

The Research Agenda: The Evolution of Factor Shares

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Ricardo (1817) argued that the principal problem of Political Economy is to understand the laws governing the distribution of income between labor and capital. Kaldor (1961) characterized the apparent stability of the share of income accruing to labor as a key stylized fact. Despite some scepticism (see, for example, Solow, 1958), the constancy of the labor share has disciplined myriad models over the past half-century. The requirement that the labor share be constant in theoretical models has shaped many economists' intuitions regarding the aggregate production function, economic growth, and inequality.

At odds with this background, the labor share of income has exhibited a pervasive global decline since the early 1980s. In this research overview, we summarize our work on the decline in the labor share. We first describe global trends in the labor share and discuss some measurement issues. Then, we summarize evidence that ties the labor share decline to the decline in the price of investment goods and contrast this with alternative explanations. Next, we present our recent work that studies the implications of joint trends in depreciation and labor shares for the structure of production, inequality, and macro dynamics. The conclusion outlines some future avenues of research.

1 Labor Share Decline: The Facts

The labor share is the fraction of gross domestic product (GDP) paid as compensation to labor for its services in the form wages, salaries in cash or in kind, and various supplements such as employer contributions for sickness, pensions, and insurance. “**The Global Decline of the Labor Share**” (Karabarbounis and Neiman, 2014a) provides a broad and systematic account of medium to long-term trends in the labor share of income. Few studies have documented how labor shares have evolved after the 1980s, with some notable exceptions being Blanchard (1997), Blanchard and Giavazzi (2003), and Jones (2003). Our paper is a first attempt to quantify trends in the labor share in a comprehensive sample of countries and industries in the past 35 years, offering new stylized facts for macroeconomists.

We build a new dataset from national income and product accounts for many countries and use it to document that the labor share has declined by more than 5 percentage points globally since the early 1980s. The decline in the labor share has been pervasive. It can be found in the United States and in 7 out of the 8 largest economies of the world (the exception is the United Kingdom for which our data starts in the late 1980s). The labor share has declined in all Scandinavian countries, where labor unions have been strong traditionally. The labor share decline is also observed in many emerging markets that recently opened up to trade including China, India, and Mexico.

The majority of industries also experienced declines in their labor shares. In most countries, changes in the aggregate labor share predominantly reflect changes in industry-level labor shares rather than changes in the size of industries with different labor share levels. This finding argues against otherwise plausible explanations for the decline of the labor share that operate through sectoral shifts in economic activity.

Our new cross-country dataset (which we have made publicly available) allows us to circumvent important measurement difficulties confronted by most of the labor share literature.

We measure labor shares within the corporate sector, which largely excludes unincorporated enterprises and sole proprietors whose income combines payments to both labor and capital. As highlighted by Gollin (2002), this “mixed income” poses problems for the consistent measurement of the labor share across countries and over time. By contrast, international comparisons of corporate labor share measures are cleaner.

Focusing on labor share measures within the corporate sector is desirable for three additional reasons. First, the production function and optimization problem in the government sector may be quite different from that in the rest of the economy and likely varies across countries. Second, labor share measures within the corporate sector are insensitive to the measurement and economic interpretation of residential housing, a controversial topic in studies of the economy-wide labor share. Most structures in the corporate sector are offices, stores, and factories and therefore should unambiguously be treated as assets that enter the production function. Finally, the depreciation rate applied to the aggregate capital stock is sensitive to the large fluctuations in residential housing prices. As we discuss below, the dynamics of depreciation are crucial for the interpretation of trends in factor shares and capital accumulation.

2 Labor Share Decline: Explanations

The decline in the price of investment relative to the price of consumption goods accelerated globally starting around 1980. This happened roughly at the same time when the labor share started to decline. The hypothesis we put forward in Karabarbounis and Neiman (2014a) is that the decline in the labor share can be explained by the decline in the relative price of investment goods. Decreases in the relative price of investment goods, often attributed to advances in information technology and the computer age, induced firms to shift away from labor and toward capital as the cost of capital declined. If the elasticity of substitution

between capital and labor in the aggregate production function exceeds one, then the shift of production toward capital is sufficiently strong to induce a decline in the labor share.

