Is Labor's Loss Capital's Gain?

Gross versus Net Labor Shares

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September 2014

Abstract

Labor share has been falling since the 1970s. I show that U.S. labor share has not fallen as much once items that do not add to capital, depreciation and production taxes, are netted out. Recent net labor share is within its historical range whereas gross share is at its lowest level. This effect holds for other countries, even reversing the direction of labor share in some cases. The overall picture is no longer one of globally declining labor share.

JEL classification: E2, J3.

Keywords: Labor share; Depreciation; Taxes

*I thank Bart Hobijn, Loukas Karabarbouris, Brent Neiman, Erick Sager and seminar participants at the NBER Summer Institute and Bureau of Labor Statistics for comments. The views expressed in this paper are solely those of the author and not necessarily those of the U.S. Bureau of Economic Analysis or the U.S. Department of Commerce. Address: U.S. Department of Commerce, Bureau of Economic Analysis, Washington, DC 20230. email: Benjamin.Bridgman@bea.gov. Tel. (202) 606-9991. Fax (202) 606-5366.

1 Introduction

After a long period of stability, labor's share of national income has been falling. Karabarbounis & Neiman (2014) and Elsby, Hobijn & Sahin (2013) document a widespread fall in labor share since the 1970s. There is concern that this phenomenon is related to increasing inequality since capital ownership tends to be concentrated (Jacobson & Occhino 2012). It is a central object in the controversy over the Piketty (2014) analysis of inequality. Determining the cause of this change is important to guiding policy response. If it is related to policy changes, such as trade liberalization (Harrison 2005) or changes in labor market institutions that reduce workers' bargaining power (Blanchard & Giavazzi 2003), policymakers may be able to counteract the decline.

However, a fall in labor share may not mean capital owners are gaining. There is a portion of production, taxes on production and depreciation, that accrues to neither labor nor capital but is included in output. Work so far has focussed on gross labor share. If depreciation rates and taxes are constant, using gross and net returns will tell the same story. However, there is reason to believe that has not been the case recently. For example, computers and other Information Technology (IT) capital have high depreciation rates. Paying for depreciation only returns the economy to its previous production possibilities. Given the increasing importance of IT, Diewert & Fox (2005) argue that output net of depreciation is a more appropriate measure. Using net production only includes output which can be used for current consumption or expanding future production.

This paper explores the degree to which changes in depreciation and taxes can explain declining labor share. I begin by showing theoretically how changes in these variables affect gross labor share. Increases in production taxes reduce gross labor share, a finding that holds even if the underlying technology is Cobb-Douglas. I also show how lower equipment prices can increase depreciation and reduce gross labor share. Lower prices lead firms to buy more equipment, which depreciates faster other capital. This shift increases both capital and depreciation shares of output. While net labor share falls, it falls by less than gross share. Movements in gross share overstate how much more income accrues to capital.

I then examine empirical labor share netting out these terms. I find that the adjusted U.S. labor share falls much less than gross labor share. From 1975 to 2011, gross labor share fell 9 percent while net share only fell 6 percent. In addition, the time series pattern gives a different view of history. While gross labor share is at its lowest recorded level, net labor share was at its 1975 level as recently as 2008.

This observation holds for a set of other countries selected for their size or their large declines in gross labor share. In some cases, the direction of the movements in share is reversed: net labor share increases while gross share declines. Even when the decline holds up, movements in net share are generally muted.

This explanation is consistent with other correlations in the literature. For example, Harrison (2005) finds a correlation between falling labor share and imports. If exposure to imports leads to increased use of IT capital, as found by Bloom, Draca & Van Reenen (2011) and Autor, Dorn & Hanson (2013), the model's mechanism would generate this correlation. IT capital may also explain the correlation between falling labor share and inequality if IT capital is complementary to skilled labor.

Labor share has been a topic of interest all the way back to the early days of national accounting. Properly measuring labor share touches nearly every area of macroeconomics, extending to modeling monetary policy (Lawless & Whelan 2011) and labor markets (Caballero & Hammour 1998). Famously, the stability of the labor share is one of the Kaldor facts (Kaldor 1957). There are a number of papers beyond the recent controversy that examine changes in labor share. A debate in the 1950s and 1960s centered on what accounted for *increasing* labor share (Solow 1958, Kravis 1959, Ferguson & Moroney 1969). A more recent literature has attempted to explain the variation of labor share over the business cycle (Rios-Rull & Santaeulalia-Llopis 2010, Shao & Silos 2014).

This paper is not the first to deduct taxes and depreciation from labor share. For example, Guerriero (2012) and Qi (2014) make these deductions. This paper differs in that it shows theoretically how shifts in depreciation and gross share are linked and examines the empirical impact of these deductions directly. Gomme & Rupert (2004) note that changes in labor share may simply reflect changes in net production taxes, but do not examine its empirical impact.

2 Model

This section sets out a simple model that shows the impact of taxes and depreciation rates on labor share. It is a standard growth model, augmented with two types of capital with different depreciation rates and different investment productivities.

2.1 Households

There is a representative household with preferences represented by the utility function:

$$\sum_{t=0}^{\infty} \beta^t \log(C_t) \tag{1}$$

where C_t is consumption. The household is endowed with one unit of labor N_t in each period.

2.2 Production

The representative firm's output is given by $Y(t)$ and is produced by a CES production function with labor augmenting technical change:

$$Y_t \leq [\alpha^s (K_t^s)^{\frac{\sigma-1}{\sigma}} + \alpha^e (K_t^e)^{\frac{\sigma-1}{\sigma}} + (1 - \alpha^s - \alpha^e)(A_t N_t)^{\frac{\sigma-1}{\sigma}}]^{\frac{\sigma}{\sigma-1}} \tag{2}$$

where K_t^s and K_t^e are low and high depreciation capital respectively: $\delta^e > \delta^s$. (Following Krusell, Ohanian, Ros-Rull & Violante (2000), s refers to structures and e to equipment.) I assume that $\sigma > 0$.

