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The Macroeconomics of the Declining U.S. Labor Share: a Debt-led Explanation

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by
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PLAGIARISM STATEMENT

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Alex J. Xu

Abstract

This paper aims to answer two major conundrums in macroeconomic theory with regards to the U.S. economy. First, standard macroeconomic models such as Harrod-Domar and Solow theoryze that factor shares are constant; however, actual measures of the U.S. labor share have been on a downward trend since the early 1980s. The second conundrum relates to the Post-Kaleckian wage-led or profit-led view of economic growth. It indicates that a fall in the labor share in a wage-led economy will result in a fall in aggregate demand (due to deceases in consumption), and an increase in aggregate demand in a profit-led economy (due to increases in investment). However, the consumption share of GDP in the U.S. has been increasing and the investment share has been stable in spite of the falling labor share.

We argue that the resolution of these conundrums involves reexamining the standard Keynesian consumption function, both theoretically and empirically. Thus, we propose an original theory of consumption based on the principles of Duesenberry's (1949) Relative Income Hypothesis. We find that the economic consequence of a falling labor share in the United States is that aggregate demand growth, despite remaining wage-led, has become increasingly dependent on the accumulation of household debt. Furthermore, we conclude that there are four ominous outcomes associated with this dependence on household debt: unstable growth, sluggish growth, stagnation and economic contraction.

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1. Introduction

The primary objective of this project is to identify a set of potential implications that a redistribution of functional income could have on macroeconomic growth and stability. Since the early 1980s the United States economy has exhibited a decline in the labor share alongside a parallel rise in income inequality. However, standard macroeconomic growth models (Harrod-Domar and Solow) offer no insight into the implications of a declining labor share since both the functional and personal distribution of income are taken as constants. Additionally, the implications of the Post-Kaleckian growth model, which does allow for changes in the function distribution of income, are inconsistent with the observed trends in wages, consumption and growth. Thus, herein lies two notable paradoxes of existing growth models.

The first conundrum relates to the behavior of the functional distribution of income by standard macroeconomic growth models. Standard macroeconomic growth models, such as the Harrod-Domar Model and the Solow model, take the distribution of factor shares as constant; however, data for the U.S. labor share show that it has been on a downward trend since the early 80s. Thus, it is necessary to explore the possible sources of the declining labor share.

The second conundrum relates to Post-Kaleckian growth literature. Post-Kaleckian theory concludes that if a country is wage-led then a fall in their wage share (labor share) will induce an economic contraction led by falling consumption. On the other hand, if a country is profit-led, a fall in the wage share will lead to an economic expansion through an increase in investment. The majority of studies have identified that the U.S. economy is wage-led, but in reality the consumption share of GDP in the U.S. has been increasing in spite the falling U.S. labor share.[1]

We argue that the inconsistency between the implications of this model and actual trends stems from an incomplete view of consumption. the Post-Kaleckian model assumes a standard Keynesian consumption function, in which households make rational consumption decisions based solely on their current disposable income. However, we hold that a more compllete theory of consumption is Duesenberry's (1949) relative income hypothesis (RIH). Specifically, the RIH's theory that individual households make

[1]Even if the U.S. is profit-led, there has been a disconnect between profits and investment. Furthermore, the pro-fit led demand regime does not fit actual trends as economic growth in the U.S. is driven by consumption and not investment.

their consumption decisions based on past consumption behavior (habitual consumption) and the relative consumption of others (social dynamics of consumption).

Additionally, we argue that technological advances have led the interpersonal aspect of consumption within modern society to evolve from a localized (microeconomic) effect to a national (macroeconomic) effect. Specifically, these technological advancements include mass media (televisions, movies and digitial advertisements) and the internet (social media, online reviews and online advertisements). Hence, we argue that the "keeping up with the Joneses" effect that is associated with the standard RIH, has evolved into the "keeping up with the Kardashians" effect. We also expanded the standard budget constraint, which only includes current disposable income, to account for both the stock of past savings (stock of liquid assets) and the supply of consumer credit (debt).

