

# INFORMATION RENTS, ECONOMIC GROWTH, AND INEQUALITY: AN EMPIRICAL STUDY OF THE UNITED STATES

**TOMAS N. ROTTA**

Goldsmiths College, University of London  
Institute of Management Studies  
t.rotta@gold.ac.uk

## **Abstract**

In this paper I estimate the impact of unproductive activities on economic growth, labor productivity, and income inequality in the United States from 1947 to 2011. Productive activities directly create value, while unproductive activities do not. I develop a new methodology to compute the growth of productive and unproductive activities in terms of flows of income and stocks of fixed assets using input-output matrices and national income accounts. A core feature of my methodology is the notion that the commodification of knowledge and information gives rise to “information rents”. Information rents are, as I demonstrate, a determinant factor of growth and distribution. I find that unproductive activities have a net positive effect on economic growth and labor productivity, but at the price of increasing income inequality. Unproductive activities that rely on information rents, in particular, have increased income inequality and slowed down valued-added growth despite their positive contribution to labor productivity. Information rents have drawn too much value from productive activities and benefitted the top income earners.

**Key Words:** Unproductive Activity, Information Rents, Growth and Distribution, Inequality, Time Series Econometrics

**JEL Codes:** B51; E11; O47

# 1. Introduction

In this paper I estimate the impact of unproductive activities on economic growth, labor productivity, and income inequality in the United States from 1947 to 2011. Productive activities directly create value, while unproductive activities do not. I develop a new methodology to compute the growth of productive and unproductive activities in terms of flows of income and stocks of fixed assets using input-output matrices and national income accounts. A core feature of my methodology is the notion that the commodification of knowledge and information gives rise to “information rents”. Information rents, as I demonstrate, are a determinant factor of growth and distribution. I find that unproductive activities have a net positive effect on economic growth and labor productivity, but at the price of increasing income inequality. Unproductive activities that rely on information rents, in particular, have increased income inequality and slowed down valued-added growth despite their positive contribution to labor productivity. Information rents have drawn too much value from productive activities and benefitted the top income earners.

*Unproductive activity* is any economic activity that does not *directly* produce new value. From a classical Political Economy perspective, to be *productive* an activity must have workers creating useful commodities with value for sale. Activities that create new use-values or recirculate existing use-values, but not new commodities with value, are considered to be *unproductive*. Unproductive activities do not directly add any new value to the economy and therefore draw their incomes from the value generated in productive activities. Productive activities create and also consume value, but unproductive activities only consume it (Shaikh 2016; Shaikh and Tonak 1994).

The productive-unproductive differentiation relies on the concept of *value* and, as such, derives from the classical Political Economy notion that value needs to come from somewhere (Foley 2013). Unproductive means neither unnecessary nor less important, and it is not a derogatory term. Neither is there a direct connection between productive activity and tangible goods, given that services and intangible

commodities can be the output of productive activities. Moreover, unproductive endeavors must be conceptualized as *activities* instead of *sectors* since most enterprises and industries operate with a mix of productive and unproductive activities, with few firms actually being classified as purely productive or purely unproductive (Rotta 2018).

Despite directly drawing from the value pool of productive endeavors, unproductive activities can well enhance labor productivity or boost demand in productive activities, thus *indirectly* enabling and improving the creation of value. There is hence a double effect under consideration in my estimations: unproductive activity might *indirectly* increase labor productivity, or increase aggregate demand, and thus boost value-added growth while it still draws from the value that it does not *directly* produce. The relation between productive and unproductive activity, therefore, can be a relation of *substitutability* (crowding out) or one of *complementarity* (crowding in). Commercial banks, for example, can create liquidity and enable a higher rate of investment in productive activities. The same banks, under different circumstances, might create liquidity to finance stock buybacks which would not necessarily enable the creation of value added, and might even be detrimental to value creation.

My empirical approach shows that the indirect boost has been greater than the direct draw from the value pool, implying that unproductive activity has had a *net positive* impact on economic growth and labor productivity in the United States. In the aggregate, there has been a *net crowding in* effect between unproductive and productive activity. But despite its net positive contribution to productivity and growth, the rise of unproductive activity has significantly contributed to the rapid increase in income inequality in the post-1980 period.

In this study I develop a new methodology to compute aggregate estimates of productive and unproductive activities using data from input-output matrices, national income accounts, and fixed assets accounts for the United States economy between 1947 and 2011. A key difference of the approach developed

in this paper in relation to previous studies is the treatment of knowledge and information production as forms of unproductive activity. Information requires labor time to be produced but tends to require no labor time to be reproduced. Because the value of a commodity is determined by the labor time necessary to reproduce it, the production and ownership of knowledge and information do not directly create new value. Intellectual property rights then allow the owners of commodified information to extract *information rents* from other activities in the economy (Rotta 2018; Rotta and Teixeira 2019, 2016; Teixeira and Rotta 2012). Corporate producers and owners of commodified information (like Google, Amazon, Microsoft, Apple, Facebook, Uber, Netflix, Alibaba, Airbnb etc.) now rank among the biggest companies in terms of global revenues and market capitalization.

The evidence presented in this paper suggests that information rents have drawn “too much” from the value pool, whose creation they enabled in the first place. My econometric estimations indicate that unproductive activities that rely on information rents as sources of income have significantly contributed to enhance labor productivity in the American economy, but at the price of slowing value-added growth in productive activities and also contributing significantly to the rise in the income shares of the top 1% and top 0.1% earners. The values channeled through information rents have benefitted the top income earners and, hence, have widened income inequality.

The paper is organized as follows. In the second section I compare my theoretical framework and empirical findings with previous studies. In the third section I present different measures of the evolution of productive and unproductive activity in the United States economy between 1947 and 2011. In the fourth section I present my econometric estimates and show that unproductive activity has had a net positive effect on economic growth and labor productivity. I also show how information rents, in particular, have contributed to increase labor productivity despite reducing value-added growth and increasing the income share of the top 1% and top 0.1% earners. In the last section I present my final remarks on unproductive activity, economic growth, and inequality. In the (online) appendix I present further technical details on the

econometric approach, impulse-response simulations, and the complete classification of productive and unproductive activities.

## **2. Comparison with Previous Studies**

In this section I review the most recent literature on the rise of unproductive activities and their impact on economic growth, labor productivity, and the distribution of income in the United States and across countries. Particular attention is given to the direction of causality between productive and unproductive growth, and also to the specific roles of finance and knowledge commodification. In the first subsection I begin by explaining how my estimates complement the existing scholarship, which has hitherto focused mostly on the effects of finance and financial assets using panel data for the post-1980 period.

### **2.1 CONTRIBUTIONS TO THE LITERATURE**

The paper provides a complementary and innovative treatment of the dynamic effects between productive and unproductive activity in the United States economy. The main contributions of the paper to the existing literature are as follows. First, most empirical studies have employed panel data models either across countries or across firms within particular countries, most often within the US and UK economies (as in Arcand et al. 2015; Autor et al. 2020; Bivens and Mishel 2013; Cecchetti and Kharroubi 2015, 2012; Davis 2018, 2017, 2016; Kneer 2013; Kohler, Gushanski, and Stockhammer 2019; Law and Singh 2014; Orhangazi 2008; Tori and Onaran 2018). The main limitation of panel regressions is data availability, which mostly start in the 1980s for panel datasets and, hence, miss the transition from the Regulated to the Neoliberal phase of Western capitalism. My approach, on the contrary, uses annual time series from 1947 to 2011 and thus covers both the pre- and post-1980 institutional regimes.

Second, empirical studies of the United States use firm-level data that focus mostly on the manufacturing sector, which is the sector with greater data coverage at the firm level (as in Autor et al. 2020); or

focus solely on listed companies given the difficulty to find reliable data on unlisted firms (as in Davis 2018 and Orhangazi 2008). My approach, on the contrary, uses industry-level data from input-output matrices and then aggregates them into several measures of productive and unproductive forms of economic activity at the national level. My estimates thus cover all sectors of the US economy from 1947 to 2011 while also controlling for the gross and net measures of output.

Third, the econometric estimates in this paper control for the short- and long-run effects of unproductive activity on value-added growth, labor productivity, and income inequality (and therefore complement the descriptive approaches of Orhangazi 2019; Rikap 2021; and Shaikh and Tonak 1994). Fourth, the econometric estimates control for the income flows and the investment expenditures in fixed assets across productive and unproductive activities. Fifth, the estimates control for the rise not only of finance but also of the knowledge economy through the measurement and econometric modelling of knowledge rents. While also controlling for financial activities, the paper emphasizes the role of knowledge rents as a driver of economic growth, labor productivity, and income inequality (unlike the usual differentiation between financial and nonfinancial corporations, as in Arcand et al. 2015; Bivens and Mishel 2013; Cecchetti and Kharroubi 2015, 2012; Davis 2018; Kneer 2013; Orhangazi 2008; Tori and Onaran 2018; Kohler, Guschanski, and Stockhammer 2019).

Sixth, my approach develops a consistent treatment of the labor theory of value and of commodified knowledge, providing empirical estimates of knowledge rents (unlike previous approaches in the Marxist tradition that do not theorize or measure information rents, as in Shaikh and Tonak 1994; Mohun 2014, 2006, 2005; Wolff 1987; Moseley 1997, 1992, 1985; Tsoulfidis and Paitaridis 2019; Paitaridis and Tsoulfidis 2012). The proposed theoretical framework brings together Marx's value theory, the determination of commodities' values by the labor time necessary to reproduce them, and the productive-unproductive distinction.

## 2.2 THE DIRECTION OF CAUSALITY

Economists have been divided for a long time regarding the implications of unproductive activity. Thomas Malthus (1820) and some of his modern followers understand that unproductive expenditures are a saving grace, for they generate demand and employment without necessarily generating supply. Malthus argued that unproductive expenditures, even if from the rentier classes, can pump up a system suffering from a chronic lack of demand. David Ricardo (1821) and his modern followers, on the contrary, argue that increases in unproductive expenditures diminish the share of the surplus available for productive investment and hence decrease the growth rate of productive capital. For the United States economy in particular, the first empirical studies on unproductive activity and its impact on productive growth date back to the 1960s. There has been, however, no final agreement on the net effects between productive and unproductive activity.

The scholarship has also long debated the direction of causality between unproductive and productive activity. On one side of the literature, we find the advocates of the hypothesis that faster unproductive growth is preceded by an earlier phase of productive stagnation. Examples of this branch of the literature are Baran and Sweezy (1968), Sweezy and Magdoff (1987), and Harvey (2003; 2005). These authors have suggested that companies first experienced a decline in productive profitability before shifting their investments towards unproductive activities such as marketing, advertisement, finance, insurance, and real estate. What explains the shift from productive to unproductive forms of investment, these authors claim, is a prior profit squeeze in productive activities. More recently, Kliman and Williams (2015) claimed that the explanation for the slowdown in the American economy in the post-1980 era was a profit rate decline rather than a lack of enough funding to finance investment in fixed assets. They argued that the interplay between investment in fixed assets and financial payments and purchases is not necessarily a zero-sum game, as many would suggest, because liquidity is created endogenously and hence these expenditures do not compete over shares of a fixed sum of funding.

On the other side of the literature, we locate the advocates of the opposite hypothesis, namely that productive activity stagnates because of a previous episode of faster unproductive growth. The rationale for this hypothesis is that unproductive activity draws from the value added created in productive activities and, hence, leaves less of it to be reinvested in productive outlets. The key studies in this group are those of Shaikh and Tonak (1994), Edward Wolff (1987), Fred Moseley (1997; 1992; 1985), Simon Mohun (2014; 2006; 2005), Tsoulfidis and Paitaridis (2019), Paitaridis and Tsoulfidis (2012), Cockshott, Cottrell, and Michaelson (1995).

Shaikh and Tonak (1994), in particular, posit that the interaction between unproductive and productive activities is more nuanced and the effects must be separated into the short and long runs. In a dynamic setting, a rise in unproductive expenditures may indeed stimulate demand and productive output in the short run (as Malthus had originally claimed). But in so far as it diminishes the share of value that stays within productive activities, unproductive activity reduces the rate of productive growth over the longer run (as Ricardo had originally claimed). My findings confirm Shaikh and Tonak's hypothesis that the impacts of unproductive activity should be distinguished between the short- and long-run effects.

### **2.3 THE ROLE OF FINANCE**

Finance is certainly the type of unproductive activity that has undergone the greatest level of scrutiny in the recent literature. A growing body of empirical work has found that an oversized financial sector does have negative implications for value-added growth, and hence that "too much" finance can cause a misallocation of resources away from productive activity (Lapavitsas 2013).

In a comprehensive examination of the effects of excessive financial activity on economic growth, Arcand, Berkes, and Panizza (2015) find robust evidence of an inverted-U relationship between the ratio of total private credit over GDP and real GDP growth per capita. Using panel data for 67 countries from 1960 to 2010, they find that the total volume of credit directed to the private sector (comprising bank credit and



credit from the shadow banking system allocated to firms and households) has a positive effect on real GDP per capita growth up to a certain threshold, which they estimate at between 80% and 120% of GDP. But beyond this threshold the level of credit over GDP begins to have a significant negative effect on real GDP per capita growth. Law and Singh (2014) find similar results using a sample of 87 developed and developing countries from 1980 to 2010. They employ different measures of financial growth and argue that a dynamic panel method with an endogenous threshold effect is more appropriate than the usual quadratic specification in modelling the inverted-U effect of finance on growth. Arcand, Berkes, and Panizza (2015) and Law and Singh (2014) conclude that there is indeed an optimal level beyond which a country has “too much” finance. They argue that the main reasons behind this result are a misallocation of labor and resources away from productive activities, and that an oversized financial sector tends to create credit not to finance production but to fund the purchase of existing assets, leading to asset price bubbles, financial crises, and increased macroeconomic volatility.

In a previous study of how the excess growth of finance leads to a misallocation of resources, Tobin (1984) suggested that a large financial sector might cause a brain drain from the productive sectors of the economy. Drawing on Tobin’s (1984) argument, Kneer (2013) and Cecchetti and Kharroubi (2015; 2012) show that a large financial sector has a negative impact on industries that, for technological reasons, need skilled workers. Using a panel of 13 countries from 1980 to 2005, Kneer (2013) finds that financial liberalization decreases labor productivity and value-added growth disproportionately in industries which rely strongly on skilled labor. Similarly to Arcand, Berkes, and Panizza (2015) and Law and Singh (2014), Cecchetti and Kharroubi (2015; 2012) find that at 90% of GDP, private sector credit extended by banks begins to harm GDP growth, and that the faster the financial sector grows, the slower the economy as a whole grows. Hence, a large and rapidly growing financial sector places a burden on the rest of the economy. In particular, they claim that financial growth disproportionately harms financially dependent and

R&D-intensive industries. Cecchetti and Kharroubi (2012) also estimate that finance tended to damage economic growth when it accounted for more than 3.9% of total employment.

In the post-Keynesian literature, empirical studies on finance have also estimated the effects of financial activities on investment, GDP growth, and wages. The most recent scholarship argues that the change in corporate governance toward shareholder value maximization has become a key determinant of the behavior of nonfinancial corporations.

Davis (2018; 2017; 2016) and Orhangazi (2008) use firm-level data for nonfinancial corporations listed in the United States and find that the level of financial assets and financial payments (interest payments, dividends, and stock buybacks) have risen rapidly in the post-1980 period. The data also reveal that corporations have received significantly more financial income by holding financial assets on their balance sheets. Orhangazi (2008) estimates a dynamic panel model and finds that both financial payments and financial profits reduce nonfinancial firms' investment rates in fixed assets, particularly among large firms. Utilizing firm data from 1971 to 2013, Davis (2018; 2017; 2016) improves Orhangazi's (2008) methodology and finds that payments to shareholders via dividends and stock buybacks need to be explored independently from interest payments to creditors. Davis (2018) proxies shareholder value orientation using average yearly industry-level stock buybacks, a variable that is exogenous to any individual firm in the industry. Among large firms, payments to shareholders depress investment rates significantly. Among smaller companies, firm-level sales volatility has a stronger negative effect on investment rates. Financial profits made by nonfinancial corporations have a significant positive effect on investment for large firms, and holdings of financial assets are positively correlated with fixed investment for all firm sizes. Davis (2018) concludes that while shareholder value maximization (via increasing dividend payments and stock repurchases) has depressed investment in large firms, the stocks of financial and nonfinancial assets are actually *complementary* to each other, therefore rejecting the hypothesis that the acquisition of financial assets by nonfinancial firms have crowded out physical investment. Tori and Onaran (2018) apply a similar

methodology to firm-level data from nonfinancial listed companies in the UK economy between 1985 and 2013. Even though not controlling for financial asset holdings, they find that financial payments and financial incomes have harmed investment in physical fixed assets.

Kliman and Williams (2015) use the notion of endogenous credit creation to call into question the hypothesis that financialization implies a reduction of available funds for investment in fixed assets. They claim that financial payments and purchases are not necessarily detrimental to firm investment, as these factors may actually improve investment and growth through leveraging. Companies' financial constraints, they argue, are not restricted to internal funds if they have easier access to credit or other financial sources of income. While Davis (2018; 2017; 2016), Orhangazi (2008), and Tori and Onaran (2018) conclude that shareholder value orientation is one of the main causes of financialization and lower investment rates, Kliman and Williams (2015) conclude that the main explanation for the lack of investment and growth is declining profitability.

## **2.4 FINANCIALIZATION VERSUS PRODUCTION OFFSHORING**

Firm-level datasets that are restricted to the domestic economy, however, might not be enough to disentangle the effects of financialization from those of outsourcing and offshoring in the post-1980 period. Firm-level data on tangible fixed assets that are constrained to national borders are unlikely to capture the effects of cross-border reallocation of production and the effects of globalized networks of production. If the financialization of the United States happened *pari passu* with outsourcing and offshoring to Asian countries, then only global data on multiple countries could help to partial out the effects of finance and globalization. Even firm-level data provided on a consolidated basis, including both the parent companies and their subsidiaries, would not circumvent Milberg and Winkler's (2010) critique that offshoring blurs the links between financialization and accumulation. If companies in the US, UK, and Europe were accumulating fixed assets in-house prior to 1980 and, in the period after 1980, shifted to increasingly outsourced

production to Asian companies in China, Taiwan, Vietnam etc., then the consolidated data would not reflect the outsourcing and offshoring of supply chains, given that the companies in Asia are not necessarily subsidiaries. Milberg and Winkler (2010) argue that the globalization, offshoring, and outsourcing of production networks have increased the profit shares in high-income countries. But the extra profits were channeled to interest payments, dividends, and stock buybacks instead of financing domestic investment in tangible assets.

## **2.5 THE IMPORTANCE OF INCOME AND WEALTH DISTRIBUTION**

Using aggregate data for the United States, UK, France, and Germany, van Treek (2008) finds that the declining correlation between aggregate profits and investment is an outcome of shareholder value maximization and growing consumption out of profit income. Despite the rise in the profit share in the post-1980 period, companies have not reinvested the extra profits into production. Amid a declining wage share and declining rates of investment, van Treek (2008) claims that GDP growth was still possible because consumption out of profit income and wealth effects kept aggregate consumption growing.

Utilizing aggregate data for the United States, Onaran, Stockhammer, and Grafl (2011) find that the rentier profit share of GDP has risen at the expense of both wages and non-rentier forms of profit. The redistribution of income away from wages and non-rentier profit income has contributed to the stagnation of investment rates and would have caused stagnation in GDP growth if it were not for the positive wealth effects from shareholders. In this regard, Onaran, Stockhammer, and Grafl' (2011) and van Treek (2008)'s argument that consumption by shareholders can keep growth apace is similar to Malthus' (1820) erstwhile insight that the consumption of the rentier classes can compensate for the lack of demand out of wage income and investment.

In an empirical study that does control for trade and capital account openness, Kohler, Guschanski, and Stockhammer (2019) estimate the impact of financialization and globalization on the wage shares of

14 developed countries from 1992 to 2014. They find that financial openness (openness of current account transactions), financial globalization (foreign assets plus foreign liabilities divided by GDP), net financial payments (interest plus dividends) of nonfinancial corporations, and trade openness (exports plus imports over GDP) all have significant negative effects on the wage share. Kohler, Guschanski, and Stockhammer (2019) estimate that capital account openness and financial payments from nonfinancial corporations have had a negative effect on the wage in the same order of magnitude as the effects of trade openness. In terms of its contribution to the fall in the wage share, the financialization of nonfinancial corporations has a similar effect to that of financial and trade globalization. Kohler, Guschanski, and Stockhammer (2019) also find that international capital mobility has a much stronger and significant negative impact on wages than labor mobility through migration. These results provide evidence that globalization is a major determinant of the fall in the wage shares of high-income countries.

