The Political Economy of Wealth Inequality and Property Ownership

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Abstract

After the World War era, there has been a gradual rise in wealth Inequality in industrialized economies, with wealth in the United States becoming more concentrated than wealth in most European economies.[1] Current research on wealth inequality attributes the main reason for the long-run divergence in wealth inequality to the $r - g$ gap, where r is the rate of return on capital and g is the economy's growth rate. Nonetheless, speculations about capital and the rate of return on capital, it's definition and measurement, have raised concerns about deriving the $r - g$ gap. Using the United States, post World Wars, as a study case, my dissertation addresses the concentration of wealth by investigating income from property ownership. Specifically it focusses on 3 main issues: (i) I provide an alternative measure for the Piketty $r - g$ gap by deriving the rate of reutrn on property ownership (r_p), and show that the gap between the long-run rate of return on property ownership ($\bar{r}_p$) and the long-run growth in the economy ($\bar{g}$) explains the fast rise in wealth inequality captured in the U.S. economy. (ii) I show that when traditional models, that focus on production only, are used to capture the natural behavior of wealth inequality, wealth inequality tends to be explosive over the long-run. (iii) Since property ownership is not confined to production alone, I implement the new measure of $r_p - g$ into a simple model of wealth accumulation, that takes into account both productive and non-productive property in generating wealth. I find that wealth inequality in the U.S. economy is more concentrated than suggested by Thomas Piketty.

JEL Classification: D31, E01, E21

Keywords: Wealth, Inequality, Property Ownership, Capital Gains

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1 Introduction

Many economist believed that John Bates Clark solved the income distribution problem. In fact, he only reduced it to a wealth distribution problem. Wealth inequality in industrialized and developed economies, over the past five decades, have become an issue of tremendous importance both politically and intellectually. The topic is of significant importance because wealth inequality impacts the overall growth prospects of an economy and its use of its resources, it impacts inequality in other sectors of the economy, and it has tremendous global significance, especially when talking about economies that impact the global economy. According to Atkinson et al. [5], people have a sense of fairness and care about the distribution of economic resources across society. As a result, all advanced economies have set in place redistributive policies such as taxation, which effectively redistribute a significant share of National Product across income groups. Nonetheless, even with these redistributive efforts, the concentration of wealth has been on the rise and shows no sign of declining.[1] Politically, there has been growing pressures on policy makers to address the concerns of rising wealth inequality. For example, the current U.S. policy debate is centered around the issue of growing large government deficits. To eliminate these large deficits, it is required that the government raise tax revenues in the up coming years (future). However, the problem for most policy makers is, "who do you tax?" With the significant decline in middle income earners in the U.S., according to the U.S. Census Bureau at the Minnesota Population Center (IPUMS), should policy makers raise taxes on lower-income earners, middle income earners or the wealthy? Or concurrently, should higher taxes be imposed on wealth? The questions of who bears the cost of the tax incidence - whether the wealthy or everyone else - is extremely important and needs to be addressed. Also, with the constant rise in the share of wealth by the wealthy, it is important that we understand the cause of the rise in wealth concentration over time. Academically, the standard response by many economists in the past has been to dismiss the importance of the rise in wealth inequality. Nonetheless, with the recent

[1] See Piketty [33] for a detailed analysis of rising wealth inequality in the United States and in other developed economies.

contribution to the literature by Piketty [33] and co-authors Atkinson, Saez, Zucman etc., in the book *Capital in the Twenty-First Century*, there has been a growing importance for economic researchers to address the topic again. What is the driving force of the rise in wealth inequality over the past decades? Should there be concern for rising wealth inequality? How is economic growth affected by rising wealth inequality? These questions need to be answered, nontheless, to answer them more needs to be done to understand the constant rise in the inequality gap over the past 5 decades. It is then that policy makers can adequately implement policies to redistribute wealth, or efficiently reallocate resourcees in the economy.

Attempts to explain the persistent increase in wealth inequality over time have yielded that the long run level of wealth inequality in most developed economies is determined by the difference between the rate of return on capital (r) and the growth rate in income per capita (g). See Piketty [33, 34]. However, there have been concerns about the definition of the rate of return on capital, r. If the gap between r and g is a major determinant of the long run structure of inequality, then it is important to derive a measure of r that captures profits, rents, dividends, interest, royalties, and capital gains. My research revisits the topic of wealth inequality after the World Wars, by specifically addressing the question: "What determines the long run level of wealth inequality?" I show that the long run level of wealth inequality is dependent on income from property ownership. That is, I show that the difference between the rate of return on property ownership and the growth rate in income per capita better explains the dynamics of wealth inequality. So why post World Wars? Piketty and Saez [36, 37] find that since the eighteenth century, the only period during world history where there is a decline in wealth inequality for developed economies (France, Sweden, Japan, United States etc.) was during the World Wars. Besides this period, which they refer to as the world war shock, inequality has been on the rise, eventhough the rise in inequality is substantially less compared to the fall in inequality. It is important to focus on the period after the world wars mainly because, the definition of the economic systems has substantially changed overtime: from an agricultural society to an industrialized society, to a capitalist society, to a financial

capitalist society. It is therefore important to address periods in which the structural change in the dynamics of the economy is not subtantially different. Using the United States as a case study, I use after tax historical data from the U.S. National Income Accounts to derive income from property ownership and I show that the level of inequality in the U.S. economy is determined by the difference between the rate of return on income from property ownership and growth in income per capita, i.e. $r_p - g$. I find that the $r_p - g$ gap is significantly wider than Piketty's $r - g$, and that the wider gap has significant implications on wealth inequality.

The paper is organized as follows. Section 2 provides a literature review on the topic of wealth inequality. In section 3, I derive income from property ownership, and present and analyze trends in the rate of retrun on property ownership over time. In section 4, I present detail analysis of the data used and section 6 offers concluding comments and extensions of my research.

2 Literature Review

2.1 Recent Developments in Wealth Inequality

The question, how do we explain the distribution of wealth, has been on the spotlight of economic research since John Bates Clark's [10] book, "The Distribution of Wealth," the theories of Kuznets' [18] paper, "Economic Growth and Income Inequality," as well as Kaldor's [16] paper, "Capital Accumulation and Economic Growth." These papers, especially Kuznets' theory,[2] greatly influenced the literature on inequality, allowing a multitude of research papers to empirically and theoretically attempt to capture the relationship between various forms of inequality and economic growth. Kuznets' hypothesis indicated that income or wealth inequality should follow an inverse-U relationship in response to industrialization, economic growth or technological advancement. This fostered an influx of research papers that attempted to understand the natural process and behavior of inequality overtime, but resulted in conclusions that remained ambigious. These studies either found statistically significant evidence in support of the Kuznets' curve or refuted the hypothesis. Some even found no relationship between inequality and economic growth.[3] Although the Kuznets seminal paper vastly contributed to the inequality literature, it fell short in explaining the persistent rise in inequality over the past five decades. According to Piketty and Saez [36], today, the Kuznets curve is widely held to have doubled back on itself, especially in the case of the United States, with a period of falling inequality during the first half of the twentieth century being succeeded by a very sharp rise in inequality since the 1950s. With the current advancements seen in technology, and with industries and individuals leap-frogging technology, according to the Kuznets' theory, one would think that there should be convergence in equality over time. Nonetheless, that has not been the case for many developed economies including the United States.[4] Stiglitz [42] refers to the Kuznets theory as an attempt to explain

[2]According Kuznets' theory (Kuznets' Curve) [18], inequality first increases in response to industrialization, economic development, or technological advancement, then decreases over time, resulting in an inverted-U relationship between growth and inequality.

[3]See Persson and Tabelini [31], Perotti [30], Li and Zou [20], Forbes [13], Barro [6], Banerjee and Duflo [12], and Atkinson [3] for research on inequality and growth

[4]See Piketty [33, 34] and related works by Emmanuel Sael and Grabriel Zucman

old stylized facts that do not explain the current rise in inequality in the now developed economies. In his book, "The Price of Inequality," Stiglitz [40] explains that the reason for this persistent rise in inequality can be attributed to an increase in rent seeking activities. Piketty [33] indicates that the Kuznets curve theory was observed mainly for the wrong reasons, and that its empirical underpinnings were extremely fragile. Kuznets [19] produced a number of top income share series covering 1913 to 1948. At the beginning of this sample period, inequality is observed to to be rising and then declines mainly because of the world wars. It no surprise then that Kuznet found an inverted-U relationship. Piketty [36] criticizes the Kuznets curve indicating that his series are not fully satisfactory from a technical viewpoint, and they do not allow the analysis of very high incomes as the top group analyzed by Kuznets is the top percentile. Also, the sharp reduction in inequality that is observed in all rich countries between 1914 and 1945 was due to the world wars, and the violent economic and political shocks they entailed, and not the automatic process or course of inequality (Piketty [33]). Therefore, the "bell shape" relationship between inequality and growth that was popularized, has nothing to do with the natural or automatic process of the behavior of inequality. In conclusion, Kuznets theory was formalized over a period that was largely accidental.

New evidence provided by Thomas Piketty's book "Capital in the Twenty-First Century" and other supporting papers with co-authors, Emmanuel Saez, Gabriel Zucman and others, have completely revolutionized the literature on income and wealth inequality, with the most noticeable contribution being the new and extensive data that they use, mainly administrative tax records, to study inequality at the very top of income and wealth distribution.[5] Piketty and Saez [36] extended the methodology of Kuznets by building a homogenous series on top shares of pre-tax incomes and wages in the United States covering 1913 to 1998. Based on this, they contruct annual series of top shares of salaries for the top fractile of the salary distribution. They also analyze top capital income earners. In constructing these series, the authors are able to study inequality at the top of income and wealth distribution. See Piketty [33, 34] and the World Top Income

[5]See the World Top Incomes Database [1] for a complete list of countries studied

Database [1] for top income data and analysis on other countries. Piketty's [33] findings reveal the following facts about inequality. First, the distribution of wealth, which he refers to as income from capital, is much more concentrated than the distribution of income from labor (income inequality.) That is, in all industrialized nations, the researchers find that the least wealthy half of the population own virtually nothing, between 0 to 5 percent of total wealth; the top decile of wealth owners own an astonishing majority of wealth, between 60 to 90 percent; and the remainder of the population (the middle class) own between 5 to 35 percent of all wealth. This compares to the top centile and decile's share of income being between 5 to 20 percent and 25 to 45 percent respectively. Clearly, there is large gap between the concentration of wealth (capital according to Piketty) and the concentration of income (labor income.)

Secondly, wealth inequality in Europe is dramatically much lower today (2010) than anytime before 1960, and is much lower than wealth inequality in the United State. According to their findings, in the early nineteenth century Europe, the top centile and decile of wealth owners, owned approximately 50 percent and 80 percent of the nations wealth respectively. Compared to the United States, the top centile and decile owned approximately 25 percent and 60 percent respectively. Until the mid-twentieth century, the wealth concentration was still higher in Europe than the United States, peaking at 55 and 90 percent for the top 1 percent and 10 percent of wealth owners in Europe, and 45 and 80 percent for the top 1 and 10 percent in the United States. Wealth inequality decreased between 1910 and 1950 for both Europe and the United States but much less in the United States than in Europe. By 2010, the top centile's share of total wealth was close to 35 percent and exceeded 70 percent for the top decile's share in the United States. In Europe however, the top centile owned approximately 25 percent of wealth, whiles the top decile owned approximately 65 percent of wealth as of 2010. That is, the percieved equitable United States economy had become less equitable in its distribution of wealth than its European counterparts. Third but not he least, Piketty and coauthors find that wealth inequality has been rising over the past 5 to 6 decades even though the rise seems small in comparison to the decline during the world wars. This finding holds

the U.S. as an exception since there wasn't much of a decline in inequality as in Europe (United Kingdom and France) during the wars. That is, during the World Wars the top decile of wealth owners in Europe had their share of national wealth fall from 90 percent in 1910 to 60 percent in 1970. For the United States economy, this was comparable to a decline in wealth ownership from 80 percent in 1910 to 65 percent in 1950. The decline for the United States was less severe, but currently it is close to the highest level of inequality attained in the first part of the twentieth century. Last but more importantly, the authors show that the rise in wealth inequality throughout history is attributable to the difference between the rates of return on capital (r) and the growth rate of income in the economy (g). This latter fact, "$r > g$ *implies inequality*", has been a topic of current debate among economist, posing the question: "Did Piketty get Inequality right or wrong?" Even though, there are shortcomings to the $r > g$ analysis, their work serves as a seminal contribution to the inequality literature, and for later developments in the literature. Their work certainly highlight the growing importance of inequality in the economy, and whether we should be concerned or not.

This paper addresses concerns and questions about the latter two stated contributions by Piketty. First, I address wealth inequality in the U.S. economy, since it serves as an anomaly to the decline in inequality during the world wars, and also because wealth inequality in the economy is much closer to the level it was during the late nineteenth century and early twentieth century. Secondly, I address the shortcomings of "$r > g$ *implies inequality*," because Piketty's definition of capital is problematic, both as a measure of capital, and a measure of wealth (Weil [45]). More specifically, the paper revisits the topic of wealth inequality in the United States, post World Wars, by address the question: "What determines the long-run level of wealth inequality?" In answering the question, I derive the rate of return on property ownership (r_p) for the United States economy as an alternative measure to Piketty's return on capital. I show that it is the difference between the return on property ownership (r_p) and the growth rate of income (g) that explains the fast rise in wealth inequality, and not the rate of return on capital (r) as asserted by Piketty [33]. Property ownership is more appropriate when studying

wealth inequality over time. Also, I show that this alternative measure for Piketty's "r" is immune to the argument encompassing Piketty's use of capital and enforces the role played by inheritance in producing inequality. Last, the paper enforces the importance of capital gains in the U.S. economy, and that it significantly contributes both to the dynamics of property ownership and the divergence of wealth.

2.2 Wealth Inequality in the United States

There are clear differences between the trajectories of wealth inequality in the United States and in other economies in Europe.[6] Wealth Inequality in the U.S. has been on the rise since 1950 (Piketty [33]). This raises concerns as people fear that wealth inequality will reach heights comparable to the level of inequality in the late nineteenth century or early twentieth century Europe. One can already assume that the U.S. economy has reached those heights of inequality, if not surpassed it. The first reason for focusing on the U.S. economy is because wealth inequality, currently, surpasses that of any other industrialized nation. Comparing wealth concentration in Europe (France and the United Kingdom) and the United States, the main finding by Piketty and Zucman (2015), is that wealth concentration in the nineteenth century was much less extreme in the U.S. than it was in Europe.[7] However, over the course of the twentieth century, this ordering has reversed. This is what the authors refer to as the Great Inequality Reversal: That is, wealth concentration in the U.S. is now significantly higher than it is in Europe. Their estimates show that the United States has almost returned to its early twentieth-century wealth concentration level.[8] This makes the U.S. an interesting case as it sets itself apart from the other countries studied. Based on the analysis of Piketty [33], the US never reached the extreme level of wealth concentration of the nineteenth century and early twentieth century Europe, where the top decile owned 90 percent or more of wealth. However, the economy might be heading in that direction. Secondly, the official U.S.

[6] For work on Sweden see Waldenstrom [44], For work on the U.K see Atkinson [4], for France see Piketty [32]

[7] The explanation provided by Piketty (2014a) was that, the U.S. was a relative young economy when it came to wealth accumulation.

[8] In the 1920s, the top decile owned 80 percent of wealth, and in 2012 it is about 75 percent. A similar relationship is observed for the top centile of wealth owners.

accounts data from both the National Income and Product Accounts (NIPA) and the Flow of Funds Accounts (FFA) do not directly follow the System of National Accounts (SNA) guidelines,[9] which most industrialized nations follow. This creates comparability problems with other economies. By focusing on the U.S. economy alone, I am able to eliminate the problem of reconstructing the data to fit international standard, thereby avoiding the loss of information. The other reason for focusing on the United States economy is because of the growing importance of its financial system. Financial capitalism places importance on shares (assets) and share prices (asset prices) which usually do not reflect production but significantly contribute to wealth acquisition through interest payments or capital gains.

2.3 The Role Played by r>g

It is important to note that $r > g$ is not the only or primary reason for considering changes in wealth over time, nor is it the primary reason for forecasting the path of inequality in the future (Piketty [35]). There are several factors that vastly affect wealth inequality, which Piketty refers to as wealth shock. These include family shocks, age shock, demographic shocks, shocks to the rate of return, labor market shocks, taste shocks, etc. In conjunction with these shocks, the role of $r > g$ solely explains the long run level of wealth inequality. Specifically, a higher $r - g$ gap will tend to greatly amplify the steady state inequality of wealth distribution that mainly arises out of a given mixture of shocks, including labor income shocks (Piketty [35]). So then wealth inequality will always converge towards a finite level. However, the finite inequality level will be a steeply rising function of the $r - g$ gap.[10] Even though a strong argument is made in support of the fact that the gap $r - g$ is central to determining the long run behavior of inequality, several concerns need to be addressed: (i) Piketty's definition of capital is misleading and hence resulting in estimates of inequality that might be overstated or understated.

[9] The System of National Accounts [23] is the internationally agreed standard set of recommendations on how to compile measures of economic activity. The SNA describes a coherent, consistent and integrated set of macroeconomic accounts in the context of a set of internationally agreed concepts, definitions, classifications and accounting rules.

[10] See Piketty [33] chapter 10, Piketty [34], and Piketty and Zucman [38] section 5.4 for the theoretical evidence of the inequality amplification of $r - g$

Piketty defines capital as "the sum total of nonhuman assets that can be owned and exchanged on some market." This definition of capital ignores the value of human capital, and transfer-wealth, which have grown enormously over the past years, and also ignores the possibility that wealth can be accumulated through rents. The assumption backing the definition is that, all capital is used in the production process, which is not the case. Weil [45] states that, "the central element of Piketty's approach to measurement is that the concepts usually classified as productive capital (the input into production that results from past investment) and wealth (claims on current and future consumption) can both be measured by a single variable, for which he uses the term capital. However, there exists evidence of mismeasurement of Piketty's capital."[11] (ii) Piketty uses capital and wealth interchangeably, assuming that capital equals wealth. That is, by assuming that all capital is used in the production process, the only means of attaining wealth is by saving (accumulating capital). Clearly, the concepts of capital and wealth are very distinct and should not be assumed to be the same. Kanbur and Stiglitz [17] indicate that what Piketty and others measure as wealth, is a measure of control over resources, not the measure of capital in the sense that it is used in the production function. There is a vast distinction between capital, an input to production, and wealth, thought of as assets including land and the capitalized value of other rents, which give command over purchasing power. (iii) If capital equals wealth, and all capital is used in the production process, then r and g are not independent. That is, they are endogenously determined. So then Piketty's *"$r - g$ implies inequality"* might not be as straight forwards as he puts it. By using the alternative measure, the rate of return on property ownership, this paper addresses the outlined flaws in the use of capital as defined by Piketty. Consider the following cases:[12]

Case I: Consider the case of all sea front property on the French Rivera. As demand

[11] Weil [45] indicates that the mismeasurement comes from comparing Piketty's data to the Penn World Tables (version 8.0), where capital stock are measured using the perpetual inventory method with depreciation rates varying by asset types. For more on this see Inklaar and Timmer (2013). Also, an obvious source of mismeasurement error in the quantity of capital is changes in asset prices.

[12] Case 1 and 2 are directly taken from Kanbur and Stiglitz (2015)

for these properties increase, the value of the sea front properties bid up. The current owners will get rents from their ownership of the fixed factor. Their wealth will go up and their ability to command purchasing power in the economy will rise. However, the actual physical input into production does not increase. All else constant, national output will not rise.

Case II: Consider the case where a government gives an implicit guarantee to bail out banks. This will be capitalized into the value of shares, creates rents for the shareowners, and increases their wealth. This will result in rising inequality, which is obvious without going through the conventional production function analysis. The rents once created will provide further resources for rentiers to lobby political systems to maintain their further increase in rents.

Case III: An agricultural landowner lobbies for a change in zoning laws so he can sell his land as commercial land. Once such a law is passed, that leads to an appreciation of the value of his land, which leads to an increase in the owner's wealth. This results in an increase in the landowner's wealth without going through the conventional production function analysis.

All three cases clearly show that wealth can be amassed without a change in the capital input to production, which is very evident in the financial capitalist society. It is the property owners that benefit from the increase in the value of their assets. In short, wealth accumulation is directly linked to accumulating property. According to El-Hodiri (2015), the history of wealth and wealth inequality is a history of property ownership and not capital used in the production process. Continuing, I derive income from property ownership, which is immune to the arguments encompassing the definition of Piketty's capital, captures the idea of rents (economic term for unearned revenue), as property can be obtained legally or illegally, and strengthens the role played by inheritance in producing inequality.

3 Deriving Income from Property Ownership

3.1 Definition

According to Piketty [33], the rate of return on capital measures the yield on capital over the course of a year regardless of its legal form: that is, profits, rents, dividends, interest, royalties, and capital gains expressed as a percentage of the value of capital invested. In order to measure the rate of return on capital, Piketty defines capital income as the total sum of housing capital income, corporate income, net foreign income, and capital income in the non-corporate business sector. In the book "Capital in the 21st Century," Piketty defines capital as the total sum of non-human assets that can be owned and exchanged on some market. These definitions raise a couple of issues

i. Both productive capital and non-productive capital creates wealth, hence to assume that all capital is productive is misleading.

ii. Human capital is excluded from Piketty's definition of capital on the premise that it cannot be owned by another person nor traded on a market. However, in today's world or advanced technological progress human capital cannot be ignored.

Measuring capital income based on Piketty's classification can be hard to measure, especially because

i. Home owners who contact mortgages consume financial intermediate services (FISIM) which are treated as intermediate consumption and there is cross country heterogeneity on how FISIM is measured

ii. The net operating surplus of the household sector only captures the income generated by household activities, but households do not own 100 percent stock of the housing stock. There are variations in the share of households owned by corporations

iii. Rules determining whether an organization falls within the corporate or non corporate business proves to be another issue at hand

iv. Piketty assumes that return on government capital is implicitly zero. This is mainly because public debt usually outweighs public capital. Nonetheless, public land is significantly undervalued, and lastly,

v The measurement of National Income Accounts do not all meet the same standards creating issues for comparision across countries.

