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Abstract

This paper investigates whether the monetary policy and the market structure have anything to do with the declining share of labor in the U.S in recent decades. For this purpose: (a) a dynamic general equilibrium model is constructed and used in conjunction with data over the 2000-2014 period to compute the income shares; (b) the latter are compared to those reported from various sources for significant differences, and (c) the influence of monetary policy is subjected to several statistical tests. With comfortable margins of confidence it is found that the interest rate the Federal Open Market Committee charges for providing liquidity to the economy is related positively with the shares of labor and profits and negatively with the share of interest. What these findings imply is that, by moving opposite to the equilibrium real interest rate, the relentless reduction of the federal funds rate since the 1980s may have contributed to the decline in the equilibrium share of labor, whereas the division of the equilibrium non-labor income between interest and profits has been evolving in favor of the former, because according to all indications the stock of producers' goods in the U.S has been aging. As for the market structure, it is found that even if firms had and attempted to exercise monopoly power, it would be exceedingly difficult to exploit it because the demand of consumers' goods is significantly price elastic. Should these results be confirmed by further research, they would go a long way towards explaining the deceleration of investment and economic growth.

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1. Introduction

Notwithstanding Solow's (1959) skeptical view, for several decades in the 20th century the dominant perception among economists was that the shares of productive factors in the national income remained fairly constant. Under the impetus of Kaldor's (1961) stylized facts and Klein, Kosobud's (1961) great ratios approach, most thought that around 75% of the net national income went to labor and the rest to capital. Then roughly from the late 1980s a few at first and many more later on started to raise doubts and question the validity of the evidence on which this perception stood. In particular, motivated by the worsening of the distribution of labor income among workers and the rising of poverty, as well as the implications for economic policy that these developments entailed, the search for the reasons why the share of labor is declining intensified. As it would be expected, this agenda took the form of research efforts in several directions. Blanchard, Giavazzi (2003), for example, looked into the macroeconomic effects of regulation-deregulation and found that the decline in the labor share may be due to changes in labor market institutions that reduce workers' bargaining powers. Harrison (2005) and Guscina (2006) tested several indices of globalization and contributed significantly to the available evidence by establishing that in the postglobalization era the labor share has been negatively affected by openness to trade and capital-augmenting technological change. Elsby, Hobijn, Sahin (2013) dup up evidence showing that the offshoring of labor intensive components in the U.S. supply chain offers the potential for explaining the decline in the labor share to a great extent; and Karabarbounis, Neiman (2014) corroborated that this development may be due to capital deepening, i.e. the replacement of workers by more automated equipment and software.[1]

The researchers in the above literature take the prevailing political and economic order in the country or countries under consideration as given and study the problems of poverty and maldistribution of income like many others that arise and fade away naturally in dynamic market-based economies. Unlike them, in another strand of literature the researchers look at these problems as manifestations of failures that are beyond repair. This originates from the Marxian criticism of the capitalist system. In our times a much celebrated standard is the

[1] Capital deepening may not be unrelated to globalization and offshoring. According to Gordon (1961, 937) for half a century the prices of producers' goods in the U.S and certain other advanced countries increased faster than those of consumers' goods. However, Gordon (1990), Restuccia, Urrutia (2001) and others have found that in more recent decades the relative prices of such goods have declined rather dramatically. In the U.S this development is due to the steep decline in the relative prices of equipment and less so of software, whereas the prices of structures continue their upward trend. Hence, given that during the same period the ratio of exported to imported capital goods has declined rather precipitously, if new machines are invented and designed at home but constructed in low cost countries, their adverse price effect on labor at home may not be independent of the above mentioned manifestations of openness to trade.

study by Picketty (2014). As with his predecessors in the same lineage of analysis, the fundamental claim laid out by this researcher is that increasing poverty and maldistribution of income are inherent to all economic systems founded on the principle of private ownership of the means of production. Just for a case in point and for later reference, let r, K, Y and s_K denote respectively the real rate of return on capital, i.e. the real interest rate, the gross capital stock, the gross domestic product, and the share of capital in the national income, assuming that the economy is closed. One of the general laws of capitalism that he states takes the form:

$$s_K = r\frac{K}{Y}.$$

This is interpreted to imply that, as the ownership of capital becomes increasingly concentrated among less and less people, the share of capital in the national income has nowhere to go but up, and hence, the culprit for the declining labor share is none other than this failure in the core of the system. However, arguing against this claim, Acemoglou, Robinson (2015) and others have shown that the laws stated in the aforementioned study lack validity because: (a) they are derived from an analytical framework that abstracts form the rebalancing powers of the political and economic institutions, as well as other endogenous factors like technological change, and (b) they are in conflict with past economic history and more recent experiences in advanced economies. Thus with the excitement of a new enlightenment regarding the future of capitalism gone, the search for the reasons why the distribution of income and poverty worsen has returned to more mundane mainstream tracks.

Still another strand of relevant literature has its origins in the so called Cambridge controversy on capital.[2] This relates to the issues of interest here by claiming that the production function approach commonly used in the study of income distribution, and not only, is untenable. To establish their claim, the more contemporary researchers in this line of thinking start from the conditions that Solow (1974, 121) laid down for estimating aggregate production functions and testing hypotheses regarding the elasticity of substitution between labor and capital, the nature of technical change, the marginal remunerations of productive factors, etc. According to Felipe, Fisher (2003), these conditions do not obtain because it is impossible to define and measure aggregate input-output variables like K above without the intervention of income shares and at the same time get a good fit of the estimated production function. Their arguments are well taken. But their force is weak. For if the results from carefully designed

[2] Stiglitz (1974) surveyed the central issues in the controversy and appraised the status of the debate up to the middle of the 1970s. Since then the proponents of the Cambridge (U.K) views have continued to battle by focusing mainly on the difficulties in the conceptualization and estimation of aggregate production functions. As argued below, even though their arguments are well-taken, they lack sufficient convincing power to win over a strong following from the camp of neoclassical economists and practitioners. That is why, judging from an impartial perspective, the influence of neoclassical economic theory as of this date is all but invisible.

laboratory experiments that meet the above conditions come close to those in everyday applications, as the two of the protagonists in this debate report in Fisher, Solow, Kearl (1977), science has its own limitations and no matter what the probability of committing Type II errors will always be present. Yet, in view of the warnings in this literature, it is wise research practice to exercise caution both in the choice of the research method as well as the data.

Although not the main, this is one of the objectives in the present research. To the extent possible the goal is to construct a model as neutral as possible to the preceding critique and test the hypotheses derived from it by paying close attention to the data used in the computations. As for the main objective this is to investigate whether changes in monetary policy, as reflected by the central bank interest rate, and changes in market structure, as indexed by the extent of their concentration and/or the price elasticity of output demand, influence in any way the shares of labor, interest and profits. Since central banks are institutions of great economic power in every country and by law and design they are responsible for preserving price stability and stimulating economic growth, their operations are unlikely to be invariant with respect to income shares.[3] Nor is it sound methodologically not to account for the ability of business firms to exercise monopoly power in the pricing of their products. Hence, given that the rate of return of capital is a price of relative scarcity in investable resources and the rate of profit may be related to the monopoly power of business firms, monetary policy and market structure should be given proper emphasis in the study of income distribution.

The model is erected on two pillars of capital using economies. These are the longevity or average useful life of producers' goods and the real interest rate. From Böhm-Bawerk (1889) and Wicksell (1898) to Wicksell (1923), Fisher (1930), Lindahl (1939), Hayek (1939), and to more contemporary scholars like Blitz (1958) and Brems (1968) we know that the useful life of capital and the real interest rate are related positively. The nominal interest rate, through which the central bank channels its efforts to influence the general price level and the rate of growth, may deviate from the equilibrium real interest rate. But not persistently and not for long because eventually they may affect adversely not only the business cycle in the economy but also other fundamentals like the distribution of income among the productive factors. To highlight this claim, the model is solved using data from the business sector of the U.S. private economy over the fifteen year period from 2000 to 20014 and then the equilibrium income shares are computed with the help of the solved model. The solution is achieved without

[3] Kurz (2015) provides a concise summary of the great debate on this issue among Hayek, Keynes and Sraffa. All three agreed that the central bank influences decisively the distribution of income and wealth. Their differences concerned the channels through which these influences are exerted and how they affect the natural coordinative functions of market prices in pushing the economy towards equilibrium.

the intervention of the income shares that are reported in various official sources. So the computed equilibrium shares constitute independent estimates. With comfortable margins of confidence it is found that the so-called federal funds rate, i.e. the interest rate that the Federal Open Market Committee (henceforth the Fed) charges for providing liquidity to the economy is related positively with the computed shares of labor and profits and negatively with the share of interest. What these findings imply is that, by moving opposite to the equilibrium real interest rate since the 1980s, the relentless reduction of the federal funds rate has contributed to the decline of the share of labor, whereas the division of the non-labor share between interest and profits has been evolving in favor of the former, because according to all indications the stock of producers' goods in the U.S is aging. As for the market structure, it is found that even if firms had and wished to exercise monopoly power, it would be exceedingly difficult because the demand of consumers' goods is significantly price elastic. Should these results be ascertained by further research, they would go a long way towards the deceleration in more recent years of investment and economic growth.

Next section lays out the model. The economy considered consists of two markets: A market where households and firms exchange consumers' goods for labor income, and a money capital market, where households, firms and the Fed exchange loans and determine the real interest rate. Technological change advances at a constant rate. Its effects surface as increases in the productivity of producers' goods and its benefits are passed on to the consumers in the form of lower consumers' goods prices, and hence higher real incomes. All construction of producers' goods is internal to firms and they decide how much to invest each time by maximizing their net worth over an infinite investment horizon. The central bank monetizes productivity and sees to it that the general price level is stable. In Section 3 the presentation centers on the application of the model. Since income shares are determined by several variables and parameters, some of them are approximated with reasonable empirical values, whereas some other are computed iteratively during the solution of the model. The U.S. sources of the data and the conventions and compromises adopted to arrive at these approximations are explained also in the same place. Section 4 presents the results of the statistical analyses that were performed, as well as their interpretation. Lastly, Sections 5 summarizes the findings and the conclusions.

