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The Labor Share and Fluctuations

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Preface

The labor share fluctuation has been widely scrutinized recently. Is the labor share of income falling as many have argued over the last few years? How do we measure labor income when the economy is populated with those self-employed? What are the consequences of falling labor income? Rising inequality? Widespread adoption of robots? There are many methodological as well as empirical discussion to be addressed regarding how to measure labor income share and the cause and consequence of changing labor income share over time. This project bravely titled "the labor income share and fluctuations" attempts to clarify some recent research on the related topic and analyzes the changing trend in the labor share in South Korea. Specifically, in Chapter 1, Facundo Piguillem reviews the rich literature on the labor share over the last thirty years. He carefully examines the dispute over the fact that the labor share is globally declining, chronically reviewing the calculation of labor share, the associated criticism, and potential implications. In Chapter 2, Marco Di Pietro estimates a model with technology choice using South Korean data and shows that this model does a fairly good job of matching data moments in comparison to a standard mode with Cobb-Douglas production technology and a model with short- and long-run CES only. This model also does a good job of replicating the behavior of the labor share of income at short to medium-run frequencies. Finally, in Chapter 3, Sun-Bin Kim analyzes the changing trend of the labor

share in South Korea and examines how much the decrease in the relative price of investment goods can explain the changing labor share.

Chapter 1
The labor share in the last thirty years

For many years since the appearance of the widely accepted Kaldor's facts, the labor and capital income shares where considered constant. However, in an influential paper Karabarbounis and Neiman (2014) argue that the labor share has been globally declining for that last 30 years. This brings about many questions. First, is the labor share actually declining? Or in other words, could there be some measurements issues that provide the appearance of a falling labor share? Second, if so, what is the driving force pushing the labor share down? Last but not least, what are the macroeconomics implications of it?

In what follows I will address these three questions based on the rich literature on the labor share. As a preview to the answers, many researchers dispute the fact that the labor share is indeed globally declining, arguing that some measurement issues related to the increased relevance of the housing sector and intellectual property capital could be driving the trend. Still, after some corrections the labor share for the U.S. economy seems to be declining, but mildly, while the global fall is not longer clear. Those who still support the decline view argue that the reason is a sharp increased in market power and, therefore, profits.[1)] As to what are the implications of the falling labor share, there has not been much literature besides the standard view, led by Piketty(2014) and Piketty and Zucman(2014), that a falling labor share reflects an ever increasing wealth inequality. There are a few excep- tions that linked the increase in the capital share to the "Corporate Savings Glut" and to a potential amplification financial shocks.

Next I will address all the aforementioned issues in detail. The review is organized chronologically to stress the order in which the different problems and findings saw the light and how they related to previous findings. In Section 1.1 I made a quick review of the initial calculations of the labor share and its shortcomings until Karabarbounis and Neiman(2014) presented credible evidence that the labor share was falling. This paper is analyzed in Section 1.2. In Section 1.3 I review the initial criticism to their estimations that point to unresolved measurement problems. Section 1.4 addresses the arguments that support the labor share fall, at least for the U.S. economy, stressing the role played by markups and profits. The arguments emphasizing the market power explanation were later disputed by Karabarbounis and Neiman(2018) in a follow up paper, which arguments are sketched in Section 1.5. Finally, Section 1.6 presents some potential implications, not only related to the trend but also to its volatility.

1.1 The traditional view and initial controversies

The share of income allocated to capitalist and workers has long

1) This hypothesis is strongly disputed by a new paper by Karabarbounis and Neiman(2018) who still argue that most of the change is related to either capital biased technological change, or equivalently, a declining price of investment goods.

been a controversial issue. The first paper to provide reliable and convincing evidence about its relative importance and variability over time was the influential Kaldor(1957). This paper originated the well known Kaldor's facts for the U.S. and UK economies, that among other findings states that the labor share is remarkable stable and between 65~70%. Putting all Kaldor's facts together there was strong evidence that the aggregate production technology exhibit Constant Returns to Scale(CRS), and because the labor share was constant, it should be Cobb-Douglas. For many decades this remain the accepted undisputed paradigm. However, in the 80's and 90's, when the availability of data for a much larger set of countries started to become available, some initial doubts arose. The labor share seemed to show large variability across countries, ranging from as low as 5% in some African countries to as large as 75% in other countries previously belonging to the USSR.[2)]

Many researchers started to dispute that the aggregate technology was Cobb-Douglas and even that the technology was the same for all countries. One striking pattern that received academic attention was that less developed countries were consistently showing low labor shares, while more developed countries exhibit large labor shares, very close to 70%. A natural question arise, is the labor share increasing with development? There are several reasons why the labor share could differ across countries. One can think about different technologies depending on the stage of development. This appears unlikely since different technologies can easily be imported to any country. A second reason is that the elasticity of substitution between capital and labor is different from 1, and therefore not Cobb-Douglas.[3)] However,

2) See Gollin(2002) for additional details encompassing 94 countries.

3) In particular, if the elasticity of substitution is smaller than one, the demand for labor grows faster with the accumulation of capital, and thus, the labor income

this solution seems to also be inconsistent. How is it possible that the labor share is stable over time if the elasticity of substitution is different from one? In other words, what solves the cross sectional differences should also explain the time series patterns. Another controversial suspect was differences in market structure. Maybe in less developed countries rich capital holders have more power and influence, and therefore there is less competition, which reflects on higher returns to capital. Last but no least, there was the possibility that the labor share was either improperly measured in poorer countries or statistical agencies where using different methodologies.

In a classical answer to this puzzle, Gollin(2002) showed that indeed the pattern across countries emerged because of measurement issues. To see this, it is useful to keep in mind that Gross Domestic Product (GDP) satisfies:

$$Y = (r + \delta)K + \omega L \tag{1.1}$$

where r is the net return on capital, δ the depreciation rate, ω average wage per worker and L is the total number of employees. The labor share is defined as:

$$LaborShare = (1 - \alpha) = \frac{\omega L}{Y} \tag{1.2}$$

This is very easy formula which is hard to implement. There are some organizations though in which it generates very clear results: corporations and other big non-corporate businesses. In general, the labor share is defined computing all labor costs, wages and other supplements. The residual is the capital share, which, as is should be

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share increases with development. In fact, there is ample evidence that in the short run the elasticity of substitution is smaller than one, see for instance Chirinko and Mallick(2017) Given the current debate about the falling labor share there is a renewed debate about this value.

clear, it could include many other components as depreciation provisions and taxes. When this methodology is applied to highly organized enterprises as corporations and big private companies, equation(1.2) generates a clear and robust indication of the proportion of income that is allocated to labor. However, there is a large sector in each economy for which this approach is either hard or impossible to apply: small sole proprietors.

First, as we mentioned, it is common practice to use employee compensation as a measure of labor income. However, from a conceptual perspective employee compensation(including supplements) differs from labor income. Employee compensation excludes some important forms of non-wage compensation and may include rents accruing to particular skills, including returns to entrepreneurial ability. More important, and it is the point stressed by Gollin(2002), employee compensation omits the labor income of people who are not employees. In some countries, the self employed account for a vast fraction of the workforce. In these countries, generally less developed, labor income is badly understated by the employee compensation measure.[4)]

As Gollin(2002) states "*Rates of self employment vary widely across countries. Even within sectors, there are large differences across countries, as shown by Gollin(1996). In Ghana, Bangladesh, and Nigeria, for example, 75-80 percent of manufacturing workers were self-employed, compared with fewer than 2 percent in the United States(ILO 1993).*" He shows not only that rates of self-employment differ greatly between countries, but also that these rates are closely related to real per capita GDP. The biased in the measured labor

4) Gollin(2002) also considers the possibility that different sectorial compositions could be generating the result. He strongly rejects this possibility based on the information provided by the data. Nevertheless, in Section 4.1 we will see there could be an issue related to sectorial compositions in the estimations post 2000.

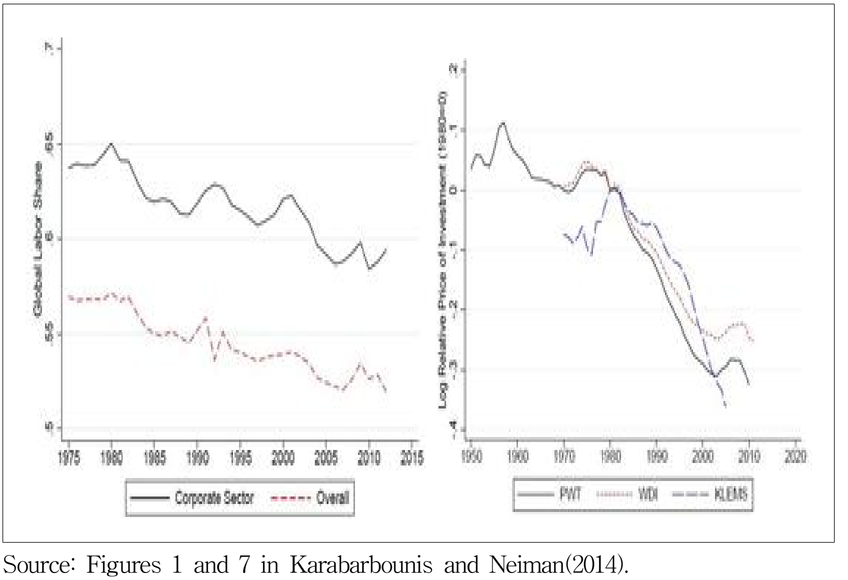
income follows because “according to the United Nations System of National Accounts, adopted in 1953, the income of the self employed is specifically not to be counted as employee compensation.” Instead, the standard practice was to count all this income as capital income. For instance, a self-employed person in Bangladesh who every day attends to the market to sell products on her/his stand, maybe even informally, would be considered a capitalist and all of her/his income would be counted as capital income.

To deal with this problem Gollin(2002) imputed the labor income to self employed workers using the same proportions as the corporate sector in each country, correcting for sectorial differences whenever possible. After these adjustments, the labor income shares look remarkably similar for all countries and very close to the ranges provided by the series of the U.S. and UK economies, most of them with labor shares between 0.65 and 0.70. This correction apparently solved the puzzle, brought back the validity of the Kaldor’s facts and muted the debate for more than a decade until the debate about the global decline of the labor share revived in 2015.

1.2 The global decline of labor share

The initial controversy about the labor share was somehow forgotten, at least in what respect to the differences across countries, but what about the stability over time? Is it the labor share really “stable”, or “almost constant”, in all countries? The first to notice that the labor share could be declining was Elsby, Hobijn, and Sahin(2013), but they did so only for the U.S. economy. Was this a general trend around the world? To deal with this question Karabarbounis and Neiman(2014) construct a database for a large set of countries, including all large economies, appealing to aggregate official data. All these data is publicly available and can be download from the internet. Of course, keeping in mind the important measurement issue due to self-employment, the authors focus almost entirely in the corporate sector.[5)6)] The main result of the paper can be seen in [Figure 1.1], left panel. The global, or average in the sample, labor share declined from around 65% in 1980 to around 58% in 2013. This is 7% of the global income moving from the hands of workers to capitalists. The decline is generalized, observed in 42 out 59 countries with data available for at least 15 years. Of the large economies, only the UK is not affected by the downward trend. All the other large economies show a secular downward trend. In [Figure 1.2] I plot the observed labor share for the four largest economies in the world.

〔Figure 1.1〕 The global decline



Source: Figures 1 and 7 in Karabarbounis and Neiman(2014).

5) They also provide calculations for the economy as whole, imputing labor income as in Gollin(2002), to stress the measured decline is not only in the Corporate sector. See [Figure 1.1], "Overall" series.

6) Figures extracted from the original paper.

This is a simple exercise that does not require much effort or complex calculations. It is a straightforward application of equation (1.2) to the global corporate sector, and because of this, it is immune to Gollin(2002)'s critic. The only other measurement issue that could arise with this methodology is that now changes in the sectoral compositions could be driving the results. For example, does the decline in the labor share simply reflect the fact that manufacturing's share of economic activity has fallen while the share of economic activity in services has risen?(Karabarbounis and Neiman, 2014)

To answer these questions the authors use the EU KLEMS (KLEMS) dataset. Because of data availability the number of countries is reduced and does not allow for a focus on the corporate sector, but it permits to construct labor shares for each country in commonly defined industries of varying granularity(Karabarbounis and Neiman, 2014). They find that more than 90% of the labor share decline reflects within-industry changes, and thus, the global decline is not due to changes in sectoral composition.

The last question that the authors try to address is the reason why the labor share is falling. They consider alternative explanations including capital biased technological change, rising markups and declining price of investment. To fix ideas, consider the Constant Elasticity of Substitution(CES) production function:

$$Y=(\alpha(A_K K)^{\frac{\sigma-1}{\sigma}}(1-\alpha)(A_L L)^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}} \quad (1.3)$$

where A_K is A_L are the capital and labor augmenting levels of productivity, respectively, and σ is the elasticity of substitution between capital and labor. If $\sigma=1$, the above equation collapses to a Cobb-Douglas. They show that in their model with imperfect competition the equilibrium labor share S_L satisfies:

$$S_L = \frac{1}{\mu}[1 - \alpha^{\sigma} (\frac{A_K}{\mu R})^{\sigma - 1}] \qquad (1.4)$$

where $\mu \geq 1$ is the markup. The first thing to notice is that if $\sigma = 1$, so that the technology is the standard Cobb-Douglas, the labor share can fall only if the markup is increasing. Also, notice that capital biased technological shocks decrease the labor share when $\sigma > 1$, and increase it with $\sigma < 1$. Thus, equation(1.4) stresses two of the main issues related to the debate on the labor share. Is it the markup or the production function exhibits a non-unitary elasticity of substitution? Needless to say, whichever the answer, it was destined to be controversial.

Since the response of the labor share to A_K is isomorphic to changes in the relative price of investment, the authors collect data on country specific investment prices. They use three alternative sources: 1) Penn World Tables(PWT, Mark 7.1), which offers measures at point in time of the relative price levels of investment and consumption goods for many countries, 2) World Bank's World Development Indicators (WDI) and 3) Finally, an industry-level analyses using KLEMS data on investment and output prices in each industry. As can be seen in [Figure 1.1], right panel, all the time series for the price of investment are highly correlated.

The authors have no exogenous variation to discipline the effects of the markup, so they trust on their model identification. There are three main conclusions from the estimation:

(1) The estimated elasticity of substitution, σ, is in all cases clearly larger than one and around 1.25. This number is significantly larger than the standard view that sets $\sigma = 1$, and completely at odds with micro-estimations that systematically find $\sigma < 1$. This estimation also validates the views sustained by many scholars, originated in Marx and firmly supported by Piketty(2014) and Piketty and Zucman(2014),

that capital accumulation and growth could lead to an ever increasing income and wealth inequality.[7] As capitalist accumulate more, their share of income increases rather than falling due marginal decreasing returns to capital.

(2) Technological innovation, either by direct impact of productivity or through decreasing investment prices, explain at least half of the fall in the labor income share. This is important because if the labor share is decreasing due to improvements in technology, it is just a consequence of an expanded feasibility set and therefore welfare improving. Whatever adverse distributional consequence could have, it could be easily solved using transfers or other means to compensate the impact on relative incomes.

(3) Even though the changes on the investment prices seem to explain most of the variation, there is still ample room to believe that increasing market power could be playing an important role. If this were the case, them maybe some firms are becoming too big, so big that in a way they could be affecting the aggregate efficiency of the economy.

1.3 Is there no measurement problem in the new estimations?

The estimation in Karabarbounis and Neiman(2014) were taken with some skepticism and quickly attacked by some measurement problems. The first problem pointed out by Rognlie(2015), argue that, at least for the U.S. economy, the rising capital share is mostly accounted for by the increasing relevance of housing in the National Accounts. His critic goes straight to the heart of one of the interpretations of the rising capital shares: growing income and wealth inequality. Contem-

7) This theory is develop with more detail in Piketty(2014).

poraneously, Koh, Santaeulalia-Llopis, and Zheng(2018) notice that the fall in the labor share started to appear after the 2003 NIPA account revisions and that in this revision there was an important change on how the investment in intellectual property capital were treated. They show that absent this methodological change in the National Accounts, the labor share would have remained constant as stated in the Kaldor's facts. I discuss these two critics in this section.

1.3.1 The role of housing in the labor share

Rognlie(2015) is mainly an answer to Piketty and Zucman(2014) and Karabarbounis and Neiman(2014)'s views, that he calls "accumulation view." Which either explicitly or implicitly imply a "vicious" cycle in which capital holders are benefited by technological innovations, then they invest more, but this instead of reducing the marginal returns to capital, the change is such that they are able to appropriate a larger portion of the total income. Since they have more income, they invest more, then again the capitalist's share of the pie increases, and so on until potentially the capitalists receive most or all the income in the economy. Conversely, Rognlie(2015) states the "scarcity view" and the central role of the housing sector: net capital share rose from 3% to 9% in the period 1980~2013, after having fallen from 1945, partly because of the rising price of residential investment and the growing scarcity of land.

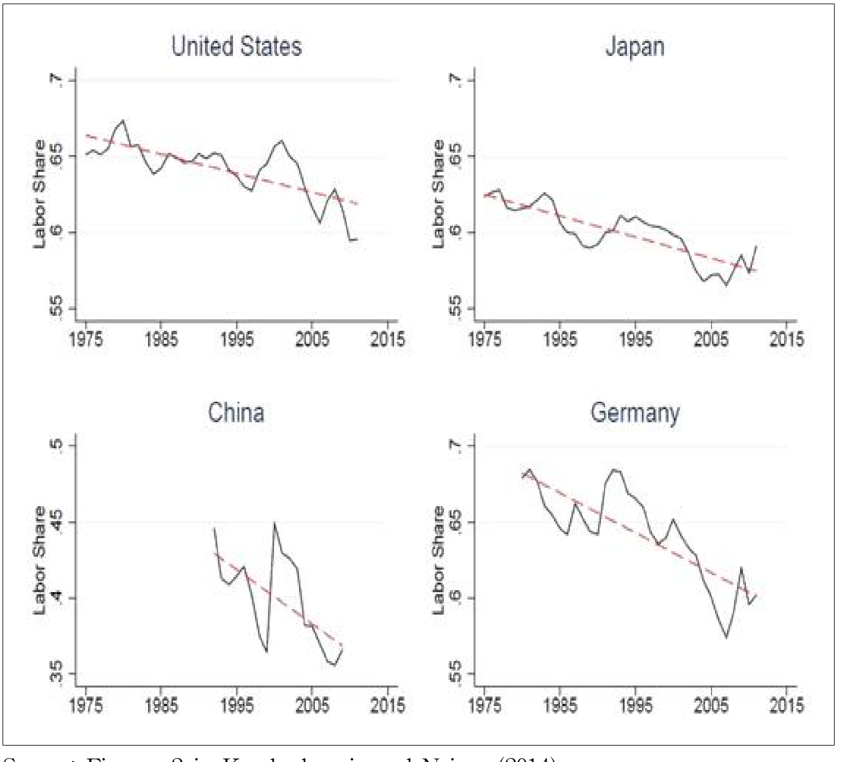
His first step is a more careful look at equation(1.1), where he notice that depreciation could be playing an important role. The larger the depreciation, the larger the share that is assigned to capital holders. However, the amount of resources devoted to depreciation are not pure income in the sense that capital holders cannot freely dispose of them. It just a cost that must be assumed to maintain the current level of capital. Thus, he defined the net income share using the identity:

$$\widetilde{Y} = Y - \delta K = rK + \omega L \tag{1.5}$$

where $\widetilde{Y}$ is the Net Domestic Product(NDP). In addition, he focuses on the NET capital share, rather than the traditional approach of measuring the labor share and recover the capital share as a residual. Further, he excludes the housing sector from his calculations. He does so because, on the one hand, it is well known that housing has an imputed labor share that is almost zero. On the other hand, this is due to the fact that a large part of the housing "income" is precisely imputed. Since most housing is used by their owners, most of its generated income is an imputed value trying to reflect what it would cost to an owner to rent an equivalent house. Last but not least, housing ownership is widespread among workers. Thus, imputing this income to "capitalist," as it is the view of Piketty and Zucman(2014), would greatly distort the distributional argument. As for "mixed income," he follows the now standard approach of assuming that the non-corporate sector(excluding housing) has the same net capital share as the corporate sector. Moreover, he uses a database on the income shares of G7 economies which is mainly based on Piketty and Zucman (2014), since it covers a long lifespan.