To address these issues, I provide an alternative measure for Piketty's capital income by focusing on income from property ownership. According to the National Income and Product Accounts (NIPA), by the Bureau of Economic Analysis (BEA), income from property ownership is the sum of interest income, dividend income and rental income. Building on this definition, however modifying the components, I define income from property ownership as

$$\begin{matrix} \textit{Income from} \\ \textit{property ownership} \end{matrix} = \begin{matrix} \textit{Interest} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Dividend} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Rental} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Capital} \\ \textit{gains} \end{matrix} \tag{1}$$

where *Interest Income* is the interest income from all sources, both monetary and imputed, that is received by individual, by private and government employee retirement plans, and by quasi-individuals. *Dividend Income* is from all sources including individuals, private and government employee retirement plans, and by quasi-individuals, non-profit institutions, and estates and trusts. Also, pension funds, some insurance reserves, and private trust funds are considered to be the property of persons hence dividends received by these institutions are included. *Rental Income* with capital consumption adjustment is the net current-production income of persons from the rental of real property. It consists of net income from the rental of tenant occupied housing by persons, the imputed net income from the housing services of owner-occupied housing, and the royalty income of persons from patents, copyrights, and the rights to natural resources. I also include data fro persons engaged in the real estate business in rental income. That is, net income from the rental of tenant occupied housing by corporations or the net income of tenant occupied housing by partnerships and sole proprietors, which is not included in the BEA

definition of rental income. *Capital Gains*

This definition captures profits, rental income, interest, dividend, royalties, capital gains, and rents more collectively than Piketty's measure of capital income. It accounts for income generated by all forms of property regardless of whether it is tangible or intangible hence accounts for the property that is generated as a result of human capital. By focusing on income from property ownership, I am able to eliminate the problem of separating income into household, corporate, non-corporate or foreign income, and also it is impervious to whether the income was made legally or illegally.

I give 2 alternative definitions for income from property ownership but it does not change my analysis and conclusion. See Appendix A

3.2 The Rate of Return on Property Ownership

Over the entire period, after the world wars, the rate of return on property ownership, $\hat{r}_p$, has been approximately 7.2 percent. The other two definitions show a long run rate of return on property ownership of 7.6 and 7.7 percent respectively. Even though the later estimates are much higher, I focus on equation (1) for my analysis, which provides a more comprehensive definition for income from property ownership. See figure (1). The estimate, r_p is 2 percentage points higher than Thomas Piketty's estimate of the return to capital, r, for the U.S. economy. This difference has signicant implications for the divergence of wealth inequality in the economy. With wealth inequality being a rising function of both the rate of return on capital ownership, (r), and the growth rate in GDP per capita, (g), a small gap between r and g can have destabilizing effects on the structure and dynamics of social inequality (Piketty [38]). Therefore, with a higher estimate, $\hat{r}_p$, the concentration of wealth in the U.S. economy is projected to be narrower than projected by Piketty. Likewise, concerns about the gradual decline of g in the U.S. economy posses another problem which further provides higher steady state levels of the concentration in wealth. Since the 1960s, there has been a gradual decline in the growth rate of income per capita per decade g. See section 3.4 for the analysis of $r - g$. By comparing the long run rate of return on property ownership of 7.2 percent to the long

run growth rate in inomce per capita of 2 percent, it is evident that owning property becomes a more attractive endeavor than working for income.

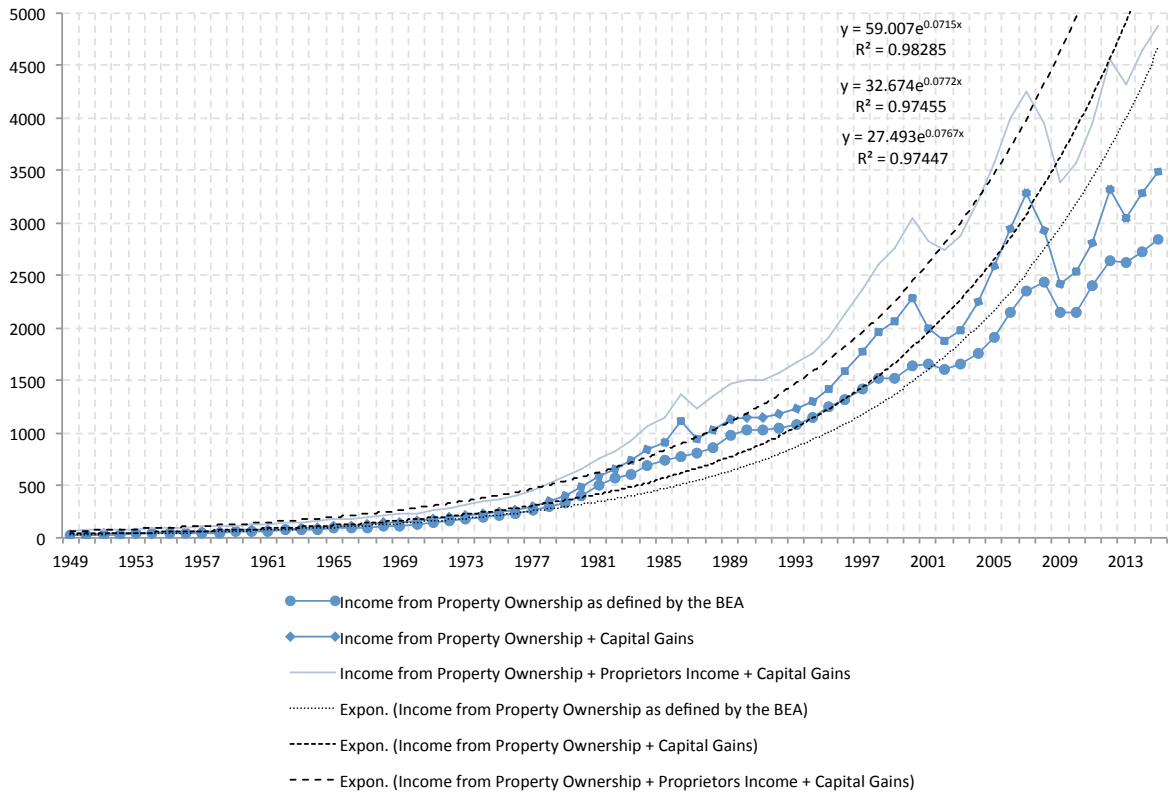

Figure 1: Income from Property Ownership in the United States, 1949 - 2015

3.3 Composition of Income From Property Ownership

Interest income and current production income of sole proprietors and partnerships, and of tax exempt coorporatives (proprietor's income hence forth) are the most significant contributors to income from property ownership in the U.S. Over the entire period of study, interest income and proprietors' income account for 35 percent and 32 percent of income from property ownership respectively. This is equivalent to 10.8 percent and 9.7 percent of national income, respectively. The contribution interest income follows an inverted-U pattern: Its contribution gradually rises from 16 percent in the 1950's, reaching a height of 55 percent in the late 1980's and early 1990's, then gradually declining to approximately 17 percent of income from property ownership in 2015. On the other

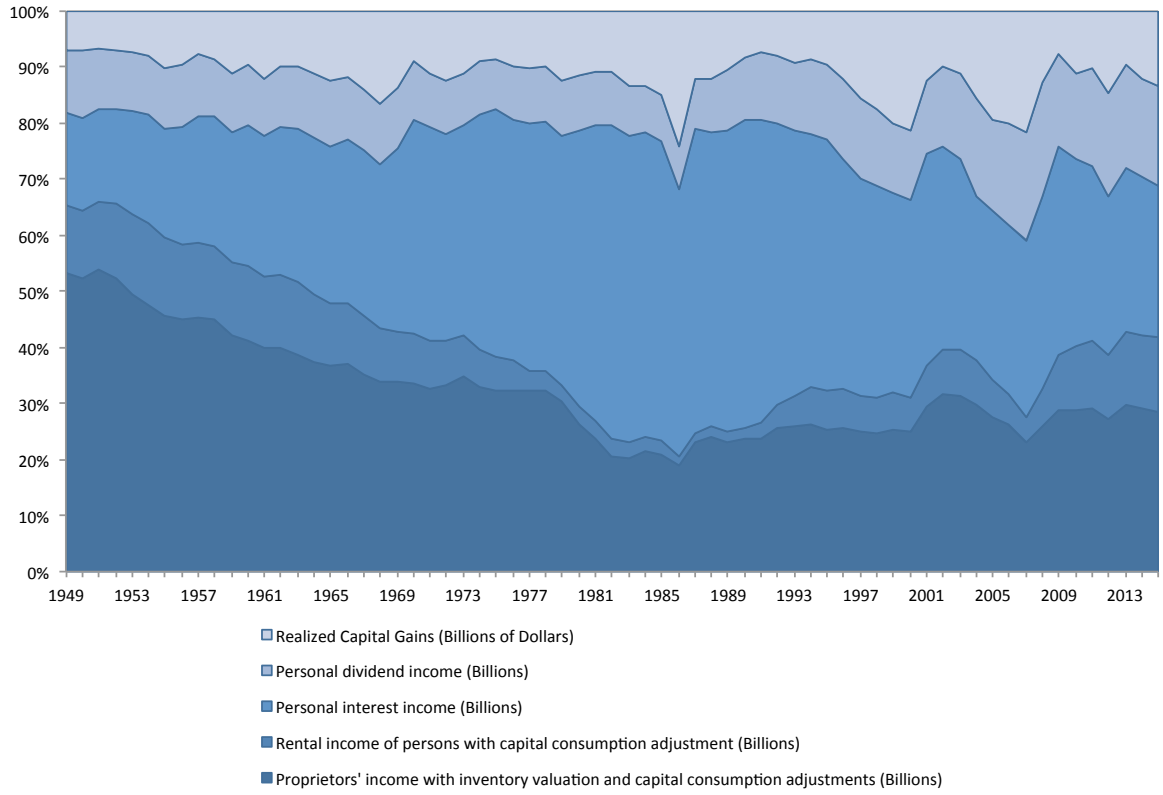

Figure 2: The Composition of Income from Property Ownership in the United States, 1949 - 2015

hand, the contribution of proprietor's income to income from property ownership was extremely high in the 1950s: 53 percent in 1950 and gradually declining to 20 percent in the early 1980s. From 1985 to 2015 there is a gradual increase in its share from 20 percent to 28 percent. Nonetheless this increase is less substantial to the decline in its share right after the world wars. Similarly, the contribution of rental income follows the same distinctive U-shaped curve as propritor's income: High contribution is the 1950's of about 12 percent, declining to 1 percent in the late 1980's, and gradually increasing to about 13 percent of income from property ownership. Together, rental income and proprietor's income account for approximately 40 percent of income from property ownership over the entire period. [13]. Realized capital gains have become an increasingly important source of income in the U.S. economy, accounting for about 3.6 percent of National Income over the period 1950 - 2015, reaching a heights of 8.8 percent in 1986 and 7.7 percent in 2007.[14].

[13]See Section 4 for a more detailed analysis of interest and rental income in the U.S. economy
[14]See Section 4 for more details on Capital Gains

On average, capital gains account for 17 percent of income from property ownership. The contribution by capital gains far outweigh the contribution by rental income alone, except for years after the Great Recession of 2007.[15] Realized capital gains accounts for 11 percent of income from property ownership. Since the 1950's this share has been fairly constant. However, there are observed spikes in it contribution usually before a reccession. Before the 2001 recession and 2007 recession, it accounted for 17 percent and 21 percent of income from property ownership respectively. Dividend income, like capital gains, has been fairly stable over the years, and accounts for 12 percent of income from property ownership in the U.S.. This is equivalent to 3.7 percent of National Income. Nontheless, dividend income has been more persistent than capital gains which reacts more substantially to expensions and recessions in the U.S. economy. See Figure 2 for a breakdown of income from property ownership.

3.4 The $r_p - g$ Gap

Based on the derived income from property ownership, I find that the gap between the long run rate of return on all assets (r_p), whether used in the production process or left to accrue interest over time, and the growth in income per capita g in the U.S. economy, after the World Wars, is approximately 5 percent. Note that r_p is the after tax rate of return on property ownership. Figure 3 shows the yearly differnce between the rate of return on property ownership and the growth in income per capita. Since 1950 the difference has been approximately 5 percent admist the fluctions. In years like 1981 and 1986, the difference reached a maximum of 14 percent and 15 percent respectively. Where as in years like 1987 and 2009, the difference reached a minimum of minus 11 percent and minus 10 percent respectively. Since wealth accumulates over time, I take 10 year averages to observe the changes in the rate of return of property ownership over the decades. Figure 4 shows that with the exception of the 2000-2009 period, where the U.S. economy is faced with two major recessions, the rate of return on property ownership is persistently above above 6 percent. During the 1970's and 1980's it reached its maximum

[15] However, that is not the case when considering rental income plus proprietor's income.

of 10.02 and 9.87 percent respectively.[16]

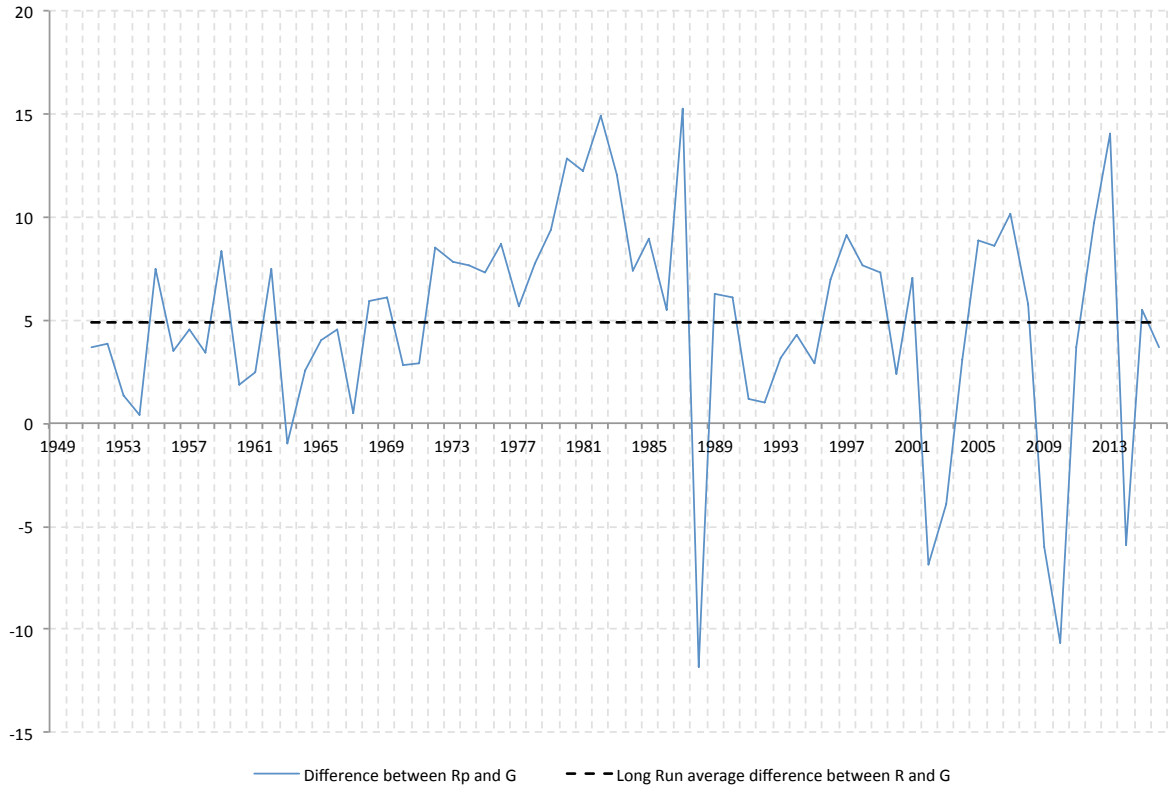

Figure 3: The Difference between the Rate of Return on Property Ownership and Growth in Income per Capita in the United States, 1949 - 2015

Even though, the rate of return to property ownership is seen to be higher than the growth rate in income per capita in the U.S. economy, it is also evident that the components of income from property ownership display the same relationship. That is, the long-run rate of return on interest income, dividend income, rental income (plus proprietor's income) and capital gains exceeds the growth in income per capita by at least 2 percentage points. Over the entire period, the rate of return on interest bearing assets, dividends, rental property, and capital gains were 8.01 percent, 7.96 percent, 6.2 percent, and 7.9 percent respectively. Clearly, the ownership of property yields more returns than earning a wage. See section 4 for a a detailed analysis of the components of income from property ownership. What is interesting about the individual components are as follows: (i) Figures 5 shows that between the 1950s and now (2015) the decade average rate of

[16]Decade averages are calculated according to the following years: 1950-59, 1960-69, 1970-79, 1980-89, 1990-99, 2000-09 and 2010-15

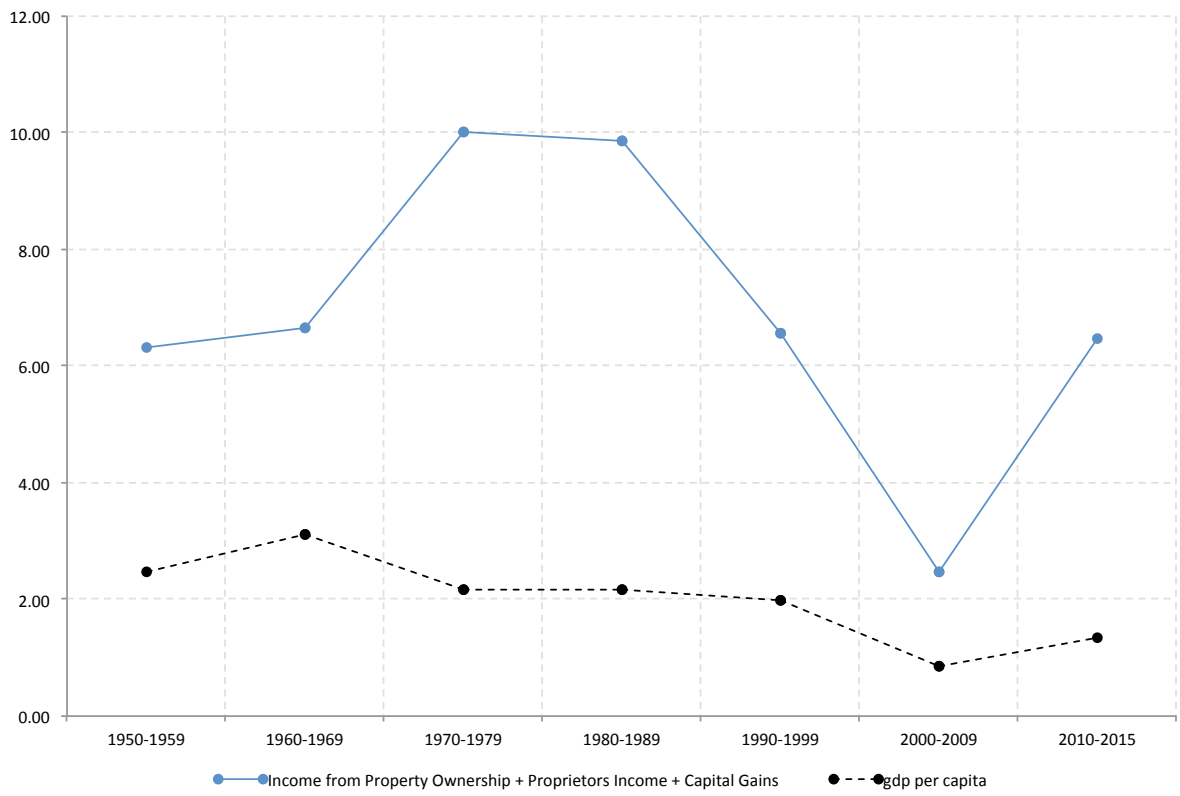

Figure 4: The $r_p - p$ Gap: Rate of Return on Property Ownership and Growth in Income per Capita in the United States, 1949 - 2015

return on income from the rental of property has persistently been rising from 4 percent to approximately 8 percent. The only exception was during the 2000s where it dips to 4 percent. The dip in the 2000s was mainly due to the 2007 financial crises which resulted in the loss of rental property nationwide. Nonetheless, by comparing the rate of return on rental property to the growth in income per capita, it is evident that rentiers can easily amass wealth over time. (ii) From the 1950s to 1980s the average rate of return on interest bearing was approximately 11.5 percent. See figure 6. Nonetheless, there was a significant decrease in the 90s to about 2 percent, and remains relatively low falling below the growth in income per capita. Evidently, eventhough interest bearing assets were a great means to create wealth, in the past 3 decades that has not been the case. The rate of return on interest bearing assets from 1990 to 2015 has been approximately 2 percent. (iii) Unlike interest income, the behavior of rate of return on income from dividends shows more variability: increasing from 6 percent in the 1950's to 11 percent in the 1980's, then

declining to almost 6 percent in the 2000's. Currently, the average return on income from dividends is well above 8 percent between the 2010 - 2015 period. See figure 7. (iv) Realized capital gains present the most striking results in the U.S. economy.[17] Figure 8 shows that over the decades the return on income from realized gains is well above 10 percent, reaching 15 percent in the 1990's, and then declined to -0.1 percent in the 2000 - 2009 period. It is important to note that the decline can mainly be attributed to property owners' unwillingness to sell their assets during this period. Nonetheless, right after the 2007 recession, the return on income from realized gains increased to well over 20 percent.

Paying attention to the components of income from property ownership, one can decipher that rental income, dividend income and capital gains are the main channels through which wealth can be created.

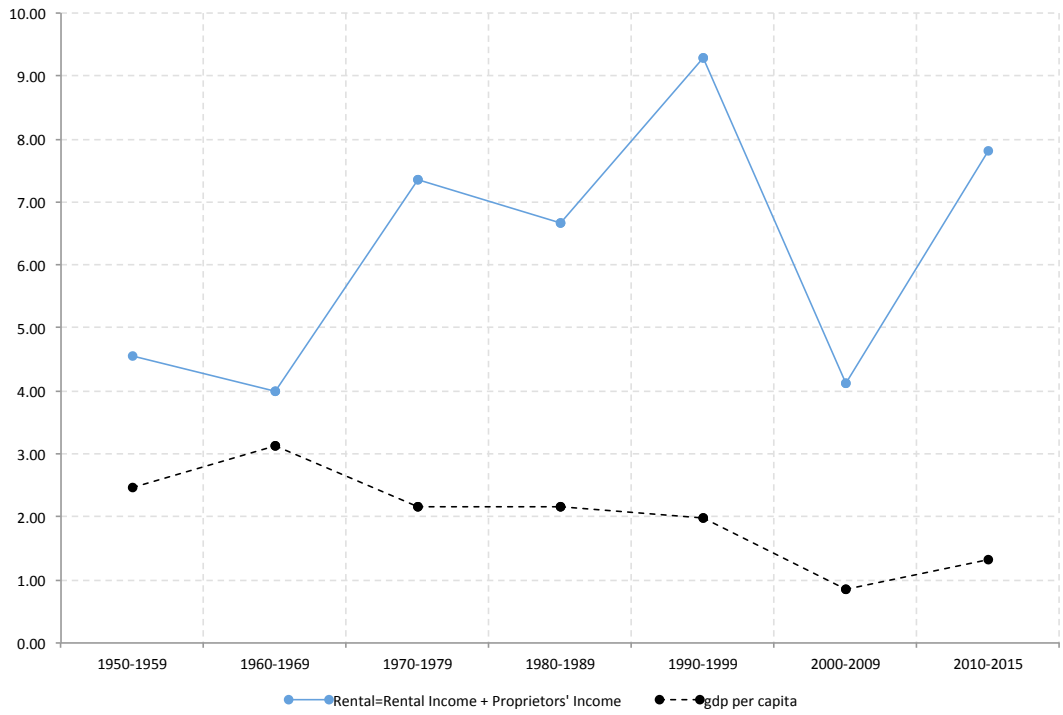

Figure 5: Rental Income and Growth in Income per Capita in the United States, 1950-2015

[17] I only used realized capital gains as data for unrealized capital is not readily available. However, capital that is not realized only appreciates in value generating wealth.