2.3 Investment

Output can be used for investment or consumption:

$$C_t + X_t^s + X_t^e \leq Y_t \tag{3}$$

Investment X_t^j is converted into new capital I_t^j with the technology $I_t^j = B_t^j X_t^j$ for $j \in \{s, e\}$. The laws of motion for capital $j \in \{s, e\}$ are:

$$K_{t+1}^j \leq K_t^j(1 - \delta^j) + I_t^j \tag{4}$$

2.4 Taxes

There is a tax on output τ_t. Dividends are given by:

$$D_t = Y_t - p_t^s I_t^s - p_t^e I_t^e - w_t N_t - \tau_t Y_t \tag{5}$$

where p_t^j is the price of each investment good. Tax revenue is rebated to the household in a lump sum transfer T_t. The government balances its budget each period.

2.5 Equilibrium

The representative household's problem is to maximize utility (Equation 1) subject to the budget constraint

$$\sum_{t=0}^{\infty} p_t C_t \leq \sum_{t=0}^{\infty} p_t \{\sum_j D_t + w_t N_t + T_t\} \tag{6}$$

where p_t^j is the price of output. The firm's problem is to maximize $\sum_{t=0}^{\infty} p_t D_t$, where D_t is given by equation 5, subject to the laws of motion on capital (Equation 4). For each type of capital, the new capital firm's problem is

$$\max p_t^j B_t^j X_t^j - X_t^j \tag{7}$$

The definition of equilibrium is standard.

Definition 2.1. *An equilibrium is sequences of prices* $\{p_t, p_t^s, p_t^e, w_t\}$ *and quantities* $\{Y_t, C_t, K_t^s, K_t^e, I_t^s, I_t^e, X_t^s, X_t^e, D_t, N_t\}$ *such that*

1. *Households choose* $\{C_t\}$ *to solve their problem,*

2. *Output firms choose* $\{I_t^s, I_t^e, D_t, N_t\}$ *to solve their problem,*

3. *Capital firms choose* $\{X_t^s, X_t^e\}$ *to solve their problem.*

4. *Allocations are feasible.*

A balanced grow path does not exist for this model except under narrow restrictions. Either the production function is Cobb-Douglas ($\sigma = 1$) or there is no technical change in investment ($B_t^j = \overline{B}^j$ for all t). As a baseline, I impose the second restriction and compare balanced growth paths for different initial conditions. This method shows the mechanism of the model without bogging down in the details of non-balanced growth. These growth paths can be thought of as end points of a transition between balanced growth paths. This strategy was used by He & Liu (2008) to analyze the Krusell et al. (2000) model. I also examine how the results change with non-balanced growth.

3 Theory Results

This section shows how changes in production taxes and depreciation impact labor share in the model. I concentrate on the empirically relevant case where equipment prices decline and compare movements in gross and net labor shares.

3.1 Model Labor Share

To generate the expression for labor share, it is convenient to solve the dual cost minimization problem. Taking factor prices r_t^s, r_t^e, w_t and the level of output $\overline{Y}$ as given, the firm minimizes cost:

$$\min_{K_t^s, K_t^e, N_t} r_t^s K_t^s + r_t^e K_t^e + w_t N_t \text{ s.t. } (1-\tau_t) Y(K_t^s, K_t^e, N_t) \geq (1-\tau_t)\overline{Y} \tag{8}$$

The first order conditions of an interior solution are:

$$r_t^j = (1 - \tau_t)\alpha^j (\frac{Y_t}{K_t^j})^{\frac{1}{\sigma}} \tag{9}$$

for capital types $j \in \{s, e\}$ and

$$w_t = (1 - \tau_t)(1 - \alpha^e - \alpha^s)(A_t)^{\frac{\sigma-1}{\sigma}} (\frac{Y_t}{N_t})^{\frac{1}{\sigma}} \tag{10}$$

Let θ^i be the income share for factor $i \in \{e, s, n\}$. Each capital share is given by $\theta^j = (r_t^j K_t^j)/Y_t$ for $j = e, s$ and labor share by $\theta_t^n = (w_t N_t)/Y_t$.

Using Equation 10, labor share is:

$$\theta_t^n = (1 - \tau_t)(1 - \alpha^e - \alpha^s)(\frac{A_t N_t}{Y_t})^{\frac{\sigma-1}{\sigma}} \tag{11}$$

3.2 Taxes

By inspection of Equation 11, taxes have a direct impact on measured labor share. Increased taxes reduce measured labor share. This is true even if the production function is Cobb-Douglas ($\sigma = 1$), where (properly measured) factor shares are constant. In that case, $\theta_t = (1 - \tau_t)(1 - \alpha^e - \alpha^s)$.

Taxes have the same effect on capital share if it is properly measured. Empirical work often calculates labor share directly and while capital share is the residual. In this case, taxes are implicitly attributed to capital share.

3.3 Depreciation

This section investigates the relationship between depreciation and labor shares. Motivated by Karabarbounis & Neiman (2014) and Elsby et al. (2013), who find a correlation between capital prices and falling gross labor share, I show how productivity improvements in the equipment production (hence lower prices) can increase both depreciation and capital share. I show that depreciation and labor share move in opposite directions. In this case, labor share net of depreciation falls less than gross labor share.

In what follows, there is no technical change in structures investment: $B_t^s = 1$ for all t. Following Hall & Jorgenson (1967), the rental rate of capital is:

$$r_t^e = p_{t-1}^e[\frac{p_{t-1}}{p_t} - \frac{p_t^e}{p_{t-1}^e}(1-\delta^e)] \tag{12}$$

The solution to the new equipment goods firm's problem (Equation 7) implies $p_t^e = 1/B_t^e$. From the solution to the household's problem, we have $p_{t-1}/p_t = (1+\gamma_t^c)/\beta$. Combining yields:

$$r_t^e = \frac{1}{B_{t-1}^e}[\frac{1+\gamma_t^c}{\beta} - \frac{B_{t-1}^e}{B_t^e}(1-\delta^e)] \tag{13}$$

Combining this expression with the solution to the dual problem (Equation 9), the capital-output ratio is given by:

$$\frac{K_t^e}{Y_t} = [\frac{(1-\tau_t)\alpha^e B_{t-1}^e}{\frac{1+\gamma_t^c}{\beta} - \frac{1-\delta^e}{1+\gamma_t^e}}]^\sigma \tag{14}$$

where $1+\gamma_t^e = B_t^e/B_{t-1}^e$. The depreciation share of output is given by:

$$\frac{\sum_j \delta^j p^j K_t^j}{Y_t} = \frac{\delta^e}{(B_{t-1}^e)^{1-\sigma}(1+\gamma_t^e)}[\frac{(1-\tau_t)\alpha^e}{\frac{1+\gamma_t^c}{\beta} - \frac{1-\delta^e}{1+\gamma_t^e}}]^\sigma + \delta^s[\frac{(1-\tau_t)\alpha^s}{\frac{1+\gamma_t^c}{\beta} - 1 + \delta^s}]^\sigma \tag{15}$$

I begin the analysis by shutting down technical change in equipment and comparing balanced growth paths as a function of initial productivity B_0^e. The following proposition establishes that depreciation and labor shares move in opposite directions in response to changes in equipment investment productivity.