## **2.6 THE LABOR VALUE OF COMMODIFIED KNOWLEDGE**

The Political Economy concept of unproductive activity, however, is broader than that of financialization and it includes other types of activities that do not directly create new value added. Examples of unproductive activities are finance and insurance, retail and wholesale trade, public administration, national defense, non-profit organizations, and real estate. But as Rotta (2018), Rotta and Teixeira (2016; 2019), and Teixeira and Rotta (2012) have claimed, the concept of unproductive activity also includes all economic activities that commodify knowledge and information. Intellectual property rights assure rent-like revenues to information proprietors such as pharmaceutical companies, software and app developers, data and tech companies, biotech companies, publishers, movie producers, record music companies, advertising and marketing companies, social media, and streaming platforms.

In a Marxist framework, an economic activity must *directly* produce new value added in order to be classified as productive. To be directly productive of new value added, an economic activity must fulfill

two necessary conditions: (i) it must produce useful goods or services for profit, meaning that it must produce commodities; (ii) these commodities must require labor time (direct living labor) to be *reproduced*, otherwise they are commodities with zero value and thus zero value added and zero surplus value. Marx and the ensuing Marxist tradition have emphasized the first condition but largely took for granted the second condition, probably because most studies have either focused on tangible goods or not paid particular attention to the huge gap between the production and reproduction time of intangible goods. Technology has a major impact on reducing the reproduction time of new commodities, given that computers can now automate many tasks with very little (or no) direct human labor. The commodification of knowledge and information therefore satisfies the first condition but not the second and, hence, must be classified as unproductive.

Commodified information is a special type of commodity, for it requires time and effort to be produced but not to be further reproduced. Hence, from a Marxist perspective, commodified information tends to have zero value. Marx's concept of *value* is substantially different from that of Adam Smith and David Ricardo. In Smith and Ricardo, value is equated with embodied labor. But in Marx, value is the social form of wealth in a commodity-producing system, and the quantity of value of a commodity is *not* determined by the labor embodied (objectified) in its original production. Marx had a much more dynamic understanding of value:

“The value of any commodity - and thus also of the commodities which capital consists of - is determined not by the necessary labour-time that it itself contains, but by the socially necessary labour-time required for its reproduction. This reproduction may differ from the conditions of its original production” (Marx [1894]1994, pp.237-238). “[T]he value of commodities is determined not by the labor-time originally taken by their production, but rather by the labor-time that their reproduction takes” (p.522). Hence, “however young and full of life the machine may be, its value is no longer determined by the necessary labour-time actually objectified in it, but by the labour-time necessary to reproduce either it or the better machine. It has therefore been devalued to a greater or lesser extent” (Marx [1887]1990, p.528)

Commodified knowledge and information such as software, computer codes and applications, data series, drug formulae, biotech, digital content of publications, advertising, news, music, movies, photos, videos, and even the commodified information from human behavior on social media all require virtually no labor time to be *re*-produced once produced, and thus tend to contain zero value. Because commodified information tends to have zero value it cannot originate either new value added or surplus value, which implies that the profits derived from commodified information are in fact value added reallocated from other activities in the economy.

For this reason, and despite potential *indirect* contributions to labor productivity, job creation, and productive investment, the commodification of information should be classified as a form of unproductive activity. Commodified knowledge and information can still increase labor productivity *indirectly*, and hence boost value added creation elsewhere if used as an *input* into another productive activity. But the revenues that information proprietors receive are *rents*, or specifically *information rents*, which are value added drawn from the aggregate pool of value added that productive activities create.

It is important to bear in mind the distinction between the knowledge commodity itself and the eventual material artifact that stores it. In the case of drugs, the knowledge commodity is the drug formula, as this is the commodified knowledge that requires no labor time to be reproduced and which gives rise to knowledge rents. The chemical powder and the pills do have some value, but they tend to be a minor fraction of production costs relative to the research and development costs necessary to discover the correct drug formula. Input-output tables and national income accounts do not allow for the separation of the revenues from R&D and non-R&D, and as an empirical approximation I classify the entire activity as unproductive.

A similar case applies to the music industry. If a singer or a musical band performs a live concert, the musicians are the productive workers. The commodified information in that case is the music score that the songwriter composed, and for which knowledge rents are due. The intellectual labor performed by the

songwriter is then classified as unproductive labor, given that virtually no reproduction time is required to make copies of the compositions. It is crucial to separate the knowledge-commodity itself (the musical composition, which is the product of the intellectual labor of the songwriter) from the productive labor of the musicians who perform live on the stage. Once composed, the music score can be reproduced (digitally copied) indefinitely with no further living labor applied to it.

Even though Marx often incorrectly assumed that the production of commodities for profit, subsumed under capital, was a necessary and sufficient condition to classify an activity as productive, in other passages he did acknowledge that this was not a sufficient condition:

“Once discovered, the law of the deflection of a magnetic needle in the field of an electric current, or the law of the magnetization of iron by electricity, cost absolutely nothing. [...] Science, generally speaking, costs the capitalist nothing, a fact that by no means prevents him from exploiting it” (Marx [1887]1990, p.508).

“[The] use-value is the general bearer of the exchange-value, but not its cause. If the same use-value could be created without labor, it would have no exchange-value, yet it would have the same useful effect as ever” (Marx [1894]1994, p.786).

Producing a commodity for profit is therefore a *necessary but not a sufficient condition* to classify an activity as productive. A worker producing commodities with zero value, even though subsumed under capital, will not create new value added and thus will be an unproductive worker in that particular task (even though the same worker could be a productive laborer in a different, complementary task). Furthermore, the productive-unproductive classification is endogenous to the existing technology. Modern computers allow many digital commodities to be reproduced indefinitely at zero reproduction cost and without the application of direct living labor. But this was not possible before the invention of modern computers and, in this way, the digital revolution transformed many previously productive activities into unproductive ones.



Marx's value theory did include limiting cases in which goods are produced for profit but require no direct labor to be further reproduced. As such, these would be commodities with no value and whose production would be unproductive of new value added and surplus value. The rise of intangible goods (as the "laws of electromagnetism" in Marx's quote above) in fact expands the domain in which goods are produced for profit but do not directly create new value added and, hence, must be classified as unproductive.

The paper therefore offers a consistent approach by combining Marx's insights on value theory, his insights on productive versus unproductive activities, and the central role of reproduction time in determining commodities' values. The relevance of the proposed approach lies in the massive growth of the digital industries, biotech industries, data commodification, and in the expansion of the knowledge economy in general. There is a growing share of commodities that, once produced, require no further living labor to be reproduced and, hence, give rise to profits at the micro level that are in fact redistributions of value added at the macro level.

## **2.7 INTANGIBLE ASSETS AND THE INFORMATION ECONOMY**

The concepts of information rents and commodified knowledge share some similarities with the mainstream approach to marginal cost. In mainstream Economics, knowledge and information have *zero marginal costs* and thus would be classified as *public goods* (non-rivalrous and non-excludable) if it were not for the existence of intellectual property rights that turn commodified information into artificially scarce goods (non-rivalrous but excludable), therefore granting their proprietors legal rights to royalties and rent-like revenues (Arrow 1962; Stiglitz 1999; Duffy 2004). Shavell and van Ypersele (2001) claim that the zero marginal cost property also applies to all industries that produce pharmaceuticals, software, data bases, movies, recorded music, news, books, advertisement, and visual products.

Information rents are an additional explanation for the investment-profit puzzle, or the rise in profits amid declining investment rates in fixed assets. Orhangazi (2019) argues that intangible assets such as patents and intellectual property rights may lead to greater profit margins but without a corresponding increase in firms' investment levels. He presents aggregate and firm-level data from the United States and shows that firms with more intangible assets have higher pricing power and lower investment to cash flow ratios. The industries with the highest markups and profit rates, namely healthcare and high-tech, are exactly the industries with the highest levels of intangible assets and the lowest ratios of investment over cash flow. The highest investment to cash flow ratios, on the contrary, are in energy and utilities industries, which are location specific and have very low intangible asset ratios. Orhangazi (2019) also presents evidence that the payments to shareholders as a ratio of cash flow is increasing much faster in the healthcare and high-tech industries, which are the industries with the highest markups, highest levels of intangible assets, and lowest investment ratios.

Pagano (2014), likewise, claims that financialization and the growth of intangible assets (knowledge assets in particular) are complementary phenomena which tend to reinforce each other. Appelbaum (2017) argues that the combination of domestic outsourcing, offshoring, rent seeking, and networked forms of production have jointly contributed to increase earnings inequality, as earnings have been higher in companies that are able to extract more rents from global production networks. Baker (2016) claims that rents derived from patents and copyrights is a crucial component in the rise of wage inequality and top earnings in the United States. Baker (2016) also claims that the rise in inequality is mostly a result of wage inequality, not of a shift of national income from wages to profits. Hence, "if inequality stems from rents, the appropriate response is not to focus on redistributive measures such as strongly progressive income taxes or wealth taxes, but rather to alter the institutional arrangements that allow for such enormous rents". Bivens and Mishel (2013) provide evidence that rents are a key element behind the rise of CEO pay and the incomes of the top 1%. They argue that the fast increase in the top 1% income share results from

opportunities and incentives to pursue rent seeking rather than well-functioning competitive markets rewarding skills or productivity based on marginal differences.

Activities that benefit from information rents are usually characterized by strong positive network externalities (when users prefer to share the same services or platforms) and a “winner take most” structure in which a few companies have very large market shares (Autor *et al.* 2020). Information rents are, hence, a plausible explanation for the concomitant rise in labor productivity, reduced economic growth, and increased inequality. The extra profits derived from information rents that are not reinvested can accumulate in the hands of the top income earners via dividends, share buybacks, and capital gains, therefore reducing investment rates and economic growth while increasing income inequality. Autor *et al.* (2020), in particular, use firm-level census data from the United States to demonstrate that the rise of the “superstar” companies has contributed to increase labor productivity but at the price of reducing the wage share. The reduction in the wage share results from the larger market share and the greater markup pricing over marginal costs in the superstar companies.

Instead of democratizing its benefits to all citizens, the zero reproduction costs of information and knowledge have disproportionately fueled the profits of a few firms (Pagano 2014). In this regard, information rents do resemble the emergence of land rents upon the enclosure of the commons and the monopolization of natural resources. A progressive agenda that aims to reduce inequality must necessarily advocate for a drastic reduction in the level of intellectual enclosure of the economy (Pagano and Rossi 2009; Rikap 2021).

In the next section I analyze the evolution of knowledge rents and unproductive activity in the American economy in more detail.

### 3. Unproductive Activity in the United States

In this section I present my measurements of productive and unproductive activity in the United States economy from 1947 to 2011. In Table 1 I summarize the variables utilized in this paper. Table A.2 in appendix 3 presents the complete classification of productive and unproductive activities used in this paper.

[Table 1 about here]

I utilize data from the *modified* benchmark input-output matrices, national income and product accounts, and fixed assets accounts from the Bureau of Economic Analysis (BEA), as well as compensation and productivity data from the Bureau of Labor Statistics (BLS). The *modified* benchmark input-output matrices from the BEA offer more accurate and detailed estimates of productive and unproductive activity. The modified input-output matrices classify each row (and respective column) into its primary and secondary sources of revenue. The secondary sources of revenue are then regrouped with their matching primary activity. A hotel that offers lodging and restaurant services, for example, would have its primary activity recorded in the lodging services row, and its restaurant would be regrouped in the restaurant services row. The same happens to an automaker that produces vehicles but also has a captive bank that offers car loans and insurance to its customers: the captive banking division is regrouped in the financial services and insurance row. Because of this transfer of secondary sources of revenue to their respective primary activity rows (and columns), the measurement of unproductive and productive *activity* (rather than *sectors*) becomes significantly more accurate.

My methodology builds on and complements previous studies from Shaikh and Tonak (1994), Mohun (2014; 2006; 2005), Wolff (1987), Moseley (1997; 1992; 1985), Tsoulfidis and Paitaridis (2019), Paitaridis and Tsoulfidis (2012). But unlike the existing literature, my approach employs the *modified* benchmark input-output matrices and offers a wide range of annual estimates of productive and unproductive

activity in terms of both *flows* of income and *stocks* of fixed assets, including aggregate estimates of information rents. Information rents are present whenever the main source of revenue comes from intellectual property rights on commodified knowledge and information that tend to require no labor time to be reproduced. Information rents consist of all income from activities involving software development, data management, research and development, advertising, development of pharmaceuticals, biotech, publishing industries, sound recording, and movie production. The full list is in Table A.2 of appendix 3.

In Table 2 I present the cumulative real growth rates of key measures of productive and unproductive activity. The estimates are broken down into cumulative rates for the whole 1947-2011 postwar period, the Regulated period from 1947 to 1980, and the Neoliberal period from 1980 to 2011. The cumulative growth rates of unproductive activity were mostly higher than their productive counterparts for the whole postwar period and more markedly so after 1980.

**[Table 2 about here]**

In Figure 1 I plot three measures of the total size of unproductive activity relative to their productive counterparts, in terms of annual aggregate flows of income. The gross income of unproductive activities relative to the total value generated in productive activities jumps from 13.4% in 1948 to 53.6% in 2009, hence quadrupling over the same period. The net income of unproductive activities relative to the value added in productive activities rises from 14.1% in 1948 to 50.8% in 2009, an accumulated increase of 260%. The net income of unproductive activities relative to the surplus value generated in productive activities rises from 24.4% in 1948 to 78% in 2009, an accumulated increase of 220% in the period.

**[Figure 1 about here]**

In Figure 2 I decompose the net income of unproductive activities into the shares of five unproductive sub-categories: (i) government administration with the exception of productive government enterprises, consisting mostly of the government wage bill at all levels; (ii) finance and insurance; (iii) non-profit

organizations and unproductive services, such as legal services and corporate management; (iv) real estate, comprising land-rents accruing to agents, managers, operators, and lessors (imputed owner-occupied rents are excluded); and (v) information rents. Finance and information rents combined have increased from 21.9% to 40.5% of the net income of all unproductive activity, nearly doubling their combined share in the postwar period.

**[Figure 2 about here]**

In Figure 3 I plot the non-residential fixed assets in unproductive activities (the “unproductive capital stock”) relative to fixed assets in productive activities (the “productive capital stock”). The stock of fixed assets in unproductive activities is plotted twice, first including and then excluding government fixed assets. The stock of residential assets is excluded from all measurements. From 1981 to 2009 the ratio of unproductive to productive capital stock rises 37.5%. Once I exclude fixed assets at all government levels (local, state, and federal; while keeping productive government enterprises in the productive capital stock) the ratio more than triples its value from 11% in 1954 to 35% in 2006.

**[Figure 3 about here]**

In Figure 4 I decompose the unproductive capital stock into the shares of five sub-categories of unproductive activity: trade, rental, and leasing; knowledge and information; finance and insurance; unproductive services; and government (excluding productive state companies, which are counted as productive of value). The major share is from the general government even though it has shrunk from 86.2% in 1947 to 64% in 2011. The unproductive activities featuring the fastest growth rates in terms of shares have been, in descending order: knowledge and information (from 0.8% to 5.0%); finance and insurance (from 1.7% to 10.3%); trade, rental, and leasing (from 8.3% to 15.3%), and finally unproductive services (from 2.9% to 5.4%). Finance- and information-related activities have grown their combined capital stock six-fold (or 502%) from 1947 to 2011 as a share of the total unproductive capital stock.

**[Figure 4 about here]**

In Figure 5 I compare the ratios of the aggregate net income to the capital stocks in productive and unproductive activities. These ratios measure how much net income a unit of fixed capital stock returns per year and indicate whether or not competition equilibrates the rates of return between productive and unproductive activities. Figure 5 reveals that a very slow convergence of return rates takes place over the postwar period. The value added relative to the stock of fixed assets in productive activities is 84% in 1947, then falling to a low point of 58% in 1982, recovering in the post-1980 period to 81% in 2000 and 68% in 2011. The net income over the stock of fixed assets in unproductive activities is 14% in 1947, then rising to a peak at 45% in 2001, and settling at 38% in 2011.

**[Figure 5 about here]**

**[Figure 6 about here]**

In Figure 6 I plot five series converted to index numbers (1980=100): the top 0.1% and top 1% income shares inclusive of capital gains; the rate of exploitation of productive workers, which is an aggregate index of class struggle; the share of financial revenues and information rents in the aggregate net income of unproductive activities; and the share of the unproductive capital stock in activities whose main revenues come from finance and information rents. The trends display sharp increases after 1980, revealing a potential long-run relationship between unproductive activity, information rents, finance, exploitation, and inequality. In the next section I test the hypothesis of such long-run relationship utilizing time series econometrics.

## **4. The Effects of Unproductive Activity on Growth, Productivity, and Inequality**

### **4.1 ESTIMATIONS AND SIMULATIONS**

To evaluate the effects of unproductive activity on value creation, labor productivity, and income inequality in the United States economy from 1947 to 2011, I estimate single-equation auto-regressive distributed-lag (ARDL) models following the approach of Pesaran, Shin, and Smith (2001) –“PSS” henceforth– utilizing the variables in Table 1. The PSS approach controls for long- and short-run effects by including lagged levels and lagged differences of the dependent and independent variables. The lagged levels control for the permanent long-run effects, while the lagged differences control for the temporary short-run effects. To avoid endogeneity problems the ARDL specifications in this paper utilize only lagged rather than contemporaneous values of the explanatory variables. Technical details of the estimation procedure and unit root tests are available in the (online) appendix.

In Table 3 I summarize the estimations results and diagnostic tests from eight different ARDL specifications. In models 1a and 1b the dependent variable is the real aggregate value added (VA) of productive activities. In models 2a and 2b the dependent variable is the economy-wide real labor productivity. Real values are in 2005 dollars. In models 3a and 3b the dependent variable is the income share of the top 0.1% inclusive of capital gains. In models 4a and 4b the dependent variable is the income share of the top 1% inclusive of capital gains. In each model I control for the growth in unproductive activity in terms of aggregate income flows, investment expenditures in the stocks of fixed assets, and I also control for the shares of unproductive activities that rely on financial revenues and information rents. To capture potential nonlinear relationships, and to reduce heteroskedasticity in the data, all variables are in natural logs.

The set of independent variables, as described in Table 1, consists of: the rate of exploitation; labor productivity; the aggregate net income of unproductive activity over the aggregate value added of



productive activity; financial incomes and information rents as shares of the net income of all unproductive activity; the aggregate stock of fixed assets in unproductive activity over the aggregate stock of fixed assets in productive activity; the share of the capital stock of unproductive activities whose main source of revenue are financial incomes and information rents; and finally, a Neoliberal dummy variable equal to 0 from 1947 to 1979 and equal to 1 from 1980 to 2011. The dummy aims to capture the institutional regime change from the Keynesian to the Neoliberal era in the 1980s. Each model is estimated twice, first without the Neoliberal dummy (version “a”) and then with the dummy included (version “b”).

**[Table 3 about here]**

The rate of exploitation is an aggregate index of class struggle that summarizes the role of factors such as labor laws and bargaining power as well as globalization, outsourcing, and subcontracting. As a robustness test, I have also re-estimated the models by adding a control for globalization (share of imports in GDP) but this variable did not affect the results and was statistically insignificant, probably because its effect is already incorporated through the rate of exploitation (with a linear correlation of 0.86).

The stocks of fixed assets measure the cumulative investments of productive and unproductive activities. The BEA computes the net capital stock as the cumulative sum of past investment expenditures in plants, equipment, and software, and then applies a nonlinear annual depreciation rate. A potential positive effect of the capital stock implies that investment expenditures in fixed assets have a positive effect on the dependent variable, while a concomitant flow effect can still be negative because the flow variables measure the resulting levels of income rather than the cumulative expenditures. Macroeconomic theory suggests that expenditures precede incomes, such that investment expenditures are logically prior to current incomes (as in Keynes and Kalecki). This implies that that the excess draw of income from productive to unproductive activity happens after the determination of investment expenditures. In this way, the positive

effect reflects the boost from the cumulative investment expenditures in fixed assets, while the concomitant negative effect reflects the excess income that unproductive activities draw from productive activities.