Most prior estimates used time series variation within a country in factor shares and factor prices to identify the elasticity of substitution in the aggregate production function. By contrast, our estimates of this elasticity are identified from cross-country and cross-industry variation in trends in labor shares and rental rates of capital. Therefore, these estimates are not influenced by the global component of the labor share decline, the object we intend to explain. The rental rate of capital can be influenced at high frequency by various factors such as short-run changes in interest rates, adjustment costs, or financial frictions. These factors, however, are unlikely to have a significant influence on long-run trends in the rental rate, particularly compared to the relative price of investment goods, which moves proportionately with the rental rate in the long run.

Countries and industries in which the relative price of investment goods declined the most experienced larger declines in their labor shares. This finding implies that the elasticity of substitution between capital and labor exceeds one. Given an estimated elasticity of substitution of 1.25, we conclude that roughly half of the global decline in the labor share can be attributed to the observed (more than 25 percent) global decline in the relative price of investment goods.

This explanation fits well with other major macroeconomic developments over the past decades. As Greenwood, Hercowitz, and Krusell (1997) argue, technology-driven changes in the relative price of investment goods constitute a major factor in economic growth. Krusell, Ohanian, Rios-Rull, and Violante (2000) show that the increase in capital equipment is a key force for understanding the increase in the skill premium. Shocks to the relative efficiency of investment goods (as in Greenwood, Hercowitz, and Huffman, 1988) are now considered a standard input into dynamic stochastic general equilibrium models that generate cyclical fluctuations in economic activity.

What about other factors potentially influencing the labor share? The hypothesis that trade and globalization have affected the labor share is theoretically appealing. The simplest story is that, following reductions in global trade frictions, capital-abundant countries have shifted production toward sectors that use capital more intensively in production. These countries import from labor-abundant countries that have shifted production toward sectors that use labor more intensively.

This Heckscher-Ohlin based explanation cannot be easily reconciled with the available evidence. First, labor-abundant countries such as China, India, and Mexico actually also experienced rapid declines in their labor shares, not the increases that this theory would predict. Second, this story attributes an important role for the between-industry component of the labor share decline. However, our evidence shows that the within-industry component is most important in developed economies. While there are other mechanisms through which international trade could affect the labor share (e.g. trade-induced declines in the relative price of investment goods), more evidence is needed before concluding that international trade plays an important role for the labor share decline.

What is the role of price markups and profit shares for the labor share decline? In a world with monopoly power, income is split between compensation to labor, rental payments to capital, and economic profits. Since in many countries capital shares did not display significant increases (reflecting the relative stability of investment rates), increasing profits shares are important in understanding the labor share decline. However, given that the estimated elasticity of substitution remains relatively stable when taking into account changes in markups, the decline in the relative price of investment still explains roughly half of the labor share decline.

Countries in our sample have experienced diverse wage growth and heterogeneous paths of economic development over the past decades. The estimates of the elasticity of substitution we described above are based on the first-order condition for capital, a condition that relates the

labor share to markups, capital-augmenting technology, and rental rates. Therefore, the effect of the declining relative price of investment on the labor share is compatible with any given cross-country variation in levels or in growth of both wages and labor-augmenting technology, once we take into account variations in markups, capital-augmenting technology, and rental rates.

A plausible hypothesis is that countries experiencing larger declines in the relative price of investment goods also experienced larger increases in capital-augmenting technological change. An important result is that such a case would never lead one to conclude that the elasticity of substitution is below one when the true elasticity of substitution is above one. The results in Karabarbounis and Neiman (2014a) do not exclude the possibility that capital-augmenting technological progress is important for the labor share decline. On empirical grounds we find declines in the relative price of investment goods a more appealing explanation than increases in capital-augmenting technology because the former are observed whereas the latter are typically estimated as residuals from first-order conditions. Nevertheless, with an elasticity of substitution greater than one, a combination of observed declines in the relative price of investment and (unobserved) increases in capital-augmenting technology can explain the decline in the labor share.

In many developed economies both the fraction of the workforce with college education and the college wage premium have increased during the past decades. This resulted in an increase in the share of income accruing to skilled labor relative to the share of income accruing to unskilled labor. A reasonable view of the world is that changes in the skill composition of the labor force interact both with the decline in the labor share and with the decline in the relative price of investment goods. However, our estimates of the role of the decline in the relative price of investment for the decline in the labor share do not change once we incorporate heterogeneity across countries and industries in changes in the skill composition of the labor force.