Proposition 3.1. *Let $\gamma_t^e = 0$ for all t. If $\sigma > 1$, larger B_0^e implies higher depreciation share $(\sum_j \delta^j p^j K_t^j)/Y_t$ and lower labor share θ^n on the balanced growth path.*

Proof. Since $\gamma_t^e = 0$, the depreciation share of output simplifies to:

$$\frac{\sum_j \delta^j p^j K_t^j}{Y_t} = \frac{\delta^e}{(B_0^e)^{1-\sigma}}[\frac{(1-\tau_t)\alpha^e}{\frac{1+\gamma^c}{\beta} - 1 + \delta^e}]^\sigma + \delta^s[\frac{(1-\tau_t)\alpha^s}{\frac{1+\gamma^c}{\beta} - 1 + \delta^s}]^\sigma \tag{16}$$

The growth rate of the economy γ^c is given by the growth rate of labor augmenting technical change, so it is not affected by B_0^e. Therefore, depreciation share increases if $(1/B_0^e)^{1-\sigma}$ increases, which is true if $\sigma > 1$.

To establish the second claim, note capital share is given by:

$$\sum_{j\in\{e,s\}} \theta_t^j = (1-\tau_t) \sum_{j\in\{e,s\}} \alpha^j (\frac{K_t^j}{Y_t})^{\frac{\sigma-1}{\sigma}} \tag{17}$$

On the balanced growth path, this expression becomes (using Equation 14):

$$\sum_{j\in\{e,s\}} \theta_t^j = (1-\tau_t) \sum_{j\in\{e,s\}} \alpha^j [\frac{(1-\tau_t)\alpha^j B_0^j}{\frac{1+\gamma^c}{\beta} - 1 + \delta^j}]^{\sigma-1} \tag{18}$$

Capital share increases if $(B_0^e)^{\sigma-1}$ increases, which is true if $\sigma > 1$. An increase in capital share (properly measured) implies a decline in labor share.

□

The proposition shows that if labor share is falling due to improved equipment investment productivity, then the gap between gross and net output is increasing. The intuition is simple: A lower equipment investment price will lead to increasing (real) holdings of equipment capital. Since equipment has higher depreciation rates, depreciation's share of output increases.

This intuition is complicated when we evaluate these comparisons in nominal values, as is typically done in examining factor shares. While real equipment holdings increase, the prices fall. Which force is stronger depend on the elasticity σ. If $\sigma > 1$, then the real capital effect is stronger than the price effect and both depreciation and capital share increase.

A corollary of this result is that labor share net of depreciation falls less than gross labor share. If *Depr* is the depreciation share of output, the net share is given by:

$$\theta_t^{n,net} = \frac{w_t N_t}{Y_t(1-Depr)} = \frac{\theta_t^n}{(1-Depr)} \tag{19}$$

If gross labor share falls and depreciation share of output increases ($\sigma > 1$), the change in net labor share from an increase in B_0^e to $B_0^{e,\prime}$ is:

$$\frac{\theta^{n,net,\prime}}{\theta^{n,net}} = \frac{\theta^{n,\prime}(1-Depr)}{\theta^n(1-Depr^\prime)} \tag{20}$$

Since $Depr < Depr^\prime$, we have

$$\frac{\theta^{n,net,\prime}}{\theta^{n,net}} > \frac{\theta^{n,\prime}}{\theta^n} \tag{21}$$

Since some of the increased payments to capital are increasing depreciation, factor shares do not move as much once the depreciation term is netted out. Since labor share and depreciation move in opposite directions, the dampening effect also applies to changes that increase labor share and lower depreciation.

Up to this point, we have concentrated on comparing balanced growth paths. The forces identified in the previous analysis hold up when looking at non-balanced growth, though there are additional complications. Suppose equipment investment technology grows at a constant rate: $B_t^e = (1+\gamma^e)^t$. The rate of return is given by

$$r_t^e = \frac{1}{(1+\gamma^e)^{t-1}}[\frac{1+\gamma_t^c}{\beta} - \frac{1-\delta^e}{1+\gamma^e}] \tag{22}$$

The impact of faster technological growth on the rate of return is:

$$\frac{\partial r_t^e}{\partial \gamma^e} = \frac{(t-2)(1-\delta^e)}{(1+\gamma^e)^{t+1}} - \frac{1+\gamma^c}{\beta(1+\gamma^e)^t} + \frac{\partial \gamma^c}{\partial \gamma^e}\frac{1}{\beta(1+\gamma^e)^{t-1}} \tag{23}$$

The second term is the analogue of the previous analysis: Lower investment prices lower the rental rate of that capital. We now have two additional terms pushing rates up. The first term in the expression reflects the capital losses of holding capital that is declining in value. Capital owners must be compensated for these losses. Since $1+\gamma_t^c > \beta$ and $1-\delta^e < 1+\gamma^e$, the net effect of these first two terms is negative. Therefore, the direct effect of improvements in equipment productivity continue to lower its rental rate.

The final term more ambiguous. The economy can grow faster with improvements in the investment technology. This effect pushes up consumption growth, which increases the rate of return. As long as this effect is not too strong, higher investment technological growth γ^e leads to lower gross returns r_t^e. The previous analysis then goes through: Lower equipment rental rates lead to equipment capital deepening. If $\sigma > 1$, capital deepening is stronger than the price decline and depreciation share rises.

An important question is what is the empirical value of σ? The relative price of equipment has fallen rapidly, suggesting the rental rate has fallen. Using a similar model, Karabarbounis & Neiman (2014) use labor share and capital prices to estimate σ and find a value of

1.25. At this value, the model predicts a decline in labor share. However, in the estimates surveyed by Leon-Ledesma, McAdam & Willman (2010), most fall within the 0.5 to 0.8 range for CES with factor augmenting technical change. In this case, a lower rental rate implies that labor share increases.

