IS LABOR'S LOSS CAPITAL'S GAIN? GROSS VERSUS NET LABOR SHARES

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US labor share has been falling since the 1970s. I show that it 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 high-income economies. The overall picture is no longer one of unprecedented, globally declining labor share. Using gross share as a proxy for net share can give misleading results. US gross share and inequality are correlated, whereas net share, the correct measure, is not.

Keywords: Labor Share, Depreciation, Taxes, Inequality

1. INTRODUCTION

After a long period of stability, labor's share of gross national income has been falling. Karabarbounis and Neiman (2014b) and Elsby et al. (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 and Occhino (2012)]. It is a central object in the controversy over the Piketty (2014) analysis of inequality [Rognlie (2014), Acemoglu and Robinson (2015), Jones (2015), Krusell and Smith (2015)]. 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 and Giavazzi (2003)], policy makers 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 typically focuses 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

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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 and 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 find that the adjusted US labor share falls much less than gross labor share. From 1948 to 2014, gross labor share fell 5.3 percentage points, whereas net share fell less than 1 percentage point. In addition, the time series pattern gives a different view of history. Although gross labor share is at its lowest recorded level, net labor share was above its 1975 level as recently as 2008. This observation holds for a set of other high-income economies selected for their size or their large declines in gross labor share. Movements in net share are generally muted compared to gross. In the case of Japan, they move in opposite directions: Net labor share increases, whereas gross share declines.

These measures are quantitatively different. I demonstrate this fact by examining the relationship between labor shares and inequality. There is a statistically significant negative correlation between US gross share and inequality. However, this correlation is not significant for net share, the appropriate measure in this application. Using gross share as a proxy for net share will give misleading results in at least one important empirical application.

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. Labor share is often used to estimate the New Keynesian Phillips curve [Gali and Gertler (1999), Hondroyiannis et al. (2009), Lawless and Whelan (2011)] and to examine labor markets [Caballero and Hammour (1998)]. Famously, the stability of the labor share is one of the Kaldor facts (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 and Moroney (1969)]. A more recent literature has attempted to explain the variation of labor share over the business cycle [Rios-Rull and Santaeulalia-Llopis (2010), Shao and Silos (2014), Colciago and Rossi (2015)].

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 examines the empirical impact of these deductions directly. Gomme and Rupert (2004) note that changes in labor share may simply reflect changes in net production taxes, but do not examine its empirical impact. The closest paper is Karabarbounis and Neiman (2014a), which also examines international gross and net shares. Their sample begins in 1975, whereas mine examines longer time series. I also examine the empirical link between labor shares and inequality. I compare their results with mine in detail below.

2. ANALYTICAL FRAMEWORK

This section explains the adjustments to labor share I make in the empirical section. I begin by linking the returns to capital in a standard growth model to national accounting conventions. Although the two are closely related, there are some differences between the returns a capital owner receives and capital share as it is typically calculated.

As an analytical framework, I use a standard one sector growth model. Output is a function of capital K_t and labor N_t inputs, $Y_t = F(K_t, N_t)$, and can be used to produce consumption C_t or investment I_t. Input prices are wage w_t and rental rate r_t. The law of motion for capital is $K_{t+1} \leq K_t(1 - \delta_t) + I_t$, where δ_t is (time-varying) depreciation. There is a tax on output τ_t.

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_t by $\tau_t Y_t$. Gross Operating Surplus is the remainder of output: $GOS_t = (1 - \tau_t)Y_t - w_t N_t$.

Although Comp is clearly a return to labor and GOS a return to capital, the tax term Tx is ambiguous. The NIPAs attempt to measure pretax 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, which are included in measured labor and capital income.

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 $NDP = C_t + r_t(K_{t+1} - K_t)$. For net product to increase, either current consumption C_t or net investment $\sum_i r_t(K_{t+1} - K_t)$ 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]

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, whereas 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 in 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.

There is a growing literature discussing why depreciation has changed. An earlier version of this paper and Karabarbounis and Neiman (2014a) examine falling prices of equipment, which has a high depreciation rate. Eden and Gaggl (2015) implement a model in the spirit of Krusell et al. (2000), where routine labor is a substitute for equipment and a complement to structures. They find that falling prices explain IT capital deepening. I do not take a stand on why depreciation has changed, but focus on what this change means for measurement.

3. EMPIRICS

This section examines quantitatively how much of the recent decline in labor share reflects changes in depreciation and production 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 tax is given by $LS_{NetTax} = Comp/(GVA - Depr - Tx)$. The corresponding capital share is $CS_{NetTax} = GOS/(GVA - Depr - Tx)$.

The gross share treats depreciation and production taxes as a return to capital. The above discussion indicates that depreciation should be deducted for the analysis of income inequality, meaning that LS_{Net} is a better indicator in such situations. The third measure LS_{NetTax} allocates the tax by using the same shares as the rest of the economy. This adjustment is done in Gollin (2002) and improves on the assumption that capital pays all of the tax. Below, I examine an alternative method of dealing with these taxes.

3.1. United States

Figure 1 shows the three labor share measures for the US corporate business sector. Using corporate business eliminates many of the confounding measurement problems, such as proprietors' income [Gollin (2002)], owner occupied housing, and the measurement of government output.

