Estimating a time-varying distribution-led regime

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[Very very preliminary draft!]

Abstract

The paper estimates the distribution-led regime of the US economy for the period 1947-2019. We use a Time Varying Parameter Model which allows for changes in the regime over time. To the best of our knowledge this is the first paper that has attempted to do this. This innovation is important, because there is no reason to expect that the regime of the US economy (or any economy for that matter) remains constant over time. On the other hand, there are significant reasons that point to changes in the regime over time. We find that the US economy has become less profit-led (or more wage-led) since the late 1970s, while in the first postwar decades the degree of the profit-ledness increased or under some specifications it remained relatively constant.

Keywords: Wage-led, Profit-led, Distribution, Growth, Time-varying parameters VAR

JEL Classifications: E11, E12, C11, C32

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1 Introduction

The introduction of the concept of wage- and profit-led growth by Bhaduri and Marglin (1990) has led to an extensive theoretical literature that extends the basic model as well as a large empirical literature that aims to estimate the distribution-led regime of various countries. The underlying assumption of most of these theoretical and empirical contributions is that the underlying regime of an economy is constant. An economy is assumed to be *either* wage-led *or* profit-led.

For example, the usual practice of the empirical literature is to obtain the data for distribution and utilization or the growth rate for an economy, run a regression for the time-period the data are available and based on the results of the regression conclude if the economies under examination is wage- or profit-led over this period of time. In the case of the US economy, which is the object of a large portion of these studies, data are available beginning in the first quarter of 1947. Thus, the implicit assumption in the related regressions is that the regime of the US economy has been constant in the period starting in 1947 and ending in the 1990s, 2000s or 2010s when the study was conducted.

However, as is explained in Nikiforos (2016b, 2021a) it is unlikely that the demand-led regime remains constant over time, as the structure of the economy and income distribution changes. There are important logical, theoretical, and empirical reasons that justify a regimes that changes over time; in the aforementioned example it is unlikely that the reaction of macroeconomic activity to changes in distribution in the United States has been the same in the 1950s, the 1970s, the 2000s and the 2010s.

In particular in Nikiforos (2016b, 2021a) two hypothesis are put forward. First, that an economy should become less profit-led (or more wage-led) as the profit-share increases. Second, the more powerful a class becomes the more it is able to push distribution in its favor, and thus distribution is unstable. However, because of the first hypothesis, this instability of distribution implies that as the profit (wage) share increases the economy becomes more (wage) profit-led and thus eventually a

crisis ensues. The result are cyclical fluctuation of growth and distribution. In the context of the US economy these hypotheses imply, the large increase in income inequality and the profit share in the US economy over the last forty years should have made the US economy less profit-led. Second, the US economy profit-ledness should have increased in the early post-war decades, a development that contributed to the (profit-squeeze) crisis of the 1970s.

The present paper is to the best of our knowledge the first attempt to estimate the regime of an economy allowing for changes in the regime itself over time. Towards that purpose we employ a time varying parameters (TVP) model and apply it to US data for the period 1947-2019. We employ different specifications. Our estimates confirm that the US economy became more profit-led in the first postwar decades until the 1970s, and has become less profit-led over the last four decades, converging to a neutral and eventually a wage-led regime after the early 2000s. These results are robust to different specifications.

Besides the interest these results have in their own right, our paper and its novel—within this literature—methodological approach aims to point towards a new direction for thinking and estimating distribution-led regimes, which take into account potential changes in the regimes over time. These changes are very important for the political economy of the countries under consideration. For example, in the case of the US the climax of profit-ledness in the 1970s are crucial for understanding the crisis of the time, and the political economy of the period. The same is true for non-profit-ledness or slight wage-ledness of the last two decades.

The rest of the paper proceeds as follows. Section 4 summarizes the theoretical arguments why the distribution-led regime might change over time, while section 3 and 4 present an overview of the empirical literature and our methodological approach (the time varying parameter model) respectively. In section 5 we discuss our results. Section 6 concludes.