How can we reconcile these estimates? Even within the survey in Leon-Ledesma et al. (2010), there are estimates above one. Another possibility is that labor is heterogeneous. Krusell et al. (2000) find that equipment's elasticity with respect to skilled labor is well below one (0.67) while it is well above one with respect to unskilled labor (1.67). Pooling the two types of labor could lead to an aggregate elasticity below one. Eden & Gaggl (2014) implement such a model and find that falling prices explain IT capital deepening. In any case, the reduction of net product due to increasing depreciation is broader than the price decline mechanism in the model. Alternative mechanisms that generate a shift to higher depreciation capital and an increase in gross capital share will feature more muted movements in net labor share.

4 Model to Data

This section explains the adjustments to labor share I make in the empirical section. It reports the formulae used and the theoretical basis for the adjustments.

4.1 National Accounting vs. the Model

I begin by linking the returns to capital in the model to national accounting conventions. While the two are closely related, there are some differences between the returns a capital owner receives and capital share as it is typically calculated.

In the National Income and Product Accounts (NIPAs), Gross Value Added (GVA) is made up of three components: Gross Operating Surplus (GOS), Labor Compensation ($Comp$) and Production and Import Taxes less Subsidies (Tx): $GVA_t = GOS_t + Comp_t + Tx_t$. The model's analogue of $Comp_t$ is given by wage payments $w_t N_t$ and Tx by $\tau_t Y_t$. Gross Operating

Surplus is the remainder of output: $GOS_t = (1 - \tau_t)Y_t - w_t N(t)$.

4.1.1 Taxes

While *Comp* is clearly a return to labor and *GOS* a return to capital, the tax term Tx is ambiguous. The NIPAs attempt to measure pre-tax income. However, Tx measures taxes that are incurred during the production process so it is not clear which factor pays for them. As result, they are held out as a separate term. These taxes do not include corporate or personal income taxes. Labor and profit taxes are allocated to labor and capital respectively.

4.1.2 Depreciation

I remove depreciation since paying for it only returns the economy to the production possibilities of the previous period. Using net production thus only includes output which can be used for current consumption or expanding future production.

Beginning with Weitzman (1976), a large literature has shown that changes in net product are proportional to changes in welfare[1]. The intuition for the result is the following. The household's welfare is determined by the stream of consumption goods it consumes. Closed economy net domestic product (NDP) can be written as $NDP = C_t + \sum_i r_t^i (K_{t+1}^i - K_t^i)$. For net product to increase, either current consumption C_t or net investment $\sum_i r_t^i (K_{t+1}^i - K_t^i)$ must increase. Increasing current consumption clearly increases welfare. Higher net investment increases the ability of the economy to produce consumption in the future. The Weitzman (1976) result shows that the current value of net investment is a proxy for the net present value to consumption[2].

[1] For example, see Weitzman & Asheim (2001) and Hulten & Schreyer (2010).

[2] There is a significant literature dealing with the technical issues of extending this result to more general environments, such as those with population growth or technical change. For our purposes, it is sufficient to note that net income is a better approximation of welfare than the gross measure. Even critiques of this literature, like Dasgupta (2009), agree that depreciation should be deducted.

Whether depreciation should be deducted depends on the purpose of measuring labor share. Hulten (1992) shows net product is the appropriate measure for questions related to welfare, while gross product is appropriate for productivity measurement. The labor share literature has been motivated by welfare related questions such as inequality, so the net measure is the correct one.

Changes to taxes and depreciation have different implications for the aggregate economy. Depreciation represents a loss of future production, so its increase is a drain on the economy. In contrast, taxes are resources that can be used for consumption or investment. They are a problem for measuring labor share, but do not reduce output. Whether labor or capital owners gain more depends on how the taxes are used. I discuss alternative methods for allocating production taxes that do not remove them from output below.

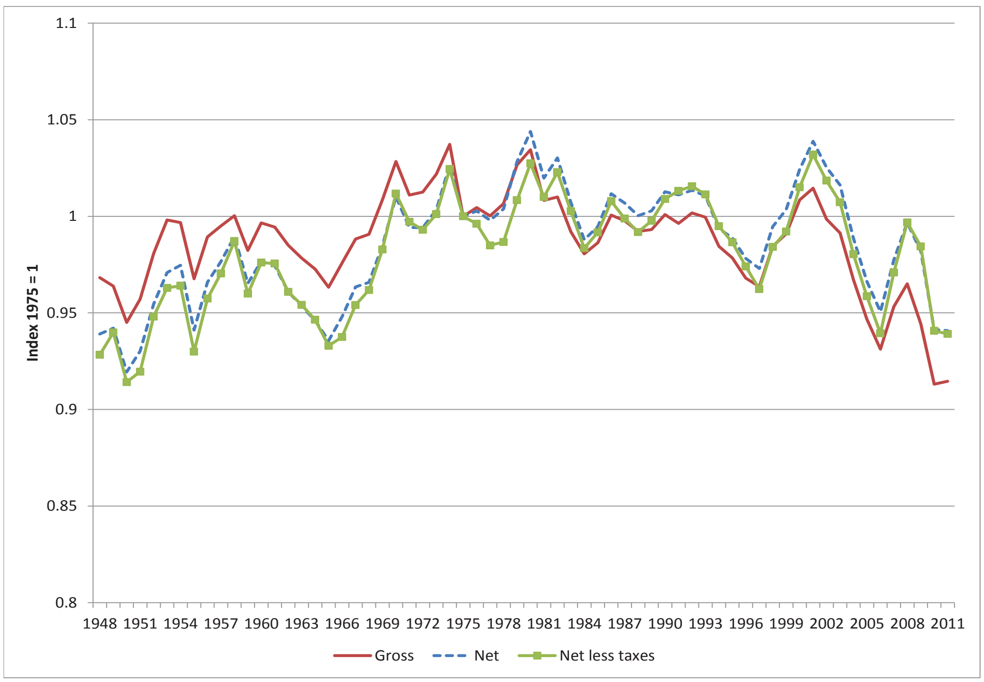
5 Empirics

This section examines quantitatively how much of the recent decline in labor share reflects changes in depreciation and taxes. I compare three measures of labor share. Specifically, gross labor share is given by $LS_{Gross} = Comp/GVA$. The corresponding capital share is $CS_{Gross} = (GOS + Tx)/GVA$. Net labor share is given by $LS_{Net} = Comp/(GVA - Depr)$ where $Depr$ is consumption of fixed capital. The corresponding capital share is $CS_{Net} = (GOS + Tx - Depr)/(GVA - Depr)$. Net labor share less taxes is given by $LS_{NetTax} = Comp/(GVA - Depr - Tx)$. The corresponding capital share is $CS_{NetTax} = GOS/(GVA - Depr - Tx)$.