3 Depreciation, Technology, and Inequality

The first paper we discussed documented a pervasive decline in the labor share since the early 1980s and argued that the decreasing relative price of investment goods played an important role for this decline. In related work, Piketty (2014) and Piketty and Zucman (2014) discussed long-term movements in capital shares and highlighted the comovement between increasing capital shares and increasing capital-output ratios. An emerging literature motivated by these facts stresses that the interpretation of these trends depends on whether one considers concepts that are inclusive or exclusive of depreciation. For example, Krusell and Smith (2014) argue that the exclusion of depreciation significantly changes Piketty’s predictions of how a growth slowdown would impact the capital-output ratio.

The analysis in Karabarbounis and Neiman (2014a) is done in terms of gross variables, whereas the analysis in Piketty (2014) is done in terms of variables measured net of depreciation. The labor share is typically measured as compensation to labor relative to gross value added (“gross labor share”). One argument in favor of using gross concepts is based on empirical grounds. Depreciation is an imputed item in the national income and product accounts, and so the principle of using more direct measurements would argue for the use of gross instead of net concepts. Since the measurement of depreciation differs across countries, the use of net concepts is even more problematic in an international context. On the other hand, depreciation represents a payment implicitly consumed by the use of fixed capital. As a result, this flow cannot be consumed by households. At least since Weitzman (1976), therefore, economists have recognized that net concepts such as the net domestic product and the net labor share may be more closely associated with welfare and inequality than their gross counterparts.

Depreciation, typically treated in macroeconomics as an uninteresting accounting concept, is a crucial input in understanding the joint dynamics of factor shares and inequality. In

an important new paper, Rognlie (2014) highlights a mismatch between the behavior of labor’s share of income net of depreciation (“net labor share”) – a focus of Piketty’s theory – and estimates of the elasticity of substitution between capital and labor that typically come from studies of the gross labor share (including the estimates in Karabarbounis and Neiman, 2014a). In fact, in his review of Piketty (2014), Summers (2014) also highlights the key role of depreciation:

“Piketty argues that the economic literature supports his assumption that returns diminish slowly (in technical parlance, that the elasticity of substitution is greater than 1), and so capital’s share rises with capital accumulation. But I think he misreads the literature by conflating gross and net returns to capital. It is plausible that as the capital stock grows, the increment of output produced declines slowly, but there can be no question that depreciation increases proportionally. And it is the return net of depreciation that is relevant for capital accumulation. I know of no study suggesting that measuring output in net terms, the elasticity of substitution is greater than 1, and I know of quite a few suggesting the contrary.”

“Capital Depreciation and Labor Shares Around the World: Measurement and Implications” (Karabarbounis and Neiman, 2014b) documents the global patterns of depreciation and labor shares and explains the implications of these patterns for inferring the shocks that hit the economy, the structure of production, and inequality. Our main empirical finding is that both gross and net labor shares have in general declined around the world over the past four decades. Some countries, including the United States, experienced increases in the value of depreciation as a share of gross domestic product. As a result, these countries experienced smaller declines in their net labor share relative to their gross labor share. However, the average economy in the world experienced a decline of similar magnitude in both measures. Further, the cross-country pattern of declines in the net labor share closely

resembles the cross-country pattern of declines in the gross labor share.

To understand the implications of these trends, we develop a simple variant of the neoclassical growth model in which the production function uses labor and two types of capital. Labor and aggregate capital combine with an elasticity of substitution greater than one. One type of capital depreciates at a low rate (for example, structures and transportation equipment) and the other type depreciates at a high rate (for example, capital related to information and communication technologies). Depreciation as a share of GDP introduces a wedge between the net and the gross labor share. For a given decline in the gross labor share, the decline in the net labor share is smaller when the increase in depreciation's share of GDP is larger. Consistent with measurement practices in national income and product accounts, depreciation as a share of GDP fluctuates in response to shifts in the composition of capital and to changes in the aggregate nominal capital-output ratio.

In this environment, we confirm the hypothesis of Summers (2014) and reproduce the finding of Rognlie (2014) that gross and net labor shares may move in different directions in response to changes in the real interest rate. A decline in the interest rate affects the net rental rate proportionately more than the gross rental rate. The large increase in the nominal capital-output ratio increases depreciation as a share of GDP, which in turn mutes the decline of the net labor share relative to the decline of the gross labor share. For reasonable parameterizations, reductions in the real interest rate cause the net labor share to increase despite a decrease in the gross labor share.