Given the behavioral consumption theory, rising top income levels (worsening income inequality) resulted in increases in the consumption of households at the top of the income distribution, which in turn, led low- and middle-income households to increase their own consumption expenditures. However, due the the declining labor share, the real incomes of low- and middle-income households have either stagnated or fallen since the early 1980s. Thus, it follows that consumption growth at the bottom required a combination of dissavings and rising indebtedness. We therefore hypothesize that the declining U.S. labor share has resulted in a debt-dependent wage-led demand regime. We identify four potential outcomes of a debt-dependent wage-led demand regime: unstable growth, sluggish growth, stagnation and economic contraction.

We test our hypothesis using a two-step approach. First, we use a standard VAR model to test if aggregate demand is consumption-led or investment-led. Our estimation results are robust and indicate that aggregate demand in the U.S. is increasingly consumption-led. Second, we conduct an analysis of the behavioral aggregate consumption model using a Bai-Perron (1998) breakpoint regression. The estimation results are also robust, and indicate that the role of disposable income of the bottom 90% in determining the consumption of the bottom 90% has been declining. Conversely, the consumption of the bottom 90% has become increasingly determined by social influences and consumer credit. However, relative to each other, the magnitude of disposable income is still the largest. Thus, the results of our two-step approach indicates that aggregate demand in the U.S. is wage-led, but increasingly debt-dependent.

The structure of this project is as follows, we presents a multifaceted literature review in chapter 2. Chapter 3 focuses on behavioral consumption theories. Chapter 4 is dedicated

to the construction of our two-step approach as well as the results. Lastly, chapter 5 includes the conclusion and policy suggestions.

2. Literature Review

2.1 The Evolution of the Labor Share in the United States

The functional distribution of income refers to the distribution of income between the two variable income generating factors: labor and capital[2]. Thus, the labor share and the capital share measures the share of total income accruing to labor and capital respectively. While the number of studies involving the functional distribution of income has been sparse, this topic was highly debated among economists during the 1930s, 40s and 50s (Giovannoni, 2014b). Part of the debate centered around measuring the factor shares, while the other focused on the implications of factor shares on economic growth.

In 1928, Charles W. Cobb and Paul H. Douglas published an article titled *A Theory of Production* containing what is now commonly referred to as the Cobb-Douglas production function. Their production function posits that output is determined by total factor productivity, labor, capital, and the output elasticity of labor and capital. Stated more formally, the Cobb-Douglas production function is given by the following equation:

$$Y = AL^{\alpha}K^{1-\alpha} \tag{2.1.1}$$

Where Y is output, A is total factor productivity (technology), L is total labor input, K is total capital input, α is the output elasticity of labor and $1-\alpha$ is the output elasticity of capital (Cobb and Douglas, 1928). It can be observed from the output elasticities of labor and capital that the Cobb-Douglas production function assume constant returns to scale.[3] Given the classical assumption that marginal costs are equal to marginal returns, an additional implication resulting from the constant returns to scale of the Cobb-Douglas is that total income is distributed between labor and capital at a constant ratio. Hence, one major implication of the Cobb-Douglas production function is a constant functional distribution of income.