5.1 United States

Figure 1 shows the three labor share measures for the U.S. corporate business sector, indexed so that 1975 equals one. I choose 1975 since Karabarbounis & Neiman (2014) use that year as their base year. Using corporate business eliminates many of the confounding measurement problems, such as proprietor's income (Gollin 2002), owner occupied housing and the measurement of government output. These data omit the recent inclusion of intangible assets to the national accounts to make them comparable to previous work and other countries.

Figure 1: U.S. Corporate Sector Labor Share 1948-2011



Labor share netting out taxes and depreciation (Net less Tax) shows a different pattern than gross labor share[3]. The decline in gross share puts it at an unprecedentedly low level. In

[3]The U.S. taxes category includes "net business current transfer payments," net payments by businesses to persons, government, and the rest of the world for which no current services are performed. Examples of these include regulatory fees and fines paid to government and net insurance settlements to government and the rest of the world.

2005, it fell below its previous low (61.5 percent in 1950) and has continued to fall. It shows a sustained fall since the early 2000s.

In contrast, Net less Tax labor share shows a more muted decline from 1975 to 2011 and remains within its historical range. The 2011 low puts it at the same level as it was in the 1950s and 1960s. Further, it does not show the same sustained fall during the 2000s. Net labor share matched its 1975 level as recently as 2008. Net share shows more year to year variation, so the recent fall is less remarkable.

To examine the impact of taxes and depreciation separately, Figure 1 also reports labor share with only depreciation netted out (Net). Depreciation is more quantitatively important. The Net and Net less Tax are largely indistinguishable. They both fall 6 percent from 1975 to 2011 while gross share falls 9 percent.

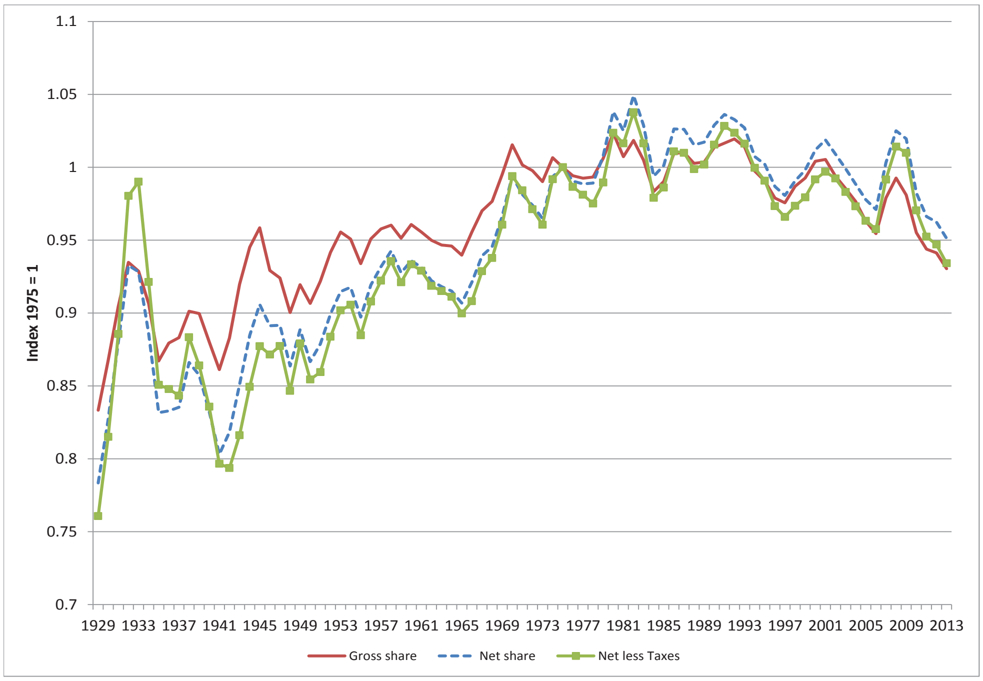
5.2 Robustness

Since most countries only publish economy-wide data without sectoral detail, Figure 2 reports the corresponding labor shares for the full economy. Moving to the aggregate economy expands the time series back to 1929. The overall picture is similar. Gross share is less variable early on while the net measures show strong growth. Gross share continues to show the biggest drop since 1975.

The impact of netting out taxes and depreciation is muted compared to the corporate sector. In part, this reflects less volatility in the gross share. The corporate sector fell 9 percent between 1975 and 2011, while the total economy gross share fell 6 percent over the same period.

The NetTax measure deducts tax payments. As discussed above, these taxes still represent output that enhances welfare. Ideally, these payments would be allocated to factors of production rather than discarded. Joines (1981) proposes a method to perform this allocation. It assigns property taxes to capital and uses the after tax factor income to allocate the rest. Figure 3 compares net labor share using the Joines (1981) method with the NetTax labor share for the total U.S. economy. (Detailed tax data are only available for the aggregate economy.)