2. The model

In a series of papers presented over several years I have drawn on a dynamic general equilibrium model originally constructed by Brems (1968) to highlight certain important issues in

the realm of capital theory.[4] For example, in Bitros (2008) the model is employed to explain the reasons why the structure of capital and the useful lives of its constituent components may offer precious insights regarding the whims of the economy's business cycles. But the focus in these papers is on the microeconomic dynamics that emanate from the presumed behavior of firms in the economy and their macroeconomic implications are held in abeyance. As a result, the strong potential of the model to shed light on such crucial contemporary issues as, for example, the slowdown of economic growth, the distribution of national income, the effects of fiscal and monetary policies, etc. remains unexploited. So what I propose in this section is to shift attention from the microeconomic to the macroeconomic dynamics of this model by focusing in particular on the relationship of monetary policy and market structure to the shares of productive factors in the national income.

Next subsection summarizes briefly the core features of the model's microeconomic foundations. Then, in the following subsection, the presentation is devoted to its analysis from a macroeconomic point of view; and finally the last subsection closes with a summary of the main results.

2.1 Microeconomics

The economy consists of any number of firms, one of which is representative of all others. Aside from its management, this representative firm comprises two distinct business units or divisions: That is, division C that produces consumer goods and division D that manufactures producer's goods for the C division. During year υ, the C division produces a basket of consumer goods in the quantity of $X(\upsilon)$ by combining $L(\upsilon)$ units of labor with $S(\upsilon)$ units of producer's goods newly built and supplied by division D. Moreover, the following definitions, conventions and functional relations pertain to the operations of the representative firm.

- The unit of physical or **real capital** used in the production of consumer goods is defined as the quantity of producer's goods operated by one unit of labor. Hence, we set:

$$L(\upsilon) = S(\upsilon)\,. \tag{1}$$

- The capital-output coefficient is defined as:

$$b(\upsilon) = \frac{S(\upsilon)}{X(\upsilon)}\,. \tag{2}$$

[4] It is hardly necessary to stress that I owe a great intellectual debt to Brems and the long list of distinguished researchers who have contributed directly and indirectly to the construction of this powerful and elegant model.

- Owing to technological progress, which proceeds at the rate μ, the capital-output coefficients declines over time as follows:

$$b(t) = e^{\mu(t-\upsilon)} b(\upsilon), \text{ for } t > \upsilon \text{ and } \mu < 0 \quad . \tag{3}$$

- The firm's pricing policy of consumer goods is given by the rule:

$$P(t) = e^{\mu(t-\upsilon)} P(\upsilon), \quad \text{for } t > \upsilon \text{ and } \mu < 0. \tag{4}$$

- The unit cost of producer's goods is described by:

$$p = kw \quad . \tag{5}$$

In this w denotes the annual wage rate that serves also as a Walrasian *numeraire* and k is the minimum labor required to build one unit of producer's goods.

- The net worth $n(\upsilon)$ of each unit of producer's goods, put in place in year υ and lasting for u years, takes the following form:

$$n(\upsilon) = \int_{\upsilon}^{\upsilon+u} \left[\frac{P(\upsilon)}{b(\upsilon)} e^{\mu(t-\upsilon)} - w \right] e^{-i(t-\upsilon)} dt = \frac{P(\upsilon)}{b(\upsilon)} \frac{1-e^{(\mu-i)u}}{1-\mu} - w \frac{1-e^{-iu}}{i} - p \,. \tag{6}$$

- It is worth noting that if (3) and (4) are divided side by side, it emerges that:

$$\frac{P(\upsilon)}{b(\upsilon)} = \frac{P(t)}{b(t)} \,. \tag{7}$$

Interpreted in conjunction with (6), this equation ascertains that the net worth of a unit of producer's goods is invariant with respect to the time it is put in place. This is as it should be because the output price $P(\upsilon)$ and the capital coefficient $b(\upsilon)$ decline at the same rate, leaving the revenue stationary.

- Lastly, with an eye towards obtaining analytically manageable results, it is postulated that in the market for consumer goods the firm faces the following constant-elasticity-of-substitution demand curve:

$$X(\upsilon) = N(\upsilon)[P(\upsilon)]^{\eta}, \text{ for } \eta < -1,\ N(\upsilon) > 0,\ P(\upsilon) > 0,\ X(\upsilon) > 0 \quad . \tag{8}$$

At time $t = 0$, if the firm maximizes the net worth of an endless stream of investments $S(0), S(u), S(2u) \cdots$ with respect to the initial price $P(0)$ and service life u, it can be shown that the optimal solution is given by the following first order conditions:

$$\left.\begin{aligned} P(0) &= \frac{\eta}{1+\eta} e^{-\mu u} b(0) w \qquad \text{(a)} \\ i e^{-\mu u} - \mu e^{-iu} &= (ki+1)(i-\mu). \qquad \text{(b)} \end{aligned}\right\} \tag{9}$$

To this two equation system the presentation will return frequently later on. But three of its key aspects are in need of immediate clarification and emphasis. The first of them has to do with its mathematical properties. Looking closer at (9) observe that while (9a) is an explicit function and can be solved for u, (9b) does not permit an analytic solution. As a result, the only approach to solve (9) for the purpose of using the solution as a reference to the general equilibrium of a real economy is through iterative methods. What this implies is that, given reasonable empirical values for the exogenous variables, convergence to the solution for the endogenous variables up to a certain level of precision will be attempted by adjusting appropriately the values of the parameters.

The second aspect of interest is the price elasticity of demand, i.e. η. The importance of this parameter lies in the realization that it ties the competitive structure in the consumer goods market with the unit net worth of producer's goods. In establishing this link it is fairly straightforward to show that by using (5), (7) and (9b), expression (6) reduces to:

$$n(v) = -\frac{1}{1+\eta} \frac{1 - e^{-\mu u} + k}{i} w. \tag{10}$$

From this it turns out that, if the market for consumer goods is perfectly competitive, it would hold that $\eta = \infty$, and hence, the unit net worth of producer's goods $n(v)$ would be equal to zero. In that event, in equilibrium, aside from covering all wage and interest costs, firms would manage to balance out the revenue losses on the older vintages of producers' goods with the rents they earn from the higher productivity of the newer vintages. Or, stating the same conclusion in another way, because of the sharp competition in the consumer goods market, firms would be forced to relinquish all benefits from technological progress to consumers. But at the same time they would cover the cost of labor and compensate fully the owners of the producers' goods they employ both for the interest they are due and the loss in income earning capacity they suffer due to the technological obsolescence of the older vintages of producers' goods. What all this implies is that, since firms would survive at the edge without realizing any pure profits, the national income would be distributed only in the form of labor income and interest.

However, from the national income accounts it is ascertained that as a rule and on the average firms realize significant above normal profits, thus indicating that they enjoy substantial market power. A formal way to allow for this is to introduce the following condition:

$$\frac{\eta}{1+\eta} > 1 . \tag{11}$$

Its implications are obvious. In view of the side condition in (8), the lower is the absolute value of η, the higher is the market power of firms, and hence, their ability not only to control the rate at which the benefits from technological progress are transferred to consumers but also to realize consistently above normal profits. Therefore, since market power is related inversely to the price elasticity of demand, the latter should be related positively to the share of labor and negatively to the share of profits in the national income.

The third and last aspect to touch upon briefly here relates to the interest rate i. At the representative firm level this is exogenous. It is determined in the money capital market where the central bank plays an important role in the form of monetary policy operations. In particular, by raising or shrinking the quantity of money, the central bank influences the availability of savings relative to the demand for loans, and hence it influences the level and the direction of change of the interest rate. But from (9b) it can be established that changes in the interest rate induce shifts in the average service life of producers' goods in the same direction. Consequently, since the interest rate is a channel through which the central bank may affect the structure of capital, and hence of investment and economic growth, the system in (9) provides a suitable analytical framework to inquire whether the monetary policy has contributed or not to the shrinking share of labor in recent years.

2.2 Macroeconomics

Turning from microeconomics to macroeconomics, let the economy consist of firms all of which are exactly like the one described above. If so, within any year the economy will produce two goods, i.e. $X(v)$ and $S(v)$, of which the former remains the same from one year to the next whereas the latter changes according to (3). Moreover, assume that: (a) there exists a money capital market in which firms may borrow and households may lend funds at the annual rate of interest i with continuous compounding; (b) the labor force $F(t)$ is growing at the annual rate g, (c) a central bank will be introduced in due course, and (c) the presence of government is ignored in the modelling stage but it will appear as a contributing mechanism later on. Among many other questions that might be pursued with the help of the model, the

ones of interest here are: Would there be steady growth with full employment? If in the positive, what would be the necessary interest rate? In that interest rate, what would be the share of labor in national income? In the face of changes in monetary policy, would labor's share shift, and if so in what direction? I will return to them, after some necessary steps to derive the relevant macroeconomic aggregates.

2.2.1 Structure of the capital stock and full employment

The mass of the physical or real capital stock $K(t)$ used in the economy may be obtained by means of the following integral:

$$K(t) = \int_{t-u}^{t} S(v)dv \,. \tag{12′}$$

In view of the controversies in the relevant literature regarding the units of measurement of this mass, it should be noted that while producers' goods of different vintages differ in quality, their quantity is well-defined because of (1).[5] Moreover, without loss in generality, producers' goods may be considered as infinitely and productively durable and that the termination of their service life at u is due solely to advancing technology which renders them obsolete.[6] Considered in this way, let $S(v)$ grow per annum at the same proportionate rate as that of labor:

$$S(t) = e^{g(t-v)}S(v) \,. \tag{12″}$$

Now, inserting (12″) into (12′) yields:

$$K(t) = \int_{t-u}^{t} e^{-g(t-v)}S(t)dv = \frac{1-e^{-gu}}{g}S(t) \,. \tag{12}$$

From this equation we see that since $S(t)$ is growing at the rate of g per annum, the accumulated capital stock is growing at the same rate.

Next, using (12) in conjunction with (1) and (5), it should be easy to establish that the structure of full employment is given by:

$$\bar{L}(t) + \bar{l}\,(t) = [\frac{1-e^{-gu}}{g} + k]S(t) = F(t) \,, \tag{13}$$

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[5] It should be noted that since by (1) the variable $S(t)$ is measured in labor units no monetary values are involved in (12′), and hence, there arise no issues of aggregation.