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 2005, it fell below its previous low (60.9% in 1950) and has continued to fall. It shows a sustained fall since the early 2000s. In contrast, net less tax labor share remains within its historical range. The 2012 low puts it at the same level as it was in the 1950s. Furthermore, it does not show the same sustained fall during the 2000s. Net labor share was above its 1970s level as
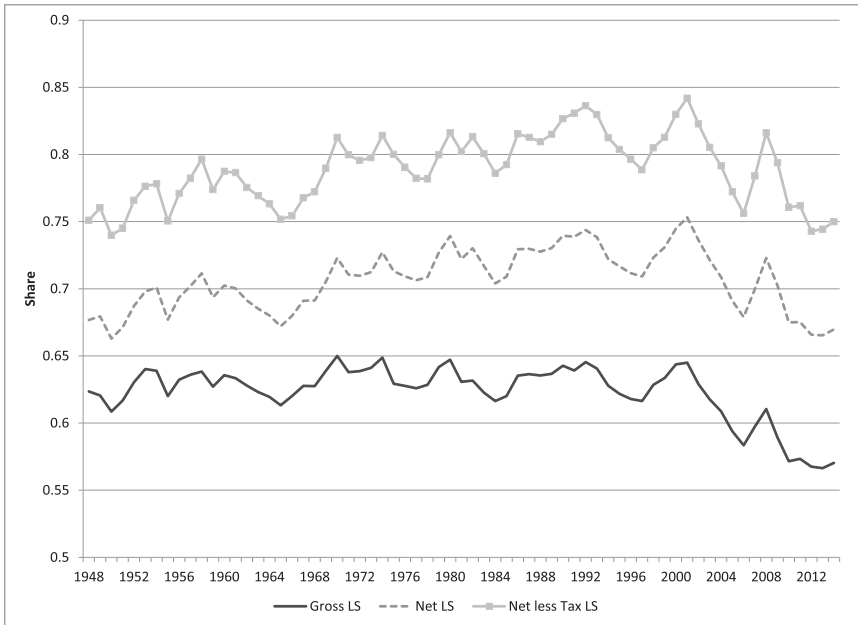
FIGURE 1. US corporate sector labor share, 1948–2014.

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). The net and net less tax labor shares have very similar patterns. Depreciation is the quantitatively more important adjustment. From 1948 to 2014, net share and net less tax fell 0.7 and 0.1 percentage points, respectively, compared to 5.3 percentage points for gross share.

3.2. International Evidence

Karabarbounis and Neiman (2014b) show that the decline in gross labor share is not confined to the United States. In this section, I examine other countries, concentrating on large economies and high-income economies with large declines in gross labor share. The discussion of inequality tends to focus on these countries. For example, see Alvaredo et al. (2013) and the other articles in the Summer 2013 issue of *Journal of Economic Perspectives*.

In what follows, I use total economy data rather than the corporate sector since not all countries publish data by sector. Therefore, these data include proprietors' income which the US data do not. When proprietors' income is reported separately, I assume that it is allocated by using the same shares as the rest of the economy, as suggested by Gollin (2002).[4] Even when I cannot make this adjustment, it should

TABLE 1. Percentage point decline in labor shares

Country (years)	Gross	Net	Net less Taxes
Proprietors' income adjustment			
Canada (1961–2011)	2.3	1.6	2.9
France (1978–2014)	5.5	3.7	3.2
Ireland (1995–2014)	9.6	9.1	11.4
Japan (1980–2009)	2.5	−4.4	−7.3
Sweden (1980–2015)	6.1	4.5	2.6
United Kingdom (1950–2014)	11.3	9.4	9.2
No proprietors' income adjustment			
Austria (1976–2012)	4.8	3.9	5.7
Germany (1991–2015)	3.2	2.4	1.5
Italy (1980–2010)	6.0	4.9	−0.6
The Netherlands (1969–2012)	2.0	−0.3	−2.4

not have a significant impact on the comparison of net and net less tax shares with gross labor share since each measure includes the same confounding elements.

I examine the G-7 countries and the four EU15 countries identified by Arpaia et al. (2009) as having large declines in labor share: Austria, Ireland, the Netherlands, and Sweden. I use this sample since the G-7 countries are the closest economic peers to the United States. I include the four big decliners since they have the most labor share change to explain.[5] Table 1 reports the percentage point decline of the three labor share measures over the sample. The top panel are the countries for which sufficient data exist to adjust for proprietors' income.

In most cases, the net less tax shares decline is either negligible (1 or 2 percentage points) or an increase. In seven of the 10 cases, net less tax shows a smaller percentage point decline than gross share. In most cases, removing depreciation has a larger quantitative effect than taxes. However, in some cases like Italy, taxes have a significant effect. In three cases, the adjustments flip the sign: Labor share actually increases! The Japanese data provide a stark case of the difference between gross and net income shares. Figure 2 reports both the SNA93 labor share used in Table 1 and the older SNA68 data. Net labor share increases since the late 1960s, whereas gross share shows a small decline since the mid-1970s.