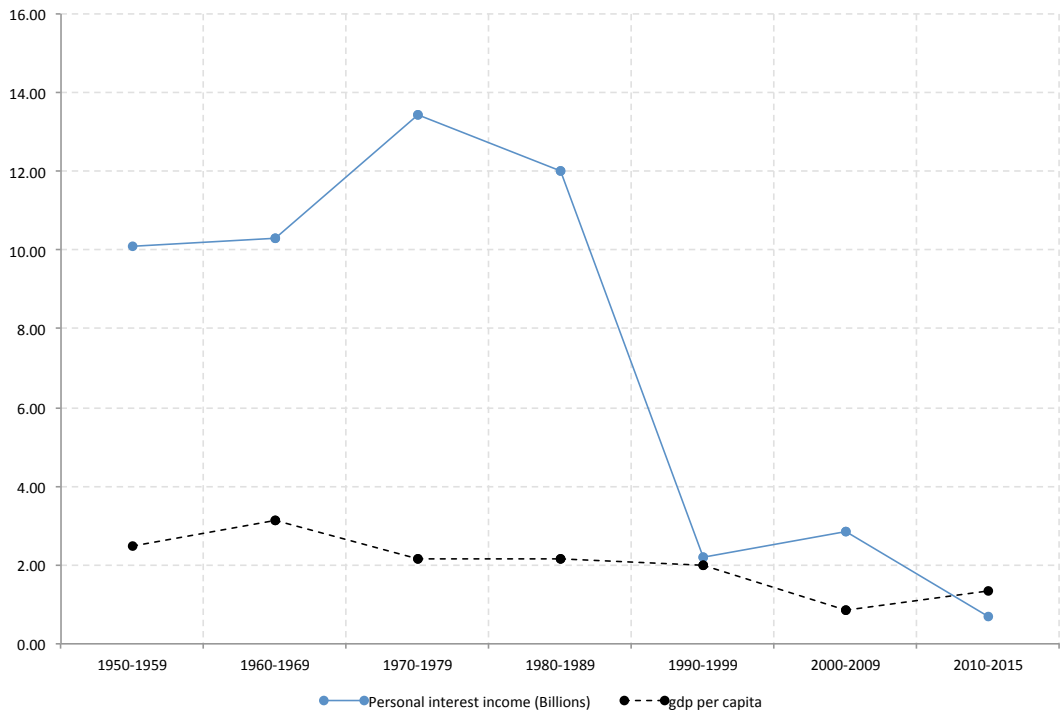

Figure 6: Interest Income and Growth in Income per Capita in the United States, 1950-2015

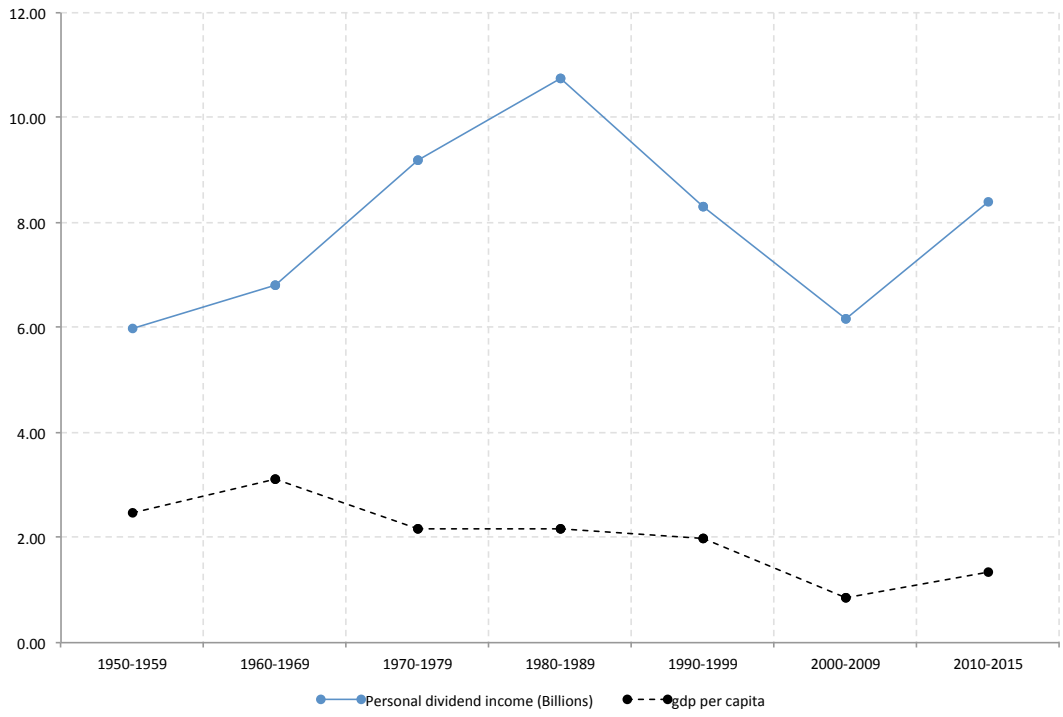

Figure 7: Dividend Income and Growth in Income per Capita in the United States, 1950-2015

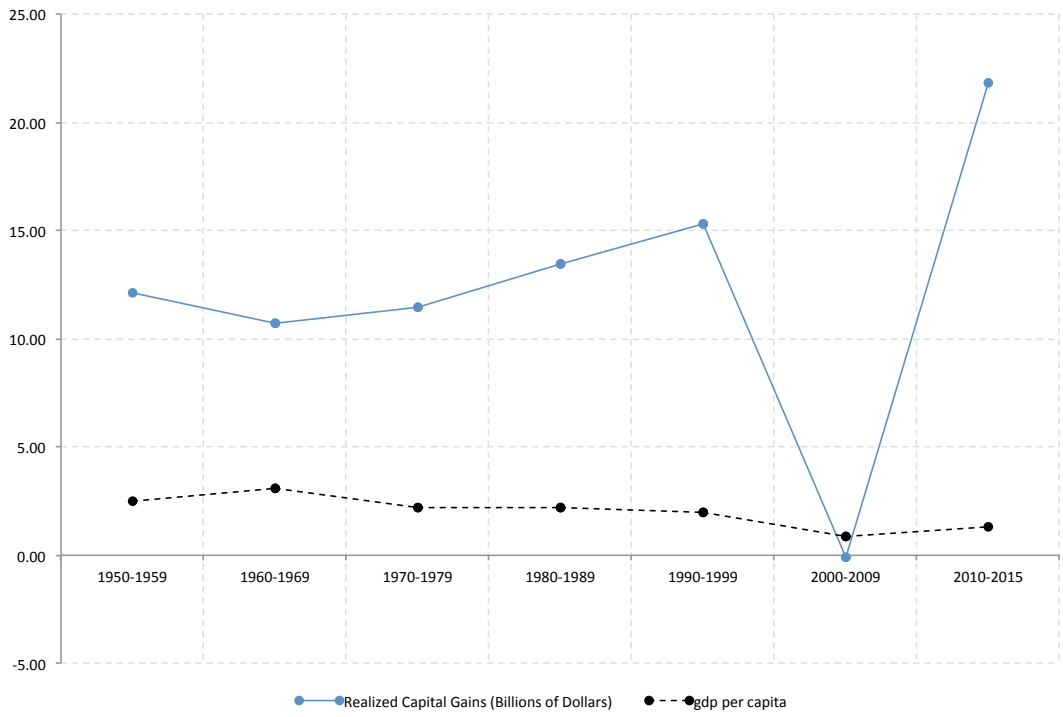

Figure 8: Capital Gains and Growth in Income per Capita in the United States, 1950-2015

4 Data

The Official U.S. National Accounts are organized in two parts: The flow of data are in the National Income and Product Accounts (NIPA), published by the Bureau of Economic Analysis (BEA), and the stock of assets and flow of financial assets are in the Flow of Funds Accounts (FFA), puplished by the Federal Reserve Board. Since the U.S. statistics does not follow the OECD national accounts data in the System of National Accounts (SNA) framework, and I am not concerned about the comparability of the US data with other countries, I am thoroughly able to investigate and capture the measure of income from property, according to the U.S standards, by employing data from NIPA tables. The NIPA tables do not contain data on capital gains, so then, I use available capital gains data from the U.S. Department of the treasury, Office of Tax Analysis, and the Congressional Budget Office. The following sub-sections provide more details about the data used.

4.1 Dividend Income in the United States, 1950 - 2015

Data on dividend income is provided by the National Income and Product Accounts (NIPA), by the BEA. There are no modifications made to the data. It is measured as the *gross dividend paid by U.S. corporations in cash and other assets, plus U.S. receipts of dividend income from the rest of the world, net of dividend income payments to the rest of the world, less dividends received by US corporations.* See equation (2). It mainly shows net dividend income arising from the ownership, in whole or part, of U.S. and foreign corporations. From 1950 to 2015 the share of dividend income to national income averages 3.7 percent. Its contibution to national income was approximately 3 percent from 1950 to 1970, falling to approximately 2 percent over the 1970 to 1984 period, and steadily rising since 1985.[18] The share reached a height of 6.8 percent in 2007, and maintained an average of 5.3 percent from 2000 to 2015.

[18]See Table 5: Summary Statistics

$$\begin{array}{c} \textit{Dividend} \\ \textit{Income} \end{array} = \begin{array}{c} \textit{Net dividend payments} \\ \textit{by domestic industries} \end{array} + \begin{array}{c} \textit{Net dividend payments} \\ \textit{by the rest of the world} \end{array} \tag{2}$$

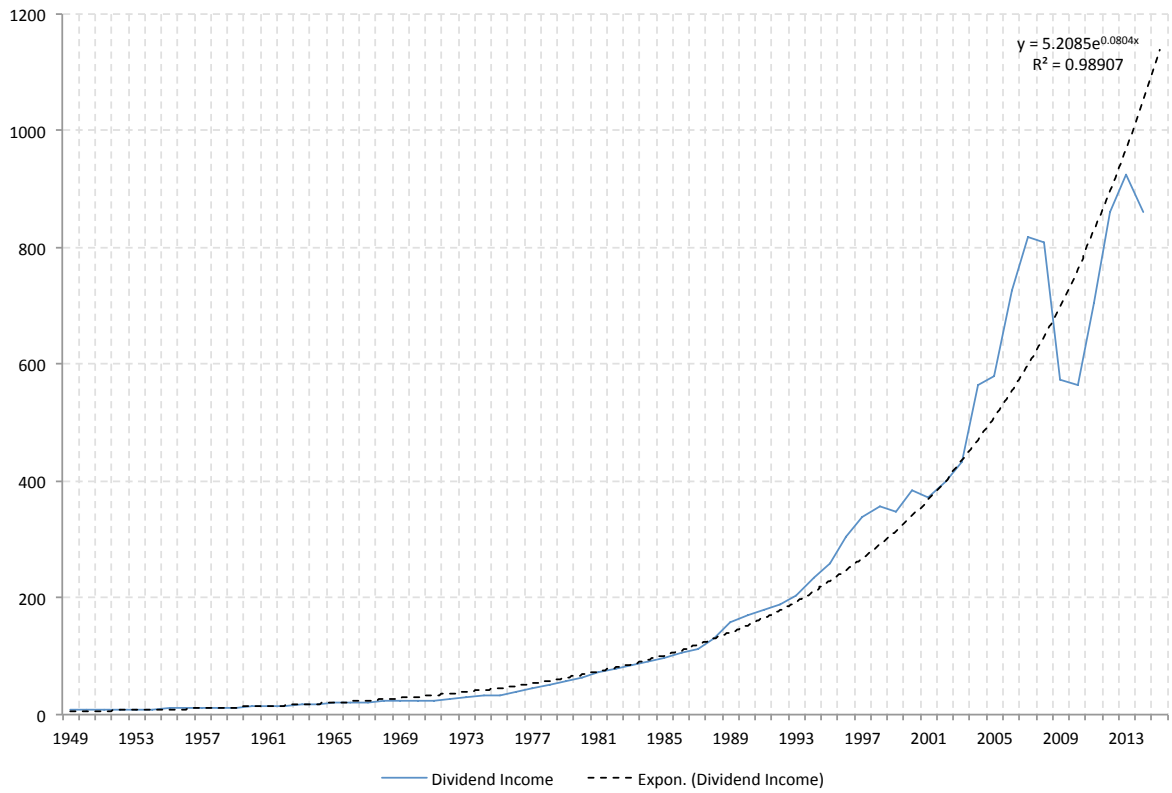

Figure 9: Dividend Income In the United States, 1949-2015

Dividend income as shown in the NIPA tables is from all sources including dividends received by individuals, by private and government employee retirement plans and by quasi-individuals, nonprofit institutions, and estates and trusts. Pension funds, some insurance reserves, and private trust funds are considered to be the property of persons, so dividends received by these institutions are included in personal dividend income. Dividends received by mutual funds are generally redistributed to the mutual fund shareholders, so these dividends can be considered to "pass through" to their owners and are also included in personal dividend income.[19] From equation 2, dividend payments made by domestic industries are categorized into the following industries: (1) agriculture, forestry and fishery; (2) mining; (3) contract construction; (4) manufacturing; (5)

[19]For more information see See more at: http://www.bea.gov/

transportation and public utilities; (6) Wholesale rade; (7) retail trade and automobile services; (8) finance, insurance and real estate and (9) service. The categorization for the periods 1998 - 2014 changed to include more sub-divisions and groups.[20]. Figure 9, Figure 10 and Figure 11 show the dynamics of dividend income in the United States.

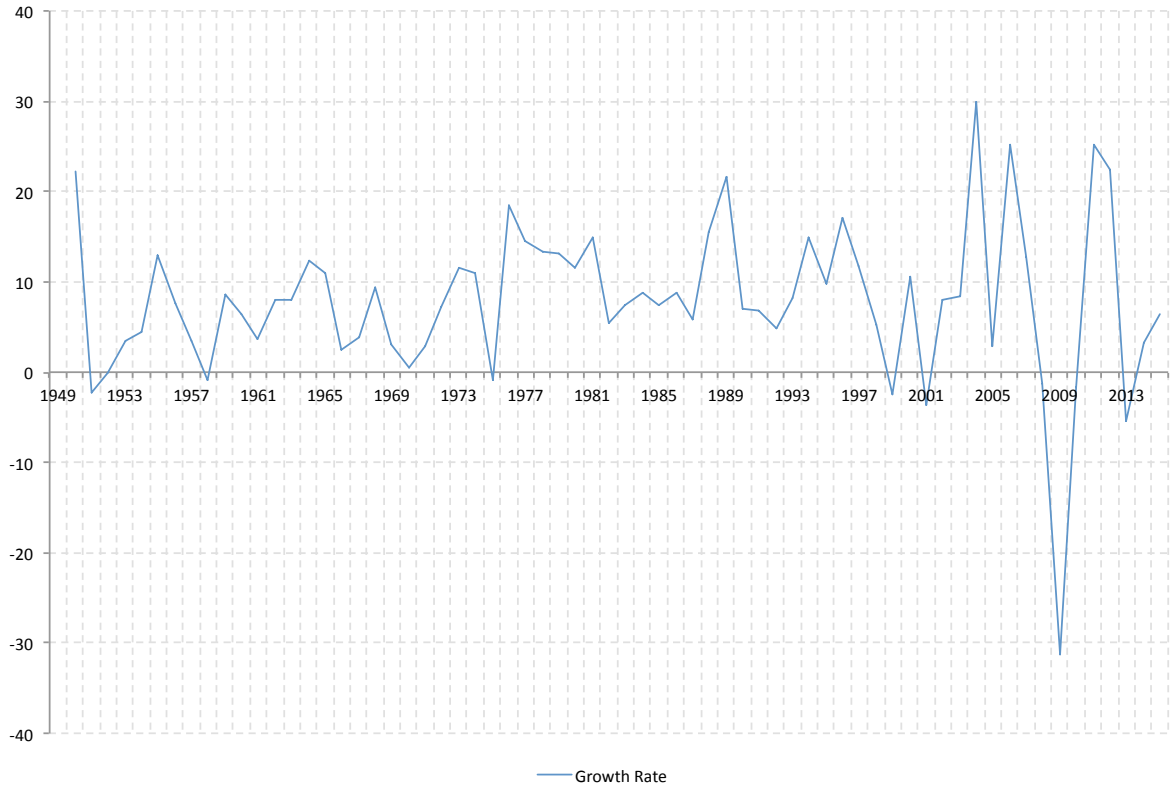

Figure 10: Growth in Dividend Income United States, 1949-2015

Dividend income in the U.S. has been growing at approximately 8 percent since 1950. See Figure 9 and Figure 10. On average, 83 percent of this income is dividends paid by U.S. corporations to domestic industries and residents, and 17 percent is dividends paid to U.S. citizens by foreigners. See Figure 11. Even though the majority share of dividend income is paid by U.S. corporations to domestic industries, it is important to note that the share of dividend income paid to U.S. residents by the rest of the world has drastically increased over the years. This places emphasis on the importance of property ownership outside the U.S. economy that generates wealth within the U.S. economy. In 1950, the

[20]See NIPA tables 6.20A, 6.20B, 6.20C and 6.20D. Table 6.20D provides the different categorization for the 1998 - 2014 data

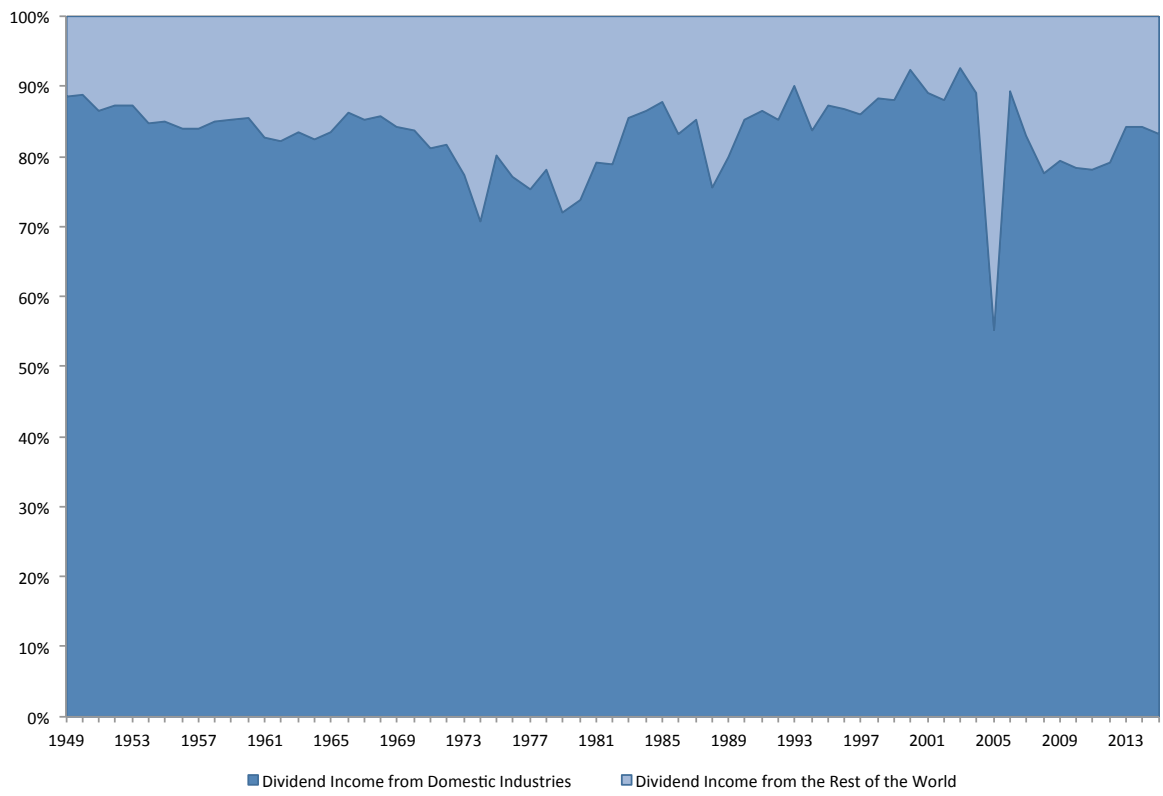

Figure 11: Composition of Dividend Income in the United States, 1950-2015

share of dividend income paid by the rest of the world to U.S. residents, contributed 11 percent to total dividend. It currently contributes approximately 18 percent. Between 1960 and 1990, the foreign component of dividend income fluctuated between 20 to 30 percent, and declined to about 10 percent in the nineties. Starting 2000 it resumed a steady rise reaching a max of approximately 40 percent in 2004. Overall, the foreign component contributes about 16% to total dividend income which is about 12 percent of income from property ownership. Also, there has been a lot of fluctuations in dividend income since 1985. This can be mainly attributed to the fact that, U.S. economy experienced several financial frictions since the 80's. With the economic expansion of the 2000's dividend income reached a max growth rate of about 29.98 in 2004. However, with the Great Recession in 2007, it decreased by 31.11 percent between 2007 and 2010. See Figure 10.