I specified the models as follows. The optimal lag length for the lagged differences is chosen via the Bayesian information criterion (BIC). The lag length is increased until the residuals are well behaved. No more than a maximum of three lags of the variables in differences are included. I test for the statistical significance of the long-run effects using the PSS (2001) bounds F-test for the variables in lagged levels, with small sample critical values from Narayan (2005). In the PSS approach to ARDL modelling it is possible to maintain an asymmetry between the long- and short-run effects given that only the variables in lagged levels determine the limiting distribution of the bounds F-test. Hence, if a set of variables contributes only to the short-run effects, these are added to the model solely in lagged differenced form. Further discussion on this asymmetry between long- and short-run regressors is available in the (online) appendix. Because the Neoliberal dummy is not a one-off variable, I include it within the long-run equilibrium equation. If I were to include contemporaneous differences of the regressors, the fit of all models would improve substantially but at the risk of generating endogeneity problems.

To evaluate the specific impact of information rents, holding constant the shares of finance in the net income and in the capital stock of unproductive activity, I estimate ARDL models 1c, 2c, 3c, and 4c. Estimates are summarized in Table 4, which is similar to Table 3 but now featuring the shares of information rents in lieu of the previous combined shares of information rents and financial incomes.

**[Table 4 about here]**

Ziliak and McCloskey (2008) argued that we should differentiate between statistical significance and economic significance. In Tables 5 and 6 I present the long-run elasticities, the cumulative change in each variable, and the economic effect of the regressors for each model. The long-run elasticity is computed

as the coefficient of the regressor in lagged level divided by the negative of the coefficient of the dependent variable in lagged level. Only the variables that appear in lagged level form in an ARDL model have long-run elasticities. The *economic effect* is the cumulative change in the variable from 1947 to 2011 times its respective long-run elasticity. A comparison of the economic effects reveals which regressors have contributed the most to the cumulative change in the dependent variable, and hence avoids overreliance on statistical significance and p-values.

The difference between Tables 5 and 6 is the same as that between Tables 3 and 4. Table 5 presents the economic effects considering the joint effects of finance and information rents, while Table 6 holds constant the shares of finance in the net income and in the capital stock of unproductive activity, thus focusing on the impact of commodified knowledge.

**[Table 5 about here]**

**[Table 6 about here]**

To compare the dynamics of the permanent long-run and temporary short-run effects, I simulate the ARDL models following the approach developed by Jordan and Philips (2018) and Philips (2018). I simulate the specifications in Tables 3 and 4 by setting the impulses to each regressor equal to the actual 1947-2011 cumulative change in the underlying variable. The responses show the *cumulative economic effects* on the dependent variable traced over time. For the variables in lagged levels, the impulse-responses converge to the permanent long-run economic effects reported in Tables 5 and 6. The temporary short-run responses of the variables in lagged differences will decay to zero over time. Simulation plots of the ARDL models are available in appendix 2. The black dashed lines represent the economic effects. The shaded bands around the economic effects represent the bootstrapped 75, 90, and 95 percentiles of the predictions from the simulations, akin to confidence intervals. The horizontal axis shows the 65 years after the initial impulse at time  $t=10$ .

## 4.2 SUMMARY OF RESULTS

The main conclusion from the estimations and simulations is as follows. At the aggregate level, unproductive activity has had a positive effect on the creation of value in productive activities and also on the economy-wide labor productivity. Despite drawing their incomes from the pool of value added, unproductive activities still had an *indirect* positive effect that more than compensated for the *direct* draw from the pool of value. There has been, hence, a *net positive effect* of unproductive activity on the creation of value added and on labor productivity.

Among unproductive activities, however, finance and the commodification of information have had a joint positive effect on labor productivity but a two-pronged effect on value creation: a *negative flow effect* coupled with a larger *positive stock effect*. In terms of flows of income, the rise in the joint share of financial revenues and information rents has been associated with an increase in the productivity of labor and a *negative effect* on value-added growth, possibly because these unproductive activities have made labor more productive but concomitantly drawing “too much” from the value pool. Even though unproductive activity in the aggregate has had a net positive effect on value-added growth, the unproductive activities that rely on financial revenues and information rents have had a joint *negative effect* on the creation of value. The investment expenditures in the accumulation of fixed assets in unproductive activities whose main source of revenue are finance and information rents have, on the other hand, had a *large positive effect* on value-added growth. Finance and the commodification of knowledge have had, therefore, a joint positive impact on value creation via their investment expenditures in fixed assets, while still drawing “too much” from the value pool of productive activities. Moreover, unproductive activity that rely on finance and information rents, coupled with the rapid rise in the rate of exploitation in the post-1980 era, have worsened income inequality by substantially increasing the income shares of the top 1% and 0.1% earners.

When the shares of finance in the incomes and fixed asset stocks of unproductive activities are held constant, as reported in Tables 4 and 6, the estimates indicate that knowledge rents per se have had a

negative effect on value added growth, a positive effect on the economy-wide labor productivity, and also contributed to substantially increase the income shares of the top 1% and top 0.1% earners. Even though unproductive activities have had an overall positive effect on the creation of value in productive activities, the particular impact of knowledge commodification within these unproductive activities has been negative. The negative effect of information rents on value-added growth might be partially explained by the fact that the “monopolization of certain product markets through the use of intangible assets allows firms to collect monopoly rents which are reflected in higher profits, while not necessarily generating a matching increase in investment” (Orhangazi 2019, p.1260).

### **4.3 INTERPRETATION OF THE ESTIMATES**

#### **(I) IMPACT ON THE CREATION OF VALUE**

From 1947 to 2011, the joint share of financial income and information rents in the aggregate net income of all unproductive activities rose 85%, while the share of information rents alone increased 120%. Each 10% rise in the share of financial income and information rents has been associated with a *reduction* in real value added by 3.2% (Model 1a) and 8.3% (Model 1b). If only information rents are considered, real value added falls by 8.8% for every 10% rise in the share of information rents (Model 1c).

In the aggregate, a rise in the net income of all unproductive activity has been associated with an *increase* in the value added of productive activity. In Models 1a and 1b, the effect is positive but temporary. Model 1c provides an estimate of the long-run elasticity: each 10% rise in the net income of all unproductive activity, relative to the value added in productive activities, has produced a 11.2% rise in real value added. Hence, unproductive activity in the aggregate has tended to have a positive contribution to value creation in the short and long runs. The cumulative economic effect from 1947 to 2011 indicates that the overall impact of unproductive activity on value creation has been *positive and larger* than then the negative cumulative economic effect caused by the rising share of finance and information rents. Therefore, even

though finance and information rents have had a negative effect on value creation, possibly by extracting too much from the value pool, unproductive activities other than finance and information commodification have had a positive and larger effect on value creation.

Once the stocks of fixed assets in unproductive activity are considered, finance and information commodification have had a two-pronged effect on value added. Each 10% rise in the cumulative investment expenditures in the net capital stock of unproductive activities whose main sources of income are finance and information rents, as a share of the total capital stock of unproductive activities, has implied a *rise* in real value added by 5.3% (in Model 1a) and 4.8% (in Model 1b). When the actual cumulative change from 1947 to 2011 is considered, the positive economic effect from the investment expenditures in fixed assets *more than compensates* for the negative economic effect from the share of financial revenues and information rents. Hence, the *positive stock effect* has been stronger than the *negative flow effect* of finance and information rents on the creation of value in productive activities. But despite this net positive effect through the accumulation of fixed assets, finance and information rents have still represented a drag on the creation of value via the negative flow effect.

Moreover, each 10% rise in labor productivity has been associated with a rise in real value added by 7.1% (in Model 1a) and 7.9% (in Model 1b). Higher rates of exploitation have also had positive temporary effects on the creation of value in productive activities.

## (II) IMPACT ON LABOR PRODUCTIVITY

Unproductive activity has had a *positive* effect on the economy-wide real labor productivity. Each 10% rise in the net income of unproductive activity over the value added in productive activity has *increased* labor productivity by 7.7% (in Model 2a), 6.5% (in Model 2b), and 7.1% (in Model 2c). Finance and the commodification of knowledge and information, considered separately or combined, have also had a *positive* but short-run impact on labor productivity.

The cumulative investment expenditures in the net stocks of fixed assets in unproductive activities (relative to the stocks of fixed assets in productive activities) have had much higher long-run elasticities compared to the elasticities of their flow counterparts. However, the larger long-run elasticities of labor productivity with respect to the capital stock of unproductive activities have been canceled out by their much lower cumulative economic effect.

### (III) IMPACT ON INEQUALITY

Financial revenues, information rents, and the rate of exploitation have been strong predictors of the rise in inequality, as measured by the income shares of the top 1% and top 0.1%. In the 1947-2011 period, the top 0.1% income share featured a cumulative rise of 136%, while the top 1% income share accumulated an increase of 64%. The 54% increase in the rate of exploitation from 1947 to 2011 has implied an increase in the top 0.1% income share by 49% (in Model 3a), 71% (in Model 3b), and 91% (in Model 3c). The cumulative increase in the rate of exploitation has also implied a rise in the top 1% income share by 39% (in Model 4a), 53% (in Model 4b), and 67% (in Model 4c).

When all unproductive activities are considered together, their joint effect has been an overall small *reduction* in inequality in the 1947-2011 period, as the small negative economic effect reported in Table 5 demonstrates. But within unproductive activities it has been finance and knowledge commodification that have in fact contributed to the rapid *increase* in the shares of the top 1% and top 0.1% income earners, as the positive and much larger economic effect reported in Table 5 indicates.

Each 10% increase in the joint share of financial income and information rents has boosted the top 0.1% income share by 12.2% (in Model 3a) and 7.8% (in Model 3b). If financial income is held constant, each 10% rise in the share of information rents has increased the top 0.1% income share by 5.5% (in Model 3c). Additionally, each 10% increase in the joint share of financial income and information rents has implied a rise in the top 1% income share by 7% (in Model 4a) and 4.7% (in Model 4b). If financial income is held

constant, each 10% rise in the share of information rents has increased the top 1% income share by 3% (in Model 4c).

The regressors that control for the investment expenditures in the capital stock in unproductive activities had only temporary and insignificant economic effects on the income shares of the top 1% and top 0.1%. Most of the variation in inequality is accounted for by the rate of exploitation and the net income flows of unproductive activity, particularly finance and information rents.

## **5. Final Remarks**

The paper contributes to the literature by estimating the impact of unproductive activity on value added, labor productivity, and inequality in the United States from 1947 to 2011. Utilizing data from modified benchmark input-output matrices, I present several measurements of productive and unproductive activity in terms of income flows and stocks of fixed assets. Particular attention is given to the rapid rise of financial revenues and information rents in the post-1980 period. Using time series econometrics, I find that unproductive activity has had an overall net positive effect on value creation and on labor productivity, but at the price of increasing income inequality.

The recent scholarship has focused on the role of finance (and financialization) as a key factor in the slowdown of economic growth and lower investment rates in tangible assets after the 1980s. My approach adds to the existing literature by claiming that information rents should be given a similar role to that of finance as a determinant factor of growth and distribution. As I argue in the paper, the production and ownership of commodified knowledge and information do not directly originate new value added, and therefore give rise to information rents that draw from the aggregate pool of value of productive activities. Information rents are therefore transfers of value that companies like Google, Amazon, Microsoft, Apple, Facebook, Uber, Netflix, Alibaba, Airbnb, Pfizer, Merck, Bayer, Eli Lilly etc., to name just a few, are able to extract from consumers, governments, and companies both at home and abroad. The literature features a



wide range of studies that show how an oversized financial sector can impact growth and distribution. My estimates confirm this result and also reveal that a similar claim can be made about intellectual property rights and information rents.

My econometric estimations indicate that the net effect of the rising joint share of information rents and financial incomes on labor productivity has been positive. Finance and the commodification of knowledge have also had a joint positive impact on value creation via their investment expenditures in fixed assets, despite the negative effect from an excessive draw from the incomes of productive activities. Coupled with a rapid increase in the rate of exploitation in the post-1980 period, the rising joint share of information rents and financial incomes has also widened the income shares of the top 1% and top 0.1% earners in the United States.

When the share of finance is held constant within unproductivity activity, the commodification of knowledge has had a negative effect on the growth of value added in productive activities, despite the positive contribution to the economy-wide labor productivity, and it has also contributed to increase economic inequality. The commodification of knowledge and information does increase the productivity of labor but, nonetheless, harms value-added growth and benefits the top 1% and top 0.1%. If we are to tackle the factors that reduce growth and worsen income distribution, we need to seriously address the rapid rise of information rents.

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# Tables and Figures

**Table 1:** Description of Variables for the United States (1947-2011)

<b>Productive Activity (PA)</b>	
Total value (TV)	Real total value created in productive activities (gross of intermediate inputs and depreciation)
Value added (VA)	Real value added created in productive activities (net of intermediate inputs and depreciation)
Surplus value (S)	Real value added minus the total compensation of productive workers in productive activities
Rate of exploitation (s)	Surplus value over the total compensation of productive workers in productive activities
K <sub>PA</sub>	Real stock of non-residential fixed assets in productive activities (at replacement cost)
<b>Unproductive Activity (UA)</b>	
G <sub>UA</sub>	Real gross income of unproductive activities (gross of intermediate inputs and depreciation)
N <sub>UA</sub>	Real net income of unproductive activities (net of intermediate inputs and depreciation)
IR in N <sub>UA</sub>	Share of information rents (IR) in N <sub>UA</sub>
FI+IR in N <sub>UA</sub>	Share of financial income (FI) and information rents (IR) in N <sub>UA</sub>
N <sub>UA</sub> / VA	Net income of unproductive activities over the value added created in productive activities
K <sub>UA</sub>	Real stock of non-residential fixed assets in unproductive activities (at replacement cost)
IR in K <sub>UA</sub>	Share of K <sub>UA</sub> in activities whose main sources of revenues are information rents
FI+IR in K <sub>UA</sub>	Share of K <sub>UA</sub> in activities whose main sources of revenue are finance and information rents
K <sub>UA</sub> / K <sub>PA</sub>	Stock of fixed assets in unproductive relative to productive activities
<b>Whole Economy</b>	
Top 1%	Income share of the top 1% earners, with capital gains included
Top 0.1%	Income share of the top 0.1% earners, with capital gains included
Labor productivity	Real GDP per total working hours (index 2005 = 100)

*Sources:* Measures of productive and unproductive activity computed from the modified benchmark BEA input-output matrices, national income and product accounts, fixed assets accounts, and from the BLS series on compensation and employment. Estimation techniques from Rotta (2018). Real values in 2005 dollars. Top income shares from Piketty (2014). Labor productivity index is the nonfarm business sector real output per hour of all persons from the BLS, rebased to 2005. See Table A.2 in appendix 3 for the complete classification of productive and unproductive activities.

**Table 2: Cumulative Growth Rates in the United States (1947-2011)**

	1947-1980	1980-2011	1947-2011
<b>Productive Activity (PA)</b>			
Total value (TV)	184%	82%	416%
Value added (VA)	179%	115%	499%
Surplus value (S)	177%	155%	607%
Rate of exploitation (s)	-2%	56%	54%
Capital stock ( $K_{PA}$ )	298%	95%	677%
$VA / K_{PA}$	-30%	16%	-19%
<b>Unproductive Activity (UA)</b>			
Gross income ( $GI_{UA}$ )	322%	335%	1734%
Net income ( $NI_{UA}$ )	461%	256%	1896%
Share of information rents in $NI_{UA}$	25%	76%	120%
Share of financial income and information rents in $NI_{UA}$	20%	54%	85%
$NI_{UA} / VA$	102%	40%	182%
Capital stock, with government assets ( $K_{UA}$ )	194%	161%	667%
Capital stock, no government assets ( $K_{UA}^*$ )	449%	266%	1909%
Share of information rents in $K_{UA}$	171%	126%	514%
Share of financial income and information rents in $K_{UA}$	208%	96%	502%
$K_{UA} / K_{PA}$	-26%	34%	-1%
$NI_{UA} / K_{UA}$	89%	44%	173%
<b>Whole Economy</b>			
Top 1% income share (with capital gains)	-16%	96%	64%
Top 0.1% income share (with capital gains)	-13%	172%	136%
Labor productivity	121%	91%	322%

*Sources:* Author's calculations. Real growth rates in 2005 dollars. Variables described in Table 1. See Table A.2 in appendix 3 for the complete classification of productive and unproductive activities.

**Table 3: ARDL Models for the United States (1947-2011)**

	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 4a	Model 4b
Dependent variable (all in first differences)	<b>Value Added</b>	<b>Value Added</b>	<b>Labor Productivity</b>	<b>Labor Productivity</b>	<b>Top 0.1%</b>	<b>Top 0.1%</b>	<b>Top 1%</b>	<b>Top 1%</b>
<b>Dependent variable</b>								
Lagged level	-0.429**	-0.310*	-0.059***	-0.126***	-0.515***	-0.560***	-0.455***	-0.498***
First lagged difference	-0.257	-0.355*	0.112	0.105	0.014	0.035	0.023	0.041
<b>Rate of exploitation</b>								
Lagged level					0.467	0.741	0.329	0.491*
First lagged difference	0.277*	0.830**	-0.010	-0.056	1.202**	0.976*	0.722**	0.590
<b>Labor productivity</b>								
Lagged level	0.303	0.244						
First lagged difference	0.718**	0.335***						
<b>Share of finance and information rents in NIUA</b>								
Lagged level	-0.139**	-0.260***			0.628***	0.439*	0.316***	0.233
First lagged difference	0.259***	0.335***	0.082**	0.117***	-0.504	-0.387	-0.263	-0.205
<b>NIUA / Value Added</b>								
Lagged level			0.046**	0.082***		-0.057		-0.046
First lagged difference	0.079	0.087	0.014	-0.042	0.280	0.270	0.154	0.152
<b>Share of finance and information rents in KUA</b>								
Lagged level	0.228***	0.148**						
First lagged difference	0.072	-0.200	-0.071	-0.145	-0.318	-0.396	-0.407	-0.449
<b>KUA / KPA</b>								
Lagged level			0.133***	0.188***				
First lagged difference	0.530	0.224	0.033	-0.030	-0.301	-0.444	-0.415	-0.466
<b>Neoliberal dummy Intercept</b>								
Lagged level		0.083**		0.023***		0.110		0.053
First lagged difference	5.299**	4.232**	-0.493***	-0.619***	-3.605**	-4.104**	-1.521	-1.796*
Lagged differences (p)	3	3	2	3	1	1	1	1
Observations (n)	65	65	65	65	65	65	65	65
Ind. regressors in levels (k)	3	3	2	3	2	4	2	4
R <sup>2</sup>	0.663	0.719	0.422	0.568	0.388	0.403	0.368	0.381
Adjusted R <sup>2</sup>	0.422	0.505	0.233	0.319	0.284	0.275	0.261	0.248
Log-likelihood	157.545	163.15	190.392	200.032	51.557	52.372	82.6	83.279
Bayes IC	-204.096	-211.195	-310.622	-301.403	-57.539	-50.883	-119.625	-112.698
Breusch-Godfrey (p-value)	0.70	0.916	0.75	0.65	0.98	0.89	0.513	0.61
Breusch-Pagan (p-value)	0.68	0.54	0.86	0.94	0.12	0.14	0.23	0.23
Shapiro-Wilk (p-value)	0.25	0.015	0.28	0.74	0.38	0.43	0.106	0.18
Jarque-Bera (p-value)	0.40	0.15	0.18	0.51	0.34	0.34	0.06	0.07
PSS bounds F-statistic	6.095**	7.064***	6.58***	5.53***	7.225***	4.548**	6.706**	4.179*
PSS bounds F-test case	case 3	case 3	case 2	case 2	case 3	case 3	case 3	case 3

Note: Significance levels: 10% (\*), 5% (\*\*), and 1% (\*\*\*). Variables in logs, as described in Table 1. ARDL models in error correction form: dependent variable in first difference. The PSS bounds F-test (for the k independent regressors in lagged levels) is from Pesaran, Shin, and Smith (2001), using small sample critical values for n=65 from Narayan (2005). Only the coefficients for the first lagged differences are shown. Model 1b uses robust HAC standard errors.