The change in net less tax share is larger than gross share in three cases: Austria, Canada, and Ireland. Canada had little decline in gross share over the sample period, which is also true of the net shares. Irish labor shares are quite volatile. Although there is a 10 percentage point fall in Irish gross share from 1995 to 2002, it nearly had returned to its 1995 level in 2009 only to fall sharply again. Austria's and Ireland's labor share declines may be related to the significant structural change these countries have undergone. Arpaia et al. (2009) find that changing industrial structure is less important for European G-7 countries than
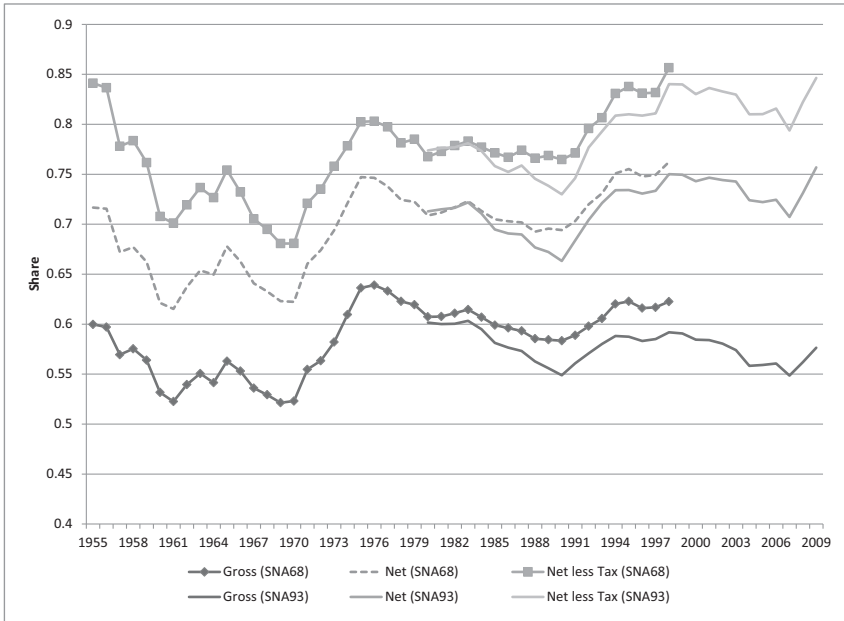
FIGURE 2. Gross and net labor share, Japan, 1955–2009.

for lower income countries in their sample. Elsby et al. (2013) find little role for structural change in the United States.

The same percentage point decline represents a smaller percentage fall for net compared to gross share since net labor shares are higher. For example, even though UK labor shares percentage point declines are similar across the three, gross share falls 17%, whereas net less tax only falls 11%. For applications where the growth rates of labor share matter, the net measures will tend to have smaller changes (in absolute value terms) than gross share.

Adjusting for depreciation and production taxes blunts, and in some cases eliminates, the fall in labor share. The instances wherein these adjustments do not have much impact are either countries with little long-term trend or small countries with changing economies. Only one G-7 country, the UK, continues to have a significant decline in net labor shares. The international evidence does not reflect a major, unprecedented decline in labor share among high-income economies.

Looking at similar data, Karabarbounis and Neiman (2014a) conclude that netting out depreciation does not have a significant impact. A major difference is the samples. I examine a longer time period, looking at all available data, whereas they start their sample in 1975. As we will see below, the earlier period is important for empirical applications. Both papers find a downward trend in both net and gross shares since 1975. The declines in net shares are within the historical
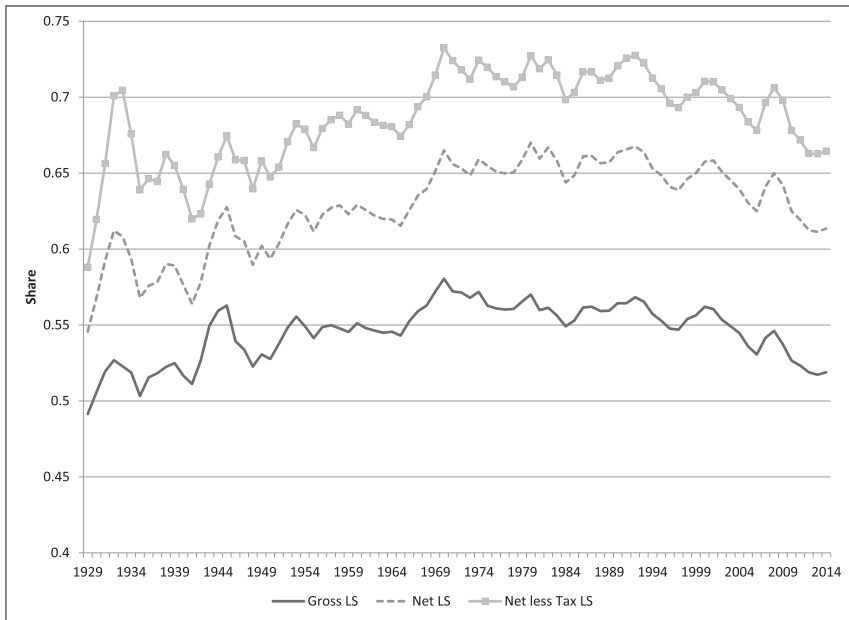
FIGURE 3. Total US economy gross and net labor share, 1929–2014.

range which is not always the case with gross shares. I examine economically advanced countries, whereas they include less developed countries. I also make an adjustment for taxes which they do not. Although taxes are not important in most cases, they do matter in a few countries such as Italy and Japan.

3.3. Robustness

The results hold up to a number of robustness checks. I examine the full economy labor shares, the impact of mismeasurement, alternative methods of allocating production taxes and the impact of various types of capital.