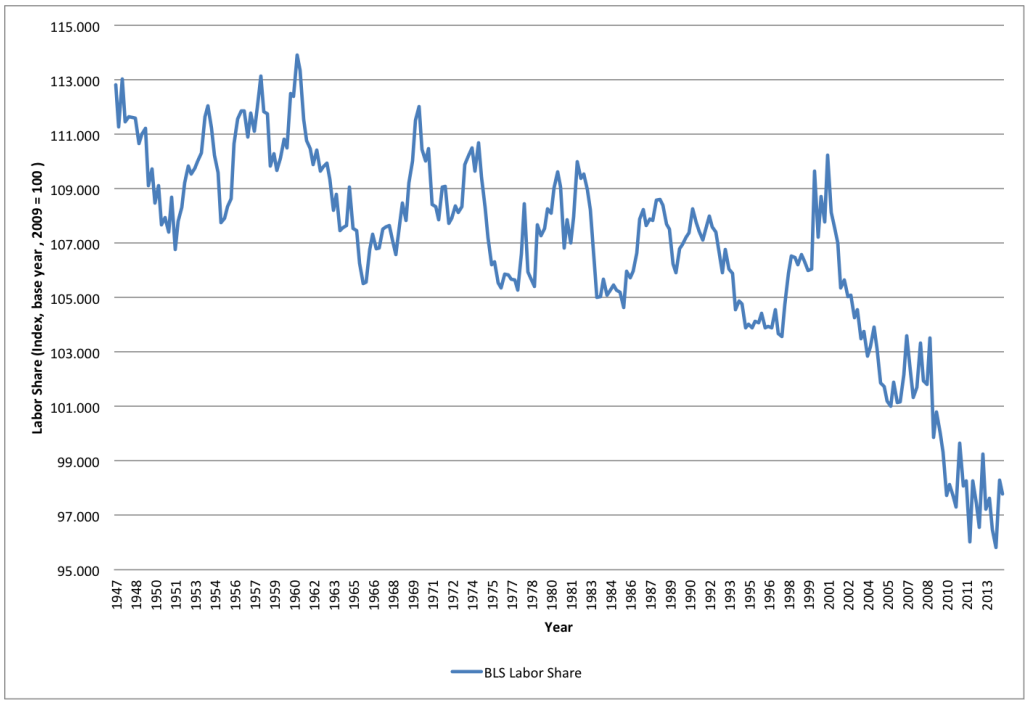
The constant returns to scale assumption is also present in the Harrod-Domar model (Harrod, 1939; Domar, 1946). Likewise, due to the use of the Constant Elasticity of Substitution (CES) production function in the construction of the Solow model (Solow,

[2]The term variable is used here to indicate that changes in the quantity of labor and capital are possible; in other words, the total quantity of labor and or capital available is not constricted by an upper limit over the long run. Conversely, the same does not hold for the third factor of production, land.

[3]Since the output elasticity of capital is equal to one minus the output elasticity of labor, $\alpha + (1-\alpha) = 1$.

1956), it too assumes constant returns to scale. It follows that, due to the constant returns to scale assumption, one prominent feature of standard growth models is a constant functional distribution of income. However, it can be observed in figure 2.1.1 that, since the 1980s, the constant distribution of functional income feature of these models is at odds with historical data for the U.S. labor share in the private sector.

Figure 2.1.1: US Labor Share for the Nonfarm Business Sector



*Source:*BLS (2014)

Since the constant functional distribution of income featured in the standard growth models results directly from the assumption of constant returns to scale it is possible to allow for a variable distribution if this assumption is relaxed. However, the overall conclusion of these growth models remains unchanged even after a variable income distribution is allowed for. Thus, we must look beyond tradintional economic growth models in order to impute the theoretical implications of changes in the distribution of income on economic growth and stability.

2.1.1 Why Has the U.S. Labor Share Fallen

Giovannoni (2014a) provides a survey of studies, and identifies sources of the falling labor share as: financialization, globalization, technological change and government

policies. The concurrent emergance of financialization and globalization were made possible by advances in technology and changes in government policies. Deregulation of financial markets allowed the financial sector to expand beyond previous constraints, and the deregulation of cross-border trades opened up new labor and goods markets abroad. Meanwhile, the I.T. and communication revolution helped to minimize geographical constraints. Lastly, Giovannoni (2014b) also identifies rising top income shares as a major contributor to the decline of the U.S. labor share.

Alvaredo, Atkinson, Piketty and Saez (2013) highlights four main factors that have led to the unprecedented rise in top income shares: a reduction in top income tax rates, changes in the dynamics of labor markets, capital income and the correlation between earned and capital income. Of the four, the first two factors can be attributed to distribution policies more directly.

