing literature on the labor share, Koh, Santaeulàlia-Llopis, and Zheng (2016) measure a linear trend in the labor share over the entire postwar period (1947to 2014). Elsby, Hobijn, and Şahin (2013) and Karabarbounis and Neiman (2014) who document the decline in the U.S. and global labor share provide evidence of a decline since the early 1980s. Moreover, these papers use data that predate the 2013 BEA revision. Using current BEA data, we can assess the impact of the expansion of IPP on the decline in the labor share since the 1980s.[31] I find that the expanded recognition of

[31] Unfortunately, the BEA does not provide a decomposition of IPP capital for the nonfinancial corporate sector. Using data on nonresidential investment in the different types of IPP capital

IPP capital leads to a measured labor share that is on average 2pp lower over the period 1984 to 2014. However, I find that the expanded recognition of IPP capital has no effect on the trend in the labor share. I approximate the labor share by a linear time trend over this period and find that current BEA measures of the labor share show an estimated decline of 6.9pp. When I remove all investment in newly recognized forms of IPP capital from gross value added, I find an estimated decline in the labor share of 6.8pp. These results show that the decline in the labor share since the early 1980s is not a result of the BEA's expanded recognition of IPP capital.

Furthermore, my measurement of capital costs includes all IPP capital. In this sense, my findings account for the contribution of IPP capital.

A.6. Labor Income in Disguise

Smith et al. (2019) present evidence that some portion of top private business income is wage income in disguise. Owner-managers of S-corporations have a tax incentive to misreport their income as business income rather than wages. Using detailed administrative tax data, the authors find that, on average, when a business changes its legal structure from a C-corporation to an S-corporation its labor share of sales drops by 1.95%.[32]

The authors estimate that in 2012, $116 billion of aggregate S-corporation profits should have been classified as labor income. Furthermore, the authors find that misreporting likely leads to an overestimate of the decline in the labor share of 1.2pp over the period 1980 to 2012.[33] Given these results, it is likely the case that my measured decline in the labor share is overstated by 1.2pp and my measured increase in the pure profit share is overstated by 1.2pp.

A.7. Entry Costs

The measure of pure profits in this paper is gross of any entry cost that does not take the form of labor costs, investment in physical capital, or recognized investment in intangible capital. A possible explanation for the increase in pure profits is an increase in entry costs. This would be consistent with the observed decline in new firm formation documented in Decker et al. (2014).

taken from BEA Fixed Asset Table 2.7, I construct a time series of the ratio of newly recognized IPP to total IPP and multiply this ratio by total nonfinancial corporate investment in IPP.

[32] Based on heterogeneity results presented in the working paper version of Smith et al. (2019), this estimate of aggregate misreporting is upward biased. The authors find that, on average, when a business changes its legal structure from a C-corporation to an S-corporation, its labor share of sales drops by 1.95%. This is an equal weighted average and almost all of the firms in the sample are small. When the authors break this out into large and small firms, they find no change for the large firms. While large firms are small in number, they account for a large fraction of sales. Based on 2003 IRS data (the last year with a publicly available breakdown by size), only 3% of S-corporation have over $50 million in sales, but these firms account for over 25% of all sales.

[33] To account for possible differences in the sample period, I repeat the authors' calculation for the period 1984 to 2013 (the IRS data end in 2013) and find that misreporting likely leads to an overestimate of the decline in the labor share of 1.2pp over this period.

The recent work of Gutiérrez, Jones, and Philippon (2019) presents a general equilibrium model to identify the causes of the increases in pure profits and industry concentration. The authors conclude that entry costs have increased and that this is the primary driver of the decline in competition.