Since many countries only publish economy-wide data without sectoral detail, Figure 3 reports the corresponding US labor shares for the full economy. Moving to the aggregate economy expands the time series back to 1929. The overall picture is generally similar. Gross share is less variable early on, whereas the net measures show strong growth. The differences between the net and gross measures is less pronounced in the recent period; both gross and net less tax measures fall by 4 percentage points from 1975 to 2014. However, for gross share this is a level not seen since the beginning of World War II, whereas the net measures were at that level in the 1960s.

BEA measures depreciation by using an asset specific constant geometric rate for most assets (US Bureau of Economic Analysis 2003). These rates are based on studies of service lives, which are necessarily backward looking. This introduces
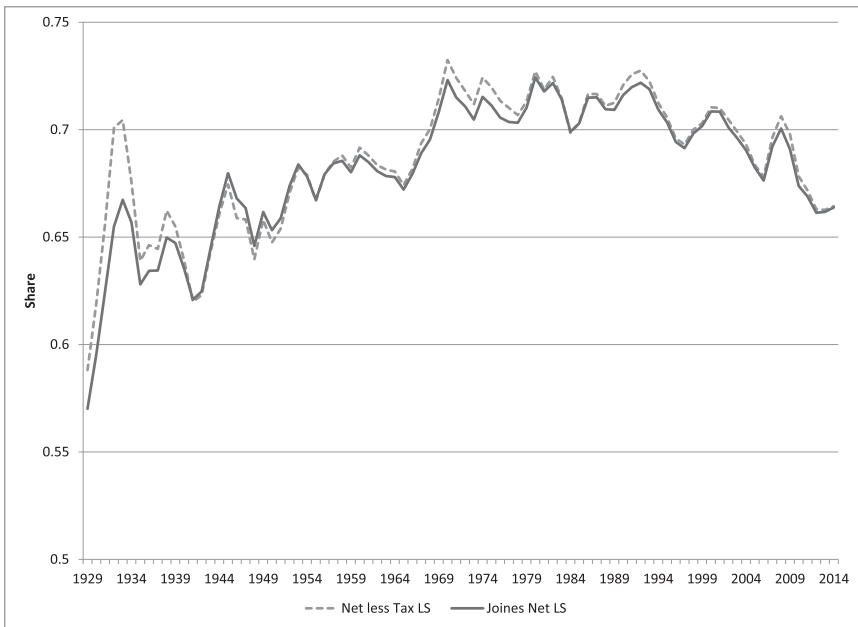
FIGURE 4. US total economy net labor share, 1929–2014.

the possibility of mismeasurement, particularly for new goods for which there is no previous experience to measure. To overturn the results would require that measured depreciation is too high for new capital. In that case, the increased gap between gross and net shares is due to this overestimated depreciation. This runs counter to the usual intuition that new IT capital must be replaced frequently. If there is mismeasurement, it is more likely that it is underestimated which would strengthen the results.

The net less tax measure deducts tax payments. This implicitly allocates the tax at the factor shares of the rest of the economy. Joines (1981) proposes an alternative method to perform this allocation. It assigns property taxes to capital and uses the after tax factor income to allocate the rest. I compare net labor share by using the Joines (1981) method with the net less tax labor share for the total US economy. (Detailed tax data are only available for the aggregate economy.) Although there are some significant differences early in the period, the two paths are very similar in recent decades (see Figure 4). 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 II. Since the late 1960s, the share has held steady at 40%.

Rognlie (2015) and Bonnet et al. (2014) give an important role for housing capital in the changes in labor share. Housing does not affect the results a great deal, though it reduces the magnitude of the changes. The corporate sector, the

FIGURE 5. US net shares, 1929–2014.

baseline case, does not include much residential capital. In the broader economy, removing income generated by the housing sector does not change the shape of net shares, though it does reduce the size of the decline. As seen in Figure 5, net share falls 3 percentage points from 1975 to 2014 without housing rather than 4 percentage points. Removing housing also pushes the peak year to 1992, from 1980.

Several intellectual property products (IPP), such as research and development (R&D) and artistic originals, were added to the US accounts in 2013. In addition to adding to gross output by including R&D investment, capitalizing intangibles also increases the level of depreciation in the gross accounts. Koh et al. (2015) give a central role for these assets in the labor share decline. These new assets have relatively high depreciation rates. For artistic originals, depreciation rates are typically in the teens [Soloveichik and Wasshausen (2013)]. R&D is higher still, ranging up to 40% for computer R&D [Li (2012)].

Intangibles do not have a major impact. Redoing the analysis with a prerevision vintage of data, corporate gross share falls 6 percentage points between 1975 and 2011 which is the same as the postrevision fall. The percentage point drops for net shares are also unchanged. 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 and Prescott (2014)]. Corrado et al. (2005) suggest that they

TABLE 2. US corporate labor share and inequality

Depreciation variable	Inequality	Inequality	Inequality
Gross share	−11.640**		
(SE)	(2.128)		
Net share		2.074	
		(2.296)	
Net less tax share			2.480
			(2.016)
N	67	67	67
Adjusted-R^2	0.30	−0.00	0.01

**Significant at the 1% level.

are a substantial part of capital. Some of these forms, like marketing, have high depreciation rates.

3.4. Labor Share and Inequality

Using gross instead of net shares can give different answers for economic questions. I demonstrate this impact by examining the correlation of labor share with inequality. There is a statistically significant negative correlation between gross share and inequality in the United States. This correlation flips sign and is no longer significant for net share. This finding extends to a number of other countries. As discussed above, net labor share is more appropriate than gross share for discussing inequality. Therefore, using gross share can give misleading results.