2 Wage- and profit-led growth

The closure Kaleckian/Structuralist model of growth and distribution (Rowthorn, 1981, Taylor, 1983, Dutt, 1984, Kurz, 1990, Bhaduri and Marglin, 1990) combines the Keynesian emphasis on the autonomous role of aggregate demand and the classical emphasis on institutions and social norms as the main determinant of the distribution of income between workers and capitalists. A change in the distribution of income does not have a certain a priori effect on output and the level of macroeconomic activity because profitability has differential effects on the various components of aggregated demand. In particular an increase in the profit share: i) has a negative effect on consumption, because workers have a higher propensity to consume; ii) has a positive effect on investment, because profitability is one of the main determinants of investment; iii) has an uncertain effect on net exports depending how the change in the profit share comes about—although under realistic assumptions an increase in the profit share has a positive effect on net exports. Thus the overall effect will depend on the relative magnitude of these partial effects. An economy is profit-led if the positive effect of an increase in the profit share on investment and exports is stronger then the negative effect on consumption. It is negative in the opposite scenario.

The implicit or explicit assumption of most of the theoretical and empirical literature on wage- and profit-led growth that has followed the aforementioned early contributions is that the regime of each economy is constant over time. An important advancement in that respect have been recent contributions that emphasize the possibility of multiple equilibria (Nikiforos and Foley, 2012, Assous and Dutt, 2013, Tavani et al., 2011). If there are multiple equilibria the regime of the economy is not unique. Nikiforos and Foley (2012) suggest the distributive schedule is non-linear: the wage share is decreasing for low levels of utilization and increases for high levels. Coupled with a monotonic demand schedule there is the possibility of two equilibria. In this case, even if demand is profit-led an increase in the profit share is contractionary for the low-utilization equilibrium.

Assous and Dutt (2013) suggest that labor conditions and the firms concentration determinate capacity utilization and distribution simultaneously. The authors also propose that the mark-up and profit rate aren't constant over the time because the market structure, workers power and the firms concentration change on the time. Assous and Dutt conclude that it is necessary to understand that there are small and large changes. Small changes do not move the system to a different equilibrium, but large shocks can do that. As a result even if demand is profi-led a large increase in the relative power of firms might lead to a shift to a low-growth equilibrium (accompanied by a higher profit share). Tavani et al. (2011) use non-parametric methods to determine the distributive schedule and reach similar conclusions.

Unlike these papers, more recent contributions by Nikiforos (2016b, 2021a) and Marglin (2017) have emphasized the non-linearities in demand itself. Marglin (2017) argues that over the course of the business cycle the reaction of investment to profitability varies. During a crisis—at low levels of utilization—entrepreneurs are less sensitive to distribution and are more interested in the performance of the economy. Profitability plays a more important role at high levels of utilization. Therefore, Marglin concludes, the regime of the economy is different at different phases of the cycle: an economy tends to be wage-led during a crisis and profit-led at high levels of utilization. Thus, Marglin arrives at the same conclusions with Nikiforos and Foley (2012), albeit from a different path.

Nikiforos (2016b, 2021a) examines the evolution of the distribution-led regimes in the long-run. He suggests that an economy tends to become less profit-led (or more wage-led) as the profit share is increasing. Since, we will use the arguments of these articles in the following sections, it is worth going over them quickly. There are at least four set of reasons why the distribution-led regime of an economy cannot be a permanent feature of that economy, irrespective of income distribution and other structural characteristics:

i) *Logical reasons*. If an economy is either wage- or profit-led and income distribution did not matter in the determination of the regime, it would follow that the optimal macroeconomic

performance would be achieved when the profit- or the wage share respectively would be equal to zero. This is clearly absurd.

ii) *Theoretical reasons*. There are several theoretical reasons why the propensity of investment and consumption with respect to the profit share might decrease as the profit share increases (a detailed discussion is provide in Nikiforos [2016b, sec. 3.2; 2021a, sec. 6]). More fundamentally, the very basis for the distinction between wage- and profit-led growth is the dual nature of wages. Wages are at the same time a cost of production whose increase tends to reduce profitability and thus investment, and the income of the major part of the population with high propensity to consume whose increase tends to increase consumption. The argument that an economy is either wage- or profit-led implies that one of these two "natures" of wages are always dominant. However, this contradicts the spirit of the Kaleckian/Structuralist model and the concept of distribution-led growth.