The reduction of top income tax rates effectively increases the after-tax income of top income earners. Similar to Minsky's (2008) theory on the effects of retained profits on investment, given an increase in disposable income, top income earners will have effectively increased their means to invest and therefore increase their capital income. The reduction of top income tax rates also an additional indirect effect of increasing the incentive for top income earners to aggressively seek ways to increase their incomes (Avaredo, et al., 2013).

Alvaredo, et al. (2013) posits that labor markets in advanced countries have evolved beyond the traditional supply and demand view. Departing from the labor market mechanisms that are outlined by the traditional supply and demand view, contemporary labor markets are characterized by a more individualized wage setting mechanism that revolves around the bargaining power of labor relative to that held by capital owners. If true, then the falling labor share may have been, to a certain degree, the byproduct of deunionization (Giovannoni, 2014a). Since unions strengthen the collective bargaining power of labor, removing them from the equation results a reduction of the relative bargaining power held by labor, and an improvement in the (relative) bargaining power of capital owners; this would in turn result in a relative shift towards profits (Alvarado, et al., 2013; Giovannoni, 2014a; Stockhammer, 2011a, 2012b).

Technology

The narrative put forth by authors who argue that technology is the main driving force behind the decline in the U.S. labor share is centered around the notion that technological

advances following the post war period have been largely capital augmenting. It follows from this narrative that the ensuing improvements in the marginal productivity of capital have exceeded the improvements to the marginal productivity of labor. Ergo, under the neo-classical factor compensation framework, that the emergence of capital-biased income growth was a direct result of capital augmenting technology (Jacobson and Occhino, 2012a,b; Berman et al., 1994; IMF 2007).

Moreover, capital-augmenting technological improvements may also lead to a greater elasticity of substitution between labor and capital in the production process (Giovannoni, 2014a). This enables U.S. firms to substitute an increasing percentage of their labor input with capital input whilst maintaining output levels. As a result, there could be a simultaneous reduction in total labor income (due to lower employment) and increase profits and capital incomes (due to lower costs and greater employment of capital).[4]

Financialization and Top Incomes

A major factor that has led to a decline in the labor share of many advanced countries is the process of financialization. While the term financialization has been used in numerous studies over the past decade, a precise definition has yet to be reached. Generally, authors (Epstein, 2001 2005; Giovannoni, 2014a; Krippner, 2005; Palley 2007) have used the term to denote an increasing weight of the financial sector in the economy. Along these lines, Krippner (2005) proposes two measures of financialization. The first measure is the ratio of ”portfolio income” to productive income of non-financial firms. The second measure would be the ratio of financial to non-financial profits in a given economy. It follows that a higher value for either measure indicates a higher level of financialization.

Giovannoni (2014a) notes that the share of financial services as a share of the United States GDP has nearly doubled from 4.9% in 1980 to 8.3% in 2006. In the same study, Giovannoni also points out that compensation within the financial industry has increased by 70%.

Authors have generally argued that the process of financialization is initiated by extensive deregulation of financial markets, labor markets and the flow of capital and goods across national borders (Hein and van Treek, 2008; Stockhammer, 2012b; van Treek, 2008). The term financialization commonly entails a change in both financial

[4]It stands to reason that an increases in the elasticity of substitution between labor and capital would also have resulted in a deterioration of labor's bargaining power. Thus, given the labor market theory presented by Alvaredo, et al. (2013), capital-augmenting technological advances could also decrease the labor share even if employment rates remain unchanged.

and non-financial corporate objectives, the increasing role of financial motivations, and a systematic increase in the size of the financial sector of an economy (Epstien, 2005; Hein and van Treek, 2008; Giovannoni, 2014a; Stockhammer, 2012b; van Treek, 2008). Under financialization corporate objectives shift away from the long-term growth, preferred by managers and workers, towards the shareholders' preference for short-term profitability (Guttmann, 2008; Hein and van Treek, 2008).