**Table 4:** Modified ARDL Models for the United States (1947-2011)

	Model 1c	Model 2c	Model 3c	Model 4c
Dependent variable (all in first differences)	<b>Value Added</b>	<b>Labor Productivity</b>	<b>Top 0.1%</b>	<b>Top 1%</b>
<b>Dependent variable</b>				
Lagged level	-0.085	-0.100***	-0.574***	-0.501***
First lagged difference	-0.368*	-0.053	0.015	0.005
<b>Rate of exploitation</b>				
Lagged level			0.981**	0.629***
First lagged difference	0.445***	-0.001	0.700*	0.434
<b>Labor productivity</b>				
Lagged level				
First lagged difference	0.648			
<b>Share of information rents in NI<sub>UA</sub></b>				
Lagged level	-0.075		0.318***	0.151***
First lagged difference	0.087	0.117***	-0.243	-0.126
<b>NI<sub>UA</sub> / Value Added</b>				
Lagged level	0.095	0.071***		
First lagged difference	0.073	-0.007	0.255	0.173
<b>Share of information rents in K<sub>UA</sub></b>				
Lagged level				
First lagged difference	0.025	-0.070	0.164	0.091
<b>K<sub>UA</sub> / K<sub>PA</sub></b>				
Lagged level		0.166***		
First lagged difference	0.369	-0.061	-0.150	-0.250
<b>Neoliberal dummy Intercept</b>	0.090*** 1.032*	0.015* -0.575***	-4.759**	-2.230**
Total lagged differences (p)	3	2	1	1
Total observations (n)	65	65	65	65
Ind. regressors in levels (k)	3	3	2	2
R <sup>2</sup>	0.641	0.49	0.399	0.374
Adjusted R <sup>2</sup>	0.384	0.31	0.297	0.267
Log-likelihood	155.61	194.281	52.16	82.884
Bayes IC	-200.226	-314.273	-58.745	-120.194
Breusch-Godfrey (p-value)	0.07	0.26	0.54	0.84
Breusch-Pagan (p-value)	0.41	0.90	0.073	0.12
Shapiro-Wilk (p-value)	0.86	0.81	0.86	0.64
Jarque-Bera (p-value)	0.93	0.80	0.92	0.65
PSS bounds F-statistic	5.203**	8.19***	7.613***	6.908***
PSS bounds F-test case	case 3	case 2	case 3	case 3

*Note:* Significance levels: 10% (\*), 5% (\*\*), and 1% (\*\*\*). Variables in logs, as described in Table 1. ARDL models in error correction form: dependent variable in first difference. The PSS bounds F-test (for the k independent regressors in lagged levels) is from Pesaran, Shin, and Smith (2001), using small sample critical values for n=65 from Narayan (2005). Only the coefficients for the first lagged differences are shown. Model 3c uses robust HAC standard errors.

**Table 5: Economic Effects and Long-Run Elasticities (1947-2011)**

	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 4a	Model 4b
Dependent variable	<b>Value Added</b>	<b>Value Added</b>	<b>Labor Productivity</b>	<b>Labor Productivity</b>	<b>Top 0.1%</b>	<b>Top 0.1%</b>	<b>Top 1%</b>	<b>Top 1%</b>
<b>Dependent Variable</b>								
Cumulative change	1.79	1.79	1.44	1.44	0.86	0.86	0.50	0.50
<b>Rate of exploitation</b>								
Cumulative change	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Long-run elasticity	--	--	--	--	0.91	1.32	0.72	0.99
Economic effect	--	--	--	--	0.39	0.57	0.31	0.42
<b>Labor productivity</b>								
Cumulative change	1.44	1.44						
Long-run elasticity	0.71	0.79						
Economic effect	1.02	1.13						
<b>Share of finance and information rents in NIUA</b>								
Cumulative change	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Long-run elasticity	-0.32	-0.83	--	--	1.22	0.78	0.69	0.47
Economic effect	-0.20	-0.51	--	--	0.75	0.48	0.43	0.29
<b>NIUA / Value Added</b>								
Cumulative change	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
Long-run elasticity	--	--	0.77	0.65	--	-0.10	--	-0.09
Economic effect	--	--	0.80	0.68	--	-0.11	--	-0.10
<b>Share of finance and information rents in KUA</b>								
Cumulative change	1.79	1.79	1.79	1.79	1.79	1.79	1.79	1.79
Long-run elasticity	0.53	0.48	--	--	--	--	--	--
Economic effect	0.95	0.86	--	--	--	--	--	--
<b>KUA / KPA</b>								
Cumulative change	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Long-run elasticity	--	--	2.23	1.49	--	--	--	--
Economic effect	--	--	-0.03	-0.02	--	--	--	--
<b>Neoliberal dummy</b>								
Cumulative change		1.00		1.00		1.00		1.00
Long-run elasticity		0.27		0.18		0.20		0.11
Economic effect		0.27		0.18		0.20		0.11

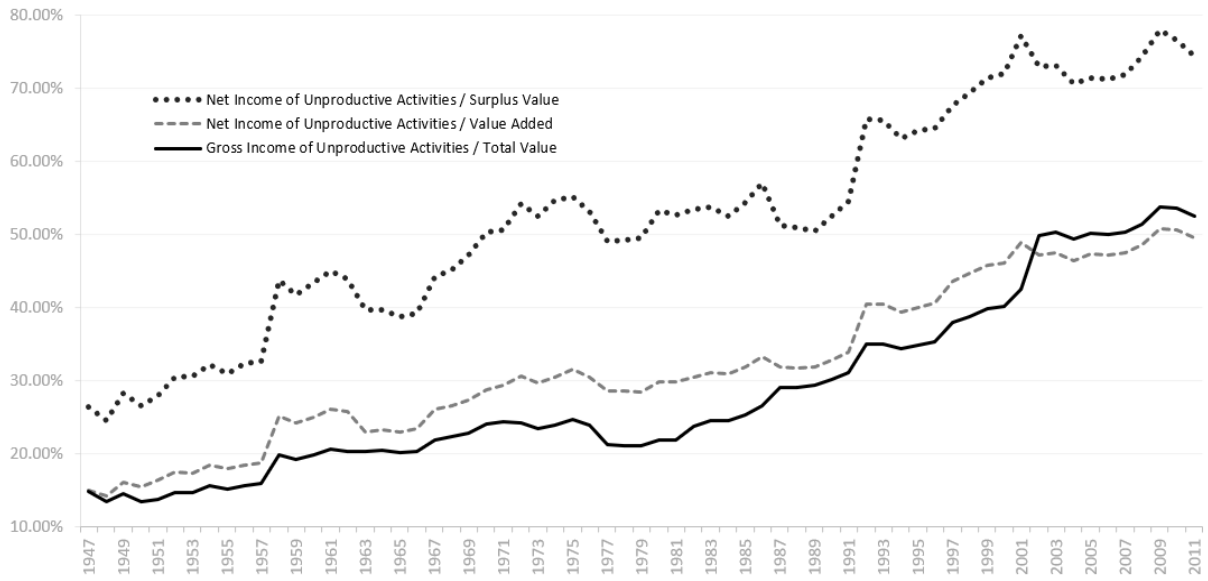
*Note:* Variables in logs, as described in Table 1. Cumulative change is the last value minus the initial value, in logs. The long-run ARDL multiplier (elasticity) is the coefficient of the lagged level of the regressor divided by the negative value of the coefficient of the dependent variable in lagged level. The economic effect is the cumulative change times the long-run multiplier. Only variables in lagged levels have long-run multipliers. Variables in lagged differences (indicated with '--') have a short-run temporary effect only.

**Table 6: Economic Effects and Long-Run Elasticities (1947-2011)**

	Model 1c	Model 2c	Model 3c	Model 4c
Dependent variable	<b>Value Added</b>	<b>Labor Productivity</b>	<b>Top 0.1%</b>	<b>Top 1%</b>
<b>Dependent Variable</b>				
Cumulative change	1.79	1.44	0.86	0.50
<b>Rate of exploitation</b>				
Cumulative change	0.43	0.43	0.43	0.43
Long-run elasticity	--	--	1.71	1.26
Economic effect	--	--	0.73	0.54
<b>Labor productivity</b>				
Cumulative change	1.44			
Long-run elasticity	--			
Economic effect	--			
<b>Share of information rents in NI<sub>UA</sub></b>				
Cumulative change	0.79	0.79	0.79	0.79
Long-run elasticity	-0.88	--	0.55	0.30
Economic effect	-0.69	--	0.44	0.24
<b>NI<sub>UA</sub> / Value Added</b>				
Cumulative change	1.04	1.04	1.04	1.04
Long-run elasticity	1.12	0.71	--	--
Economic effect	1.16	0.73	--	--
<b>Share of information rents in K<sub>UA</sub></b>				
Cumulative change	1.81	1.81	1.81	1.81
Long-run elasticity	--	--	--	--
Economic effect	--	--	--	--
<b>K<sub>UA</sub> / K<sub>PA</sub></b>				
Cumulative change	-0.01	-0.01	-0.01	-0.01
Long-run elasticity	--	1.65	--	--
Economic effect	--	-0.02	--	--
<b>Neoliberal dummy</b>				
Cumulative change	1.00	1.00		
Long-run elasticity	1.06	0.15		
Economic effect	1.06	0.15		

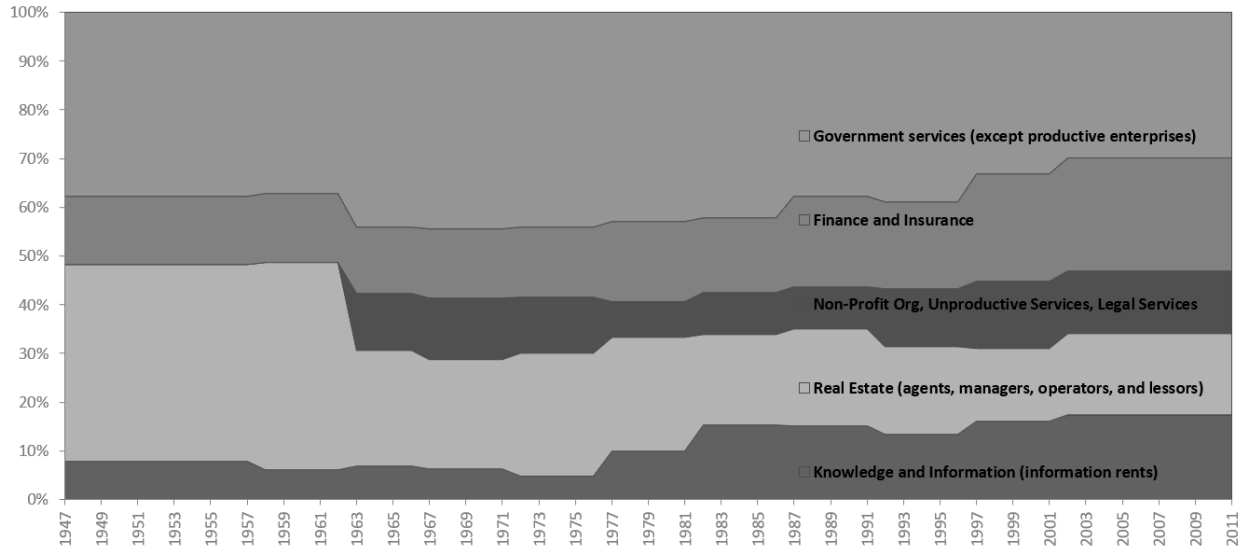
*Note:* Variables in logs, as described in Table 1. Cumulative change is the last value minus the initial value, in logs. The long-run ARDL multiplier (elasticity) is the coefficient of the lagged level of the regressor divided by the negative value of the coefficient of the dependent variable in lagged level. The economic effect is the cumulative change times the long-run multiplier. Only variables in lagged levels have long-run multipliers. Variables in lagged differences (indicated with '--') have a short-run temporary effect only.

**Figure 1: Unproductive Activity Relative to Productive Activity – Aggregate Flows (1947-2011)**



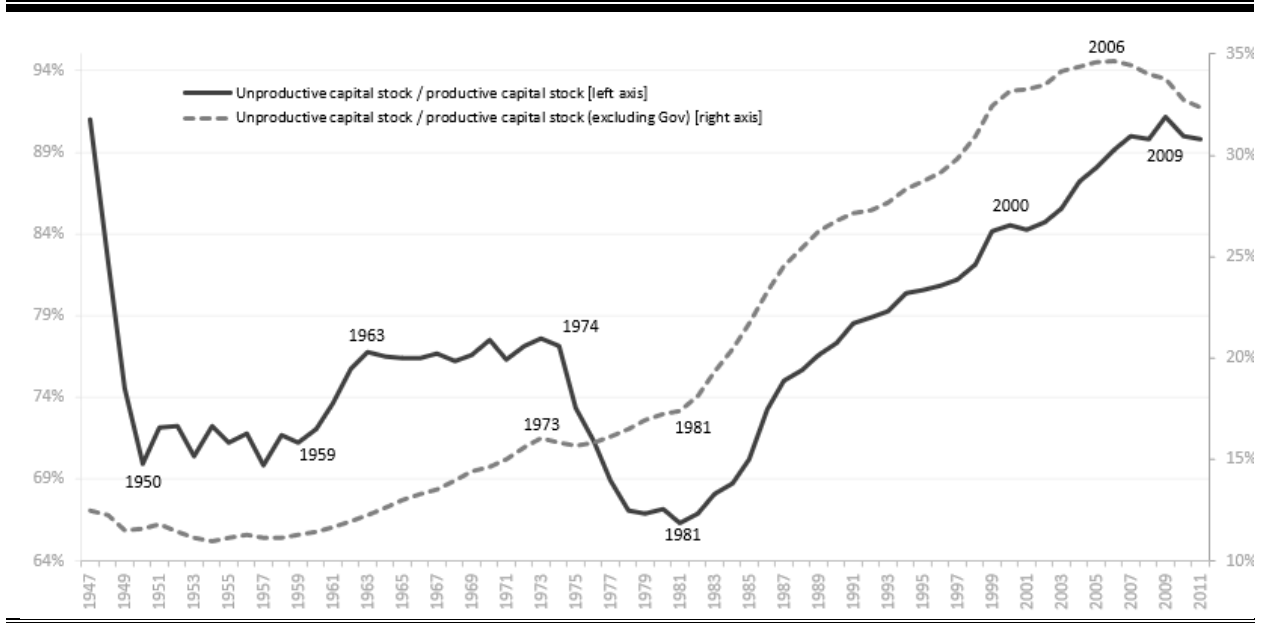
Source: Author's own calculations. Raw data from BEA and BLS.

**Figure 2: Decomposition of the Net Income of Unproductive Activity (1947-2011)**



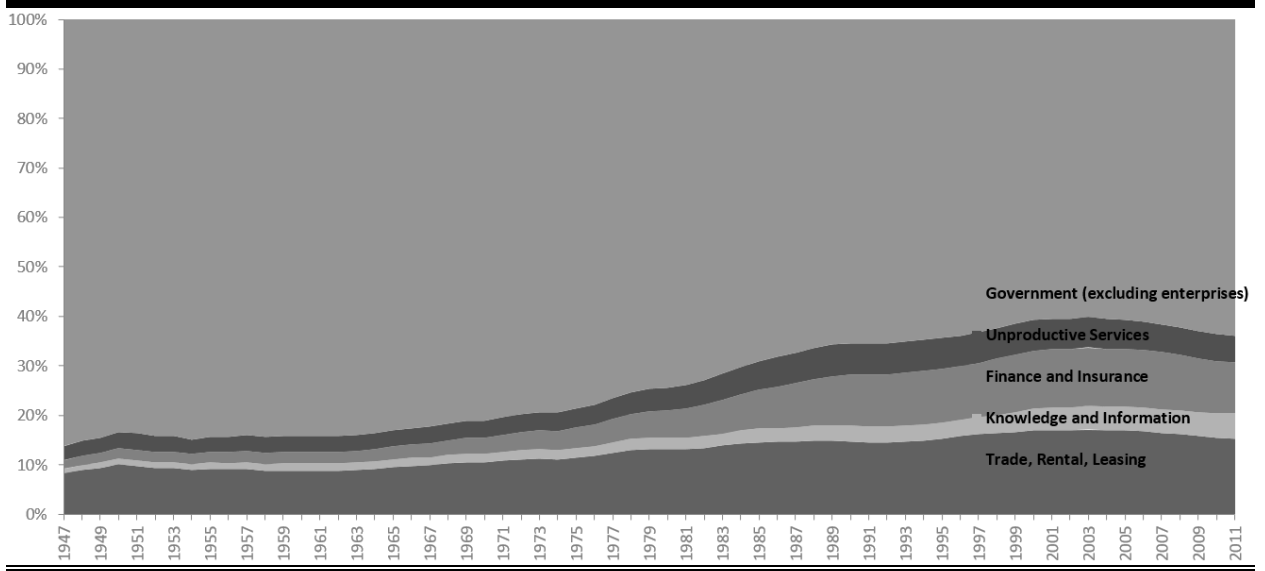
Source: Author's own calculations. Raw data from BEA and BLS.

**Figure 3: Ratio of Unproductive to Productive Capital Stock, with and without Government Fixed Assets (1947-2011)**



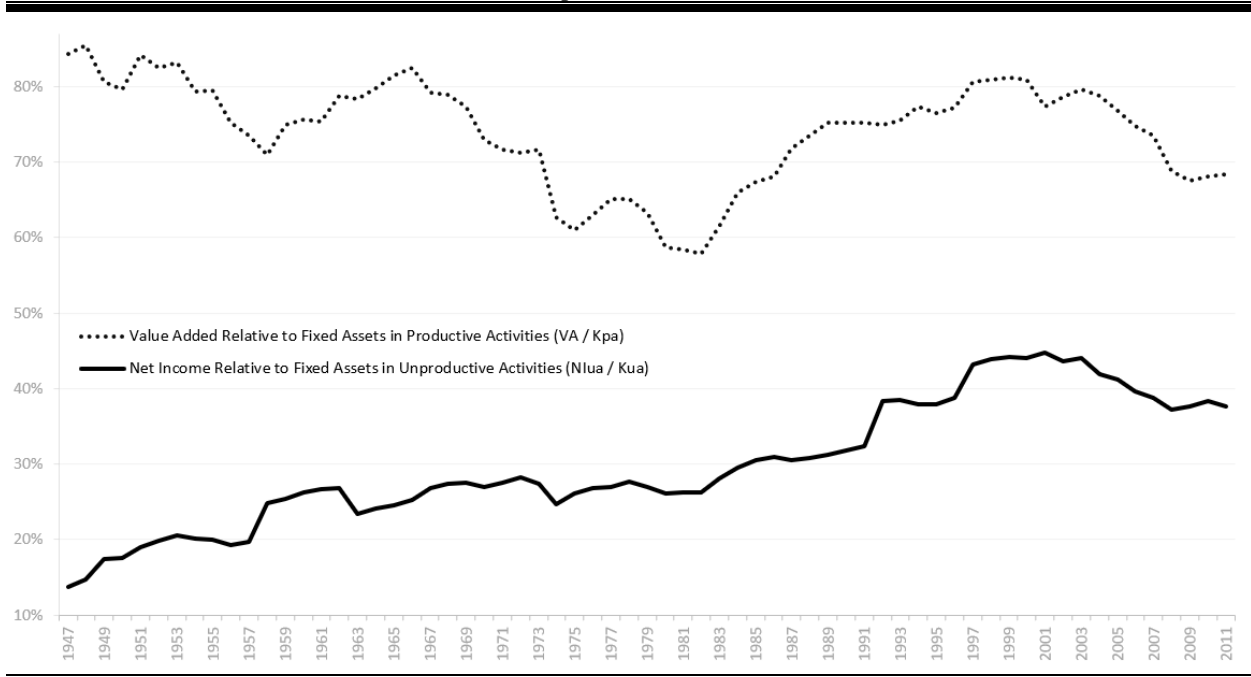
Sources: Author's own calculations. Raw data from BEA and BLS.