[6] In the present model absent from the determination of the useful life of capital are *operating policies* like the intensity of utilization and maintenance, and *capital policies* like abandonment and scrapping. For a detailed analysis of these policies and how they determined the useful life o producers' goods, see Bitros, Flytzanis (2002, 2004).

where the symbols $\bar{L}(t)$ and $\bar{l}(t)$ stand for the workers employed in the industries of consumers' and producers' goods, respectively. Observe from the middle expression that time enters only through $S(t)$, which by (15″) grows at the proportionate rate g per annum. This ascertains that full employment is guaranteed because by definition the labor force $F(t)$ is growing at the same rate.

2.2.2 National income and the share of labor

The instantaneous rate of consumers' goods emanating from the entire capital stock existing at time t is:

$$\int_{t-u}^{t} X(v)dv = \int_{t-u}^{t} \frac{S(v)}{b(v)}dv. \tag{14}$$

Inserting into this (3) and (12″) yields:

$$\int_{t-u}^{t} X(v)dv = \int_{t-u}^{t} e^{-(g-\mu)(t-v)} \frac{S(t)}{b(t)}dv = \frac{1-e^{-(g-\mu)u}}{g-\mu}\frac{S(t)}{b(t)}. \tag{15}$$

From this it follows that the quantity of consumer goods increases at the rate of the ratio $S(t)/b(t)$. What is this rate? To find out, divide (3) and (12″) side by side to obtain:

$$\frac{S(t)}{b(t)} = e^{g-\mu}\frac{S(v)}{b(v)}. \tag{16}$$

As it could be expected, the answer is that the quantity of consumer goods rises at the rate $g-\mu$. However, what about the revenues? These grow as per (18) below:

$$P(t)\int_{t-u}^{t} X(v)dv = \frac{\eta}{1+\eta}e^{-\mu u}\int_{t-u}^{t} e^{-(g-\mu)(t-v)}\frac{S(t)}{b(t)}dv = \frac{\eta}{1+\eta}e^{-\mu u}\frac{1-e^{-(g-\mu)u}}{g-\mu}wS(t), \tag{17}$$

From this we observe that the money value of consumer goods grows only at the rate of g. This again is at should be because, at the same time that their quantity increases at the annual rate $g-\mu$, their prices decline at the rate of technological progress μ.

On the other hand, the money value of producer goods is given by the expression:

$$pS(t) = kwS(t), \tag{18}$$

Therefore, adding (17) and (18) gives the money value of gross national product $\bar{Y}_{gross}(t)$ as:

$$Y_{gross}(t) = \left[k + \frac{\eta}{1+\eta} e^{-\mu u} \frac{1-e^{-(g-\mu)u}}{g-\mu} \right] wS(t). \tag{19}$$

Now, obtaining the expression of net national income $Y_{net}(t)$ requires calculating and subtracting from (19) the money value of capital consumption or depreciation. To this effect, recall that earlier it was assumed for simplicity that producer's goods are indestructible in the sense that their physical and productive properties remain unaffected by the wear and tear of usage as well as the sheer passage of time. If these were the only reasons of capital consumption, firms would not have to allow in the pricing of their products for depreciation and then it would hold that $Y_{gross}(t) = Y_{net}(t)$. But in the present case, as ascertained by (3), technological progress renders newer producers' goods more productive that older ones, implying that the latter become obsolete in the sense that they lose income earning capacity relative to the former. Hence, aside from the interest they must pay to whoever are the money capital owners of the producer's goods they employ, firms must allow in their pricing policies for the income losses money capital owners suffer because of technological obsolescence. Due to the complications involved, the derivation of the money value of producers' goods on which interest is reckoned and paid by firms is relegated to Appendix A. The value sought is given by expression (8A), so the interest bill in the economy is:

$$V(t) = iZ(t) = \frac{\eta}{1+\eta} wQS(t). \tag{20}$$

On the other hand, from (13) it follows that at full employment the aggregate wage bill $W(t)$ is:

$$W(t) = [\frac{1-e^{-gu}}{g} + k] wS(t). \tag{21}$$

Now, adding (20) and (21) and using (10b) for simplification gives net national income $\hat{Y}_{net}$ as:

$$Y_{net}(t) = \frac{\eta}{1+\eta} \cdot \frac{ie^{-\mu u} + (g-\mu-i)e^{-gu} - (1+kg)(g-\mu)}{(g-\mu)(i-g)} wS(t). \tag{22}$$

Hence, the share of labor in net national income s_L is given by:

$$s_L = \frac{W(t)}{\hat{Y}_{net}(t)} = \frac{(\frac{1-e^{-gu}}{g} + k)}{\frac{\eta}{1+\eta} \cdot \frac{ie^{-\mu u} + (g-\mu-i)e^{-gu} - (1+kg)(g-\mu)}{(g-\mu)(i-g)}}. \tag{23}$$

Looking at this expression, observe that t does not appear explicitly anywhere. By implication, the share of labor does not have a time trend and as long as the economy stays in equilibrium, it remains constant. But if the monetary policy pushes the interest rate steadily downwards, as it has done in recent years, or if the market structure worsens due to increasing concentration, a whole train of shifts take place in the real economy that are unlikely to leave the share of labor unchanged. So, among other experiments with the model, with the equilibrium values of variables in (9) at hand, it may be possible to trace the impact of monetary policy and market structure on the share of labor.

2.2.3 Equilibrium in the money capital market

Recall that all producers' goods are built by firms for their own use. This implies that there is no market for selling and buying such goods. The only markets that exist in the economy are those for exchanging consumer goods and loans. Therefore, invoking Walras' law, if the one of these markets is in equilibrium by necessity the other is in equilibrium as well. Here, because of the nature of the issues under consideration, the analysis will focus on the equilibrium of the money capital market.

Let us return to (12′). We observe that all units of $S(v)$ aggregated to obtain $K(t)$ are the same. But it does not reveal what these units are like. In other words it does not say whether this mass of producers' goods consists of bulldozers or pick-and- shovel implements. To understand what they are, we must look at (5) in conjunction with (6). In (5) w is fixed and serves as a Walrasian *numeraire*. A lower rate of interest will induce firms to use higher priced producers' goods which have lower capital coefficient, implying that they are more productive. But irrespective of the quality of such goods, equilibrium in the economy would require that the demand for funds equals their supply. The demand for funds stems from the need of firms to finance the aggregate depreciated capital stock, whereas their supply, say $M(t)$, emanates from accumulated savings. Hence it must hold that:

$$\frac{\eta}{1+\eta}\frac{w}{i}Q = \frac{M(t)}{S(t)}. \tag{24}$$

Looking at this condition, observe that equilibrium requires the available money capital $M(t)$ to grow at the proportionate annual rate g, i.e. the same rate by which the quantity of gross investment $S(t)$ is growing. For then the ratio $M(t)/S(t)$ is stationary and there are no forces at work to change the variables (k,i,u) from their equilibrium values (k^*, i^*, u^*). Does $M(t)$ grow at this rate? From (20) and (23) it turns out that the funds released from the depreciation of producers' goods do grow at this rate. The same would be true if we aggregated savings, given some propensity to consume net income by households. Hence, full employment equilibrium growth is possible. But whether it is stable or not needs further analysis. To this end, let us focus on (24). This implies that the market for loanable funds, functioning freely and without any outside interference, determines the full employment equilibrium interest rate i^*. Taking this interest rate as given, the firms adjust their production and capital policies and by solving system (9) they determine the equilibrium values of $P(0)^*$ and u^*, whereas the equilibrium quantities of consumers' and producers' goods determine the equilibrium value of b^*, and hence of k^*. By implication, there is equilibrium in both the microeconomic and the macroeconomic levels. Now to find out whether it is stable or not, assume that at time t consumers hoard a part of their savings. As a result, the available funds in the money capital market fall short of the funds demanded and the interest rate increases. *Ceteris paribus*, the rise in the interest rate would induce firms to build producers' goods with higher useful lives ($u \uparrow$), thus economizing on the depreciation funds, and lower labor requirements $(k \downarrow)$, thus economizing on the funds for financing the construction of such goods. This process would continue until $u \to u^*$ and $k \to k^*$, upon which the disturbed equilibrium would be reestablished as $i \to i^*$. Thus the equilibrium is stable, irrespective of the time it would take to complete. Consequently steady full employment equilibrium growth is possible, even though the actual economy may not follow it.

At this point a remark is in order regarding the prices $P(t)$ and $p(t)$. In contemporary jargon $p(t)$ is actually a transfer price, i.e. an accounting price for intrafirm exchange and record keeping purposes. From this clarification it follows that $P(t)$ stands both for the prices of consumers' goods as well as the general price index in the economy. So now that the monetary authorities in every country strive to re-inflate their economies to avoid the zero bound on the nominal interest rate, the question is how to tweak the model to render it capable for shedding light on issues of monetary policy. To this effect, assume that a central bank is established with two mandates. One to keep stable the general price level at a predetermined

rate of inflation, say θ, and another to set the central bank interest rate in relation to the real equilibrium interest rate so us to prop up economic growth. To achieve the first objective, drawing on Buiter (2007) let the central bank introduce a mechanism relating the currency in circulation as medium of exchange, and hence store of value, to the unit of account in such a way that at the new numeraire $\hat{w}$ the price $P(0)$ in (9) rises at the target rate of inflation. This can be accomplished by setting $\hat{w} = we^{\rho\theta u}$, $\theta \geq 0$, where the parameter ρ is to be estimated during the solution. Substituting into (24), we obtain:

$$\frac{\eta}{1+\eta}\frac{\hat{w}e^{-\rho\theta u}}{i}Q = \frac{M(t)}{S(t)}. \tag{25′}$$

Looking closer at this condition, it is important to observe that the adopted modification changes nothing but the numeraire. Consequently, since all prices in the economy increase at the same rate, the relative prices remain unchanged and all real variables are left undisturbed at their equilibrium levels.

Next, abstracting from money illusion on the part of economic agents, let us consider the second objective. Pursuing it would require the central bank to aim at reducing the equilibrium real interest rate i, because only then households and firms might be motivated to change their plans and accelerate saving and investing. Traditionally monetary policies to this effect have taken the form of quantitative easing, i.e. increasing the interest bearing quantity of money $M(t)$, pushing the equilibrium nominal interest rate $\hat{i}$ downwards, or both. Here, assume that the central bank targets the latter interest rate by setting $i = \hat{i} - \theta$. Substituting into (25′) yields:

$$\frac{\eta}{1+\eta}\frac{\hat{w}e^{-\rho\theta u}}{\hat{i}-\theta}Q = \frac{M(t)}{S(t)}. \tag{25}$$

For this to hold, the equilibrium values (k^*, i^*, u^*) that would result from (9) would be different than in the absence of the central bank or even in the presence of the central bank but in the above limited role of conducting only numeraire changing policies. The reason is that by changing the central bank interest rate, the central bank would stir adjustments to the real economy that may be accompanied by serious unintended consequences.