B. Literature Review

There have been many recent empirical and theoretical contributions to the study of the decline in the labor share. Elsby, Hobijn, and Şahin (2013) provide detailed documentation of the decline in the U.S. labor share and Karabarbounis and Neiman (2014) document a global decline in the labor share. Many possible explanations for the decline in the labor share have been put forward, including capital-augmenting technological change and the mechanization of production (Zeira (1998), Acemoglu (2003), Summers (2013), Brynjolfsson and McAfee (2014), Acemoglu and Restrepo (2016)), a decline in the relative price of capital (Jones (2003), Karabarbounis and Neiman (2014)), capital accumulation (Piketty (2014), Piketty and Zucman (2014)), globalization (Elsby, Hobijn, and Şahin (2013)), a decline in the bargaining power of labor (Blanchard and Giavazzi (2003), Bental and Demougin (2010), Stiglitz (2012)), and an increase in the cost of housing (Rognlie (2015)). I contribute to this literature by documenting and studying the simultaneous decline in the shares of labor and capital and by emphasizing the role of declining competition and increasing pure profits.

Previous studies have considered the welfare implications of the decline in the labor share. Fernald and Jones (2014), drawing on Zeira (1998), show that a decline in the labor share that is due to the mechanization of production leads to rising growth and income. Karabarbounis and Neiman (2014) find that the decline in the labor share is due in part to technological progress that reduces the relative cost of capital, which leads to a substantial increase in consumer welfare, and in part to an increase in markups, which reduces welfare. The authors find that the increase in welfare due to the change in the relative price of capital is far greater than the decline that is due to the change in markups. Acemoglu and Restrepo (2016) present a model in which the labor share fluctuates in response to capital-augmenting technological change and show that in the long run, the endogenous process of technology adoption will restore the labor share to its previous level. Blanchard and Giavazzi (2003) present a model in which a decline in the bargaining power of labor leads to a temporary decline in the labor share and a long-run increase in welfare. By contrast, I find that the decline in the labor share is due to a decline in competition and an increase in pure profits, is accompanied by large gaps in output, wages, and investment, and that without a subsequent increase in competition, the labor share will not revert to its previous level.

This paper contributes to a large literature on the macroeconomic importance of competition and pure profits. Rotemberg and Woodford (1995) provide evidence, suggesting that the share of pure profits in gross value added was close to zero in the period prior to 1987. Basu and Fernald (1997) find that U.S.

industries had a pure profit share of sales of at most 3% during the period 1959 to 1989. Theoretic research has argued that in a setting without pure profits, there are benefits to ex-post estimates of capital costs (realized gross value added less realized labor costs) instead of ex-ante capital costs (the product of the required rate of return on capital and the value of the capital stock).[34] Past empirical estimates of small economic pure profits together with the potential theoretical advantage of indirectly inferring capital costs have led many researchers to prefer the assumption of zero pure profits over the direct measurement of capital costs. Indeed, the seminal works of Jorgenson, Gollop, and Fraumeni (1987) and Jorgenson and Stiroh (2000) that measure changes in U.S. productivity do not estimate capital costs,[35] and many subsequent studies follow in their path.

Finally, this paper contributes to a recent and diverse literature on declining competition. Peltzman (2014) shows that concentration, which (on average) had been unchanged from 1963 to 1982, began rising after the Department of Justice Merger Guidelines adopted Robert Bork's "Rule of Reason." Recent studies of mergers and acquisitions (M&A) in manufacturing industries find evidence that consolidation has led to a decline in competition and consumer surplus. Kulick (2016) studies M&As in the quick-mix concrete industry and shows that horizontal mergers are associated with an increase in price and a decline in output, leading to a substantial decline in consumer surplus. Blonigen and Pierce (2016) study the effect of M&As in manufacturing industries and find that M&As are associated with increases in markups, but have little or no effect on productivity or efficiency.

Recent studies find evidence that increases in concentration and barriers to entry increase the market value of incumbent firms. Grullon, Larkin, and Michaely (2019) show that the large increase in industry concentration has been driven by the consolidation of publicly traded firms into larger entities and that firms in industries with the largest increases in product market concentration have enjoyed higher profit margins, positive abnormal stock returns, and more profitable M&A deals. Bessen (2016) provides evidence that increases in federal regulation favor incumbent firms and lead to increases in market valuations and operating margins. Bessen concludes that increases in federal regulation and political rent-seeking have increased corporate valuations by $2 trillion and annually transfer $200 billion from consumers to firms.

