DECLINING LABOR AND CAPITAL SHARES

SIMCHA BARKAI

University of Chicago

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Abstract. This paper shows that the decline in the labor share over the last 30 years was not offset by an increase in the capital share. I calculate payments to capital as the product of the required rate of return on capital and the value of the capital stock. I document a large decline in the capital share and a large increase in the profit share in the U.S. non-financial corporate sector over the last 30 years. I show that the decline in the capital share is robust to many calculations of the required rate of return and is unlikely to be driven by unobserved capital. I interpret these results through the lens of a standard general equilibrium model, and I show that only an increase in markups can generate a simultaneous decline in the shares of both labor and capital. I provide reduced form empirical evidence that an increase in markups plays a significant role in the decline in the labor share. These results suggest that the decline in the shares of labor and capital are due to an increase in markups and call into question the conclusion that the decline in the labor share is an efficient outcome.

Over the last 30 years we have witnessed a large decline in the labor share of gross value added (Elsby et al. (2013) and Karabarbounis and Neiman (2014)). Many existing explanations of 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 capital. In these explanations, the decline in the labor share is offset by an increase in the capital share. Furthermore, these explanations view the shift from labor to capital as an efficient outcome. In this paper, I show that shares of both labor and capital are declining and are jointly offset by a large increase in the share of profits.

I document a large decline in the capital share and a large increase in the profit share in the U.S. non-financial corporate sector over the last 30 years. Following Hall and Jorgenson (1967), I compute a series of capital payments equal to the product of the required rate of return on capital and the value of the capital stock. I find that shares of both labor and capital are declining. Measured in percentage terms, the decline in the capital share (30%) is much more dramatic than the decline in the labor share (10%). During the

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sample period, the required rate of return on capital declines sharply, driven by a large decline in the risk-free rate. At the same time, the quantity of capital used in production (measured as a share of gross value added) does not increase 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).

I take several steps to ensure the robustness of the constructed series of capital payments. First, I consider the possibility that the data miss a large omitted or unobserved stock of capital and that my measured profits are in fact capital payments on this unobserved stock of capital. With minimal assumptions, I calculate the value of the potentially omitted or unobserved stock that would offset the increase in profits. I show that the value of the omitted or unobserved stock of capital, measured as a share of gross value added, would need to increase over the sample by a total of 490 percentage points, which would amount to $42 trillion in 2014. By the end of the sample, the value of the unobserved capital stock would need to be thirty times higher than existing estimates of the missing intangible capital and three times higher than the value of all observed capital. Second, I consider alternative specifications of the required rate of return on capital that account for equity financing. I find that estimates of the required rate of return on capital that use the equity cost of capital or the weighted average cost of capital lead to a larger decline in the capital share. Last, I consider specifications of the required rate of return on capital that include the tax treatment of capital and debt, and I find that they lead to a large decline in the capital share.

I interpret the simultaneous decline in the shares of labor and capital through the lens of a standard general equilibrium model. The model has two important assumptions: first, production is homogeneous in capital and labor; second, the static first-order conditions of firms are satisfied, i.e., labor and capital inputs fully adjust to their long-run levels. I show that, when markups are fixed, any change in preferences, technology or relative prices that causes the labor share to decline must also cause an equal increase in the capital share. This result of the model is very general and does not depend on assumptions of household behavior, firm ownership, or the functional form of the production function. I calibrate the model and show that the observed increase in markups can explain the decline in the shares of both labor and capital. Furthermore, I show that the increase in markups inferred from the data causes a large steady-state decline in output. If we accept the assumptions of the model, then we are led to conclude that the decline in the shares of labor and capital are caused by an increase in markups and are an inefficient outcome.

I provide reduced form empirical evidence that an increase in markups plays a significant role in the decline of the labor share. In the data I am unable to directly measure markups, instead I proxy for markups using industry concentration. 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 the entire decline in the labor share. These regression results rely on cross-sectional variation, rather than time series variation. Furthermore, the regression results do not rely on capital data and are not subject to concerns with the measurement of capital. Taken as a whole, my results suggest that the decline in the shares of labor and capital are due to an increase in markups and call into question the conclusion that the decline in the labor share is an efficient outcome.

1. Literature Review

There have been many recent empirical and theoretical contributions to the study of the decline in the labor share. Elsby et al. (2013) provide detailed documentation of the decline in 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), Brynjolfsson and McAfee (2014), Summers (2013), 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 et al. (2013)), a decline in the bargaining power of labor (Bental and Demougin (2010), Blanchard and Giavazzi (2003) and 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 markups.

The two closest papers to my work are Karabarbounis and Neiman (2014) and Rognlie (2015). Both papers find that the capital share does not sufficiently increase to offset the decline in the labor share and furthermore the capital share might decrease slightly.[1] By contrast, I find a large decline in the capital share. The difference in our findings is driven by our treatment of the required rate of return on capital. Karabarbounis and Neiman (2014) and Rognlie (2015) use a constant required rate of return on capital, whereas I infer the required rate of return from market prices. Market prices show that the required rate of return on capital declines sharply over the last thirty years, which results in a dramatic decline in the capital share. The magnitude of the decline in the capital share is of central importance for understanding why the labor share has declined. While a decrease in the labor share and little change in the capital share is consistent with a variety of economic explanations, a simultaneous decline in both the labor share and the capital share of similar magnitudes forces us to consider changes in markups as the explanation. Further details appear in Sections 2.6 and 3.4.

Previous studies have also considered the welfare implications of the decline of the labor share. Karabarbounis and Neiman (2014) find that the decline in the labor share is due to technological progress that reduces the relative cost of capital and that this technological progress leads to a substantial increase in

[1] See Karabarbounis and Neiman (2014) section IV.B and column 6 of table 4; Rognlie (2015) Section II.B

consumer welfare. 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. Acemoglu and Restrepo (2016) present a model in which the labor share fluctuates in response to capital-augmenting technological change and show that the endogenous process of technology adoption, in the long run, restores 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 an increase in markups, is accompanied by a decline in output and consumer welfare, and that without a subsequent reduction in markups, the labor share will not revert to its previous level.

This paper contributes to a large literature on the macroeconomic importance of profits and markups. Rotemberg and Woodford (1995) provide evidence suggesting that the share of profits in value added was close to zero in the period prior to 1987. Basu and Fernald (1997) find that U.S. industries had a profit share of most 3 percent during the period 1959-1989. Hulten (1986) and Berndt and Fuss (1986) show that in settings without profits, estimating the payments to capital as realized value added less realized payments to labor leads to an unbiased estimate of capital payments and that this estimation can properly account for cyclical patterns in capital utilization. Past empirical estimates of small economic profits together with the potential theoretical advantage of indirectly inferring capital payments has led many researchers to prefer the assumption of zero profits over the direct measurement of capital payments. The seminal works of Jorgenson et al. (1987) and Jorgenson and Stiroh (2000) that measure changes in U.S. productivity do not estimate total payments to capital,[2] and many subsequent studies follow in their path. By contrast, my findings overturn previous empirical measurements of profits. While I confirm previous estimates of low profits in the early 1980s, I show that profits have substantially increased over the last 30 years. I show that these profits are potentially large enough to generate large declines in the shares of labor and capital, as well as a large decline in output.

2. The Capital Share

In this section I document a large decline in the capital share and a large increase in the profit share in the U.S. non-financial corporate sector over the last 30 years. Following Hall and Jorgenson (1967), I compute a series of capital payments equal to the product of the required rate of return on capital and the value of the capital stock. I find that the required rate of return on capital declines sharply, driven by a large decline in the risk-free rate. At the same time, the ratio of capital to gross value added does not sufficiently increase to offset the decline in the required rate of return, and as a result the capital share

[2]See for example Jorgenson et al. (2005), p. 157.

declines. Measured in percent terms, the decline in the capital share (30%) is much more dramatic than the decline in the labor share (10%). My results show that the shares of both labor and capital are declining and are jointly offset by an increase in the share of profits.

2.1. **Accounting.** I assume that the true model of accounting for the U.S. non-financial corporate sector in current dollars is

$$P_t^Y Y_t = w_t L_t + R_t P_{t-1}^K K_t + \Pi_t \tag{2.1}$$

P_t^Y is the current dollar price of output and $P_t^Y Y_t$ is the current dollar value of gross value added. w_t is the current dollar wage rate and $w_t L_t$ is the total current dollar expenditures on labor. R_t is the required rate of return on capital, P_{t-1}^K is the price of capital purchased in period $t-1$, K_t is the stock of capital used in production in period t and is equal to the stock of capital available at the end of period $t-1$, and $R_t P_{t-1}^K K_t$ is the total current dollar capital payments. Π_t is the current dollar profits. This can be written in shares of gross value added as

$$1 = S_t^L + S_t^K + S_t^{\Pi} \tag{2.2}$$

where $S_t^L = \frac{w_t L_t}{P_t^Y Y_t}$ is the labor share, $S_t^K = \frac{R_t P_{t-1}^K K_t}{P_t^Y Y_t}$ is the capital share and $S_t^{\Pi} = \frac{\Pi_t}{P_t^Y Y_t}$ is the profit share.

2.1.1. *Mapping to the Data.* In the data, nominal gross value added $P^Y Y$ is the sum of expenditures on labor wL, gross operating surplus, and taxes on production and imports less subsidies. By separating gross operating surplus into capital payments $RP^K K$ and profits Π, we get

$$P^Y Y = wL + RP^K K + \Pi + \text{taxes on production and imports less subsidies} \tag{2.3}$$

The main challenge in constructing the capital share of gross value added is to compute the unobserved required rate of return on capital. There are two approaches to constructing this required rate of return. The first approach, pioneered by Hall and Jorgenson (1967), specifies a required ex-ante rate of return to capital that is derived from the standard model of production theory. The second approach, often referred to as the ex-post rate of return on capital, assumes that all payments not made to labor are capital payments. This second approach is equivalent to assuming that profits are zero and therefore it does not allow us to distinguish movements in the capital share and movements in the profit share. In order to construct separate time series of the capital and profits shares, I construct the required rate of return on capital as the ex-ante required rate of return. Complete details of the construction appear in the next subsection.

An additional consideration has to do with taxes and subsidies on production. Unlike taxes on corporate profits, it is unclear how to allocate taxes on production across capital, labor and profits. Consistent with previous research, I study the shares of labor, capital and profits without allocating the the taxes.

2.2. **The Required Rate of Return on Capital.** The construction of the required rate of return on capital follows Hall and Jorgenson (1967) and is equal to the rental rate of capital that occurs in equilibrium. The required rate of return on capital of type s is[3]

$$R_s = (i - \mathbb{E}[\pi_s] + \delta_s) \tag{2.4}$$

where i is the nominal cost of borrowing in financial markets, π_s is the inflation rate of capital of type s, and δ_s is the depreciation rate of capital of type s. Nominal payments to capital of type s are $E_s = R_s P_s^K K_s$, where $P_s^K K_s$ is the replacement cost of the capital stock of type s. Summing across the different types of capital, total capital payments are $E = \sum_s R_s P_s^K K_s$ and the aggregate required rate of return on capital is $R = \frac{E}{\sum_s P_s^K K_s}$, where $\sum_s P_s^K K_s$ is the replacement cost of the aggregate capital stock. The capital share is

$$S^K = \frac{\sum_s R_s P_s^K K_s}{P^Y Y} \tag{2.5}$$

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

To clarify the terminology and units, consider a firm that uses 2000 square feet of office space and 100 laptops. The firm's nominal cost of borrowing in financial markets is 6% per year. The sale value of the office space is \$880,000 at the start of the year, and the office space is expected to appreciate in price by 4% and depreciate at a rate of 3%. The required rate of return on the office space is 5% and the annual cost of the office space is $\$44,000 = 0.05 \times \$880,000$ (or \$22 per square foot). The sale value of the 100 laptops is \$70,000 at the start of the year, and the laptops are expected to appreciate in price by $(-10)\%$ and depreciate at a rate of 25%. The required rate of return on the laptops is 41% and the annual cost of the laptops is $\$28,700 = 0.41 \times \$70,000$ (or \$287 per laptop). Total capital payments are \$72,700 and the total replacement cost of the capital 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, then the firm's capital share is $S^K = \frac{\$72,700}{\$500,000} \approx 0.15$.

[3]The model of production presented in Section 3 has, in equilibrium, a required rate of return on capital equal to $R_s = (i - (1-\delta_s)\mathbb{E}[\pi_s] + \delta_s)$. The formula presented in equation 2.4 is more widely used in the literature. In the data, the two versions yield similar results.

2.3. **Data.** Data on nominal gross value added are taken from the National Income and Productivity Accounts (NIPA) Table 1.14. Data on compensation of employees are taken from the NIPA Table 1.14. 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;[4] 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.