**Figure 4: Decomposition of the Capital Stock of Unproductive Activity (1947-2011)**



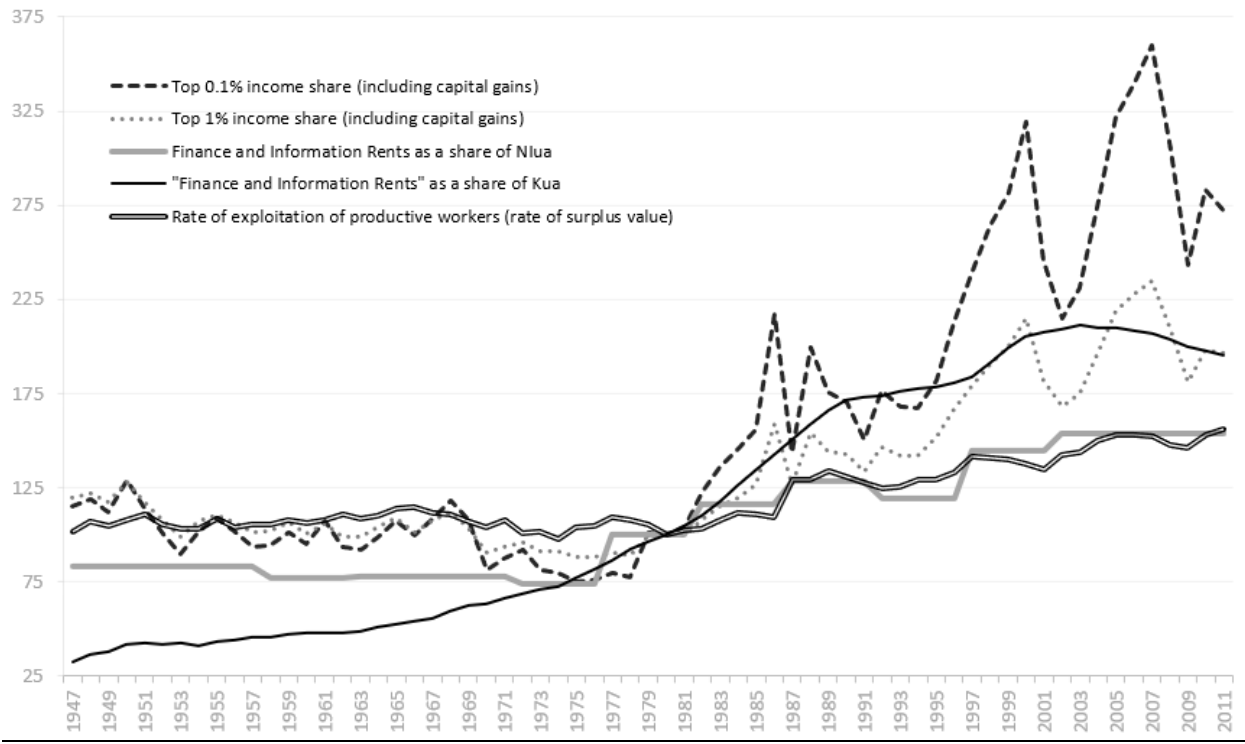
Sources: Author's own calculations. Raw data from BEA and BLS.

**Figure 5: Aggregate Income Relative to Fixed Assets  
in Productive and Unproductive Activities (1947-2011)**



Sources: Author's own calculations. Raw data from BEA and BLS.

**Figure 6:** Top 0.1%, Top 1%, Financial Income and Information Rents, and the Rate of Exploitation – Index Numbers (1980 = 100)



Sources: Author's own calculations. Raw data from BEA and BLS. Top income shares from Piketty (2014).

# **Appendix**

[The entire appendix can be placed online]



# Appendix 1

In this appendix I provide further technical details on estimation and simulation procedures.

## A.1 THE ARDL MODEL

I use the functional form in equation A.1 to estimate the auto-regressive distributed lag (ARDL) models in error correction form:

$$\Delta Y_t = \alpha + \left[ \beta Y_{t-1} + \sum_{j=1}^k \beta_j X_{j,t-1} \right] + \left[ \sum_{i=1}^p \gamma_i \Delta Y_{t-i} + \sum_{h=1}^m \sum_{i=1}^p \gamma_{h,i} \Delta X_{h,t-i} \right] + \varepsilon_t \quad (\text{A.1})$$

Where  $\Delta Y_t$  is the dependent variable in first difference,  $Y_{t-1}$  is the dependent variable in lagged level,  $X_{j,t-1}$  are the  $k$  independent variables in lagged levels,  $\Delta Y_{t-i}$  are the  $p$  lagged differences of the dependent variable,  $\Delta X_{h,t-i}$  are the  $p$  lagged differences of the  $m$  independent variables,  $\alpha$  is a constant, and  $\varepsilon_t$  is a white noise error process.

The variables in lagged levels (the first bracket on the right-hand side) represent the permanent long-run effects. The variables in lagged differences (the second bracket on the right-hand side) represent the temporary short-run effects. The lagged independent variables  $\Delta X_{h,t-i}$  should be at least weakly exogenous, and the error term  $\varepsilon_t$  must be a normally distributed white noise process free of serial correlation. To avoid endogeneity problems, the specifications include lagged terms only. The PSS bounds F-test procedure tests the null hypothesis that the long-run coefficients  $\beta$  and  $\beta_j$  are jointly equal to zero.

In an ARDL model with both long- and short-run effects, and in which the dependent variable  $\Delta Y_t$  is in first differences on the left-hand side of the equation, the coefficient on the lagged dependent variable  $Y_{t-1}$  in levels is expected to be negative. If the coefficient is negative, a rise in the level of the dependent variable will produce a change in the opposite direction, which implies a stable (self-correcting) long-run

equilibrium. If the coefficient were positive, the long-run equilibrium would be unstable and the trajectory of the dependent variable would not converge to its long-run equilibrium.

## **A.2 ASYMMETRY BETWEEN SHORT- AND LONG-RUN REGRESSORS**

On July 6<sup>th</sup>, 2020, I sent the following email to the original authors of the ARDL bounds F-test (Pesaran, Shin, and Smith 2001):

Dear Prof., I have a question about your PSS (2001) bounds F-test and would really appreciate it if you could help me. I have read a few publications that employ the PSS (2001) bounds F-test in an ARDL model in error correction (EC) form with a set of variables that are  $I(1)$  in levels and  $I(0)$  in first differences. However, the authors of these papers selectively drop regressors from the list of variables appearing in lagged level form if they do not cointegrate, while still keeping the same excluded variables in lagged difference form in order to control for short-run effects. Hence, some variables that are  $I(1)$  in levels are included in the ARDL EC model in lagged difference form only (to capture short-run effects) but not in lagged level form (within the long-run cointegrating relationship). So my question to you would be the following: Does your bounds F-test allow for this asymmetry between short-run and long-run variables? Or is it the case that the critical values for the PSS bounds F-test suppose that all  $I(1)$  variables included in lagged difference form must also be included in lagged level form?

Reply from prof. Yongcheol Shin on July 6<sup>th</sup>, 2020:

Strictly speaking, only the number of  $I(1)$  regressors included as the level matters, because the stationary regressors (say first differences) do not affect the limiting distribution of the PSS test. Still, you need to justify why you use  $I(1)$  regressors differently.

Reply from prof. Ron Smith, also on July 6<sup>th</sup>, 2020:

Hashem Pesaran passed your question to me, we work together. The bounds test only applies to the lagged level terms, there is no requirement that the same variables appear both in the first difference and levels terms. Notice that the bounds test is for a long run levels relationship, which is more general than a test for cointegration. It applies whether the variables are  $I(0)$  or  $I(1)$  in levels. But if they are  $I(1)$  in levels, it is perfectly possible for a variable to have a short run effect but no long run effect. If you think of logs of consumption and income being  $I(1)$ , the consumption income relationship may be the only long run relationship, but growth rates of other variables or  $I(0)$  variables may influence the short run growth rate of consumption.

Hence, we can keep an asymmetric list of variables across short-run and long-run effects, giving us more freedom in building the ARDL model.

### A.3 UNIT ROOT TESTS

The PSS bounds F-test allows for I(0) and I(1) variables, but it does not allow for I(2) variables. In Table A.1 I present the results from six unit-root tests on the variables in levels and in differences. The first five unit-root tests are: Augmented Dickey-Fuller (ADF), Philips-Perron (PP), Kwiatkowski–Phillips–Schmidt–Shin (KPSS), Elliott, Rothenberg, Stock (ERS) feasible point optimal test, and the Dickey-Fuller Generalized Least Squares (DF-GLS) test. Note that the KPSS has a null hypothesis of no unit root, which is the opposite of the other unit root tests. Test statistics, null hypotheses, and significance levels are summarized in Table A.1.

The unit root tests indicate that three variables might be I(2) in levels, namely the “share of finance and information rents in Kua”, the “share of information rents in Kua”, and the “Kua / Kpa” ratio. For these three variables we cannot unanimously reject the null of unit root in first differences. Visual inspection of the variables in first differences reveals a structural break in the 1980s which some of the unit root tests identify as a potential unit root process. I run the Zivot-Andrews (ZA) unit-root test with one endogenous structural break to account for the possibility that a seemingly I(1) process is an I(0) process with structural break. The Zivot-Andrews (ZA) model employs an intercept shift and a trend shift to identify a structural change in a time series, selecting the break point endogenously by minimizing the ADF t-statistic. There is strong evidence of an endogenous break point during the 1980s in the first differences given that the ZA test rejects the null of a unit root at the 1% significance level in these three series. Hence, the variables “share of finance and information rents in Kua”, “share of information rents in Kua”, and the “Kua / Kpa” ratio are non-stationary I(1) processes in levels and I(0) break-stationary processes in first differences, with a structural break in the 1980s. For this reason, I add the Neoliberal dummy variable (equal to 1 after 1980) within the long-run relationship in the ARDL models estimated in Tables 3 and 4.

**Table A.1: Unit Root Tests**

	<b>ADF</b>	<b>PP</b>	<b>KPSS</b>	<b>ERS</b>	<b>DF-GLS</b>	<b>ZA</b>	<b>Conclusion</b>
Null hypothesis	Unit root	Unit root	No unit root	Unit root	Unit root	Unit root	
Deterministic components	Drift	Drift	Drift	Drift	Drift	Drift and trend breaks	
<b>Top 0.1% with capital gains</b>							
Level	-0.44	-0.58	1.32***	17.14	-0.24		I(1): non-stationary
First difference	-5.89***	-9.64***	0.17	0.79***	-3.71***		I(0): stationary
<b>Top 1% with capital gains</b>							
Level	-0.38	-0.47	1.25***	16.04	-0.25		I(1): non-stationary
First difference	-5.79***	-9.26***	0.23	0.76***	-3.82***		I(0): stationary
<b>Value Added</b>							
Level	-1.25	-1.53	1.72***	760.01	1.16		I(1): non-stationary
First difference	-5.88***	-8.08***	0.19	0.97***	-2.72***		I(0): stationary
<b>Rate of exploitation</b>							
Level	0.002	-0.16	1.38***	32.06	0.67		I(1): non-stationary
First difference	-5.31***	-8.55***	0.15	1.39***	-2.41**		I(0): stationary
<b>Labor productivity</b>							
Level	-1.33	-1.35	1.70***	1831.1	1.35		I(1): non-stationary
First difference	-4.92***	-7.02***	0.25	1.05***	-3.63***		I(0): stationary
<b>Share of finance and information rents in NIua</b>							
Level	-0.22	-0.19	1.52***	35.83	0.18		I(1): non-stationary
First difference	-5.73***	-8.09***	0.17	0.67***	-3.98***		I(0): stationary
<b>Share of information rents in NIua</b>							
Level	-0.78	-0.80	1.31***	14.37	-0.61		I(1): non-stationary
First difference	-5.53***	-7.90***	0.12	0.69***	-3.87***		I(0): stationary
<b>NIua / Value Added</b>							
Level	-2.19	-1.70	1.57***	107.44	0.15		I(1): non-stationary
First difference	-5.27***	-9.22***	0.12	1.98**	-2.09**		I(0): stationary
<b>Share of finance and information rents in Kua</b>							
Level	-1.09	-1.74	1.70***	185.66	0.33		I(1): non-stationary
First difference	-2.52	-5.31***	0.42*	19.42	-0.55	-6.44*** (a)	I(0): break-stationary
Second difference	-7.11***	-15.91***	0.10	1.10***	-0.37		I(0): stationary
<b>Share of information rents in Kua</b>							
Level	-0.38	-1.62	1.72***	992.31	2.70		I(1): non-stationary
First difference	-4.56***	-7.60***	0.15	7.87	-0.78	-5.79*** (b)	I(0): break-stationary
<b>Kua / Kpa</b>							
Level	-1.19	-1.80	0.80***	21.73	-1.63*		I(1): non-stationary
First difference	-6.09***	-5.48***	0.42*	20.28	-0.50	-6.45*** (c)	I(0): break-stationary
Second difference	-7.13***	-11.36***	0.22	0.73***	-5.74***		I(0): stationary

*Note:* Significance levels: 10% (\*), 5% (\*\*), and 1% (\*\*\*). Variables in levels are in logs. Regression results are for the entire postwar period (1947-2011). ZA unit root test with one endogenous break point, using both intercept and trend shifts: (a) with 3 lags, structural break in 1989; with 1 lag, structural break in 1983; (b) with 3 lags, structural break in 1997; with 1 lag, structural break in 1950; (c) with 3 lags, structural break in 1981; with 1 lag, structural break in 1981.

#### A.4 SIMULATION OF ECONOMIC EFFECTS

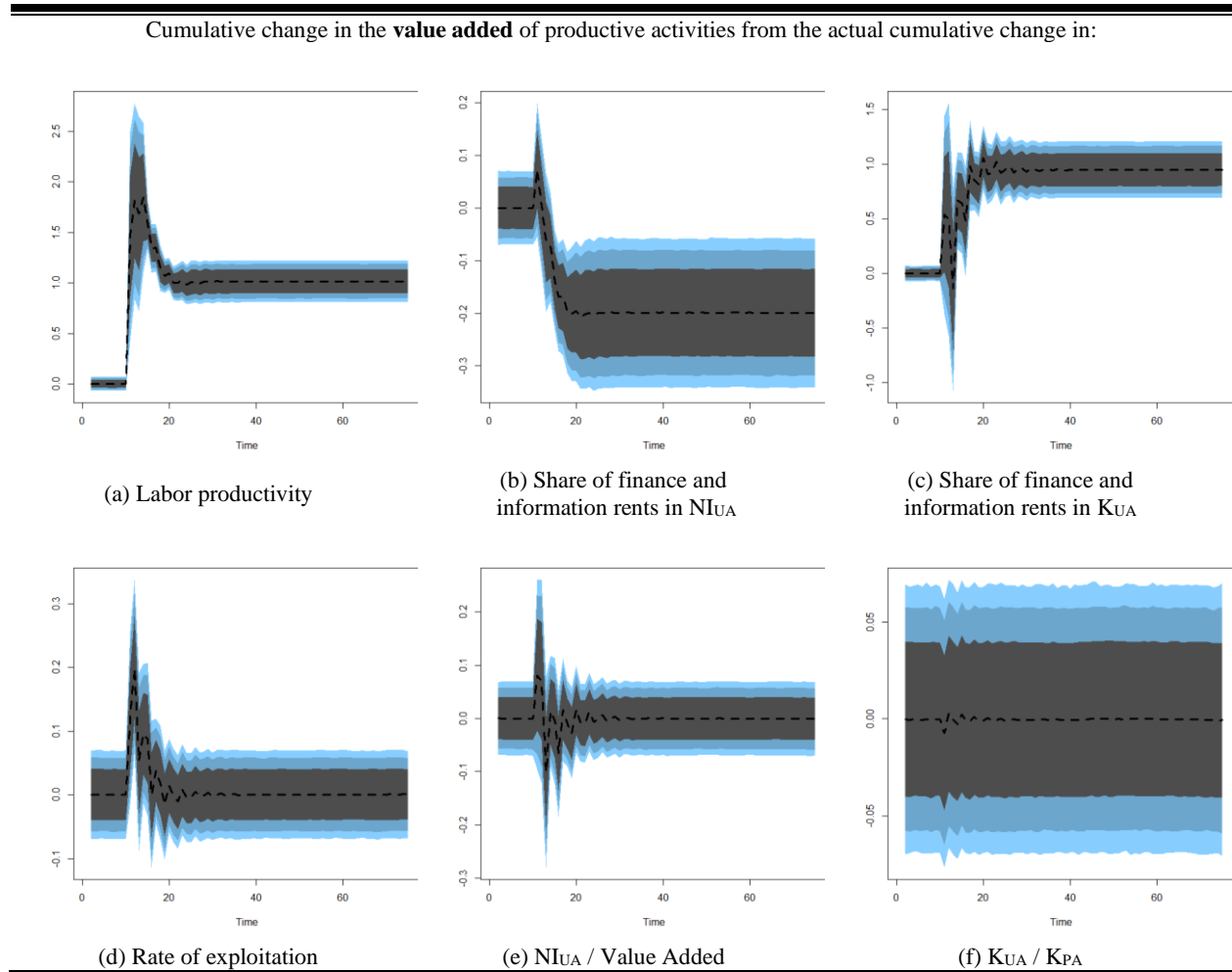
To compute the ARDL specifications, PSS bounds F-tests, and model simulations with bootstrapped intervals, I use the approach from Jordan and Philips (2018) and Philips (2018) and their open-source package “dynamac” for R. Jordan and Philips (2018) and Philips (2018) compute the ARDL simulations as follows. The ARDL coefficients are simulated through 20,000 draws from a multivariate normal distribution with mean and variance from the estimated variance-covariance matrix from equation A.1. A stochastic component is added to the predicted value of each simulation by computing the standard deviations scaled by random draws from the chi-squared distribution. The independent variables in levels are held at their means and other variables in differences are held at 0. A “burn in” period of 10 years allows equation A.1 to equilibrate before the independent variables are shocked. The 20,000 simulated draws do not lower uncertainty as they do not decrease the underlying variance from equation A.1. More simulations just improve and smooth the estimates within each time period. Simulation plots of all models are available in appendix 2.

In this paper I simulate the ARDL models using impulses that replicate the actual cumulative changes in the underlying variables from 1947 to 2011. For the variables in lagged differences, the respective temporary responses of the dependent variables will decay to zero over time. For the variables in lagged levels, the responses of the dependent variables will converge to their long-run economic effect. The economic effect of a regressor is equal to its long-run elasticity times the actual cumulative change in the underlying variable. Tables 5 and 6 in the main text present the long-run elasticities, cumulative changes, and economic effects of the regressors in each model. The '--' symbol indicates that the regressor is included only in lagged differences.

## Appendix 2

In this appendix I present the simulations of the ARDL models in Tables 3 and 4. The simulations show the temporary short-run effects as well as the permanent long-run economic effects. Regressors receive an impulse equal to the actual cumulative change in the respective variables as reported in Tables 5 and 6.