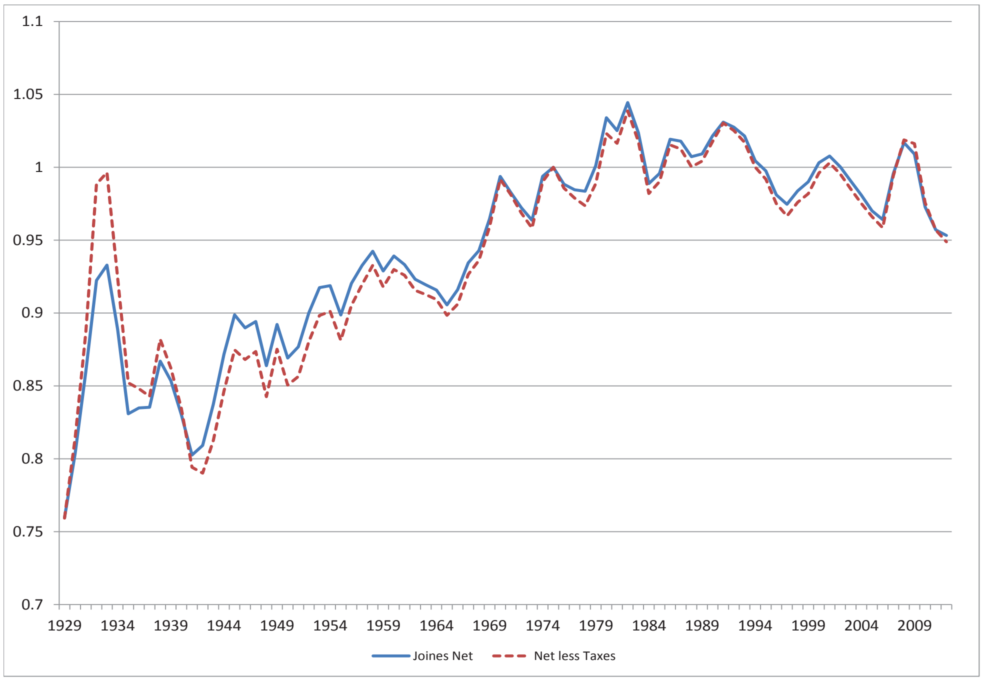
Figure 2: Total U.S. Economy Gross and Net Labor Share 1929-2013



While there are some significant differences early in the period, the two paths are very similar in recent decades. The early years saw big changes in the importance of property taxes. They were very important early on, accounting for two thirds of production taxes in the early 1930s. This share dropped to a third during World War Two. Since the late 1960s, the share has held steady at 40 percent.

Research and development (R&D) and artistic originals were added to the U.S. accounts in 2013. In addition to adding to gross output by including R&D investment, capitalizing intangibles also increase the level of depreciation in the gross accounts. These new assets have relatively high depreciation rates. For artistic originals, depreciation rates are typically in the

Figure 3: U.S. Total Economy Net Labor Share 1929-2012



teens (Soloveichik & Wasshausen 2013). R&D is higher still, ranging up to 40 percent for computer R&D (Li 2012). Including intangibles makes the difference between gross and net share a bit sharper. Gross share still falls 9 percent between 1975 and 2011 while net share falls slightly less at 5 percent (rather than 6 percent).

This estimate may be a lower bound since the newly included assets do not incorporate all intangible assets. Other difficult to measure assets, such as organizational capital and marketing, continue to be excluded (McGrattan & Prescott 2014). Corrado, Hulten & Sichel (2005) suggest they are a substantial part of capital. Some of these forms, like marketing, have high depreciation rates.

5.3 International Evidence

Karabarbounis & Neiman (2014) show that the decline in labor share is not confined to the United States. In this section, I examine other economies and find that the U.S. findings also show up in other countries. I concentrate on large economies and those that have large declines in gross labor share.

These data have some of the confounding elements that the U.S. do not have. Capital share includes proprietors income, some of which is really labor income. It also includes owner-occupied housing and government, sectors with measurement challenges. However, this should not have a significant impact on the comparison of net and net tax shares with gross labor share since each measure includes the same confounding elements.

The rest of the G-7 countries show a dampening effect from the adjustments[4]. Japanese data provides a stark case of the difference between gross and net income shares. As seen in Figure 4, the direction of the change in labor share is different depending on whether net or gross shares are used[5]. Net labor share increases throughout the sample period while gross share shows a small decline since the mid-1970s.

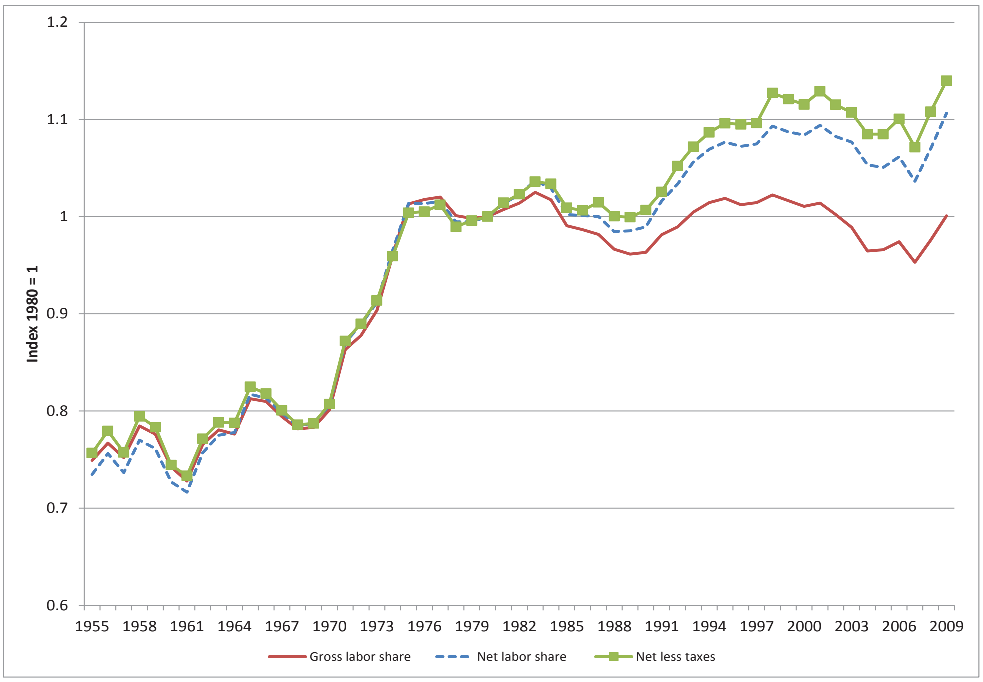
Canadian net tax share falls much less than gross share from 1975 to 2011, dropping only 3 percent less than half the 7 percent for gross share. The shape of the time series is different. Gross share shows a distinct fall in the early 1980s. In contrast, the net tax share shows no trend. Both the tax and depreciation adjustments contribute to the moderation of labor share.

Europe is also dampened. Figure 6 shows the United Kingdom and France. The impact is muted by the relatively small declines in gross labor share. The French decline is nearly eliminated from the adjusted share over the period 1978 to 2012 while gross share falls

[4] I omit Germany since unification makes the time series too short.