4.2 Interest Income in the United States, 1950 - 2015

As defined by the BEA, it is the interest income from all sources, both monetary and imputed, that is received by individuals, by private and government employee retirement plans and by quasi-individuals. Monetary interest recevied by individuals and quasi-individuals consists largely of interest that is reportable for federal individual income tax - including nontaxable interest from municipal bonds - but it also includes the interest received by nonprofit institutions, the interest retained by estates and trusts, and the interest accrued on individual retirement accounts and other tax deffered savings accounts in the year in which the interest is earned.[21] Monetary interest received by private and government employee retirement plans compromises interest received by private pension plans, by the Federal Civilian employee retirement plans (including TFPs), by the military retirement plan, and the state and local government employee retirement plans.[22] Imputed interest income by persons consists of the investment that is received on behalf of individuals by life insurance carriers and the imputed interest that is received by persons from banks, credit agencies, and regulated investment companies, which represents the value of financial services for which person are not explicitly charged. Interest income is the second most significant component of income from property ownership. Over the 1950 - 2015 period, interest income accounted for 10.95 percent of total personal income at the national level. See Table 5. This contribution is 6 percentage points higher than the contribution by dividend income, and capital gains, whose share are 3.7 percent and 3.5 percent respectively.[23] Interest income as measured by the BEA is calculated as

$$\begin{array}{c}\textit{Interest}\\ \textit{Income}\end{array} = \begin{array}{c}\textit{Net Interest paid}\\ \textit{by businesses}\end{array} + \begin{array}{c}\textit{Net interest paid}\\ \textit{by the government}\end{array} + \begin{array}{c}\textit{Personal interest}\\ \textit{payments}\end{array} \tag{3}$$

[21] For more details see www.bea.gov

[22] The BEA calculations indicates that, for each of the civilian categories, 60 percent of the interest - the "currently employed" portion - is assumed ot be recived on behalf of current employees, and 40 percent - the "retired" portion - on behalf of retired persons and their survivors. For the military plan, the "currently employed" portion is assumed to be 40 percent, and the "retired" portion is 60 percent

[23] The contribution of interest income to total personal income is greater than the contribution of dividend income and capital gains combined.

where

$$\begin{array}{l}\textit{Net Interest paid}\\ \textit{by businesses}\end{array} = \begin{array}{l}\textit{Net domestic}\\ \textit{business interest}\end{array} + \begin{array}{l}\textit{Owner occupied}\\ \textit{housing interest}\end{array} + \begin{array}{l}\textit{Nonprofit}\\ \textit{institutions}\\ \textit{interest}\end{array} + \begin{array}{l}\textit{Interest from the}\\ \textit{rest of the world}\end{array} \tag{4}$$

$$\begin{array}{l}\textit{Net interest paid}\\ \textit{by the government}\end{array} = \begin{array}{l}\textit{Monetary}\\ \textit{interest}\\ \textit{paid}\end{array} + \begin{array}{l}\textit{Depositor, insurance}\\ \textit{\& pension services}\\ \textit{imputed interest paid}\end{array} + \begin{array}{l}\textit{Borrower services}\\ \textit{imputed interest}\\ \textit{paid}\end{array} - \begin{array}{l}\textit{monetary interest}\\ \textit{received}\end{array} - \begin{array}{l}\textit{depositor, insurance \&}\\ \textit{pension services imputed}\\ \text{interest received}\end{array} \tag{5}$$

$$\begin{array}{l}\textit{Personal}\\ \textit{interest}\\ \textit{payments}\end{array} = \begin{array}{l}\textit{Monetary interest}\\ \textit{paid by persons}\\ \textit{of households}\end{array} + \begin{array}{l}\textit{Borrower services}\\ \textit{imputed interest paid}\\ \textit{by persons of households}\end{array} \tag{6}$$

From 1950 to 2015 the rate of growth of income from interest has been approximately 8 percent. Before 1965, most of interest income in the U.S. was due to net interest paid by the government which went from about 60 percent of total interest income in 1950 to about 40 percent in the early 1960's and further falling to 30 percent in the early 1980's. The share of interest income by the government has been persistently stable after 1985, accounting for 34 percent admist fluctuations. See Figure 14. Even though interest income by domestic businesses, owner-occupied housing, non-profit institutions and the rest of the world contributed approximately 29 percent to total interest income in the 1950's, there's been a drastic increase in it's share over the years. It accounted for 60 percent in 1980 and remain between 40 to 50 percent through the 90's and 2000's. Currently, it is the most substantial contributor to interest income, averaging 48 percent since 1965. On the contrary, the share of interest income by households has remained

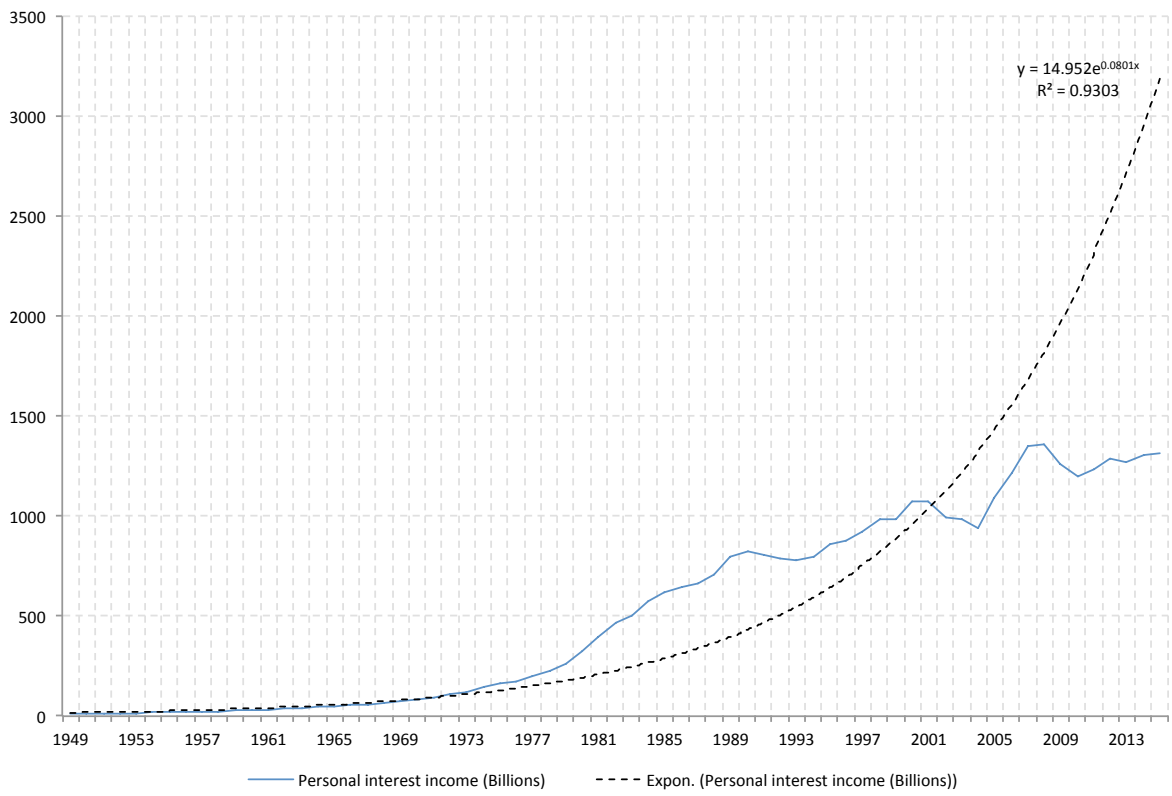

Figure 12: Interest Income in the United States, 1949-2015

fairly stable over the years, fluctuating mainly between 10 and 20 percent of total interest income. See Figure 14 for details on the components of interest income. Figure 12 shows a structural break in the growth rate of interest income before and after 1985. Before 1985, the long-run growth rate of interest was approximately 11.9 percent, during which we observe a significant increase in the share of interest income payments by businesses, nonprofit institutions, foreign organization and the housing market.[24]. However, after 1985, there has been a drop in the growth rate of interest income to 2.9 percent. What does this imply for wealth creation? Even though, the current growth in interest income is much lower than it was in the 1950 - 1980 period, it is evident from the data that the acquisition of private sector interest bearing assets creates more wealth than government interest bearing assets and interest bearing assets by households. An alternative way of measuring interest income, defined by the BEA, is given by

[24]There is an increase in the share of interest income payments by businesses, nonprofit institutions, foreign organizations and the housing market to total interest income from 25 percent in 1950 to approximately 55 percent in 1980's.

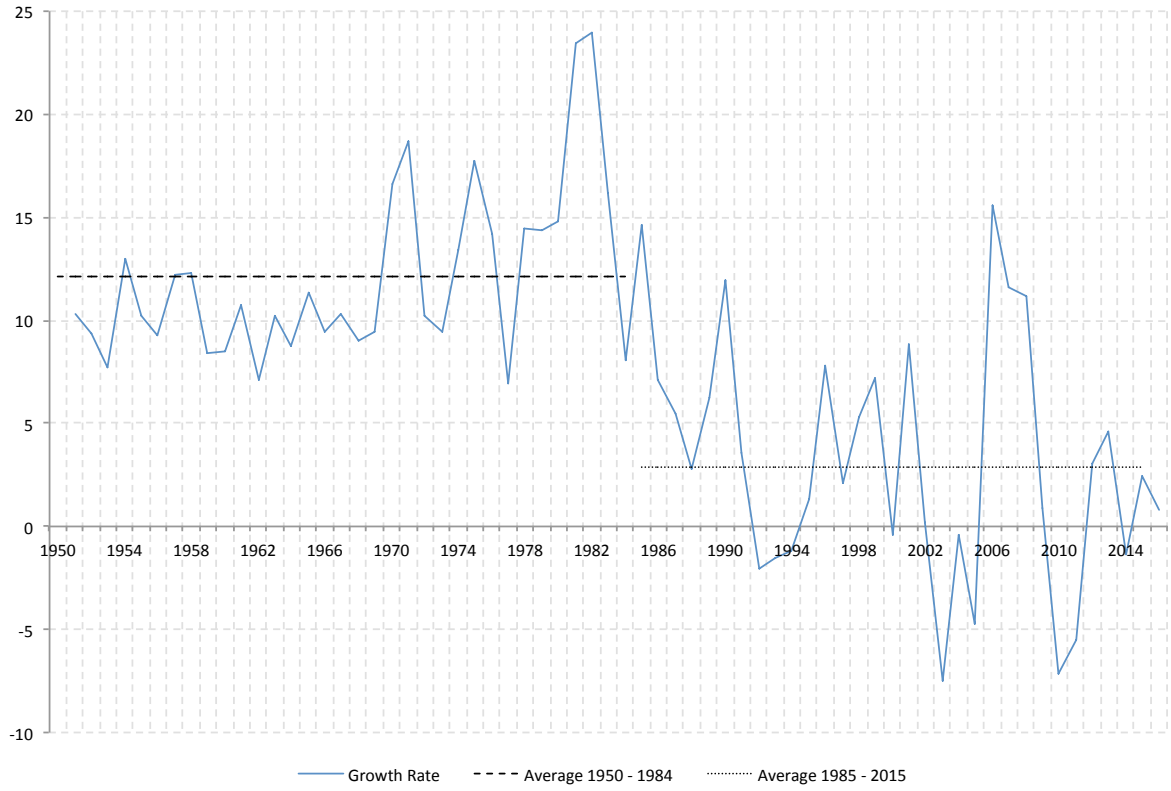

Figure 13: Growth in Interest Income in the United States, 1949-2015

$$\begin{array}{c}\textit{Interest}\\ \textit{Income}\end{array} = \begin{array}{c}\textit{Monetary interest}\\ \textit{received by persons}\end{array} + \begin{array}{c}\textit{Imputed interest}\\ \textit{received by persons}\end{array} + \begin{array}{c}\textit{Imputed interest received}\\ \textit{by non-profit institutions}\end{array} \tag{7}$$

where monetary interest received consists of interest that is reportable for federal individual tax and imputed interest received consists of interest that is received on behalf of individuals. Equation (7) reveals interest facts about the composition of interest income from a different perspective. First and foremost, it shows that imputed interest received by non-profit institutions account for almost zero percent of interest income.[25] Until 1976, the share of interest received by non-profit institutions to interest income was actually zero, and then averaged 0.099 percent after 1976. Secondly, monetary interest received by persons has been persistently declining over the entire period: 55 percent of interest income in 1950 to an average of 36 percent between 2010 and 2015. On the other

[25] Over the 1950 to 2015 period, imputed interest received by non-profit institutions accounted for 0.05 percent.

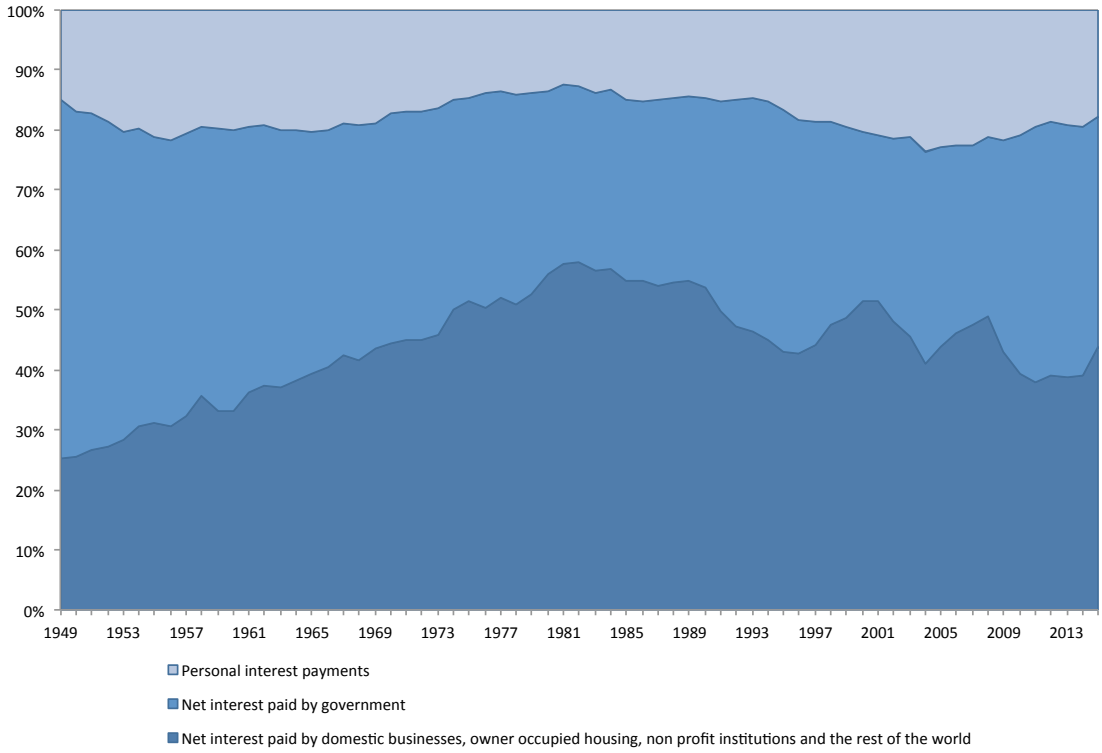

Figure 14: Composition of Interest Income in the United States, 1949-2015

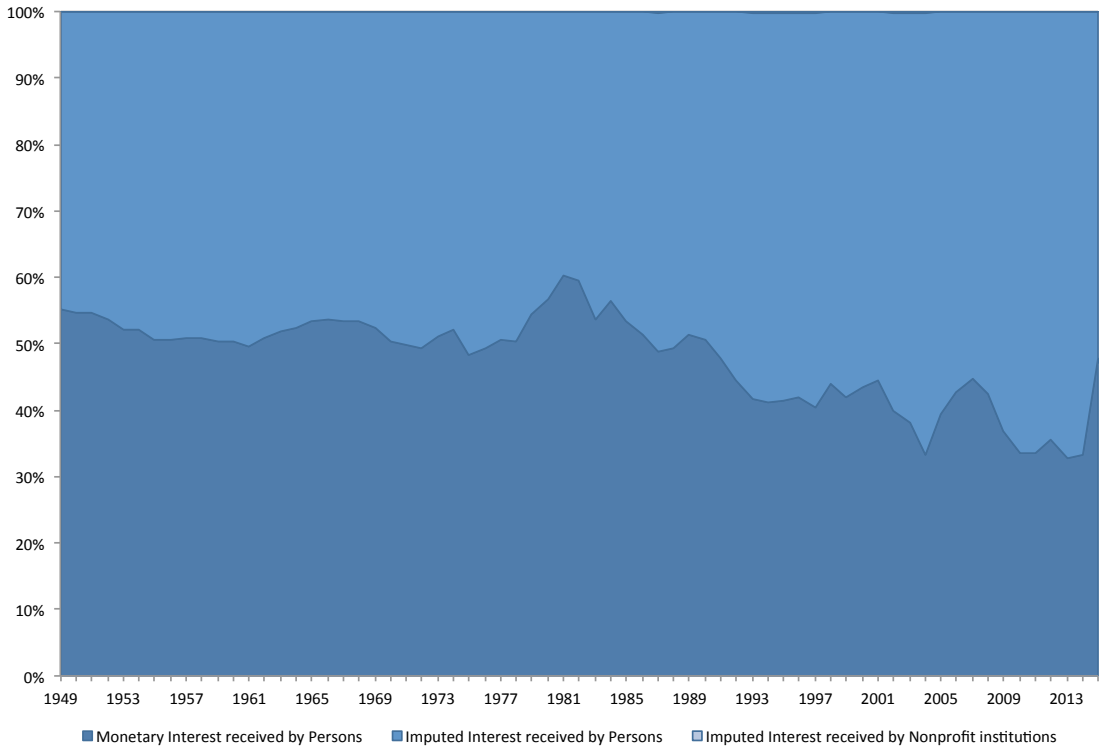

Figure 15: Alternative Composition of Interest Income in the United States, 1949-1950

hand, imputed interest received by persons has been persistently rising, and currently accounting for more than 60 percent of interest income. This certainly enforces the role of inherited wealth as imputed interest income by persons consists of investment that is received on the behalf of others through life-insurance careers, and from banks, credit agencies, and regulated investment companies.

4.3 Rental Income in the United States, 1950 - 2015

Rental income with capital consumptions adjustment as defined by the BEA, is the net current-production income of persons from the rental of real property. It consists of net income from the rental of tenant occupied housing by persons, the imputed net income from the housing services of owner-occupied housing, and the royalty income of persons from patents, copyrights, and the rights to natural resources. Rental income is divided into monetary rental income and imputed rental income. Monetary rental income is the net rents and royalties that are received by individuals and quasi-individuals, and also net rents and royalties that are recived by private pension plans. Imputed rental income consists of imputed net rents received by the owner-occupants of mobile homes and imputed net rents received by owner-occupants of all other non-farm dwellings. See [25] for more details. Rental income with capital consumption adjustment (unaltered measure as provided by the BEA) is calculated as

$$\begin{array}{l}\textit{Rental}\\ \textit{income}\end{array} = \begin{array}{l}\textit{Rental income from}\\ \textit{private businesses}\end{array} + \begin{array}{l}\textit{Rental income from households}\\ \textit{and nonprofit institutions}\end{array} \tag{8}$$

where

$$\begin{array}{l}\textit{rental income from}\\ \textit{private businesses}\end{array} = \begin{array}{l}\textit{tenant occupied}\\ \textit{housing income}\end{array} + \begin{array}{l}\textit{Income from farms}\\ \textit{owened by nonoperator}\\ \textit{landlords}\end{array} + \begin{array}{l}\textit{Income from nonfarm}\\ \textit{nonresidential property}\end{array} + \textit{royalties} \tag{9}$$

$$\begin{aligned}\textit{rental income from households} \\ \textit{and nonprofit institutions}\end{aligned} = \begin{aligned}\textit{income from nonfarm} \\ \textit{owner occupied housing}\end{aligned} + \begin{aligned}\textit{Income from farm owner} \\ \textit{occupied housing by} \\ \textit{farm operators}\end{aligned} + \begin{aligned}\textit{Income from tenant} \\ \textit{occupied housing owned} \\ \textit{by nonprofits}\end{aligned} \tag{10}$$

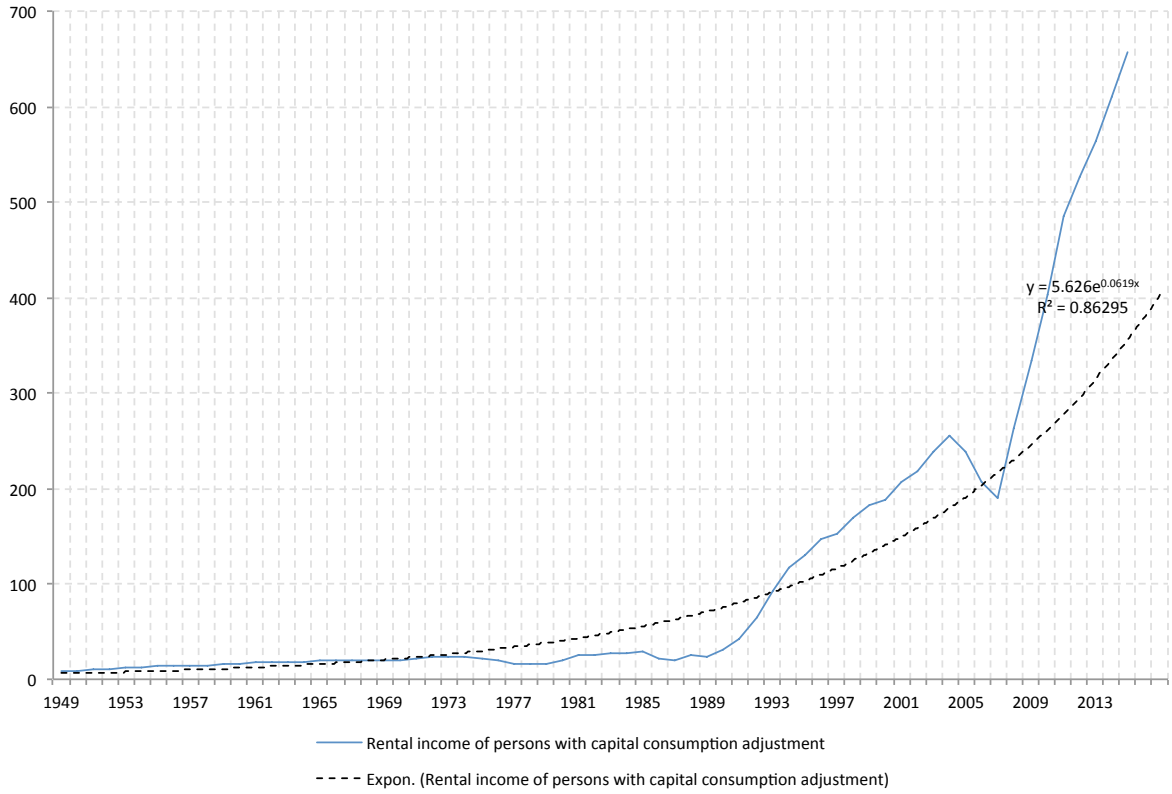

Figure 16: Rental Income in the United States, 1949 - 2015

Rental income in the U.S. has been growing at 6 percent since 1950s as shown in Figure 16. The rate of growth of income from rental has been equally due to both rental income from private businesses and rental income from households and nonprofit institutions as shown in Figure 17. Between 1950 and 1985 the share of rental income from private businesses followed a U-shape pattern: decreasing from 55 percent of total rental income to 30 percent in the 1960's, then rising to almost 100 percent in 1985. The