Capital data are taken from the Bureau of Economic Analysis (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 (structures, equipment and intellectual property products), 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.

The data cover the geographic area that consists of 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 value added, investment, capital, and compensation of employees. By contrast, all economic activity by the U.S.-owned the Ford automobile manufacturing plant in Almussafes, Spain is not included in the data and is not reflected in the measures of value added, investment, capital, and compensation of employees.

The construction of the required rate of return on capital requires that I specify the nominal cost of borrowing in financial markets, i, and asset specific expected inflation, $\mathbb{E}[\pi]$. In the main results, I set i equal to the yield on Moody's Aaa bond portfolio. In the robustness subsection that follows the main results, I show that using the equity cost of capital or the weighted average cost of capital across debt and equity generates an even larger decline in the capital share. Throughout the results, asset-specific expected inflation is calculated as a three-year moving average of realized inflation. Replacing expected inflation with realized inflation generates very similar results.

2.4. **Results.**

[4]There are two major types of employee stock option: 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 exercised, an employee incurs a tax liability equal to the difference between the market price and the exercise price that is 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).

2.4.1. *Capital.* Figure 1 presents the time series of the required rate of return on capital for the U.S. non-financial corporate sector during the period 1984–2014. In the figure, the nominal cost of borrowing in financial markets is set to the yield on Moody's Aaa bond portfolio and expected inflation is calculated as a three-year moving average of realized inflation. The figure shows a clear and dramatic decline in the required rate of return on capital. This result is not surprising: during the sample period the risk-free rate (the yield on the ten-year treasury) undergoes a dramatic decline and risk premia do not increase. As a result, the nominal cost of borrowing in financial markets declines dramatically. During this same period there is little change in the other components of the required rate of return; the depreciation rate and expected capital inflation are roughly constant. The fitted linear trend shows a decline of 6.6 percentage points (or 39 percent). In summary, the required rate of return on capital declines sharply, driven by a large decline in the risk-free rate.

The decline in the required rate of return on capital need not translate to a decline in the capital share. Indeed, firms can respond to the decline in the required rate of return on capital by increasing their use of capital inputs. However, during the sample period, the ratio of capital to output does not increase sufficiently to offset the decline in the required required rate of return on capital and, as a result, the capital share declines. Figure 2 presents the time series of the capital share of gross value added for the U.S. non-financial corporate sector during the period 1984–2014. The figure shows a clear and dramatic decline in the capital share. The fitted linear trend shows a decline of 7.2 percentage points (or 30 percent). In summary, firms did not accumulated enough capital to offset to decline in the required rate of return on capital and as a result the capital share of output declines sharply.

2.4.2. *Profits.* I construct profits as the difference between gross value added and the sum of labor costs, capital costs, and indirect taxes on production. This construction is described above in equation 2.3. Profits are constructed as a residual that measures the dollars left over from production after firms pay all measured costs of production. The measure of profits includes economic profits and potentially unobserved costs of production. Figure 3 presents the time series of the profit share for the U.S. non-financial corporate sector during the period 1984–2014. Consistent with previous research,[5] I find that profits were very small at the beginning of the sample. However, they increased dramatically over the last three decades. The fitted linear trend shows that profits increased from 2.2% of gross value added in 1984 to 15.7% of gross value added in 2014, a more than sixfold increase of 13.5 percentage points.

2.4.3. *Complete Picture of Gross Value Added.* Table 1 presents a complete picture of the changes in shares of gross value added for the U.S. non-financial corporate sector during the period 1984–2014. The shares

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

of both labor and capital are declining: the labor share declines by an estimated 6.7 percentage points and the capital share declines by an estimated 7.2 percentage points. Measured in percentage terms, the decline in the capital share (30%) is much more dramatic than the decline in the labor share (10%). The decline in shares of labor and capital are offset by a large increase in the share of profits. While the profit were very small at the start of the sample they have since increased by more than six-fold. In summary, the shares of labor and capital are both declining and are jointly offset by an increase in the share of profits.

To offer a sense of magnitude, the combined shares of labor and capital decline 13.9 percentage points, which amounts to $1.2 trillion in 2014. Estimated profits in 2014 were approximately 15.7%, which is equal $1.35 trillion or $17,000 for each of the approximately 80 million employees in the corporate non-financial sector.

2.5. **Robustness.** I take several steps to ensure the robustness of the constructed series of capital payments. The construction of capital payments requires: (1) a measure of capital and (2) a required rate of return on capital. First, I ask whether the BEA accounts miss a large omitted or unobserved stock of capital and whether my measurement of profits is in fact the cost of renting this potentially omitted or unobserved stock of capital. I find that the value of an omitted or unobserved stock of capital, measured as a share of gross value added, would need to increase during the sample period by a total of 490 percentage points, which amounts to $42 trillion in 2014. I show that the existing measure of missing intangible capital does not have the needed time-series properties and that the value of this capital stock does not exceed $1.4 trillion. Second, I ask whether calculations of the required rate of return on capital that use the equity cost of capital or the weighted average cost across debt and equity lead to an increase in the capital share. I find that estimates of the required rate of return on capital based on the equity cost of capital or the weighted average cost of capital leads to a larger decline in the capital share. Last, I consider specifications of the required rate of return on capital that include the tax treatment of capital and debt, and I find that they lead to a large decline in the capital share.

2.5.1. *Unobserved 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 BEA measures. Indeed, past research has considered several forms of intangible capital that are not currently capitalized by the BEA. These additional forms of intangible capital include organizational capital, market research, branding, and training of employees.

Extending the analysis to account for an omitted or unobserved capital stock requires two separate corrections. First, we must correct the measure of gross value added so tha it includes the production of the omitted or unobserved capital stock.[6] Currently, the national accounts expense any costs of producing productive assets that are not classified by the BEA as capital. Recognizing these potentially productive assets as capital requires that we reclassify the costs of producing these productive assets as investment rather than intermediate consumption. This correction increases gross value added by the nominal value of investment in these productive assets. This correction has been discussed extensively by McGrattan and Prescott (2010, 2014). Second, we must correct the measure of capital payments so that it includes payments on the omitted or unobserved capital stock. Currently, my measure of capital payments includes only those assets that the BEA classifies as capital. Recognizing these potentially productive assets as capital requires that I include them in my measure of capital payments. As a result my measurement of capital payments would increase.

The resulting corrections to the construction of capital costs and profits are as follows. Total nominal capital payments equal $R^K P^K K + R^X P^X X$, where $R^K P^K K$ are the total capital payments on the capital recognized by the BEA and $R^X P^X X$ are the payments on the omitted capital ($P^X X$ is the nominal value of the potentially omitted or unobserved stock of capital and R^X is the required rate of return on this capital stock). Nominal gross value added equals $P^Y Y + I^X$, where $P^Y Y$ is the nominal value of gross value added, as currently recorded by the BEA, and I^X is nominal investment in the potentially omitted or unobserved stock of capital X. Nominal profits equal

$$\Pi^{TRUE} = \left(\underbrace{P^Y Y + I^X}_{\text{gross value added adjustment}}\right) - \left(\underbrace{R^K P^K K + R^X P^X X}_{\text{capital payments adjustment}}\right) - wL \tag{2.6}$$

$$= \Pi + \underbrace{I^X - R^X P^X X}_{\text{profits adjustment}} \tag{2.7}$$

Having made these corrections, we can ask how large the unobserved capital stock would have to be in order to eliminate profits. Clearly, if the profit correction $I^X - R^X P^X X$ is allowed to be any arbitrary amount then we cannot rule out the hypothesis that profits are always zero, i.e., that the decline in the share of labor is offset by an increase in the share of capital. Thus, in order to make progress I will need to make some assumptions that restrict unobserved investment and unobserved capital costs. First, I assume that investment is at least as large as depreciation. This appears to be a mild assumption, especially when applied to the analysis of long-run trends: if investment is consistently lower than depreciation then the

[6] I assume that production of the omitted or unobserved capital takes place inside the firm or, more generally, inside the non-financial corporate sector. This requires that we add the value of the produced capital – which is equal to the nominal investment in the capital – to the gross value added of the non-financial corporate sector.

stock of unobserved capital goes to zero.[7] Second, I assume that the required rate of return on the omitted or unobserved capital stock is $R^X = \left(i - \mathbb{E}\left[\pi^X\right] + \delta^X\right)$, where $\mathbb{E}\left[\pi^X\right]$ is the expected inflation of productive asset X and δ^X is the rate of depreciation of productive asset X. Last, I assume that the expected inflation of productive asset X is equal to the expected inflation of the assets classified by the BEA as intellectual property products. The results that follow are very similar if I assumed that the expected inflation of productive asset X is equal to the expected inflation of the aggregate capital stock or equal to the expected inflation of gross value added.

Under these assumptions, the correction to profits that results from taking into account this potentially omitted or unobserved capital stock is at most the net return on the capital $\left(i - \mathbb{E}\left[\pi^X\right]\right) P^X X$. This implies a lower bound on true profits $\Pi^{TRUE} \geq \Pi - \left(i - \mathbb{E}\left[\pi^X\right]\right) P^X X$. In order to eliminate profits the nominal value of the unobserved capital stock has to satisfy

$$P^X X \geq \frac{\Pi}{i - \mathbb{E}\left[\pi^X\right]} \tag{2.8}$$

I construct the nominal value break-even stock of omitted or unobserved capital as $\frac{\Pi}{i - \mathbb{E}\left[\pi^X\right]}$. This is represented on the right-hand side of equation 2.8 and is a lower bound on the nominal value of the stock of omitted or unobserved capital that rationalizes zero profits. Figure 4 plots the break-even stock of omitted or unobserved capital as a fraction of observed gross value added. The break-even unobserved capital stock is increasing during the sample period, from an estimated 70% of gross value added in 1984 to 560% in 2014. To offer a sense of magnitude, during the same period the combined value of all capital recorded by the BEA fluctuates between 135% and 185% of observed gross value added. By the end of the sample, the break-even stock of omitted or unobserved capital needs to be three times the value of the observed capital stock in order to rationalize zero profits in 2014. Indeed, the value of omitted or unobserved capital needs to be 560% of the value of observed gross value added, or $48 trillion. If the hypothesis that the decline in the labor share was offset by an increase capital share was true then break-even stock of omitted or unobserved capital needs to increase from 70% of gross value added in 1984 to 560% in 2014. This 490 percentage point increase amounts to $42 trillion in 2014.

Thus far, I have not taken a stance on the precise nature of the omitted or unobserved stock of capital. Instead, I have asked how large this omitted or unobserved stock of capital needs and what time series properties it needs to posses in order to eliminate profits. I find that, as a fraction of gross value added, the value of this omitted or unobserved stock of capital would need to increase quadratically during the sample period and reach $48 trillion by the end of the sample. Now, an alternative approach to the problem of a

[7] In order to maintain a capital stock that does not decline in value relative to output, investment needs to be at least as large as $\left(\delta^X + g\right) P^X X$, where δ^X is the depreciation rate of the unobserved capital stock and g is the growth rate of output.

potentially omitted or unobserved stock of capital is to take a stance on the precise nature of this capital and then attempt to measure it. Past research on the subject of intangible capital has taken this approach, most notably Corrado et al. (2009, 2012). In Figure 4 I have included a line that represents the value of all intangible capital that is constructed by Corrado et al. (2012), except for that stock that has already been accounted for by the BEA. As is clear from the figure, the value of the additional stock of intangible capital that is constructed by Corrado et al. (2012) does not have the needed time-series properties: the time trend of the value of this additional stock of intangible capital does not increase quadratically (as a share of observed gross value added) and the value of this capital stock is far too low (does not exceed \$1.4 trillion). From these results I conclude that the large decline in the capital share and the large increase in the profit share are unlikely to be driven by unobserved capital.

2.5.2. *Debt and Equity Costs of Capital.* Thus far, I have assumed that the cost of borrowing in financial markets is equal to the yield on Moody's Aaa bond portfolio. I now show that using the equity cost of capital or the weighted average cost of capital across debt and equity leads to larger estimated decline in the capital share. Furthermore, I show that the yield on Moody's Aaa bond portfolio that I used in the main analysis is similar in both levels and trends to the Bank of America Merrill Lynch representative bond portfolio in the overlapping period 1997–2014.

Unlike the debt cost of capital, which is observable in market data, the equity cost of capital is unobserved. Thus, constructing the equity cost of capital requires a model of equity prices that relates observed financial market data to the unobserved equity cost of capital. A standard model for constructing the equity cost of capital is the Dividend Discount Model (DDM). In the DDM[8] the equity cost of capital is the sum of the risk-free rate and the equity risk premium, and the risk premium is equal to the dividend price ratio. Based on this model, I construct the equity cost of capital as the sum of the yield on the ten-year U.S. treasury and the dividend price ratio of the S&P 500.