To explain why, the analysis is straightforward. Initially a reduction in the central bank interest rate would depress the nominal interest rate in the economy below its equilibrium value, say $\hat{i}' < \hat{i}^*$. With the expected inflation rate given, firms would interpret this decline as a signal that the availability of savings has increased, i.e. that $i' < \hat{i}^* - \theta$, and behaving

rationally they would start building capital goods with lower useful lives $(u' < u^*)$ and higher construction labor requirements $(k' > k^*)$. In turn, these initiatives would raise the cost of producers' goods, reduce the price of consumer goods, and lead to unexpected losses of net worth for the firms. Eventually all these changes would lower savings by households, thus driving the real and the nominal interest rates back to their equilibrium levels, leaving the growth rate of the economy to its natural rate $g - \mu$. If monetary authorities insisted on keeping the central bank interest rate at the low level they set it, would such an initiative be free of detrimental consequences to the real economy? No they would not, because as we know from Hayek (1939), it would aggravate the business cycle of the economy. But could such initiatives have wider and less transient undesirable effects? The answer to this question is the subject of the presentation immediately below.

3. Model solution for the business sector of the U.S private economy

The research plan in this section provides for three tasks. The first is to solve (9) for the values of $u(t)$ and $i(t)$. Presumably, the interest rates that would result from the solution would be the ones firms faced during these years when arriving at their decisions regarding the production of consumers' and producers' goods, as well as the financing of such activities. As argued earlier, these interest rates are determined in the money capital market by the joint decisions of households, firms and the central bank. Hence, if they are not in actuality at least they can be conceived as "natural" or "equilibrium interest rates", whereas the so-called "federal funds rates" are policy rates through which the central bank channels its efforts to influence the course of real economic activity. Accomplishing this task necessitated the substitution into (9) of plausible empirical values for the variables and parameters $P(t)$, $k(t)$, θ and μ. The presentation in the following subsection explains what compromises were adopted and how annual data from the business sector of the U. S. private economy over the period 2000-2014 were used to obtain such plausible values.

The second task entails employing the computed equilibrium values $u_c(t)$ and $\hat{i}_c(t)$ in conjunction with the values of the variables and parameters mentioned above, in order to compute the labor share $s_{Lc}(t)$ and the shares of profits $s_{\pi c}(t)$ and interest $s_{ic}(t)$. The series thus computed together with those reported in official U.S. sources are presented in the second subsection. The results from an assessment of the differences among these series are found in the same place. Lastly, in the third subsection, the focus is on the implications of changes in the market structure for the shares of labor and profits.

3.1 Empirically plausible values of certain key variables and parameters

Turning first to the useful life of producers' goods, an indirect way to compute it is to apply the ratio $1/d(t)$, i.e. the reciprocal of the depreciation rate $d(t)$. Doing so would appear to be handy. But in the present case it is beset by a major shortcoming. This has to do with the realization that, in the available data sources it is computed by national product and income accountants on the basis of some prior assumptions regarding the useful lives of producers' goods that are aggregated into the economy wide measures of the capital stock. As a result, calculations based on this ratio reproduce these prior assumptions of service lives rather than yielding independent estimates. Fortunately, since equation (9a) is explicit with respect to u, it offers a convenient approach to solving for it. On the way to doing so, it emerges that by taking advantage of (11), (9a) can be reduced to the much simpler form of:

$$\varepsilon A(t) = e^{\rho\theta u(t)}, \quad \varepsilon = \frac{1+\eta}{\eta}, \; A(t) = \frac{P(t)X(t)}{p(t)S(t)}, \; t = 0,\cdots,14\,. \tag{26}$$

In this expression $A(t)$ is the ratio of the value of output produced by the producers' goods that are put in place in the same period through new investment. In other words, it is the marginal or incremental output-capital ratio. As such it is very likely that it varies erratically because of the frequent and at time sizable changes among economic sectors with various capital intensities.[7] To confront this possibility a reasonable compromise is to use the average output-capital ratio and, in particular, approximate it by the ratio of gross value added over the undepreciated stock of fixed assets. Additionally, it should be noted that, contrary to the assumption in the model, the producers' goods industry does use capital, and hence, it is more accurate to approximate this ratio by using in the numerator and in the denominator the respective aggregates of the economy as a whole. Column 3 in Table 1 in Appendix B reports the estimates for this ratio. They relate to the business sector of the U.S private economy over the said period, whereas the sources of the data and certain conventions adopted in the calculations are described in the notes section at the bottom of the table.

Estimates of the minimum building labor of producers' goods may be obtained by starting from the expression:

$$k(t) = k(t)\frac{\hat{w}K(t)}{\hat{w}K(t)}, \; t = 0,\cdots,14 \quad . \tag{28′}$$

Employing (1), (5) and (26), this can be re-written as:

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[7] For empirical evidence to the effect that the incremental output-capital ratio may be unstable, see Gianaris (1969).

$$k(t) = \frac{p(t)K(t)}{\hat{w}\bar{L}(t)},\ t = 0,\cdots,14. \qquad (28'')$$

Implicit in (28″) is that the time it takes to construct each unit of producers' goods is zero. To relax this assumption, but also for computational purposes, it helps to introduce two adjustments. The first is to write (28) in the following modified form:

$$k(t) = \alpha\frac{p(t)K(t)}{\hat{w}\bar{L}(t)},\ t = 0,\cdots,14, \qquad (28)$$

where α is a parameter to be computed during the solution of system (9). As for the second adjustment, this derives from the observation that in the model the ratio $p(t)K(t)/\hat{w}\bar{L}(t)$ is the value of the undepreciated capital stock to the wage bill in the consumers' goods industry. Hence, in line with the explanation in the preceding paragraph, an estimate of $k(t)$ may be obtained by using the economy wide values of the undepreciated stock of fixed assets and the wage bill at the same level of aggregation. The estimates for this ratio are shown in Column 5 of Table 1.

Next, let us turn to the parameters. Regarding the rate of technological progress μ, conventionally it is approximated by two measures: labor productivity, or output per man-hour, and Total Factor Productivity (TFP), or output per unit of all inputs used. The former measure is more in tune with the model because it coincides with the reciprocal of the capital coefficient, i.e. $1/b(v) = X(v)/L(v)$. To be sure, this measure is biased in several respects. For example, it attributes all productivity to labor, even though firms employ also producers' goods and many other inputs in the production of goods and services; As mentioned above, it relates exclusively to one of the sector in the economy, i.e. the consumers' goods industry; and moreover it varies significantly from year to year, whereas technological progress, emanating primarily from systematic Research and Development (R&D) efforts, is a slow moving incremental process. To allow for these shortcomings a reasonable compromise is to adopt the data for labor productivity as reported by the U.S. Bureau of Labor Statistics for the business sector of the U.S. economy. But, instead of relying on the annual figures, a better choice is to use their simple average for the years 2000-2014. Column 6 of Table 1 displays both the annual figures of labor productivity as well as their simple average, giving $\mu \cong$ -0.0209.

The figures in Column 7 give the rate of inflation as measured by the Consumer Price Index (CPI). Each figure in this series constitutes an approximation to the target rate of inflation that the central bank had set in the particular year. While solving equation (26) it would be more accurate to treat θ as an independent variable and solve for each given year. But the solution did

not converge, particularly because of the negative inflation rate in the year 2009. For this reason the series of inflation was approximated by its mean, i.e. by setting $\theta = 0.0238$

Columns 8 and 9 display two series of g . In the model this was defined as the growth rate of the labor force. Doing so was appropriate because it set the minimum rate of growth that the economy ought to achieve for attaining and maintaining full employment stable equilibrium economic growth. But if technological change and/or other reasons enable the economy to achieve higher rates of economic growth, the appropriate rates to use would be those higher rates. On this basis, in the computations g is approximated by the figures in column 8 that represent the growth rates of the U.S. economy.

Finally, some details about the parameters α, η and ρ . In the computations their values are determined iteratively so as to achieve convergence in the solution of system (9). In particular, during the solution the Solve algorithm in the mathematical software package Mathcad was directed to assign such values to them so as to maximize pairwise the correlation between the computed series $(u_c(t),\ \hat{i}_c(t))$ and the reported series $(u_r(t),\ i_r(t))$ from official U.S. government and semi-government sources.

3.2 Comparative analysis of computed and reported series of key variables

Table 2 in Appendix B consists of two sections. The one on the left presents the main series of interest that were computed from the model, whereas the one on the right displays the same series that were retrieved from the sources mentioned in the notes section of the table. The figures in the top two rows give the values of the parameters for which the computed series hold, as well as the correlations among certain selected pairs of computed and reported series.

Looking closer at this table, several key results stand out. To facilitate their presentation and interpretation, Figure 1 brings together the computed and the reported series in a uniform visual setting. In particular, in order to add the time perspective in the discussion, the reported series have been extended as far back as the 1950s. From the graphs of $u_c(t)$ and $u_r(t)$ we observe that: (a) both series are increasing; (b) the difference of $u_c(t)$ over $u_r(t)$ grows larger by the year, and (c) given from Table 2 that they are correlated to the tune of 0.937, the series $u_c(t)$ tracks the series $u_r(t)$ extremely well. These findings ascertain with comfortable margins of confidence that the stock of producers' goods in the U.S private economy is getting older from the early years of the 1980s, and indeed since 2000 at much faster rates than those estimated by the national income and product accountants. Hence, unless it is propagated by large shifts towards sectors of economic activity using longer lived fixed assets, which is high-

ly unlikely,[8] this persistent upward trend of the average useful life of producers' goods should be due to other reasons that need to be identified and explained, because the aging of the capital stock in an economy is intimately related to the slowdown in productivity, the deceleration in economic growth, the decline in the labor share, etc.