iii) *Empirical reasons*. There is empirical evidence from other bodies of literature that the propensities of the components of aggregate demand with respect to profitability have changed over time. For example, the literature of financialization has shown that over the last four decades there has been a decoupling between profit flows and investment. This piece of evidence is inconsistent with a constant distribution-led regime over that period.

iv) *History-of-thought reasons*. The prevalence of the assumption of the constant regimes is all the more surprising given that the concept of the distribution-led growth and the distinction between wage- and profit-led growth emerged from a research project that emphasized that the regime changes over time (Marglin, 1988, Marglin and Schor, 1990). Marglin and Bhaduri (1990) discuss the changes in the distribution-led regime of the US economy as a factor that contributed to the demise of "The Golden Age of Capitalism."

For all these reasons the hypothesis that an economy becomes more wage led as the profit share increases and vice versa. Given the significant increase in the wage share over the last decades we would expect that economies like the one of the United States have become less profit led.

Finally, it is worth mentioning that if this mechanism is coupled with an unstable distribution—where each class becomes more able to tilt distribution in its favor as its share of income is increasing—which is also affected by the distribution-led regime (in the sense that in a, say wage-led economy the profit share would tend to decrease all other things equal), it is likely that the system exhibits endogenous cycles with distribution-ledness with the economy moving endogenously between periods of wage- and profit-led growth.

3 Empirical literature

The introduction of the distinction between wage- and profit-led growth has led to a very extensive empirical literature that aims to estimate the regime of various economies around the world. A review of the literature is beyond the scope of the present paper—a comprehensive review is provided by Blecker (2016). In his own terminology, this literature uses two main approaches for the estimation of the regime: the 'structural' and 'aggregative'approaches. The structural approach decomposes demand into its various components (consumption, investment and net exports) and estimates the effects of changes in distribution on each of these components individually. The overall regime is then calculated as the sum of these individual effects. On the other hand, the aggregative approach estimates the effect of changes in distribution on total output, or the rate of capacity utilization. Overall, contributions following the first approach tend to produce wage-led results, while contributions following the aggregative approach tend to produce profit-led results.

The obvious benefit of the structural approach is that one can distinguish between the effects of redistribution on the different parts of economic activity, and therefore the process that these results are produced is transparent. On the other hand, these contributions suffer from serious endogeneity problems. Since causality between distribution and growth runs both ways, the simple OLS regressions that are usually being used capture the correlation between the variables under investigation rather than the causal effect of (changes in) distribution on growth. Another weak

point of this approach is that the investment function is famously difficult to estimate. The strategy that is usually being employed is that if the coefficient of the regression of growth on distribution is statistically insignificant, it is being treated as zero. This can explain why this approach tends to show that economies are wage-led. On the other hand the aggregative approach has the advantage of dealing with the endogeneity problem, as related contribution usually employ VARs or use instrumental variables, and does not have to specify an investment function—at the cost of not being able to distinguish between the different components of aggregate demand.

The discussion of the previous section reveals another problem in this literature, namely that the regime of the economy is taken to be fixed over the whole period of estimation. The usual strategy is to use data for a country, run a regression and conclude if the economy is wage- or profit-led. For example, in the case of the US, data are available in quarterly frequency since 1947. The implicit assumption of most studies is that the distribution-led regime of the economy is the same for the period 1947 until the last year of the sample in the 1990s or the 2000s. For the reasons explained in the previous section this is problematic.

Some notable exceptions to this assumption of constant regime are studies which split the overall period of estimation on (usually) two periods and apply their estimation methods separately on each of these periods—in addition to estimating the regime for the whole period. For example, Nikiforos and Foley (2012) estimate their model for the period 1948-2009 and find a profit-led regime. In turn they estimate their model for the periods before 1960, before 1970 and after 1970, and find that the coefficients for the first two period are not statistically significant while they are (indicating a profit-led economy) for the period after 1970. Carvalho and Rezai (2016) apply a threshold VAR model to data for the period 1967-2010. Using the Gini coefficient as the threshold variable they identify 1981 as the threshold year. They then find that the US economy was more profit-led in the year after 1981. Finally, Barrales and von Arnim (2017) use data for the period 1949-2011. They show that over the whole period of their sample and the period before 1980 an increase in the wage share has a positive effect on macroeconomic activity this is not the case in the post-1980 period

when an increase in the wage share tends to have a positive effect in the medium-run. The results of the present paper are not directly comparable with the results of these studies. As it will become obvious in the following sections the sub-periods under examination (e.g. post-1970, post-1980) are themselves very long and subject to significant structural change.