Figure 5 plots the debt cost of capital and the equity cost of capital. The debt cost of capital is equal to the yield on Moody's Aaa and the equity cost of capital is equal to the sum of the yield on the ten-year U.S. treasury and the dividend price ratio of the S&P 500. The figure displays several important features. First, both the debt cost of capital and the equity cost of capital are declining during the sample period. Second, before 1997 the equity cost of capital is higher than the debt cost of capital, but after 1997 the two costs of capital are extremely similar. As a result, calculating the required rate of return on capital using the equity cost of capital results in a greater decline in the capital share over time: at the start of the sample the capital share is larger than in my estimates and by the end of the sample the capital share is equal to

[8]This results is based on the assumptions that the growth rate of dividends is constant and is equal to the risk-free rate.

my estimate. Since the debt cost of capital is lower than the equity cost of capital at the beginning of the sample and the two are approximately equal later in the sample, my constructed series of the required rate of return on capital and the capital share serve as a lower bound on the decline in capital share.

Figure 6 plots the yield on Moody's Aaa bond portfolio, Moody's Baa bond portfolio, and the Bank of America Merrill Lynch representative bond portfolio.[9] In the overlapping period 1997–2014, Moody's Aaa bond portfolio and the Bank of America Merrill Lynch representative bond portfolio display similar levels and trends. With the exception of the great recession, the Bank of America Merrill Lynch representative bond portfolio appears to have a yield equal to or below the yield on Moody's Aaa bond portfolio. While Moody's Aaa has a higher grade than the representative portfolio, it also has a longer maturity and this can explain why the two portfolios have similar yields throughout the sample. The figure also shows that Moody's Baa bond portfolio closely tracts the time series trend of the Moody's Aaa bond portfolio, although the two portfolios have a different price level.

2.5.3. *Taxes.* I now consider specifications of the required rate of return on capital that include the tax treatment of capital and debt. The two specifications are common in the literature.[10] The first specification accounts for the tax treatment of capital. Unlike compensation of labor, firms are unable to fully expense investment in capital and as a result the corporate tax rate increases the firm's cost of capital inputs. In order to account for the tax treatment of capital, the required rate of return on capital of type s must be

$$R_s = (i - \mathbb{E}[\pi_s] + \delta_s)\,\frac{1 - z_s\tau}{1-\tau} \tag{2.9}$$

where τ is the corporate income tax rate and z_s is the net present value of depreciation allowances of capital of type s. The second specification accounts for the tax treatment of both capital and debt. Since interest payments on debt are tax-deductible, the financing of capital with debt lowers the firms' cost of capital inputs. In order to account for the tax treatment of both capital and debt, the required rate of return on capital of type s must be

$$R_s = (i \times (1-\tau) - \mathbb{E}[\pi_s] + \delta_s)\,\frac{1 - z_s\tau}{1-\tau} \tag{2.10}$$

[9]The BofA Merrill Lynch US Corporate Master Effective Yield "tracks the performance of US dollar denominated investment grade rated corporate debt publically issued in the US domestic market. To qualify for inclusion in the index, securities must have an investment grade rating (based on an average of Moody's, S&P, and Fitch) and an investment grade rated country of risk (based on an average of Moody's, S&P, and Fitch foreign currency long term sovereign debt ratings). Each security must have greater than 1 year of remaining maturity, a fixed coupon schedule, and a minimum amount outstanding of $250 million."

[10]See, for example, 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 1983, which is prior to the start of my sample.

I take data on the corporate tax rate from the OECD Tax Database and data on capital allowance from the Tax Foundation. I find that constructing the required rate of return on capital in accordance with equations 2.9 and 2.10 generates a decline in the capital share that ranges from 17 to 35 percent. In summary, I find that specifications of the required rate of return that include the tax treatment of capital and debt show a large decline in the capital share.

2.6. **Discussion.** 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 is not sufficiently increasing to offset the decline in labor and further the capital share might not be increasing at all.

In this paper, I construct the capital share as $S_t^K = \frac{(i_{t+1} - \mathbb{E}[\pi_{t+1}] + \delta_t) P_{t-1}^K K_t}{P_t^Y Y_t}$. We can decompose my construction of the capital share into the product of three terms:

$$S_t^K = \frac{P_t^I I_t}{P_t^Y Y_t} \times \frac{P_{t-1}^K K_t}{P_t^I I_t} \times (i_{t+1} - \mathbb{E}[\pi_{t+1}] + \delta_t) \tag{2.11}$$

The first term in the decomposition is the ratio of nominal investment to nominal gross value added. The second term is the ratio of the nominal value of the capital stock to nominal investment. The last term is the required rate of return on capital. Karabarbounis and Neiman (2014) assume that the ratio of the nominal value of the capital stock to nominal investment is constant and that the required rate of return on capital is constant.[11] 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 7 plots the ratio of nominal investment to nominal gross value added in the U.S. corporate sector using the Karabarbounis and Neiman (2014) replication data set. Figure 8 plots the ratio of investment to gross value added in the U.S. corporate sector using NIPA data. Neither data source shows a decline in the ratio of investment to gross value added. Table 2 presents the estimated time trend of the ratio of investment to gross value added using the Karabarbounis and Neiman (2014) replication data set and the NIPA data over several time periods. To make the results comparable to Karabarbounis and Neiman (2014), I present estimates of the 10-year percentage-point change in the ratio of nominal investment to nominal gross value added. The table clearly shows that there has been no decline in the ratio of investment to gross value added. This is true in the sample period 1975–2011, studied by Karabarbounis and Neiman (2014), and remains true if we start the sample in 1984 or end the sample before the great recession. All estimates are economically trivial and statistically zero. As a reference point, the mean investment rate in the period

[11]The construction of the capital share in Karabarbounis and Neiman (2014) appears in Section IV.B. The 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 appear on p. 92.

1975–2011 is 15.6% in the Karabarbounis and Neiman (2014) replication data and 17.6% in the NIPA data. No measure of U.S. corporate investment suggests a decline in the capital share. These NIPA results are quantitatively similar in the U.S. corporate non-financial sector.

Rognlie (2015) provides two measures of the capital share.[12] In the first measure, the author assumes that the required rate of return on capital is constant. This assumptions 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 1984–2014. 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. Combining NIPA data with the cost of capital presented in Rognlie (2015), I find no decline in the capital share.[13]

I conclude that my finding of a declining capital share in the U.S. non-financial corporate sector is new to the literature, is not due to differences in time periods, and is not due to differences in the sources or quality of data. Instead, I find a decline in the capital share due to my treatment of the required rate of return on capital. I directly infer the required rate of return from market prices. Market prices show that the required rate of return on capital declines sharply over the last thirty years, which results in a dramatic decline in the capital share. Measures of the capital share that assume a constant required rate of return show no decline.

While my research focuses on the U.S. non-financial corporate sector, there is reason to believe that many other countries experience a decline in the capital share. Karabarbounis and Neiman (2014) show that the rate of investment does not increase in many advanced economies. At the same time, many advanced economies experience a decline in the cost of capital, driven by a decline in government bond yields. Taken together, a large decline in the cost of capital and the constant investment rate suggest that the capital share may be declining globally. Further research is needed to study the capital share in other countries.

[12] The construction of the capital share appears in Rognlie (2015) Section II.B.

[13] 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 1984–2014. 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.

3. Model of the Corporate Sector

In this section I present a standard general equilibrium model of monopolistic competition to study the decline in the shares of labor and capital. In the model, I allow changes in technology, preferences, relative prices, and markups to cause the decline in the shares of labor and capital. The model distinguishes between two types of changes: joint movements, in which the shares of labor and capital move together, and offsetting movements, in which a change in the share of labor is perfectly offset by an equally sized change in the capital share of the opposite sign. In Proposition 1, I show that changes in technology, preferences, and relative prices can only cause offsetting movements in the shares of capital and labor; i.e., any change in preferences, technology, or relative prices that causes the labor share to decline must cause an equal increase in the capital share. A corollary to this proposition is that only an increase in markups can cause a joint decline in the shares of labor and capital.

A fully specified calibration of the model decomposes the observed changes in the shares of labor and capital into joint movements and offsetting movements. I calibrate the model to the U.S. non-financial corporate sector and show that the declines in the shares of labor and capital are entirely joint and are due to an increase in markups. Using the calibrated model, I further explore the welfare implications of the increase in markups. The model in this section is standard in order to ensure that my results are not due to novel modeling features, but rather are a direct consequence of my measurement of the capital share.

3.1. Model.

3.1.1. *Final Goods Producer.* The corporate sector is made up of a unit measure of firms, each producing a differentiated intermediate good. The final good is produced in perfect competition as a CES aggregate of the intermediate goods

$$Y_t = \left(\int_0^1 y_{i,t}^{\frac{\varepsilon_t-1}{\varepsilon_t}} di\right)^{\frac{\varepsilon_t}{\varepsilon_t-1}} \tag{3.1}$$

where $\varepsilon_t > 1$ is the elasticity of substitution between goods. The profits of the final goods producer are $P_t^Y Y_t - \int_0^1 p_{i,t} y_{i,t} di$, where P_t^Y is the exogenous price level of output and $p_{i,t}$ is the endogenous price of intermediate good i. The solution to the cost minimization problem, together with the zero profit condition of the final goods producer, leads to the following demand function for intermediate good i:

$$D_t(p_{i,t}) = Y_t \left(\frac{p_{i,t}}{P_t^Y}\right)^{-\varepsilon_t} \tag{3.2}$$

3.1.2. *Firms.* Firm i produces intermediate good $y_{i,t}$ using the constant return to scale production function

$$y_{i,t} = f_t(k_{i,t}, l_{i,t}) \tag{3.3}$$

where $k_{i,t}$ is the amount of capital used in production and $l_{i,t}$ is the amount of labor used in production. In period $t-1$ the firm exchanges one-period nominal bonds for dollars and purchases capital $k_{i,t}$ at the nominal price P^K_{t-1}. In period t the firm hires labor in a competitive spot market at the nominal wage rate w_t and produces good $y_{i,t}$ which is sold at price $p_{i,t}(y)$. After production the firm pays the face value of its debt and sells the undepreciated capital at the the nominal price P^K_t. The firm's nominal profits are

$$\begin{aligned} \pi_{i,t} &= \max_{k_{i,t}, l_{i,t}} p_{i,t} y_{i,t} - (1+i_t) P^K_{t-1} k_{i,t} - w_t l_{i,t} + (1-\delta_t) P^K_t k_{i,t} \\ &= \max_{k_{i,t}, l_{i,t}} p_{i,t} y_{i,t} - R_t P^K_{t-1} k_{i,t} - w_t l_{i,t} \end{aligned} \tag{3.4}$$

where $R_t = i_t - (1-\delta_t)\frac{P^K_t - P^K_{t-1}}{P^K_{t-1}} + \delta_t$ is the required rate of return on capital.

The profit maximization problem of the firm determines the demand for labor and capital inputs, as well as profits, as a function of the current period nominal interest rate, the current period nominal wage rate, and aggregate output. The first-order condition for capital is $p_{i,t}\frac{\partial f}{\partial k} = \mu_t R_t P^K_{t-1}$, where $\mu_t = \frac{\varepsilon_t}{\varepsilon_t - 1}$ is the equilibrium markup over marginal cost. Similarly, the first-order condition for labor is $p_{i,t}\frac{\partial f}{\partial l} = \mu_t w_t$. Integrating demand across firms determines the corporate sector demand for labor and capital inputs, as well as profits, as a function of the nominal interest rate, the nominal wage rate, and aggregate output.

3.1.3. *Households.* A representative household is infinitely lived and has preferences over its consumption $\{C_t\}$ and its labor $\{L_t\}$ that are represented by the utility function

$$\sum_t \beta^t U(C_t, L_t) \tag{3.5}$$

The economy has a single savings vehicle in the form of a nominal bond: investment of 1 dollar in period t pays $1+i_{t+1}$ dollars in period $t+1$. In addition to labor income and interest on savings, the household receives the profits of the corporate sector. The household chooses a sequence for consumption $\{C_t\}$ and labor $\{L_t\}$ to maximize utility subject to the lifetime budget constraint

$$a_0 + \sum_t q_t [w_t L_t + \Pi_t] = \sum_t q_t P^Y_t C_t \tag{3.6}$$

where a_0 is the initial nominal wealth of the household, $q_t = \prod_{s \le t} (1+i_s)^{-1}$ is the date zero price of a dollar in period t, w_t is the nominal wage in period t, Π_t are nominal corporate profits in period t, and P^Y_t is the price of a unit of output in period t.