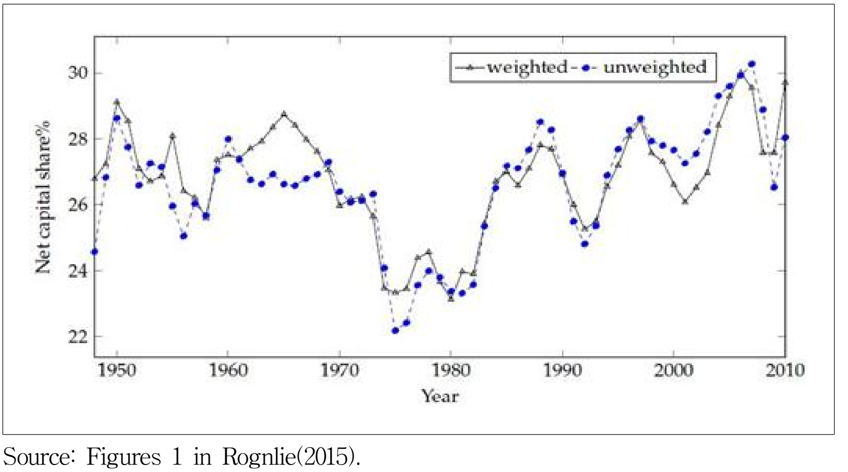
[Figures 1.3](net capital share) and [Figure 1.4](gross capital share) show the capital shares(still including housing) implicit in his database. The comparison between [figures 1.3 and 1.4] provide some interesting insights. First, both show an steady increase in the capital share (decrease in the labor share) since 1980 to the present, in the same way as Karabarbounis and Neiman(2014) does. However, the net capital share rather than being increasing, seem to be recovering from abnormally low levels in the 70's, while the gross capital share seem to be ever increasing. This stark discrepancy between net and gross

〔Figure 1.2〕 The global decline



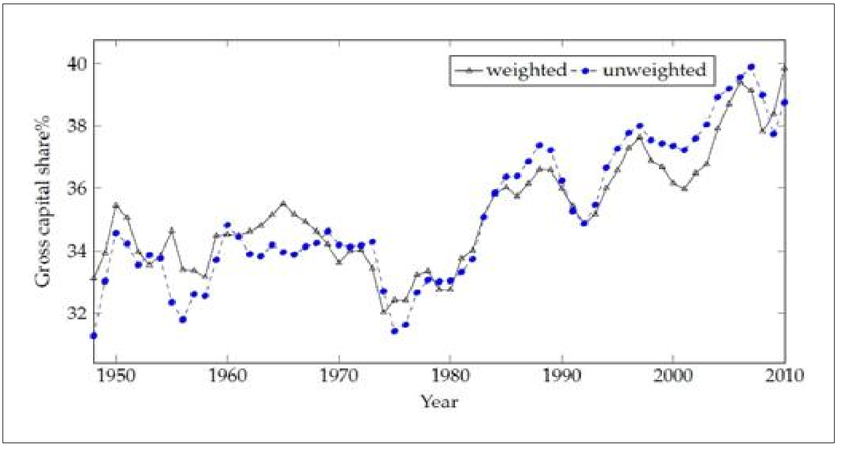
Source: Figures 2 in Karabarbounis and Neiman(2014).

〔Figure 1.3〕 Net capital share in G7 economies



Source: Figures 1 in Rognlie(2015).

〔Figure 1.4〕 Gross capital share in G7 economies



Source: Figures 2 in Rognlie(2015).

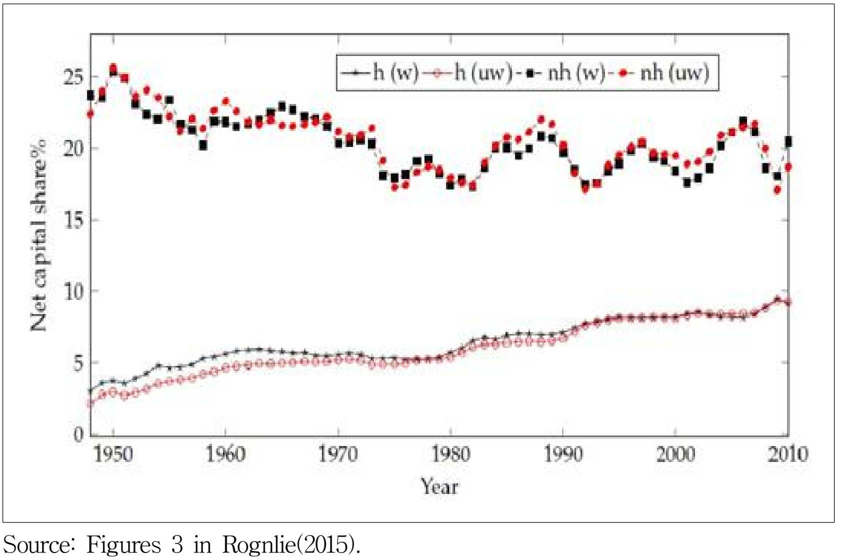
income shares was first stressed by Bridgman(2014).

These calculations also emphasize the danger of calling “trend” as Karabarbounis and Neiman(2014) do, something that has been observed for “only” 25 years or so. Still, the net capital share seem to be above the levels previous to the beginning of the sample. Could it be that the capital share is not only recovering but will continue increasing above levels never seen before? In this point is where he uses the distinction between housing and non-housing capital share. This decomposition can be seen in [Figure 1.5]. There a striking pattern emerges, the net non-housing capital share exhibits, if anything, a decreasing trend, while the net housing capital share shows an steady upward trend. These two facts, greatly contradict the Piketty(2014) and Piketty and Zucman(2014) hypotheses that the capital share seem to be in an ever increasing path. As Rognlie(2015) post it: “*Since housing has relatively broad ownership, it does not conform to the traditional story of labor versus capital, nor can its growth be easily explained with many of the stories commonly proposed for the income split elsewhere in the economy-the bargaining power of labor,* *the growing role of technology, and so on.*"

To further emphasize his point, Rognlie(2015) also takes a look at the net capital share inside the corporate sector. It is clear from [Figure 1.6] that the net corporate capital resembles the behavior of the net non-housing capital share in [Figure 1.5]. This makes sense because in the U.S economy the share of housing in the corporate sector is rather negligible. Rather than an increase in the capital income share, there seems to be a steady decrease. In the light of this estimations, most of the decline in the labor share is then due to the increased relevance of housing and depreciation.

Based on this finding he proposes the alternative theory of "scarcity" to explain the fall in the labor share. In short, land is a fix input, as the demand for it increases, its value also increases, leading to a growing relevance of its weight over total income. The problem is not that capitalists are accumulating too much, but that there is no enough land to satisfy everyone demands. Finally he develops a model to

〔Figure 1.5〕 Housing and non-housing capital share



Source: Figures 3 in Rognlie(2015).

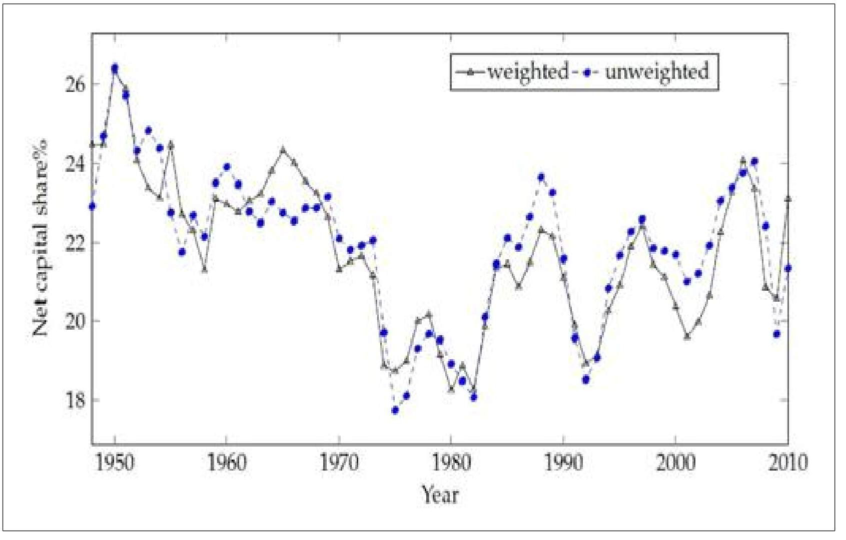
understand the reaction of the economy to different shocks to uncover whether the accumulation view or the scarcity view are better suited to explain the observed patterns. He finds that a fall in r leads to a fall in the net capital share(in contrast with Piketty, 2014), the effect of investment prices is ambiguous, whereas both a rise in the price of residential investment and a fall in the quantity of residential land lead to a rise in the net capital share.

But what about the global decline in the corporate labor income share?

As we mentioned in Sections 1.2 and 1.3 the approach taken by Karabarbounis and Neiman(2014) was supposed to be immune to the self-employment critic, and as pointed out by Rognlie(2015) the corporate sector does not seem to be greatly affected by housing. Then, is the global decline just an effect of depreciation? In contrast to what happen in the U.S., Gutierrez and Piton(2019) notice that housing has an important impact in the corporate sector in many countries. Thus, they harmonize the series to correct for the housing problem, but still include depreciation as capital income. The first interesting finding, see [Figure 1.7], is that indeed the corporate sector in the U.S. is mostly unaffected by housing while in many European countries housing is very important.

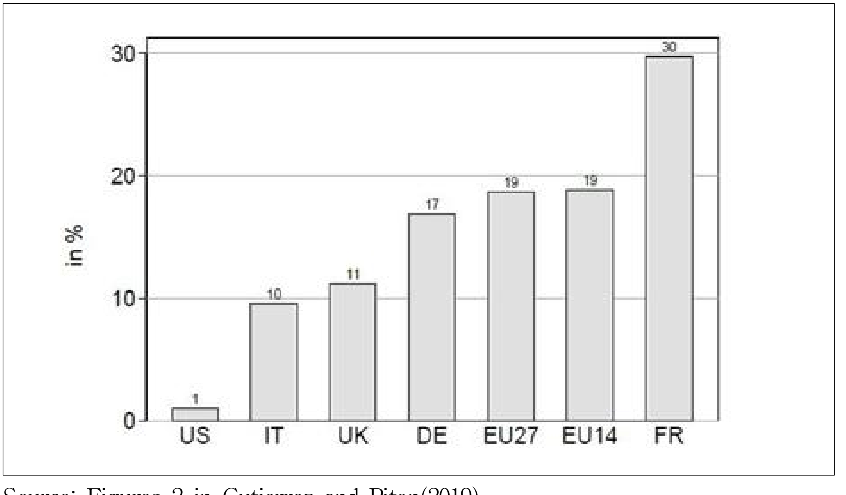
This paper argues that the global(especially non-U.S.) decline of the gross labor share is just a byproduct of measurement issues that have been faced wrongly. Hence, they propose two different methods to face the inclusion of housing services and self-employed workers in the corporate sector of most countries. The first method uses industry accounts and fully controls for housing while the second uses sector accounts, focusing on the corporate sector. These new “harmonized”

〔Figure 1.6〕 Net corporate capital share



Source: Figures 4 in Rognlie(2015).

〔Figure 1.7〕 Share of dwelling in total fixed assets



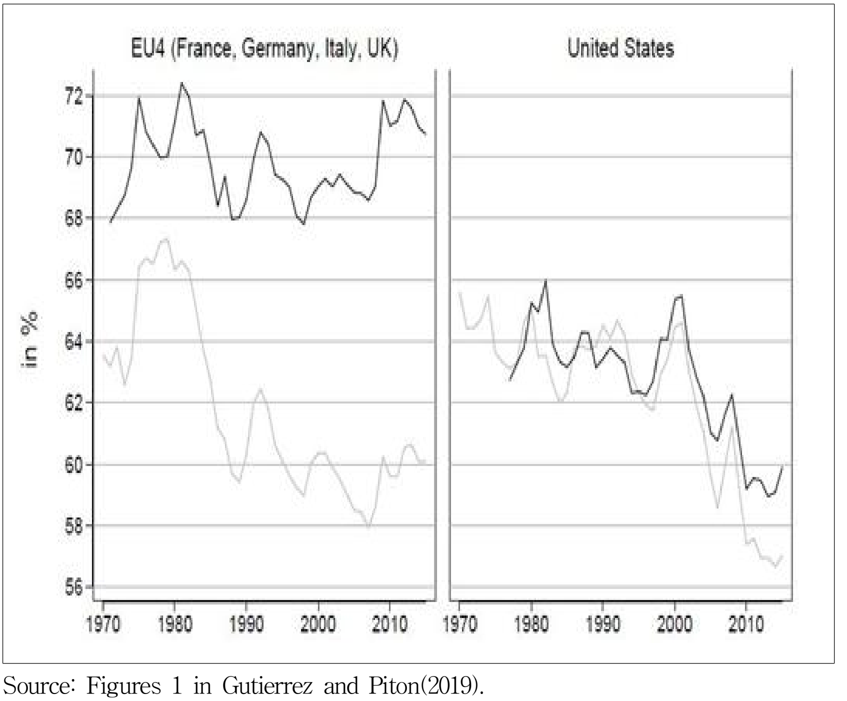
Source: Figures 2 in Gutierrez and Piton(2019).

series do not exhibit a global decline in the labor share. On the contrary, it remained largely stable across industries, except for the U.S. manufacturing sector, which is responsible of most of the U.S.

decline. In fact, the decline of European labor share is entirely explained by the rise of real estate. Their main result can be seen in [Figure 1.8], where the correction mildly dampens the fall in the U.S. gross labor share, consistent with Rognlie(2015) gross measure, but completely eliminates the fall of the labor share in the European countries, even without considering the NET labor share.

The measurement challenges presented are linked to the fact that while in the U.S. the integrated macroeconomic accounts include a corporate and non-corporate business sector, most non-U.S. countries follow the 2008 SNA, under which all units engaged in market production that act independently of their owners belong to the corporate sector. Thus, they present a broader definition of corporations.

〔Figure 1.8〕 Labor share adjusted by housing



Source: Figures 1 in Gutierrez and Piton(2019).

1.3.2 The arrival of intellectual property capital

Even though Rognlie(2015) critic is powerful and convincing, there is still the increasing pattern of the capital share after 1980. Maybe is not as pronounced as originally thought, but still there is a change of tendency that could call for an explanation. Koh, Santaeulalia-Llopis, and Zheng(2018) notice that the striking fall in the U.S. labor share started to be evident after the 2013 revision of the National Accounts. This revision(and a previous one in 1999) aimed to provide a better categorization of Intellectual Property Capital(IPP).

As pointed out by Koh, Santaeulalia-Llopis, and Zheng(2018) "*The capitalization of IPP has been gradually introduced by the Bureau of Economic Analysis(BEA) through two comprehensive revisions of the NIPA. In 1999, the 11th BEA revision capitalized software expenditures by business, Non-profit Institutions Serving Households (NPISH), and government. Prior to this revision, software expenditure was considered intermediate nondurable consumption in the business sector and final consumption in NPISH and general government. Analogously, after the 14th revision in 2013, the BEA treats the expenditures by businesses, NPISH, and the government for R&D and those by private enterprises for the creation of entertainment, literary and artistic originals(henceforth, artistic originals) as investments in the form of durable capital, that is, no longer as business expenditures in intermediate nondurable goods or as NPISH and government final consumption. These newly recognized forms of investment(i.e., software, R&D, and artistic originals) constitute the set of intangible assets currently measured by the BEA, the so-called IPP. These revisions aim to capture the increasingly important role of IPP in the U.S. economy. Notably, the share of IPP in aggregate investment increases from 8% in 1947 to*

26% in 2016 in the NIPA."

The effect of this revisions and its controversial role can easily be seen with some accounting identities. Recall equation(1.2) where total income is equal to value added.

$$Y = (r + \delta) + \omega L$$

However, businesses not only use their revenue to pay capital and labor, but also to buy some intermediate inputs. Thus, letting I be the intermediate inputs and Q the gross output, the calculation of value added is:

$$Y = W - I = (R + \delta)K + \omega L$$

Previous to the BEA revisions all expenses in IPP, including softwares and such, even when produced in house, where computed as intermediate inputs. Clearly, this treatment was grossly underestimating the investment of firms on intangible capital. To address this issue, the BEA correctly changed the treatment of IPP, changing its denomination from intermediate input to gross output, or value added. This means that if the GDP before the revision was $Y_0 = Q_0 - I_0$, after the revision the GDP is $Y_1 = Q_0 = Y_0 + I_0$. The problem arises because the total amount of income allocated to labor remained unaltered in $\omega_0 L_0$, and hence all the additional income was allocated to capital, so that $(r_1 + \delta)K_1 = (r_0 + \delta)K_0 + I_0$. As a result the labor income drop from

$$1 - \alpha_0 = \frac{\omega_0 L_0}{Y_0}$$

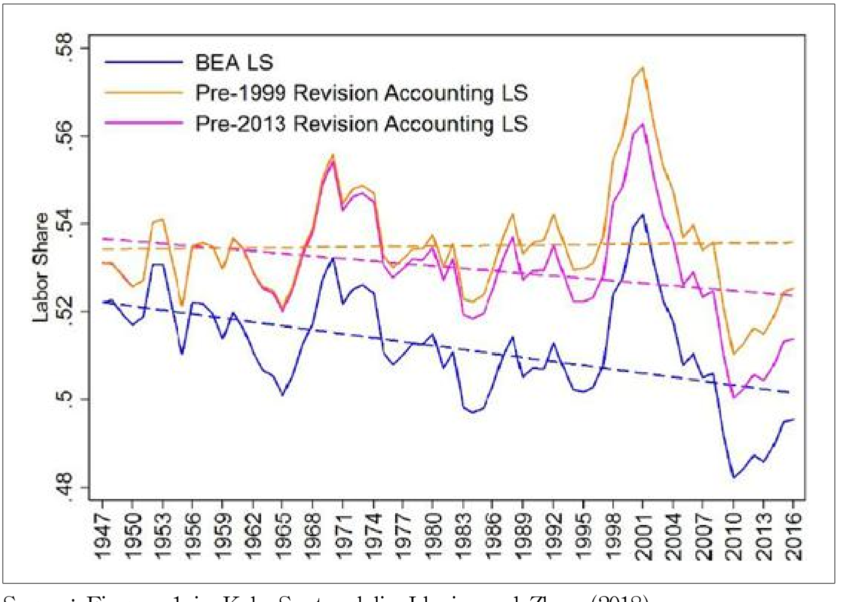
to

$$1 - \alpha_1 = \frac{\omega_1 L_1}{Y_1} = \frac{\omega_0 L_0}{Y_0 + I_0}$$

This resulted in a sharp fall in the labor share depicted in [Figure 1.9]. The authors emphasize the fact that without the correction the labor share would have remained constant, as predicted by the Kaldor's facts, while due to the correction the labor share exhibits a downward trend. They go even further estimating an aggregate elasticity of substitution, with the new BEA accounts, and find that it is around $\sigma = 1.14$, still above the micro-estimations. However, when they perform the same estimation for sectors that are not affected expenses in IPP they find an elasticity of substitution statistically no different from $\sigma = 1$.

Is then the labor share falling due to IPP investments? This correction, which in principle better reflects the production of value added, would be also properly reflecting the labor share if in fact all the expenses in IPP were payments to capital input and non of it was due to labor income. However, clearly this is not the case, and a large

〔Figure 1.9〕 The effect of IPP revisions on the labor share



Source: Figures 1 in Koh, Santaeulalia-Llopis, and Zheng(2018).

proportion of these expenses correspond to labor compensations that are not properly allocated in the national accounts. How much of it corresponds to labor is a key question, whose answer is fundamental to be able asses whether the labor share is falling or not.

1.4 If it is falling, could it be market power?

As we saw in Section 1.2, more precisely in equation(1.3), a key determinant of the labor share is the markup and its implied profits. Is there any evidence that market power and profits are increasing? This is a hard question to answer. The reason why a correct measure of markups and profits have traditionally been elusive is because it is not easy to find a trustable measure of marginal cost and a clear distinction between capital income and profits. Two very recent papers have managed to provide convincing evidence that in fact both markups and profits seem to be rising, these are Loecker and Eeckhout (2017) and Barkai(2017). In what follows I briefly discuss both papers.