4 Empirical strategy

The goal of our paper is to estimate the effect of changes in income distribution on macroeconomic activity. As it is common in the related empirical literature we used the wage share as a measure of income distribution. In our baseline model we used the growth rate of real Gross Domestic Product to measure macroeconomic activity.

The empirical strategy we chose was dictated by two concerns. First, the potential endogeneity of income distribution to macroeconomic activity. For that reason a simple OLS regression of growth on distribution gives inconsistent estimators, that capture the correllation between the two variables rather than the causal effect of changes in distribution on growth. Second, for the reasons explained in section 2 this effect might vary over time. This also raises issues for the consistency of the estimators that do not take these changes into account.

With these in mind we chose to use a time-varying parameter structural vector autoregressive (TVP-SVAR) model (Primiceri, 2005, Nakajima, 2011, Fernández-Villaverde et al., 2011, Koop and Korobilis, 2010). It is beyond the scope of the present paper to discuss the details of the TVP-SVAR model. The interested reader can refer to these aforecited works. In a nutshell, the main difference of the TVP-SVAR compared to a conventional VAR is that the structural parameters of the model are allowed to vary over time, and are thus able to capture time variation in the contemporaneous relationship and lag structure of the model. It is then up to the data to determine whether the variation of this structure comes from changes in the size of shocks or the propagation mechanism (Kim and Nelson, 1999).

For the estimation of the model we used the relatively standard methods using the Kalman filter, Bayesian inference and a Markov Chain Monte Carlo (MCMC) algorithm. We ran 12,000 draws to estimate the conditional posterior distribution of the parameters. To mitigate the initial values, we discarded 2,000 draws (burn-in simulations) that allow converge the posterior values. Finally, we present the posterior median of the parameters and the 68 percent equal-tailed point-wise posterior probability bands.

For the identification of the model we followed the usual Cholesky decomposition, where we assumed that the wage share is exogenous to GDP in the contemporaneous relationship ($t = 0$). As it is common in this type of exercises, our results are sensitive to this ordering assumption. We are comfortable with this assumption, as it is consistent with the classical theory of distribution, which is also adopted in the Kaleckian/Structuralist model, and posits that income distribution is primarily determined by institutions and social norms.

We used quarterly series up to the last quarter of 2019. On the other hand we went as far back in time as possible. The time range of each of our regressions was determined by data availability.

Finally, we chose the number of lags with the usual Schwartz and Hannan-Quin Information Criteria in a traditional-invariant Structural VAR, and solved the model in Matlab.[1]

4.1 Model Variations

In addition to the baseline model, we estimated—using the same strategy—a series of other models with additional or different variables. These variations can serve as robustness checks and provide some evidence on the sensitivity of the results on the particular specification, They which fall into five broad categories:

I. *Substituting the rate of capacity utilization for the growth rate as a measure of macroeconomic activity.* The baseline Kaleckian/Structuralist model uses capacity utilization as a measure of economic activity. Several important contributions provide discuss separately the effect of a

[1] For our simulations we benefited from the Matlab code provided by Koop and Korobilis (2010).

change in distribution on utilization and the growth rate Bhaduri and Marglin (1990), Kurz (1990). One problem with using the rate of capacity utilization is that the data on the rate of utilization provided by the FED tend to be stationary in the medium run, hence whatever effect redistribution might have—or for that matter any other shock—would tend to dissipate (Nikiforos, 2016c, 2021b). For this reason we opted to choose the output-to-capital ratio as a proxy for utilization. This measure is not without problems either. The most important of it being that it also changes when technology changes—when the potential output to capital ratio changes. We should keep this in mind when we discuss the results. Nevertheless on balance it is the best measure to approximate the rate of utilization, which is available at quarterly frequency over a long period of time.[2]