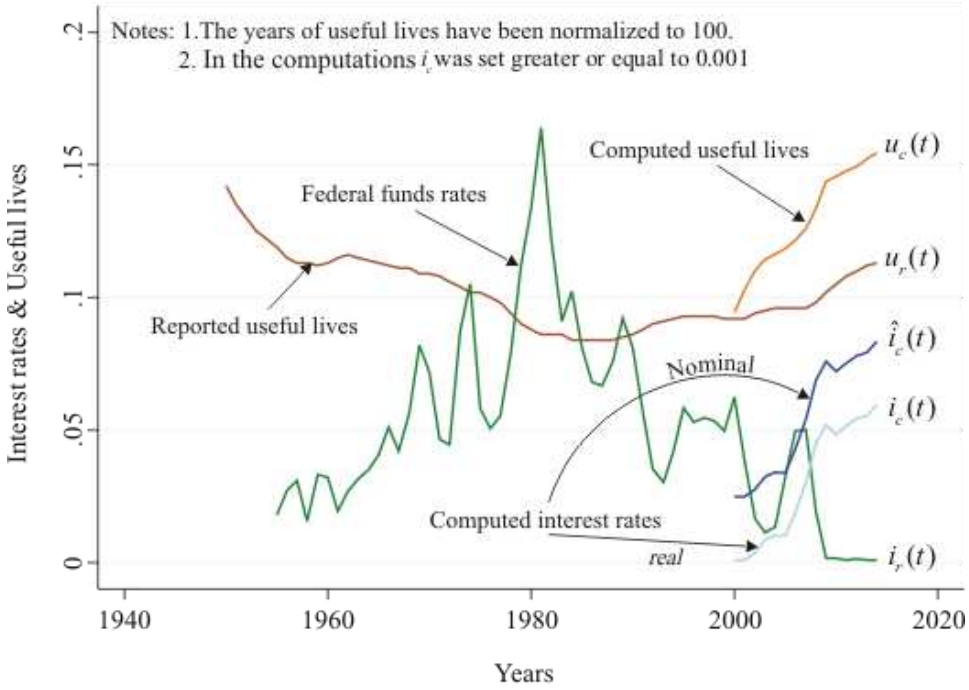

Figure 1: Trends in the interest rates and useful lives of producers' goods

Certainly, there may be many reasons that have shaped this trend. The parameters in the second row from the top in Table 2 reveal that the model accounts for three of them. These are technological change, shifts in the competitive structure of markets, and monetary policy. Regarding technological change, the value of μ embedded in the calculations may be biased upwards, if not from a long term perspective, at least since 2005. Therefore, given that ceteris paribus μ is related negatively with $u(t)$, the true upward trend in the series $u_c(t)$ may be a bit sharper. Turning to the market structure, recall that the value of η results from the solution of system (9) that maximizes the correlation between the series $u_c(t)$ and $u_r(t)$. This implies that it is derived endogenously and that it cannot be assessed empirically whether it is reasonable or not. However, it should be noted that ceteris paribus the higher is the output price elasticity of demand, and hence the more competitive are the markets for consumers' goods, the

[8] Since structures are significantly longer lived fixed assets relative to equipment and software, such a shift would be expected to show as an increase in the ratio of investment in structures to total investment. However, according to the data given by BEA for real private non-residential investment, during the period under consideration this ratio declined from 31.5% in 2000 to 21.6% in 2014.

lower the useful lives of producers' goods that are employed. Lastly, the model accounts for changes in monetary policy that are channeled through the numeraire and the nominal interest rate. According to Buiter (2007), decoupling of the numeraire from the other functions of money is still far from being adopted as an instrument of monetary policy. Hence, the value of $\rho\theta = 0.112$ may stand for the rate of increase in the quantity of money capital. Of this rate 0.0209 percentage points might be aimed at monetizing technological change, because then $\mu + 0.0209 = 0$, whereas the rest might aim at achieving other objectives, including the target rate of inflation $\theta = 0.0238$.

In the model all effects from expanding the quantity of money capital are channeled to the equilibrium useful life of producers' goods $u_c(t)$ through changes in the nominal equilibrium rate of interest $\hat{i}_c(t)$, which in turn bring about changes in the real equilibrium rate of interest $i_c(t)$.[9] Exactly as we would expect from capital theory and past experience in mature market economies, Figure 1 shows that these two variables are related positively and strongly, and more precisely from Table 2 to the extent of 0.973. By contrast, as we see in Figure 1, the federal funds rate $i_r(t)$ moves opposite to the nominal and real equilibrium interest rates, giving for the period since 2000 a correlation of -0.742 (see top row of Table 2).[10] Moreover, observe in Figure 1 that in the decades going back to 1950s the federal funds rate moved opposite to the reported useful life of producers' goods, thus rendering it most likely that the federal funds rate moved opposite to the equilibrium interest rate throughout the post war period. These findings are highly puzzling, and hence, in need of an explanation.

One that comes to mind is the following. Suppose that the U.S. economy sometime in the early years of the 1980s switched from a capital abundant to a capital scarce phase. From capital theory and past experience we would expect firms to switch to policies for economizing in the use of fixed assets by slowing down or even postponing plans for new expansionary and replacement investments. As a result the useful life of the stock of producers' goods would change course and from declining it would turn increasing. This shift is consistent with the path in Figure 1 of the reported useful lives $u_r(t)$ since 1950, as well as with the computed useful lives $u_c(t)$ since 2000. But while the switching from relative abundance to relative scarcity of investable resources in the real economy is reflected in the rising of the useful lives of produc-

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[9] Mishkin (1996) reviews the channels of monetary policy and emphasizes the importance of changes in the real interest rate for monetary policy to be effective.

[10] The relationship between the nominal and the real interest rate is given by $i_c = \hat{i}_c - 0.0238$. To avoid repeating the distinction between them, from now on all references will be made to the nominal interest rate.

ers' goods, in the money capital market it surfaces as a rising interest rate. Why then have the U.S. monetary authorities been driving the federal funds rates opposite to these fundamentals? A possible answer is that they lean against the wind in the sense that they try to play a balancing act by sending signals opposite to the ones that prevail in the economy just to discourage the creating of bubbles due to animal spirits and other excesses. However, doing so is not without welfare costs, because in the process they may distort, for example, the distribution of income in unknown magnitudes and directions. Whether this possibility in the form of testable hypotheses is confirmed or refuted by the data is an issue that will be taken up in the next section.

Columns 3, 4 and 5 in Table 2 give the income shares of labor, profits and interest. The ones shown in the left section are percentages of income allocations derived from the model. Hence they are based on the net value added in the business sector of the U.S private economy. Those shown in the right section are similar percentages reckoned on the basis of gross domestic income in the particular manner explained in note 6 of the table. On inspection, it can be seen that the share of profits from the model is much higher than that derived from the U S. National Income and Product me Accounts (NIPA), of the U.S Bureau of Economic Analysis (BEA). The reason is that the model allocates to profits sources of incomes that BEA accounts separately, because they cannot be allocated with certainty among labor, profits and interest. However, this difficulty presents no problem for our purposes, because the only aspect that matters here is the trends reflected in these series and not their levels. On this basis, Figure 2 displays the three pairs of income shares in order to identify and draw attention to important differences in the ways they have evolved since 2000.

The graphs at the top relate to the computed and the reported series of the labor share. We observe that both decline, the former somewhat slower and with much less variability than the latter. Actually the rates at which they decline per annum are so small that this evidence may be viewed as a confirmation of the result from equation (23) that the labor share is free of any time trend. In turn these findings lead to the near certainty that the decline in the labor share is due mainly to the forces that have been allowed for in the model and that whatever differences in the variability between the computed and the reported series of the labor share are due to unaccounted forces like the changes in monetary policy that are channeled to the real economy through the federal funds rate.

Significant are also the findings regarding the shares of profits and interest. In the period under consideration these evolved as shown by the graphs in the lower part of Figure 2. The pair of graphs colored brown depicts the series of computed and reported share of profits, whereas the graphs colored blue show the respective series of the share of interest. What we

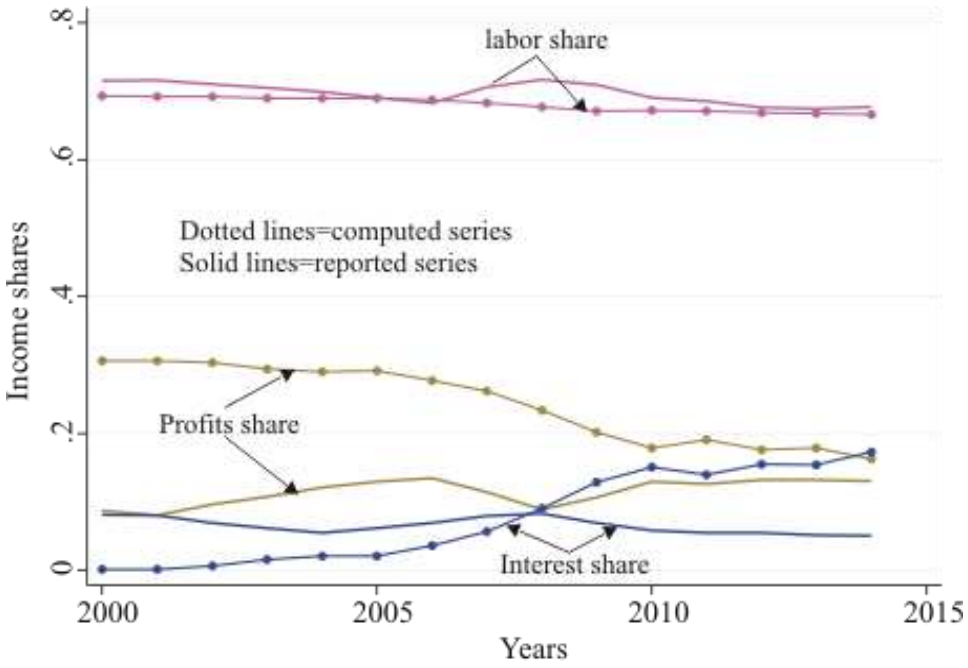

Figure 2: Trends in the labor, profits and interest shares

observe is that the computed share of profits and interest move opposite to those reported. The difference, particularly with regard to the share of profits, is important not because it contrasts sharply with the established wisdom, which sides with the view that the share of profits is increasing, but because if the equilibrium share of profits is indeed on a downward trend, several puzzling questions about the deceleration of investment and productivity can be explained by appeal to rational entrepreneurial decisions. As for the rising equilibrium share of interest, the explanation is straightforward. The net stock of producers' goods on which interest income is reckoned grows faster because: first, as the useful life of producers' goods increases the net stock of such goods declines slower, and, second, as the depreciation of the producers' goods in place declines the proportion of expansionary investment in gross investment grows. Thus, given that at the same time the equilibrium interest rate rises, the share of interest increases. Expressed in another way, the share on non-labor income increases, albeit mildly, not because the profits share is increasing but because of the increasing interest share due to the increasing average useful life of producers' goods and the increasing nominal, and hence real, equilibrium interest rate.