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

There is a statistically significant negative correlation between US gross labor share and inequality. The first column of Table 2 regresses US corporate sector gross labor shares on inequality, as measured by the inverted Pareto–Lorenz coefficient from the World Top Incomes Database [Alvaredo et al. (2014)]. (I do not report the constant.) I use this measure of inequality, which is based on top earners, since the recent controversies have emphasized capital holdings among these earners as an engine of inequality. This measure also has a long time series, which is not true of most measures. The coefficient on labor share is strongly negative and significant at the 1% level. However, this correlation does not hold up for the net and net less tax measures. As seen in columns 2 and 3, the coefficient is positive and insignificant for the net measures. These results obtain even though the different measures are correlated.

To see why there is such a difference, Figure 6 plots US inequality versus both gross and net less tax labor shares. The gross share (top panel) shows little movement early in the sample period, a time of small movements in inequality. Share falls beginning in the 2000s, matching an increase in inequality. Overall, there is a negative relationship. The relationship is much weaker for net shares; there are increases in inequality without changes in labor share and vice versa. The net less tax share shows much more movement early in the period. There are also increases in net shares in the 1990s when inequality was increasing.

The results also hold up for alternative measures of inequality. I redo the exercise in Table 2 by using the Gini coefficient on pretax and transfer income from the Organisation for Economic Co-operation and Development (OECD).[6] This measure uses information outside the top 10% of earners and is the concept that matches labor shares. (Recall that income taxes are included in all of the labor share measures.) The results are unchanged with this broader measure. This is not surprising given that the correlation coefficient between these measures is 0.91.

The United States is not the only case where gross and net share give different results. I repeat the exercise in Table 2 for the rest of the sample aside from Austria, which does not have the required inequality data. I find that gross share is correlated with inequality, whereas net less tax is not for Italy, the Netherlands, and Sweden. Net less tax share is correlated, but in the wrong direction for Japan. Net less tax is correlated for Canada, France, Germany, Ireland, and the United Kingdom.

The US result can undone by restricting the sample to more recent data. Starting the sample in 1980 causes the US correlation between net less tax share and inequality to become significant. As seen in Figure 6, net less tax share shows a lot of variation with little change in inequality prior to 1980. After 1980, the two are more correlated.

In several cases, gross share and inequality are correlated even when net shares are not. This does not mean that gross share is a better indicator of inequality than net shares. The correlation may be simply coincidence. The analysis indicates that there is not a strong, stable relationship between inequality and labor share. Data requirements to calculate both labor share and inequality tend to restrict the sample to more recent years. In some cases, such as the United States, only using recent data will give different results from those if a longer series were available.

Shocks that affect capital composition and other variables may generate a correlation between gross share and those variables. For example, the literature has found correlations between changes in gross labor share and imports [Harrison (2005), Bockerman and Malirantay (2012)]. However, this may be an artifact of the impact of competition on capital composition. Bloom et al. (2016) and Autor et al. (2015) 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 et al. (2014) find that globalization increased labor share in China. Ahsan and Mitra (2014) find a similar effect for labor intensive industries in India. Globalization
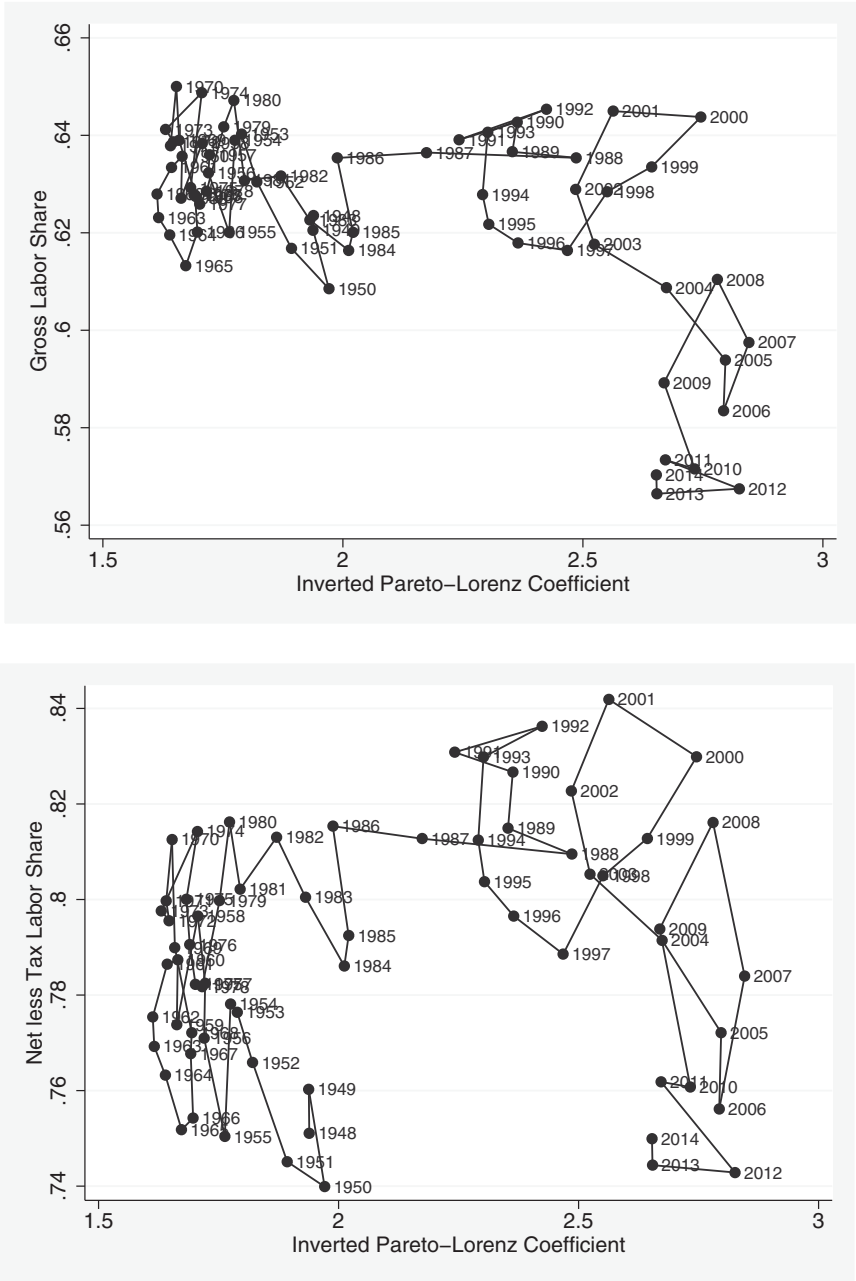
FIGURE 6. Gross and net labor shares vs. inequality, United States 1948–2014.