II. *Including the debt-to-disposable income ratio of households as an endogenous variable.* Changes in indebtedness can play an important role in the relation between distribution and growth, as they can mitigate whatever effect changes in income distribution has on growth. It is likely for example than in an otherwise wage-led economy a decrease in the wage share is associated with no change in the growth rate or even an increase in the growth rate if worker households increase their indebtedness to finance their consumption. The increase in household debt-to-income ratio before the 2007–9 crisis seem to have played that role and mitigated the negative macroeconomic effects of the—by then—three-decades long increase in inequality (see Nikiforos [2016a] and references therein). Similarly, in a wage-led economy in an period of household deleveraging an increase in the wage share might have no effect on growth—or a decrease in the wage share might be associated with decreases in consumption and growth of a higher magnitude than if no deleveraging was taking place. Given that household indebtedness has varied a lot over the period of our sample it is important to examine how sensitive are results are to it.

III. *Including labor productivity as an endogenous variable.* Lavoie (2014, 323-5) has suggested that the estimates of studies who have found profit-led regimes might be biased because they ignore the pro-cyclical behavior of labor productivity—which in turn is the result of overhead

[2]This measure has been used before as a proxy for the rate of utilization by Barrales and von Arnim (2017).

labor. Since, by definition an increase in productivity leads to an increase in the profit share (*ceteris paribus*), Lavoie argues that the pro-cyclical tendency of the the profit share to increase might be captured as a positive effect of increases in the profit share on macroeconomic activity. Cauvel (2019) provides some empirical support to this hypothesis.

IV. *Including government deficit and trade balance.* The period under consideration saw significant changes and fluctuations in the trade balance and the government deficit, it is thus important to take them into account and see how and if they change our conclusions.

V. *Combinations of the previous variations.* We run several models that combine the aforementioned variations.

The results of these extensions are not sensitive to the ordering of the variables as long as the wage share remains first as in the baseline specification.

4.2 Data

We used quarterly data for the United States that we retrieved from the FRED database. Originally the series we used are published by the Bureau of Economic Analysis, the Bureau of Labor Statistics and the Federal Reserve Board. More precisely we used the following series (in parenthesis is their FRED code) [in square brackets is the period for which data is available]. We calculated the growth rate of real GDP using "Real Gross Domestic Product" (GDPC1) [1947q1-2019q4]. We used "Nonfarm Business Sector: Labor Share for All Employed Persons" (PRS85006173) [1947q1-2019q4] as the wage share. The debt-to-income ratio of households was calculated as the ratio of "Households and Nonprofit Organizations; Total Liabilities, Level" (TLBSHNO) [1951q4-2019q4] over "Disposable Personal Income" (DPI) [1947q1-2019q4]. We calculated the growth rate of labor productivity based on "Nonfarm Business Sector: Labor Productivity (Output per Hour) for All Employed Persons" (OPHNFB) [1947q1-2019q4]. The trade balance and government deficit as a percentage of GDP was calculated using "Net exports of goods and services" (NETEXP) [1947q1-2019q4] and "Net lending or net borrowing (-), NIPAs: Government" (AD01RC1Q027SBEA)

[1960q1-2019q4] respectively and dividing them with "Gross Domestic Product" (GDP) [1947q1-2019q4].

We calculated the output-capital ratio, which we used as a proxy for the rate of capacity utilization, by dividing "Net value added of corporate business" (A439RC1Q027SBEA)[1947q1-2019q4] with the "Current-Cost Net Stock of Corporate Fixed Assets" (line 4 in table 6.1 of the BEA's fixed assets database) [annual data 1947-2019]. Since the measure of fixed assets is available only at annual frequency, we calculated the output-capital ratio at annual frequency and we then converted it into quarterly using the Chow-lin method for temporal dissagregation with the the net value added series as the indicator. This implies that the variations of the output-capital ratio are assumed to be driven solely by movements of the numerator at quarterly frequency.