Finally, in order to get a glimpse into the differences in the levels, the variability and the rates of decline in the reported and the computed share of labor, Table 3 in Appendix B brings together the series s_{Lc} and s_{Lr} from Table 2 with two additional series s'_{Lr} and s''_{Lr} from the sources mentioned in the notes section of the table and shown in Figure 3. We observe that all

three reported series indicate that the labor share has been declining and that the series computed from the model is consistent with this finding. So there is no doubt about this stylized fact. But otherwise the differences in their levels and variability are wide, with the largest observed between the series from BEA and BLS. As a matter of fact, given that the latter series includes some allocation from the share of proprietors' incomes, whereas the series from BEA is comprises only the compensation of employees, the difference between the two series is even wider.

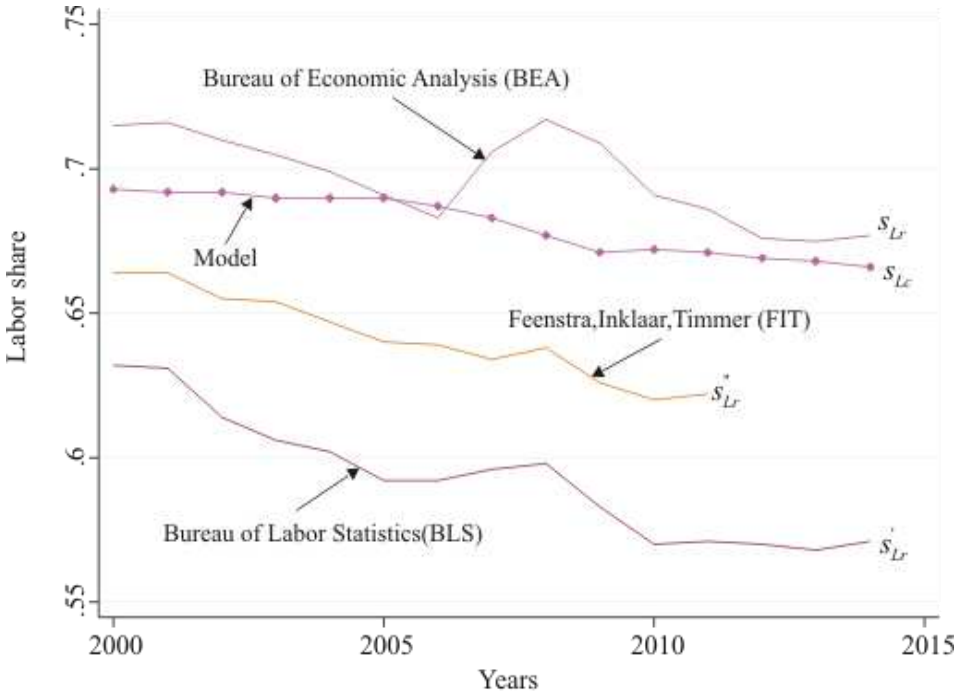

Figure 3: The labor share from various sources

3.3 Market structure and the share of labor

By virtue of condition (11) the firms in the model are endowed with some monopoly power in their markets and they can set the prices of their products so as to maximize the unit net worth of the producers' durables they employ. This monopoly power is associated with a finite price elasticity of demand that translates into profits over and above what the firms pay out in the form of interest to money capital owners. From Table 2 it can be ascertained that in the 15 year period under consideration with a price elasticity of aggregate demand for consumer goods equal to -2.865, the computed average share of profits was 21.6 percent.

Instead, let us abandon for the moment the above conceptualization and concentrate on the case in which all markets in the economy are perfectly competitive. Since this implies that the price elasticity of demand approaches *minus* infinity, (11) would transform into:

$$\frac{\eta}{1+\eta} \cong 1 . \qquad (11')$$

The value of the expression $\eta/(1+\eta)$ would decline from 1.536 in the model to 1; the labor share according to expression (23) would increase as much as required to drive the share of profits to zero; and the net national income would be allocated only in the form of labor incomes and interest payments. Consequently, by drawing on these implications in comparison to the results from the model, we may surmise that: (a) the degree of monopoly power firms command and exercise in the economy is intimately related to the level of labor share; (b) changes in the monopoly power of firms affect the share of labor in the opposite direction; (c) public policies which intentionally or unintentionally increase (decrease) the monopoly power of firms should be expected to decrease (increase) the share of labor, and (d) monetary policy, in particular, may affect the labor share both directly through its influence on the interest rate and indirectly by encouraging or discouraging the concentration of firms among others through the process of mergers and acquisitions. That is why keen competition, first and foremost in the money capital markets, is of primary importance and interest.

However, gauging the monopoly power of firms and especially in the economy as a whole faces many difficulties. Some are conceptual. For example, if a concentration index shows that a small number of firms realize a very large percentage of the overall sales in the economy, this by itself does not imply necessarily that the firms use their market power to set abusively high prices, since their profits may come from innovative activities or efficiency gains that eventually may benefit the consumers. Some other difficulties emanate from the nature of the available data. The case in this regard is that the data which can be accessed, say from the cite http://www.census.gov/epcd/www/concentration.html, are reported for five year periods and refer to manufacturing, not the overall economy. Lastly, by most indications concentration in the aggregate economy appears to be decreasing rather than increasing. For instance, according to the U.S. Economic Census in 1997 the fifty largest U.S. companies accounted for 24 percent of the value added in manufacturing. This percentage was the same in 1992 and even in 1954, whereas by such measures as the percentage of total employment and total assets controlled by the 50, 100, or 200 largest firms, industrial concentration in the U S. actually has declined since World War II.

From the above it follows that concentration in the U.S. economy is unlikely to have increased the monopoly power of firms, at least not to an extent that it may have contributed to the observed downward trend of the labor share since

2000. This narrows whatever adverse effects may have been exerted from this source to possible concentration gains in the banking sector, particularly due to mergers, acquisitions and liquidations of failed banks during the 2007-10 economic turmoil. The following excerpt from Wheelock (2011, 167) draws on considerable evidence showing that concentration in this sector has not increased:

> "…this article finds that except for a few rural banking markets, acquisitions of failed banks by in-market competitors generally had only a small impact on market concentration. Most banks that failed during 2007-10 were small, and although many of those banks were acquired by much larger institutions, those acquisitions generally had little impact on market concentration. Acquisitions of larger banks that failed during 2007-10, such as the acquisition of Washington Mutual Bank by JPMorgan Chase Bank, also had only limited impact on the concentration in most of the banking markets involved. Among large MSAs, the Houston and New York City banking markets were most affected by the acquisition of Washington Mutual but both remained relatively unconcentrated after the acquisition."

To conclude, the research effort below will be conducted as if the degree of concentration and the exercise of monopoly power by U. S. firms remained stable throughout the 15 year period under consideration.

4. Test results and interpretations

Drawing on the above findings and assessments, the emphasis in this part is on testing the following two hypotheses:

H_1: At least since 2000 the stance of monetary policy as gauged by the federal funds rate has been easing. However, contrary to popular thinking, this policy has been perceived and acted upon by households and firms as a worsening scarcity of investable resources, thus leading to a persistent rise in the equilibrium useful life of producers' goods as well as the equilibrium nominal and real interest rates. In turn both these trends resulted in a persistent, albeit mild, decline in the share of labor. Therefore, the monetary policy may not have been as innocuous as commonly thought with respect to this undesirable development.

H_2: According to the computations, quite more sizable that the decline in the equilibrium share of labor is the decline in the share of profits. Since during the period under consideration the degree of competition remained roughly stable, if not declining, it is not unlikely that the monetary policy by pushing the federal finds rates to the zero bound may have contributed to this trend.

The objective of the statistical analysis below is to confirm or refute these two hypotheses with a comfortable margin of confidence.

4.1 Monetary policy and the share of labor

Equation (29) presents the results from the estimation of the relationship between the computed nominal equilibrium interest rate $\hat{i}_c$ and the federal funds rate i_r.

$$\hat{i}_c = 0.084 - 1.5363\hat{i}_r$$
$$(30.0)\ \ (-13.3) \qquad (29)$$
$$\bar{R}^2 = 0.926,\ \mathrm{F}(1,13)=176.7\ \ \mathrm{RMSE}=0.0062$$

In this equation the figures underneath the parameter estimates give the *t-statistic*; $\bar{R}^2$ is the adjusted coefficient of determination; $\mathrm{F}(1,13)$ denotes the *F-statistic* for the indicated degrees of freedom; RMSE stands for the Root Mean Square Error; and $\hat{i}_r$ is the federal funds rate net of its time trend so as to match the equilibrium interest rate which by conception does not have a time trend. Thus, since the parameter estimates are statistically significant at comfortable levels of significance and from the table of the F-distribution it turns out that $\mathrm{Prob} > F(1,13) = 0.0000$, on the basis of standard statistical criteria equation (29) may be interpreted to represent the true relationship between these two interest rates.

Observe in (29) that the value of $\bar{R}^2$ explains 92.2 percent of the variability in the equilibrium nominal interest rate. Hence, given that in the money capital markets central banks participate along with firms and households, this finding reveals that true to popular perceptions the U.S. monetary authorities do influence the equilibrium nominal rate of interest. Contrary though to those beliefs they influence it in directions opposite to the ones pursued. For as it turns out from the sign of the slope coefficient in (29) this is negative. Moreover, from (29) and Figure 1 we see that small reductions in the federal funds rate bring about large increases in this equilibrium rate. What these findings imply is that the Fed not only has lost control of the interest rate, which is consistent with the evidence from Fama (2013), but also that interest-based monetary policies may be accompanied by highly adverse unintended consequences.