1.4.1 The rise of market power

The first paper that attracted a great deal of attention is Loecker and Eeckhout(2017). Using firm-level data with financial statements of all publicly traded firms covering all sectors of the U.S. economy, they find an increase in markups from 21% above marginal costs in 1980 to 61% in 2016. In particular, the rise in average weighted markups is due to an increase in the upper tail of the un-weighted markups(roughly one third), combined with the reallocation of market share from low to high markup firms(about two thirds).[8] Simultaneously, they find an

8) This evidence is supported by Hopenhayn, Neira, and Singhania(2018) who also find a sizable increase in the markup by large firms but not by smaller firms.

increase in overhead costs from 15% to 21% of the total costs, with this meaning that part of the increase in markups covered greater costs but the rest led to higher profits(from 1% to 8%).

Regarding the income shares they use a different approach that the one used in the macro literature. The labor share is computed as a fraction of sales instead of the usual gross value added. As a result, the level is roughly half the standard measure using aggregate date. Using a similar model as Karabarbounis and Neiman(2014) and therefore and equilibrium condition akin to equation(1.3) they find that labor share is inversely proportional to markup. Moreover, regressing the log of the labor share on the log of markups and on the log of cost share they find that an increase in markups of 10% leads to a decrease in labor share of 2~2.4%. Thus, an increase in markups of 33% for a hypothetical representative firm should decrease the aggregate labor share by -8%, in accordance with the actual decline of around 9%.

The sharp increase in the markup brings out a new prediction, not only the labor share should be falling but also the capital share. Letting PQ be total sales, $P^V V$ be the total variable costs(including

They go a step further trying to explain what could generate this pattern and argue that is mainly due to demographic changes. The mechanism goes through firm entry rates. A decrease in population growth lowers firm entry rates, shifting the firm-age distribution towards older firms. Heterogeneity across firm age groups combined with an aging firm distribution replicates the observed trends. With the data they show that an aging firm distribution fully explains i) the concentration of employment in large firms, ii) and trends in average firm size and exit rates, key determinants of the firm entry rate. In short, they show that firm aging induced by population growth increases the market share of larger firms, leading to a decline in the aggregate labor share. This framework is important because it shows that it is possible to generate an increase in concentration without decreasing competition. See also Karahan, Pugsley, and Sahin(2019) for a closely related paper linking demographics to the fall in the labor share. Finally, Autor, Dorn, Katz, Patterson, and Reenen(2017) documents a positive correlation between industry concentration and the decline in the labor share.

labor) and $P^X X$ total overheads costs, the following equality must hold:

$$\frac{P^V V}{PQ} + \frac{rK}{PQ} = 1 - \frac{P^X X}{PQ} - \frac{\Pi}{PQ} \tag{1.6}$$

i.e., the sum of variable inputs share(labor, intermediate goods, materials...) and capital share must be equal to 1 minus the overhead share minus the profit share. Hence, since they showed that overhead share and profit share increase, the left hand side must decrease. Assuming that capital and variable inputs are complementary, the capital share must also be decreasing in the long run. As with the labor share, regressing the log of capital share on the log of markups they find that a 10% increase in markups is correlated with a -1.4% decrease in the capital share.

1.4.2 Is the capital share also declining?

The standard interpretation always was that any change in the labor share must reflects with the opposite sign in the capital share. Thus, a falling labor share implies an increasing capital share. This interpretation takes the capital share as everything that is not labor. One can think about the capital share just as the return to capital and give an alternative classification to profits. We could write equation (1.1) as:

$$Y = (r+\delta)K + \omega L + \pi \tag{1.7}$$

Now, if the profits share is increasing, it is possible that both the capital and labor income shares are decreasing? This was a natural possibility that arises in Loecker and Eeckhout(2017) work and is implicit in equation(1.5). Could it be that both the labor and capital share are declining?

Indeed, Barkai(2017) contemporaneously to Loecker and Eeckhout (2017) was analyzing this question. He finds that both the labor and capital shares have declined in the period 1984~2014, whereas profits share have sharply increased. Measured in percentage terms, the decline in the capital share(25%) is much more dramatic than the decline in the labor share(10%). The large decline in the capital share is driven by a pronounced fall in the cost of capital(especially of borrowing) in financial markets. Finally, he also documents that industries that experienced the higher increases in concentration also experienced a larger decline in the labor share.

There are two main challenges to measure the capital share. The first one is what to do with the taxes that are paid out of the net operating surplus? Who is ultimately liable for them? To avoid controversies he does not allocate them, and thus, there is an implicit share of taxes as well. The second main challenge is how to calculate the required rate of return on capital r? This is extremely complicated, if not impossible to do. The standard in the literature is to compute the ex-post return on investment and to assume that profits are zero. Thus, anything that is not labor compensation is a return on capital. But this approach would defeat the purpose of the exercise. To address this issue he follows Hall and Jorgenson(1967) and computes a series of capital payments equal to the product of the "required" rate of return on capital and the value of the capital stock. He builds it considering three different specifications: 1) assumes that firms finance capital with debt, 2) assumes that firms finance capital with both debt and equity, and 3) further accounts for the tax treatment of debt and capital. All measures show a large decline of 7 percentage points, which is depicted in [Figure 1.10].

There is a big problem with this approach, the author is entering again into the game of "imputed" incomes, rather than actual realized values. This is very important because the main driver of the sharp fall in the capital returns is the well known observed falling trend of the risk-free interest rate.[9] The risk free interest rate can move for many reason unrelated to the actual required return on capita. The methodology used and other implications of this approach are extensively discussed by Karabarbounis and Neiman(2018), which I review in the next section.[10] Nevertheless, [Figure 1.11] shows the implied capital(left panel) and profits(right panel) shares with this methodology. The capital share falls from around 24% to 18% and the profit share increases from as little as 2% to more than 15%.

Another important finding of this approach is that when calibrating the model, Barkai(2017) uses an elasticity of substitution, σ, between 0.4 and 0.7. That is, he assumes a pro-cyclical labor share, more in

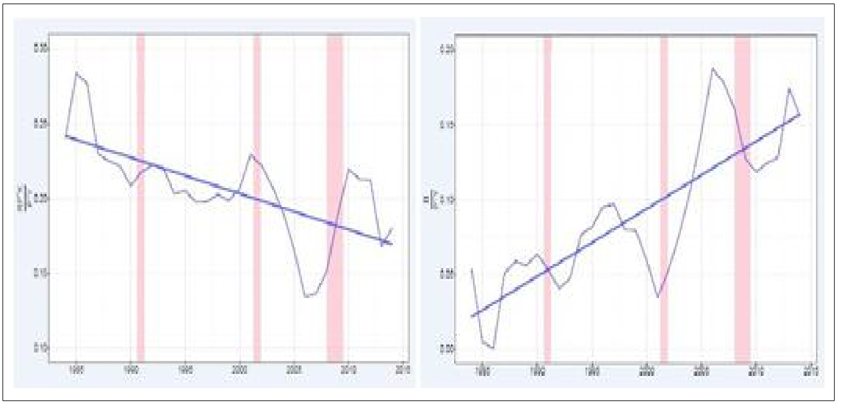
〔Figure 1.10〕 Imputed return to capital

Source: Figures 1 in Barkai(2017).

9) For a complete review related to the global fall in interest rates see Del Negro, Giannone, Giannoni, and Tambalotti(2019).

10) Rognlie(2015) also discusses the influence of the observed risk-free interest rate on the imputed returns on capital.

〔Figure 1.11〕 Capital and profits share



Source: Figures 2 and 3 in Barkai(2017).

line with the micro-estimates and with opposite implications to Karabarbounis and Neiman(2014), Piketty and Zucman(2014) and Koh, Santaeulalia-Llopis, and Zheng(2018). He does not highlight this choice, but it is a key parameter determining the distributive implication of the labor share and a controversial parameter when the macro-estimates are compared to the micro-estimates.

1.5 Some ex-post discussions about the different approaches

After the large wave of research triggered by Karabarbounis and Neiman(2014) the same authors came back to revisit the issue and analyze the alternative explanations to their findings. In Karabarbounis and Neiman(2018) they notice that most of the controversies arise because of what they call “factorless income”, which since the 80s has been a growing share of value added. In short, they defined the factorless income as the difference between value added and the sum of measured payments to labor, ωL, and imputed rental payments to capital Rk, where the imputation, again, follows Hall and Jorgenson

(1967)'s methodology. So that:

$$\text{factorless income} = Y - \omega L - Rk$$

They consider three alternatives: 1) Case k, emphasizes that capital stock estimates can be sensitive to initial conditions, or other assumptions like depreciation or intangibility of capital. 2) Case π, embraces the possibility that firms have pricing power that varies over time and interprets factorless income as economic profits. 3) Case R, attributes factorless income to elements such as time-varying risk premia or financial frictions that generate a wedge between the imputed rental rate using Hall and Jorgenson(1967)'s formula and the rental rate that firms perceive when making their investment decisions.

They quickly discard case k showing that either the amount of initial unmeasured capital or the variations on the proportion of unmeasured capital over time should be so large that becomes implausible. But then, they focus on case π, which is the driving force in Barkai(2017) and Loecker and Eeckhout(2017). They first show that the profit share is intimately related to the value assumed for the real interest. [Figure 1.12] (a) shows the extremely high negative correlation between the business sector(excluding housing) profits share and the real interest rate. [Figure 1.12] (b) plots the analogous figures for the housing sector. A conclusion from these figures is that taking this possibility seriously requires a theory that links the real interest rate to the profits share. For example, cheaper credit might be crucial for facilitating corporate mergers and acquisitions in a way that increases concentration and market power. Alternatively, a growing share of firms with higher market power might desire lower investment and result in a lower real interest rate.[11)]

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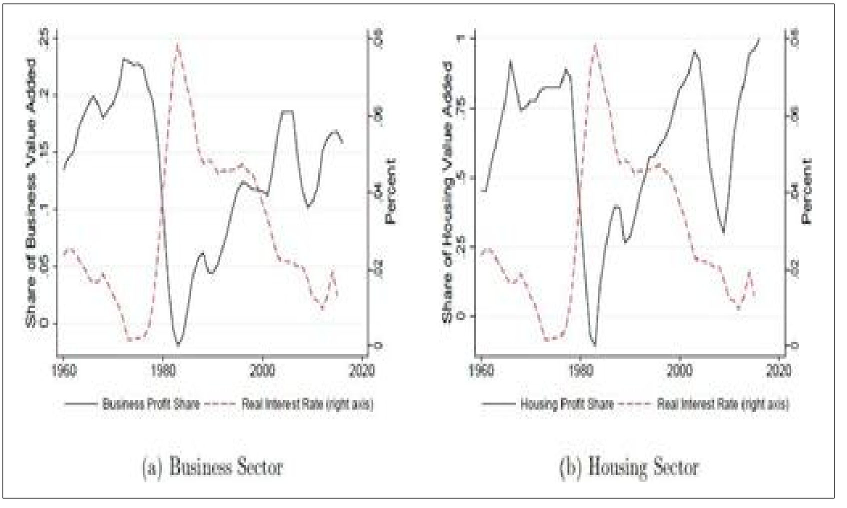
11) There is new paper by a Job Market candidate, Has Van Vlokhoven, "Estimating the Cost of Capital and the Prot Share" that develops a

〔Figure 1.12〕 Profit shares and interest rate



Source: Figures 2 in Karabarbounis and Neiman(2018).

Then, they address the markup story risen by Loecker and Eeckhout (2017). Since the key determinant of the markup, which is no more than a wedge between the price and the marginal cost, is precisely the marginal cost, they take a careful look at Loecker and Eeckhout (2017)'s choice for measured variable cost. They show that this choice is a fundamental driver of the result. Loecker and Eeckhout(2017) use cost of goods sold(COGS) as their proxy for variable costs. The fall of COGS relative to sales in their sample appears to be the core empirical driver of their result. The long-dashed red line in [Figure 1.13] (a) plots the average across firms of the sales to COGS ratio in these same data and tracks the estimated markup trajectory quite well.

This pattern could reflect forces other than growing economic profits. In particular, COGS suffers from some important shortcomings as a proxy for the behavior of spending on variable inputs.

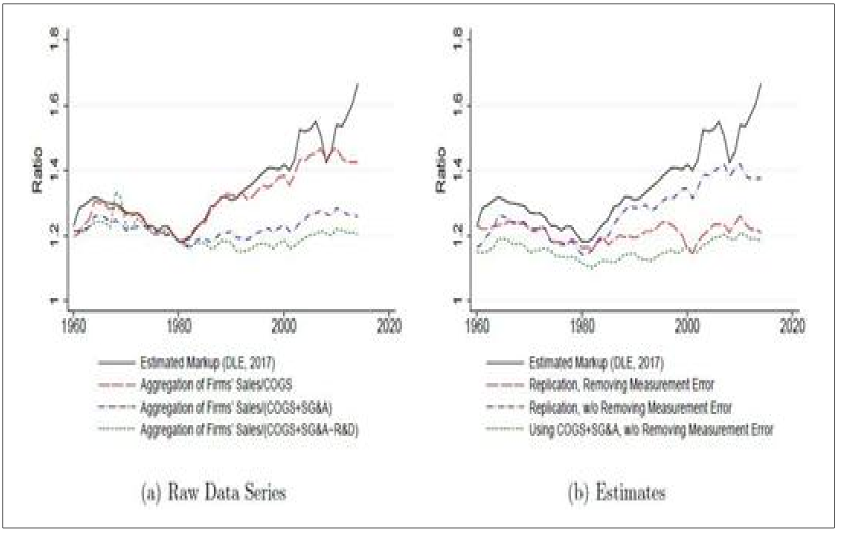
methodology to compute the required return on capital. The paper is not yet available, but looks promising.

Compustat's data definitions describe it as including "*all expenses directly allocated by the company to production, such as material, labor, and overhead...*" While materials align well with the notion of variable costs, it is unclear that only variable labor costs are included and overhead is unlikely to capture variable costs in the way desired. Further, the Compustat variable Selling, General, and Administrative Expense(SG&A) also includes some variable costs. SG&A is described in Compustat's data definitions as including "*all commercial expenses of operation(such as, expenses not directly related to product production) incurred in the regular course of business pertaining to the securing of operating income...*" Such expenses include bad debt expenses, commissions, delivery expenses, lease rentals, retailer rent expenses, as well as other items that more clearly should be included as variable costs. Most importantly, Compustat itself explicitly corroborates the blurred line between COGS and SG&A when it states that items will only be included in COGS if the reporting company does not themselves allocate them to SG&A.

The dashed blue line in [Figure 1.13] (a) shows the average across firms of the ratio of sales to the sum of COGS and SG&A. There is a very mild increase in sales relative to this measure of operating costs. Put differently, the empirical driver of the rising markup result in Compustat data appears to be the shift in operating costs away from COGS and toward SG&A, not a shift in operating costs relative to sales. This may be consistent with a rise in markups, but also might be consistent with other trends such as a rise in outsourcing, changing interpretations of what is meant by "production," or substitution of production activities performed by labor toward production activities performed by capital, the expenses of which may then be recorded by companies under a different category.

The simple averages shown in [Figure 1.13] (a) are very informative,

〔Figure 1.13〕 Markups and variable costs of production



Source: Figures 6 in Karabarbounis and Neiman(2018).

but still they are not even close to the complexity embedded in the methodology used in Loecker and Eeckhout(2017). To asses whether this methodology can appropriately deal with the different implications due to using COGS versus SG&A, the authors try to replicate the findings of Loecker and Eeckhout(2017) using the same methodology. They confess not to be able to exactly replicate the numbers, but they find one regression that fares fairly well, see [Figure 1.13] (b), blue dashed line. Then they apply the same methodology using COGS + SG&A, instead of COGS alone and find that the implied markup is roughly constant over the period(green doted line in Figure 1.13(b)). As a result, the increasing markup seem to be a consequence of the divergency between alternative measures of marginal cost, rather than an increase in profits and hence the profit share. Regarding the case R the authors show multiple evidence that there is a significant impact of the variability of the assumed reference rate. This could reflect fundamental issues, in particular a sizable increase in the risk premium that some scholars as Caballero, Farhi, and Gourinchas(2017) have uncovered. In this point is where their calibrated model seems to be most useful. They find that in all the calibrations, independently of the assumed value for the elasticity of substitution σ, the generated R is very stable and far from the large movements observed with the imputed R and all the calibrated model generated implications for the case π seem to be at odds with the data. They conclude that if anything, the explanation for the falling labor share must be found in the way in which the required returns to capital are imputed.

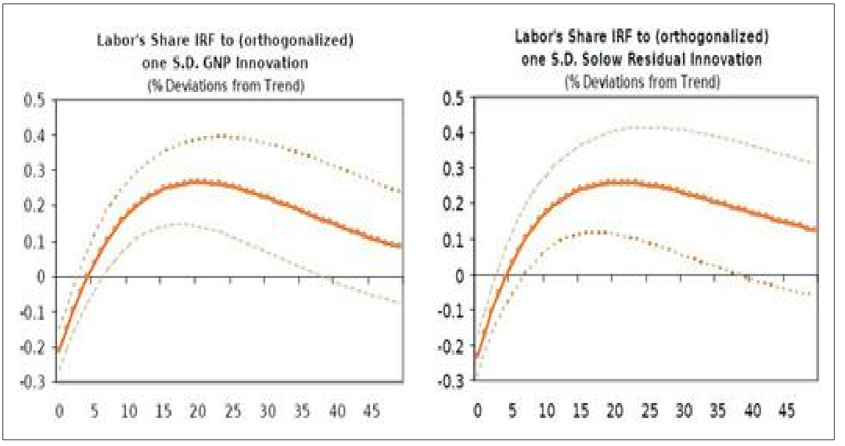
1.5.1 What about the elasticity of substitution?

Throughout this analysis one parameter that appears again and again is the elasticity of substitution between capital and labor. This elasticity is consistently estimated to be below one in most, if not all, microeconomic studies. However, when it comes to macroeconomic models the evidence points in the opposite direction, the labor share appears to be counter-cyclical, which suggests an elasticity of substitution larger than one. How to reconcile these two robust facts? The first answer comes from Rios-Rull and Santaeulalia-Llopis(2010). Unusually for the time, they computed the impulse response of the labor share to both, GNP and TFP(Hick's neutral) shocks and find that the labor share exhibits an "overshooting property". This pattern can be observed in [Figure 1.14].[12)]

They show that after a positive shock, to either GNP or TFP, the labor share immediately falls, staying at a lower value for more than a year, and then recovers and remains above its initial level for more than 5 years. That is, the labor share is counter-cyclical in the short run and pro-cyclical in the long run. In terms of the elasticity of

12) The horizontal axes in [Figure 1.14] is measured in quarters.

〔Figure 1.14〕 Impulse responses of the labor share



Source: Figures 3 in Rios-Rull and Santaeulalia-Llopis(2010).

substitution, this shows evidence that σ is larger than one when computed annually, but it is smaller than one in the long run, consistent with the micro-estimates.

How is this possible? One striking implication of these findings is that if in fact $\sigma < 1$ in the long run, the labor share should be growing over time, unless the GDP is moved by capital biased technological shocks. To deal with this puzzle LeonLedesma and Satchi(2018) construct a model where firms are able to separate the technology choice from the capital accumulation decision. This separation would be irrelevant if the technology adoption decision is costless, since firms would be always up to date with technology, and thus, the elasticity of substitution would not vary over time. However, when the technology adoption is costly, that is, there are adjustment costs, some firms are stuck with old technologies and thus the elasticity of substitution in the short and long run could differ. They show that it is possible to replicate the observed impulse response functions with a technology that resembles a Cobb-Douglas in the long-run, hence maintaining the Kaldor's facts, but also replicating the micro-estimated elasticity of substitution with the appropriate choice of the "short-run technology". As a result, the controversial issue between the micro and macro economist is resolved, both estimates are consistent.

1.6 Some macroeconomic implications

Most of the debate about the labor share is around its distributive implications. A fall on it, implies that workers receive a lower share of the total pie. However, one my wonder whether there are other macroeconomic implications besides redistribution. The answer is yes. There some implications related to the way in which the standard monetary policy models are constructed and a potential impact in the financial sector.

1.6.1 Business cycle and monetary policy

The first implication is related to Rios-Rull and Santaeulalia-Llopis (2010). Is it possible to obtain their impulse responses without appealing to assumptions about technology? The answer is yes, as showed by Choi and Rios-Rull(2019) this could be related to how workers bargaining power moves over the business cycle. What generates the movements in the labor share in their model is that after a positive TFP shock the workers' bargaining power decreases relative to the firms' bargaining power, so that wages go down. As firms adapt their investment decisions the workers' bargaining power increases, even above the long term mean, and therefore the wage bill overshoots. If one looks at the whole process, the gains arising from the positive shock seem to be equally shared. Somehow the income's split is intertemporally allocated to allow for more investment upon the arrival of the shock and being able to take advantage of better possibilities to invest. On the flip side, their theory states that after a bad shock the households bargaining power becomes relatively stronger, increasing the labor share. This could be rationalized thinking that when negative TFP socks arrive there are fewer investments opportunities, so that increasing workers compensations, relative to output, is not that painful for firms. However, their model fails in some important dimensions as the impulse response of consumption, which in general is a fundamental element in any bushiness cycle model.