5 Results

In a regular VAR model, once the parameters are estimated, the usual way of visualizing the results is by plotting the impulse response functions (IRFs), which show how a shock to a certain variable affects some other (or the same) variable over time. In a time varying parameter VAR, the parameters of the model change over time, and therefore so do the IRFs. One can present this time varying in two ways. First, they can plot the IRFs at different points in time and see if and how they have changed, so in our case we could plot the IRFs in 1950q1, 1975q1, 1990q1 and 2015q1 (or any other period we chose) and see how these IRFs differ. Another way is to present the evolution of the IRFs over time at a certain time horizon. In this way, by combining plots of different time horizon one can see how the structure of the model has changed over time. For example, one can plot how a shock to a certain variable affects another variable contemporaneously (or after x periods of time) changes over the time period under investigation.We chose to use the second approach approach

because it allows to visualize the change in the structure of the model continuously over the time period the sample—albeit at the cost of presenting only a certain number of time horizons.[3]

Our results are presented in figures 1 and 2 The figure presents the effect of a one-unit shock to the wage share on the growth rate at different frequencies: a) the contemporaneous effect (0 quarters); b) after 1 quarter; c) after 3 quarters etc. To interpret the results we should keep in mind that all variables have been standardized. We can summarize our findings as following:

i) Growth was profit-led in the early decades of our sample, but the degree of profit-ledness has decreased started in the late 1970s.

ii) The "profit-ledness" of the US converged towards zero after the early 2000s, and then eventually has become slightly wage-led over the last few years of the sample (at least for the longer time horizons).

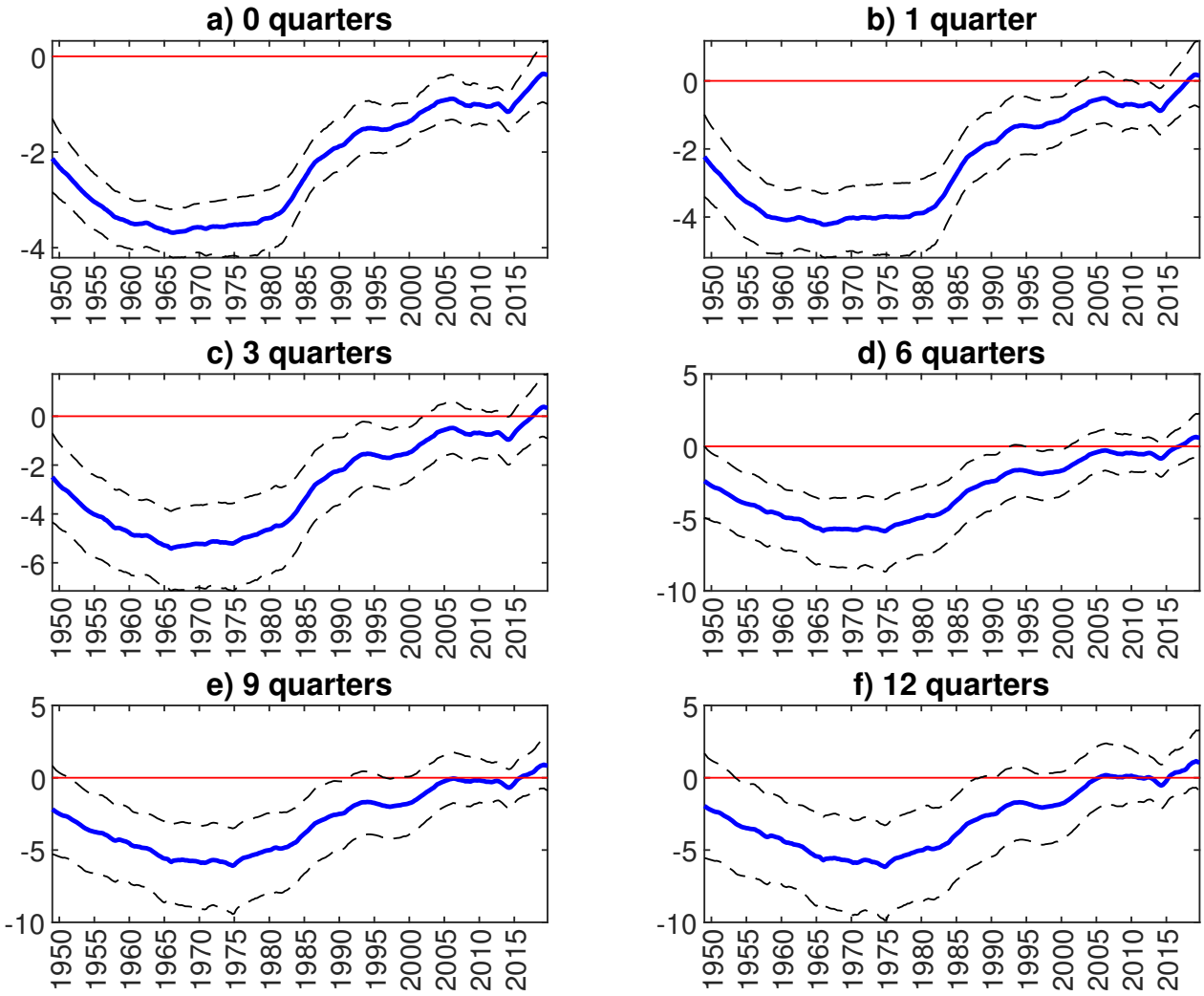
iii) There is some evidence of cyclicality; the US economy was becoming more profit-led over the first years postwar decades until the 1970s.