Giovannoni (2014a) and Guttmann (2008) argue that this shift towards short-term profitability has been reinforced by increasing the use of stock options and profit-based performance bonuses in the composition of manager compensation.[5] [6] Consequently, this change in the composition of manager compensation has resulted in a departure from the classic agency theory.

Therefore, it follows that managers compensation has increased significantly[7] given the increase in the use of stock options in manager compensation, and the shift of corporate objectives from long-term growth to short-term (financial) profitability. Additionally, corporate profits have also increased substantially during this period as well (Giovannoni, 2014a). However, Palley (2007) finds that wages have stagnated despite the spike in managerial compensation and corporate profitability. More specifically, the median wage in the United States has not followed the trend of rising labor productivity. Figure 2.1.2 shows that while hourly compensation has tracked labor productivity, the medium wage has not. This divergence of hourly compensation from the median wage is highlighted by the divergence of the real average wage of the bottom 90% from the real average wage of the top 10% in figure 2.1.3.

Thus, the increased emphasis that has been placed on short-term (financial) profitability, and the increased use of financial performance-based manager compensation has dual edged effect on the labor share. On one hand the shift in corporate objectives increases the level of capital income; on the other hand financialization has also limited wage growth for the majority of the U.S. workers (the bottom 90%).

Globalization and the Political Economy of Trade Model

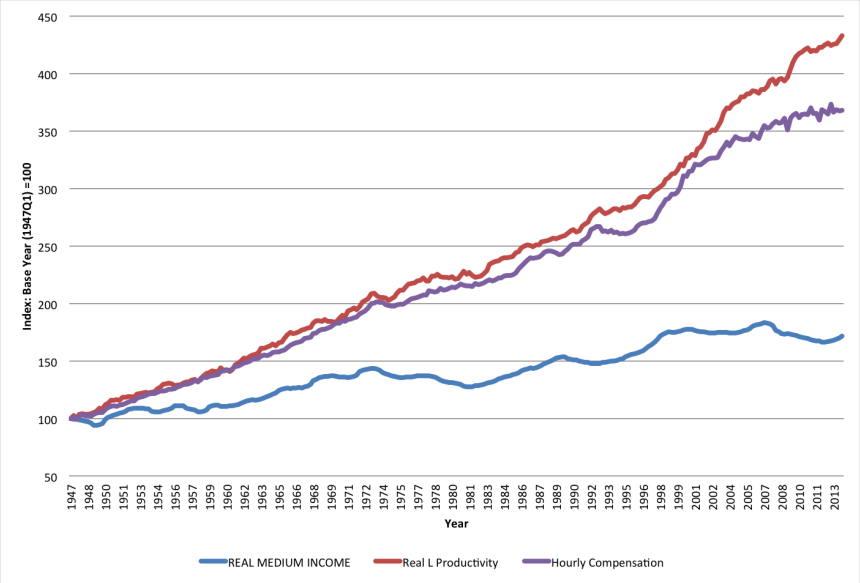
A second factor that has contributed to the decline in the U.S. labor share is the rise of globalization. The United States economy is becoming increasingly integrated into the

[5] In this context manager refers to high level managers such as chief executives and not low level managers.

[6] Jensen, Murphy and Wruck (2004) finds that base CEO salaries have decreased from 38% in 1992 to 17% in 2000. However, during the same period stock options as a share of CEO compensation increased from 24% to 50%.