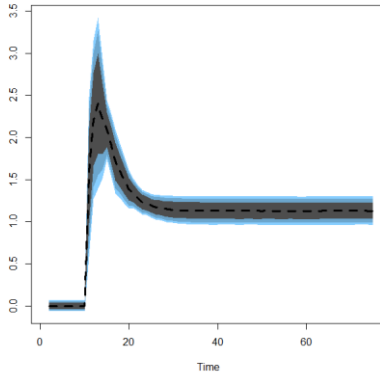
**Figure A1: Economic Effect on Value Added (Model 1a)**



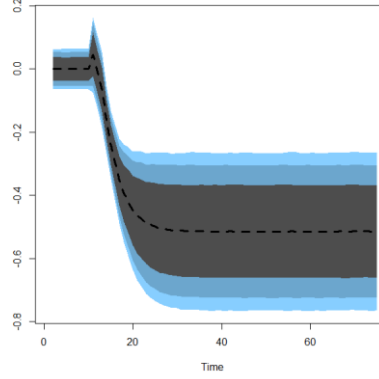
*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A2: Economic Effect on Value Added (Model 1b)**

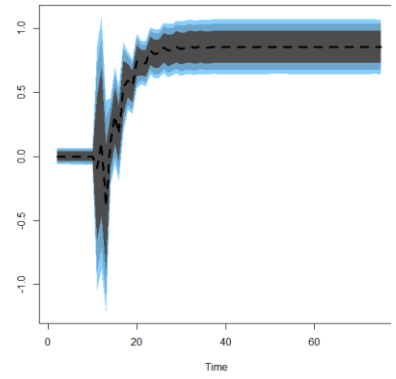
Cumulative change in the **value added** of productive activities from the actual cumulative change in:



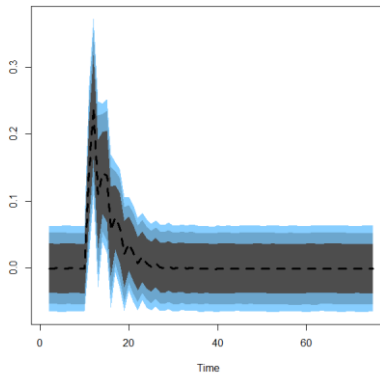
(a) Labor productivity



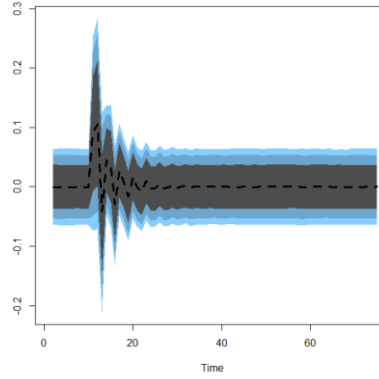
(b) Share of finance and information rents in  $NI_{UA}$



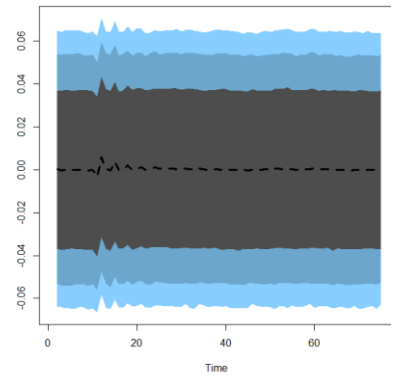
(c) Share of finance and information rents in  $K_{UA}$



(d) Rate of exploitation



(e)  $NI_{UA} / \text{Value Added}$

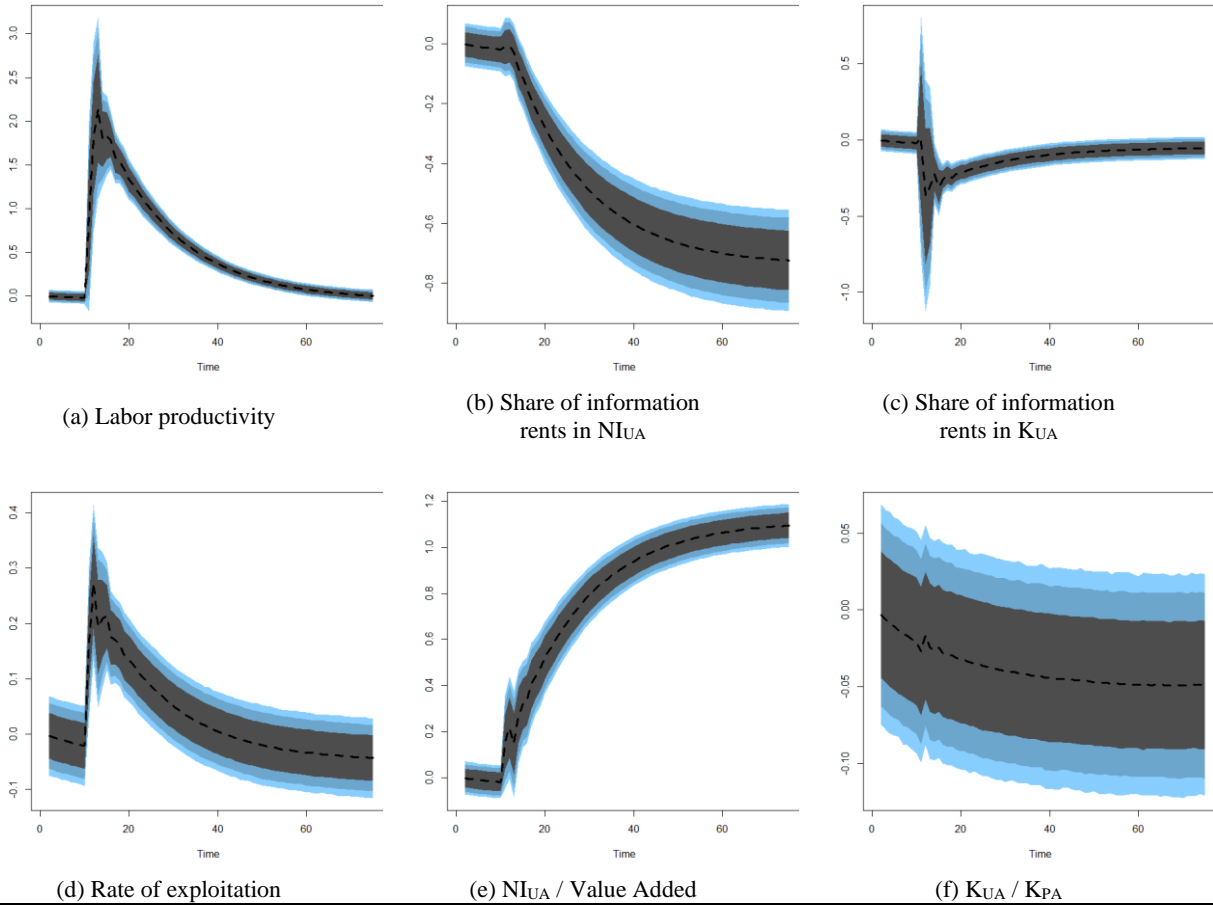


(f)  $K_{UA} / K_{PA}$

*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A3: Economic Effect on Value Added (Model 1c)**

Cumulative change in the **value added** of productive activities from the actual cumulative change in:

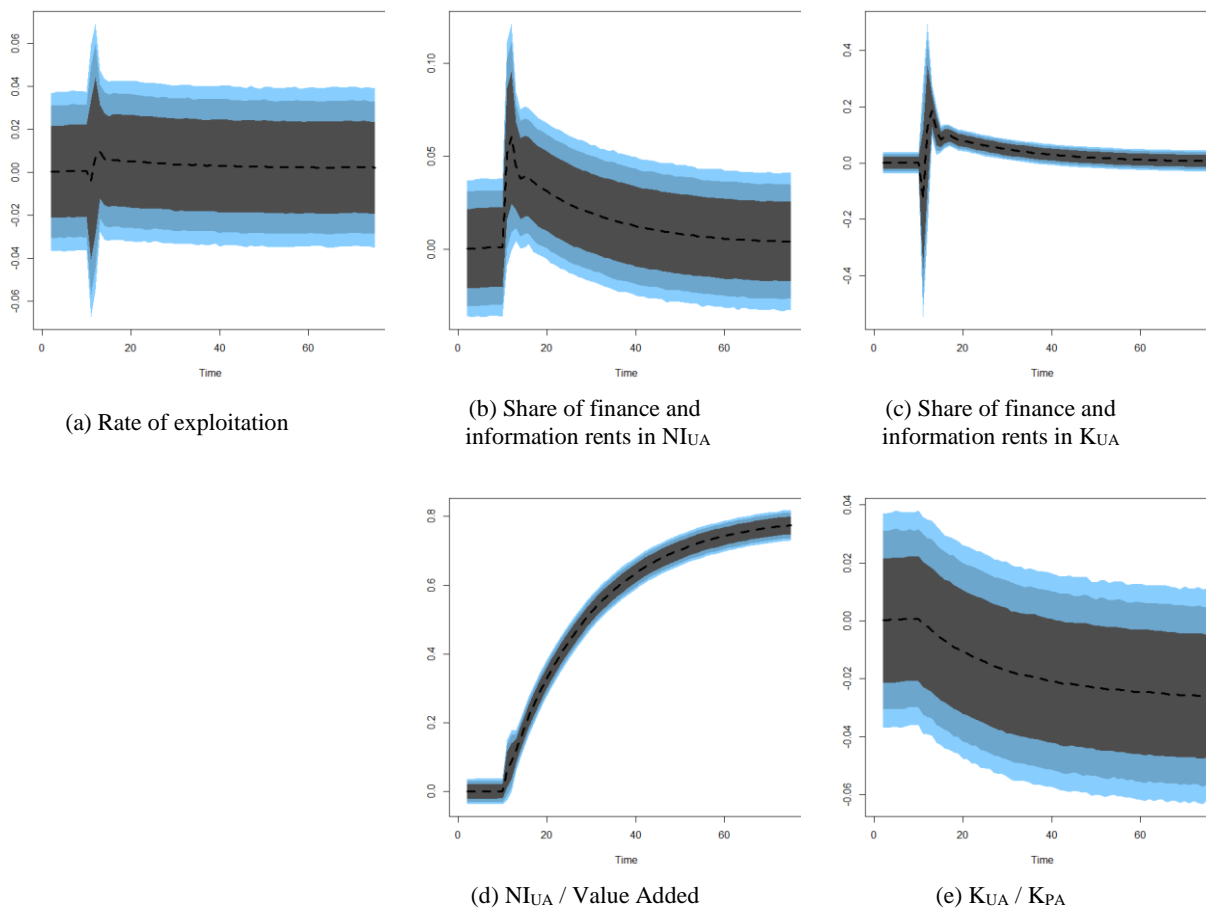


*Note:* ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.



**Figure A4: Economic Effect on Labor Productivity (Model 2a)**

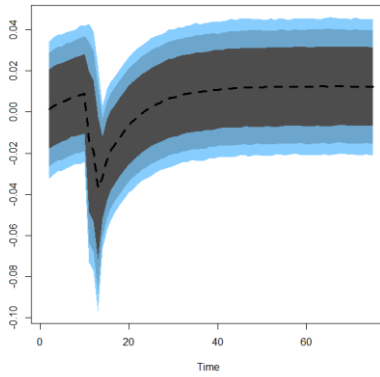
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



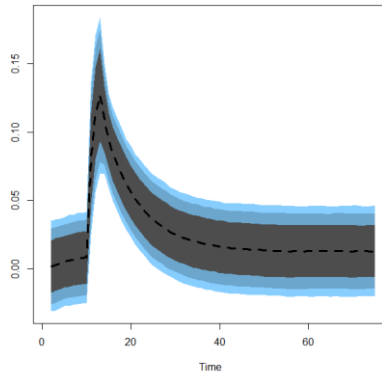
*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A5: Economic Effect on Labor Productivity (Model 2b)**

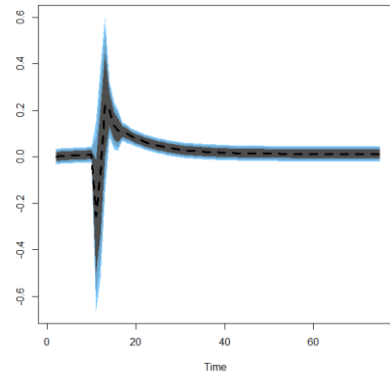
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



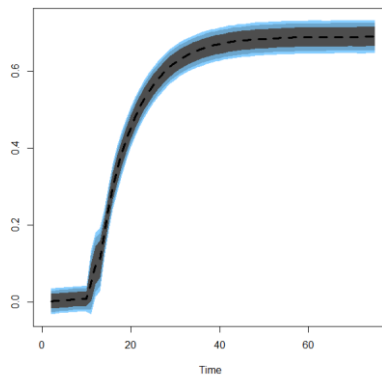
(a) Rate of exploitation



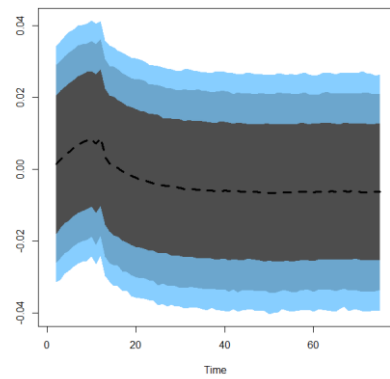
(b) Share of finance and information rents in  $NI_{UA}$



(c) Share of finance and information rents in  $K_{UA}$



(d)  $NI_{UA} / \text{Value Added}$

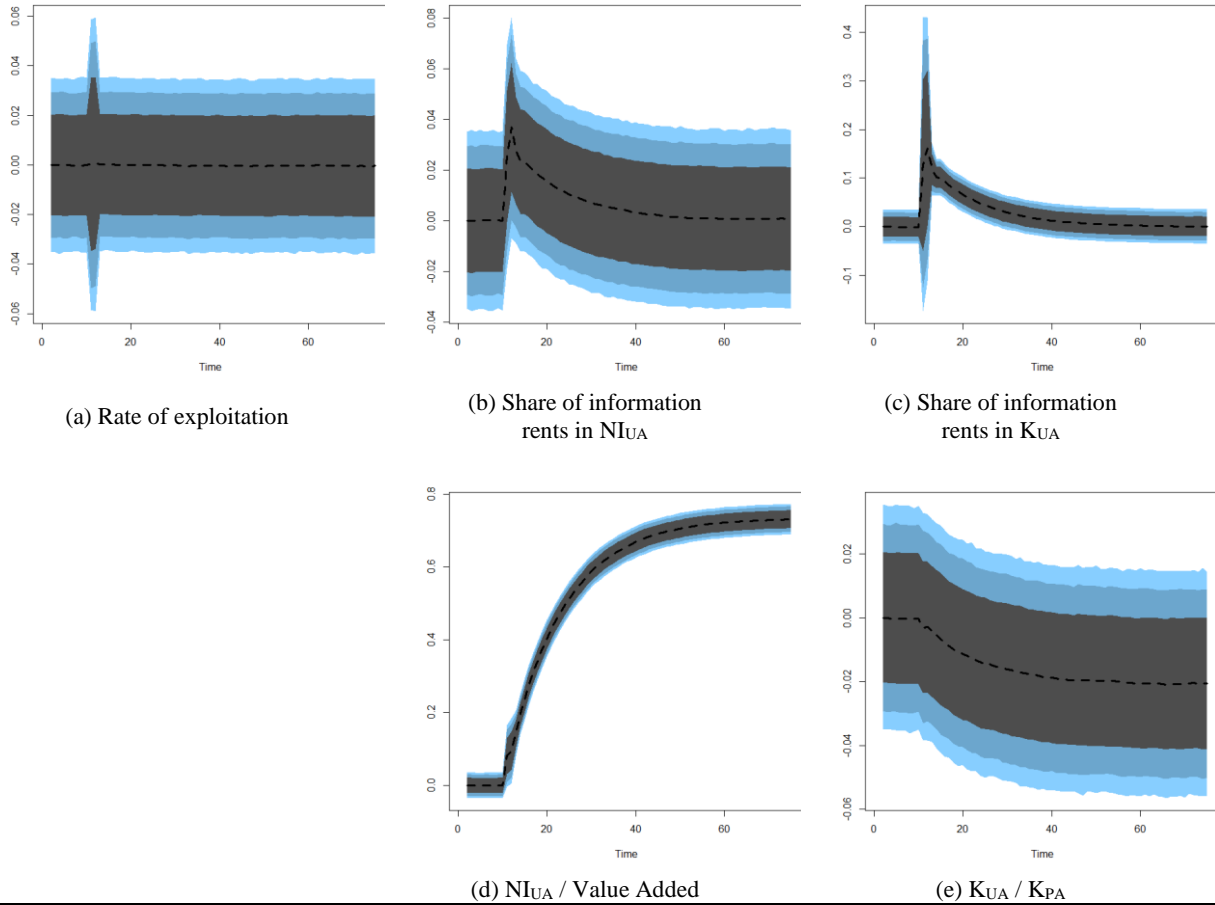


(e)  $K_{UA} / K_{PA}$

*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A6: Economic Effect on Labor Productivity (Model 2c)**

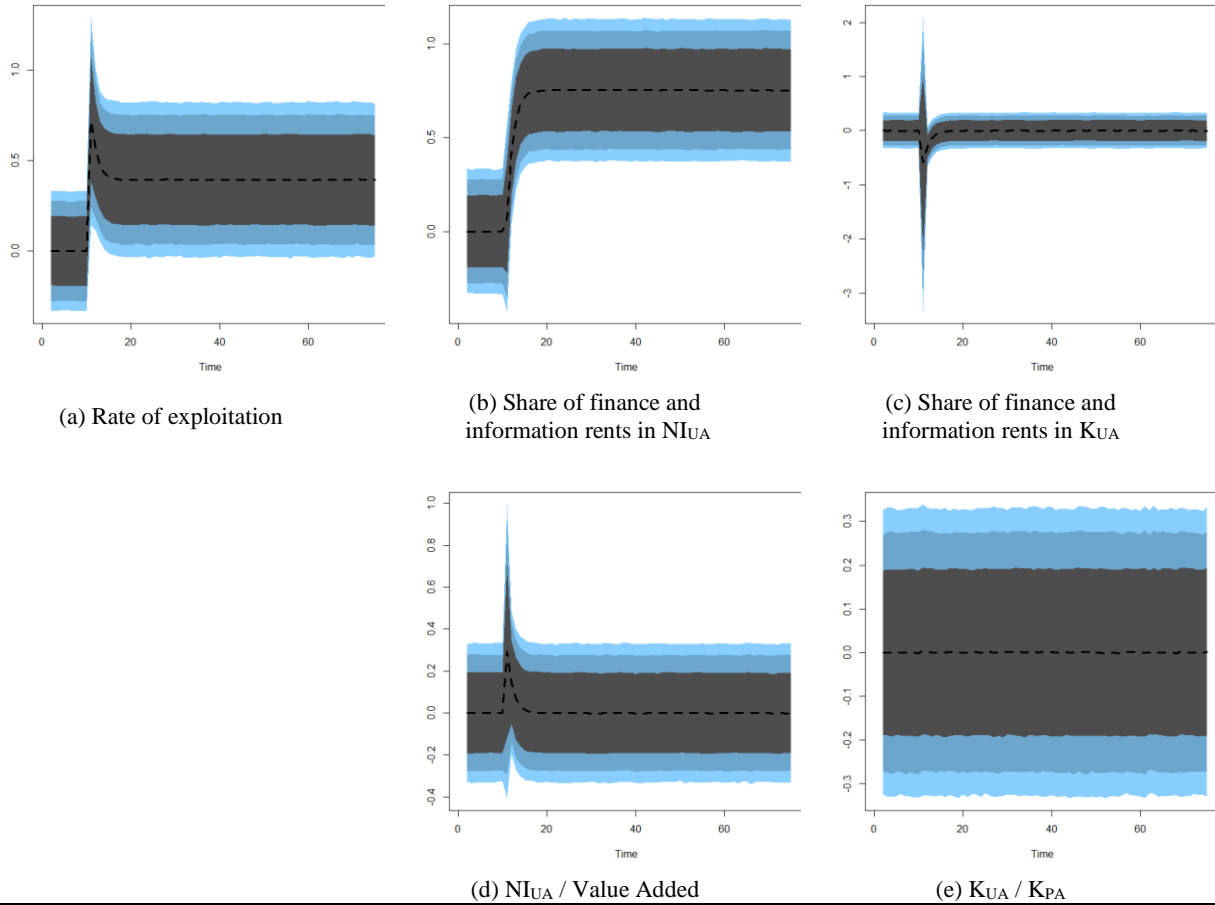
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



*Note:* ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A7: Economic Effect on Inequality (Model 3a)**

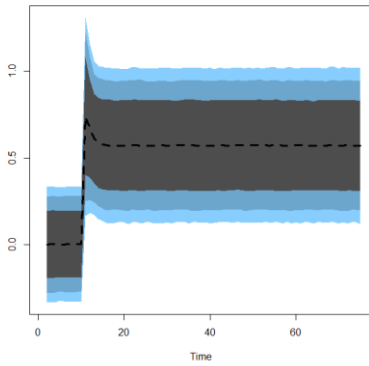
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



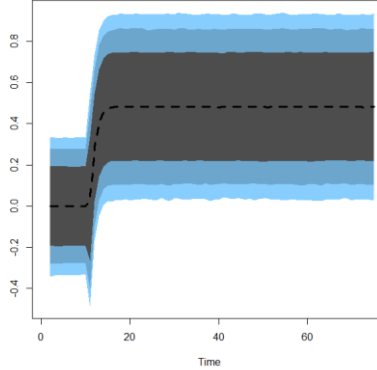
*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A8: Economic Effect on Inequality (Model 3b)**

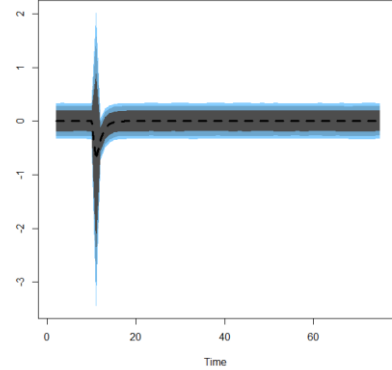
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