The utility maximization problem of the household determines the supply of labor and nominal household wealth as a function of the path of nominal interest rates, the path of nominal wage rates and the net present value of nominal corporate profits. The inter-temporal first-order condition of the household [Euler equation] is $1 = \beta\left(1+i_{t+1}\right)\left(1+\frac{P_{t+1}^{Y}-P_{t}^{Y}}{P_{t}^{Y}}\right)^{-1}\frac{U_c(C_{t+1},L_{t+1})}{U_c(C_t,L_t)}$ and the intra-temporal first-order condition [MRS] is $U_l\left(C_t,L_t\right) = -\frac{w_t}{P_t^Y}U_c\left(C_t,L_t\right)$. The nominal wealth of the household follows the path

$$a_{t+1} = \left(1+i_t\right)a_t + w_t L_t + \Pi_t - P_t^Y C_t \tag{3.7}$$

3.1.4. *Capital Creation.* I assume that all agents in the model have free access to a constant returns to scale technology that converts output into capital at a ratio of $1:\kappa_t$. I further assume that this technology is fully reversible.[14] Arbitrage implies that, in period t, κ_t units of capital must have the same market value as 1 unit of output. This pins down the relative price of capital

$$\frac{P_t^K}{P_t^Y} = \kappa_t^{-1} \tag{3.8}$$

3.1.5. *Equilibrium.* In equilibrium three markets will need to clear: the labor market, the capital market and the market for consumption goods. The labor market clearing condition equates the household supply of labor with the corporate sector demand for labor. The capital market clearing condition equates the nominal value of household savings a_{t+1} with the nominal value of the corporate sector demand for capital $P_t^K K_{t+1}$. The aggregate resource constraint of the economy, measured in nominal dollars, can be written as

$$P_t^Y Y_t = P_t^Y C_t + P_t^K\left[K_{t+1} - (1-\delta)K_t\right] \tag{3.9}$$

By Walras' law the aggregate resource constraint of the economy will hold if the labor and capital markets clear and the households are on their budget constraint. An equilibrium[15] is a vector of prices $(i_t^*, w_t^*)_{t\in\mathbb{N}}$ that satisfy the aggregate resource constraint and clear all markets in all periods. Since all firms face the same factor costs and produce using the same technology, in equilibrium[16] they produce the same quantity of output $y_t = Y_t$ and sell this output at the same per-unit price $p_{i,t} = P_t^Y$.

3.2. **The Roles of Technology, Preferences and Markups.**

[14] Without this assumption, the relative price of capital is pinned down so long as investment is positive. In the data, investment in each asset is positive in each period. Moreover, the data show no substantial movement in the relative price of capital over the sample period.

[15] Firm optimization requires that firms have beliefs over aggregate output Y_t and house optimization requires that households have beliefs over corporate profits Π_t. Equilibrium further requires that firm beliefs and household beliefs hold true.

[16] With a constant returns to scale production technology and the specified market structure there is no indeterminacy in the firm's maximization problem. In more general cases, indeterminacy may arise, in which case there can exist non-symmetric equilibria. With appropriate regularity conditions, it is possible to select an equilibrium by assuming that for a given level of profits firms will choose to maximize their size.

Proposition 1. *When markups are fixed, any decline in the labor share must be offset by an equal increase in the capital share.*

Proof. In equilibrium, a marginal allocation plan of labor across firms $\{dl_{i,t}\}_i$ increases aggregate output by $\int_0^1 \mu_t \frac{w_t}{P_t^Y} dl_{i,t} di = \mu_t \frac{w_t}{P_t^Y} \int_0^1 dl_{i,t} di$. Since the aggregate output response to a marginal allocation plan depends only on the aggregate increase in labor $\left(dL_t = \int_0^1 dl_{i,t} di\right)$, we have a well defined notion of the aggregate marginal productivity of labor that is equal to $\frac{\partial Y_t}{\partial L_t} = \mu_t \frac{w_t}{P_t^Y}$. Similarly, for any marginal allocation plan of capital across firms we have $\frac{\partial Y_t}{\partial K_t} = \mu_t R_t \frac{P_{t-1}^K}{P_t^Y}$. Rearranging these equations we have the following expressions for the labor and capital shares of gross value added

$$S_t^L = \mu_t^{-1} \times \frac{\partial \log Y_t}{\partial \log L_t} \tag{3.10}$$

$$S_t^K = \mu_t^{-1} \times \frac{\partial \log Y_t}{\partial \log K_t} \tag{3.11}$$

Summing across the shares of labor and capital we have

$$S_t^K + S_t^L = \mu_t^{-1} \times \underbrace{\left(\frac{\partial \log Y_t}{\partial \log L_t} + \frac{\partial \log Y_t}{\partial \log K_t}\right)}_{\text{constant=scale of production}} \tag{3.12}$$

The combined shares of labor and capital are a product of two terms: the equilibrium markup and the scale of production. □

Remark 1. The proof of the proposition does not rely on any assumptions of household behavior, firm ownership, or the functional form of the production function. Furthermore, the proof does not rely on the assumption of constant returns to scale, and holds for any fixed returns to scale parameter.

Corollary 1. *When markups are fixed, any change in preferences, technology or relative prices that causes the labor share to decline must cause an equal increase in the capital share.*

3.3. **Model-Based Counterfactual and Welfare.** In this subsection I calibrate the model to and calculate the welfare consequences of the increase in markups inferred from the data.

3.3.1. *Functional Form Specifications.* I assume that firms produce using a CES production function

$$y_{i,t} = \left(\alpha_K \left(A_{K,t} k_{i,t}\right)^{\frac{\sigma-1}{\sigma}} + (1-\alpha_K)\left(A_{L,t} l_{i,t}\right)^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}} \tag{3.13}$$

where σ is the elasticity of substitution between labor and capital. In equilibrium, aggregate output is a CES aggregate of labor and capital with parameters that are identical to the firm level production function

$$Y_t = \left(\alpha_K \left(A_{K,t} K_t\right)^{\frac{\sigma-1}{\sigma}} + (1-\alpha_K)\left(A_{L,t} L_t\right)^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{\sigma-1}} \tag{3.14}$$

The first-order conditions of firm optimization are

$$\alpha_K A_{K,t}^{\frac{\sigma-1}{\sigma}} \left(\frac{Y_t}{K_t}\right)^{\frac{1}{\sigma}} = \mu_t R_t \frac{P_{t-1}^K}{P_t^Y} \tag{3.15}$$

$$(1-\alpha_K) A_{L,t}^{\frac{\sigma-1}{\sigma}} \left(\frac{Y_t}{L_t}\right)^{\frac{1}{\sigma}} = \mu_t \frac{w_t}{P_t^Y} \tag{3.16}$$

I assume that household preferences over consumption $\{C_t\}$ and labor $\{L_t\}$ are represented by the utility function

$$\sum_t \beta^t \left[\log C_t - \gamma \frac{\theta}{\theta+1} L_t^{\frac{\theta+1}{\theta}}\right] \tag{3.17}$$

The intra-temporal first-order condition [MRS] is $\gamma L_t^{\frac{1}{\theta}} = \frac{w_t}{P_t^Y} C_t^{-\eta}$ and the inter-temporal first-order condition of the household [Euler equation] is $1 = \beta\left(1 + i_{t+1}\right)\left(1 + \frac{P_{t+1}^Y - P_t^Y}{P_t^Y}\right)^{-1}\left(\frac{C_{t+1}}{C_t}\right)^{-\eta}$.

3.3.2. *Moments and Parameter Values.* The model has two capital parameters: the relative price of capital, which I normalize to 1, and the depreciation rate, which I match to the average depreciation rate of capital in the BEA data. The model has four production parameters: I consider values of the elasticity of substitution between labor and capital σ between 0.4 and 1.25; I calibrate the remaining three parameters (α_K, A_K, A_L) to match the labor share and the capital to output ratio in 1984 and to equate the level of output across the different specifications of the elasticity of substitution. The model has three preference parameters: I set the rate of time preference to the standard value of 0.95; I consider values of the Frisch elasticity of labor supply, θ, between 0.5 and 4; and I normalize the disutility of labor parameter γ to equate the steady-state supply of labor across the different specifications.

3.3.3. *Markups.* The equilibrium conditions of the model imply that the cost share of gross value added is equal to the inverse of the markup $\mu_t^{-1} = \frac{w_t L_t + R_t P_{t-1}^K K_t}{P_t^Y Y_t}$. In the data the markup increases from 2.5% in 1984 to 21% in 2014.

3.3.4. *Output Gap and Welfare.* I compute the steady-state decline in output and welfare in response to the increase in markups inferred from the data. I find that the increase in markups inferred from the data causes a steady-state decline in output of at least 10% and a consumption equivalent decline in utility of at least 2.9%. The declines in output and utility are greater for higher values of σ and for higher values of θ. The model can match the simultaneous decline in the shares of labor and capital, but it is unable to match decline in the real interest rate or the capital-to-output ratio. Furthermore, matching the shares of both labor and capital requires a high value of the elasticity of substitution between labor and capital.

In Section 2, I show that the decline in the capital share is due to a large decline in the risk-free rate rather than a decline in the ratio of capital to output. To match these features of the data, I consider the possibility that the steady-state interest rate declines over time. In this exercise, I vary the rate of time preference in order to match the observed change in the real interest rate. I assume that at the start of the sample the economy is in a steady state with a real interest rate of 8.5% $\left(\beta = 1.085^{-1}\right)$ and at the end of the sample the economy is a steady state with a real interest rate of 1% $\left(\beta = 1.01^{-1}\right)$. I calculate potential output in 2014 as the steady-state output in a model with $\beta = 1.01^{-1}$ and markups equal to 2.5% – all other parameters are kept at their 1984 values. In addition to calculating the output gap, I ask whether this model can match the observed declines in the shares of labor and capital. I find that the increase in markups causes output to decline by at least 8.5% relative to potential output and the decline in output is greater for higher values of σ and for higher values of θ. The model matches the decline in the shares of both labor and capital as well as the decline in the real interest rate and the capital-to-output ratio. Matching the shares of both labor and capital now requires an elasticity of substitution between labor and capital equal to 0.6 – this value is in line with the estimates of Antràs (2004), Chirinko (2008) and Oberfield and Raval (2014). This evidence suggests that the increase in markups inferred from the data can explain the entire decline in the shares of both labor and capital and that the decline in the shares of labor and capital are an inefficient outcome.

3.4. **Discussion.** The model is based on two important assumptions: first, production is homogeneous in capital and labor; and second, the static first-order conditions of firms are satisfied, i.e., labor and capital inputs fully adjust to their long-run levels. In any model with these two features, a change in preferences, technology, or relative prices that causes the labor share to decline must cause an equal increase in the capital share. The precise decomposition of the decline in the shares of labor and capital into a joint decline (due to an increase in markups) and offsetting movements (which can be due to preferences, technology, or relative prices) is determined in the calibration. I impose a consensus value of the elasticity of substitution between labor and capital, and I find that the entire decline in the shares of labor and capital are due to an increase in markups. Furthermore, model-based counterfactual calculations suggest that the increase in markups inferred from the data is large enough to generate a large decline in output.

The magnitude of the decline in the capital share is of central importance for understanding why the labor share has declined. To understand this point it is worth considering two hypothetical worlds. In the first hypothetical world, which matches my findings, the labor share declines 6.7 percentage points, the capital declines 7.2 percentage points, and the profit share increases 13.5 percentage points. In this world, the calibrated model tells us that the entire decline in the shares of labor and capital are joint and are entirely due to an increase in markups. In the second hypothetical world, which matches the findings of Karabarbounis and Neiman (2014) and Rognlie (2015), the labor share declines 5 percentage points, the capital share remains constant, and the profit share increases by 5 percentage points. In this world, the calibrated model tells us that an increase in markups can account for only part of the decline. Indeed, an increase in markups would have caused the shares of both labor and capital to decline ; the labor share would have declined by less than 5 percentage points. A further change in preferences, technology, or relative prices is needed in order to increase the capital share at the expense of the labor share.

Existing research has already documented an increase in the share of profits. In addition to the work of Karabarbounis and Neiman (2014) and Rognlie (2015), Hall (2017) documents a growing wedge between the return to capital and the risk-free real interest rate, suggestive of an increase in profits. An increase in the share of profits is not sufficient to determine the cause of the decline in the share of labor. In both hypothetical worlds described above, the share of profits increases. In order to determine the cause of the decline in the labor share we need to measure the capital share. The measurement of the capital share is also needed to determine the welfare consequences of the decline in the labor share. Indeed, based on their measurement of the capital share, Karabarbounis and Neiman (2014) find increasing welfare and output.[17] By contrast, based on my finding of a large decline in the capital share, I find that output declines substantially in response to the data-inferred increase in markups.[18]

My work points to a world in which the shares of capital and labor are jointly declining. This finding is new to the literature. My finding leads me to conclude that an increase in markups is the entire story. After accounting for the increase in markups there is no room or need for change in preferences, technology or relative prices.