In addition to the increase in industry concentration, concentration of firm ownership is increasing. Azar (2012) documents a large increase in the concentration of ownership. Fichtner, Heemskerk, and Garcia-Bernardo (2017) find that, together, BlackRock, Vanguard, and State Street constitute the largest shareholder in 88% of S&P 500 firms. Recent work has linked the increase in common ownership to a decline in competition. Azar, Schmalz, and Tecu (2016) show that increases in common ownership of airlines have increased

[34] Hulten (1986) and Berndt and Fuss (1986) show that in settings without pure profits, ex-post measures of capital costs can properly account for cyclical patterns in capital utilization.

[35] See, for example, Jorgenson, Ho, and Stiroh (2005, p. 157).

prices by as much as 10%. Azar, Raina, and Schmalz (2016) show that the increase in the concentration of bank ownership has led to higher fees, higher thresholds, and lower returns on savings.

This paper contributes to the literature on declining competition in two ways. First, it provides an aggregate measure of pure profits. To the best of my knowledge, no such measure exists for the past three decades. Second, this paper relates the increase in industry concentration to the decline in the labor share. My empirical results suggest that the increase in industry concentration can account for most of the decline in the labor share.

This paper is complementary to the independent and contemporaneous work of Gutiérrez and Philippon (2016) and Autor et al. (2017). Gutiérrez and Philippon (2016) show that a lack of competition and firm short-termism explain underinvestment. They find that industries with more concentration and more common ownership invest less, even after controlling for current market conditions. The authors also find that those firms that underinvest spend a disproportionate amount of free cash flows buying back their shares. Autor et al. (2017) independently discover a negative industry-level correlation between a decline in the labor share and an increase in industry concentration. Their work further uses firm-level data to provide evidence that reallocation across firms has contributed to the decline in the labor share. Taken together, the evidence shows that increases in industry concentration can explain the decline in the labor share, underinvestment, and a large increase in corporate profits. Consistent with the findings in this paper, the subsequent work of De Loecker and Eeckhout (2017) constructs firm-level markups for publicly traded U.S. firms and finds a large increase in markups since the 1980s and the subsequent work of Hall (2018) constructs industry-level markups and similarly finds a large increase in markups since the 1980s.

VII. Conclusion

Labor compensation in the U.S. economy used to track labor productivity. Up until the 1980s, increases in labor productivity were accompanied by equally sized increases in labor compensation. The decline in the labor share since the early 1980s measures the growing gap between labor productivity (which has continued to grow) and compensation (which has stagnated).

The existing literature on the decline in the labor share is focused on trade-offs between labor and physical capital. It argues that, whether due to technological change, globalization, or a change in relative prices, firms have replaced expenditures on labor inputs into production with expenditures on physical capital inputs into production. By contrast, this paper shows that labor costs have not been replaced by capital costs.

This paper takes a direct approach to measuring capital costs and the capital share. Following Hall and Jorgenson (1967), I compute a series of capital costs for the U.S. nonfinancial corporate sector over the period 1984 to 2014, equal to the product of the required rate of return on capital and the value of the capital stock. This direct measure of capital costs shows that the capital share is declining.

Measured in percentage terms, the decline in the capital share (22%) is much larger than the decline in the labor share (11%). Thus, despite the decline in the labor share, labor costs have, in fact, increased faster than capital costs. Offsetting the large declines in the labor and capital shares is a large increase in the pure profit share. The increase in pure profits amounts to over $1.2 trillion in 2014, or $14.6 thousand per employee (nearly half of median personal income in the United States).

Providing additional evidence on the role of competition, I find that increases in industry concentration are associated with declines in the labor share. Taken as a whole, my results suggest that the decline in the shares of labor and capital are due to a decline in competition.