Related to this approach Cantore, Ferroni, and Leon-Ledesma(2019) try to determined what type of models are able to replicate not only the impulse response function of the labor share but also simultaneously all other response functions thatare of interest for policy analysis. The first contribution of the paper is empirical. They uncover a new set of stylized facts: monetary policy tightening increases the labor share and decreases real wages and labor productivity.

In the simplest version of a New-Keynesian model, the labor share is equal to the inverse of the markup. One can think about equation (1.3) with $\sigma = 1$. This makes the labor share pro-cyclical (the markup is counter-cyclical) conditional on a monetary policy shock, which is at odds with the empirical evidence previously found. However, this direct correspondence between the markup and the labor share does not necessarily hold in other versions of the model such as those that, for instance, consider a cost channel of monetary policy or search and matching frictions. They also consider the role played by wage rigidities and fixed production costs. In short, they look at different families of models that can break the relationship between markups and the labor share. Then they argue that there is a puzzling mismatch between data and theory, which is not just a feature of the basic New Keynesian model, but carries over in richer setups used for monetary policy analysis. They show that depending on the frictions assumed for the labor market, they either are able to match the impulse response of the labor share, or the impulse response of real wages, but not both at the same time. This posted a puzzle, the standard models of monetary policy are not able to replicate the movements in the labor share.

1.6.2 Implications for the financial markets

There are many trends in aggregate variables to started to appear in 1980. One particular trend that have caught the attention of both scholars and policy makers is the increase in holdings of risk-free assets by part of the corporate sector. This trend show up rest in the U.S. economy but lately this pattern has been found in almost every sector and almost every country. This originated the literature on the "Corporate Savings Glut"(CSG). The first to link this phenomena to the falling labor share were Chen, Karabarbounis, and Neiman(2017). They do not argue that the fall in the labor shares causes by itself the CSG, but instead they show that the lessons and parametric implications drawn from the labor share literature, naturally imply the CSG.

The mechanism is that, with an elasticity of substitution larger than one, the decline in the cost of capital and the increase in markups both lead to a decline in the labor share and an increase in corporate profits. Given the stability of dividends relative to GDP, this increase in profits leads to an increase in corporate saving. Further, firms have tax incentives to buy back more shares as saving increases and this lead to an improvement in the corporate net lending position.

Finally, Grasso, Passadore, and Piguillem(2019) focus not as much on the secular trend of the labor share but rather on its rediscovered variability and counter-cyclicality. They study on the possibility of insuring against aggregate risk. One can think as workers and capitalists as two separate sectors who when facing aggregate uncertainty, try to insure it. When the income shares are constant every agent in the economy is facing exactly the same risk, thus in equilibrium no insurance in possible. However, when the income shares change with the business cycle, there are additional redistributive effects that create the possibility of insurance, now workers and capitalist are affected in different ways.

They derive some implications for the trading of financial assets. First, they show that when the income shares are constant there is no need to use a risk-free bond. Thus, it is not traded in equilibrium. However, when the labor share counter-cyclicality the risk-free bond together with a risky indexed bond(think about SP 500) becomes very useful. In short, workers insure the changes in the labor share borrowing in the risk-free asset and investing in the risky asset. Because of market clearing, this implies that capitalist lend in the risk-free asset and issue equity. This generates and patter akin to the "corporate savings glut", as stressed by Chen, Karabarbounis, and Neiman(2017), which must be accompanied by the "households equity glut". Both implications are consistent with data.

Second, they show that varying income shares implies that a worsening of the financial market's amplification effects, in the sense of Krishnamurthy(2003). This results relies on the fact that in general corporate business are more exposed to uninsured idiosyncratic risk than workers, so that when the capital share increases, the amount of uninsured risk rises, making it difficult for the financial transactions related to assets with payments contingent on aggregate shocks. This effect resembles Tella(2017) argument about time varying uncertainty.

1.7 Conclusions

Even though many researchers are working on the matter, there seems to be no clear consensus about the “trend” in the labor share. The increased relative relevance of both housing and IPP investment, and the difficulty to properly measure depreciation, add significant noise to the calculations. What makes this measurement problem more complicated is that it affects all the sectors in one way or another, but the way in which does it is not clear enough to isolate it. Anyhow, there are seem to be a downward trend in the U.S., but much smaller than original thought. Is the market power playing a big role? Again, one faces the traditional problem of the proper measure of marginal cost. This measure is elusive and always controversial. Without it is cumbersome to provide a definitive answer. Albeit, the evidence points towards an increased markup in the very large firms, but not in the medium and small firms, some authors as Hopenhayn, Neira, and Singhania(2018) stress that this is not necessarily due to reduced competition. It could just reflect demographic trends that have slowed down the firm’s entry rate.

Chapter 2
Estimated technology shocks and the labor income share

The aim of this chapter is to estimate a model incorporating technology choice in line with what proposed by Leon-Ledesma and Satchi(2018). We bring our attention to this framework because there are two advantages related to the modelization of firms' technology choice on a technology frontier. First of all, given the shape of the technology frontier it is possible to determine how the capital/labor share and the long-run elasticity of substitution evolve along the long-run growth path. Moreover, the shape of the technology frontier determines the long-run elasticity of substitution between capital and labor. Secondly, under technology choice it is possible to obtain an elasticity of substitution between capital and labor that in the long-run is larger than in the short-run. Then, the long-run elasticity can be one as in a Cobb-Douglas function and below one in the short-run. To obtain short-and long-run elasticities that differ after an exogenous shock, Leon-Ledesma and Satchi(2018) showed that it suffices to introduce adjustment costs to technology choice.

We apply this framework to South Korea and test the performance ability of this model against two specifications often used in the literature: CES production function and Cobb-Douglas. The rest of the chapter is organized as follows: Section 2.1 outlines the model we employ for our estimation; Section 2.2 presents the estimation methods and results; Section 2.3 concludes.

2.1 The model

In this section we present the technology choice(TC, henceforth) model employed for our estimation. The model is the same built by Leon-Ledesma and Satchi(2018) incorporating technology choice in a standard RBC model. The two main sectors in the economy are represented by households and firms with optimizing representative households and firms. A representative household maximizes its utility function by properly choosing the consumption level and the quantity of labor to supply. Households hold capital and rent it to firms. Firms choose factors demand in order to maximize their profits.

2.1.1 Households

We start the presentation of our model from the households sector. We posit the constant relative risk aversion(CRRA) utility with logarithmic preferences:

$$U_t = (\log C_t - \nu \frac{L_t^{1+\phi}}{1+\phi}) \tag{2.1}$$

where C_t denotes the consumption, L_t is the quantity of hours worked, ϕ represents the inverse of Frisch elasticity and v is a parameter denoting the disutility of labor. The budget constraint faced by the representative household is

$$C_t + I_t + B_{t+1} = r_t^k K_{t-1} + w_t L_t + (1 + r_t) B_t \quad (2.2)$$

where I_t is the investment in new capital stock, B_{t+1} represents one-period non-contingent bonds, r_t^k is the rental price of capital, K_t is the capital stock owned by the households and rent to the firms, w_t are wages, r_t is the interest rate on one-period bonds. The law of motion of capital is given by

$$K_{t = Q_t} I_t + (1 - \delta) K_{t-1} \quad (2.3)$$

where Q_t is the inverse of the price of investment relative to consumption goods and represents investment specific technical change that increases the productivity of new investment goods.13) The parameter δ indicates the depreciation rate. The optimization problem of the representative household can be summarized as follows

$$\max_{C_t, L_t, K_t, B_{t+1}} E_0 \sum_{t=0}^{\infty} \beta^t U_t \quad (2.4)$$

subject to Equation(2.2). Thus, the household optimally chooses its consumption, labor supply, capital accumulation, and bonds demand that maximize its lifetime utility. The term β denotes the subjective discount factor.

2.1.2 Firms

The representative firm produces a final good by using the following production function

13) We embed in the model a investment specific technical change(IST) as, following Greenwood, Hercowitz, and Krusell(1997), Greenwood, Hercowitz, and Krusell(2000) and Fisher(2006), it is considered an important source of macroeconomic fluctuations.

$$Y_t = X_t[(\theta_t^{\alpha-1}K_{t-1})^{\rho} + (\theta^{\alpha}L_t)^{\rho}]^{\frac{1}{\rho}} \tag{2.5}$$

where X_t is a Hicks-neutral expansion of the technology frontier, ρ represents the elasticity of substitution between capital and labor and θ_t is the ratio between the labor and capital efficiencies, i.e., a measure of the technology choice.

The model includes an adjustment cost given by $\gamma(\Omega_t)Y_t$ with $\Omega_t = \theta_t/\theta_{t-1}$, with $\gamma \geq 0, \gamma'(1) = 0, \gamma''(\cdot) < 0$. The functional form for the technology adjustment costs is assumed to be a symmetric exponential function

$$\gamma(\Omega_t) = 1 - \exp^{-\frac{1}{2}\tau(\Omega_t - 1)^2}$$

where τ denotes the speed of adjustment. Essentially, the latter function represents the cost that a firm has to bear to change Θ. The representative firm takes as given the real interest rate r_t, the rental price of capital r^{k_t}, and the real wage w_t. Then, it chooses θ_t, K_{t-1}, L_t that maximize its profit function

$$\max_{\theta_t, K_{t-1}, L_t} E_0 \sum_{t=0}^{\infty} \left([\Pi_{s=0}^{t}(1+r_s)^{-1}][(1-\gamma(\Omega_t))Y_t - r_t^k K_{t-1} - w_t L_t] \right) \tag{2.6}$$

subject to Equation(2.5). The transition between the short- and long-run depends on the speed of adjustment and hence how costly it is to change Θ. Our main goal is to estimate a model incorporating technological choice and evaluate its empirical properties. Moreover, we also compare of this model with two comparison frameworks: in the first case we consider an identical model with a Cobb-Douglas production function, while in the second case the model has CES production function.[14] In both the case aforementioned, there is no technological choice, thus the adjustment cost in(2.6) is zero. More in detail we have that $(1-\gamma(\Omega_t))Y_t$ will be

$$Y_t = X_t K_{t-1}^{\alpha} L_t^{1-\alpha} \qquad \text{for the Cobb-Douglas case}$$

$$Y_t = [\alpha K_{t-1}^{\rho} + (1-\alpha)(Z_t L_t)^{\rho}]^{\frac{1}{\rho}} \qquad \text{for the CES case}$$

where α is the capital share in the Cobb-Douglas case and the efficiency of capital in the CES case.

2.1.3 First-order conditions

Once we solve the optimization problems described above, the first-order conditions for households and firms are:

$$\frac{E_t C_{t+1}}{C_t} = \beta(1+r_t) \tag{2.7}$$

$$w_t = \nu L_t^{\phi} C_t \tag{2.8}$$

$$1 + r_t = \frac{(1-\delta)Q_t}{E_t Q_{t+1}} + E_t r_t^k Q_t \tag{2.9}$$

$$[1-\gamma(\Omega_t)](\theta_t^{\alpha-1} X_t)^{\rho} \left(\frac{Y_t}{K_{t-1}} \right)^{1-\rho} = r_t^k \tag{2.10}$$

$$[1-\gamma(\Omega_t)](\theta_t^{\alpha-1} X_t Z_t)^{\rho} \left(\frac{Y_t}{L_t} \right)^{1-\rho} = w_t \tag{2.11}$$

$$\alpha[1-\gamma(\Omega_t)] - \frac{r_t^k K_{t-1}}{Y_t} - \left[\Omega_t \gamma'(\Omega_t) - \frac{E_t \Omega_{t+1}}{1+r_t} \gamma'(E_t \Omega_{t+1}) \frac{E_t Y_{t+1}}{Y_t} RIGHT \right] = 0 \tag{2.12}$$

Equation(2.7) represents the Euler equation denoting the intertemporal

14) In this latter case, for compatibility with balanced growth path, the Hicks-neutral shock must by replaced by a labor-augmenting shock Z_t. Moreover, the shock Q_t is required to be temporary for compatibility with balanced growth.

consumption choice, equation(2.8) is the labor supply, equation(2.9) is an arbitrage condition in capital markets, equation(2.10) is the capital demand and equation(2.11) is the labor demand. In presence of adjustment costs, equation(2.12) is the first-order condition for θ_t and is specific to the model with technological choice.[15] The evolution of the shocks that perturb the economy is the following

$$d\log Z_t = (1-k_Z)\nu_Z + k_Z d\log Z_{t-1} + (1-k_Z)\epsilon_Z \quad (2.13)$$

$$d\log X_t = (1-k_X)\nu_X + k_X d\log X_{t-1} + (1-k_X)\epsilon_X \quad (2.14)$$

$$d\log Q_t = (1-k_Q)\nu_Q + k_Q d\log Q_{t-1} + (1-k_Q)\epsilon_Q \quad (2.15)$$

Thus, technological progress is specified as(permanent) rate of growth shocks with drifts ν_i and persistence parameters k_i for $i = Z, X, Q$. The terms $\epsilon_i$are the innovations and evolve as a white noise process.

2.2 Estimation

We aim to compare the empirical performance of the TC model, embedding technology choice and permanent Hicks-Neutral(X_t) and investment-specific(Q_t) shocks to two equivalent models that do not incorporate technology choice: one with the same shocks and a standard Cobb‑Douglas production function, and the other with a CES production function that uses instead permanent labor augmenting shocks(Z_t) and temporary investment-specific shocks(Q_t) for compatibility with balanced growth(León-Ledesma and Satchi, 2018, p.820). The models are estimated using quarterly data for South Korea ranging from 1993:Q1 to 2019:Q1 via Bayesian likelihood methods.[16]

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15) In absence of adjustment costs, equation(3.12) would reduce to $\alpha = \frac{r_t^k K_{t-1}}{Y_t}$, i.e., the same arising in a model with Cobb-Douglas technology.

After writing the model in state-space form, the likelihood function is evaluated using the Kalman filter, whereas prior distributions are used to introduce additional non-sample information into the parameters estimation: once a prior distribution is elicited, the posterior density for the structural parameters can be obtained by reweighting the likelihood by a prior. The posterior is computed using numerical integration by employing the Metropolis-Hastings algorithm for Monte Carlo integration; for the sake of simplicity, all structural parameters are supposed to be independent of one another(Bartolomeo and Pietro, 2017, p.15).

2.2.1 Data and prior distributions

The observables used were the first differences of the log of labor productivity and hours per-capita. For the labour productivity we used the Early Estimate of Quarterly ULC Indicators(from OECD database) whereas for the hours per capita we used the Monthly Hours Worked (from OECD database). The dynamics of the model is driven by two orthogonal shocks, i.e., X_t and Q_t. As the number of observable variables equals the number of exogenous shocks, the estimation does not present problems deriving from stochastic singularity[17](Bartolomeo and Pietro, 2017, p.15). We must calibrate some parameters to avoid identification problems.[18] In particular, the discount factor β is calibrated to 0.99, while the steady state capital share α is 0.33. The

16) For an exhaustive analysis of Bayesian estimation methods, see Geweke(1999) and An and Schorfheide(2007).

17) The problems deriving from misspecification are widely discussed in Lubik and Schorfheide(2006).

18) The identification procedure has been performed using the Identification toolbox for Dynare, which implements the identification condition developed by Iskrev(2010b) and Iskrev(2010a). For a review of identification issues arising in DSGE models, see Canova and Sala(2009).

annual depreciation rate is 10%, involving a calibrated value for δ equal to 0.025. The inverse of Frisch elasticity is 0.33. The values used for the short-run elasticity of substitution ranged from 0.1 to 0.3 (implying a ρ coefficient between -9 and -2.3).

With regard to the TC model, our choices regarding prior beliefs are as follows. Parameter τ follows a Gamma distribution with mean 20 and standard deviation 5; k_X has Beta distribution with mean 0.35 and standard deviation 0.15; ν_X is normally distributed with mean 0.01 and standard deviation equal to 0.01; the standard deviation of ϵ_X follows an Inverse Gamma distribution with mean 0.01 and 1 degree of freedom.

We also estimated two alternative versions of the model differing among them for the specification of the production function: a version with CES production function and another version with a Cobb-Douglas function. For the CES model, the investment-specific technical change(Q_t) follows a stationary AR(1) process, while we use the labor-augmenting technology shocks(Z_t) instead of X_t. For this model, we calibrated the elasticity of substitution to 0.5, a higher value than the technology choice model, as there is no adjustment towards Cobb-Douglas. The drift and persistence of Z_t are the object of our estimation and our priors choices are as follows: k_Z and k_Q are both Beta distributed with standard deviation 0.1 and mean 0.2 and 0.3, respectively; ν_Z follows a Normal distribution with mean 0.005 and standard deviation 0.01; ϵ_Z and ϵ_Q have a Inverse Gamma distribution with mean 0.01 and 1 degree of freedom. For the model with Cobb-Douglas, the estimation follows the same procedure, but τ is restricted to be zero. We elicit the following priors: k_Z has a Beta distribution centered on 0.1 and with standard deviation 0.1; ν_Z has a Normal distribution with mean 0.005 and standard deviation equal to 0.001; ϵ_Z

follows an Inverse Gamma with mean 0.01 and 1 degree of freedom.

2.2.2 Estimation results

In <Table 2.1> we report the estimation results of the TC model. The posterior distributions are obtained using the Metropolis-Hastings algorithm; the procedure is implemented using the MATLAB-based Dynare package. The mean and posterior percentiles are from two chains of 100,000 draws each from the Metropolis-Hastings algorithm, for which we discarded the initial 30% of draws(Bartolomeo and Pietro, 2017, p.17).

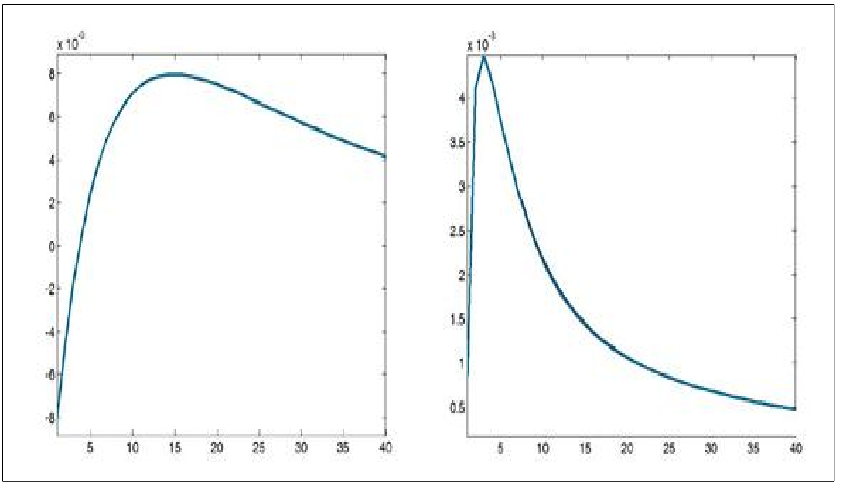
The outcome of our estimation shows that posteriors distributions are significantly different from the priors, indicating that data are adding relevant information in the estimation process. In [Figure 2.1] we plot the Bayesian impulse response function(IRF, from now on) of the labor share conditional to the two shocks that hit our economy, i.e., Q_t and X_t.

The left panel plot the Bayesian IRF of the labor share conditional to the X_t shock. Initially we observe a fall of the labor share, but after 5 period there is an overshooting and labor share rises above its steady state value. The right panel depicts the Bayesian IRF of the labor share to the Q_t shock. The labor share exhibits a hump-shaped

〈Table 2.1〉 Posterior estimates of parameters for TC model

	Prior distribution			Posterior distribution
	Density	Mean	St. Dev.	
τ	Gamma	20	5	69.4710
k_X	Beta	0.35	0.15	0.0004
ν_X	Normal	0.01	0.01	0.0226
ϵ_X	Inv. Gamma	0.01	1	0.0608

〔Figure 2.1〕 Bayesian impulse response for the labour share to a Xt(left panel), and Qt(right panel) shocks



behavior and behaves like a capital-augmenting process which increases the labor share. With regard to the two comparison models, i.e., those with CES and Cobb-Douglas functions, their estimated parameters are reported in the following table. Again, we observe as posterior means are far from prior means showing that data add lot of information in the estimation process and that the parameters are well identified.