[17]See Karabarbounis and Neiman (2014), Table IV, column 6, for their welfare results. See also Section 2.6 of this paper for a discussion of their measurement of the capital share.

[18]At first glance, my calibration results look very similar to Karabarbounis and Neiman (2014) (KN), Table IV, column 4. This is not, however, the case. I compute the steady-state decline in output and welfare in response to the increase in markups inferred from the data and report a lower bound on the output and consumption loss across a wide range of parameters. I consider a range for the elasticity of substitution σ and the Frisch elasticity of labor supply. If I impose the production parameters of KN ($\sigma = 1.25$ and $\theta = 1$), then I find a decline in output of 17% and a welfare-equivalent decline in consumption of 5.5%. In the second experiment, in which I allow the rate of time preference to vary, I find a decline in output of 20%. These output and welfare effects are much larger KN's. This is not surprising: due to my measurement of the capital share, I find a much larger increase in markups (a 13.5pp increase vs KN's 5pp increase). More importantly, my estimates are based on my findings that the capital share declines as rapidly as the labor share. KN reject the view of a decline in capital (KN, Table IV, column 4) and instead accept the view that the capital share is flat (KN, Table IV, column 6).

4. Labor Share and Industry Concentration

In this section I provide reduced form empirical evidence to support the hypothesis that an increase in markups plays a significant role in the decline of the labor share. In the data I am unable to directly measure markups, instead I proxy for markups using industry concentration. I assume that an increase in concentration captures increases in markups. 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 the entire decline in the labor share.

4.1. **Data.** I use census data on industry payrolls, 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 in 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.

In order to construct changes in the labor share and concentration I match industries across census years.[19] 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, my sample consists of 750 six-digit NAICS industries. As a share of the sectors covered by the census, my 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,[20] my matched sample covers 66% of sales receipts in 1997 and 76% of sales receipts in 2012. Table 3 provides descriptive statistics of the labor share (the payroll share of sales) and the four census measures of industry concentration for my matched sample.

4.2. **Empirical Specification.** I consider two reduced form empirical specifications that relate the increase in concentration to the decline in the labor share. The first empirical specification is a regression in first differences

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

[20]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.

$$S^L_{j,t} - S^L_{j,t-k} = \alpha_t + \beta\left(C^{(n)}_{j,t} - C^{(n)}_{j,t-k}\right) + \varepsilon_{j,t} \tag{4.1}$$

where $S^L_{j,t} - S^L_{j,t-k}$ is the change in the labor share of sales in industry j from year $t-k$ to year t, and $C^{(n)}_{j,t} - C^{(n)}_{j,t-k}$ 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

$$\log S^L_{j,t} - \log S^L_{j,t-k} = \alpha_t + \beta\left(\log C^{(n)}_{j,t} - \log C^{(n)}_{j,t-k}\right) + \varepsilon_{j,t} \tag{4.2}$$

I choose two different specifications for k. In the first specification I use the two end years of data, 1997 and 2012 ($k = 15$). The intercept in this first specification is the predicted decline in the labor share after controlling for changes in concentration. In the second specification I use data from all four census years ($k = 5$). I use this specification to address concerns that the results may be due to cyclical variation. In all specifications, I weight each observation by its share of sales in year t and standard errors are clustered by 3-digit NAICS industry.

4.3. **Results.** I present the results of the the cross-sectional regression in two stages. First, I report the results that use only data from the 1997 and 2012 censuses. In this first set of results, the intercept of the regression is the implied change in the labor share after controlling for changes in industry concentration. Second, I report results that include data from the four censuses, 1997, 2002, 2007 and 2012. The two sets of results are quantitatively similar. In both cases, I find that that an increase in concentration is associated in the cross section with a decline in the labor share ($\beta < 0$) and the observed increase in concentration can account for most, and perhaps all, of the decline in the labor share.

Table 4 presents the results of regressions of the change in the labor share on the change in industry concentration, as specified in equation 4.1. Column 1 regresses changes in the labor share on a constant and shows that the weighted average decline in the labor share is 0.82 percentage points. Columns 2–5 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 of sales also experience larger declines in the labor share. The slope coefficient is negative and statistically significant in each of the regressions. After controlling for changes in industry concentration, the sales weighted average decline in the labor share is statistically zero and economically small. Table 5 presents the results of the log specification and shows qualitatively similar results. Taken together, the results suggest that the increase in concentration can account for the entire decline in the labor share.

4.4. **Robustness.** One possible concern is that changes in the labor share are driven by business cycle fluctuations, which are correlated with changes in concentration. To address this concern I run a regression specification using all four census years ($k = 5$). The slope coefficients of this specification are presented in Tables 6 and 7 and are statistically indistinguishable from the slope coefficients in the main results. By using more years of data, my results are less likely to be driven by cyclical variation.

Second, 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 tradable industries. To address this concern I repeat the analysis excluding all tradable industries.[21] I find that excluding tradable industries does not alter the results. Furthermore, in the sample of tradable industries there is no cross sectional relationship between changes in measured concentration and changes in the labor share. These results are reported in columns 2 and 3 of Table 8.

Third, in several sectors the census measures concentration separately for tax-exempt firms. This introduces measurement error in the concentration variable. Column 4 of Table 8 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.

Last, 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 an increase in markups. Column 5 of 8 repeats the analysis after excluding R&D intensive industries.[22] I find that excluding these industries does not alter the results.

4.5. **Discussion.** My results show that the decline in the labor share is strongly associated with an increase in concentration. This is consistent with my hypothesis that an increase in markups plays a significant role in the decline of the labor share. Unlike the aggregate results of Section 2, the results of this section do not rely on capital data and are not subject to concerns with the measurement of capital. Using alternative sources of data and variation, this section complements my aggregate findings.

The results of this section are consistent with several price-setting mechanisms. First, the results are consistent with a model in which firms face barriers to entry, where prices are the result of monopolistic competition. An increase in barriers to entry results in higher concentration driven by a decline in the

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

[22] 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).

number of firms, higher markups driven by an increase in prices, and a decline in the labor share. The results are also consistent with a model of a dominant firm and a competitive fringe, where prices are equal to the marginal cost of the firms in the competitive fringe. In such a model, an increase in the productivity of the dominant firm also results in higher concentration driven by the growth of the dominant firm, higher markups driven by a decline in production costs of the dominant firm, and a decline in the labor share. Further research is needed to tell apart these models of competition.

5. Conclusion

In this paper I show that the decline in the labor share over the last 30 years was not offset by an increase in the capital share. I calculate payments to capital as the product of the required rate of return on capital and the value of the capital stock. Using aggregate time series data, I document a large decline in the capital share and a large increase in the profit share in the U.S. non-financial corporate sector over the last 30 years. I show that the decline in the capital share is robust to many calculations of the required rate of return on capital and is unlikely to be driven by unobserved capital. I interpret these results through the lens of a standard general equilibrium model. The model is based on two important assumptions: first, production is homogeneous in capital and labor; second, the static first-order conditions of firms are satisfied, i.e., labor and capital inputs fully adjust to their long run levels. If we accept the assumptions of the model, then we are led to conclude that the decline in the shares of labor and capital are caused by an increase in markups and are an inefficient outcome. I provide reduced form empirical evidence that an increase in markups has played a significant role in the decline in the labor share. The reduced form results rely on cross-sectional variation, rather than time series variation, and do not rely on capital data. Taken as a whole, my results suggest that the decline in the shares of labor and capital are due to an increase in markups and call into question the conclusion that the decline in the labor share is an efficient outcome.

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Figure 1. **The Required Rate of Return on Capital**

The figure shows the required rate of return on capital for the U.S. non-financial corporate sector over the period 1984–2014. The required rate of return on capital is calculated as $R = (i - \mathbb{E}[\pi] + \delta)$. Capital includes both physical capital and intangible capital. The cost of borrowing is set to Moody's Aaa and expected inflation is calculated as a three-year moving average. See Section 2 for further details.

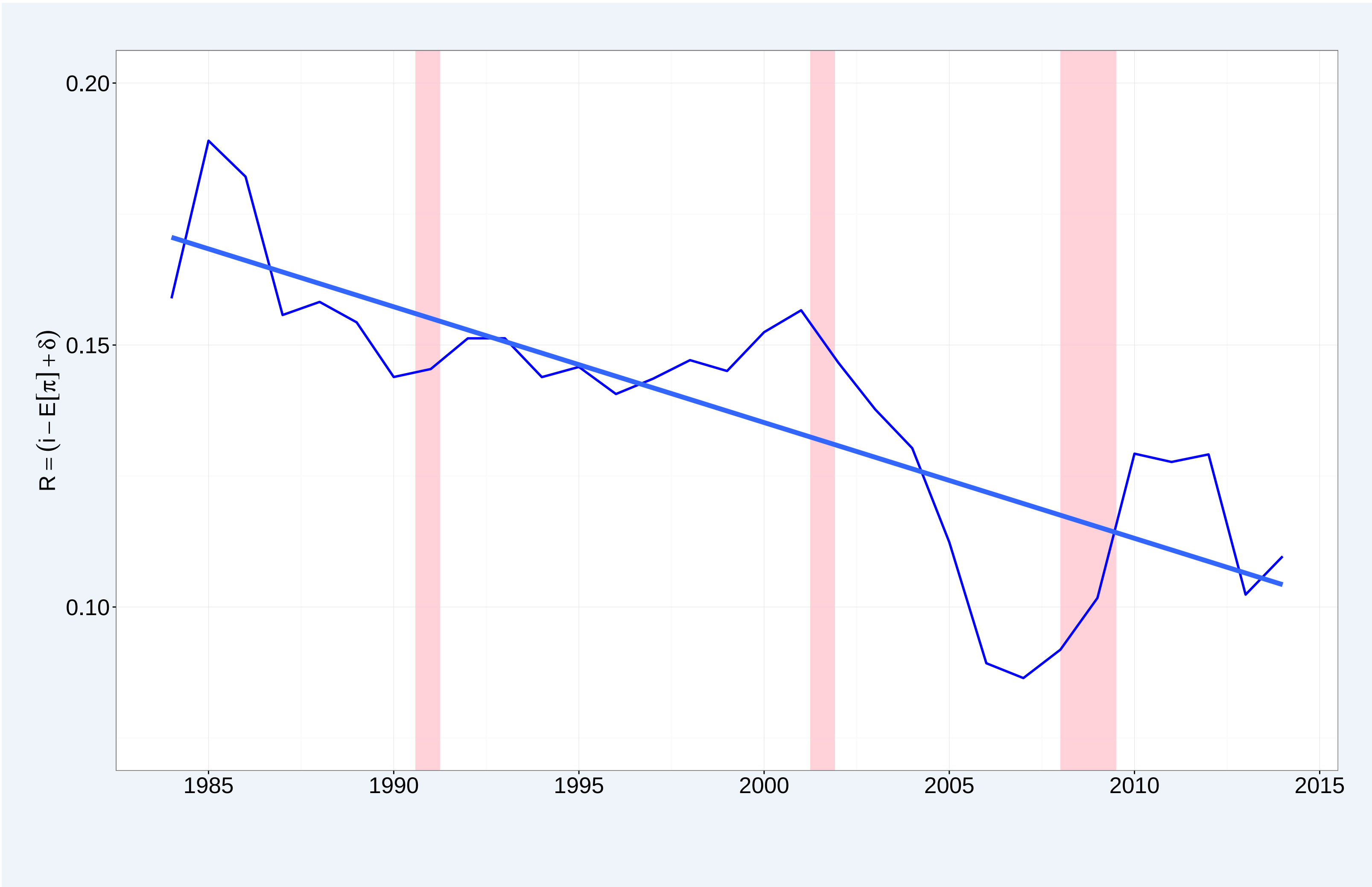

Figure 2. **The Capital Share of Gross Value Added**
The figure shows the capital share of gross value added for the U.S. non-financial corporate sector over the period 1984–2014. Capital payments are the product of the required rate of return on capital and the value of the capital stock. The capital share is the ratio of capital payments to gross value added. The required rate of return on capital is calculated as $R = (i - \mathbb{E}[\pi] + \delta)$. Capital includes both physical capital and intangible capital. The cost of borrowing is set to Moody's Aaa and expected inflation is calculated as a three-year moving average. See Section 2 for further details.