Above we found that the federal funds rate is related inversely with the equilibrium interest rate. Hence, since the latter is related directly with the useful life of producers' goods, which is related inversely with the labor share, the federal funds rate should be related directly with the labor share. Equation (30) tests the nature of this relationship, and by doing so it tests hypothesis H_1. From this equation it turns out in a rather unequivocal way that the monetary

$$s_{Lc} = 0.667 + 0.695\hat{i}_r$$
$$(520.7)\ (13.3) \qquad (30)$$
$$\bar{R}^2 = 0.926,\ \mathrm{F}(1,13)=176.0\ \mathrm{RMSE}=0.0028$$

policy in place at least since 2000 has contributed to the decline in the equilibrium share of labor. In particular, the elasticity at the mean values of s_{Lc} and $\hat{i}_r$ suggests that for every 10% decline in the detrended federal funds rate the labor share declined by 2.03%.

Table 1 below shows the results from regressing the three reported series of the labor share against the detrended rate of the federal funds. With the exception of certain narrow differ-

Table 1: Results from the reported series of the labor share

	s_{Lr}	s'_{Lr}	s''_{Lr}
Constant	0.681 (142.0)	0.610 (271.1)	0.564 (175.1)
$\hat{i}_r$	0.780 (4.03)	1.283 (15.6)	1.412 (10.7)
$\bar{R}^2$	0.551	0.956	0.891
F	16.23	242.6	114.8
RMSE	0.011	0.003	0.000

ences particularly in the slope coefficients, all three equations are consistent with and confirm that the monetary policy may have contributed significantly to the decline of the labor share.

Moreover, it should be noted that this conclusion has been found to be highly robust to alternative specifications of the labor share. For example, in the results reported above s_{Lc} and s_{Lr} are labor shares computed on the basis of gross domestic product net of depreciation and a few other items in the case of s_{Lr} (on this see the notes in Table 2 in Appendix B). This specification was adopted for the same reasons considered by Bridgman (2014). However the bulk of research work in this area has been conducted using labor shares reckoned on the gross domestic product. So to extend the testing in this direction, depreciation was added back to the computed and reported series of gross domestic product. The results from the statistical analysis did not change materially. The coefficient signs, the test criteria and the explanatory power of the equations remained remarkably stable. Therefore, all in all these tests ascertain that the monetary policy should be held responsible to some extent for the decline in the labor share at least since 2000.

4.2 Monetary policy and the allocation of non-labor income

Equation (31) presents the results from a regression between the computed equilibrium share of profits and the detrended federal funds rate:

$$\begin{gathered} s_{\pi c} = 0.168 + 3.7576\hat{i}_r \\ (22.9)\ (12.6) \\ \bar{R}^2 = 0.918,\ \text{F(1,13)=157.7, RMSE=0.016} \end{gathered} \tag{31}$$

We observe that the decline in the federal funds rate reduces the share of profits. In particular, based on the elasticity at the means of the respective variables, a 10% decline in the detrended federal funds rate may be expected to reduce the share of profits by 30.9%.

If instead of the computed equilibrium share of profits we use on the left hand side of the regression equation the reported share, the results change as follows:

$$\begin{aligned} s_{\pi r} &= 0.132 - 0.889\hat{i}_r \\ &\quad (20.3)\ (-3.35) \\ \bar{R}^2 &= 0.422,\ \text{F(1,13)=11.2, RMSE=0.014} \end{aligned} \tag{32}$$

These imply that a decline in the federal funds rate increases the share of profits and indeed by a sizeable percentage. For if we use again the elasticity at the means of the variables involved, a reduction of the detrended federal funds rate by 10% increases the share of profits by 15.7%.

In light of the sharp conflict between these two sets of results, but also the conflict of (31) with most available literature claiming that during this period the share of profits was rising, one may be tempted to surmise that the model suffers from some kind of internal inconsistency. This view would be unwarranted. To explain why, the computed and reported shares of interest and profits were added to obtain the computed and reported shares of non-labor income s_{NLc} and s_{NLr}, respectively, and equations (31) and (32) were estimated anew on this basis. The results that emerged are given below:

$$\begin{aligned} s_{NLc} &= 0.333 - 0.699\hat{i}_r \\ &\quad (272.9)\ (-14.0) \\ \bar{R}^2 &= 0.933,\ \text{F(1,13)=195.8, RMSE=0.0027} \end{aligned} \tag{33}$$

$$\begin{aligned} s_{NLr} &= 0.187 - 0.386\hat{i}_r \\ &\quad (38.2)\ \ (-1.93) \\ \bar{R}^2 &= 0.164,\ \text{F(1,13)=3.74, RMSE=0.0107} \end{aligned} \tag{34}$$

From these equations it follows that, as the detrended federal funds rate declined over the said period, the share of non-labor income did increase. But this transpired because what increased precipitously was the share of interest, whereas the share of profits either declined or increased much less slowly. That is why, unless we keep these two shares distinct, we run the risk of questionable generalizations like, for example, the following from Ellis, Smith (2007,1):

> "Strong profit growth has been observed across a range of developed economies in recent years, and it is perceived that the share of factor income going to profits – the return on capital – is particularly high."

For, it is needless to stress that, even if the share of profits went to zero in the long run, the share of interest would be positive because the "return on capital", or alternatively the interest rate, is the price of scarcity and not of market imperfections, risk taking or inventiveness.

5. Summary and conclusions

Depending on the data one looks at, one gets a different view of the level and variability of income shares. The differences in the reported series from various government and semi-government sources in the U.S are significant and arise primarily because of the difficulty to allocate ""Proprietors' income" among labor, profits and interest. However, ignoring the differences in their levels, the graphs in Figure 3 leave no doubt that over the period under consideration the labor share has been declining, more or less severely, whereas the share of the non-labor income in the form of interest and profits is increasing. In view of this development and the indications that the distribution of labor income among workers as well as poverty are worsening, researchers have sought to identify the probable causes for this highly unsettling trend and prescribe policies to reverse it. The main objective in this paper was to add to these efforts by looking into the possibility that the monetary policy and the competitive structure of the markets in the U.S. economy may contribute in this regard.

To this end, adopting the long established dynamic general equilibrium model of heterogeneous capital that ties together the useful life of capital with the real interest rate was an easy choice. But grafting into it monetary policy operations required considerable tweaking. This was achieved through two channels. First, by decoupling the accounting from other functions of money, so as to allow the central bank to change prices without changing the interest bearing quantity of money, and second, by the more orthodox approach of changing the federal funds rate, given a target rate of inflation. Thus modified the model was then solved to convergence and the equilibrium values sought for the useful lives of producers' goods, the nominal and the real interest rates, and the income shares were obtained in an internally consistent and elegant way.

Comparing the computed to the reported income shares proved quite revealing. The labor share from the model comes very close to that of BEA, since the means of the series are 68.1 and 69.7 percent, respectively, and their correlation is over 90%. But perhaps even more revealing is the contrast with the income shares that make up the non-labor share. According to the figures reported by BEA, in the years since 2000 the share of interest is declining, whereas that of profits is increasing. On the contrary, the shares of interest and profits from the model move in the opposite directions, thus rendering the series from BEA hard to explain. For,

since the average age of producers' goods and the equilibrium real interest rate are both increasing, the shares of interest and profits would be expected to evolve as in the model.

Finally, regarding the core issues of interest in this research, the statistical analysis showed that the monetary policy does influence the income shares in the expected direction. In particular, in the case of the labor share, no matter whether the federal funds rate is regressed against the computed or the reported series the results show a positive relationship. This finding implies that the monetary policy influences the labor share in the same direction, and hence, it leads to the conclusion that in the 15 year period under investigation the race of monetary policy to zero bound of the policy rate influenced the labor share negatively. If this is not surprising enough, the finding that the decline in the policy rate led to the decline of the profit share should have been unexpected. Because, if monetary policy attempted to boost economic growth by accelerating investment, the negative impact of the policy on the profit share should have discouraged investment, and this is what happened in reality. As for the impact of the market structure, this turned out to be minimal, because even if firms had and wished to exercise monopoly power in the pricing of their product, they could not exploit it because the price elasticity of demand is relatively high.

Appendix A

Derivation of the money value of the depreciated capital stock

Observe from (5) in the text that the sum total $R(\upsilon,\tau)$ of revenues minus operating expenses of a unit of producers' goods from time τ to the rest of its useful life u is given by:

$$R(\upsilon,\tau)=\int_{\tau}^{\upsilon+u}\left[\frac{P(\upsilon)}{b(\upsilon)}e^{\mu(t-\upsilon)}-w\right]e^{-i(t-\upsilon)}dt\,. \tag{1A}$$

Depreciation on the unit of producers' goods of vintage υ from τ to time $\tau+1$ is defined as the decline in its worth during that year:

$$D(\upsilon,\tau)=R(\upsilon,\tau)-R(\upsilon,\tau+1)\,. \tag{2A}$$

So, on the way to finding the expression for net income, let us derive the expression for $R(\upsilon,\tau)$. With the help of (11) and (14), expression (8) simplifies into:

$$\frac{P(\upsilon)}{b(\upsilon)}=we^{-\mu u} \tag{3A}$$

Substituting this into (1A) and carrying out the integration gives the value of one unit of producers' goods of vintage υ computed as of time τ:

$$\begin{aligned}R(\upsilon,\tau)&=w\left[e^{-\mu u}\int_{\tau}^{\upsilon+u}e^{\mu(t-\tau)-i(t-\tau)}dt-\int_{\tau}^{\upsilon+u}e^{-i(t-\tau)}dt\right]=\\&=w\frac{ie^{-\mu(\upsilon+u-\tau)}-\mu e^{-i(\upsilon+u-\tau)}-(i-\mu)}{i(i-\mu)}.\end{aligned} \tag{4A}$$

Expression (11′) gives the units of all producers' goods employed at time t. Hence, its value should be:

$$Z(K(t))=Z(t)=\int_{t-u}^{t}R(\upsilon,\tau)S(\upsilon)d\upsilon\,. \tag{5A}$$

In turn, by drawing on (12″) to write:

$$S(\upsilon)=e^{g(\upsilon-\tau)}S(\tau)\,, \tag{6A}$$

expression (5A) can be transformed into:

$$Z(t) = \int_{t-u}^{t} R(\upsilon,\tau)S(\upsilon)d\upsilon =$$
$$= \frac{\eta}{1+\eta}\frac{wS(\tau)}{i(i-\mu)}\left[\int_{t-u}^{\tau} ie^{-\mu(\upsilon+u-\tau)+g(\upsilon-\tau)} - \mu e^{-\mu(\upsilon+u-\tau)+g(\upsilon-\tau)} - (i-\mu)e^{g(\upsilon-\tau)}\right]d\upsilon. \quad (7A)$$

Upon evaluation of this integral and some re-arrangements of terms, we obtain the money value of the depreciated capital stock as:

$$Z(t) = \frac{\eta}{1+\eta}\frac{w}{i}QS(t)$$

where (8A)

$$Q = \frac{ie^{-\mu u}}{(g-\mu)(i-\mu)} + \frac{\mu e^{-iu}}{(i-g)(i-\mu)} - \frac{i\mu e^{-gu}}{g(g-\mu)(i-g)} - \frac{1}{g}.$$

Expression (8A) gives the value of the undepreciated capital stock on which interest is due and paid to the owners of the corresponding money capital.