2.2.3 Model and data moments

To better evaluate the empirical properties of the TC model we compare the short- and medium-run theoretical and data moments and check whether the model incorporating technological choice does a better job in matching the data compared with traditional models embedding a CES or Cobb-Douglas function. To this end, following Leon-Ledesma and Satchi(2018) we generate synthetic data for the macroeconomic variables considered using calibrated values and posterior means of the estimated parameters. We proceed as follows: we generate 2,000 and kept 105 of them to have the same sample size as in the data. Then, data are make stationary via a band-pass filter; this allows us to compare the short- and medium-run moments with those in the data. Our comparison involved the three models considered herein, i.e., TC, Cobb - Douglas and CES. More in detail, each of these models is perturbed by two technological shocks. The TC model is characterized by a permanent Hicks-neutral(X_t) and a IST shock(Z_t); the model with Cobb-Douglas has a Hicks-neutral(X_t) and a IST shock(Q_t) that are both permanent; finally, the CES model has permanent labor-augmenting(Z_t) and temporary investment specific shocks(Q_t).

In the following table we report theoretical and data moments both in the short- and long-run. In particular, we rely on the relative standard

⟨Table 2.2⟩ Posterior estimates of parameters for CES and Cobb-Douglas models

	Prior distribution			Posterior distribution
	Density	Mean	St. Dev.	
CES				
k_Q	Beta	0.3	0.1	0.1494
k_Z	Beta	0.2	0.1	0.0417
ν_Z	Normal	0.005	0.001	0.0056
ϵ_Q	Inv. Gamma	0.01	1	0.0329
ϵ_Z	Inv. Gamma	0.01	1	0.0336
Cobb-Douglas				
k_Z	Beta	0.1	0.1	0.0049
ν_Z	Normal	0.005	0.001	0.0030
ϵ_Z	Inv. Gamma	0.01	1	0.0231

deviations to and correlations with output. The macro variables for which we implement this analysis are consumption, investment, real wage, hours worked, productivity and labor share.

From <Table 2.3> it is clear as the CES model does a good job in capturing the standard deviation of investment relative to output but exhibit an almost zero correlation between consumption and output. The TC model exhibit a high level of correlation between all the variables considered, except labor share, and output. The model with Cobb-Douglas is the one that exhibits the lower volatility and do not account for the labor share.

In the medium-run the TC model match in a satisfactory way the correlation between labor share and output, while the CES model fails to capture this correlation. However, the TC model exhibits a too low volatility for the labor share with respect to the one observed in the data.

The superiority of the TC model over the other two specifications arises because Cobb-Douglas model is unable to generate any dynamics in the labor share(the elasticity of substitution is equal to one). Moreover, the CES model is not able to capture the observed

〈Table 2.3〉 Short-run theoretical and data moments: relative st. dev. to and correlations with output

	Cobb-Douglas		CES		TC		Data	
	St.	Corr.	St.	Corr.	St.	Corr.	St.	Corr.
C	0.6611	0.7963	0.7954	0.0952	0.7897	0.9887	1.2343	0.8259
Inv	2.7022	0.8960	4.1037	0.8530	1.2900	0.9659	4.4393	0.7765
W	0.7107	0.9061	0.6448	0.2701	0.7908	0.9887	1.8601	0.3762
L	0.4660	0.7640	0.6140	0.4858	0.1125	0.9287	3.1551	0.2292
Prod	0.7107	0.9061	0.8834	0.7943	0.8965	0.9989	0.7718	0.8057
LSH	na	na	0.3603	-0.9401	0.1125	-0.1589	3.8394	0.1153

trends in the relative price of investment as, in this framework, IST shocks can only be temporary.

2.3 Conclusion

We make use of a model incorporating technological choice and estimate it with data for South Korea. We aim to test whether this model has good empirical performance and is able to replicate the moments and correlations observed in the data for a set of macro variables. The results show that the model does a good job at matching the behavior of the labor share of income at short- and medium-run frequencies: the labor share is countercyclical and volatile in the short run, and almost acyclical and smoother in the medium run. The model also performs well in terms of data moments and statistical behavior against a standard RBC model with Cobb - Douglas, and an RBC model with short- and long-run CES only. It is also capable of reproducing the overshooting of the labor share in reaction to a technology innovation obtained from structural VAR estimates(León-Ledesma and Satchi, 2018, p.833).

〈Table 2.4〉 Medium-run theoretical and data moments: relative st. dev. to and correlations with output

	Cobb-Douglas		CES		TC		Data	
	St.	Corr.	St.	Corr.	St.	Corr.	St.	Corr.
C	0.8607	0.8692	0.8341	0.8749	0.9479	0.9951	1.2603	0.9260
Inv	2.1714	0.8087	2.0472	0.8456	0.9802	0.9939	2.9363	0.9175
W	0.8715	0.9301	0.8370	0.8967	0.9485	0.9952	1.2762	0.8108
L	0.3719	0.5093	0.1349	0.4680	0.0952	0.7018	0.6294	0.5430
Prod	0.8715	0.9301	0.9444	0.9920	0.9356	0.9974	0.4700	0.7524
LSH	na	na	0.2149	-0.5565	0.0569	0.7084	1.1794	0.4847

Chapter 3
Analyzing the changing trend in the labor share of South Korea(한국 노동소득분배율 추세 변화의 원인 분석)

3.1 서 론

Kaldor(1957)가 노동소득분배율이 특별한 추세 없이 안정적이라는 것을 제시한 이후 이는 거시경제학의 핵심적인 요소로 자리 잡았다. 노동소득분배율이 경기변동상에서 변화는 있지만 중장기적으로 추세를 가지지 않고 일정하게 유지된다는 사실에 근거하여 생산함수를 구성하였다. 노동소득분배율이 일정하게 유지된다는 사실은 생산함수를 Cobb-Douglas 형태로 사용할 수 있도록 해주었고 이를 바탕으로 총량변수들의 경기변동성 분석이나 경제성장 경로에 대한 연구들이 다양하게 진행되었다. 그러나 최근 많은 연구들이 노동소득분배율이 더 이상 일정한 수준을 유지하고 있지 못하다는 실증분석을 다양하게 제시하고 있다. Kaldor 사실을 핵심적으로 뒷받침해주고 있던 미국의 노동소득분배율이 1980년대 중반 이후부터 지속적으로 감소하고 있다는 사실이 최근 수많은 연구들에서 보고되고 있다(Elsby et al., 2013이 가장 대표적이다). Karabarabounis and Neiman(2014)은 노동소득분배율의 하락 추세는 미국뿐만 아니라 전세계적으로 나타나는 현상이라는 것을 제시하고 있다. 특히, 노동소득분배율의 감소 추세는 1980년 이후에 두드러지게 나타나고 있으며 미국을 비롯하여 독일이나 일본, 중국 등과 같은 주요 국가들에서도 나타나는 것

을 확인했다.

노동소득분배율은 경제 전체의 소득 중 노동이 가져가는 몫을 의미한다. 그런데 자영업자는 노동과 자본을 동시에 소유하고 있기 때문에 이들의 소득을 노동소득과 자본소득으로 어떻게 나누는지가 노동소득분배율 측정에서 중요한 요소로 작용한다. Gollin(2002)은 자영업자의 소득 조정 방식을 크게 세 가지로 만들어 다양한 노동소득분배율 지표를 제시하였다. 그러나 자영업자소득을 처리하는 방법들은 각기 다른 측면에서 노동소득분배율을 과대 혹은 과소 측정하는 문제를 가지고 있다. 나아가 이를 추세적으로 분석하는 데 있어서는 다른 문제들을 야기할 수 있다. 자영업자의 비중이 크지 않은 국가들에서는 자영업자소득 처리방식이 노동소득분배율 추세에 큰 영향을 주지 않는다. 반면, 한국은 자영업자 비중이 여타의 국가들에 비해 높고 추세변화가 크기 때문에 이들의 소득을 처리하는 방식에 따라 노동소득분배율의 추세가 매우 크게 달라진다.

한국은 지난 40여 년간 매우 높은 경제성장을 경험하면서 산업구조 역시 대단히 급속하게 바뀌었다. 1970년대 이전에는 농업이 중심이었으나 이후부터는 점차 제조업의 비중이 높아졌다. 이 과정에서 자영업자와 가족종사자로 구성되는 비임금근로자의 비중은 급속도로 감소하였다. 자영업자의 경우 1970년대 전체 취업자 중 55%를 상회했지만 2010년 이후에는 30% 이하로 감소하면서 지난 40여 년간 25%p가 감소하였다. 그러나 2015년 기준으로 자영업자 비중 25%는 여전히 다른 국가들에 비해 매우 높은 비중이다. 산업 구조가 이와 같은 특징으로 인해서 노동소득분배율의 추세는 자영업자소득 처리 방식에 따라 수준과 추세가 매우 다르게 나타난다. 자영업자소득을 노동소득에서 모두 제외하는 경우 노동소득분배율은 평균 45% 정도이며 1970년부터 지속적으로 증가하는 것으로 나타난다. 반면, 자영업자소득을 노동소득에 모두 포함시키는 방법으로 측정하면 평균 노동소득분배율은 65% 정도로 높아지고 추세는 1970년부터 지속적으로 감소하는 것으로 나타난다. 이런 까닭에 한국의 노동소득분배율에 대한 추세가 높아지는지 감소하는지에 대해서는 아직 논의가 진행 중이다.

기존에 노동소득분배율 추세 변화의 원인을 분석하는 연구들은 자영업

자소득 측정 방식에 따라 수준과 추세가 달라지는 것을 피하기 위해 노동소득분배율을 피용자보수증가율이라는 보다 좁은 범위로 한정해서 분석하고 있다(Karabarabounis and Neiman, 2014; Elsby et al., 2013). 피용자보수증가율은 자영업자소득을 모두 노동소득에서 제외한 것으로 노동소득분배율을 임금근로자들의 소득으로만 한정해서 측정한 것이다. 이와 같은 측정 방식을 취하는 것은 자영업자소득 중 일부를 노동소득에 반영할 때 이 비율을 시간 변화에 따라 어떻게 반영할지에 대한 적절한 방법이 없기 때문이다. 이와 같은 문제는 자영업자 비중이 지속적으로 변하고, 자영업자와 임금소득자 간의 임금 격차 역시 계속 변하는 한국에서는 노동소득분배율 측정에 있어서 더 큰 영향을 미칠 수 있다. 따라서 본 연구에서도 이와 같은 문제를 피하기 위해 노동소득을 임금근로자소득으로 한정하는 피용자보수분배율을 가지고 분석하고자 한다.[19)]

일차적으로는 노동소득분배율의 추세를 파악하는 것이 중요하다. 그러나 어떤 추세가 나타나면 그 원인을 분석하는 것 역시 매우 중요한다. 미국에서는 노동소득분배율 하락이 다양한 자료로 확인되면서 하락 추세에 대한 의견에는 학계가 일정 정도의 합의점에 도달했다. 따라서 최근 노동소득분배율 관련 연구들은 노동소득분배율 하락 원인을 분석하는 데 중점을 두고 있다. 그중에서 가장 많이 분석된 원인은 기술진보와 관련 있다. 대표적으로 Karabarabounis and Neiman(2014)처럼 새로운 장비 등의 투자재 관련 기술진보로 투자재 가격이 하락했고, 이것이 1980년 이후 노동소득분배율 감소를 초래했다는 의견이 있다. 기술진보로 자본이 노동을 대체하면서 노동소득분배율이 감소하기 위해서는 생산함수에서 노동과 자본 간 대체탄력성이 1보다 커 자본과 노동이 상호 대체관계에 있어야 된다. 그러나 최근 Oberfield and Raval(2014)이나 Glover and Short(2018)가 대체탄력성을 추정한 결과 미국뿐만 아니라 다른 국가들

19) 자영업자소득에 해당하는 혼합소득 중 일부를 노동소득에 포함시키거나 총부가가치와 노동소득에서 모두 제외시키는 방법들을 고려할 수 있다. 그러나 이와 같은 방법 역시 다음과 같은 한계를 갖는다. 우선, 혼합소득 자료의 시계열이 1980년부터 시작하기 때문에 노동소득분배율 분석 자료가 줄어들게 된다. 다음은 혼합소득의 일부를 노동소득에 반영하는 과정이 앞서 논의한 것과 같이 임의적이라는 것이다.

도 대체탄력성이 1보다 작아 오히려 자본과 노동이 상호 보완적 관계에 있다고 보고하고 있다. 즉, 투자재 가격 하락으로 자본 투입이 용이해지면 오히려 노동소득분배율이 증가하기 때문에 다른 원인을 찾아야 된다고 주장한다.

반면, 본 연구에서는 여전히 투자재 가격 하락이 한국의 노동소득분배율 추세를 얼마나 설명할 수 있는지를 정량적으로 분석하고자 한다. 한국은 피용자보수증가율로 측정한 노동소득분배율이 지난 40여 년간 지속적으로 증가해왔다. 2010년 이후에는 증가 추세가 다소 둔화되었지만 다른 선진국가들처럼 하락 추세가 뚜렷하게 나타나지 않는다. 동시에 1980년부터 2000년까지 투자재 가격이 급락하는 것으로 나타났다. 이와 같은 상황들을 고려해 볼 때, 다른 국가들과는 달리 오히려 한국의 노동소득분배율 증가 추세가 기술진보에 따른 투자재 가격 하락으로 설명될 수 있는 가능성이 높다. 이 관계를 설명하기 위해서는 자본과 노동의 대체 탄력성이 1보다 적어야 한다는 것이 최대 핵심이다. OECD 국가들을 대상으로 대체 탄력성을 추정한 결과들에 따르면 대부분의 국가들에서 자본과 노동이 보완적 관계를 이루도록 대체 탄력성이 1보다 적게 추정되었다. 이와 같은 상황을 종합적으로 고려해 볼 때, 한국 노동소득분배율의 추세적인 증가를 투자재 가격 하락으로 설명할 수 있는 경로가 존재한다. 이와 같은 결과는 Karabarabounis and Neiman(2014)이 분석한 것과는 정반대의 상황이지만 오히려 한국 상황에 적용 가능한 것으로 판단된다. 그러나 실제 투자재 가격 하락이 노동소득분배율 증가를 어느 정도 생성할 수 있는지는 다른 문제이다. 이를 살펴보기 위해 본 연구에서는 동태적 일반균형(DGE : Dynamic General Equilibrium) 모형을 구성하여 정량적으로 분석한다. 한 시점에 투자재 가격이 하락하는 충격을 모형 경제 내에 도입하고 전이 경로를 분석함으로써 실제 투자재 가격 하락이 노동소득분배율 하락에 얼마나 기여하는지를 측정하고자 한다.

본 연구는 다음과 같이 구성된다. 3.2는 노동소득분배율 추세 변화를 설명하는 연구들을 살펴본다. 최근 제시되고 있는 다양한 논의를 살펴봄으로써 과거 노동소득분배율 추세 변화를 설명할 수 있는 경로를 찾을 뿐만 아니라, 향후 다른 추세를 보이게 되는 경우에도 변화 원인을 파악하

는 데 도움이 될 것으로 판단된다. 3.3에서는 노동소득분배율의 추세를 실증적으로 분석한다. 이를 위해서 다양한 노동소득분배율 추정방법을 살펴보고, 실제 자료의 결과를 분석한다. 특히, 산업별로 노동소득분배율 추세가 분석 기간 동안 어떻게 달라졌는지 살펴본다. 3.4는 투자재 가격 하락이 노동소득분배율 증가를 얼마나 설명하는지 정량적으로 분석한다. 우선, 투자재 가격과 노동소득분배율 간의 관계를 설명할 수 있는 동태적 일반균형 모형을 구성한다. 이 관계를 설명하는 데 가장 중요한 모수인 CES 생산함수의 대체 탄력성 모수를 자료에서 추정한다. 설정된 모수들을 바탕으로 구성된 모형에 투자재 가격 하락을 반영했을 때 노동소득분배율 증가를 얼마나 생성할 수 있는지 분석한다. 그리고 3.5 결론을 끝으로 본 연구를 마무리하고자 한다.

3.2 선행연구

거시경제학에서 노동소득분배율은 특별한 추세 없이 0.6 정도의 수준을 유지하는 것으로 알려져 왔다. 그러나 2008년 글로벌 금융위기 이후 고용이 위기 이전 수준을 회복하지 못하는 상황과 맞물려 노동소득분배율도 기존에 알려진 수준을 회복하지 못하는 것으로 보여졌다. 이후 많은 연구들에서 노동소득분배율이 하락하고 있는 것을 보고하기 시작했고, 시계열 분석을 통해서 1980년 초중반부터 하락이 시작한 것으로 보고 있다. 최근 연구들은 노동소득분배율 하락 추세 자체에 대해서는 합의를 보이고 있기 때문에 연구 내용이 하락 원인을 분석하는 방향으로 이루어지고 있다. 이 장에서는 노동소득분배율 하락 추세를 보고하고 원인을 분석하는 초기 논문 중 가장 주목을 받은 두 편을 살펴본다. 이를 바탕으로 이후 연구들이 어떻게 진행되고 있는지를 논의하고 현재 한국의 노동소득분배율 연구를 간략하게 살펴보고자 한다.

Elsby et al.(2013)과 Karabarabounis and Neiman(2014)을 비롯하여 Piketty and Zucman(2014) 등에서 노동소득분배율이 하락하는 추세에 있다는 것을 보고하기 시작하면서 이후 다양한 연구들이 촉발되었다. 본 연구에서는 이 중 미국 노동소득분배율에 대한 추세를 실증적으로 자세히

분석한 Elsby et al.(2013)과 노동소득분배율 추세가 미국뿐만 아니라 세계적으로 나타나는 추세임을 분석한 Karabarabounis and Neiman(2014)의 연구들을 중점적으로 살펴보고자 한다.

Elsby et al.(2013)은 지난 30여 년간의 미국 노동소득분배율 추세를 분석한다. 추세가 어떻게 바뀌었는지를 비롯하여 변화 정도와 변화 원인 등을 다양한 측면에서 살펴본다. 우선, 노동소득분배율 측정방법이 가지고 있는 문제점을 논의하고, 피용자보수분배율(payroll share)로 측정된 노동소득분배율의 추세가 하락하고 있다는 것을 제시한다. 미국은 BLS에서 기준 노동소득분배율(headline labor share)을 발표한다. 이때, BLS에서는 자영업자 노동소득이 임금근로자의 평균임금과 같다는 가정을 바탕으로 측정을 한다. 이로 인해서 노동소득분배율이 과대 측정되는 문제를 가지게 될 뿐만 아니라, 노동소득분배율의 추세에도 영향을 미친다. 최근 노동소득분배율 하락을 주도하는 것은 피용자보수 하락인데, 자영업자의 노동소득을 임금근로자와 동일하게 처리함으로써 노동소득분배율 하락 추세가 더 심하게 나타나게 된다. 이와 같은 문제를 해결하기 위해 Elsby et al.(2013)은 노동소득분배율을 피용자보수분배율로 한정해서 분석하고, 이 추세 역시 하락하고 있다는 것을 보인다. 산업별로 노동소득분배율을 구분해서 살펴보면, 산업 내의 하락 추세는 1980년 이전부터 있었던 것으로 나타나는데, 전체 분배율의 하락 추세가 이후에 나타나는 것은 분배율이 높은 산업의 비중이 커졌기 때문으로 제시하고 있다. 마지막으로 이 논문은 노동소득분배율 하락 원인도 분석하고 있는데, 해당 시점에서 가장 많은 원인으로 제시되고 있는 것은 '기술 진보'였다. 기술 진보로 자본이 노동을 대체하면서 노동소득분배율이 하락하기 위해서는 생산함수의 대체탄력성이 1보다 커야 된다. 그러나 Elsby et al.(2013)은 기존 연구들을 바탕으로 생산함수의 대체탄력성이 1보다 작기 때문에 해당 원인은 하락 추세를 설명하기 어렵다고 결론 내린다. 산업별 자료를 바탕으로 분석한 결과 이들은 노동소득분배율과 수입 비중 간에 상당히 높은 상관관계가 있음을 확인하였고, offshoring이 노동소득분배율 하락에 중요한 요인임을 제시하기에 이른다.