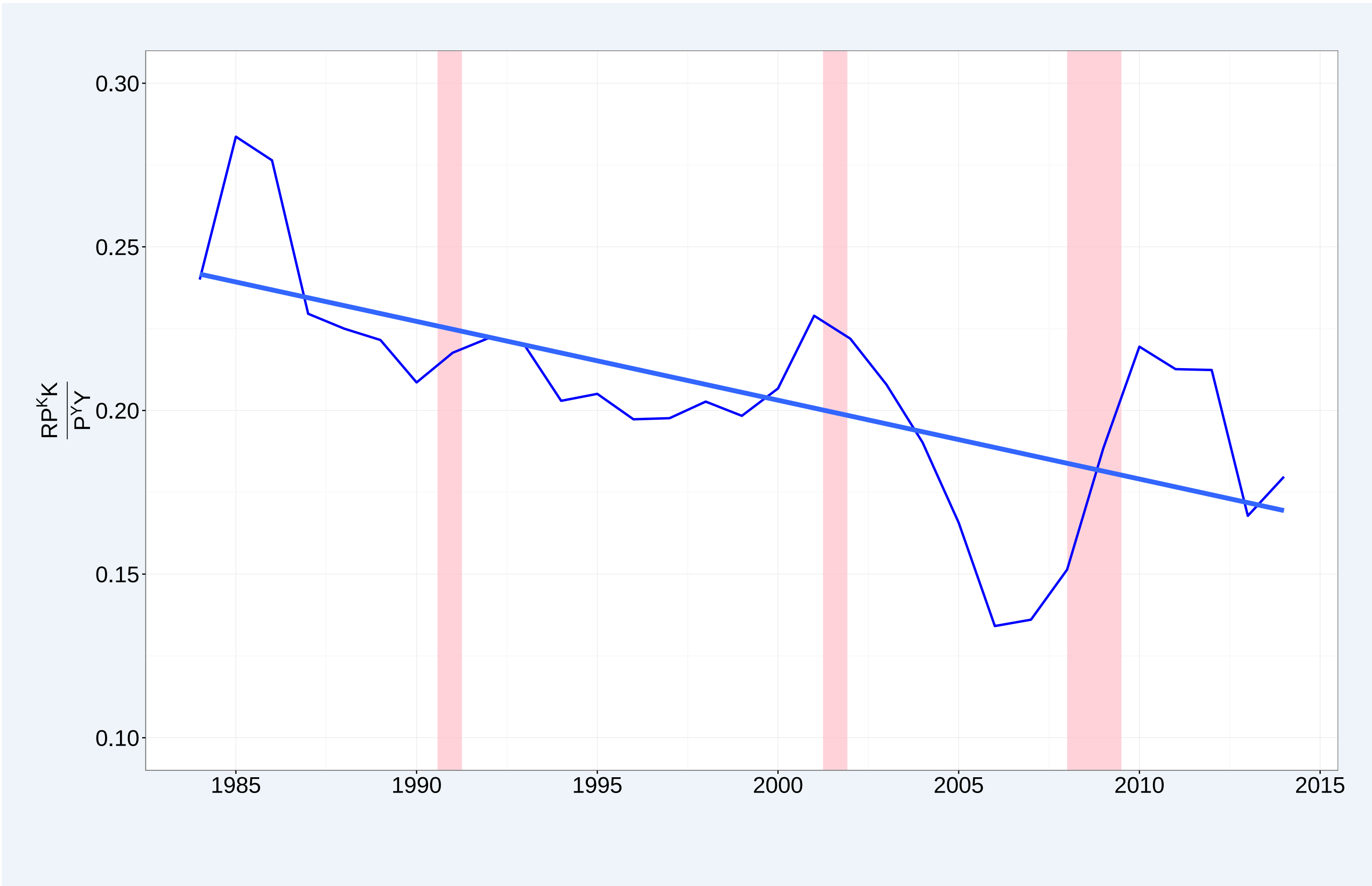

Figure 3. **The Profit Share of Gross Value Added**

The figure shows the profit share of gross value added for the U.S. non-financial corporate sector over the period 1984–2014. Profits are defined as gross operating surplus less total capital payments ($\Pi = P^Y Y - wL - RP^K K$ − taxes on production and imports less subsidies). Capital payments are the product of the required rate of return on capital and the value of the capital stock. The required rate of return on capital is calculated as $R = (i - \mathbb{E}[\pi] + \delta)$. Capital includes both physical capital and intangible capital. The cost of borrowing is set to Moody's Aaa and expected inflation is calculated as a three-year moving average. See Section 2 for further details.

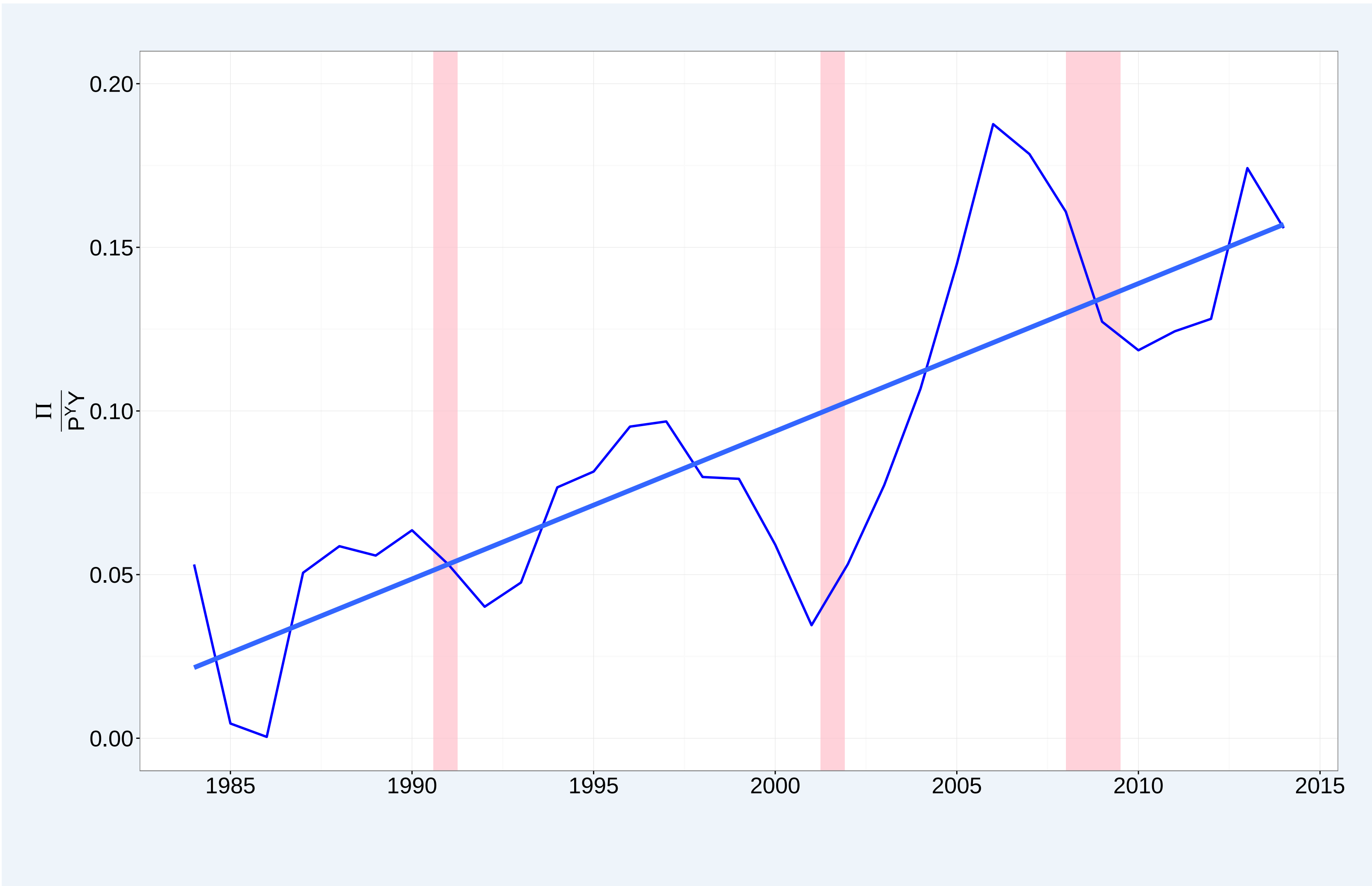

Figure 4. **Break-Even Value of Unobserved Capital**

The figure shows the value of the break-even stock of omitted or unobserved capital, reported as a share of observed gross value added. This break-even stock is a lower bound on the nominal value of the stock of omitted or unobserved capital that rationalizes zero profits. See Section 2.5.1 for details.

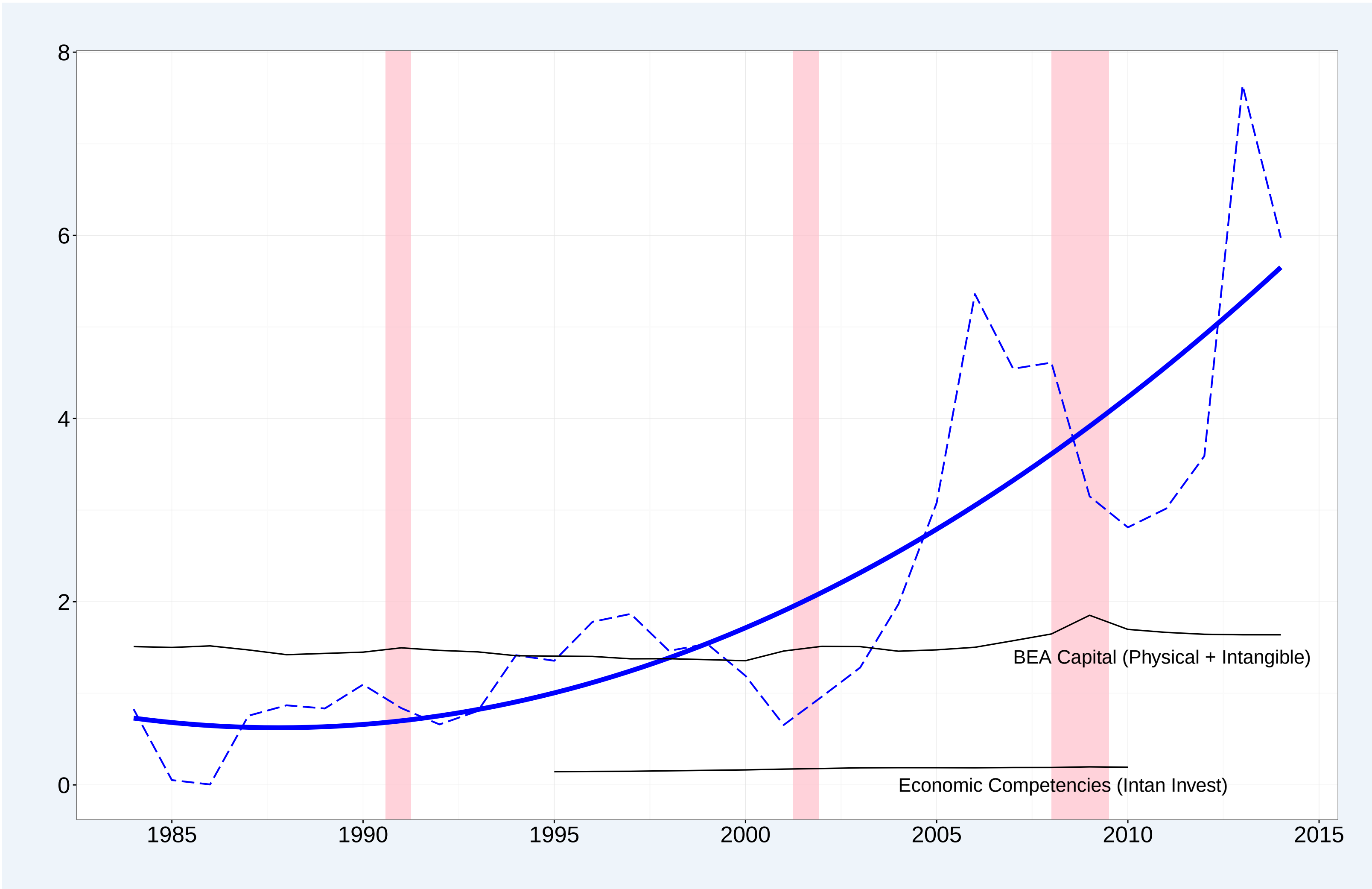

Figure 5. **Debt and Equity Costs of Capital**
This figure plots the debt cost of capital and the equity cost of capital. The debt cost of capital is set to the yield on Moody's Aaa bond portfolio and the equity cost of capital is set to the sum of the risk-free rate (yield on the ten-year treasury) and the equity risk premium (dividend price ratio of the S&P 500). See Section 2.5.2 for further details.