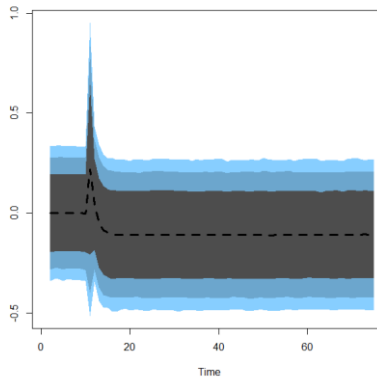
(a) Rate of exploitation



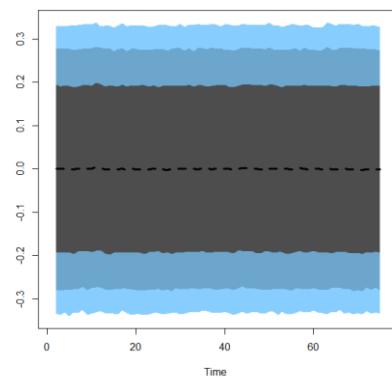
(b) Share of finance and information rents in  $NI_{UA}$



(c) Share of finance and information rents in  $K_{UA}$



(d)  $NI_{UA} / \text{Value Added}$

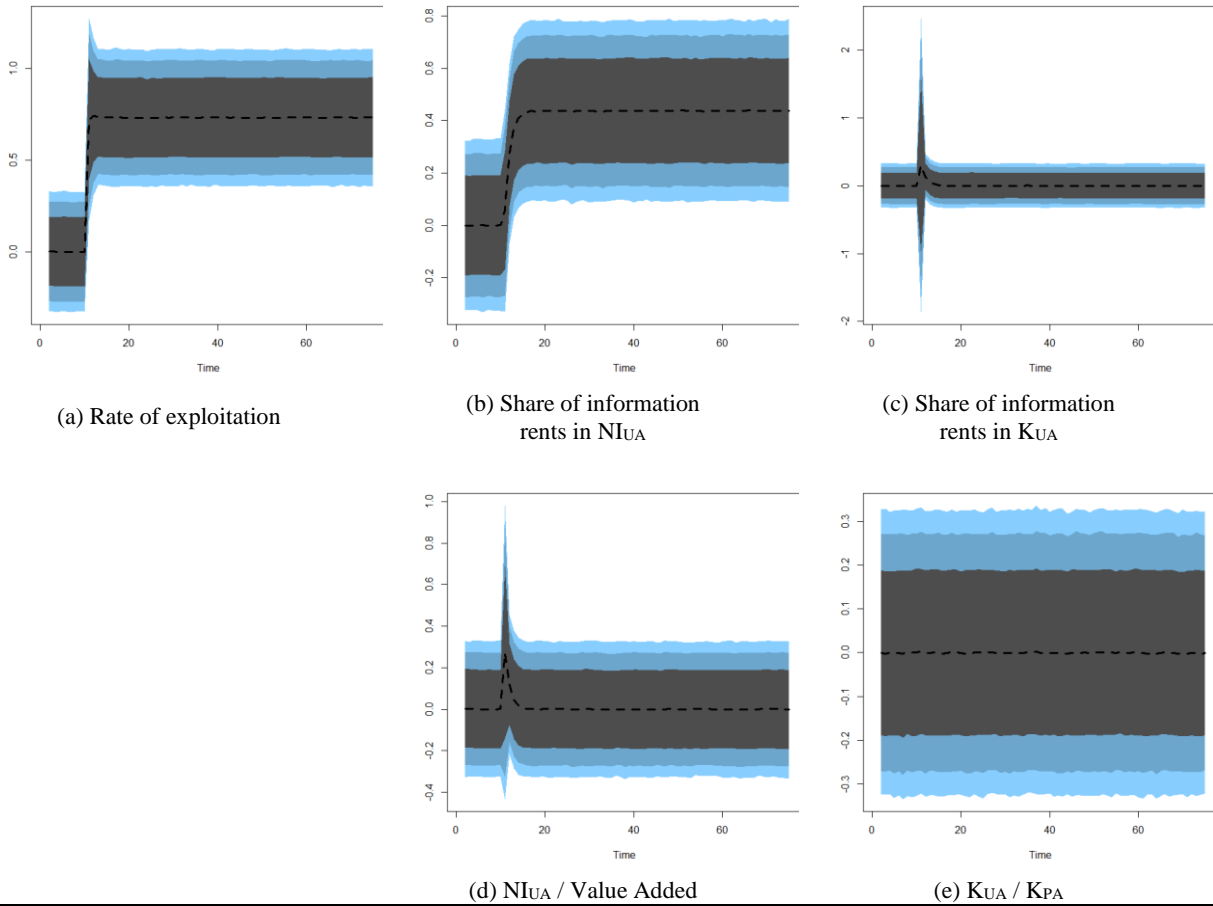


(e)  $K_{UA} / K_{PA}$

*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A9: Economic Effect on Inequality (Model 3c)**

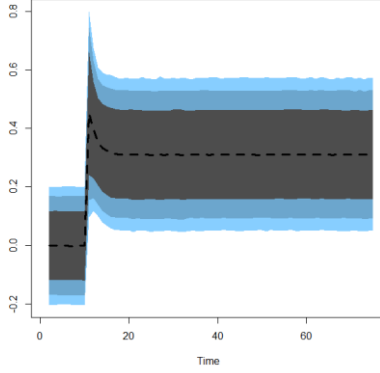
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



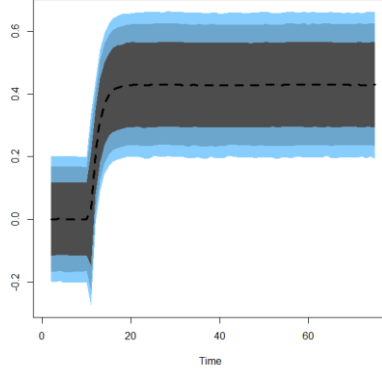
*Note:* ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A10: Economic Effect on Inequality (Model 4a)**

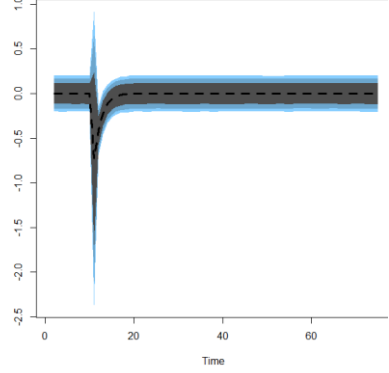
Cumulative change in the **income share of the top 1%** from the actual cumulative change in:



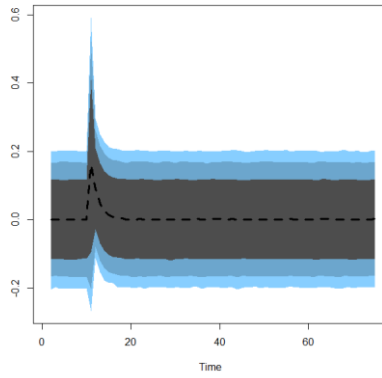
(a) Rate of exploitation



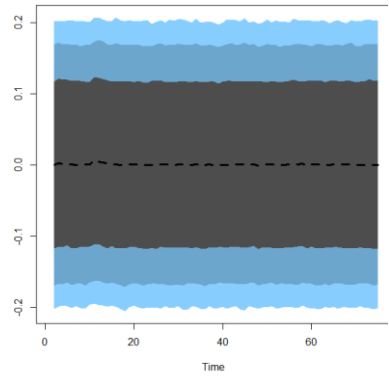
(b) Share of finance and information rents in  $NI_{UA}$



(c) Share of finance and information rents in  $K_{UA}$



(d)  $NI_{UA} / \text{Value Added}$

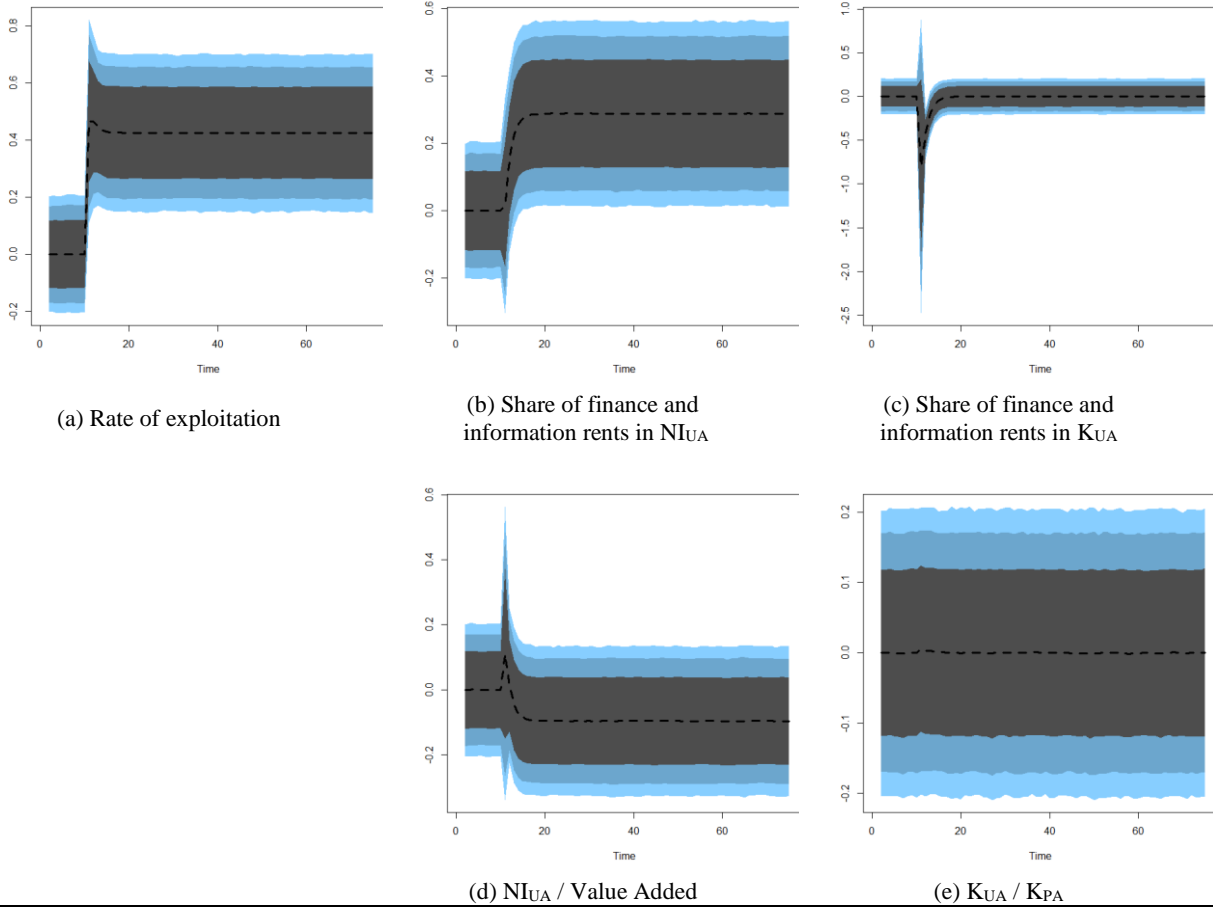


(e)  $K_{UA} / K_{PA}$

*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

**Figure A11: Economic Effect on Inequality (Model 4b)**

Cumulative change in the **income share of the top 1%** from the actual cumulative change in:

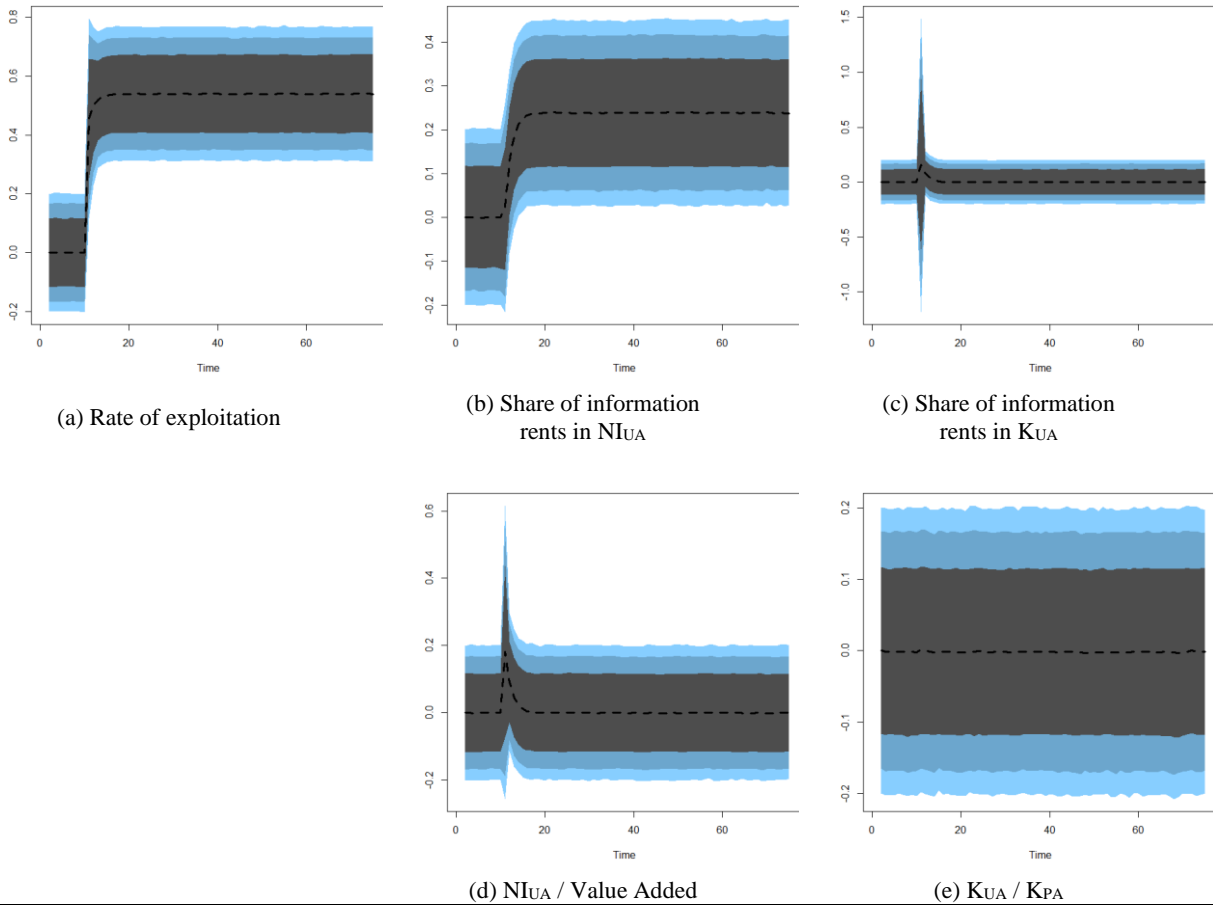


*Note:* ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.



**Figure A12: Economic Effect on Inequality (Model 4c)**

Cumulative change in the **income share of the top 1%** from the actual cumulative change in:



*Note:* ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

## Appendix 3

In this appendix I present the classification of productive and unproductive activities using the 2002 BEA modified benchmark input-output table. Table A.2 shows the classification that I maintain throughout the paper. The methodology employed follows the approach developed in Rotta (2018). For a detailed explanation of the construction of all series from 1947 to 2011 for the United States, see the long appendix of Rotta (2018).

There are, evidently, some specific activities that are difficult to classify in practice. But from an empirical perspective, borderline sectors are not big enough to modify the aggregate measures in any significant way. Even if we modify the classification of certain particular sectors, the aggregate measures at the national level will change only slightly.

The paper focuses on the 1947-2011 period because the available data and the most recent methodology (from Rotta 2018) to transform the BEA input-output matrices and the NIPA accounts into Marxist categories relate to that time frame. At the time of writing, the BEA has released two newer benchmark input-output matrices, one for 2007 and another for 2012. But the more recent period requires a different estimation methodology, given that in the years from 1997 to 2019 the BEA has released both the benchmark input-output matrices (with 405 industries) and also the aggregate annual input-output matrices (with 71 industries). The estimation of Marxist categories from the combination of benchmark input-output matrices and aggregate annual input-output matrices requires a proper estimation technique that is not yet available in the literature. The main difference in terms of estimation techniques is that the current methodology from Rotta (2018) interpolates the benchmark input-output matrices with the NIPA accounts, while a newer technique must be developed to interpolate the benchmark input-output matrices with the annual aggregate input-output matrices between 1997 and 2019.

**Table A.2: 2002 BEA Modified Benchmark Input-Output Matrix**

<b>Productive Activities</b>	<b>code</b>	<b>Productive Activities (continued)</b>	<b>code</b>
Oilseed farming	<b>1111A0</b>	Rolling mill and other metalworking machinery manufacturing	<b>33351B</b>
Grain farming	<b>1111B0</b>	Turbine and turbine generator set units manufacturing	<b>333611</b>
Vegetable and melon farming	<b>111200</b>	Speed changer, industrial high-speed drive, and gear manufacturing	<b>333612</b>
Tree nut farming	<b>111335</b>	Mechanical power transmission equipment manufacturing	<b>333613</b>
Fruit farming	<b>1113A0</b>	Other engine equipment manufacturing	<b>333618</b>
Greenhouse, nursery, and floriculture production	<b>111400</b>	Pump and pumping equipment manufacturing	<b>333911</b>
Tobacco farming	<b>111910</b>	Air and gas compressor manufacturing	<b>333912</b>
Cotton farming	<b>111920</b>	Material handling equipment manufacturing	<b>333920</b>
Sugarcane and sugar beet farming	<b>1119A0</b>	Power-driven handtool manufacturing	<b>333991</b>
All other crop farming	<b>1119B0</b>	Packaging machinery manufacturing	<b>333993</b>
Dairy cattle and milk production	<b>112120</b>	Industrial process furnace and oven manufacturing	<b>333994</b>
Cattle ranching and farming	<b>1121A0</b>	Other general purpose machinery manufacturing	<b>33399A</b>
Poultry and egg production	<b>112300</b>	Fluid power process machinery	<b>33399B</b>
Animal production, except cattle and poultry and eggs	<b>112A00</b>	Electronic computer manufacturing	<b>334111</b>
Logging	<b>113300</b>	Computer storage device manufacturing	<b>334112</b>
Forest nurseries, forest products, and timber tracts	<b>113A00</b>	Computer terminals and other computer peripheral equipment manufacturing	<b>33411A</b>
Fishing	<b>114100</b>	Telephone apparatus manufacturing	<b>334210</b>
Hunting and trapping	<b>114200</b>	Broadcast and wireless communications equipment	<b>334220</b>
Support activities for agriculture and forestry	<b>115000</b>	Other communications equipment manufacturing	<b>334290</b>
Oil and gas extraction	<b>211000</b>	Audio and video equipment manufacturing	<b>334300</b>
Coal mining	<b>212100</b>	Electron tube manufacturing	<b>334411</b>
Iron ore mining	<b>212210</b>	Bare printed circuit board manufacturing	<b>334412</b>
Copper, nickel, lead, and zinc mining	<b>212230</b>	Semiconductor and related device manufacturing	<b>334413</b>
Gold, silver, and other metal ore mining	<b>2122A0</b>	Electronic connector manufacturing	<b>334417</b>
Stone mining and quarrying	<b>212310</b>	Printed circuit assembly (electronic assembly) manufacturing	<b>334418</b>
Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	<b>212320</b>	Other electronic component manufacturing	<b>334419</b>
Other nonmetallic mineral mining and quarrying	<b>212390</b>	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing	<b>33441A</b>
Drilling oil and gas wells	<b>213111</b>	Electromedical and electrotherapeutic apparatus manufacturing	<b>334510</b>
Support activities for oil and gas operations	<b>213112</b>	Search, detection, and navigation instruments manufacturing	<b>334511</b>
Support activities for other mining	<b>21311A</b>	Automatic environmental control manufacturing	<b>334512</b>
Electric power generation, transmission, and distribution	<b>221100</b>	Industrial process variable instruments manufacturing	<b>334513</b>
Natural gas distribution	<b>221200</b>	Totalizing fluid meters and counting devices manufacturing	<b>334514</b>
Water, sewage and other systems	<b>221300</b>	Electricity and signal testing instruments manufacturing	<b>334515</b>
Nonresidential commercial and health care structures	<b>230101</b>	Analytical laboratory instrument manufacturing	<b>334516</b>
Nonresidential manufacturing structures	<b>230102</b>	Irradiation apparatus manufacturing	<b>334517</b>
Other nonresidential structures	<b>230103</b>	Watch, clock, and other measuring and controlling device manufacturing	<b>33451A</b>
Residential permanent site single- and multi-family structures	<b>230201</b>	Magnetic and optical recording media manufacturing	<b>334613</b>
Other residential structures	<b>230202</b>	Electric lamp bulb and part manufacturing	<b>335110</b>
Nonresidential maintenance and repair	<b>230301</b>	Lighting fixture manufacturing	<b>335120</b>
Residential maintenance and repair	<b>230302</b>	Small electrical appliance manufacturing	<b>335210</b>
Dog and cat food manufacturing	<b>311111</b>	Household cooking appliance manufacturing	<b>335221</b>
Other animal food manufacturing	<b>311119</b>	Household refrigerator and home freezer manufacturing	<b>335222</b>
Flour milling and malt manufacturing	<b>311210</b>	Household laundry equipment manufacturing	<b>335224</b>
Wet corn milling	<b>311221</b>	Other major household appliance manufacturing	<b>335228</b>
Fats and oils refining and blending	<b>311225</b>	Power, distribution, and specialty transformer manufacturing	<b>335311</b>
Soybean and other oilseed processing	<b>31122A</b>	Motor and generator manufacturing	<b>335312</b>
Breakfast cereal manufacturing	<b>311230</b>	Switchgear and switchboard apparatus manufacturing	<b>335313</b>
Beet sugar manufacturing	<b>311313</b>	Relay and industrial control manufacturing	<b>335314</b>