Karabarabounis and Neiman(2014)은 노동소득분배율을 보다 다양한

국가들을 대상으로 분석하고 있다. 이들 역시 피용자보수분배율을 노동소득분배율로 사용하고 있다. 1975년에서 2012년 중 자료가 가용한 59개 국가들을 대상으로 분석한 결과 피용자보수분배율 하락 추세가 42개 국가들에서 관찰된다는 사실을 보고했다. 동시에 해당 기간 동안 투자재 가격이 소비재 가격보다 급격히 하락했다는 사실에 주목하고 있다. 이 두 가지 사실을 결합하여 노동소득분배율 하락을 기술진보에 따른 투자재 가격 하락으로 설명하는 것이다. 이때, 가장 중요한 역할을 하는 노동과 자본 간의 대체탄력성은 표본국가들을 대상으로 노동소득분배율 추세와 투자재 가격 추세 간의 관계에 기초하여 1보다 높은 값으로 추정했다.

이후 연구들은 적어도 미국의 노동소득분배율 하락에 대해서는 합의하고 그 원인을 분석하는 것에 초점을 두고 있다. 첫 번째 연구들은 기술진보로 인해 자본이 노동을 대체하면서 노동소득분배율이 하락했다고 보는 유형이다. 이 연구들은 Karabarabounis and Neiman(2014)과 맥락을 같이 한다. Eden and Gaggl(2018)이나 Acemoglu and Restrepo(2018)은 정보통신 관련 자본이나 로봇들로 자본을 한정해서 논의하고 있다. Koh et al.(2018)은 지적재산권이나 R&D와 같은 무형 자본의 증가를 원인으로 꼽고 있다. 이와 같은 연구들은 앞서 살펴본 것처럼 자본과 노동의 대체탄력성이 1보다 커야 된다는 조건이 필요하다. 그러나 Lawernce (2015)나 Oberfield and Raval(2014) 등은 사업체나 산업별 수준뿐만 아니라 경제 전체의 총생산함수에서도 대체탄력성이 1보다 작다고 보고하고 있다. Glover and Short(2020)는 Karabarabounis and Neiman(2014)이 대체탄력성을 노동소득분배율과 투자재 가격의 국가 간 편차를 이용해서 추정하는 과정에서 편의가 발생한 까닭에 대체탄력성이 1보다 크게 추정되었다고 보고 있다. 노동소득분배율과 투자재 가격 간의 관계를 이용해서 대체탄력성을 추정할 때 균제상태를 만족하는 것이 중요하다. 그런데 대부분의 국가들이 경제 발전 과정에서 투자재 가격이 추세를 보이고 있기 때문에 이것만을 사용하면 추세를 통제하지 않은 과정에서 편의가 발생하게 된다. 따라서 대체탄력성을 추정할 때 투자재 가격의 추세를 통제하기 위해 소비증가율을 같이 고려해야 된다는 것을 모형을 통해서 보여 주었다. 그리고 동일한 자료를 바탕으로 소비 증가율을 통제하고 대체탄력성

을 추정하면 1보다 작아지는 것도 보였다.

기술 진보 등에 따른 자본재 가격 하락으로 노동소득분배율을 설명하는 데에 대체 탄력성으로 인한 문제가 발생하면서 다른 요인들을 찾는 연구들이 진행되고 있다. Grossman et al.(2017)은 노동과 자본이 보완 관계에 있지만 성장률이 둔화되면서 노동소득분배율이 하락할 수 있는 경로를 제시했다. Boehm et al.(2015)은 제조업부문을 사업체 수준에서 분석한 결과 outsourcing이 증가하면서 노동소득분배율이 감소했다고 보고 있다. Glover and Short(2018)는 노동자들의 고령화를 원인으로 분석을 했고, Kaymack and Schott(2018)는 OECD 국가들을 대상으로 법인세와 노동소득분배율 간의 관계를 제시했다. 마지막으로 markup 증가와 노동소득분배율이 낮은 기업으로의 부가가치 집중이 제조업 분야에서 노동소득분배율 감소의 원인임을 보여주는 연구들도 있다(Grullon, et al., 2016; Autor, et al., 2017; Kehrig and Vincent, 2018).

미국 노동소득분배율에 대한 최근 연구들이 노동소득분배율 하락 원인을 분석하는 데 초점을 맞춘 반면, 한국은 아직 노동소득분배율의 추세에 대한 논의가 주를 이루고 있다. 앞서 논의한 것처럼 노동소득분배율을 측정하는 데 자영업자소득 처리 방식이 매우 중요하다. 한국은 자영업자 비중이 높을 뿐만 아니라 추세적으로 변화가 심하기 때문에 이들의 소득을 처리하는 방식에 따라 노동소득분배율의 추세가 매우 달라진다. 여러 가지 측정방식이 존재하지만 기본적으로 자영업자소득 중 노동소득이 차지하는 비중이 높일수록 노동소득분배율은 자영업자 비중 추세와 유사해진다. 이처럼 노동소득분배율 측정 자체에 대한 문제로 대부분의 연구들이 추세를 실증적으로 분석하는 데 집중되어 있다(주상영ㆍ전수민, 2014). 반면, 김배근(2013)은 노동소득분배율의 결정요인을 노동과 자본 간의 대체탄력성, 마크업 변화, 노동자의 협상력(bargaining power) 등으로 나누어 분석했고, 홍민기(2014)는 산업구조의 변화가 전체 노동소득분배율에 미치는 영향을 분석했다.

본 논문은 다음과 같은 점에서 이전 연구들과 차별성을 갖는다. 먼저, 자영업자소득 처리문제를 피하기 위해 Elsby et al.(2013)이나 Karabarabounis and Neiman(2014)과 동일하게 피용자보수분배율을 사용한다.

이와 같은 노동소득분배율 측정 방식은 한국은행이 제시하는 노동소득분배율과 동일한 방법이다. 이 방식에 따르면 한국의 노동소득분배율은 1970년부터 지속적으로 증가하다가 최근에 증가추세가 둔화되는 것으로 나타난다. 다음은 이와 같은 추세가 나타나는 요인으로서 기술 진보에 따른 투자재 가격하락을 설명하고자 한다. 이를 위해서 Karabarabounis and Neiman(2014)의 모형과 유사한 동태적 일반균형 모형을 구성한다. 이때 중요한 요소로 작용하는 자본과 노동 간 대체탄력성은 산업별 자본과 노동 자료를 바탕으로 추정한다. 모형에 투자재 가격 하락을 반영했을 때 노동소득분배율이 얼마나 증가하는지를 시뮬레이션으로 정량 분석한다. 투자재 가격 하락으로 노동소득분배율 하락 추세를 설명하는 것은 기존 한국의 선행연구들과 가장 큰 차이점이라고 할 수 있다.

3.3 노동소득분배율 측정 및 추세

노동소득분배율 측정은 자영업자의 소득을 어떻게 노동소득과 자본소득으로 구분하는지에 따라 달라진다. 본 장에서는 노동소득분배율을 측정하는 다양한 방법을 살펴보고, 각 방법에 따라 측정된 노동소득분배율 추세를 비교한다. 마지막으로 산업별로 노동소득분배율 추세가 어떻게 다른지에 대해서 살펴본다.

3.3.1 측정방법

노동소득분배율을 분배 측면에서 정의할 때는 노동소득이 국민소득에서 차지하는 비중으로 측정하지만, 소득 측면에서 정의할 때는 국내총생산 또는 총부가가치 중에서 노동소득이 차지하는 비중으로 정의된다. 여기서는 생산 측면에서 노동소득분배율을 분석하기 위해 총부가가치 기준으로 노동소득분배율을 측정하는 개념을 사용한다.

노동소득분배율을 측정할 때 임금근로자의 보수인 피용자보수만을 노동소득으로 고려한 노동소득분배율 혹은 피용자보수분배율(payroll share)은 총부가가치에서 총피용자보수가 차지하는 비중으로 측정된다.

(기준) 노동소득분배율 = 피용자보수/총부가가치

한국은행의 요소소득 분류에 따르면 자영업자소득은 영업잉여 항목에 포함되어 있다. 자영업자의 경우 노동과 자본을 모두 활용하여 생산활동에 참여하지만 두 요소의 소득이 별도로 구분되지 않고 하나의 소득으로만 제공된다. 그렇기 때문에 자영업자소득을 노동소득과 자본소득으로 어떻게 구분해서 얼마를 노동소득에 포함시키는지에 따라 노동소득분배율이 달라진다. 여기서는 자영업자소득을 조정하는 방법을 Gollin(2002)이 제시한 세 가지 방법으로 측정해서 비교한다.

첫 번째 조정방식은 자영업자소득을 모두 노동소득으로 간주하여 노동소득분배율을 측정하는 방법이다. 피용자보수분배율에서 자영업자소득을 모두 자본소득으로 간주한 것과 정반대의 방식으로 측정한 것이다.

(조정1) 노동소득분배율 = (피용자보수 + 자영업자소득)/총부가가치

다음은 자영업자의 생산함수가 다른 경제부문과 동일하다고 가정하고 노동소득을 분리하는 방법이다. 자영업자의 노동소득분배율이 다른 부문의 노동소득분배율과 동일하기 때문에 총부가가치에서 자영업자소득을 제외하고 피용자보수에 대한 비중을 구하는 방식으로 측정할 수 있다.

(조정2) 노동소득분배율 = 피용자보수/(총부가가치-자영업자소득)

마지막 조정안은 자영업자와 임금근로자 간의 평균임금 수준의 격차를 이용한 방식이다.

(조정3) 노동소득분배율
= (피용자보수 + 임금격차×평균임금×자영업자 수)/총부가가치
= 피용자보수/총부가가치×[1 + 임금 격차×자영업자 수/(임금근로자 수 + 자영업자 수)]

두 집단 간의 임금격차가 없다고 가정하면 자영업자의 노동소득은 임금근로자의 평균임금 수준과 자영업자 수에 의해서 결정된다. 따라서 노동소득분배율은 피용자보수분배율에 전체 취업자 중 자영업자 비중을 추가적으로 고려한 것과 동일해진다. 이때, 자영업자와 임금근로자 간의 임

금격차를 고려하면 전체 취업자 중 자영업자 수의 비중을 임금격차만큼 할인하여 적용하는 방식으로 된다.

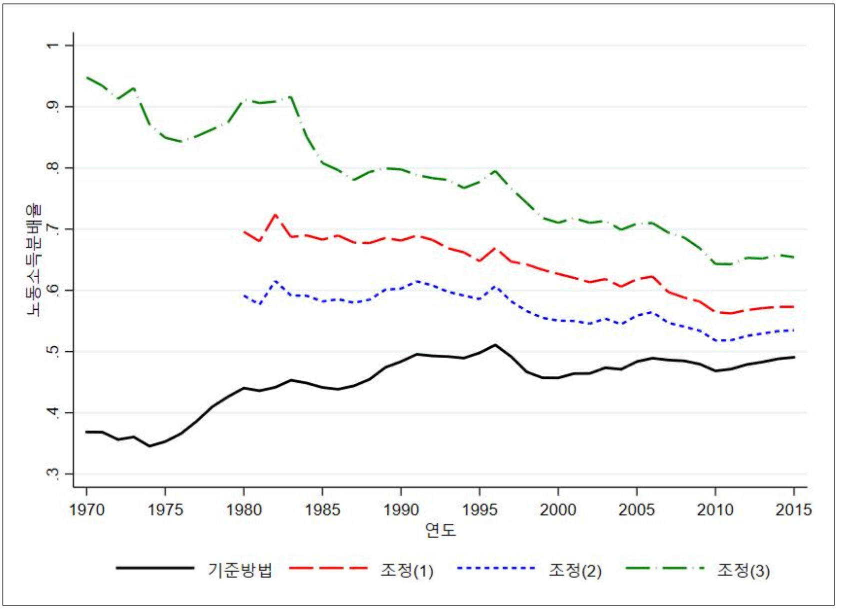
노동소득분배율을 측정하는 방식은 자영업자의 평균임금 수준을 임금근로자에 대비해서 얼마나 제공할 것인지에 의해서 결정된다. 피용자보수분배율의 경우 자영업자의 노동소득을 없는 것으로 간주한 것이고 (조정 3)은 임금격차를 0보다 큰 수에서 1까지 고려하는 방식이다. 이때, 고려되는 임금격차는 연구들에 따라 다르게 적용된다. 그러나 한 가지 공통점은 자영업자의 노동소득을 실질적으로 관측할 수 없기 때문에 모든 기간에 걸쳐 일정한 값을 부여하고 있다. 즉, 경제발전단계나 경기변동과 상관없이 자영업자의 임금수준을 임금근로자 평균임금의 일정 수준으로 적용하는 방식이다. 따라서 노동소득분배율의 추세를 분석하는 데 있어서는 (조정 3)과 같은 방식이 적합한지에 대해서 재고할 여지가 있다. 본 논문에서는 이러한 논란에서 벗어나기 위해 Elsby et al.(2013)과 Karabarabounis and Neiman(2014)이 사용하고 있는 피용자보수분배율 개념을 사용하고자 한다.

3.3.2 노동소득분배 추세

본 논문에서는 노동소득분배율뿐만 아니라 자본과 노동 간 대체 탄력성 추정을 위해 자본과 총부가가치에 대한 정보가 필요하다. 따라서 최근 정보통신연구원에서 구축한 산업별 생산 계정 자료를 사용한다. 이 자료는 한국은행과 통계청의 국가승인통계 자료들을 활용하여 국제기구에서 제시하는 각종 측정 매뉴얼에 근거하여 산업별로 총산출, 부가가치, 노동, 자본, 중간재, 각 분야의 가격과 소득분배 정보를 종합적으로 구축한 것이다.

[그림 3.1]은 앞서 논의한 다양한 방식으로 측정한 노동소득분배율을 1970년부터 2015년까지 나타낸 것이다. 자영업자소득은 1980년부터 제공되기 때문에 이를 직접 이용해야 되는 (조정 1)과 (조정 2)의 시계열은 1980년부터만 제공된다. 피용자보수분배율로 측정된 기준방법의 추세를 살펴보면 1970년부터 지속적으로 증가하는 것을 볼수 있다. 1998년 위환

〔그림 3.1〕 노동소득분배율 추세

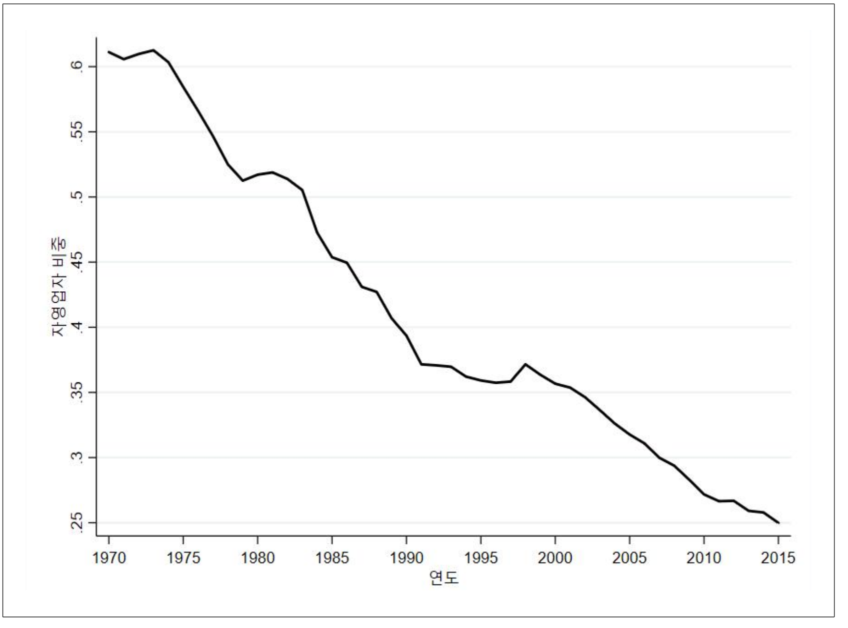


위기를 기점으로 노동소득분배율이 급격히 하락했지만 이후 다시 증가 추세를 이어가 2015년에는 1996년 수준으로 거의 회귀한 것을 볼 수 있다. 반면, 자영업자의 소득을 고려하기 시작하면 노동소득분배율의 추세가 매우 달라지는 것을 볼 수 있다. 임금근로자와의 임금 격차를 전혀 고려하지 않은 방식인 (조정 3)은 1970년부터 지속적으로 감소하는 것으로 나타난다. 이는 전체 취업자 중 자영업자 비중의 추세(그림 3.2)에 의해서 결정되기 때문이다. 자영업자소득을 분자 혹은 분모에서 반영하는 방식인 (조정 1)과 (조정 2) 역시 (기준방법)보다 모든 기간에 높은 수준을 보이고 추세도 하락하는 것으로 나타난다.

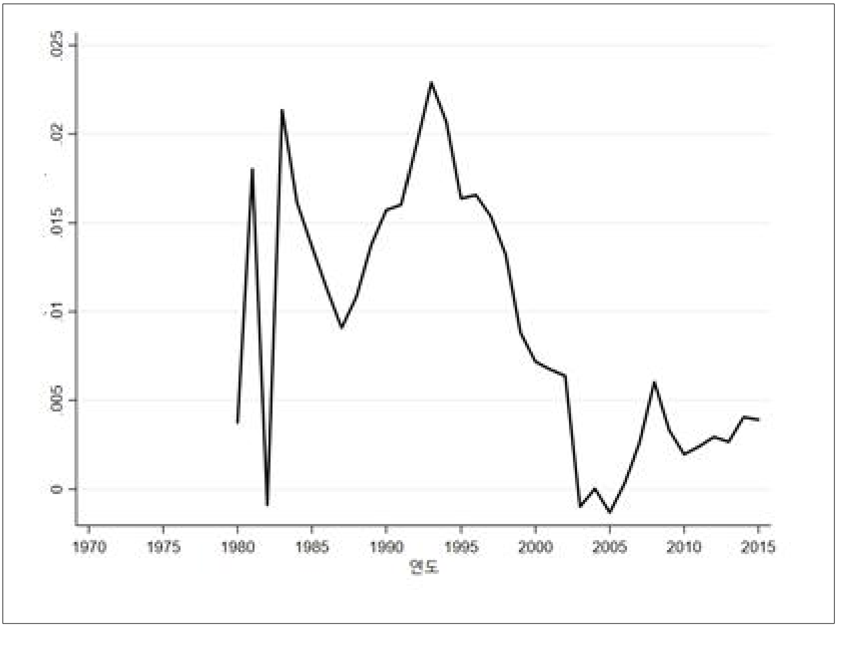
이상의 결과에서 알 수 있듯이 자영업자 비중과 자영업자소득이 총부가가치에서 차지하는 비중이 노동소득분배율의 추세를 결정하는 데 중요한 역할을 한다. 이해를 위해 자영업자 비중과 총부가가치 대비 자영업자소득을 살펴보자.

[그림 3.2]와 [그림 3.3]은 자영업자 비중과 자영업자소득 비중을 나타낸 것이다. 우선, 자영업자 비중을 살펴보면 1970년 이후 지속적으로 감

〔그림 3.2〕 자영업자 비중



〔그림 3.3〕 총부가가치 대비 자영업자소득



소해왔다. 그러나 2015년에도 25% 수준을 보이면서 여타의 OECD 국가들에 비해서는 여전히 매우 높은 수준을 유지하고 있다. 자영업자 비중이 지속적으로 하락하고 있기 때문에 이 추세를 반영하기 시작하면 노동소득분배율 추세 역시 감소하게 된다. (조정 3)에서 볼 수 있듯이 자영업자와 임금근로자 간의 평균임금 격차를 어떻게 설정하는지가 결국 자영업자 비중의 추세를 피용자보수분배율에 얼마나 반영할지를 결정하는 것이다. 적용 정도에 따라 자영업자 비중 추세가 반영되는데, 한국은 매우 강한 하락 추세가 반영되는 것이다.

[그림 3.3]은 자영업자소득이 총부가가치에서 차지하는 비중을 나타낸 것이다. 이는 (조정 1)과 (조정 2)에서처럼 자영업자소득을 분자와 분모 중 어디에 위치시킬 것인지에 따라 비중이 달라지는 경우 중요하다. 자영업자 비중은 평균적으로 1% 수준으로 특별한 추세 없이 변동 폭이 크게 나타난다. 비중의 추세가 없기 때문에 자영업자소득 수준의 추세는 총부가가치와 유사하게 증가한 것으로 판단할 수 있다. 이 증가 추세를 분자에 추가하거나 분모에서 제외시키면 노동소득분배율이 다소 감소 추세로 전환되는 것을 [그림 3.1]에서 확인할 수 있다.