[5] The series are based in 1980 since it is a composite of the 1968 and 1993 Systems of National Accounts (SNA). The historical data were only backcast to 1980 with the transition to the 1993 SNA. The SNA68 data are used up to 1980 and SNA93 afterward.

Figure 4: Gross and Net Labor Share, Japan 1955-2009

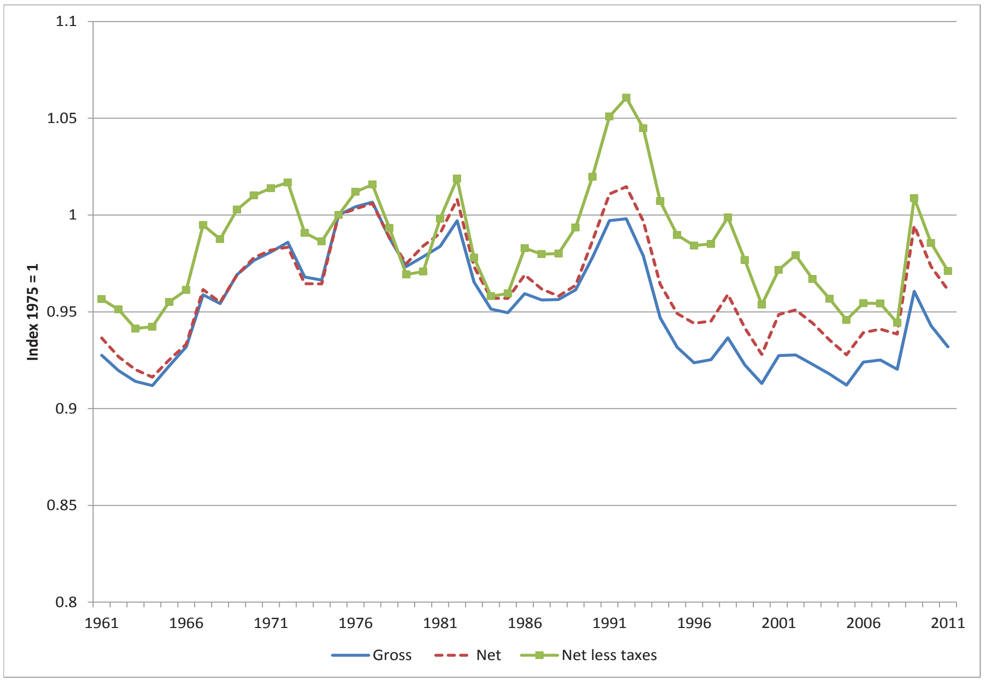


5 percent. The decline is small compared to the overall increase in the postwar period. British net and gross share fall by significant amounts from from 1975 to 2012. Much of the decline reflects the fact that 1975 was a temporary spike in labor share. The adjusted share is quite similar to the pre-oil shock years. Italy (not shown) shows a 12 percent drop in gross share from 1980 to 2010, while the net tax share shows no decline.

China also shows a dampening. Qi (2014) shows gross share fell 5 percentage points between 1978 and 2012 while net tax share returned was nearly the same at the beginning and end of this period.

The countries with the largest movements in labor share tend to be smaller economies.

Figure 5: Gross and Net Labor Share, Canada 1961-2012



Arpaia, Perez & Pichelmann (2009) identify four countries as having the largest decline in labor share in Europe: Austria, Ireland, the Netherlands and Sweden. I find that the adjustments significantly reduce the decline in the Netherlands and Sweden.

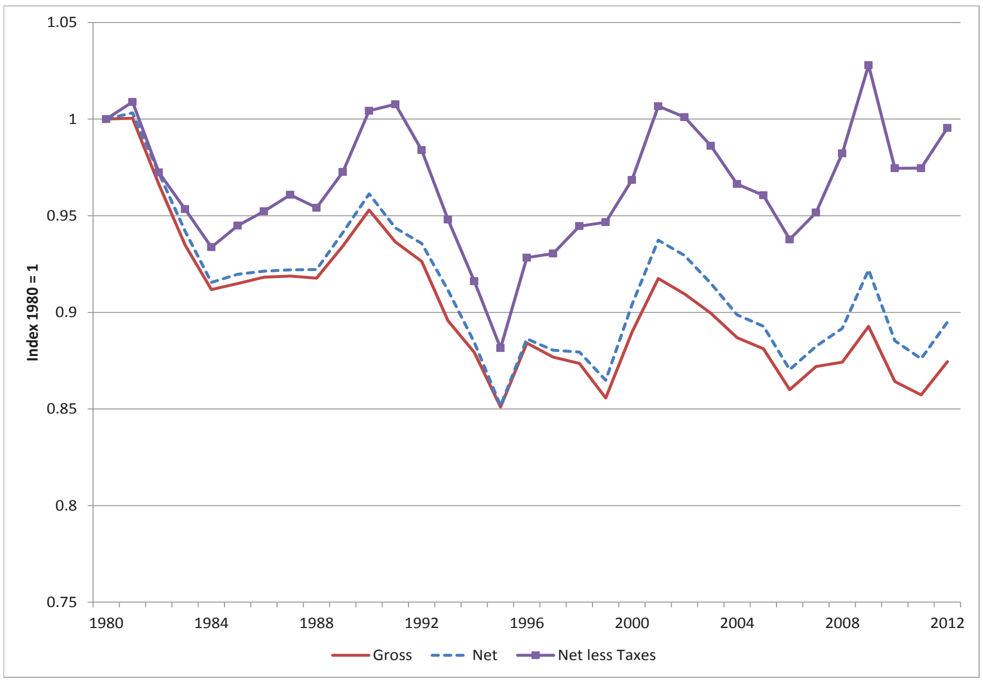
The tax adjustment has a significant impact in Sweden. Figure 7 shows changes in labor share with and without the adjustments. Netting out taxes eliminates the decline in labor share that gross share shows. Depreciation shows little impact.

The adjustments also dampen the decline in the Netherlands. As Figure 8 shows, depreciation has the major effect while taxes play essentially no role.