itself does not affect labor share. Only in cases when globalization leads to changes in capital stock is there an effect.

This analysis is not meant to prove definitely that labor shares are a poor summary indicator of inequality, though other studies have obtained similar results [Harjes (2007), Gordon and Dew-Becker (2008)]. At minimum, these results show that using gross shares when net shares are called for is not innocuous. The measures are both theoretically and quantitatively different. In this case, gross shares suggest a stronger relationship between labor share and inequality than what is found by using the correct measure.[7]

4. 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. US labor share net of these items has not fallen as much as gross share. Recent net labor share is near its historical highs, whereas 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. The differences between these measures is not simply a theoretical curiosity since using the wrong measure can lead to misleading results. US gross share is correlated with inequality, whereas net share, the appropriate measure, is not.

NOTES

1. For example, see Weitzman and Asheim (2001) and Hulten and 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.

3. The US 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.

4. Specifically, adjusted LS is Comp/(GVA−Proprietors' Income).

5. An additional benefit is that high income and European countries have relatively complete national accounts. Even among this sample, obtaining all the required elements for long time series by using consistent classifications is challenging. Longer time series could be obtained by using older data, but this would involve co-mingling information from multiple classification systems.

6. Specifically, I use market income before taxes and transfers for the total population, pre-2012 income definition, from the OECD's Income Distribution and Poverty Dataset, extracted April 13, 2016.

7. Karabarbounis and Neiman (2014a) argue that gross share can be more relevant to welfare in the transition path after certain shocks. Whether gross or net share should be used in a particular situation does not change the point that one may obtain quantitatively different results if the wrong measure is used.

REFERENCES

Acemoglu, Daron and James A. Robinson (2015) The rise and fall of general laws of capitalism. *Journal of Economic Perspectives* 29, 3–28.

Ahsan, Reshad N. and Devashish Mitra (2014) Trade liberalization and labor's slice of the pie: Evidence from Indian firms. *Journal of Development Economics* 108, 1–16.

Alvaredo, Facundo, Anthony B. Atkinson, Thomas Piketty, and Emmanuel Saez (2013) The top 1 percent in international and historical perspective. *Journal of Economic Perspectives* 27, 3–20.

Alvaredo, Facundo, Anthony B. Atkinson, Thomas Piketty, and Emmanuel Saez (2014) World Top Incomes Database. Electronic resource September 18, Paris School of Economics.

Arpaia, Alfonso, Esther Perez, and Karl Pichelmann (2009) Understanding Labour Income Share Dynamics in Europe. Economic papers 379, European Commission.

Autor, David H., David Dorn, and Gordon H. Hanson (2015) Untangling trade and technology: Evidence from local labor markets. *Economic Journal* 125, 621–646.

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

Bloom, Nicholas, Mirko Draca, and John Van Reenen (2016) Trade induced technical change? The impact of Chinese imports on innovation, IT and productivity. *Review of Economic Studies* 83, 87–117.

Bockerman, Petri and Mika Malirantay (2012) Globalization, Creative Destruction, and Labour Share Change: Evidence on the Determinants and Mechanisms from Longitudinal Plant-Level Data. Oxford Economic Papers 64, pp. 259–280.

Bonnet, Odran, Pierre-Henri Bono, Guillaume Chapelle, and Etienne Wasmer (2014) Does Housing Capital Contribute to Inequality? A Comment on Thomas Piketty's Capital in the 21st Century. Discussion paper 2014–07, Sciences Po Economics.

Caballero, Ricardo J. and Mohamad L. Hammour (1998) Jobless growth: Appropriability, factor substitution, and unemployment. *Carnegie-Rochester Conference Series on Public Policy* 48, 51–94.

Colciago, Andrea and Lorenza Rossi (2015) Firm dynamics, endogenous markups and the labor share of income. *Macroeconomic Dynamics* 19, 1309–1331.