3.3.3 산업별 노동소득분배율

다음은 산업별로 노동소득분배율의 추세를 살펴본다. 경제 전체의 노동소득분배율은 산업별 노동소득분배율의 가중평균으로 나타낼 수 있다.

$$\lambda_t = \frac{W_t L_t}{Y_t} = \sum_{i \in I} \frac{W_{i,t} L_{i,t}}{Y_t} = \sum_{i \in I} \frac{W_{i,t} L_{i,t}}{Y_{i,t}} \frac{Y_{i,t}}{Y_t} = \sum_{i \in I} \lambda_{i,t} \omega_{i,t}$$

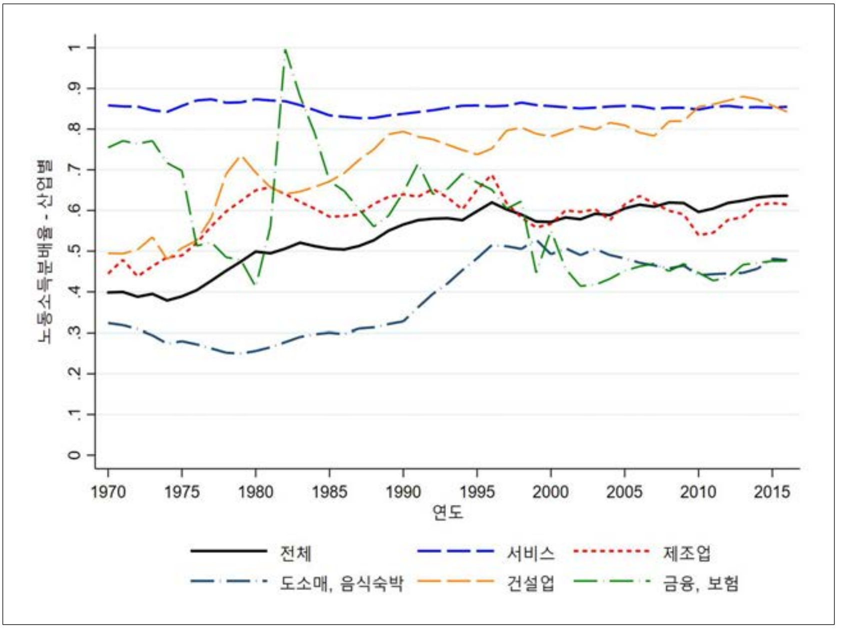
여기서 λ_i는 산업별 노동소득분배율을 의미하고, ω_i는 해당 산업의 부가가치가 총부가가치에서 차지하는 비중을 의미한다. 이 식에 따르면 노동소득분배율의 증가 추세는 각 산업별 노동소득분배율의 증가 추세에 의해서 설명되거나, 산업별 노동소득분배율의 변화가 없더라도 높은 노동소득분배율을 갖는 산업이 차지하는 비중이 경제 내에서 커지기 때문에 나타날 수 있다. 첫 번째 효과를 산업 내 효과로 본다면 두 번째 효과

는 산업 간 구성비 변화 효과로 이해할 수 있다.

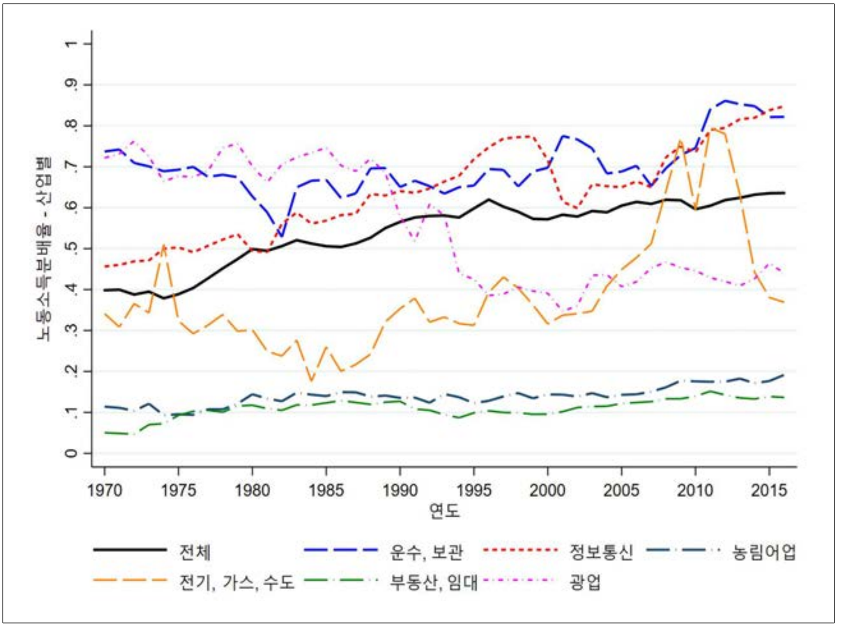
[그림 3.4]와 [그림 3.5]는 산업별 노동소득분배율을 나타낸 것이다. 두 그림에서 실선은 경제 전체의 노동소득분배율을 의미한다. 1970년부터 2015년까지 노동소득분배율이 증가한 산업을 보면 제조업과 건설업, 정보통신업을 꼽을 수 있다. 도소매, 음식, 숙박업과 전기, 가스, 수도 산업 역시 증가추세를 보이지만 1990년대 중반 이후나 2000년 이후에 급격히 증가하고 이전에는 큰 증가추세를 보이고 있지 않다. 반면, 금융, 보험업과 광업은 노동소득분배율이 지속적으로 감소하고 있다. 서비스업은 노동소득분배율이 0.8~0.9 사이로 지난 40년간 추세 변화 없이 높은 수준을 유지하고 있다. 부동산, 임대와 농림어업은 노동소득분배율이 0.2 이하로 여타의 산업에 비해서 매우 낮은 수준을 보이고 있다. 부동산, 임대업은 토지나 건물의 수익이 대부분을 차지하기 때문에 낮은 노동소득분배율이 이해가 된다. 그러나 일반적으로 노동집약적인 산업으로 알려진 농림어업의 노동소득분배율이 낮은 것은 다소 의외이다. 이는 본 논문에서 노동소득분배율을 피용자보수분배율로 측정하는 것과 관련이 있다. 농림어업분야는 가족종사자들로 구성된 비임금근로자들이 상당부분 차지한다. 따라서 노동자를 고용해서 임금을 주는 비중은 매우 낮을 수 있다. 즉, 농림어업은 노동집약적인 산업으로 노동소득이 대부분을 차지하지만 임금근로자와 자영업자가 나누어 갖기 때문에 피용자보수로 측정된 노동소득분배율이 매우 낮게 나타난다. 농림어업 분야는 낮은 노동소득분배율에도 불구하고 지난 40여 년간 지속적으로 증가해왔다. 1970년대 0.1 수준에서 2010년 0.17 수준까지 증가하면서 증가 폭으로만 보면 제조업 분야(0.50~0.58)와 거의 유사하다. 이와 같은 변화는 자영농업인들이 감소하면서 노동소득분배율 측정 시 분모가 감소하는 데 따른 것으로 파악된다.

노동소득분배율은 산업별 분배율뿐만 아니라 산업이 차지하는 비중에 의해서도 영향을 받는다. [그림 3.6]과 [그림 3.7]은 경제 전체 부가가치 중에서 각 산업이 차지하는 비중을 나타낸 것이다. 가장 특징적인 것은 서비스업과 제조업이 차지하는 비중이 급격히 증가했다는 점이다. 제조업은 노동소득분배율 역시 증가했지만 서비스업의 경우 높은 수준에서

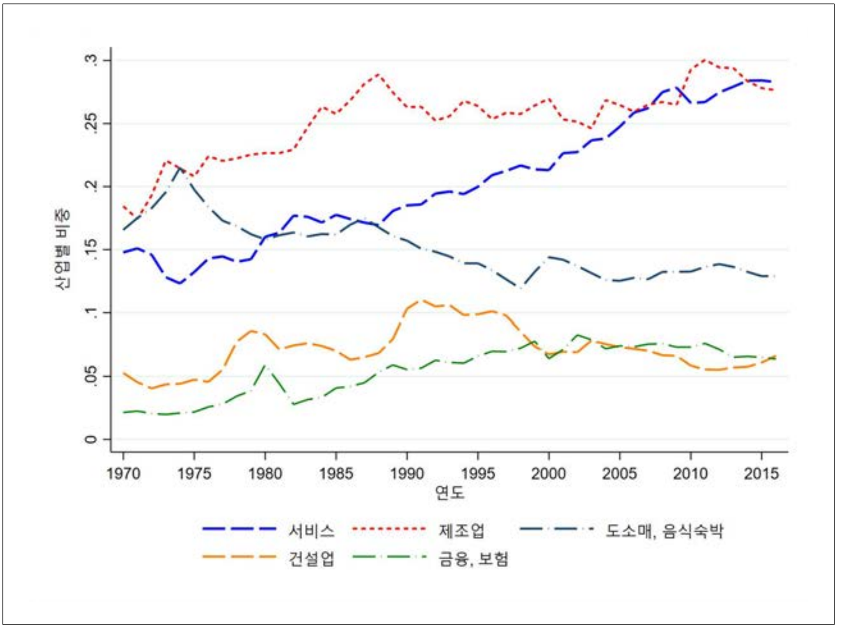
〔그림 3.4〕 산업별 노동소득분배율(1)



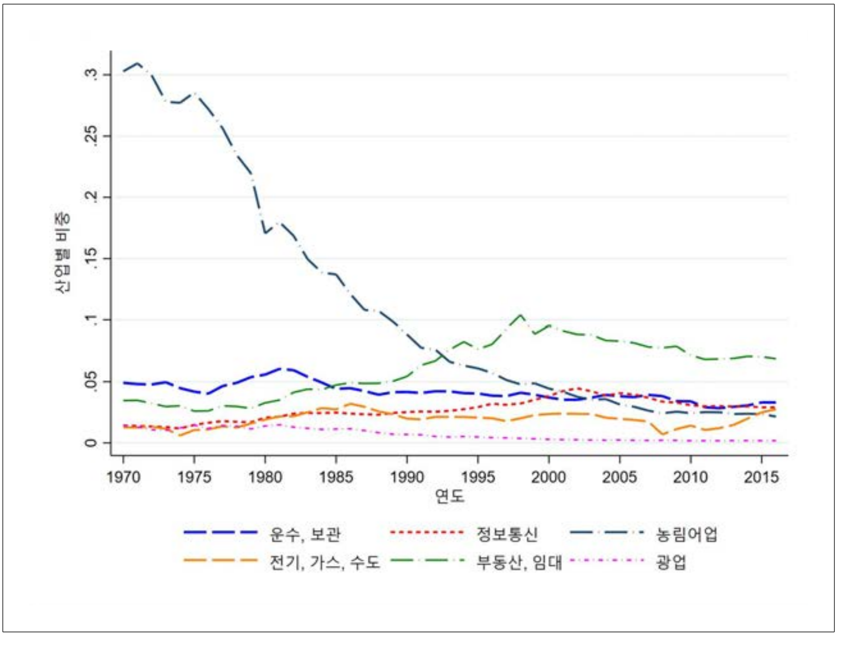
〔그림 3.5〕 산업별 노동소득분배율(2)



〔그림 3.6〕 총부가가치 대비 비중(1)

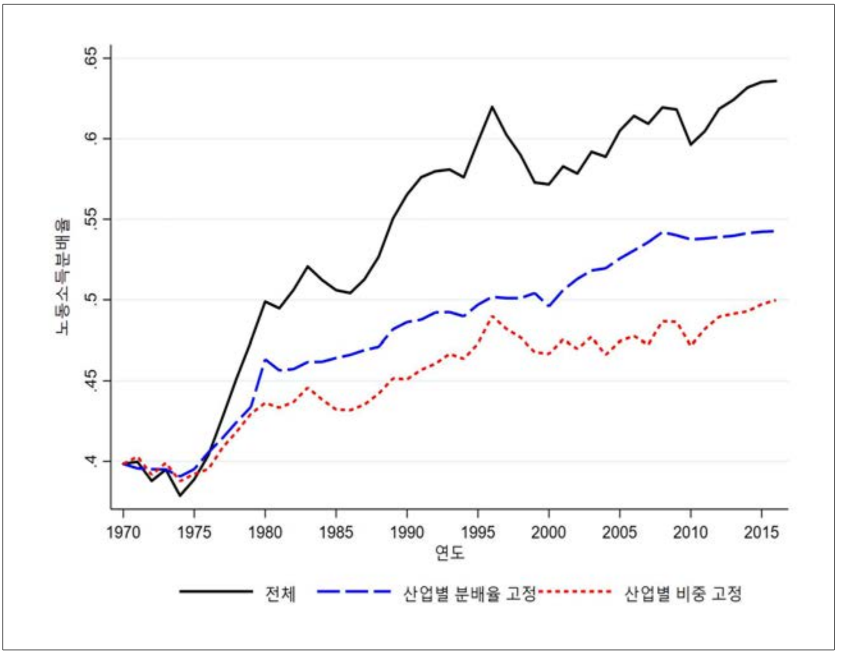


〔그림 3.7〕 총부가가치 대비 비중(2)



거의 변화가 없었다. 그러나 서비스업이 차지하는 비중이 높아지면서 전체 노동소득분배율의 증가를 유도했다. 금융, 보험업과 부동산, 임대업이 차지하는 비중 역시 증가하는 것으로 나타난다. 그러나 금융, 보험업의 노동소득분배율은 감소했기 때문에 전체 노동소득분배율 증가에 기여하는 정도가 크지 않다. 부동산, 임대업은 노동소득분배율의 수준이 낮기 때문에 비중의 증가는 오히려 전체 노동소득분배율의 감소에 영향을 주었다. 반면, 도소매, 음식숙박업과 농림어업이 차지하는 비중은 급격히 감소하고 있다. 도소매, 음식숙박업의 경우 노동소득분배율은 증가하지만 비중이 감소하면서 전체 노동소득분배율 증가 추세에 미치는 역할이 크지 않다. 농림어업은 노동소득분배율이 낮을 뿐만 아니라 경제에서 차지하는 비중이 급격히 감소하면서 전체 노동소득분배율 증가에 기여하고 있다. 요컨대, 제조업은 산업 내 변화와 총부가가치 대비 비중 변화 모두가 노동소득분배율 증가에 기여하는 반면, 서비스업과 농림어업은 비중 변화로써 노동소득분배율 증가에 기여하고 있다.

〔그림 3.8〕 노동소득분배율 요인분해



마지막으로 산업별 노동소득분배율의 추세와 산업 비중의 변화가 전체 노동소득분배율 추세에 미치는 영향을 살펴보자. [그림 3.8]은 산업별 노동소득분배율과 산업별 비중을 각각 1970년의 분배율과 비중에 고정시켰을 때의 노동소득분배율 추세 변화를 나타낸 것이다. 예를 들어, 산업별 분배율 고정은 산업별 노동소득분배율이 지속적으로 변하지만 각 산업이 차지하는 비중을 1970년 값으로 고정한 것이다. 따라서 이 결과는 산업별 노동소득분배율 변화가 전체 노동소득분배율 변화에 얼마나 기여하는지를 보여준다. 반면, 산업별 비중 고정은 반대로 산업 간 구성비 변화가 전체 노동소득분배율 변화에 미치는 영향을 보여준다. 두 그래프의 추세를 보면 전체 노동소득분배율 추세와 유사한 방향으로 움직이는 것을 확인할 수 있다. 따라서 한국의 노동소득분배율 증가 추세는 산업별 노동소득분배율 증가와 산업 간 구성비 변화가 모두 기여하는 것으로 이해된다.

3.4. 투자재 가격 변화에 따른 노동소득분배 추세 변화

이 장에서는 동태적 일반균형 모형으로 노동소득분배율 증가 추세를 투자재 가격 하락으로 설명하고자 한다. 이를 위해서 Greenwood et al.(1997) 모형을 사용한다.

3.4.1 모형 및 모수 설정

경제 내의 대표 가계는 임금과 자본임대료를 소득으로 받아 주어진 예산제약 조건에서 효용극대화를 하는 소비와 투자 수준을 결정한다. 이때, 투자재 가격이 p_x로 주어진다.

$$\max_{\{c_t,\, x_t\}_{t=0}^{INF}} E_0 \sum_{t=0}^{INF} \beta^t u(c_t) = E_0 \sum_{t=0}^{INF} \beta^t \frac{{c_t}^{1-\theta}}{1-\theta}$$

subject to

$$c_t + p_x x_t = w_t + r_t k_t$$

$$k_{t+1} = (1-\delta) k_t + x_t$$

$$p_x{}' = g(p_{x,} \epsilon)$$

투자재 가격이 하락하는 것을 반영하기 위해 외생적으로 주어진 p_x가 매기 g만큼 하락하는 것으로 설정한다. 여기서 예산제약식과 자본축적식을 결합하여 다음과 같이 나타낼 수 있다.

$$c_t + p_x k_{t+1} = w_t + \left(r_t + p_x(1-\delta)\right) k_t$$

이상의 결과를 종합하여 가치함수로 나타내면 다음과 같다.

$$V(k, p_x) = \max_{\{c, k'\}} u(c) + \beta E[V(k', p_x{}')]$$

subject to

$$c + p_x k' = w + \left(r + p_x(1-\delta)\right) k$$

1계 조건을 이용하여 Euler equation을 구하면 다음과 같다.

$$u_c(c) = \beta E\left[\left(\frac{r'}{p_x} + \frac{p'_x}{p_x}(1-\delta)\right) u_c(c')\right]$$

이때, Euler equation은 일반적인 형태에 투자재 가격 p_x의 동학이 반영된 형태이다. 즉, 투자재 가격 변화 $(p_x{}'/p_x)$가 소비와 저축 의사결정에 영향을 미친다.

경제 내의 대표기업은 주어진 임금 수준과 자본임대료 수준 아래 이윤극대화를 하는 노동과 자본을 결정한다. 이때, 생산함수는 노동소득분배율의 변화를 고려하기 위해 일반적으로 사용하는 Cobb-Douglas 생산함수가 아닌 CES 생산함수로 가정한다.

$$Y = AF(K, N) = Af(k) = A\left[\alpha K^{\psi} + (1-\alpha) N^{\psi}\right]^{1/\psi} \quad \text{where}$$

$$\psi = \frac{\sigma - 1}{\sigma}$$

이상의 식들을 종합하여 경제의 동학을 구성하면 다음과 같다.

$$u_c(c) = \beta E\left[\left(\frac{r'}{p_x} + \frac{p'_x}{p_x}(1-\delta)\right)u_c(c')\right]$$
$$k' = (1-\delta)k + p_x x$$
$$c + p_x x = y = Af(k,1)$$
$$p_x{}' = (1-g)p_x$$
$$r(k) = Af_k(k,1), \quad w(k) = Af_n(k,1)$$

투자재 가격 변화가 경제에 미치는 영향을 설명하기 위해 우선, 균제상태를 가정하고 투자재 가격 변화에 따른 소비, 투자, 노동소득분배율 등의 변화를 비교정태 분석을 통해서 살펴본다. 균제상태에서 1인당 자본과 소비, 투자, 노동소득분배율 등은 다음과 같이 정리된다.

$$u_c(c^*) = \beta\left(\frac{Af_k(k^*,1)}{p_x} + (1-\delta)\right)u_c(c^*) \Rightarrow 1 = \beta\left(\frac{Af_k(k^*,1)}{p_x} + (1-\delta)\right)$$
$$y^* = Af(k^*, 1)$$
$$x^* = \delta k^*$$
$$c^* = y^* - p_x x^* = y^* - p_x(\delta k^*)$$
$$\lambda^K(k^*) = \frac{(r(k^*) + \delta)k^*}{y^*} = \frac{Af_k(k^*,1)k^*}{Af(k^*,1)} = \frac{f_k(k^*,1)k^*}{f(k^*,1)}$$
$$\lambda^N(k^*) = \frac{w(k^*)n^*}{y^*} = \frac{f_n(k^*,1)}{f(k^*,1)} = 1 - \lambda^K(k^*)$$

투자재 한 단위의 가격이 하락하면 균제상태의 자본축적과 투자가 증가하여 총생산이 증가하게 된다. 그 결과 총소비도 증가하는 결과를 가져온다.

$$\frac{dk^*}{dp_x} = \frac{1}{p_x}\frac{f_k(k^*,1)}{f_{kk}(k^*,1)} < 0$$
$$\frac{dx^*}{dp_x} = \delta\frac{dk^*}{dp_x} < 0$$

$$\frac{dy^*}{dp_x} = Af_k(k^*,1)\frac{dk^*}{dp_x} < 0$$

$$\frac{dc^*}{dp_x} = p_x\left(\frac{1}{\beta} - 1\right)\frac{dk^*}{dp_x} - \delta k^* < 0$$

그러나 자본과 노동소득분배율은 다른 변수들과는 달리 대체탄력성에 따라 증감여부가 달라진다. 우선, 자본과 노동소득분배율은 투자재 가격에 대해서 반대로 움직인다.

$$\frac{d\lambda^N(k^*)}{dp_x} = -\frac{d\lambda^K(k^*)}{dp_x}$$

투자재 가격 변화에 따른 자본소득분배율의 변화는 다음과 같다.

$$\frac{d\lambda^K(k^*)}{dp_x} = \left(1 - \frac{1}{\sigma}\right)\frac{\lambda^N(k^*)\lambda^K(k^*)}{k^*}\frac{dk^*}{dp_x}$$

여기서 $dk^*/dp_x < 0$이지만 대체탄력성을 의미하는 σ의 크기에 따라 자본소득분배율의 움직임이 달라지는 것을 확인할 수 있다. $\sigma = 1$인 경우는 생산함수가 Cobb-Douglas 형태로 각 소득분배율이 일정하다. 따라서 투자재 가격 변화가 자본소득분배율에 아무런 영향을 미치지 못한다. $\sigma > 1$이면 자본과 노동은 상호 대체관계에 있는데, 이 경우 투자재 가격이 하락하면 자본소득분배율이 증가하는 것으로 나타난다. 따라서 노동소득분배율은 하락하게 된다. 이러한 결과가 Karabarabounis and Neiman (2014)에서 나타난다. 그러나 $\sigma < 1$이면 노동과 자본은 상호 보완관계를 갖게 되고, 이때 투자재 가격이 하락하면 자본소득분배율이 감소하고 노동소득분배율은 오히려 증가하게 된다. 한국은 노동소득분배율이 증가하는 반면, 투자재 가격은 급격히 하락했기 때문에 대체탄력성이 1보다 적다면 투자재 가격 변화로 노동소득분배율을 설명할 수 있는 가능성이 존재한다. 그러나 이상의 결과들은 균제상태에서 정성적인 결과만을 제공할 뿐 정량적으로 투자재 가격 하락이 노동소득분배율 증가를 얼마나 설명하는지에 대해서는 답을 주지 못한다. 따라서 이후에는 모형의 모수들을 설정하고 시뮬레이션을 통해서 기여 정도를 분석하고자 한다.