Several recent papers have focused attention on the increase in industry concentration. Gutiérrez and Philippon (2016) show that a lack of competition and firm short-termism explain underinvestment. Even after they control for current market conditions, they find that industries with more concentration and more common ownership invest less. The authors also find that those firms that underinvest spend a disproportionate amount of free cash flows buying back their shares. Grullon, Larkin, and Michaely (2019) show that firms in industries that are growing more concentrated enjoy higher profit margins, positive abnormal stock returns, and more profitable M&A deals. A decline in the demand for labor inputs (which results in a decline in the labor share) and a simultaneous decline in the demand for capital inputs (which results in underinvestment) are distinctive traits of declining competition.

This paper is not arguing that technology, automation, and globalization have played no part in the decline in the labor share. It may well be the case that the forces of technological change and globalization favor dominant firms and are causing the decline in competition. The causes of the decline in competition are left as an open question for future research.

Initial submission: September 6, 2017; Accepted: March 11, 2019
Editors: Stefan Nagel, Philip Bond, Amit Seru, and Wei Xiong

REFERENCES

Acemoglu, Daron, 2003, Labor- and capital-augmenting technical change, *Journal of the European Economic Association* 1, 1–37.

Acemoglu, Daron, and Pascual Restrepo, 2016, The race between machine and man: Implications of technology for growth, factor shares and employment, Technical report, NBER Working Paper 22252.

Atkeson, Andrew, and Patrick J. Kehoe, 2005, Modeling and measuring organization capital, *Journal of Political Economy* 113, 1026–1053.

Autor, David, David Dorn, Lawrence F. Katz, Christina Patterson, and John Van Reenen, 2017, The fall of the labor share and the rise of superstar firms, Technical report, NBER Working Paper 23396.

Avdis, Efstathios, and Jessica A. Wachter, 2017, Maximum likelihood estimation of the equity premium, *Journal of Financial Economics* 125, 589–609.

Azar, José, 2012, A new look at oligopoly: Implicit collusion through portfolio diversification, Technical report, Ph.D. Thesis, Princeton University.

Azar, José, Sahil Raina, and Martin C. Schmalz, 2016, Ultimate ownership and bank competition, Technical report, University of Michigan Working Paper.

Azar, José, Martin C. Schmalz, and Isabel Tecu, 2016, Anti-competitive effects of common ownership, Technical report, Ross School of Business Working Paper No. 1235.

Barkai, Simcha, and Seth G. Benzell, 2018, 70 years of US corporate profits, Technical report, Stigler Center for the Study of the Economy and the State, New Working Paper Series No. 22.

Basu, Susanto, and John G. Fernald, 1997, Returns to scale in us production: Estimates and implications, *Journal of Political Economy* 105, 249–283.

Bental, Benjamin, and Dominique Demougin, 2010, Declining labor shares and bargaining power: An institutional explanation, *Journal of Macroeconomics* 32, 443–456.

Berndt, Ernst R., and Melvyn A. Fuss, 1986, Productivity measurement with adjustments for variations in capacity utilization and other forms of temporary equilibrium, *Journal of Econometrics* 33, 7–29.

Bessen, James E., 2016, Accounting for rising corporate profits: Intangibles or regulatory rents?, Technical report, Boston University School of Law, Law and Economics Research Paper No. 16-18.

Blanchard, Olivier, and Francesco Giavazzi, 2003, Macroeconomic effects of regulation and deregulation in goods and labor markets, *Quarterly Journal of Economics* 118, 879–907.

Blonigen, Bruce A., and Justin R. Pierce, 2016, Evidence for the effects of mergers on market power and efficiency, Technical report, NBER Working Paper 22750.

Brynjolfsson, Erik, and Andrew McAfee, 2014, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies* (WW Norton & Company, New York and London).

Campbell, John Y., and Samuel B. Thompson, 2008, Predicting excess stock returns out of sample: Can anything beat the historical average?, *The Review of Financial Studies* 21, 1509–1531.

Corrado, Carol, Jonathan Haskel, Cecilia Jona-Lasinio, and Massimiliano Iommi, 2016, Intangible investment in the EU and US before and since the Great Recession and its contribution to productivity growth, Technical report, EIB Working Papers No. 2016/08.