Corrado, Carol, Charles Hulten, and Daniel Sichel (2005) Measuring capital and technology: An expanded framework. In C. Corrado, J. Haltiwanger, and D. Sichel (eds.), *Measuring Capital in the New Economy*, pp. 11–41. Chicago: University of Chicago Press.

Dasgupta, Partha (2009) The welfare economic theory of green national accounts. *Environmental and Resource Economics* 42, 3–38.

Diewert, Erwin and Kevin Fox (2005) The New Economy and An Old Problem: Net Versus Gross Output. Working paper 2005/02, Centre for Applied Economic Research.

Eden, Maya and Paul Gaggl (2015) On the Welfare Implications of Automation. Policy Research working paper 7487, World Bank.

Elsby, Michael W. L., Bart Hobijn, and Aysegul Sahin (2013) The decline of the U.S. labor share. *Brookings Papers on Economic Activity* 47, 1–52.

Ferguson, C. E. and John R. Moroney (1969) The sources of change in labor's relative share: A neoclassical analysis. *Southern Economic Journal* 35, 308–322.

Fixler, Dennis and David S. Johnson (2012) Accounting for the distribution of income in the U.S. national accounts. In D. W. Jorgenson, J. S. Landefeld, and P. Schreyer (eds.), *Measuring Economic Sustainability and Progress*, pp. 157–174. Chicago: University of Chicago Press.

Gali, Jordi and Mark Gertler (1999) Inflation dynamics: A structural econometric analysis. *Journal of Monetary Economics* 44, 195–222.

Gollin, Douglas (2002) Getting income shares right. *Journal of Political Economy* 110, 458–474.

Gomme, Paul and Peter Rupert (2004) Measuring Labor's Share of Income. Policy discussion paper 7, Federal Reserve Bank of Cleveland.

Gordon, Robert J. and Ian Dew-Becker (2008) Controversies About the Rise of American Inequality: A Survey. Working paper 13982, NBER.

Guerriero, Marta (2012) The Labour Share of Income Around the World: Evidence from a Panel Dataset. Development Economics and Public Policy working paper 32/2012, University of Manchester.

Harjes, Thomas (2007) Globalization and Income Inequality: A European Perspective. Working paper 07/169, IMF.

Harrison, Ann E. (2005) Has Globalization Eroded Labor's Share? Some Cross-Country Evidence. Working paper 39649, MPRA.

Hondroyiannis, George, P. A. V. B. Swamy, and George S. Tavlas (2009) New Keynesian Phillips curve in a time-varying coefficient environment: Some European evidence. *Macroeconomic Dynamics* 13, 149–166.

Hulten, Charles R. (1992) Accounting for the wealth of nations: The net versus gross output controversy and its ramifications. *Scandinavian Journal of Economics* 94(Supplement), 9–24.

Hulten, Charles R. and Paul Schreyer (2010) GDP, Technical Change, and the Measurement of Net Income: The Weitzman Model Revisited. Working paper 16010, NBER.

Jacobson, Margaret and Filippo Occhino (2012) Labor's Declining Share of Income and Rising Inequality. Economic commentary 2012–13, Federal Reserve Bank of Cleveland.

Joines, Douglas H. (1981) Estimates of effective marginal tax rates on factor incomes. *Journal of Business* 54, 191–226.

Jones, Charles I. (2015) The macroeconomics of Piketty. *Journal of Economic Perspectives* 29, 29–46.

Kaldor, Nicholas (1957) A model of economic growth. *Economic Journal* 67, 591–624.

Kamal, Fariha, Mary E. Lovely, and Devashish Mitra (2014) Trade Liberalization and Labor Shares in China. Center for Economic Studies paper CES-WP-14-24, Census Bureau.

Karabarbounis, Loukas and Brent Neiman (2014a) Capital Depreciation and Labor Shares Around the World: Measurment and Implications. Mimeo, Chicago Booth.

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

Koh, Dongya, Raul Santaeulalia, and Yu Zheng (2015) Labor Share Decline and the Capitalization of Intellectual Property Products. Mimeo, Washington University of St. Louis.

Kravis, Irving B. (1959) Relative income shares in fact and theory. *American Economic Review* 49, 917–949.

Krusell, Per and Anthony Smith (2015) Is Piketty's 'Second Law of Capitalism' fundamental? *Journal of Political Economy* 123, 725–748.

Krusell, Per, Lee E. Ohanian, Jose-Victor Rios-Rull, and Giovanni L. Violante (2000) Capital-skill complementarity and inequality: A macroeconomic analysis. *Econometrica* 68, 1029–1053.

Lawless, Martina and Karl T. Whelan (2011) Understanding the dynamics of labor shares and inflation. *Journal of Macroeconomics* 33, 121–136.

Li, Wendy C. Y. (2012) Depreciation of Business R&D Capital. R&D satellite account paper, Bureau of Economic Analysis/National Science Foundation.

McGrattan, Ellen and Edward C. Prescott (2014) A reassessment of real business cycle theory. *American Economic Review Papers and Proceedings* 104, 177–182.

Piketty, Thomas (2014) *Capital in the 21st Century*. Cambridge, MA: Belknap Press.

Qi, Hao (2014) The labor share question in China. *Monthly Review* 65(8), 23–35.