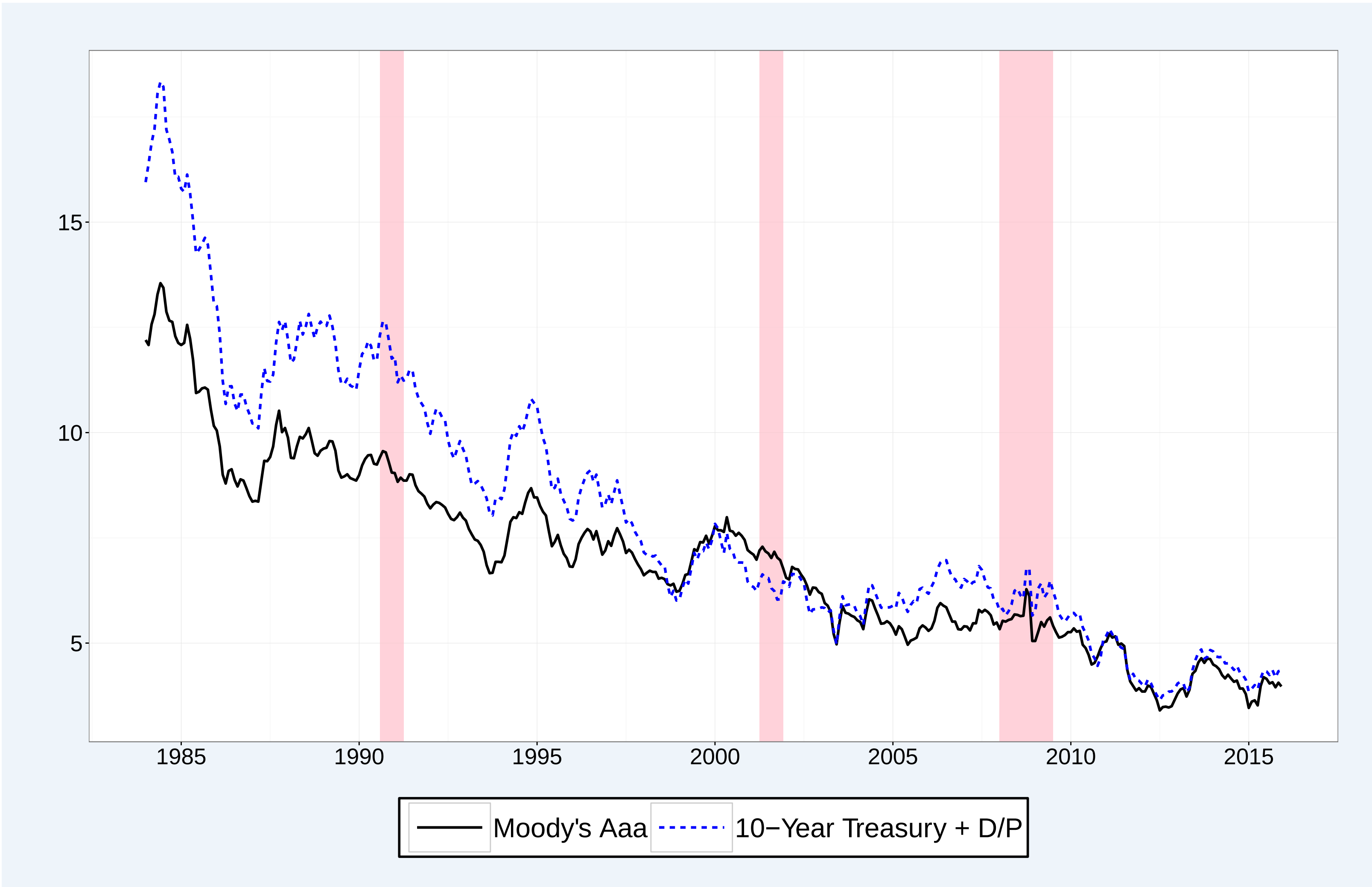

Figure 6. **Alternative Bond Portfolios**
This figure plots the yield on three bond portfolios: Moody's Aaa bond portfolio, Moody's Baa bond portfolio, and the Bank of America Merrill Lynch U.S. Corporate Master Effective bond portfolio. See Section 2.5.2 for further details.

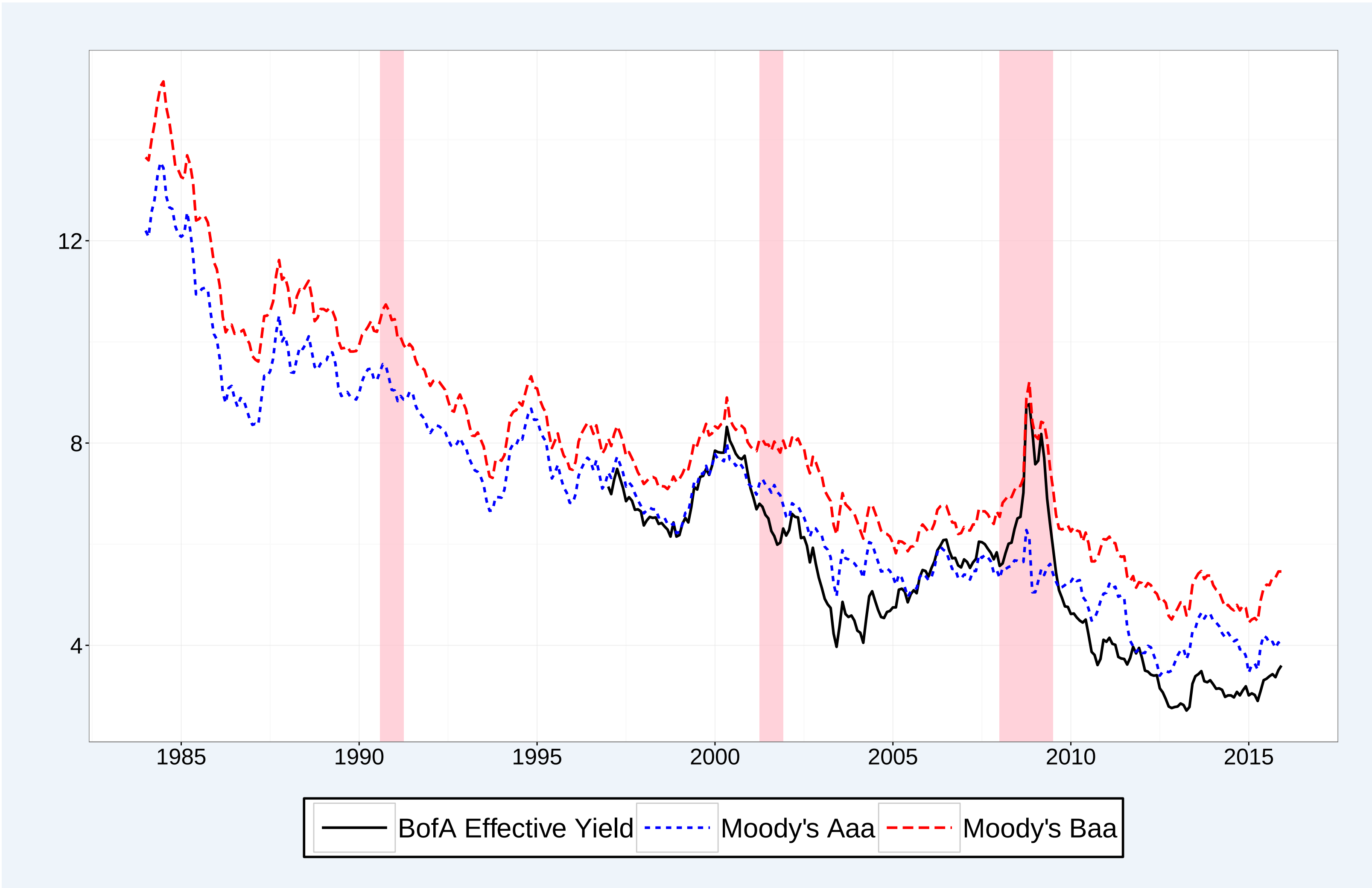

Figure 7. **Ratio of U.S. Corporate Investment to Gross Value Added (KN Replication Data)**
This figure plots the ratio of nominal investment to nominal gross value added in the U.S. corporate sector. Data are taken from Karabarbounis and Neiman's (2014) replication data set (KN). See Section 2.6 for further details.

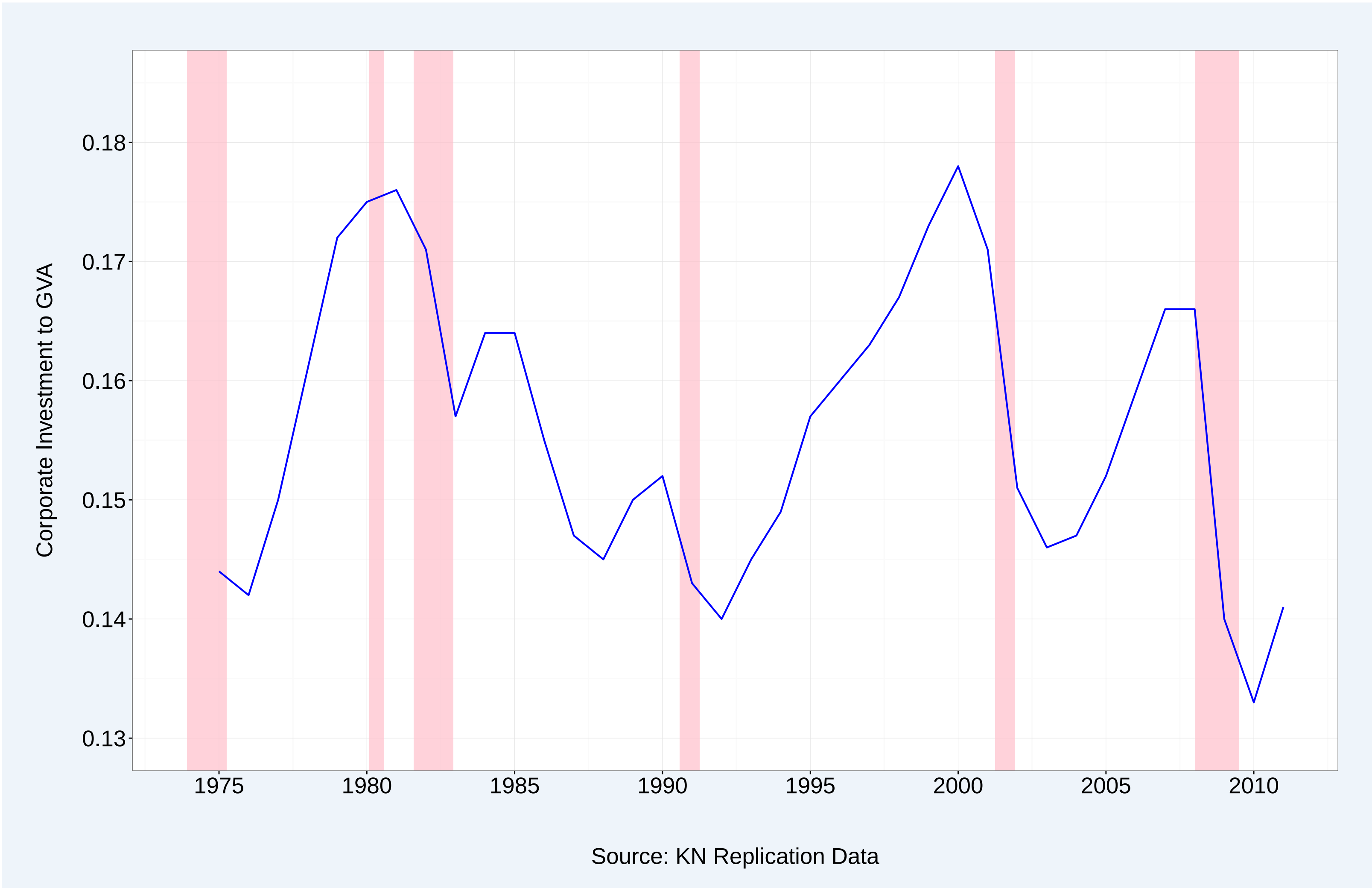

Figure 8. **Ratio of U.S. Corporate Investment to Gross Value Added (NIPA)**
This figure plots the ratio of nominal investment to nominal gross value added in the U.S. corporate sector. Data are taken from the the NIPA. See Section 2.6 for further details.