Sugar cane mills and refining	<b>31131A</b>	Storage battery manufacturing	<b>335911</b>
Chocolate and confectionery manufacturing from cacao beans	<b>311320</b>	Primary battery manufacturing	<b>335912</b>
Confectionery manufacturing from purchased chocolate	<b>311330</b>	Communication and energy wire and cable manufacturing	<b>335920</b>
Nonchocolate confectionery manufacturing	<b>311340</b>	Wiring device manufacturing	<b>335930</b>
Frozen food manufacturing	<b>311410</b>	Carbon and graphite product manufacturing	<b>335991</b>
Fruit and vegetable canning, pickling, and drying	<b>311420</b>	All other miscellaneous electrical equipment and component manufacturing	<b>335999</b>
Cheese manufacturing	<b>311513</b>	Automobile manufacturing	<b>336111</b>
Dry, condensed, and evaporated dairy product manufacturing	<b>311514</b>	Light truck and utility vehicle manufacturing	<b>336112</b>
Fluid milk and butter manufacturing	<b>31151A</b>	Heavy duty truck manufacturing	<b>336120</b>
Ice cream and frozen dessert manufacturing	<b>311520</b>	Motor vehicle body manufacturing	<b>336211</b>
Poultry processing	<b>311615</b>	Truck trailer manufacturing	<b>336212</b>
Animal (except poultry) slaughtering, rendering, and processing	<b>31161A</b>	Motor home manufacturing	<b>336213</b>
Seafood product preparation and packaging	<b>311700</b>	Travel trailer and camper manufacturing	<b>336214</b>
Bread and bakery product manufacturing	<b>311810</b>	Motor vehicle parts manufacturing	<b>336300</b>
Cookie, cracker, and pasta manufacturing	<b>311820</b>	Aircraft manufacturing	<b>336411</b>
Tortilla manufacturing	<b>311830</b>	Aircraft engine and engine parts manufacturing	<b>336412</b>
Snack food manufacturing	<b>311910</b>	Other aircraft parts and auxiliary equipment manufacturing	<b>336413</b>
Coffee and tea manufacturing	<b>311920</b>	Guided missile and space vehicle manufacturing	<b>336414</b>
Flavoring syrup and concentrate manufacturing	<b>311930</b>	Railroad rolling stock manufacturing	<b>336500</b>
Seasoning and dressing manufacturing	<b>311940</b>	Ship building and repairing	<b>336611</b>
All other food manufacturing	<b>311990</b>	Boat building	<b>336612</b>
Soft drink and ice manufacturing	<b>312110</b>	Motorcycle, bicycle, and parts manufacturing	<b>336991</b>
Breweries	<b>312120</b>	Military armored vehicle, tank, and tank component manufacturing	<b>336992</b>
Wineries	<b>312130</b>	All other transportation equipment manufacturing	<b>336999</b>
Distilleries	<b>312140</b>	Wood kitchen cabinet and countertop manufacturing	<b>337110</b>
Tobacco product manufacturing	<b>3122A0</b>	Upholstered household furniture manufacturing	<b>337121</b>
Fiber, yarn, and thread mills	<b>313100</b>	Nonupholstered wood household furniture manufacturing	<b>337122</b>
Broadwoven fabric mills	<b>313210</b>	Institutional furniture manufacturing	<b>337127</b>
Narrow fabric mills and schiffli machine embroidery	<b>313220</b>	Propulsion units and parts for space vehicle and guided missiles	<b>33641A</b>
Nonwoven fabric mills	<b>313230</b>	Metal and other household furniture (except wood) manufacturing	<b>33712A</b>
Knit fabric mills	<b>313240</b>	Office furniture and custom architectural woodwork and millwork manufacturing	<b>337212</b>
Textile and fabric finishing mills	<b>313310</b>	Showcase, partition, shelving, and locker manufacturing	<b>337215</b>
Fabric coating mills	<b>313320</b>	Wood television, radio, and sewing machine cabinet manufacturing	<b>33721A</b>
Carpet and rug mills	<b>314110</b>	Mattress manufacturing	<b>337910</b>
Curtain and linen mills	<b>314120</b>	Blind and shade manufacturing	<b>337920</b>
Textile bag and canvas mills	<b>314910</b>	Laboratory apparatus and furniture manufacturing	<b>339111</b>
All other textile product mills	<b>314990</b>	Surgical and medical instrument manufacturing	<b>339112</b>
Apparel knitting mills	<b>315100</b>	Surgical appliance and supplies manufacturing	<b>339113</b>
Cut and sew apparel contractors	<b>315210</b>	Dental equipment and supplies manufacturing	<b>339114</b>
Men's and boys' cut and sew apparel manufacturing	<b>315220</b>	Ophthalmic goods manufacturing	<b>339115</b>
Women's and girls' cut and sew apparel manufacturing	<b>315230</b>	Dental laboratories	<b>339116</b>
Other cut and sew apparel manufacturing	<b>315290</b>	Jewelry and silverware manufacturing	<b>339910</b>
Apparel accessories and other apparel manufacturing	<b>315900</b>	Sporting and athletic goods manufacturing	<b>339920</b>
Leather and hide tanning and finishing	<b>316100</b>	Doll, toy, and game manufacturing	<b>339930</b>
Footwear manufacturing	<b>316200</b>	Office supplies (except paper) manufacturing	<b>339940</b>
Other leather and allied product manufacturing	<b>316900</b>	Sign manufacturing	<b>339950</b>
Sawmills and wood preservation	<b>321100</b>	Gasket, packing, and sealing device manufacturing	<b>339991</b>
Reconstituted wood product manufacturing	<b>321219</b>	Musical instrument manufacturing	<b>339992</b>
Veneer and plywood manufacturing	<b>32121A</b>	Broom, brush, and mop manufacturing	<b>33999A</b>
Engineered wood member and truss manufacturing	<b>32121B</b>	All other miscellaneous manufacturing	<b>33999A</b>
Wood windows and doors and millwork	<b>321910</b>	Air transportation	<b>481000</b>
Wood container and pallet manufacturing	<b>321920</b>	Rail transportation	<b>482000</b>
Manufactured home (mobile home) manufacturing	<b>321991</b>	Water transportation	<b>483000</b>
Prefabricated wood building manufacturing	<b>321992</b>	Truck transportation	<b>484000</b>

All other miscellaneous wood product manufacturing	<b>321999</b>	Transit and ground passenger transportation	<b>485000</b>
Pulp mills	<b>322110</b>	Pipeline transportation	<b>486000</b>
Paper mills	<b>322120</b>	Scenic and sightseeing transportation and support activities for transportation	<b>48A000</b>
Paperboard mills	<b>322130</b>	Postal service	<b>491000</b>
Paperboard container manufacturing	<b>322210</b>	Couriers and messengers	<b>492000</b>
Coated and laminated paper, packaging paper and plastics film manufacturing	<b>32222A</b>	Warehousing and storage	<b>493000</b>
All other paper bag and coated and treated paper manufacturing	<b>32222B</b>	Radio and television broadcasting	<b>515100</b>
Stationery product manufacturing	<b>322230</b>	Cable and other subscription programming	<b>515200</b>
Sanitary paper product manufacturing	<b>322291</b>	Telecommunications	<b>517000</b>
All other converted paper product manufacturing	<b>322299</b>	Accounting, tax preparation, bookkeeping, and payroll services	<b>541200</b>
Printing	<b>323110</b>	Architectural, engineering, and related services	<b>541300</b>
Support activities for printing	<b>323120</b>	Specialized design services	<b>541400</b>
Petroleum refineries	<b>324110</b>	Other computer related services, including facilities management	<b>54151A</b>
Asphalt paving mixture and block manufacturing	<b>324121</b>	Management, scientific, and technical consulting services	<b>541610</b>
Asphalt shingle and coating materials manufacturing	<b>324122</b>	Environmental and other technical consulting services	<b>5416A0</b>
Petroleum lubricating oil and grease manufacturing	<b>324191</b>	All other miscellaneous professional, scientific, and technical services	<b>5419A0</b>
All other petroleum and coal products manufacturing	<b>324199</b>	Photographic services	<b>541920</b>
Petrochemical manufacturing	<b>325110</b>	Veterinary services	<b>541940</b>
Industrial gas manufacturing	<b>325120</b>	Office administrative services	<b>561100</b>
Synthetic dye and pigment manufacturing	<b>325130</b>	Facilities support services	<b>561200</b>
Alkalies and chlorine manufacturing	<b>325181</b>	Employment services	<b>561300</b>
Carbon black manufacturing	<b>325182</b>	Business support services	<b>561400</b>
All other basic inorganic chemical manufacturing	<b>325188</b>	Travel arrangement and reservation services	<b>561500</b>
Other basic organic chemical manufacturing	<b>325190</b>	Investigation and security services	<b>561600</b>
Plastics material and resin manufacturing	<b>325211</b>	Services to buildings and dwellings	<b>561700</b>
Synthetic rubber manufacturing	<b>325212</b>	Other support services	<b>561900</b>
Artificial and synthetic fibers and filaments manufacturing	<b>325220</b>	Waste management and remediation services	<b>562000</b>
Fertilizer manufacturing	<b>325310</b>	Elementary and secondary schools	<b>611100</b>
Pesticide and other agricultural chemical manufacturing	<b>325320</b>	Junior colleges, colleges, universities, and professional schools	<b>611A00</b>
Paint and coating manufacturing	<b>325510</b>	Other educational services	<b>611B00</b>
Adhesive manufacturing	<b>325520</b>	Home health care services	<b>621600</b>
Soap and cleaning compound manufacturing	<b>325610</b>	Offices of physicians, dentists, and other health practitioners	<b>621A00</b>
Toilet preparation manufacturing	<b>325620</b>	Medical and diagnostic labs and outpatient and other ambulatory care services	<b>621B00</b>
Printing ink manufacturing	<b>325910</b>	Hospitals	<b>622000</b>
All other chemical product and preparation manufacturing	<b>3259A0</b>	Nursing and residential care facilities	<b>623000</b>
Plastics packaging materials and unlaminated film and sheet manufacturing	<b>326110</b>	Community food, housing, and other relief services, including rehabilitation services	<b>624200</b>
Unlaminated plastics profile shape manufacturing	<b>326121</b>	Child day care services	<b>624400</b>
Plastics pipe and pipe fitting manufacturing	<b>326122</b>	Individual and family services	<b>624A00</b>
Laminated plastics plate, sheet (except packaging), and shape manufacturing	<b>326130</b>	Performing arts companies	<b>711100</b>
Polystyrene foam product manufacturing	<b>326140</b>	Spectator sports	<b>711200</b>
Urethane and other foam product (except polystyrene) manufacturing	<b>326150</b>	Independent artists, writers, and performers	<b>711500</b>
Plastics bottle manufacturing	<b>326160</b>	Promoters of performing arts and sports and agents for public figures	<b>711A00</b>
Other plastics product manufacturing	<b>32619A</b>	Museums, historical sites, zoos, and parks	<b>712000</b>
Tire manufacturing	<b>326210</b>	Fitness and recreational sports centers	<b>713940</b>
Rubber and plastics hoses and belting manufacturing	<b>326220</b>	Bowling centers	<b>713950</b>
Other rubber product manufacturing	<b>326290</b>	Amusement parks, arcades, and gambling industries	<b>713A00</b>
Pottery, ceramics, and plumbing fixture manufacturing	<b>32711A</b>	Other amusement and recreation industries	<b>713B00</b>
Brick, tile, and other structural clay product manufacturing	<b>32712A</b>	Hotels and motels, including casino hotels	<b>7211A0</b>
Clay and nonclay refractory manufacturing	<b>32712B</b>	Other accommodations	<b>721A00</b>
Flat glass manufacturing	<b>327211</b>	Food services and drinking places	<b>722000</b>

Other pressed and blown glass and glassware manufacturing	<b>327212</b>	Car washes	<b>811192</b>
Glass container manufacturing	<b>327213</b>	Automotive repair and maintenance, except car washes	<b>8111A0</b>
Glass product manufacturing made of purchased glass	<b>327215</b>	Electronic and precision equipment repair and maintenance	<b>811200</b>
Cement manufacturing	<b>327310</b>	Commercial and industrial machinery and equipment repair and maintenance	<b>811300</b>
Ready-mix concrete manufacturing	<b>327320</b>	Personal and household goods repair and maintenance	<b>811400</b>
Concrete pipe, brick, and block manufacturing	<b>327330</b>	Personal care services	<b>812100</b>
Other concrete product manufacturing	<b>327390</b>	Death care services	<b>812200</b>
Lime and gypsum product manufacturing	<b>3274A0</b>	Dry-cleaning and laundry services	<b>812300</b>
Abrasive product manufacturing	<b>327910</b>	Other personal services	<b>812900</b>
Cut stone and stone product manufacturing	<b>327991</b>	Federal electric utilities	<b>S00101</b>
Ground or treated mineral and earth manufacturing	<b>327992</b>	Other state and local government enterprises	<b>S00203</b>
Mineral wool manufacturing	<b>327993</b>	Noncomparable imports	<b>S00300</b>
Miscellaneous nonmetallic mineral products	<b>327999</b>	Scrap	<b>S00401</b>
Iron and steel mills and ferroalloy manufacturing	<b>331110</b>	Used and secondhand goods	<b>S00402</b>
Steel product manufacturing from purchased steel	<b>331200</b>		
Secondary smelting and alloying of aluminum	<b>331314</b>	<b>Trade, Rental, Leasing</b>	<b>code</b>
Alumina refining and primary aluminum production	<b>33131A</b>		
Aluminum product manufacturing from purchased aluminum	<b>33131B</b>	Wholesale trade	<b>420000</b>
Primary smelting and refining of copper	<b>331411</b>	Retail trade	<b>4A0000</b>
Primary smelting and refining of nonferrous metal (except copper and aluminum)	<b>331419</b>	Automotive equipment rental and leasing	<b>532100</b>
Copper rolling, drawing, extruding and alloying	<b>331420</b>	Commercial and industrial machinery and equipment rental and leasing	<b>532400</b>
Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying	<b>331490</b>	General and consumer goods rental except video tapes and discs	<b>532A00</b>
Ferrous metal foundries	<b>331510</b>		
Nonferrous metal foundries	<b>331520</b>	<b>Unproductive Activities</b>	<b>code</b>
Custom roll forming	<b>332114</b>		
All other forging, stamping, and sintering	<b>33211A</b>	Medicinal and botanical manufacturing	<b>325411</b>
Crown and closure manufacturing and metal stamping	<b>33211B</b>	Pharmaceutical preparation manufacturing	<b>325412</b>
Cutlery, utensil, pot, and pan manufacturing	<b>33221A</b>	In-vitro diagnostic substance manufacturing	<b>325413</b>
Handtool manufacturing	<b>33221B</b>	Biological product (except diagnostic) manufacturing	<b>325414</b>
Plate work and fabricated structural product manufacturing	<b>332310</b>		
Ornamental and architectural metal products manufacturing	<b>332320</b>	Software, audio, and video media reproducing	<b>33461A</b>
Power boiler and heat exchanger manufacturing	<b>332410</b>	Newspaper publishers	<b>511110</b>
Metal tank (heavy gauge) manufacturing	<b>332420</b>	Periodical publishers	<b>511120</b>
Metal can, box, and other metal container (light gauge) manufacturing	<b>332430</b>	Book publishers	<b>511130</b>
Hardware manufacturing	<b>332500</b>	Directory, mailing list, and other publishers	<b>5111A0</b>
Spring and wire product manufacturing	<b>332600</b>	Software publishers	<b>511200</b>
Machine shops	<b>332710</b>	Motion picture and video industries	<b>512100</b>
Turned product and screw, nut, and bolt manufacturing	<b>332720</b>	Sound recording industries	<b>512200</b>
Coating, engraving, heat treating and allied activities	<b>332800</b>	Internet publishing and broadcasting	<b>516110</b>
Plumbing fixture fitting and trim manufacturing	<b>332913</b>	Internet service providers and web search portals	<b>518100</b>
Valve and fittings other than plumbing	<b>33291A</b>	Data processing, hosting, and related services	<b>518200</b>
Ball and roller bearing manufacturing	<b>332991</b>	Other information services	<b>519100</b>
Fabricated pipe and pipe fitting manufacturing	<b>332996</b>	Nondepository credit intermediation and related activities	<b>522A00</b>
Ammunition manufacturing	<b>33299A</b>	Securities, commodity contracts, investments, and related activities	<b>523000</b>
Arms, ordnance, and accessories manufacturing	<b>33299B</b>	Insurance carriers	<b>524100</b>
Other fabricated metal manufacturing	<b>33299C</b>	Insurance agencies, brokerages, and related activities	<b>524200</b>
Farm machinery and equipment manufacturing	<b>333111</b>	Funds, trusts, and other financial vehicles	<b>525000</b>
Lawn and garden equipment manufacturing	<b>333112</b>	Monetary authorities and depository credit intermediation	<b>52A000</b>
Construction machinery manufacturing	<b>333120</b>	Real estate	<b>531000</b>
Mining and oil and gas field machinery manufacturing	<b>333130</b>	Video tape and disc rental	<b>532230</b>
Plastics and rubber industry machinery manufacturing	<b>333220</b>	Lessors of nonfinancial intangible assets	<b>533000</b>
Semiconductor machinery manufacturing	<b>333295</b>	Custom computer programming services	<b>541511</b>
Other industrial machinery manufacturing	<b>33329A</b>	Computer systems design services	<b>541512</b>
Optical instrument and lens manufacturing	<b>333314</b>	Legal services	<b>541100</b>

Photographic and photocopying equipment manufacturing	<b>333315</b>	Scientific research and development services	<b>541700</b>
Other commercial and service industry machinery manufacturing	<b>333319</b>	Advertising and related services	<b>541800</b>
Vending, commercial, industrial, and office machinery manufacturing	<b>33331A</b>	Management of companies and enterprises	<b>550000</b>
Heating equipment (except warm air furnaces) manufacturing	<b>333414</b>	Religious organizations	<b>813100</b>
Air conditioning, refrigeration, and warm air heating equipment manufacturing	<b>333415</b>	Grantmaking, giving, and social advocacy organizations	<b>813A00</b>
Air purification and ventilation equipment manufacturing	<b>33341A</b>	Civic, social, professional, and similar organizations	<b>813B00</b>
Industrial mold manufacturing	<b>333511</b>	Other Federal Government enterprises	<b>S00102</b>
Special tool, die, jig, and fixture manufacturing	<b>333514</b>	General Federal defense government services	<b>S00500</b>
Cutting tool and machine tool accessory manufacturing	<b>333515</b>	General Federal nondefense government services	<b>S00600</b>
Metal cutting and forming machine tool manufacturing	<b>33351A</b>	General state and local government services	<b>S00700</b>

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