3.4.2 모수 설정

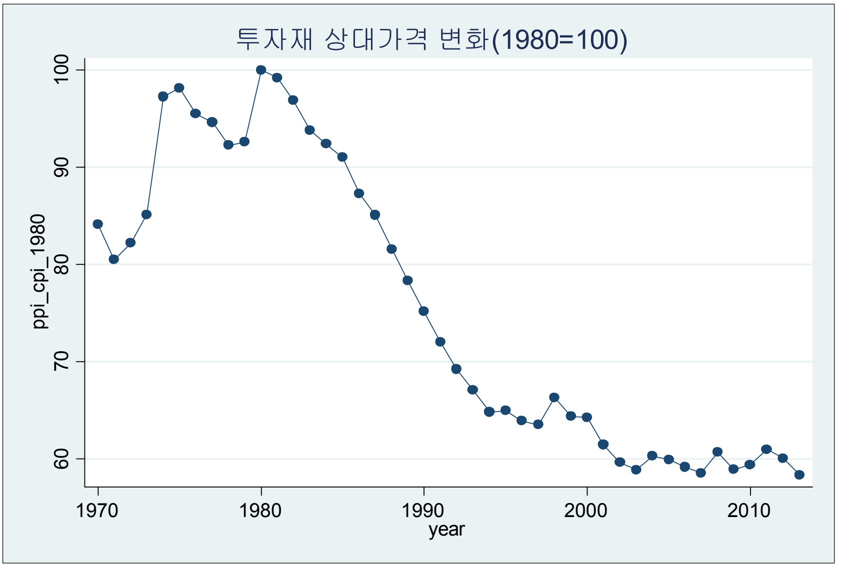
모형의 결과를 결정하는 가장 중요한 모수는 투자재 가격 변화 과정과 자본과 노동의 대체 탄력성의 크기이다. 먼저, 투자재 가격을 살펴보자.

투자재 가격 변화는 Gordon(1990)와 Cummins and Violante(2002)에서 제시한 방법을 사용한다. 기본적인 내용은 생산자물가지수와 소비자물가지수 간의 차이로 측정한다.

[그림 3.9]는 1970년부터 2015년까지 투자재 상대가격을 1980년 상대가격으로 표준화하여 나타낸 것이다. 1970년대에는 투자재 상대가격이 증가하는 모습을 보인다. 그러나 1980년부터 2000년대 중반까지 지속적으로 하락하는 것을 볼 수 있다. 해당 기간 동안 투자재 가격은 40% 정도 하락했고, 연간 1.6% 수준으로 거의 일정하게 감소하였다. 2000년대 중반 이후에는 특별한 추세 없이 변동만을 보이고 있다.

투자재 가격의 시계열을 노동소득분배율의 시계열과 비교하면 정확히 반대로 움직이는 것을 확인할 수 있다. 1970년부터 1980년까지 노동소득분배율은 다소 감소 추세에 있었으나 1980년부터 2000년대 중반까지는

〔그림 3.9〕 투자재 상대가격 변화



급격히 증가했다. 이후에는 증가 추세가 보이지만 그 정도가 이전에 비해서는 많이 약화된 것으로 나타난다. 반면, 투자재 상대가격은 거의 정확히 반대로 움직인다. 이상의 결과를 종합해볼 때, 노동소득분배율과 투자재 상대 가격 변화 간에 상당한 상관관계가 있기 때문에 투자재 가격 변화로 노동소득분배율을 설명할 수 있는 여지가 있다고 본다.

다음은 자본과 노동 간 대체탄력성의 추정 결과를 살펴본다. 먼저, 생산함수를 1인당 총생산과 자본으로 전환하여 로그를 취하면 다음과 같다.

$$\begin{aligned}\ln y_t &= \ln A_t + \frac{1}{\psi}\ln\left[\alpha k_t^{\psi} + (1-\alpha)\right] \\ &= \ln A_t + \frac{\sigma}{\sigma-1}\ln\left[\alpha k_t^{(\sigma-1)/\sigma} + (1-\alpha)\right]\end{aligned}$$

여기서 자본과 노동의 대체탄력성인 σ를 추정하는 것이 필요하다. y_t와 k_t는 일인당 총생산과 자본으로 자료에서 관측이 가능하지만 A_t는 총요소생산성으로 관측이 불가능하기 때문에 선형함수로 가정한다. 위 식을 추정식으로 전환하면 다음과 같다.

$$\ln y_t = \hat{\beta}_0 + \hat{\beta}_1 t + \hat{\beta}_2 \ln\left[\hat{\beta}_3 k_t^{1/\hat{\beta}_2} + \left(1-\hat{\beta}_3\right)\right] + \epsilon_t$$

여기서 대체탄력성은 $\hat{\beta}_2\left(=\frac{\sigma-1}{\sigma}\right)$에 의해서 결정된다. 그러나 위 식은 로그를 취했음에도 불구하고 비선형관계가 계속 유지되고 있기 때문에 OLS로 직접 추정하는 것이 용이하지 않다. 따라서 본 논문에서는 Non-linear Least Square(NLS)와 Kmenta approximation을 이용하여 선형화한 후 추정하는 방식 두 가지를 고려한다.

Kmenta approximation은 생산함수에서 비선형 부분인 $\alpha \ln k_t^{\psi} + (1-\alpha)$을 $\psi = 0\,(\sigma = 1)$에서 2차 Taylor approximation을 하여 추정하는 방식이다. 이 방법은 NLS에 비해 추정이 간단하다는 장점이 있다. 반면, 생산함수가 Hick neutral technology인 경우에만 approximation이 가능하고 σ가 1에서 크게 벗어나지 않는 경우에만 적용 가능하다는 단점이 있다. Kmenta approximation을 이용하여 추정식을 구성하면 다음과 같다.

$$\ln y_t = \hat{\beta}_0 + \hat{\beta}_1 t + \hat{\beta}_2 \ln k_t + \hat{\beta}_3 (\ln k_t)^2 + \epsilon_t$$

이때, σ와 자본소득분배율을 의미하는 α는 추정계수들에 의해서 다음과 같이 정리된다.

$$\hat{\alpha} = \hat{\beta}_2$$

$$\hat{\sigma} = \frac{1}{1-\hat{\psi}} = \frac{1}{1-\frac{2\hat{\beta}_3}{\hat{\beta}_2(1-\hat{\beta}_2)}} = \frac{\hat{\beta}_2(1-\hat{\beta}_2)}{\hat{\beta}_2(1-\hat{\beta}_2)-2\hat{\beta}_3}$$

대체탄력성을 추정하기 위해서 필요한 총생산과 총자본은 한국은행 자료를 이용한다. 총자본은 건설자본을 포함한 것과 그렇지 않은 것 두 가지로 적용한다. 노동자 수는 임금근로자의 수로 한정한다. 추정 결과는 다음과 같다.

<표 3.1>은 NLS와 Kmenta approximation을 이용하여 OLS 추정을 한 결과로 괄호 안은 표준편차를 의미한다. 단, OLS로 추정한 경우, 대체탄력성은 여러 계수들의 관계로 이루어져 있기 때문에 표준편차를 제공하지 않는다. 대체탄력성과 노동소득분배율 모두 추정방법과 상관없이 유사한 값을 갖는다. 대신 건설자본 포함 유무에 따라 그 결과가 달라진 것을 확인할 수 있다. 그러나 대체탄력성의 경우 0.9~0.97 사이로 추정되고 자본소득분배율 역시 0.36~0.37 값을 갖는다. 이상의 결과에 따르면 한국은 자본과 노동 간의 대체관계가 존재하기 때문에 투자재 가격이 하락하는 경우 노동소득분배율이 증가하게 된다.

〈표 3.1〉 추정 결과

	NLS		OLS	
	건설자본 포함	건설자본 제외	건설자본 포함	건설자본 제외
$\hat{\alpha}$	0.363 (0.112)	0.375 (0.120)	0.363 (0.112)	0.375 (0.120)
$\hat{\sigma}$	0.903 (0.113)	0.967 (0.135)	0.903 –	0.967 –

<표 3.2>는 나머지 모수들을 어떻게 설정했는지를 나타낸다.

〈표 3.2〉 모수 설정

변수명	설명	target moment	값
θ	risk aversion	-	2
β	discount factor	capital share 2005-2009	0.96
σ	elasticity of substitution	estimation	0.90
α	share parameter	match labor share in 1980	0.60
δ	capital depreciation	capital stock dynamics	0.05
p_x	relative price change of investment goods	relative price drop from 1980-1990 to 2005-2014	40%

3.4.3 시뮬레이션 결과

시뮬레이션 결과는 1980년대 투자재 가격이 40% 하락했을 때, 총생산을 비롯한 거시경제 변수들과 노동소득분배율의 변화를 살펴본다. 먼저, 초기 균제상태와 투자재 가격이 하락한 상태의 균제상태를 비교한다.

<표 3.3>은 투자재 가격 하락 전 균제상태(SS1)와 40% 하락한 균제상태(SS2)에서의 총량변수와 노동소득분배율을 정리한 것이다. 마지막 행은 각 변수들의 SS1와 SS2 간 변화율을 의미한다. 투자재 가격이 하락하면 투자재가 증가하여 자본축적이 증가한다. 그 결과, 총생산과 총소비가 증가한다. 본 모형에서 노동은 자본과 보완관계를 갖기 때문에 총자본이 증가하면 노동도 증가한다. 그러나 모형에서 모든 경제주체들이 노동공급에 대한 선택이 외생적으로 주어졌기 때문에 1인당 자본(K/L)은 감소하게 된다. 자본은 증가하는 반면, 노동은 변화가 없기 때문에 임금은 증

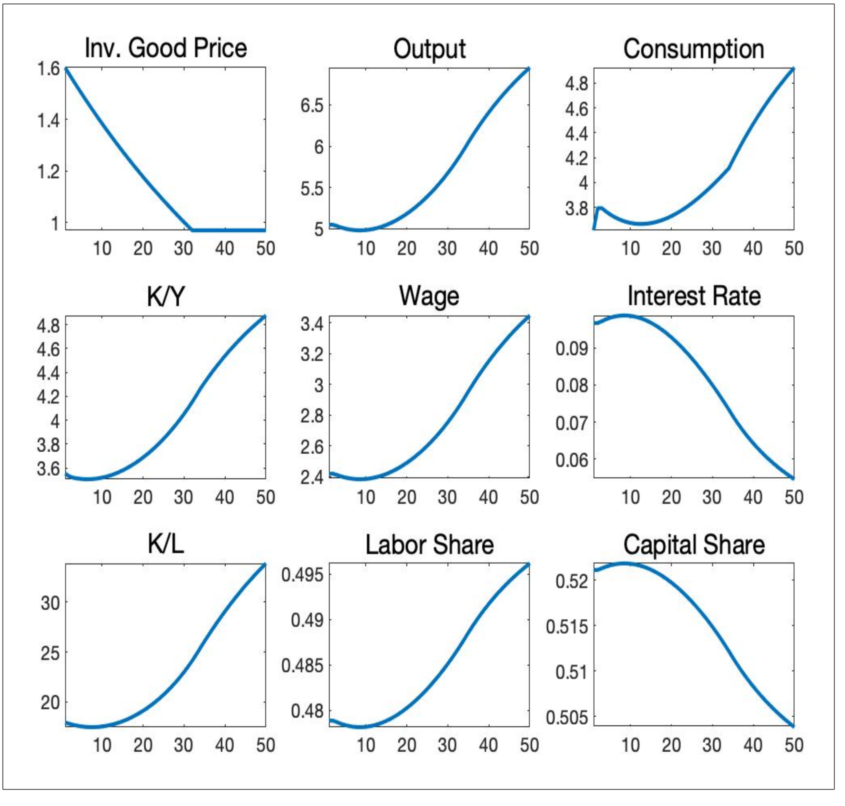
〈표 3.3〉 균제상태 간 총량변수 변화

	총생산	총소비	K/Y	임금	이자율	K/L	λ^N
SS1	5.049	3.614	3.553	2.418	9.7%	17.940	48%
SS2	8.042	5.867	5.573	4.055	3.9%	44.815	51%
변화율	59.3%	62.4%	56.8%	67.7%	-5.8%p	149.8%	9.6%

가하고 이자율은 하락하게 된다. 마지막으로 노동소득분배율은 48%에서 51%로 3%p 증가한다.

[그림 3.10]은 투자재 가격이 매년 1.6%씩 30년간 하락하는 경우의 전이경로를 나타낸 것이다. 투자재 가격은 30년 이후 최종적으로 40% 정도 하락한다. 투자재 가격이 지속적으로 하락하면서 총자본이 증가하여 총생산과 총소비 역시 전이경로상에서 지속적으로 증가하는 것을 볼 수 있다. 그 결과 균형에서 임금은 상승하지만 이자율(=한계자본생산성-감가상각률)은 하락한다. 노동소득분배율은 지속적으로 증가하여 새로운 균제상태로 수렴하는 반면, 자본소득분배율은 지속적으로 하락하는 것으로 나타난다. 본 모형에서 투자재 가격 변화로 새로운 균제상태로 수렴하기까지 150 기간 정도가 걸리는 것으로 나타난다.

〔그림 3.10〕 투자재 가격 하락에 따른 총량변수 및 노동소득분배율 변화 전이경로



이상의 결과들을 종합하여 보면 다음과 같은 결론을 얻을 수 있다. 우선, 자본과 노동이 보완관계 ($\sigma < 1$)에 있는 경우 투자재 가격 하락은 노동소득분배율을 감소시키는 것으로 나타난다. 즉, 정성적으로는 투자재 가격 하락이 노동소득분배율 증가를 설명한다. 그러나 정량적으로 보면 투자재 가격 하락이 노동소득분배율 증가를 충분히 설명하지 못한다. 자료를 보면 투자재 가격 하락이 시작되는 1980년대와 2015년의 노동소득분배율 변화를 보면 48%에서 63%로 15%p 정도 증가한 것으로 나타난다. 그러나 시뮬레이션 결과에 따르면 동일한 정도의 투자재 가격 하락은 노동소득분배율을 3%p 정도만 증가시킨다. 다시 말해서, 투자재 가격만으로는 노동소득분배율의 변화를 전부 설명하기 어렵다는 것을 의미한다.

이와 같은 결과를 이해하기 위해서는 노동소득분배율 변화를 산업 비중 변화와 산업 내 노동소득분배율 증가로 요인 분해를 한 [그림 3.8]의 결과를 다시 살펴볼 필요가 있다. 요인분해 결과 산업 간 비중 변화와 산업별 노동소득분배율 증가는 전체 노동소득분배율 증가의 각각 50% 정도를 설명하는 것으로 나타난다. 모형은 산업 간 비중 변화를 고려하고 있지 않기 때문에 15%p 증가 중 7.5%p 정도만 설명할 수 있다. 이를 고려하면 투자재 가격 하락 3%p 증가는 설명력이 크게 떨어지는 것은 아닌 것으로 판단된다. 그러나 다른 요인들을 고려할 필요가 있다. 추가적으로 반사실적 실험을 통해서 노동소득분배율 변화를 7% 정도 설명할 수 있는 자본과 노동 간의 대체탄력성을 역으로 측정해보면 0.65 정도로 나타난다. 이는 대체탄력성 값이 중요한 역할을 함을 반증하는 것이다.

3.5 결 론

본 연구는 피용자보수로 측정하는 노동소득분배율의 추세를 투자재 가격 하락으로 설명하고 있다. 우선, 피용자보수로 측정된 노동소득분배율의 추세를 살펴보면, 한국은 여타의 국가들과는 다르게 1970년부터 지속적으로 증가해왔다. 1970년대 중반부터 1980년대 중반까지 급격히 증가했고, 이후에는 증가세가 둔화되는 모습을 보이고 있다. 노동소득분배율의 증가 추세의 원인을 이해하기 위해 산업별 노동소득분배율과 총부가

가치에서 각 산업이 차지하는 비중을 비교했다. 한국은 서비스업과 제조업이 전체 경제에서 가장 큰 비중을 차지했고, 농업은 1970년에 큰 비중을 차지했지만 지속적으로 하락한 것으로 나타났다. 산업별 비중 변화와 산업 내 노동소득분배율 변화로 요인분해를 한 결과에 따르면 두 요인이 전체 노동소득분배율 변화의 50% 정도를 설명하는 것으로 나타난다. 산업별 비중 변화는 노동소득분배율이 90% 정도로 나타나는 서비스산업 비중 증가와 동시에 노동소득분배율이 10% 정도로 낮은 농업 비중 감소에 따라 나타난 결과이다. 농업은 주로 가족종사자를 활용했기 때문에 임금근로자 고용이 적어 피용자보수로 측정된 노동소득분배율이 매우 낮은 것으로 나타났다. 반면, 제조업은 노동소득분배율이 증가함과 동시에 경제 전체에서 차지하는 비중도 증가하였다. 이러한 요인들이 종합적으로 작용하여 한국 노동소득분배율은 지난 40여 년간 증가한 것으로 보인다.

이와 같은 증가 추세를 설명하기 위해 여기서는 투자재 가격 하락이라는 요인을 사용한다. 이때, 노동과 자본 간의 대체탄력성이 1보다 작아 상호 보완적이어야 하는 조건이 필요하다. 한국은 대체탄력성이 0.9 정도로 추정되어 투자재 가격 하락으로 자본축적이 증가하면 노동소득분배율이 증가할 수 있는 조건을 갖추고 있다. 그러나 모형의 시뮬레이션 결과 투자재 가격 하락이 노동소득분배율 변화를 정량적으로 설명하기에는 다소 부족한 것으로 나타났다. 전체 노동소득분배율 증가의 절반 정도를 설명하기 위해서는 대체탄력성이 0.65 수준으로 낮아져야 하는 것으로 시뮬레이션 결과 나타났다.

이상의 결과를 종합하면 투자재 가격 하락과 노동 및 자본 간의 보완관계가 노동소득분배율 증가를 일부 설명하는 것으로 판단된다. 그러나 보다 정량적으로 높은 설명력을 보이기 위해서는 노동공급을 내생화하고 노동소득분배율이 다른 산업 간의 이동을 고려하는 등의 시도가 필요하다고 본다.

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