Rios-Rull, Jose-Victor and Raul Santaeulalia-Llopis (2010) Redistributive shocks and productivity shocks. *Journal of Monetary Economics* 57, 931–948.

Rognlie, Matthew (2014) A Note on Piketty and Diminishing Returns to Capital. Mimeo, MIT.

Rognlie, Matthew (2015) Deciphering the Fall and Rise in the Net Capital Share: Accumulation or Scarcity? Brookings Papers on Economic Activity 2015.

Shao, Enchuan and Pedro Silos (2014) Accounting for the cyclical dynamics of income shares. *Economic Inquiry* 52, 778–795.

Soloveichik, Rachel and David Wasshausen (2013) Copyright Protected Assets in the National Accounts. Working paper 2013–14, Bureau of Economic Analysis.

Solow, Robert M. (1958) A skeptical note on the constancy of relative shares. *American Economic Review* 48, 618–631.

U.S. Bureau of Economic Analysis (2003) *Fixed Assets and Consumer Durable Goods in the United States, 1925–99*. Washington, DC: U.S. Government Printing Office.

Weitzman, Martin and Geir Asheim (2001) Does NNP growth indicate welfare improvement? *Economic Letters* 73, 233–239.

Weitzman, Martin L. (1976) On the welfare significance of national product in a dynamic economy. *Quarterly Journal of Economics* 90, 156–162.

APPENDIX A: DATA APPENDIX

Figure 1

- National income: NIPA Table 1.13, lines 3, 4, and 9, August 6, 2015 revision.
- Depreciation: NIPA Table 7.5, line 4, August 27, 2015 revision.

Figure 2

- Cabinet Office of Japan, National Accounts Table 1, 2000 (SNA68) and 2009 (SNA93) Annual Reports. Table 1, lines 1.1 (Compensation), 1.3-5 (Depreciation, Product taxes and subsidies), and GDP. Table 2, line 3.3 (Entrepreneurial income of private unincorporated business).

Figure 3

- National income: NIPA Table 1.12, lines 1, 2, 19, and 20, August 27, 2015 revision.
- Depreciation: Table 7.5, line 1, August 27, 2015 revision.

Figure 4

- Property taxes: Table 3.5, line 27, August 6, 2015 revision.

Figure 5

- Data from Figure 3 less housing income from NIPA Table 7.4.5, lines 13 (Net VA) and 14 (Compensation of employees), August 6, 2015 revision.

Figure 6

- Labor shares are same source as Figure 1. Inequality data is inverted Pareto–Lorenz coefficient from the World Top Incomes Database, September 18, 2014 edition [Alvaredo et al. (2014)].

APPENDIX B: INTERNATIONAL DATA SOURCES

Austria   Statistics Austria, National Accounts. "Income approach of gross domestic product." Compiled on July 12, 2013.

Canada   Statistics Canada, "Gross domestic product (GDP), income-based, annual," Table 380-0016. Accessed: February 25, 2014. Proprietors income: "Accrued net income of farm operators from farm production" plus "Net income of non-farm unincorporated business, including rent."

France   INSEE, National accounts - Base 2010, May 13, 2015 release. Table 1.105, GDP, Compensation, Product taxes and subsidies. Table 1.112 (Consumption of fixed capital), Table 4.102, Gross mixed income (unincorporated enterprises).

Germany   Statistisches Bundesamt, National accounts of the Federation, April 18, 2016 Edition. "National accounts - Gross value added, gross domestic product." Variable: GDP. "Gross national income, national income." Variables: Compensation of employees (national concept), Consumption of fixed capital, Taxes on production and imports less subsidies.

Ireland   Central Statistics Office, Ireland. "National Income and Expenditure 1995-2014." Table 2, lines 28, 32, 33. (Depreciation, product taxes and subsidies). Table 3, line 54 (GDP at market prices). Table 12. "Income of independent traders etc." (Proprietors' income).

Italy   OECD.stat, "GDP Main Aggregates - annual national data," March 2011 Edition. Variables: B1XG 3 (GDP), D1 (Compensation), D2 (Production taxes) less D3 (Subsidies). "Sequence of accounts - annual national data," March 2011 Edition. Variable: Consumption of fixed capital.

Netherlands   Statistics Netherlands Statline database. "GDP from the generation of income." Variables: GDP, Compensation of employees, Taxes less subsidies. "GDP, production and expenditures; output and income by activity." Variable: Consumption of fixed capital, all industries. Accessed February 25, 2014.

Sweden   Statistics Sweden. "Institutional non-financial sector accounts (ESA2010)," lines II.1.1.B1gm (GDP at market prices), II.1.1.D1.PAY (Compensation of employees), II.1.1.B3g (Mixed income, gross), II.1.1.B3n (Mixed income, net), II.1.1.B1nm (NDP at market prices), II.1.1.B1nf (NDP at factor prices). February 29, 2016 Edition. Gross share is Compensation / (GDP at market prices − gross mixed income). Net share is Compensation / (NDP at market prices − net mixed income). Net less tax is Compensation / (NDP at factor prices − net mixed income).

UK   Bank of England, "The UK recession in context – what do three centuries of data tell us?" by Sally Hills, Ryland Thomas and Nicholas Dimsdale. Version 2.2 (July 2015). Table 10. YBHA (GDP(A) at market prices), NQAE (Capital consumption), DTWM (Compensation of Employees), Taxes on products and production net of subsidies. QWLT (Gross Mixed income).