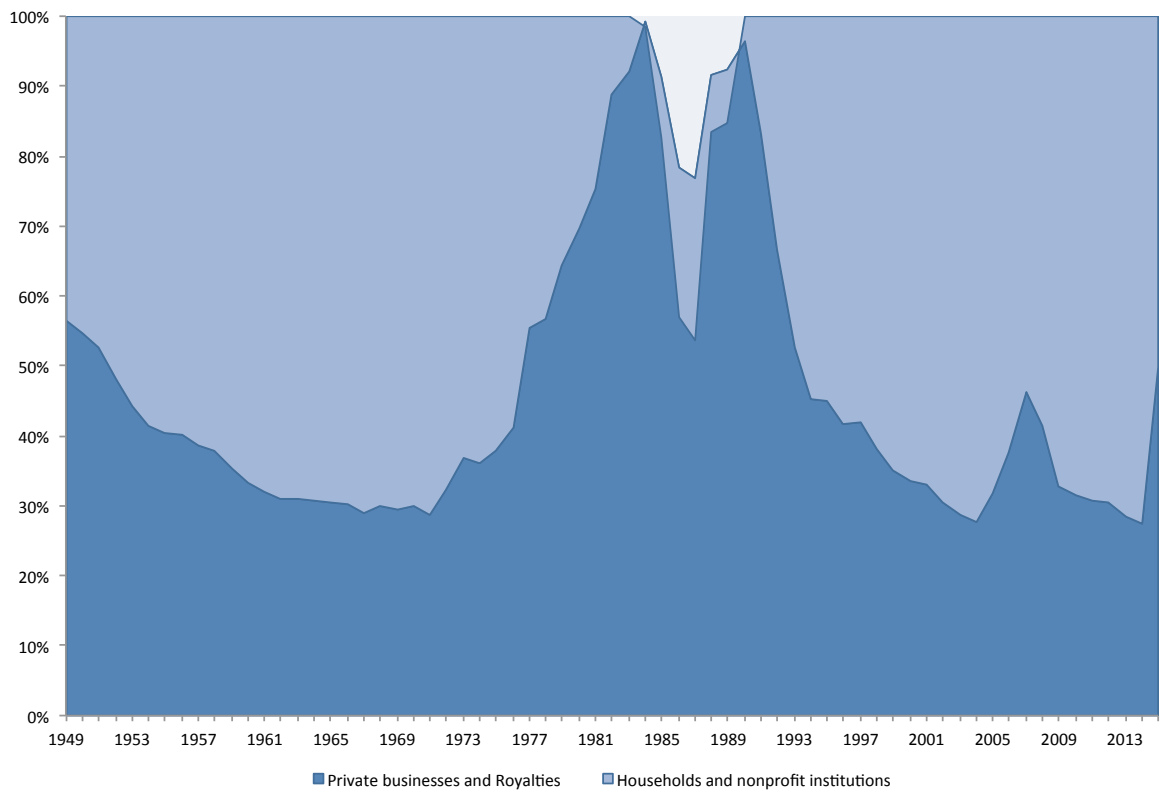

Figure 17: Composition of Rental Income in the United States, 1949 - 2015

rise during the 1980's was mainly due to the increase in income from royalties and tenant occupied housing activitives. See Figure 18. Likeweise, during the same time there was a significant decline in rental income from households, mainly because of decline in nonfarm owner-occupied activities between 1984 and 1989. See Figure 19. During this period, the sum of the components of rental income was less than 100 percent, mainly because income from household were mainly in the negative. Since 1990, on the other hand, there has been a gradual decline in the share of rental income by private businesses to about 30 percent between 2010 and 2015. During the same period, the growth in rental income from household and nonprofit institutions also increased to about 70 percent. This can by explain solely by the increase in household nonfarm owner-occupied housing since 1990, which coincides with the rise in housing market activities the U.S. economy.

However, the BEA definition of rental income does not include data for persons engages in the real estate business. That is, it does not include the net income from the rental of tenant occupied housing by corporations, which in included in the calculation

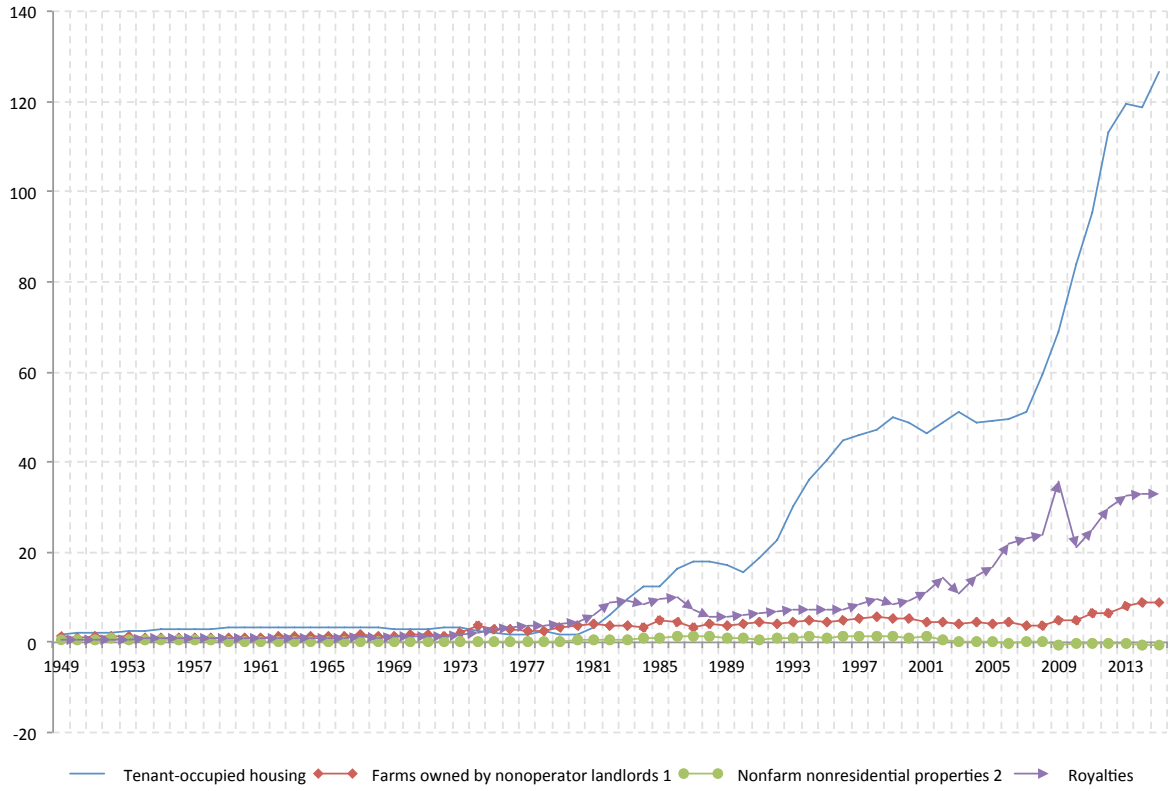

Figure 18: Composition of Rental Income from Private Businesses and Royalties in the United States, 1949-2015

of corporate profits, or the net income of tenant occupied housing by partnerships and sole proprietorships, which is included in proprietors' income. I provide an alternative measure for rental income by including rental income of persons engaged in the real estate business. Since Corporate profits are usually distributed in the form of dividends, or interests, or reinvested in the company I do not include the portion tenant occupied housing by corporations.[26] Data on persons in the real estate business can be found in NIPA table 7.2, line 9, Proprietors' Income. Proprietors' income, with inventory valuation and capital consumption adjustments, is defined as the current-production income of sole proprietorships and partnerships, and of tax-exempt coorporatives. Proprietors' income is usually presented in two parts - nonfarm proprietors income which accounts for more than 80 percents of proprietors' income and then farm proprietors' income. For my

[26]To compensate this problem I provide an alternative measure for income from property ownership which includes undistributed corporate profits. This accounts for real estate businesses owned by corporations but it only serves to increase the $r_p - g$ gap.

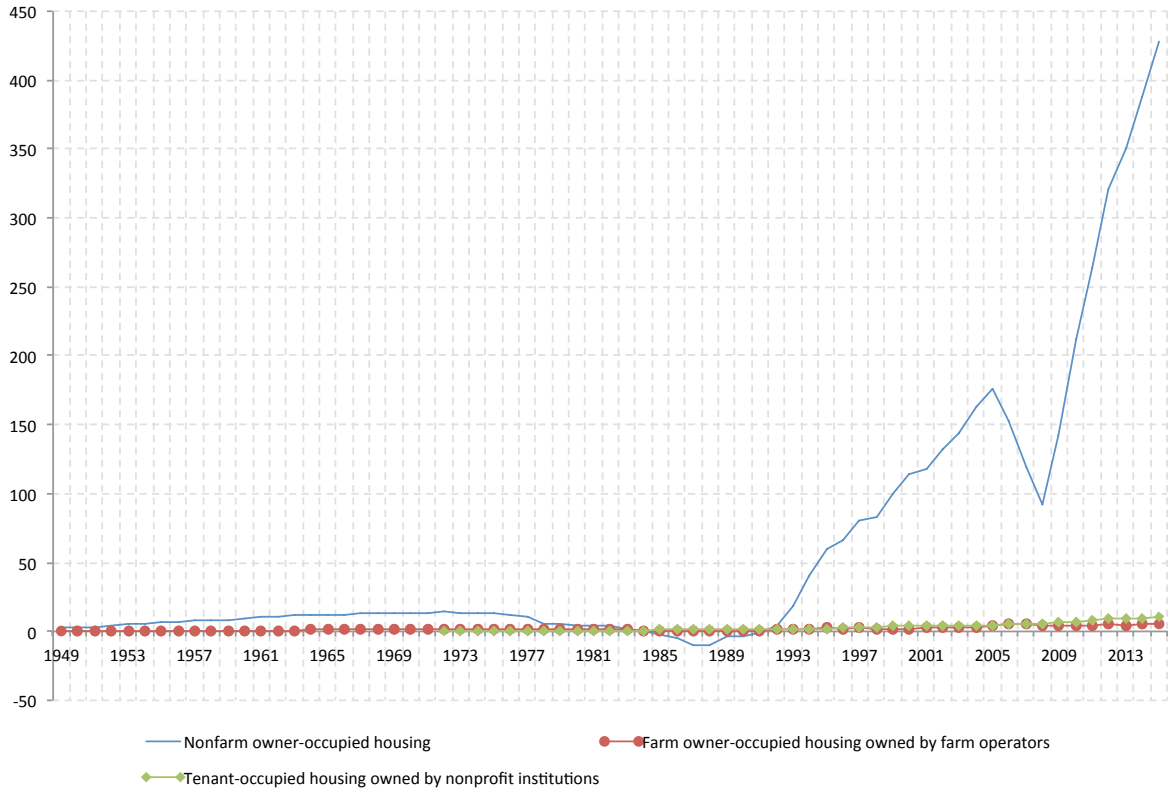

Figure 19: Composition of Rental Income from Households and Non-Profit Institutions in the United States, 1949-2015

analysis, I use rental income adjusted for persons engaged in the real estate businesses.[27] So then, the modified equation for rental income is given by

$$\begin{array}{c}\textit{Rental}\\ \textit{income}\end{array} = \begin{array}{c}\textit{Rental income}\\ \textit{from private}\\ \textit{businesses}\end{array} + \begin{array}{c}\textit{Rental income from}\\ \textit{households and}\\ \textit{nonprofit institutions}\end{array} + \begin{array}{c}\textit{Proprietors'}\\ \textit{income}\end{array} \tag{11}$$

By including proprietors income into rental income, the long-run growth rate of income from rental remains at 6 percent per annum since 1950. See Figure 20. This growth rate is the same as the unadjusted rental income defined by the BEA. However, it is evident from Figure 21 that the contribution of households, non-profit institutions, private businesses and royalties, is trumped by the contribution of persons engaged in the real estate business. Over the entire period, proprietors' income accounts for more than 80

[27] The alternative measure is based on the authors own calculations.

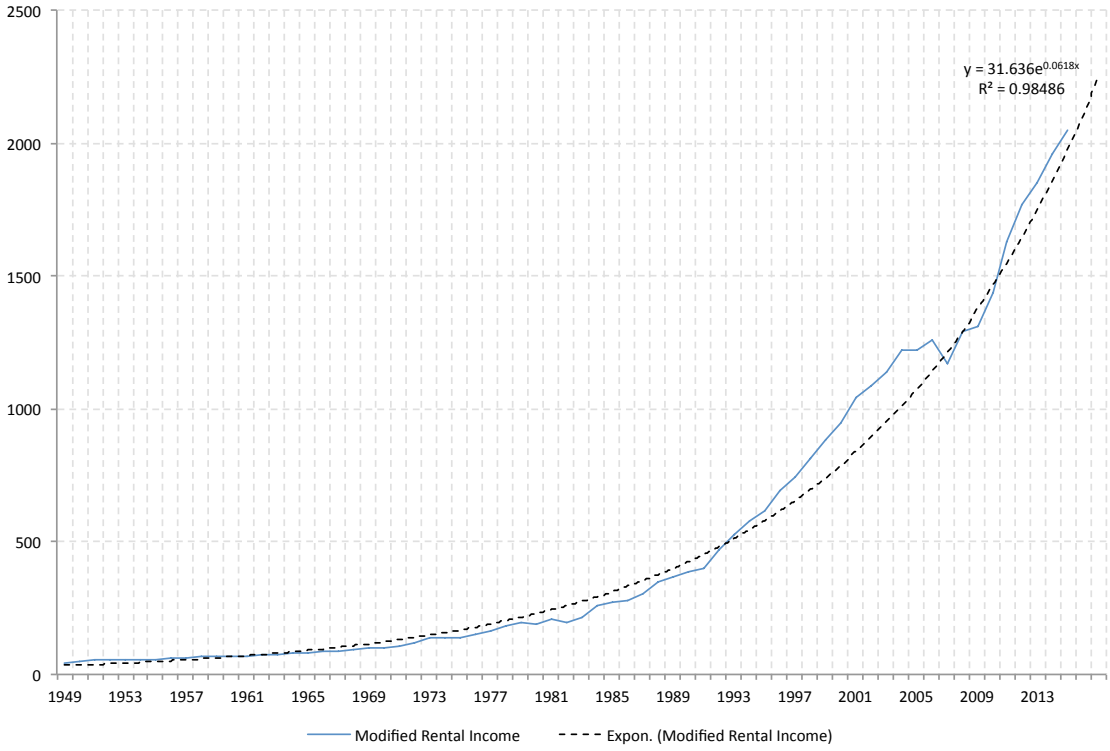

Figure 20: Adjusted Rental Income in the United States, 1949 - 2015

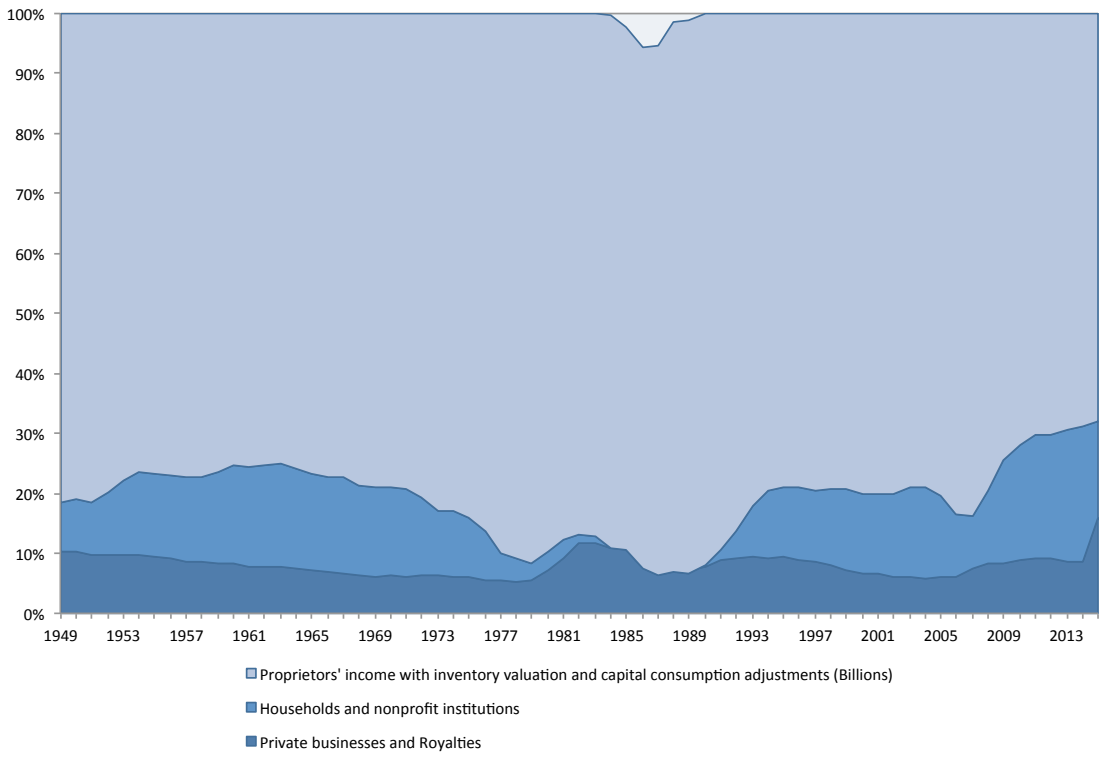

Figure 21: Composition of Adjusted Rental Income in the United States, 1949 - 2015

percent of rental income reaching heights of approximately 93 percent between 1986 and 1990. Nonetheless, after the 2007 financial crises in the U.S., its contribution has substantially reduced to approximately 70 percent between 2009 and 2015. During the same period, there has been a spike in rental income from household and non-profit instituion. It is important to highlight the role played by real estate businesses, as acquiring property significanly leads to wealth creation, and we see that it is corporations that benefit more from the acquisition of property.

4.4 Capital Gains in the United States, 1950 - 2015

Realized capital gains data are not readily available from BEA sources, so then I obtain the series on realized capital gains by splicing data from the U.S. Department of Treasury, Office of Tax Analysis for the years 1954 to 2009 and from the Congressional Budget Office for the years 1995 to 2013.[27, 28] The CBO data for 2014 to 2015 are projected values and data for 1950 to 1953 are estimated values based on the long-run growth from 1954 to 2013 . See Table 6 and Table 7.[28] Captial gains have increasingly become an integral part of income in the U.S. even though it is not included in the National Income and Product Accounts. Between 1950 and 2015, realized capital gains were about 3.6 percent of National income. This share gradually increased over the years, reaching heights of 8.8 and 7.7 percent of national income in 1986, and right before the Great recession of 2007, respectively. The contribution of realized gains cannot be ignored when observing income from property ownership. See Table 5.

In the United states, individuals and corporations are both subject to U.S. federal taxes on the net of their capital gains just as they are subject income tax. Particulary, short-term capital gains - which are gains on assets held for a year or less before being sold - are taxed at the same rate as income tax, and long-term capital gains - which are gains on the sale of assets held for more than one year - are generally taxed at a more favorable rate than the income tax rates. [11] According to the Internal Revenue Services (IRS) the current (2015) tax rate on most net capital gain is no higher than 15% for

[28] To get data for the years 1950 to 1953, I extrapolated the long run values for captial gains based on the growth rate of realized capital gains from 1954 and 2014.

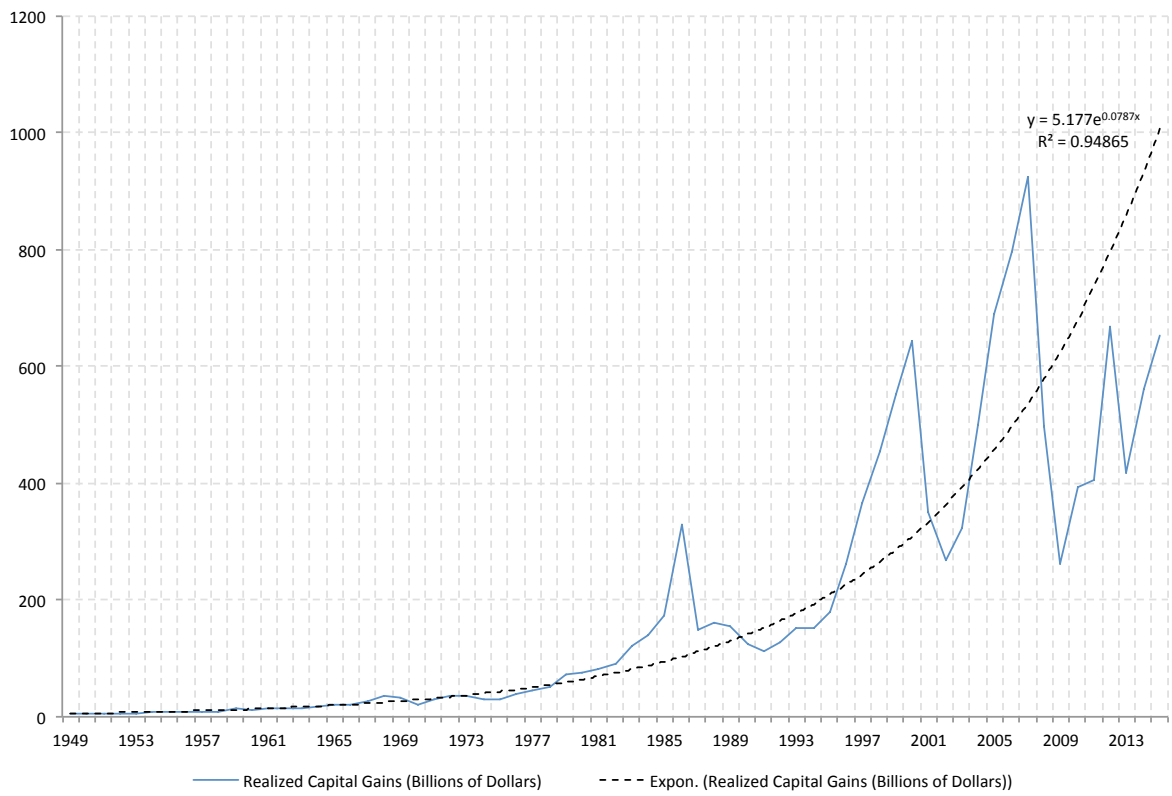

Figure 22: Realized Capital Gains in the United States, 1950 - 2015

most taxpayers. Some or all net capital gains are taxed at 0% for individuals that fall within the 10% - 15% ordinary income tax bracket; 15% for individuals within the 25% - 35% income tax bracket; and 20% for the 39.6% income tax bracket. See Table 8. The gains tax is mainly dependent on the investors tax bracket and the amount of time the investment was held before being sold. However, there are few exceptions where capital gains may be taxed at rates greater than 15%. These include: the taxable part of a gain from selling qualified small business stock which is taxed at a maximum 28%, net capital gains from selling collectibles (coins, art etc.) which are taxed at a maximum 25%, and the portion of any unrecaptured gain from selling real property is taxed at a maximum 25%. On the other hand, under the "step up in basis" rule in the federal tax code, capital gains are taxed at 0% in case of death. Also, for an individual who inherits stock or property and later sells it, the stock/property is subject to capital gains tax on the difference between what the stock or property was sold for and what the stock was worth when it was inheritted. That is, there is no capital gains tax from when the stock

or property was purchased to when it was inheritted. Inherently, it shows that property is not taxed when inherited even though it might have appreciated in value and generated wealth over the years.