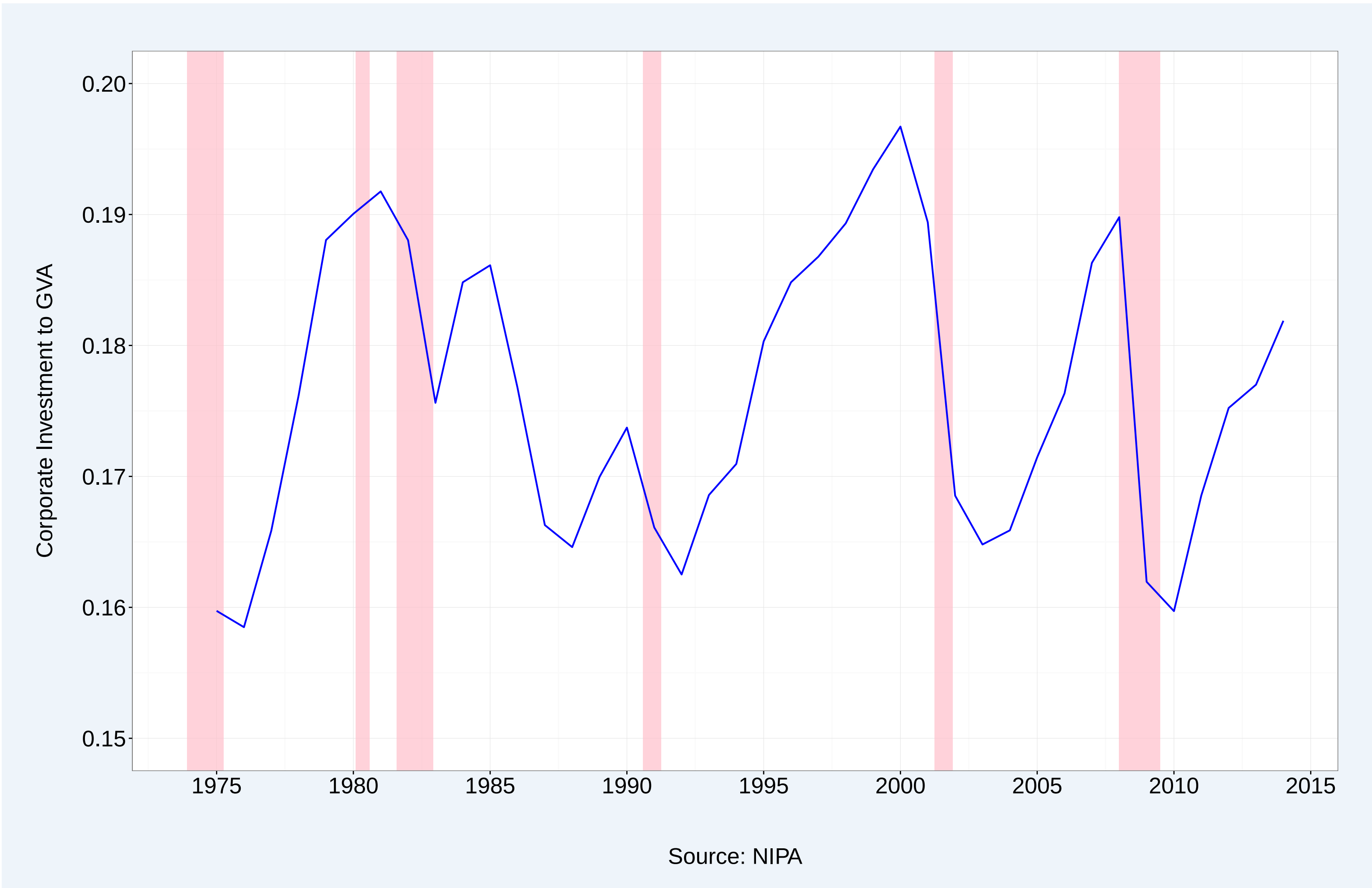

Table 1. **Time Trend of Factor and Profit Shares**
Capital payments are the product of the required rate of return on capital and the value of the capital stock. The capital share is the ratio of capital payments to gross value added. The required rate of return on capital is calculated as $R = (i - \mathbb{E}[\pi] + \delta)$. Capital includes both physical capital and intangible capital. The cost of borrowing is set to the yield on Moody's Aaa and expected inflation is calculated as a three-year moving average. Profits are defined as gross operating surplus less total capital payments ($\Pi = P^Y Y - wL - RP^K K -$ taxes on production and imports less subsidies). See Section 2 for further details.

	Time trend	se	Fitted value in 1984	Fitted value in 2014	Difference
Labor Share	-0.22	(0.03)	65.28	58.60	-6.69
Capital Share (Physical + Intangible)	-0.24	(0.05)	24.17	16.94	-7.22
Profit Share	0.45	(0.06)	2.16	15.70	13.54
Indirect Tax Share	0.01	(0.01)	8.39	8.76	0.37

Table 2. **Ratio of U.S. Corporate Investment to Gross Value Added**
This table reports time trends of the ratio of nominal investment to nominal gross value added in the U.S. corporate sector. Data are taken from Karabarbounis and Neiman's (2014) replication data set (KN) and from the NIPA. See Section 2.6 for further details.

Source	Sample Period	Estimated 10-Year Change (pp)	se
KN Replication Data	1975–2011	-0.18	0.19
KN Replication Data	1975–2008	0.07	0.20
KN Replication Data	1984–2011	-0.09	0.27
KN Replication Data	1984–2008	0.41	0.28
NIPA	1975–2015	0.01	0.15
NIPA	1975–2011	-0.01	0.18
NIPA	1975–2008	0.20	0.19
NIPA	1984–2011	-0.05	0.26
NIPA	1984–2008	0.32	0.29

Table 3. **Descriptive Statistics**
This table reports descriptive statistics of my sample of census industries. Data on industry payrolls, sales and concentration are taken from the economic census. The unit of observation is a six-digit NAICS industry. See Section 4.1 for further details.

	N	median	mean	sd
Value in 1997				
Labor share of sales	750	19.80	21.47	11.87
Sales share of largest 4 firms	748	25.95	30.57	20.87
Sales share of largest 8 firms	747	37.40	40.09	24.62
Sales share of largest 20 firms	750	43.95	46.30	24.85
Sales share of largest 50 firms	749	51.00	52.49	25.18
Value in 2012				
Labor share of sales	750	17.70	20.28	12.88
Sales share of largest 4 firms	748	32.50	35.85	21.78
Sales share of largest 8 firms	747	44.10	45.86	24.72
Sales share of largest 20 firms	750	51.65	52.25	24.77
Sales share of largest 50 firms	749	57.80	58.11	24.83
Change in value				
Labor share of sales	750	-1.41	-1.19	5.90
Sales share of largest 4 firms	748	4.15	5.28	12.10
Sales share of largest 8 firms	747	4.70	5.77	11.80
Sales share of largest 20 firms	750	4.95	5.94	11.49
Sales share of largest 50 firms	749	4.70	5.62	10.95
Log change in value				
Labor share of sales	750	-0.08	-0.10	0.28
Sales share of largest 4 firms	748	0.17	0.21	0.46
Sales share of largest 8 firms	747	0.13	0.18	0.38
Sales share of largest 20 firms	750	0.11	0.16	0.31
Sales share of largest 50 firms	749	0.09	0.13	0.26

Table 4. **Labor Share on Industry Concentration – Regression in First Difference**
The table reports results of regression of changes in the labor 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 in the 2012 census. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales and concentration are taken from the economic census. See Section 4.2 for further details.

	Dependent variable:				
	$S^L_{j,2012} - S^L_{j,1997}$				
	(1)	(2)	(3)	(4)	(5)
$C^{(4)}_{j,2012} - C^{(4)}_{j,1997}$		-0.109^{***}			
		(0.027)			
$C^{(8)}_{j,2012} - C^{(8)}_{j,1997}$			-0.099^{***}		
			(0.027)		
$C^{(20)}_{j,2012} - C^{(20)}_{j,1997}$				-0.095^{***}	
				(0.028)	
$C^{(50)}_{j,2012} - C^{(50)}_{j,1997}$					-0.101^{***}
					(0.028)
Constant	-0.818^{***}	-0.010	0.051	0.177	0.218
	(0.186)	(0.415)	(0.416)	(0.429)	(0.439)
Observations	750	748	747	750	749
R^2	0.000	0.060	0.052	0.051	0.056
Adjusted R^2	0.000	0.059	0.051	0.050	0.054

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5. **Labor Share on Industry Concentration – Regression in Log Difference**
The table reports results of regression of log changes in the labor on log changes in industry concentration. The unit of observation is a six-digit NAICS industry. Observations are weighted by an industry's share of sales in the 2012 census. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales and concentration are taken from the economic census. See Section 4.2 for further details.

	Dependent variable:				
	$\log S^L_{j,2012} - \log S^L_{j,1997}$				
	(1)	(2)	(3)	(4)	(5)
$\log C^{(4)}_{j,2012} - \log C^{(4)}_{j,1997}$		-0.287^{***}			
		(0.043)			
$\log C^{(8)}_{j,2012} - \log C^{(8)}_{j,1997}$			-0.280^{***}		
			(0.047)		
$\log C^{(20)}_{j,2012} - \log C^{(20)}_{j,1997}$				-0.467^{***}	
				(0.073)	
$\log C^{(50)}_{j,2012} - \log C^{(50)}_{j,1997}$					-0.627^{***}
					(0.100)
Constant	-0.219^{***}	-0.120^{***}	-0.136^{***}	-0.091^{***}	-0.078^{***}
	(0.018)	(0.021)	(0.022)	(0.023)	(0.024)
Observations	750	748	747	750	749
R^2	0.000	0.077	0.055	0.102	0.126
Adjusted R^2	0.000	0.076	0.053	0.101	0.125

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6. **Regression in First Difference – All Census Years**
The table reports results of regression of changes in the labor on changes in industry concentration. The unit of observation is a six-digit NAICS industry. The regressions include data from all four census years (1997, 2002, 2007, 2012). Observations are weighted by an industry's share of sales in each census year. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales and concentration are taken from the economic census. See Section 4.2 for further details.

	Dependent variable:			
	$S^L_{j,t} - S^L_{j,1997}$			
	(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)		
$C^{(20)}_{j,t} - C^{(20)}_{j,t-5}$			-0.121^{***}	
			(0.029)	
$C^{(50)}_{j,t} - C^{(50)}_{j,t-5}$				-0.129^{***}
				(0.033)
Year FE	Yes	Yes	Yes	Yes
R^2 (Within)	0.07	0.06	0.07	0.06
Observations	2,224	2,227	2,231	2,232

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7. **Regression in Log Difference – All Census Years**
The table reports results of regression of log changes in the labor on log changes in industry concentration. The unit of observation is a six-digit NAICS industry. The regressions include data from all four census years (1997, 2002, 2007, 2012). Observations are weighted by an industry's share of sales in each census year. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales and concentration are taken from the economic census. See Section 4.2 for further details.

	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)			
$\log C^{(8)}_{j,t} - \log C^{(8)}_{j,t-5}$		-0.243^{**}		
		(0.110)		
$\log C^{(20)}_{j,t} - \log C^{(20)}_{j,t-5}$			-0.333^{**}	
			(0.147)	
$\log C^{(50)}_{j,t} - \log C^{(50)}_{j,t-5}$				-0.450^{**}
				(0.180)
Year FE	Yes	Yes	Yes	Yes
R^2 (Within)	0.07	0.06	0.07	0.08
Observations	2,224	2,227	2,231	2,232

Note: *p<0.1; **p<0.05; ***p<0.01

Table 8. **Labor Share on Industry Concentration – By Subsample**
The table reports results of regression of changes in the labor 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 in 2012. Standard errors are clustered by three-digit NAICS industry. Data on industry payrolls, sales and concentration are taken from the economic census. 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 4.4 for further details.

	Dependent variable:				
	$S^L_{j,2012} - S^L_{j,1997}$				
	Full Sample	Excluding Tradables Industries	Tradable Industries	Excluding Sectors with Tax-Exempt Firms	Excluding R&D Industries
	(1)	(2)	(3)	(4)	(5)
$C^{(4)}_{j,2012} - C^{(4)}_{j,1997}$	-0.109^{***}	-0.152^{***}	0.011	-0.132^{***}	-0.118^{***}
	(0.027)	(0.027)	(0.026)	(0.024)	(0.029)
Constant	−0.010	0.720^{*}	-2.359^{***}	0.346	0.168
	(0.415)	(0.375)	(0.446)	(0.429)	(0.480)
Observations	748	506	242	677	675
R^2	0.060	0.097	0.003	0.081	0.069
Adjusted R^2	0.059	0.095	−0.001	0.080	0.068

Note: *p<0.1; **p<0.05; ***p<0.01