The adjustments do not have a significant effect on Austria or Ireland. Austrian gross

Figure 6: Gross and Net Labor Share, Europe 1948-2012

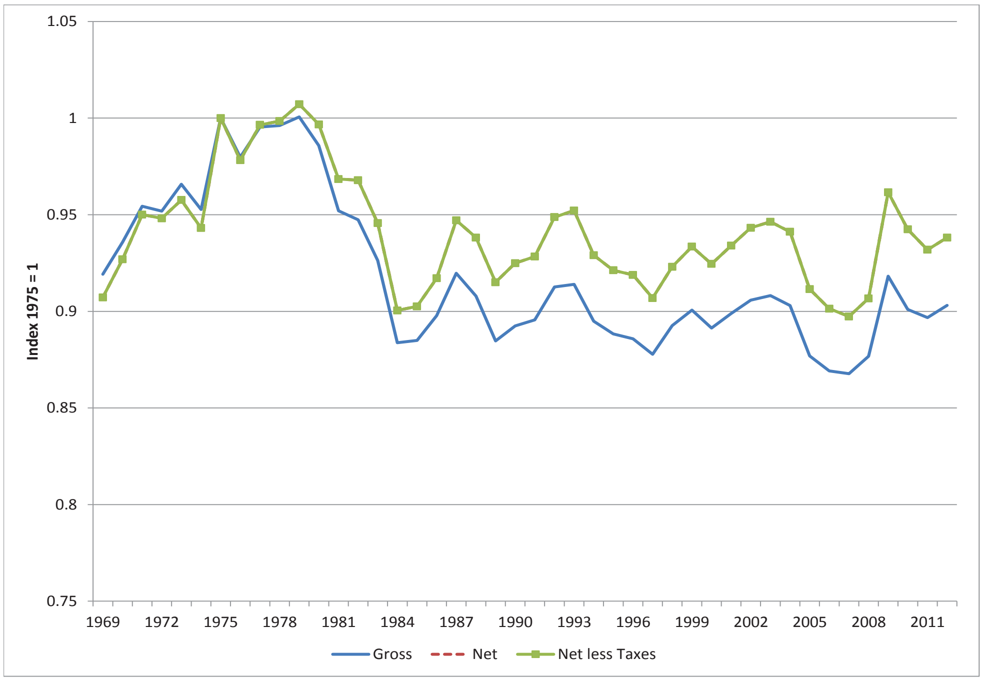
Figure 7: Gross and Net Labor Share, Sweden 1980-2012



share falls 9 percent from 1976 to 2012 while the fully adjusted case falls 8 percent. The adjusted and unadjusted labor share are virtually identical in Ireland. While there is a significant decline from 1980 to 2003, this decline may just reflect a more variable labor share. By 2012, Irish labor share is at it highest level since in 1970, the first year data are available. Their changes in labor share may be related to the significant structural change these countries have undergone. Arpaia et al. (2009) find that labor share does not fall nearly as far if industrial structure is held constant.

Adjusting for taxes and depreciation blunts, and in some cases eliminates, the fall in global labor share. The instances where they do not have much impact are either countries

Figure 8: Gross and Net Labor Share, Netherlands 1969-2012



with little long term trend, like the UK, or small countries with changing economies. The international evidence does not reflect a major global decline in labor share.

5.4 Discussion

The results indicate that net labor share has not changed much. However, the literature has found correlations between changes in gross labor share and other indicators. This section discusses how the results fit in with previous findings using gross labor share.

The correlation between falling labor share and imports found by Harrison (2005) may work through the impact of competition on capital composition. Bloom et al. (2011) and Autor et al. (2013) find that exposure to imports led to increased use of (high depreciation) IT capital goods. Trade exposure does not have the same effects in all cases. For developing countries, increased openness often increases labor share. Kamal, Lovely & Mitra (2013) finds that globalization increased labor share in China. Ahsan & Mitra (2010) find a similar effect for labor intensive industries in India. Globalization itself does not affect labor share. Only in cases when globalization leads to changes in capital stock is there an effect.

It is sometimes asserted that labor share is a measure of inequality. While such aggregate numbers are not on their own a measure of inequality (Fixler & Johnson 2012), falling labor share may be associated with rising inequality since capital ownership tends to be more concentrated (Jacobson & Occhino 2012). A robust finding is that income inequality has increased since the late 1970s, the same period gross labor share is falling (Alvaredo, Atkinson, Piketty & Saez 2013).

Are gross labor share and inequality related? Inequality can increase without changes to capital. Increasing wage inequality is sufficient. Labor income at the very top of the income distribution have grown relative to other workers. However, the two may be related. The post-1980 period has also seen increased wages for college educated relative to less educated workers. If skill and IT capital are complements, as suggested by Krusell et al. (2000), increasing depreciation and wage inequality would be related.

The results do suggest that gross labor share has not fallen due to capital owners' increased bargaining power, as suggested by Brock & Dobbelaere (2006) among others. Trade liberalization or other forms of increased competition can put pressure on wages without reducing labor's relative bargaining power. If competition drives down mark-ups, wages will fall even if labor's share of the rents is unchanged. (See Alder, Lagakos & Ohanian (2013) for a recent discussion of this process.)

6 Conclusion

Gross labor share has been falling since the 1970s. This paper examines whether a shift to high depreciation capital and higher production taxes can explain this decline. I find that at least a portion of the global decline in labor share is due to these effects. I find that U.S. labor share net of these items has not fallen as much as gross share since 1975. Recent net labor share is near its historical highs, while gross share is at its lowest recorded level. Net labor share tends to fall less in other countries, even reversing the direction of movements in share in the case of Japan.

A Data Appendix

Figure 1

- Data without intangibles: NIPA Table 1.13, Lines 3, 4 and 9. Table 7.5, line 5. Accessed January 30, 2013.
- Data with intangibles: NIPA Table 1.13, Lines 3, 4 and 9. Table 7.5, line 5. Accessed August 15, 2013.

Figure 4

- Cabinet Office of Japan, National Accounts Table 1, 2000 (SNA68) and 2009 (SNA93) Annual Reports.

Figure 5

- Statistics Canada. Table 380-0016. Accessed: February 25, 2014.

Figure 6

- Eurostat database, GDP and main components - Current prices [nama gdp c]. Accessed February 25, 2014.

Figure 7

- Statistics Sweden. National Income Table 2, Overview of the Swedish economy 1980-2012, current prices. Accessed February 25, 2014.

Figure 8

- Statistics Netherlands Statline database. GDP, production and expenditures; output and income by activity, All industries A-U. Accessed February 25, 2014.

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