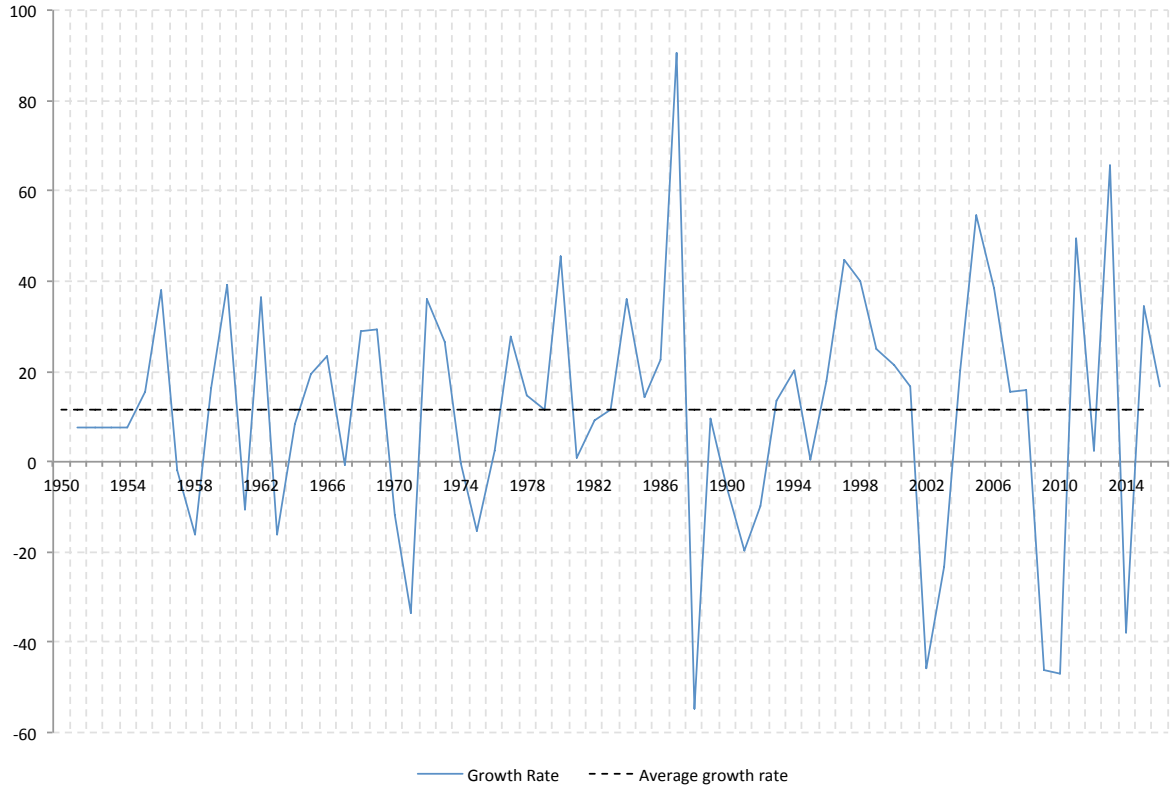

Figure 23: Growth Rate of Income from Realized Capital Gains in the United States, 1950 - 2015

To highlight the importance of capital gains in the United States, emphasis must be placed on the history of marginal tax rates on gains, and how it affects the investors income, especially after the world wars. During 1921, the United States District Court of Connecticut ruled that an appreciation in capital assets, inasmuch as it was merely an increase in capital rather than income, was not taxable as income under the federal income tax ammendment.[29][14] This decision was in conformity with British practice. However, the supreme court soon reversed the decision of the Connecticut court, and the Revenue Act of 1921, introduced by the Harding Administration, recognized and defined the difference between ”capital gains” and ”ordinary net income.” The new law provided

[29] Walsh vs. Brewster, 268 Fed. 207

that captital net gains of individuals may be taxeded at 12.5 percent instead of at the higher surtax rates which are applicable to ordinary net income that reach the higher tax brackets, provided that any one who elects to have his capital gains taxed at 12.5 percent shall in no case pay less than 12.5 percent upon his entire net income. This limitation on the taxation of capital gains was of no benefit to individual having a net income less than $31,000, for such a person would have to pay less than an average 12.5 percent on his/her income [9]. From 1934 to 1941, tax payers could exclude a percentage of their capital gains which mainly varied with the length of their holding period. That is, taxpayers could exclude 20, 40, 60 and 70 percent of their gains from taxes if their assets were held for 1, 2, 5 and 10 years respectively [11]. The tax breaks created the incentive for investors to delay realizing their gains. Beginning 1940's, more incentives were given to asset holders as taxpayers could exclude 50 percent of capital gains on assets held for shorter periods, at least six months, or they could elect a 25 percent alternative tax rate if their ordinary tax rate exceeded 50 percent [11]. The incentive to long-term captial gains were drastically reduced in the 1969 Tax Reform and 1976 Tax Reform. The 1969 Tax Refor Act under the Nixon administration, indicated that the alternative tax on long-term capital gains gives an incentive for high income taxpayers to convert their income into capital gains in order to receive lesser rates because the alternative rates decreases their effective tax rate by more than one-half. To solve the solution, the 1969 act eliminated the 6 months holding period deduction, imposed a 10 percent minimum tax, and limited the alternative tax to $50,000 of gains. The 1976 act further increased the capital gains tax rates by increasing the minimum tax rate to 15 percent. By 1977 and 1978, the maximum tax rate on capital gains had reached 39.875 percent with the minimum tax and 49.875 percent including an interation with the maximum tax. [11, 43, 26] The 1980's were accompanied with capital gain tax reductions. In 1981 there were tax rate reductions on capital gains to a maximum of 20 percent on long-term gains. However, these reductions did not last long as the 1986 Tax Reform Act repealed the exclusion of long-term gains and raised the maximum rate to 28 percent (33 percent for taxpayers subject to certain phaseouts). Top ordinary tax rates were increased by the

1990 and 1993 budget acts and an alternative 28 percent capital gains tax was introduced. However, the effective tax rate exceeded 28 percent for many high-income taxpayers so then in 1997 new lower rate reductions for 18-month and 5-year assets were adopted. [11] See Table 6 and Table 7 for Nominal and Effective tax rates for the period 1954 to 2014.

The Taxpayer Relief Act of 1997, imposed imposed a 20% maximum tax rate on assets held for more than 18 month before sale. This Relief Act substantially changed the taxation of capital gains on principal residence. It included a one-time exclusion of up to $125,00 of capital gains for taxpayers age 55 and over, and the rollover of capital gains from one resident to another, were replaced with an exclusion of up to $500,000 ($250,000 for nonjoint returns). [11] The issue of taxes with realized capital gains has raised criticism as very little federal tax revenue is generated. Nonetheless, since 1997 the maximum tax rate on long-term gains has averaged 20 percent. This is 18 percentage points lower than the income tax bracket imposed on the wealthy. It is evident then that by converting income payment to capita gains, the wealthy are able to substantially lower their taxes. [30].

During the period 1950 to 2015, the long-run growth rate of income from realized capital gains was approximately 7.8 percent. Like the other components of income from property ownership, this is 5.8 percentage points higher than the long-run growth rate in income per capita in the U.S. economy. It is important to note that the data used is only on realized capital gains. Unrealized gains certainly create wealth when asset prices appreciate in value. However, due to the lack of data on unrealized capital gains, it is excluded from my analysis.

[30] This does not include the fact tax payers can exclude almost up to 80 percent of their gains from taxes

5 Models of Wealth Concentration

5.1 The Piketty Model of wealth Accumulation

I employ the Piketty dynamic wealth-accumulation model with random idiosyncratic shocks [38], where I make the assumption that the return on capital (r) as defined in the model is well captured by the rate of return on property ownership (r_p). I consider a dynamic economy with a discrete set of generations $0, 1, ..., t, ...$ The model can be interpreted as an annual model, with each period lasting T=1 year, or a generational model with each period T=30 years, in which case the savings taste can be interpreted as bequest taste. Assuming a stationary population, $N_t = [0, 1]$, made of a continuum of agents of size one, aggregate variables and average variables are the same for wealth and national income. That is $W_t = w_t$ and $Y_t = y_t$. I also assume that effective labor supply $L_t = N_t \cdot h_t = h_0 \cdot (1 + g)^t$ grows at an exogenous rate g. Domestic output, Y_{td}, is given by the CES production function

$$Y_{td} = F(K_t, L_t) = \left[a K_t^{\frac{\sigma-1}{\sigma}} + (1-a) L_t^{\frac{\sigma-a}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \tag{12}$$

Let's assume that each individual $i \in [0, 1]$ receives labor income $y_{Lt,i} = y_{Lt}$ and has some annual rate of return $r_{pt,i} = r_{pt}$. Each agent chooses c_{ti} and $w_{t+1,i}$ to maximize their utility function with wealth taste parameter, s_{ti}, given by the Cobb-Douglass utility function

$$U\left(c_{ti}, w_{ti}\right) = c_{ti}^{1-s_{ti}} w_{ti}^{s_{ti}} \tag{13}$$

and subject to the budget constraint

$$c_{ti} + w_{t+1,i} \leq y_{Lt} + (1 + r_{pt}) w_{ti} \tag{14}$$

Random shocks are introduced into the model only in the form of idiosyncratic variations in the savings taste parameter, s_{ti}, which is drawn from an *iid* random process with mean $s = E(s_{ti}) < 1$. Intuitively, s cannot equal one, because people who save all their income and returns from wealth are left with nothing to consume. Utility maximization implies that

$$c_{ti} = (1 - s_{ti})\Big[y_{Lt} + (1 + r_p t)w_{ti}\Big] \tag{15}$$

which indicates that individuals consume a fraction of their total resources, both labor income and wealth, available at time t. By substituting equation (15) into equation (14) (the budget constraint), we have that

$$w_{t+1,i} = s_{ti}\Big[y_{Lt} + (1 + r_{pt})w_{ti}\Big] \tag{16}$$

which gives us the individual transition equation for wealth. At the aggregate level $y_t = y_{Lt} + r_{pt}w_t$, and $s_{ti} = s$, and by substituting into equation (16) we get that [31]

$$w_{t+1} = s\Big[y_t + w_t\Big] \tag{17}$$

Since we are interested in the wealth to income ratio, let's divide equation (16) by $y_{t+1} \approx (1 + g)y_t$, then

$$\frac{w_{t+1}}{y_{t+1}} = s\left[\frac{y_{Lt}}{y_t(1+g)} + \frac{(1 + r_{pt})}{1 + g} \cdot \frac{w_t}{y_t}\right] \tag{18}$$

By denoting the capital share as $\alpha_t = r_{pt}\beta_t$, and the labor share as $1 - \alpha_t = \frac{y_{Lt}}{y_t}$, and that the wealth-income ratio at time t is equal to β_t, by rearranging (18) this results in the

[31] We also take that the aggregate variables and average variables are the same for wealth and national incomehence.

transition equation for the wealth income ratio, which is given by

$$\beta_{t+1} = s\left[\frac{1-\alpha_t}{1+g} + \frac{1+r_{pt}}{1+g}\beta_t\right] \tag{19}$$

In an open economy case, $r_{pt} = r_p$ and from equation (19), it is obvious that β_t converges towards a finite limit β if and only if

$$\omega = s \cdot \frac{1+r_p}{1+g} < 1 \tag{20}$$

If $\omega > 1$ then β_t keeps increasing from generation to generation, and β_t converges to infinity (∞). In the long-run, the economy is no longer a small open economy and "r_p" will have to fall so that $\omega < 1$. This explains the fact that individuals cannot accumulate wealth forever. If $\beta_t < \beta_{t+1} < \beta_{t+2} < ...$ then eventually, r_p will fall until $\omega < 1$ at which β_t converges. On the other hand, β_t always converges, in a closed economy case, towards a finite limit. In the long-run, the rate of return on capital is equal to the marginal product of capital, and depends negatively upon β and is determined by the CES production function. However since the rate of return on capital is captured by the rate of return on property ownership, then $r_p = F_k = \alpha\beta^{-1/\sigma}$. The steady-state level of wealth-income ratio implies that $\beta_{t+1} = \beta_t$. By substituting this in equation (17) and dividing through by y_{t+1} you obtain the steady-state wealth income ratio:

$$\beta_t \to \beta = \frac{s}{g+1-s} = \frac{\tilde{s}}{g} \tag{21}$$

where $\tilde{s} = s(1+\beta) - \beta$ is the steady state savings rate expressed as a fraction of national income. Taking that normalized individual wealth (z_{ti}) is equal to w_{ti}/w_t, and by dividing both side of equation (16) by $w_{t+1} \approx (1+g)w_t$, you obtain

$$\frac{w_{t+1,i}}{w_{t+1}} = s_{ti}\left[\frac{1-\alpha}{1+g} \cdot \frac{y_t}{w_t} + \frac{1+r_{pt}}{1+g} \cdot \frac{w_{ti}}{w_t}\right] \tag{22}$$

Given that $\frac{w_t}{y_t} = \beta = \frac{s}{1+g-s}$ which implies that $\frac{y_t}{w_t} = \frac{1}{\beta}$, and that $\alpha = r_p\beta = r_p \cdot \frac{s}{1+g-s}$, then

$$z_{t+1,i} = \frac{s_{ti}}{s}\left[1 - s\frac{1+r_p}{1+g} + s\frac{1+r_p}{1+g}z_{ti}\right] \tag{23}$$

Since ω is defined as $s\frac{1+r_p}{1+g}$, the individual level transition equation for wealth can be written as

$$z_{t+1,i} = \frac{s_{ti}}{s}\left[(1-\omega) + \omega \cdot z_{ti}\right] \tag{24}$$

Following the work of Piketty and Zucman [38], let's assume a simple 2 dimensional inequality model with Binomial Random Tastes, where the role played by taste in the model takes only two values. The shocks could come from taste or other factors such as in the primogeniture model of Stiglitz [41], or from the rates of return as seen in the models of Benhabib et al. [7, 8] and Nerei [24].[32] That is

$$s_i = \begin{cases} s_0 & \text{with probability} 1-p \\ s_1 & \text{with probability} p \end{cases}$$

Then the aggregate savings rate in the economy is given by

$$s = E(s_i) = ps_1$$

Given the transition equation for wealth and assuming that $\omega < 1 < \omega^* = \omega/p$, if $s_i = s_0 = 0$, then $z_{t+1,i} = 0$ with probability $1-p$, and if $s_i = s_1 > 0$, then $z_{t+1,i} = \frac{s_1}{s}[(1-\omega) + \omega z_{ti}]$ with probability p, which implies that $z_{t+1,i} = \frac{1-\omega}{p} + \frac{\omega}{p} \cdot z_{ti}$. The

[32] From Piketty [38] this is applicable to models with multiplicative random shocks in the wealth accumulation process, whether shocks are binomial or multinomial, and whether the shocks come from tastes or other factors.

steady-state wealth distribution, $\phi(z)$, is discrete and given by

$$
\begin{aligned}
&z = z_0 = 0 \quad \text{with probability} \quad 1-p \\
&z = z_1 = \frac{1-\omega}{p} = \frac{1-\omega}{p} + \frac{\omega}{p}\left(\frac{1-\omega}{p}\right) \quad \text{with probability} \quad (1-p)p \\
&z = z_2 = \frac{1-\omega}{p} + \frac{\omega}{p}z_1 = \frac{1-\omega}{p} + \frac{\omega}{p}\left(\frac{1-\omega}{p}\right) + \frac{\omega^2}{p^2}\left(\frac{1-\omega}{p}\right) \quad \text{with probability} \quad (1-p)p^2 \\
&\vdots \\
&z = z_k = \frac{1-\omega}{p} + \frac{\omega}{p}z_k = \frac{1-\omega}{p} = \frac{1-\omega}{p} + \frac{\omega}{p}\left(\frac{1-\omega}{p}\right) + \frac{\omega^2}{p^2}\left(\frac{1-\omega}{p}\right) + \cdots + \frac{\omega^k}{p^k}\left(\frac{1-\omega}{p}\right)
\end{aligned}
$$

which implies that

$$
z_k = \frac{1-\omega}{\omega-p}\left[\left(\frac{\omega}{p}\right)^k - 1\right] \qquad \text{with probability}(1-p)p^k \tag{25}
$$

Note that as $k \to \infty$, $z_k \approx \frac{1-\omega}{\omega-p} \cdot (\frac{\omega}{p})$. Also, assuming that $\frac{\omega}{p} < 1$, then $(\frac{\omega}{p})^k - 1$ becomes negative for any k and hence $z_k = \frac{1-\omega}{p-\omega}[1 - (\frac{\omega}{p})^k]$ which has a finite upper bound $\frac{1-\omega}{p-\omega}$ as $k \to \infty$.

The cummulated distribution of wealth is given by

$$
\begin{aligned}
1 - \Phi(z_k) &= Prob(z \geq z_k) \\
&= \sum_{k' \geq k} (1-p)p^{k'} \\
&= p^k
\end{aligned} \tag{26}
$$

as $z \to +\infty$, this implies that

$$
log[1 - \Phi(z)] \approx a[log(\omega) - log(z)] \tag{27}
$$

That is,

$$
1 - \Phi(z) \approx \left(\frac{\lambda}{z}\right)^a \tag{28}
$$

where $\lambda = \frac{1-\omega}{\omega-p}$ is a constant term and $a = \frac{log(1/p)}{log(\omega/p)}$ is the pareto coefficient. The inverted

Pareto coefficient (the ratio of average wealth z^* of individuals with wealth above z to z) for the distribution is given by

$$b = \frac{a}{a-1} = \frac{log(\frac{1}{p})}{log(\frac{1}{\omega})} > 1 \tag{29}$$

For a given probability p, as $\omega \to 1$, the pareto coefficient $a = \frac{log(1/p)}{log(\omega/p)} \to 1$ and $b \to +\infty$, which implies infinite wealth inequality. That is, an increase in $\omega = s\frac{1+r_p}{1+g}$ implies a larger wealth reproduction rate ω^* for wealth holders, which provides a stronger amplification of inequality. Likewise, as $\omega \to p$, the pareto coefficient $a \to +\infty$ and the inverser pareto coefficient $b \to 1$ which implies zero wealth inequality. On the other hand, for a given level of ω, as $p \to 0$, $a \to 1$ and $b \to +\infty$, implying that a small fraction of the population gets an infinitely large stock of wealth. Conversely, as $p \to \omega$, $ato + \infty$, and $b \to 1$ which implies that the long run level on inequality approaches zero. This inherently shows that the inequality of wealth is an increasing function of r_p and g

5.2 Simulating the Piketty Model of Wealth Accumulation

By simulating a simple model for the United States economy over the 1950 - 2015 period, the dynamics of the wealth inequality profile can be produced in comparison to the findings by Piketty [34] (Chapter 10). If we assume each period to be a discrete-time model as shown above as lasting H years (with H=30 years = generation length), and if r_p and g denote instantaneous rates, then ω can be written as

$$\omega = s \cdot \frac{1+R_p}{1+G} = s \cdot e^{(r_p - g)\cdot H} \tag{30}$$

with $1 + R_p = e^{r_p \cdot H}$ the generational rate of return on property and $1 + G = e^{g \cdot H}$ the generational growth rate. Simulating the model for the entire period post World Wars, $r_p = 7.17\%$ and $g = 2.06\%$. So then the gap $r_p - g$ equals 5.09% for the United States economy. With a savings rate, $s = 8.65\%$ and $H = 65$ years, this implies that

$\omega = s \cdot e^{(r_p - g) \cdot H} = 2.489$.[33] See Table 2 for results. I find that $\omega > 1$, which implies that wealth inequality is explosive in the U.S. economy. This also implies that there is no existence of a long run level of wealth concentration hence overtime ω would have to fall such that $\omega < 1$. Assuming the same estimates for growth in income per capita and savings rate, the level of r_p necessary for there to be a stable equilibrium wealth inequality in the U.S. economy, r_p has to be less than 5.83%. This corresponds to a maximum $r - g$ gap of 3.77%. By assuming that $r_p = 5$, equivalent to the long run rate of return on capital suggested by Piketty [33], for a given binomial shock structure with $p = 10\%$, $\omega = 0.6080$, the pareto coefficient $a =$ equals 1.2757, and the inverse pareto coefficient b equals 4.627. This estimate corresponds to an economy with high wealth inequality where the top 1 percent wealth share is around 50-60 percent. Significantly higher than the estimates of wealth inequality suggested by Piketty. Table 1 shows the estimates of the pareto coefficients (a) and the inverse pareto coefficients (b) over the decades. Table 2 shows the estimates over a 30-year period and for the entire 1950-2015 period. Both Table 1 and Table 2 assume that the probability of a wealth distribution shock (p) occuring is 0.1 (10 percent). For Table 3, I simulate the model assuming that the probability of a shock occuring is 0.0015 (0.15 percent).

[33] I assume a savings rate equal to the United States personal savings rate expressed as a percentage of disposable income (NIPA Table 2.1) over the period 1950 - 2014.