Corrado, Carol A., Charles R. Hulten, and Daniel Sichel, 2009, Intangible capital and US economic growth, *Review of Income and Wealth* 55, 661–685.

De Loecker, Jan, and Jan Eeckhout, 2017, The rise of market power and the macroeconomic implications, Technical report, NBER Working Paper 23687.

Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda, 2014, The secular decline in business dynamism in the U.S., Technical report, University of Maryland Working Paper.

Eisfeldt, Andrea L., and Dimitris Papanikolaou, 2013, Organization capital and the cross-section of expected returns, *The Journal of Finance* 68, 1365–1406.

Elsby, Michael W.L., Bart Hobijn, and Ayşegül Şahin, 2013, The decline of the U.S. labor share, *Brookings Papers on Economic Activity* 2013, 1–63.

Fernald, John G., and Charles I. Jones, 2014, The future of U.S. economic growth, *American Economic Review* 104, 44–49.

Fichtner, Jan, Eelke M. Heemskerk, and Javier Garcia-Bernardo, 2017, Hidden power of the big three? Passive index funds, re-concentration of corporate ownership, and new financial risk, *Business and Politics* 19, 1–29.

Fraumeni, Barbara, 1997, The measurement of depreciation in the US national income and product accounts, *Survey of Current Business* 77, 7–23.

Furman, Jason, and Peter Orszag, 2015, A firm-level perspective on the role of rents in the rise in inequality, Technical report, Presentation at "A Just Society" Centennial Event in Honor of Joseph Stiglitz, Columbia University.

Gilchrist, Simon, and Egon Zakrajsek, 2007, Investment and the cost of capital: New evidence from the corporate bond market, Technical report, NBER Working Paper 13174.

Grullon, Gustavo, Yelena Larkin, and Roni Michaely, 2019, Are U.S. industries becoming more concentrated?, *Review of Finance* 23, 697–743.

Gutiérrez, Germán, Callum Jones, and Thomas Philippon, 2019, Entry costs and the macroeconomy, Technical report, NBER Working Paper 25609.

Gutiérrez, Germán, and Thomas Philippon, 2016, Investment-less growth: An empirical investigation, Technical report, NBER Working Paper 22897.

Hall, Robert E., 2001, The stock market and capital accumulation, *American Economic Review* 91, 1185–1202.

Hall, Robert E., 2018, New evidence on the markup of prices over marginal costs and the role of mega-firms in the US economy, Technical report, NBER Working Paper 24574.

Hall, Robert E., and Dale W. Jorgenson, 1967, Tax policy and investment behavior, *American Economic Review* 57, 391–414.

Hansen, Lars Peter, John C. Heaton, and Nan Li, 2005, Intangible risk, in Carol Corrado, John Haltiwanger, and Daniel Sichel, eds., Measuring Capital in the New Economy, 111–152 (University of Chicago Press, Chicago).

Hartman-Glaser, Barney, Hanno Lustig, and Mindy Z. Xiaolan, 2019, Capital share dynamics when firms insure workers, *The Journal of Finance* 74, 1707–1751.

Hulten, Charles R., 1986, Productivity change, capacity utilization, and the sources of efficiency growth, *Journal of Econometrics* 33, 31–50.

Hulten, Charles R., and Xiaohui Hao, 2008, What is a company really worth? Intangible capital and the 'market to book value' puzzle, Technical report, NBER Working Paper 14548.

Hulten, Charles R., and Frank C. Wykoff, 1981, The measurement of economic depreciation, in Charles R. Hulten, ed., Depreciation, Inflation, and the Taxation of Income from Capital (Urban Institute Press, Washington, WC).

Jones, Charles I., 2003, Growth, capital shares, and a new perspective on production functions, in Federal Reserve Bank of San Francisco Proceedings.

Jorgenson, Dale W., Frank M. Gollop, and Barbara M. Fraumeni, 1987, Productivity and U.S. Economic Growth (North-Holland, Amsterdam).