Appendix B

Data used in the computations of the model and the statistical analysis

Table 1: Estimates of certain key variables and parameters of the model

Years	Series used in the calculations								
	V[1]	K[1]	A[2]	W[1]	k[3]	μ[4]	θ[5]	g_l[6]	g[7]
	(1)	(2)	(3)=(1):(2)	(4)	(5)=(2):(4	(6)	(7)	(8)	(9)
2000	7.89	12.89	0.612	4.05	3.186	-0.034	0.0338	0.0230	4.09
2001	8.08	14.29	0.566	4.13	3.457	-0.028	0.0283	0.0083	0.98
2002	8.29	15.63	0.530	4.12	3.791	-0.043	0.0159	0.0076	1.79
2003	8.67	17.00	0.510	4.22	4.025	-0.038	0.0227	0.0113	2.81
2004	9.27	18.52	0.501	4.47	4.143	-0.032	0.0268	0.0060	3.79
2005	9.92	20.18	0.492	4.70	4.293	-0.021	0.0339	0.0130	3.35
2006	10.51	22.00	0.478	5.02	4.380	-0.010	0.0323	0.0142	2.67
2007	10.98	23.91	0.459	5.31	4.505	-0.015	0.0285	0.0113	1.78
2008	11.02	25.75	0.428	5.39	4.779	-0.008	0.0384	0.0078	-0.29
2009	10.60	27.16	0.390	5.08	5.350	-0.033	-0.0036	-0.0009	-2.78
2010	11.06	28.81	0.384	5.19	5.555	-0.033	0.0164	-0.0020	2.53
2011	11.54	30.60	0.377	5.44	5.626	-0.001	0.0316	-0.0017	1.60
2012	12.10	32.60	0.371	5.73	5.688	-0.007	0.0207	0.0088	2.32
2013	12.52	34.71	0.361	5.91	5.876	-0.004	0.0146	0.0027	2.22
2014	13.08	36.97	0.354	6.24	5.925	-0.006	0.0162	0.0033	2.39
Mean	10.37	24.07	0.454	5.00	4.705	-0.021	0.0238	0.0075	1.95

Notes:

1. The figures in these columns are in trillions of U.S. dollars.
2. The figures for A resulted by dividing the figures in column (1) by those in column (2). The figures in the former column represent the gross value added in the business sector of the U.S. economy and were retrieved from Table 1.9.5, line 2 of the National Income and Product Accounts (NIPA) of the U.S. Bureau of Economic Analysis (BEA). The figures in the latter column were computed by adding cumulatively the figures of gross investment for the same sector and from the aforementioned source to an estimated level of the undepreciated capital stock in the year 2000. This estimate was obtained by adding gross investment for the previous 10 years, i.e. the number of years BEA estimated the service life of fixed assets..
3. The numerator in the estimation of k is the same as the denominator in the estimation of A. Therefore, see note (2) above. As for the denominator, this is the wage bill and the figures for W come from Table 2.2B, line 2, of the National Income and Product Accounts of the U.S. Bureau of Economic Analysis.
4. The series in this column gives the annual percentage change of labor productivity (output per man hour) in the major business sector of the U.S. Economy and comes from the database of the U.S Bureau of Labor Statistics. In particular, it is the series labeled PRS84006092.
5. Consumer Price Index from the database of the Federal Reserve Bank of St. Louis, series CPALTT01USA657N .
6. Annual percentage change of the civilian labor force from the U.S Bureau of Labor Statistics, series PRS84006091.
7. Annual growth rate of the U.S. gross national product from the database of the Federal Reserve Bank of St. Louis, series CLF16OV

NAEXKP01USA657S.

Table 2: Series of computed and reported variables of interest

Years	$corr(u_c,u_r)=0.937$ $corr(u_c,\hat{i}_c)=0.9732$ $corr(u_r,i_r)=-0.742$ $corr(\hat{i}_c,i_r)=-0.673$[1]									
	$\mu=-0.0209$, θ=0.0238, ρ=4.7 α=0.3565, $\eta=-3.2573$[2]									
	u_c	$\hat{i}_c$[3]	s_{Lc}[4]	$s_{\pi c}$[4]	s_{ic}[4]	u_r[5]	i_r[6]	s_{Lr}[7]	$s_{\pi r}$[7]	s_{ir}[7]
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(2	(4)	(5)
2000	9.43	2.48	0.693	0.306	0.001	9.2	6.24	0.715	0.087	0.081
2001	10.29	2.48	0.692	0.306	0.001	9.2	3.88	0.716	0.080	0.080
2002	11.01	2.76	0.692	0.303	0.006	9.4	1.67	0.710	0.096	0.069
2003	11.43	3.25	0.690	0.294	0.015	9.5	1.13	0.705	0.107	0.061
2004	11.63	3.41	0.690	0.290	0.020	9.6	1.35	0.699	0.121	0.054
2005	11.83	3.39	0.690	0.291	0.020	9.6	3.22	0.691	0.129	0.061
2006	12.15	4.28	0.687	0.277	0.036	9.6	4.97	0.683	0.134	0.069
2007	12.59	5.42	0.683	0.262	0.056	9.6	5.02	0.706	0.114	0.079
2008	13.36	6.88	0.677	0.234	0.090	9.8	1.92	0.717	0.088	0.082
2009	14.38	7.58	0.671	0.201	0.128	10.2	0.16	0.709	0.106	0.069
2010	14.55	7.21	0.672	0.178	0.150	10.5	0.18	0.691	0.129	0.058
2011	14.76	7.53	0.671	0.190	0.139	10.8	0.10	0.686	0.126	0.054
2012	14.93	7.81	0.669	0.176	0.155	11.0	0.14	0.676	0.132	0.054
2013	15.23	7.92	0.668	0.178	0.154	11.2	0.11	0.675	0.132	0.051
2014	15.45	8.34	0.666	0.162	0.172	11.3	0.09	0.677	0.130	0.050
Mean	12.87	5.38	0.681	0.243	0.076	9.2	2.01	0.697	0.114	0.065

Notes:

1. These correlations hold for the parameter values shown in the row immediately below.
2. At these values of the parameters the solution of system (9) maximizes the correlation coefficients referred to in the above row.
3. This is the computed nominal interest rate. The computed real interest rate results from the same series by subtracting the mean inflation rate, i.e. $\theta = 2.38$.
4. Computed shares of labor, profits and interest in the computed net income in the business sector of the U.S. private economy.
5. Average age at year end of the stock of private fixed assets in the business sector of the U.S. private economy using historical cost prices. The data come from Table 3.10ESI, Line 1, of the National Income and Product Accounts of the U.S. Bureau of Economic Analysis (BEA).
6. Effective federal funds rates, series DFF, U.S. Board of Governors of the Federal Reserve System. Data retrieved from the database of the Federal Reserve Bank of St. Louis.
1. The calculation of these shares draws on data from Table 1.11, National Income and Product Accounts (NIPA), U.S. Bureau of Economic Analysis (BEA). In particular, they are percentages of gross domestic income (Line 1) net of "Taxes on production and imports" (Line 7) and "Consumption of fixed capital," (Line 21), plus "subsidies" (Line 8). The share of labor corresponds to the "Compensation of employees, paid," (Line 2); The share of profits corresponds to the sum of the entries "Business current transfer payments (net)" (Line 12) and "Corporate profits with inventory valuation and capital consumption adjustments, domestic industries," (Line 15); and, lastly, the share of interest is based on the entry "Net interest and miscellaneous payments, domestic industries," (Line 11). These shares do not add up to 1 because the following categories of incomes are not allocated: (a) Proprietors' income with inventory valuation and capital consumption adjustments (line 13), and (b) Rental income of persons with capital consumption adjustment (line 14).
1. 57.162.059.8

Table 3: Share of labor from various sources

Years	s_{Lc}^{1}	s_{Lr}^{1}	$s_{Lr}^{''2}$	$s_{Lr}^{'3}$
	(1)	(2)	(3)	(4)
2000	0.673	0.715	0.632	0.664
2001	0.673	0.716	0.631	0.664
2002	0.672	0.710	0.614	0.655
2003	0.671	0.705	0.606	0.654
2004	0.671	0.699	0.602	0.647
2005	0.671	0.691	0.592	0.640
2006	0.671	0.683	0.592	0.639
2007	0.671	0.706	0.596	0.634
2008	0.670	0.717	0.598	0.638
2009	0.669	0.709	0.583	0.626
2010	0.668	0.691	0.570	0.620
2011	0.668	0.686	0.571	0.622
2012	0.668	0.676	0.570	n.a.
2013	0.668	0.675	0.568	n.a.
2014	0.668	0.677	0.571	n.a.
Mean	0.670	0.697	0.593	0.644

Notes

1. The figures in these two columns come from Table 2.
2. Headline share of labor constructed and reported by the U.S. Bureau of Labor Statistics (BLS) as part of their regular releases in the section Labor Productivity and Costs. For more details regarding the differences of this series to that reported by BEA and depicted in Column (2), see Armenter (2015)
3. Share of labor in the Gross Domestic Product (GDP) of the United States. The data were retrieved from the database of the Federal Reserve Bank of St. Louis. The series is labeled LABSHPUSA156NRU comes originally from the study by Feenstra, Inklaar, Timmer (2013).

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