Table 1: Results from Simulating the Piketty Model: $H = 10$ years

Time	Savings Rate s	Return on Property Ownerhsip r_p	Growth per capita g	omega $\omega = s \cdot e^{H \cdot (r_p - g)}$	Pareto Coefficient $a = \frac{log(1/p)}{log(\omega/p)}$	Inverse Pareto Coefficient $b = \frac{a}{a-1}$
1950-1959	0.1063	0.0632	0.0248	0.156	5.18	1.24
1960-1969	0.1113	0.0666	0.0312	0.1586	4.99	1.25
1970-1979	0.1183	0.1002	0.0217	0.0929	negative	-
1980-1989	0.0931	0.0987	0.0218	0.2009	3.3	1.43
1990-1999	0.0672	0.0657	0.0199	0.1062	38	1.03
2000-2009	0.0426	0.0246	0.0085	0.05	negative	-
2010-2015	0.0567	0.0646	0.0133	0.0947	negative	-

Calculations by Author. The probability of a shock occuring in the United States economy (p) is set to 0.1

Table 2: Results from Simulating the Piketty Model: $H = 30$ years or more

Time	Savings Rate s	Return on Property Ownerhsip r_p	Growth per capita g	omega $\omega = s \cdot e^{H \cdot (r_p - g)}$	Pareto Coefficient $a = \frac{log(1/p)}{log(\omega/p)}$	Inverse Pareto Coefficient $b = \frac{a}{a-1}$
1956-1985	0.1119	0.084	0.0234	0.689	1.196	6.102
1986-2015	0.0583	0.0484	0.0156	0.156	5.181	1.239
1950-2015	0.0865	0.0715	0.0206	2.489	-	-

Calculations by Author. The probability of a shock occuring in the United States economy (p) is set to 0.1

Table 3: Results from Simulating the Piketty Model: $p = 0.0015$

Time	Savings Rate s	Return on Property Ownerhsip r_p	Growth per capita g	omega $\omega = s \cdot e^{H \cdot (r_p - g)}$	Pareto Coefficient $a = \frac{log(1/p)}{log(\omega/p)}$	Inverse Pareto Coefficient $b = \frac{a}{a-1}$
1950-1959	0.1063	0.0632	0.0248	0.156	1.40	3.5
1960-1969	0.1113	0.0666	0.0312	0.1586	1.39	3.56
1970-1979	0.1183	0.1002	0.0217	0.0929	1.58	2.72
1980-1989	0.0931	0.0987	0.0218	0.2009	1.33	4.03
1990-1999	0.0672	0.0657	0.0199	0.1062	1.52	2.92
2000-2009	0.0426	0.0246	0.0085	0.05	1.86	2.16
2010-2015	0.0567	0.0646	0.0133	0.0947	1.57	2.75
1956-1985	0.1119	0.084	0.0234	0.689	1.06	17.67
1986-2015	0.0583	0.0484	0.0156	0.156	1.40	3.5
1950-2015	0.0865	0.0715	0.0206	2.489	-	-

Calculations by Author. The probability of a shock occuring in the United States economy (p) is set to 0.0015.

The main findings of this paper is that, the Piketty Random Shock model does not explain wealth inequality in the United States when considering the return on property ownership. This is mainly due to the restrictions that are placed on the model: $\omega = s \cdot \frac{1+r_p}{1+g} < 1$ and $\omega < p$. These conditions are necessary for an equilibrium level of wealth inequality to exist. Intuitively, people don't decide to accumulate wealth because of these conditions. The results shown in Table 1 indicate that the inverse pareto coefficient (b) ranges between 1.0 and 1.5. This shows that the U.S. economy is an extremely egalitarian society with the top 1 percent owning between 0 to 10 percent of the nations wealth. For certain decades, 1970-1979, 2000-2009, and 2010-2015, $\omega < p$ resulting in a negative pareto coefficient.[34] Since a must alway be greater than zero, there cannot exist an equilibrium level of wealth inequality when $a < 0$. The reason why Piketty [33] suggests that the

[34] Calculation are made given a binomial shock structure $p = 0.1$. This is what is used in Piketty and Zucman [38].

U.S. economy hasn't reached levels of wealth inequality previously experienced by most European economies before the World Wars is because, enough time hasn't elapsed for wealth to be accumulated. Perhaps, this is true and evident when simulating the dynamic wealth-accumulation model with random idiosyncratic shocks over decades. That is, the long run effect of $r_p - g$ on wealth is not made evident within the decade. Next, I evaluate the model over 30 year periods and over the entire period of study, 1950 to 2015. See table 2 for results.

There are two main contradictions from simulating the longer period effect of $r_p - g$ on wealth inequality, assuming a probability shock of 10 percent ($p = 0.1$). First, between 1956 and 1985, $a = 1.196$ and $b = 6.102$ which implies a level of wealth inequality where the top 1 percent own approximately 70 - 80 percent of total wealth in the U.S. economy. However, we that that from 1986 to 2015, there is a decline in the level of wealth inequality in the U.S. economy. That is, the inverse pareto coefficient, b, is equal to 1.239 which is equivalent to an economy where the top 1 percent own approximately 5 percent of total wealth. This contradicts Piketty's [33] findings as wealth inequality after the World Wars has been gradually rising. By taking the average of the two wealth inequality estimates over the two periods, we get an estimate close to Piketty's prediction of wealth inequality in the U.S. economy, where the top 1 percent own about 40 percent of wealth. The second contradiction comes by ways of estimating the model over the entire period, 1950 - 2015. From Table 2 we see that $\omega = s \cdot e^{(r_p - g) \cdot H} = 2.489$. If ω is greater than 1, then we have explosive inequality. Therefore, based on the model, there is explosive wealth inequality in the U.S. economy. The level of $r_p - g$, given the estimate for s in the U.S. economy over the 66 year period, needed to ensure that there exists an equilibrium level of inequality ($\omega < 1$) implies that $r_p - g < 0.037$ (3.7 percent). Piketty [33] assuming an $r - g$ gap of 3 percent certainly ensures that an equilibrium level does exist. However, by looking at income from property ownership we see that inequality is explosive in the U.S. economy.

To ensure a level of inequality where the top 1 percent own approximately 35 percent of wealth as in Piketty [36, 37], where the pareto coefficient (b) is equal to 3.5, this implies that, the probability of a binomial random shock occurring has to equal 0.0015

(0.15 percent).[35] This implies that the probability of a shock occuring, whether from taste, primogeniture, the number of children, or from the rates of return, which Piketty [33] mentions, has been practically non-existent since the 1950's. Table 3 shows the results for the simulated model for decades, starting from the 1950s, for 30 year periods, and for the entire period assuming that $p = 0.0015$.

5.3 A Simple Model of Wealth Accumulation

A lot of ideology went into the design and display of the U.S. National Income and Product Accounts (NIPA). The NIPA propagates the notion that national income is identical to the production of goods and services. Hence, the only way of generating income is through the production of goods and services valued by the people. Likewise, it also corroborates the notion that wealth is built through production, which is in line with Piketty's claim that all capital is used in the production process only. However, as shown in section 2.3 wealth can be created without the production of goods and services taking place. The central role of Piketty's $r - g$ in generating wealth has given rise to some confusion. According to Jones [15], This confusion is rooted in the fact that, the relationship between Piketty's $r - g$ and wealth inequality is not obviously clear in the Neoclassical Growth model. Jones [15] indicates that the relationship between $r - g$ and inequality is much more easily appreciated in models that explicitly generate pareto wealth inequality. The key link between the data and the theory is the pareto distribution.

In this section, I examine a simple model of wealth accumulation that gives rise to Pareto Distribution, and considers the economic forces that influence top inequality over time for the U.S. economy. Pareto inequality is generated through a mechanism that is characterized by the power law: *an exponential growth that occurs over an exponentially distributed amount of time results in a pareto distribution.*[36] My contribution here is that I introduce the rate of return on property ownership into the model.

[35] Calculation are made with the assumption that $\frac{a}{a-1} = 3.5$ hence $a = 1.4$, and the current estimates of the savings rate (s), the rate of return on property ownership (r_p), and the growth rate of GDP per capita (g) in the U.S. economy.

[36] The defining characteristic of a Pareto Distribution is $Pr[x > y] = y^{-\frac{1}{\eta}}$, which implies that the probability that x is greater than y is proportional to y raised to some power. See Pareto [29]

Following the work of Jones [15], let's assume an economy with heterogenous people, there is no labor income, individuals consume a constant fraction α of their wealth, wealth is subject to tax, τ, and that the average wealth per person (capital per person) grows at an exogenous rate g. So then, let a denonte an individuals wealth which accumulates over time according to

$$\dot{a} = r_p a - \tau a - c \tag{31}$$

where r_p is the rate of return on property ownnership (assets), τ is a wealth tax rate, and c is the individuals consumption.[37] Assuming that consumption is a constant fraction of wealth α, then

$$\dot{a} = (r_p - \tau - \alpha) \cdot a \tag{32}$$

which is the law of motion for wealth accumulation. The wealth of an individual of age x at date t is then given by

$$a_t(x) = a_{t-x}(0) \cdot e^{(r_p - \tau - \alpha) \cdot x} \tag{33}$$

where $a_{t-x}(0)$ is the initial wealth of a new born at date $t - x$. Note that capital is not equal to property. That is, the exponential growth of wealth is fundamentally affected by the return on property ownership, r_p. Therefore, in the asset accumulation equation, the return on property ownership is the key determinant of an individuals wealth. To obtain a variable that exhibits a stationary distribution, the individual's wealth is normalized by average wealth per person or income per person in the economy.

Same as Jones [15], I introduce heterogeneity into the model through a birth-death process, where each new born in the economy inherits the same amount of wealth, and the aggregate inherittance is simply equal to the aggregate wealth of the people who die each period. The number of people born at date t is give by

$$B_t = B_0 e^{\bar{n}t} \tag{34}$$

[37] Other models that promote a simple model of wealth accumulation include Wold and Whittle [46], Stiglitz [41], Quadrini [39], Benhabib and Bisin [7], Nirei [24], Moll [22], and Piketty and Zucman [33]

Death follows a poisson process with the arrival rate $\bar{d}$. Hence the stationary distribution of the birth-death process is an exponential process, given by

$$Pr[Age > x] = e^{-(\bar{n}+\bar{d})x} \tag{35}$$

See Appendix B for more details.

The model can be analyzed in either a general equilibrium framework or in a partial equilibrium framework.[38] For comparison with the Piketty model, I focus on a partial equilibrium model. The ideal with wealth distribution in a partial equilibrium framework is that newborns inherit wealth of the people who die in the economy, hence

$$\begin{aligned} a_t(0) &= \frac{\bar{d}K_t}{(\bar{n}+\bar{d})N_t} \\ &= \bar{a}k_t \end{aligned} \tag{36}$$

where $\bar{a} \equiv \frac{\bar{d}}{\bar{n}+\bar{d}}$ and $k_t \equiv \frac{K_t}{N_t}$ is capital per person in the economy.[39] Even though I am using capital in the model, the assumption is that capital is not equal to wealth. If an economy is in a steady state, then the capital per person grows at a constant and exogenous rate, g, over time. That is

$$k_t = k_0 e^{gt} \tag{37}$$

The assumption here is that the growth of income per person determines the initial wealth of a person, therefore the amount of wealth that a person of age x at date t inherited when they were born at date $t - x$ is given by

$$a_{t-x}(0) = \bar{a}k_{t-x} = \bar{a}k_t e^{-gx} \tag{38}$$

[38] Note that in a partial equilbrium model, the growth rate of normalized wealth is $r_p - g - \tau - \alpha$. In a general equilibrium model, the key source of heterogeneity is population growth. Newborns in such an economy inherit wealth of the people who die. However, since there are more newborns than people who die, newborns inherit less than the average amount of wealth per capita.

[39] $\bar{d}K_t$ equals the aggreate wealth of the people who die, and $(\bar{n}+\bar{d})N_t$ is the number of new borns. Because of population growth, new borns inherit less than the average amount of capital per person in the economy, and this fraction is $\bar{a}$.

Substituting this into the equation for wealth accumulation, we get that

$$a_t(x) = \bar{a}k_t e^{(r_p - g - \tau - \alpha)x} \tag{39}$$

The above equation is the exponential growth process that is central to the pareto distribution of normalized wealth, and it is obvious that $r_p - g$ plays an important role as shown by Piketty [33]. However, another process central to the process is the exponential age distribution (population growth) providing heterogeneity in the model. We now have an exponential growth process occuring over an exponentially distributed amount of time. By inverting $a_t(x)$ we have that

$$x(a) = \frac{1}{r_p - g - \tau - \alpha} log(\frac{a}{\bar{a}k_t}) \tag{40}$$

which gives the age at which a person achieves wealth a. The wealth distribution is then given by

$$\begin{aligned} Pr[wealth > a] &= Pr[Age > x(a)] \\ &= e^{-(\bar{n}+\bar{d})x(a))} \\ &= (\frac{a}{\bar{a}k_t})^{(-\frac{\bar{n}+\bar{d}}{r_p - g - \tau - \alpha})} \end{aligned} \tag{41}$$

Since the pareto inequality is measured by the inverse of the exponent, we get a steady state distribution that is pareto wealth, such that

$$\eta_{wealth} = \frac{r_p - g - \tau - \alpha}{\bar{n} + \bar{d}} \tag{42}$$

The above equation is at the basis of wealth creation and emphasises the Piketty $r - g$ relation as well. Note that as the gap $r_p - g$ increases so does wealth inequality, all other things being equal. Likewise, a lower wealth tax will increase wealth inequality and vice versa. It is also very important to address $\bar{n} + \bar{d}$ in the pareto wealth equation. In a society where $\bar{n} + \bar{d}$ is low either because of a decine in birth rate($\bar{n}$) or a decline in death rate ($\bar{d}$) - people who are part of a long lived dynasty - greater stocks of wealth will be

accumulated. So then, low population growth will aid wealth creation by minimizing the distribution of wealth leading to high inequality and vice versa.

5.4 Simulating the Simple Model of Wealth Accumulation

Simulationg the simple model of wealth accumulation for the United States economy over the period 1950 - 2015, I compare the results to the model in section 5.1 and 5.2, and also to the findings by Piketty [33]. The analysis is based on the simple pareto wealth accumulation, where

$$\eta_{wealth} = \frac{r_p - g - \tau - \alpha}{\bar{n} + \bar{d}} \tag{43}$$

I simulate the model for the entire period post World Wars where $r_p = 7.17\%$ and $g = 2.06\%$, implying that the long-run gap between r_p and g is 5.09%. I also simulate the model over 30-year periods, starting 1956, and over 10-year periods starting in 1950. The results are show in Table 4, Figure 24 and Figure 25. In column (1) of Table 4, I evaluate the model based on the criteria that, data for income from property ownership already accounts for taxes, consumption and depreciation. However, in columns (2) and (3), I evaluate the model considering different tax growth rates (progressive taxes). Based on the Pareto wealth inequality (Inverse pareto coefficient), three (3) main facts are evident: First and foremost, After the World Wars, wealth inequality starts rising as suggested by Piketty [33]. In the 1950's, it is observed that the average wealthy individual owns approximately 3.6 times as much wealth as the average person. An increase is observed through the 1960's and 1970's until the 1980's where the average wealthy individual owns approximately 10 times as much wealth as the average individual in the U.S. economy. This pattern is also observed when different levels of tax growth rates are examined. Nonetheless, the level of inequality throughout this period far exceeds the level suggested by Piketty. Based on the the results in column (1) of Table 4, it is observed that the top 1 percent own approximately 35 percent of wealth in the 1950's. This rise in inequality rises until the 1980's where the top 1 percent own about 90 percent of wealth in the economy. When the model is evaluated assuming higher levels of tax growth rates, I find that from 1950 to the 1980's, the top 1 percent go from owning between 30 percent and

25 percent to owning between 80 and 70 percent of wealth respectively. This is shown in columns (2) and (3) of Table 4.

Table 4: Results from Simulating the Simple Model of Pareto Wealth Accumulation

Time	Return on Property Ownerhsip	Population Growth	(1) $\frac{r_p-g-\tau-\alpha}{\bar{n}+\bar{d}}$	(2) $\frac{r_p-g-\tau(2)-\alpha}{\bar{n}+\bar{d}}$	(3) $\frac{r_p-g-\tau(3)-\alpha}{\bar{n}+\bar{d}}$
1950-1959	6.32	1.73	3.65	3.07	2.49
1960-1969	6.66	1.36	4.90	4.16	3.43
1970-1979	10.02	1.05	9.53	8.58	7.62
1980-1989	9.87	0.95	10.41	9.35	8.30
1990-1999	6.57	1.22	5.38	4.56	3.74
2000-2009	2.46	0.96	2.57	1.53	0.48
2010-2015	6.46	0.74	8.71	7.36	6.01
1956-1985	8.67	1.23	7.05	6.24	5.42
1986-2015	5.20	1.00	5.22	4.21	3.21
1950-2015	7.17	1.17	6.13	5.28	4.42

Calculations by Author.

Secondly, in the 1990's and 2000's, I observe a drastic decline in wealth inequality to where the average wealthy individual owns only approximately 2.5 times more than the average individual in the economy. In the model where different tax rates are observed, the decline is as low as the average wealthy individual owning the same amount of wealth as the average individual. See column (2) and (3). The drop in wealth inequality is evident with the technology boom in the 1990 and the recessions in the 2000's. Basically, with the technology boom of the 1990's, different channels were present for individuals to attain property though copyrights and patents, which had nothing to do with physical property. Likewise, during the 2000's, the great recession led to a loss of value in housing

prices which could have translated to a loss in wealth for many. Not only that, but the stock market crush also led to a loss of wealth for many. Third but not the least, after 2010, I observe that inequality is getting back to the level where the average wealthy individual owned 10 times more wealth than the average individual. Based on the model simulation, after 2010 the average wealthy individual owned 6 times more than the average individual in the U.S. economy which corresponds to the top 1 percent owning more than 50 percent of wealth in the economy.

When the model is evalutate over 30 year periods, we see that wealth inequality remains high after the World Wars with the average wealthy individual owning 7 times more wealth than the average individual. there is a slight drop in the pareto wealth inequality coefficient after 1985. However, it still remains high with the average wealthy individual owning 5 times more wealth than the average individual.

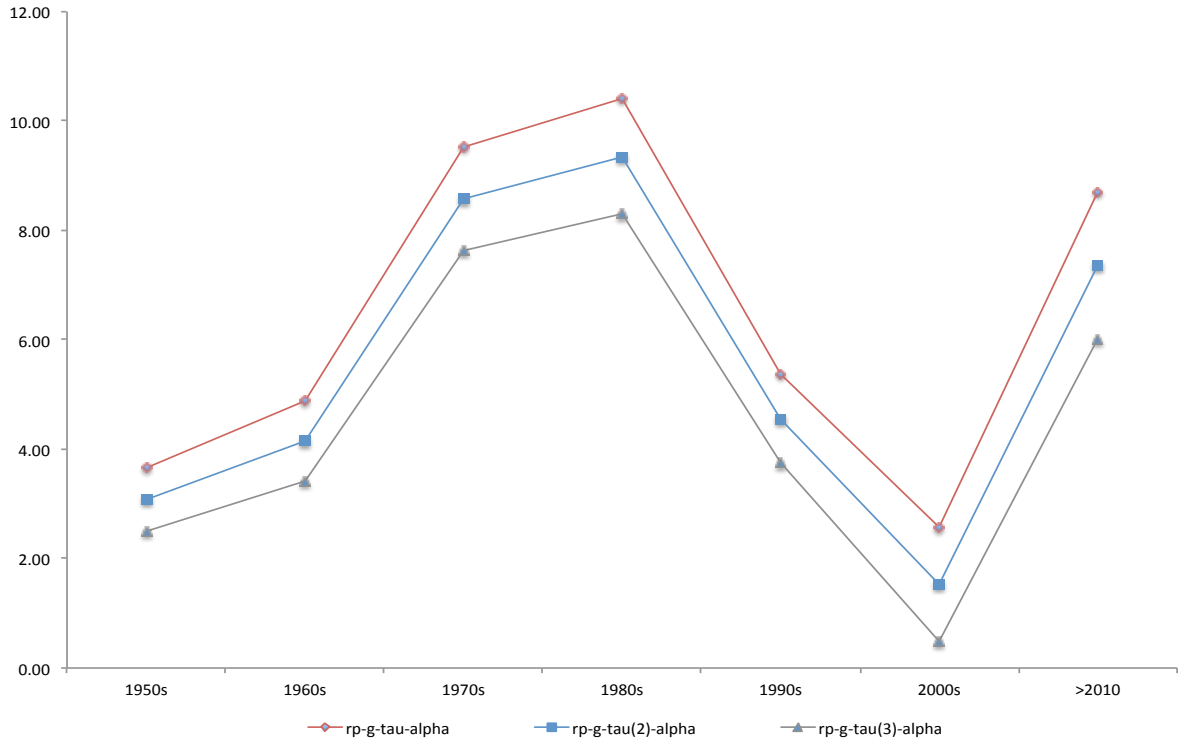

Figure 24: Estimated Inverse Pareto Coefficients, 10-Year Periods, 1950-2015

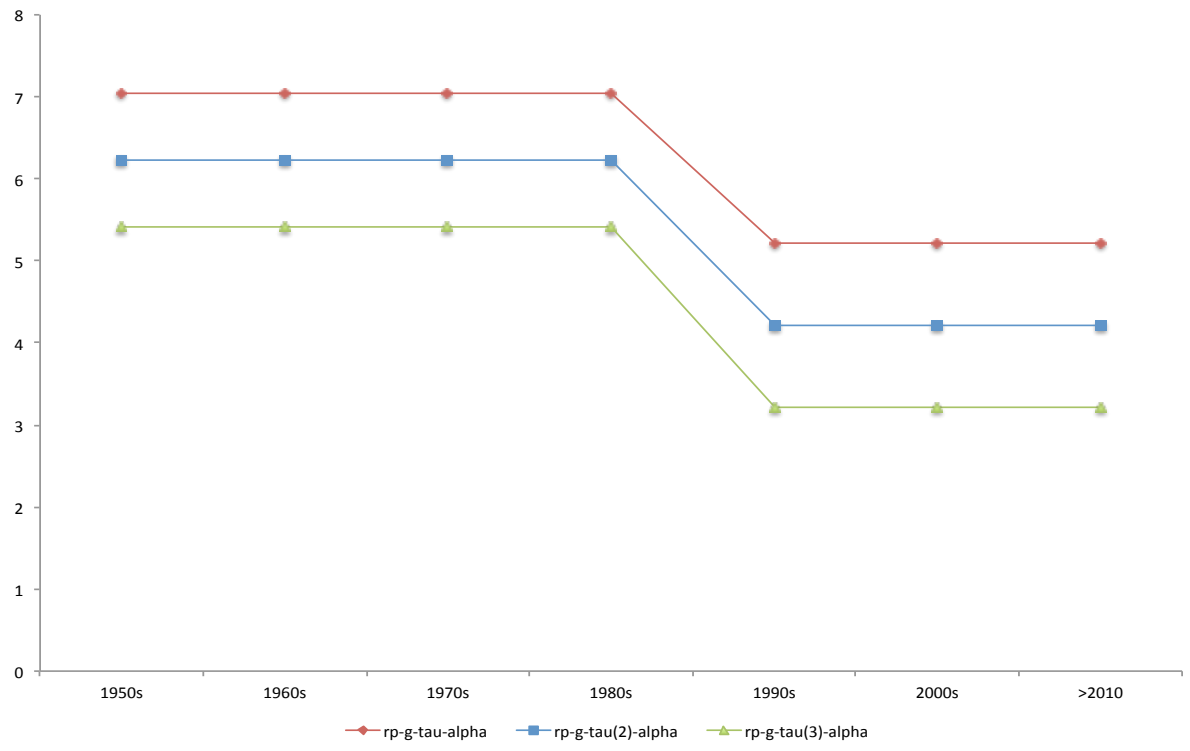

Figure 25: Estimated Inverse Pareto Coefficients, 30-Year Periods, 1950-2015

6 Conclusion

Antonio [2], on his review of Piketty's work states that, "Piketty's rentier thesis taps public fears that the new normal of declining opportunity, mobility, fairness, and political efficacy is here to stay. The impressive array of comparative data that he deloys to make his case illuminates the enormous scale of economic inequality, radical rupture from the postwar Trent Glorieuses, and prospect of a much more more unequal, undemocratic future, should divergence continue unopposed." Many are sceptical to the findings that wealth inequality in developed economies is rising, which contradicts the popular equitable portrayal of these economies politically. Nonetheless, the evidence cannot be refuted that there is growing concerns of inequality in our society, which needs to addressed by researchers. My thesis, adds to the literature by specifically addressing wealth inequality, and by focusing on property ownership. For the first part of the thesis, I use after tax historical data from the U.S. National Income and Product Accounts to derive income from property ownership, and show that the level of wealth inequality in the U.S.

economy is much higher than suggested in the Piketty literature. I find that when you account for property ownership, the inequality gap $r_p - g$ is wider than Piketty's $r - g$, which has significant implications for wealth concentration. In the second and third sections of thesis, I implement the $r_p - g$ gap into different models of wealth inequality: the Piketty model, and a simple model of wealth accumulation. The Piketty model assumes that wealth is created through production, where as the latter model accounts specifically for wealth creation without using the Neo-Classical Growth framework.