Jorgenson, Dale W., Mun S. Ho, and Kevin J. Stiroh, 2005, Productivity, Volume 3: Information Technology and the American Growth Resurgence (MIT Press, Cambridge).

Jorgenson, Dale W., and Kevin J. Stiroh, 2000, Raising the speed limit: U.S. economic growth in the information age, *Brookings Papers on Economic Activity* 2000, 125–235.

Jorgenson, Dale W., and Kun-Young Yun, 1991, Tax Reform and the Cost of Capital (Oxford University Press, Oxford).

Karabarbounis, Loukas, and Brent Neiman, 2014, The global decline of the labor share, *Quarterly Journal of Economics* 129, 61–103.

King, Mervyn A., and Don Fullerton, 1984, The Taxation of Income from Capital (University of Chicago Press, Chicago).

Koh, Dongya, Raül Santaeulàlia-Llopis, and Yu Zheng, 2016, Labor share decline and intellectual property products capital, Technical report, Washington University St. Louis Working Paper.

Kulick, Robert, 2016, Horizontal mergers, prices, and productivity, Technical report, Ph.D. Thesis, University of Maryland.

Lettau, Martin, Sydney C. Ludvigson, and Jessica A. Wachter, 2008, The declining equity premium: What role does macroeconomic risk play?, *The Review of Financial Studies* 21, 1653–1687.

Martin, Ian, 2017, What is the expected return on the market?, *The Quarterly Journal of Economics* 132, 367–433.

McGrattan, Ellen R., and Edward C. Prescott, 2010, Unmeasured investment and the puzzling US boom in the 1990s, *American Economic Journal: Macroeconomics* 2, 88–123.

Mian, Atif, and Amir Sufi, 2014, What explains the 2007–2009 drop in employment?, *Econometrica* 82, 2197–2223.

Moody's, 2018, Annual default study: Corporate default and recovery rates, 1920–2017, Technical report, Moody's Investor Service.

Moylan, Carol E., 2008, Employee stock options and the national economic accounts, *Survey of Current Business* 88, 7–13.

Peltzman, Sam, 2014, Industrial concentration under the rule of reason, *Journal of Law and Economics* 57, S101–S120.

Piketty, Thomas, 2014, Capital in the Twenty-First Century (Belknap Press, Cambridge, MA).

Piketty, Thomas, and Gabriel Zucman, 2014, Capital is back: Wealth-income ratios in rich countries 1700–2010, *Quarterly Journal of Economics* 129, 1255–1310.

Rognlie, Matthew, 2015, Deciphering the fall and rise in the net capital share: Accumulation or scarcity?, *Brookings Papers on Economic Activity* 2015, 1–619.

Rotemberg, Julio J., and Michael Woodford, 1991, Markups and the business cycle, *NBER Macroeconomics Annual* 6, 63–140.

Rotemberg, Julio J., and Michael Woodford, 1995, Dynamic general equilibrium models with imperfectly competitive product markets, in Thomas F. Cooley, ed., Frontiers of Business Cycle Research, 243–293 (Princeton University Press, Princeton, NJ).

Salinger, Michael, 1990, The concentration-margins relationship reconsidered, *Brookings Papers on Economic Activity* 1990, 287–335.

Smith, Matthew, Danny Yagan, Owen Zidar, and Eric Zwick, 2019, Capitalists in the 21st century, *Quarterly Journal of Economics* 134, 1675–1745.

Stiglitz, Joseph E., 2012, The Price of Inequality: How Today's Divided Society Endangers Our Future (WW Norton & Company, New York).

Summers, Lawrence H., 2013, Economic possibilities for our children, Technical report, NBER Reporter.

Tobin, James, 1981, Discussion of Summers, *Brookings Papers on Economic Activity* 1981, 132–139.

Zeira, Joseph, 1998, Workers, machines, and economic growth, *Quarterly Journal of Economics* 113, 1091–1117.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1: Internet Appendix.
Replication code.