iv) The effect of changes in distribution on growth at smaller time horizons is smaller than at longer horizons.

Overall, these results confirm that the distribution-led regime of the US economy has changed significantly over time. In the first postwar decades it became more profit-led,but it has been moved to the opposite direction since the late 1970s. These finding are also consistent with the hypothesis put forward in Nikiforos (2016b, 2021a) that the economy become more wage-led as distribution becomes more unequal and vice versa.

The results for the other model specifications are broadly in line with the baseline specification.

[3] Obviously the opposite is the case of the first approach.



Note: The solid line depict posterior point-wise median response of GDP. The dashed lines define the 68 percent equal-tailed point-wise posterior probability bands.

Figure 1: Time-varying effects of a wage share shock on real GDP growth rate at different horizons (1947-2019). Baseline specification: wage share, real GDP growth rate.

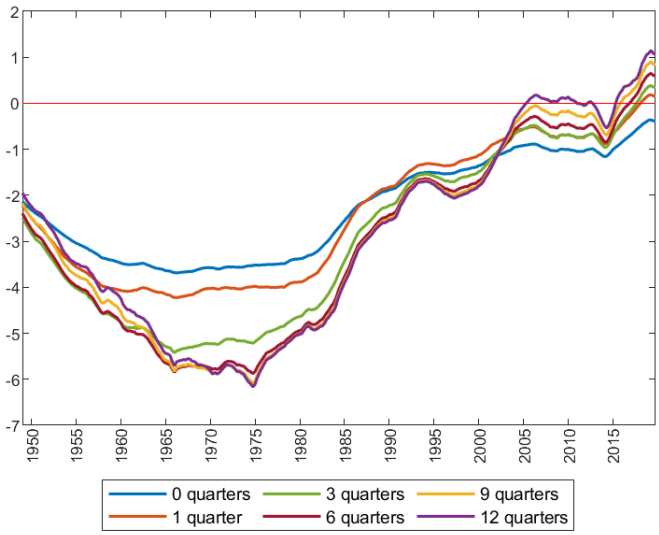


Figure 2: Summary of time-varying effects of a wage share shock on real GDP growth rate at different horizons (1947-2019)

6 Conclusion

The present paper estimates the distribution-led regime of the US economy for the period 1947-2019. Our methodology was dictated by the concern the the regime of an economy might not remain stable over time. In the case of the US economy there are several reasons—logical, theoretical, empirical, and what we called history-of-economic-thought reasons—why the regime might have changed over the period under examination.

For that purpose, we employ a time-varying parameter vector autoregressive model to estimate the (time-varying) effect of changes in distribution on macroeconomic activity. This is to the best of our knowledge the first attempt to estimate the regime of an economy allowing for changes in the regime itself over time. We utilize various specifications and we find that the US economy has become less profit-led over the last four decades, while in the first three postwar decades profit-ledness was increasing or remained roughly constant. These results are in line with theories of growth and distribution that emphasize the changing cyclical character of the distribution-led regimes.

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