In the Piketty model, I find that there is no convergence of wealth inequality over the entire period, when you account for income from property ownership. That is, inequality is explosive in the U.S. economy. The model is highly dependent on fact that *omega*, the difference between the exponential growth between the return on property ownership and growth in income per capita, over time has to be less than 1. That is, $\omega = s \cdot \frac{1+R_p}{1+G} = s.e^{(r_p-g)\cdot H} < 1$. Nonetheless, when $\omega > 1$ this implies that wealth inequality is explosive. Surprisingly, evaluating the model over shorter periods, 10 years, reveals that wealth ownership has been more equitable in the U.S. economy. Certainly, this contradicts the fact that when evaluated over the entire period, wealth is explosive. The varying results can be attributed to the fact that wealth accumulates over time. However, because the Piketty model emphasizes on wealth creation based on production, inconsistencies are created when wealth created without production is accounted for. That is, wealth creation cannot be restricted by the fact that ω has to be less than 1. To replicate the economy described by Piketty, I had to evaluate the model, with the assumption that the probability of a shock affecting wealth accumulation is 0.015. I found that, wealth inequality declined when the model was evaluated over two 30 year period: 1954-1985 and 1986-2015. However, even with a low probability of a disrutive shock occuring, wealth inequality is explosive over the entire period.

Nonetheless, the main problem with the Piketty model is that it rooted in the Neo-Classical Growth framework. That is, wealth must be created through production. As indicated by Jones [15], the confusion with the central role of Piketty's $r - g$ is that, the relationship between $r - g$ and wealth inequality is not obviously clear in the Neoclassi-

cal Growth model. I use as simple model of wealth accumulation for the U.S. economy, accounting for income from property ownership. 3 main facts are obvious. (i) After the World wars, there is a spike in wealth inequality in the U.S. economy, reaching a peak in the 1980's were the average wealthy individual owns 10 times as much wealth as the average person. (ii) There is a decline in wealth inequality in the 1990's and 2000's, however an inclease in wealth in equality is observed again after 2010. (iii) Overall, the level of wealth inequality found in the simple model of wealth accumulation is much higher than levels found in the Piketty literature. I find that with $r_p - g = 5\%$, the top 1 percent of wealth owners, own approximately 50 percent of wealth in the economy.

A Defining Income From Property Ownership

I provide three (3) main definitions of income from property ownership. According to the National Income and Product Accounts (NIPA), by the Bureau of Economic Analysis (BEA), income from property ownership is defined as in equation (44)

$$\begin{matrix} \textit{Income from} \\ \textit{property ownership} \end{matrix} = \begin{matrix} \textit{Interest} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Dividend} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Rental} \\ \textit{income} \end{matrix} \tag{44}$$

This definition captures interest, dividend, and rental income regardless of whether it is household capital income, corporate income or non-corporate business income. This definition is the basis for the other definitions. The second definition is a modified version of the BEA definition to incorporate realized capital gains (or losses) which has increasingly become an important part of the U.S. economy. I define income from property ownership given by equation (45)

$$\begin{matrix} \textit{Income from} \\ \textit{property ownership} \end{matrix} = \begin{matrix} \textit{Interest} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Dividend} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Rental} \\ \textit{income} \end{matrix} + \begin{matrix} \textit{Capital} \\ \textit{gains} \end{matrix} \tag{45}$$

In equaltion (46) I address the concerns of rental income as measured by the NIPA tables. Rental income is defined as the net income of persons from the rental of property (rental of tenant-occupied housing, imputed net income from the housing services of owner-occupied housing, royalties, patents, copyrights, and rights to natural resources), but does not include net income from the rental of tenant-occupied housing by corporations (which is included in corporate profits) or by partnerships and sole proprietors (which is included in proprietors' income). I modifify the definition of rental income to include net income from the rental of tenant-occupied housing by corporations, and by partnerships and sole-proprietors.[40] This definition is provided below and becomes the main equation for my analysis and comparision.

[40]See section 4 for more information about rental income. Calculations by author.

$$\begin{array}{c}\textit{Income from}\\ \textit{property ownership}\end{array} = \begin{array}{c}\textit{Interest}\\ \textit{income}\end{array} + \begin{array}{c}\textit{Dividend}\\ \textit{income}\end{array} + \begin{array}{c}\textit{Modified}\\ \textit{Rental}\\ \textit{income}\end{array} + \begin{array}{c}\textit{Capital}\\ \textit{gains}\end{array} \tag{46}$$

By defining income from property ownership as in equations (44), (45) and (46), I obtain a long run rate of return on property ownership, $\hat{r}_p$, that serves as an alternative estimate to the return on capital that best captures profits, rents, dividends, interest, royalties and capital gains expressed as a percentage of the value of capital invested. For the period 1950 to 2015, after the World Wars, income from property ownership as defined by the BEA accounted for 17 percent of National Income. Accounting for capital gains and rental income by tenant-occupied housing, income from property ownership accounted for 20 percent and 30 percent of total personal income at the national level, respectively. Equation (46) provides a more comprehensive definition of income from property ownership, therefore my following analyis focuses it. The contibution of income from property ownership is significantly higher in more recent years: From 1950 to 1984, it accounted for 29 percent of national income. Nonetheless, it accounted for 32 percent from 1985 to 2015, even though the latter period experienced more volatility. See the summary statistics in Table 5.[41]

B Heterogeneity through a birth-death process

The birth-death process here follows the demography literature. The number of people born at date t is given by

$$B_t = B_0 e^{\bar{n}t} \tag{47}$$

Death is a Poisson process with arrival rate $\bar{d}$. To find the stationary distribution for the birth-death process, let $G(x,t) = Pr[Age > x]$ denote the age distribution at time t. Given that the population growth rate is $\bar{n}$ and the death rate is $\bar{d}$, the distribution

[41] Averages over decades since 1950 also confirm the fact that contributions of income from property to national have been persistently higher in more recent decades. It accounted for over 30 percent of national income after the 1980s: 29 percent in the 1950s and 1960s, 27 percent in the 1970s, 31 percent in the 1980s and 1990s, 32 percent in the 2000s, and 30 percent after 2010.

evolves over a time interval Δt as

$$G(x, t + \Delta t) = \frac{1 - \bar{d}\Delta t}{1 + \bar{n}\Delta t} \cdot G(x, t) + G(x - \Delta x, t) - G(x, t) \tag{48}$$

where $\frac{1-\bar{d}\Delta t}{1+\bar{n}\Delta t} \cdot G(x, t)$ captures the change from deaths and population growth whiles the $G(x - \Delta x, t) - G(x, t)$ captures the inflow of younger people ito higher ages. Using the taylor expansion but ignoring higher order terms, this implies that

$$\frac{G(x, t + \Delta t) - G(x.t)}{\Delta t} = -(\bar{n} + \bar{d})G(x, t) - fracG(x, t) - G(x - \Delta x, t)\Delta x \tag{49}$$

where $\Delta x = \Delta t$. Taking the limit as $\Delta t \to 0$ implies that

$$\frac{\partial G(x.t)}{\partial t} = -(\bar{n} + \bar{t})G(x, t) - \frac{\partial G(x, t)}{\partial x} \tag{50}$$

By setting the time derivative to zero and solving the equation, the result is the stationary distribution for the birth-death process which is exponential:

$$G(x) = Pr[Age > x] = e^{-(\bar{n}+\bar{d})x} \tag{51}$$

Table 5: Summary Statistics

		Share of Personal Income					Share of Income from Property Ownership			
Year	Personal income	Dividend Income	Interest Income	Rental Income	Capital Gains	Property Income	Dividend Income	Interest Income	Rental Income	Capital Gains
1949	211.20	3.41	5.07	20.12	2.18	65.01	11.07	16.46	65.37	7.10
1950	233.90	3.76	5.04	19.79	2.12	71.87	12.24	16.42	64.43	6.91
1951	264.50	3.25	4.88	19.77	2.02	79.14	10.87	16.30	66.08	6.75
1952	282.70	3.04	4.92	19.03	2.03	82.05	10.48	16.94	65.57	7.01
1953	299.60	2.97	5.24	18.02	2.07	84.79	10.50	18.52	63.69	7.30
1954	302.60	3.07	5.72	18.31	2.37	89.16	10.43	19.40	62.14	8.03
1955	324.60	3.23	5.82	17.78	3.04	96.98	10.83	19.49	59.50	10.19
1956	348.40	3.24	6.08	17.08	2.78	101.68	11.11	20.85	58.52	9.52
1957	368.50	3.18	6.46	16.80	2.20	105.51	11.09	22.56	58.67	7.69
1958	379.50	3.06	6.80	17.13	2.49	111.84	10.37	23.07	58.12	8.44
1959	403.20	3.13	6.94	16.34	3.26	119.64	10.53	23.40	55.08	10.98
1960	422.50	3.17	7.34	15.88	2.78	123.25	10.87	25.15	54.44	9.53
1961	441.10	3.15	7.53	15.96	3.63	133.50	10.41	24.87	52.73	11.99
1962	469.10	3.20	7.80	15.60	2.87	138.25	10.85	26.47	52.95	9.73
1963	492.80	3.29	8.08	15.24	2.96	145.68	11.12	27.32	51.55	10.01
1964	528.40	3.44	8.38	14.74	3.30	157.83	11.53	28.07	49.36	11.04
1965	570.80	3.54	8.50	14.54	3.76	173.18	11.66	28.00	47.93	12.41
1966	620.60	3.34	8.62	14.15	3.44	183.35	11.29	29.18	47.89	11.64
1967	665.70	3.23	8.76	13.49	4.14	197.14	10.91	29.57	45.55	13.97
1968	730.70	3.22	8.73	12.85	4.87	216.81	10.84	29.43	43.31	16.42
1969	800.30	3.02	9.30	12.17	3.93	227.44	10.64	32.71	42.82	13.82
1970	864.60	2.81	10.21	11.39	2.41	231.95	10.48	38.07	42.47	8.99
1971	932.10	2.68	10.44	11.35	3.04	256.44	9.75	37.94	41.26	11.05
1972	1023.60	2.62	10.40	11.52	3.50	287.07	9.34	37.10	41.07	12.49
1973	1138.50	2.63	10.61	11.93	3.14	322.26	9.28	37.49	42.14	11.10
1974	1249.30	2.66	11.38	10.85	2.42	341.12	9.73	41.69	39.72	8.86
1975	1366.90	2.41	11.88	10.29	2.26	366.90	8.97	44.26	38.35	8.42
1976	1498.50	2.60	11.58	10.12	2.64	403.69	9.66	43.00	37.55	9.78
1977	1654.60	2.70	12.01	9.71	2.74	449.44	9.95	44.21	35.76	10.09
1978	1859.70	2.73	12.22	9.83	2.72	511.43	9.91	44.44	35.76	9.88
1979	2078.20	2.76	12.55	9.43	3.53	587.74	9.77	44.39	33.35	12.50
1980	2317.50	2.76	13.89	8.25	3.20	651.43	9.82	49.43	29.37	11.38
1981	2596.50	2.83	15.37	7.90	3.12	758.84	9.70	52.61	27.03	10.67
1982	2779.50	2.79	16.68	7.10	3.24	828.75	9.36	55.95	23.81	10.88
1983	2970.30	2.80	16.87	7.20	4.13	920.87	9.05	54.40	23.22	13.33
1984	3281.80	2.76	17.50	7.80	4.28	1061.60	8.53	54.11	24.12	13.23
1985	3516.30	2.77	17.50	7.70	4.89	1155.39	8.43	53.26	23.42	14.89
1986	3725.70	2.85	17.43	7.47	8.80	1361.43	7.79	47.69	20.45	24.07
1987	3955.90	2.84	16.88	7.75	3.75	1235.05	9.08	54.06	24.83	12.02
1988	4276.30	3.03	16.59	8.21	3.80	1352.79	9.59	52.45	25.94	12.02
1989	4619.90	3.42	17.19	7.93	3.33	1472.34	10.72	53.94	24.88	10.46
1990	4906.40	3.44	16.76	7.86	2.52	1500.78	11.25	54.80	25.71	8.25
1991	5073.40	3.55	15.87	7.84	2.20	1495.09	12.05	53.86	26.62	7.46
1992	5413.00	3.49	14.65	8.62	2.34	1575.59	12.00	50.34	29.62	8.04
1993	5649.00	3.62	13.88	9.28	2.70	1664.96	12.29	47.08	31.48	9.14
1994	5937.30	3.96	13.38	9.72	2.57	1759.13	13.37	45.15	32.80	8.68
1995	6281.00	4.11	13.63	9.77	2.87	1907.83	13.52	44.87	32.17	9.44
1996	6667.00	4.53	13.11	10.42	3.91	2131.60	14.18	41.02	32.58	12.23
1997	7080.70	4.77	13.00	10.45	5.15	2363.13	14.30	38.95	31.31	15.44
1998	7593.70	4.68	13.00	10.72	5.99	2611.82	13.61	37.79	31.17	17.43
1999	7988.40	4.34	12.31	11.06	6.92	2765.81	12.52	35.55	31.94	19.98
2000	8637.10	4.44	12.39	10.95	7.46	3043.29	12.59	35.17	31.07	21.17
2001	8991.60	4.11	11.92	11.61	3.89	2835.14	13.02	37.82	36.83	12.33
2002	9153.90	4.35	10.83	11.89	2.93	2747.32	14.51	36.10	39.61	9.78
2003	9491.10	4.55	10.41	11.99	3.41	2881.91	15.00	34.29	39.49	11.22
2004	10052.90	5.59	9.37	12.11	4.97	3220.45	17.45	29.24	37.81	15.50
2005	10614.00	5.45	10.25	11.47	6.50	3573.95	16.18	30.45	34.06	19.31
2006	11393.90	6.35	10.66	11.07	7.01	3997.81	18.10	30.38	31.55	19.97
2007	12000.20	6.80	11.25	9.74	7.70	4259.36	19.17	31.70	27.44	21.70
2008	12502.20	6.44	10.89	10.31	3.98	3953.44	20.37	34.44	32.59	12.59
2009	12094.80	4.58	10.45	10.80	2.18	3388.16	16.34	37.32	38.57	7.78
2010	12477.10	4.36	9.58	11.51	3.16	3569.33	15.26	33.48	40.22	11.04
2011	13254.50	5.15	9.29	12.29	3.05	3947.14	17.28	31.20	41.27	10.24
2012	13915.10	6.00	9.26	12.70	4.81	4559.96	18.31	28.26	38.74	14.68
2013	14068.40	5.61	9.04	13.14	2.96	4325.27	18.24	29.39	42.74	9.63
2014	14694.20	5.55	8.86	13.32	3.82	4635.64	17.59	28.09	42.23	12.09
2015	15357.40	5.65	8.55	13.32	4.25	4880.13	17.79	26.90	41.93	13.39

Table 6: Capital Gains and Taxes Paid on Capital Gains in the United States, 1954 - 2009 Dollar amounts in millions

Tax Year	Total Realized Capital Gains	Taxes Paid on Capital Gains	Average Effective Tax Rate	Realized Gains as a Percentage of GDP	Maximum Tax Rate on Long-Term Gains
1954	7,157	1,010	14.1	1.88	25
1955	9,881	1,465	14.8	2.38	25
1956	9,683	1,402	14.5	2.21	25
1957	8,110	1,115	13.7	1.76	25
1958	9,440	1,309	13.9	2.02	25
1959	13,137	1,920	14.6	2.59	25
1960	11,747	1,687	14.4	2.23	25
1961	16,001	2,481	15.5	2.94	25
1962	13,451	1,954	14.5	2.3	25
1963	14,579	2,143	14.7	2.36	25
1964	17,431	2,482	14.2	2.63	25
1965	21,484	3,003	14	2.99	25
1966	21,348	2,905	13.6	2.71	25
1967	27,535	4,112	14.9	3.31	25
1968	35,607	5,943	16.7	3.91	26.9
1969	31,439	5,275	16.8	3.19	27.5
1970	20,848	3,161	15.2	2.01	32.21
1971	28,341	4,350	15.3	2.52	34.25
1972	35,869	5,708	15.9	2.9	36.5
1973	35,757	5,366	15	2.59	36.5
1974	30,217	4,253	14.1	2.02	36.5
1975	30,903	4,534	14.7	1.89	36.5
1976	39,492	6,621	16.8	2.16	39.875
1977	45,338	8,232	18.2	2.23	39.875
1978	50,526	9,104	18	2.2	39.875/33.85
1979	73,443	11,753	16	2.87	28
1980	74,132	12,459	16.8	2.66	28
1981	80,938	12,852	15.9	2.59	28.00/20.00
1982	90,153	12,900	14.3	2.77	20
1983	122,773	18,700	15.2	3.47	20
1984	140,500	21,453	15.3	3.57	20
1985	171,985	26,460	15.4	4.08	20
1986	327,725	52,914	16.1	7.35	20
1987	148,449	33,714	22.7	3.13	28
1988	162,592	38,866	23.9	3.19	28
1989	154,040	35,258	22.9	2.81	28
1990	123,783	27,829	22.5	2.13	28
1991	111,592	24,903	22.3	1.86	28.93
1992	126,692	28,983	22.9	2	28.93
1993	152,259	36,112	23.7	2.28	29.19
1994	152,727	36,243	23.7	2.16	29.19
1995	180,130	44,254	24.6	2.43	29.19
1996	260,696	66,396	25.5	3.33	29.19
1997	364,829	79,305	21.7	4.38	29.19/21.19
1998	455,223	89,069	19.6	5.18	21.19
1999	552,608	111,821	20.2	5.91	21.19
2000	644,285	127,297	19.8	6.47	21.19
2001	349,441	65,668	18.8	3.4	21.17
2002	268,615	49,122	18.3	2.52	21.16
2003	323,306	51,340	15.9	2.9	21.05/16.05
2004	499,154	73,213	14.7	4.21	16.05
2005	690,152	102,174	14.8	5.47	16.05
2006	798,214	117,793	14.8	5.97	15.7
2007	924,164	137,141	14.8	6.59	15.7
2008	497,841	68,791	13.8	3.48	15.35
2009	263,460	36,686	13.9	1.89	15.35

[1] Source of Data: Department of the Treasury, Office of Tax Analysis, June 8, 2012.

[2] Data include returns with positive total net capital gains, both short and long-term. Data for each year include some late-filed prior year returns. The maximum rate is the effective rate applying to high-income taxpayers, including effects of provisions that alter effective rates for significant amounts of gains. Maximum rates include the effects exclusions (1954-1986), alternative tax rates (1954-1986, 1991-1997), the minimum tax (1970-1978), the alternative minimum tax (1979 -), income tax surchages (1968-1970), and phaseouts of itemized deductions (3% 1991-2005, 2% 2006-2007 and 1% 2008-2009). The maximum statutory rate on long-term gains was 28% starting 1991, 20% starting May 1997 and 15% starting May 2003. The 2009 maximum rate included the effect of the 1% itemized deduction phaseout, computed as $15.35=15+0.01\times35$. Starting 1997, gains on collectibles and certain depreciation recapture are taxed at ordinary rates, up to maximum rates of 28% on collectibles and 25% on recapture. Midyear rate changes occurred in 1978, 1981, 1997 and 2003. Estimates are subject to revision.

Table 7: Actual and Projected Capital Gains Realizations and Tax Receipts, 1995 - 2014

	Capital Gains Realizations[a]		**Capital Gains Tax Receipts**[b]	
	(Billions of dollars)	(Percentage of GDP)	(Billions of dollars)	(Percentage of individual income tax receipts)
		Actual		
1995	180.13	2.43	39.84795	6.75
1996	260.695619	3.33	54.2179	8.26
1997	364.829	4.38	72.20505	9.79
1998	455.223	5.18	83.6988	10.10
1999	552.608	5.91	99.3074	11.29
2000	644.285	6.47	118.7852	11.83
2001	349.441	3.40	99.56395	10.01
2002	268.615	2.52	58.2223	6.78
2003	323.306	2.90	50.1201	6.31
2004	499.1537	4.21	61.18285	7.58
2005	690.1521	5.47	86.24545	9.26
2006	798.214	5.97	109.20255	10.46
2007	924.164	6.59	126.4996	10.87
2008	497.8407	3.48	106.3835	9.29
2009	263.460082	1.89	54.34375	5.94
2010	394.229541	2.6	44.88635	5.00
2011	404.3443	2.55	54.5958	5.00
2012	669.5572	4.12	67.548	5.97
2013	416.473373	2.48	104.21964	7.92
		Projected		
2014	590.4547194	3.50	89.75894659	6.63

[1] Source: Congressional Buget Office
[2] Notes: Capital gains realizations are the sum of net capital gains from tax returns reporting a net gain. Data for realizations after 2011 and data for tax receipts in all years are estimated or projected by the CBO. Data on realization before 2012 are estimated by the Treasury Department
[a] Calenda year basis
[b] Fiscal year basis. This measure is CBO's estimate of when tax liabilities resulting from capital gains are paid to the Treasury.

Table 8: Regular and Capital Gains Tax Rates for 2015

Ordinary Income Rate	Long-term Capital Gain Rate	Short-term Capital Gain Rate	Long-term Gain on Commercial Buildings	Long-term gains rate (Collectibles)	Long-term Gains on Certain Small Business Stock
10%	0%	10%	10%	10%	10%
15%	0%	15%	15%	15%	15%
25%	15%	25%	25%	25%	25%
28%	15%	28%	25%	28%	28%
33%	15%	33%	25%	28%	28%
35%	15%	35%	25%	28%	28%
39.60%	20%	39.60%	25%	28%	28%

[1] Source of Data: http://www.irs.gov/pub/irs-drop/rp-08-66.pdf

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