Very few countries, however, experienced opposite movements in net and gross labor shares over the past 40 years. We demonstrate theoretically that, unlike shocks to the real interest rate, technology-driven changes in the relative price of investment goods cause gross and net labor shares to always move in the same direction. Declines in the price of capital tend to offset increases in the real capital-output ratio, which dampens the increase in depreciation's share of GDP and allows net and gross labor shares to fall together. This dynamic results in

behavior at odds with the description in Summers (2014) because declines in the relative price of investment affect both the net and the gross return to capital proportionally. Equivalently, in response to changes in the relative price of investment, the elasticities of substitution in the gross and the net production functions are on the same side of (or equal to) one. Collectively, these theoretical and empirical results can reconcile the global decline in the relative price of investment, as analyzed in Karabarbounis and Neiman (2014a), with the narrative of Piketty (2014) that rests on a high net elasticity of substitution.

A contribution of this work is to clarify that both gross and net concepts can be useful and complementary. The argument for using net domestic product and net labor shares instead of their gross counterparts is that the former are more relevant for welfare and inequality. It is useful to note that this logic most naturally applies in an economy's steady state. It is not obvious whether gross or net concepts are most informative for thinking about welfare and inequality during the economy's transition.

In the simple variant of the neoclassical growth model that we described above, there are two types of agents, workers and capitalists. Workers cannot save and simply consume their labor earnings in every period. The dynamics of consumption inequality between these two groups are governed by the assumption that capitalists, in contrast to workers, are forward looking and have a positive saving rate. Using simple examples, we illustrate that both the gross and the net labor shares can be jointly informative about the evolution of consumption inequality. The net labor share perfectly summarizes inequality between workers and capitalists in the steady state of the model as workers consume their wages each period and capitalists consume their capital income net of depreciation expenses. This simple relationship, however, ceases to hold along the transition. Intuitively, the net labor share only captures the net income position of workers relative to capitalists in a specific time period. Net income inequality need not translate into consumption inequality when capitalists are forward looking and can save to achieve an optimal allocation of resources across time.

4 Work in Progress and Future Plans

The decline in the labor share has generated attention in part due to its association with increasing inequality. Our view is that the labor share is a useful starting point for thinking about distributional issues, but more work is necessary in order to link factor shares to income and wealth inequality. For example, even in a very stylized model with a striking division between hand-to-mouth workers and forward-looking capitalists, Karabarbounis and Neiman (2014b) demonstrate the inadequacy of either gross or net labor share measures to fully capture inequality in a satisfactory way outside of the steady state.

A fruitful direction for future research is to develop more realistic models that help us understand the joint dynamics of inequality and factor shares. Overall income inequality depends on a host of additional factors, such as the correlation of capital income with labor income and each of the within components of labor and capital income inequality, that also change when some shock causes the labor share to fluctuate. In research in progress together with Jon Adams (a graduate student at Chicago Econ), we examine theoretically the link between factor shares and overall income inequality in a rich model with incomplete markets, worker heterogeneity along various dimensions, bequests, redistributive taxation, and production that combines skilled and unskilled labor with different capital goods.

In other research in progress together with Sara Moreira (a graduate student at Chicago Econ), we have started creating a dataset of labor shares in the United States at the industry-state level between the late 1960s and 2012. As a first step in this empirical analysis, we have focused on the measurement of the labor component of sole proprietors' income at the industry-state level, using both aggregate and micro data. This dataset will allow researchers to better understand the patterns of labor share changes at a less aggregated level and how these patterns are related to industry and regional economic outcomes.

Finally, the decline in the labor share has been associated with significant changes in the

flow of funds between households and corporations. “**Declining Labor Shares and the Global Rise of Corporate Savings**” (Karabarbounis and Neiman, 2012) documents a substantial change in the distribution of saving between households and corporations. Using sectoral data from more than 50 countries, we show that by 2010, corporations, as opposed to households and governments, supplied saving that financed over 60% of global investment. The corresponding number in the early 1980s was roughly 40%.

Declines in the relative price of investment are consistent both with the decline in the labor share and the global rise of corporate saving. Corporate saving increases as it is the cheapest means to finance increased desired investment. Investment here should be broadly interpreted as encompassing both tangibles and intangibles. The latter types of investment have increased dramatically over the past 30 years (Corrado, Hulten, and Sichel, 2009).

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