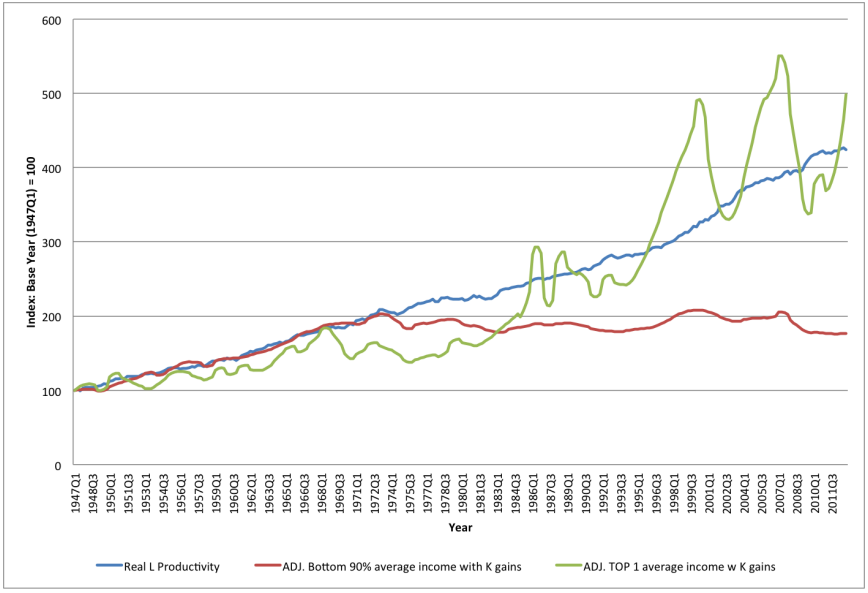
[7] This observation is supported by the findings of Avaredo, Atkinson, Piketty and Saez (2013), and data from the World Top Income Database.

Figure 2.1.2: Labor Productivity and Labor Compensation in the U.S.



*Source:*BLS (2014), U.S. Census Bureau (2014), Author's Calculations

Figure 2.1.3: Labor Productivity and Labor Compensation in the U.S. Between Income Shares



*Source:*BLS (2014), WTID (2014), Author's Calculations

global economy. Since the 1960s, the exposure of the U.S. economy to international trade has tripled; the global labor force has increased fourfolds; and by 2005, the United State's trade volume with developing countries has surpassed their trade volume with advanced countries (Giovannoni, 2014a). The majority of literature on the effect of globalization on income distribution relates to the personal distribution of income rather than the functional distribution (Harrison, 2005). However, in spite of this notable advancements towards understanding the nexus of globalization and functional income distribution have been made.

Rodrik (1998) links each factor's mobility with their respective bargaining power. Rodrik posits that factor prices are set within a bargaining framework between labor owners and capital owners. However, the extent of bargaining power that each factor has is determined by each factor's relative mobility so that the factor with greater mobility also has greater bargaining power. This follows from Rodrik's argument that the more mobile factor will be able to relocate to where their returns are highest. In other words, if capital is the more mobile factor the owners of capital will be able to negotiate for larger profit margins, and thus lower wages, by threatening to relocate their capital elsewhere if their terms are not met. Conversely, if labor is the more mobile factor labor owners will be able to gain the upper hand in negotiating wages by threatening a mass exodus to another location where their terms will be met. However, due to the reduction in both the physical and political barriers to trade and international capital flows capital will always be more mobile than labor. Thus, as of this writing, capital holds a greater degree of bargaining power relative to labor, ceteris paribus.

The political economy of trade model is the product of merging the insights of Rodrik (1998) and the Heckscher-Ohlin framework. Set in the bargaining power framework presented by Rodrik, the political economy of trade model posits that globalization (trade liberalization) benefits the more mobile factor through increased bargaining power (Onaran, 2011; Stockhammer, 2013). Epstein and Burke (2001) and Stockhammer (2013) also posit that under the framework of the political economy of trade a redistribution of income could occur if the more mobile factor threatens to relocate.[8] Therefore, the political economy of trade would suggest that given the rise of globalization that workers in the U.S. have suffered a relative reduction in their bargaining power while employers have benefited from an increase in their bargaining power. Consequentially, within the

[8]Similarly, increasing trade volumes between similar countries could also lead to a redistribution of income during subsequent negotiations

wage setting environment employers will use their greater leverage and negotiate for lower wages.

2.1.2 Measures of the Labor Share

The labor share is is one of two factor shares that makes up the functional distribution of income (the capital share being the other). Generally, the labor share is defined as the percentage of total labor compensation in an economy divided by GDP. However, from the general definition of the labor share we can also derive another method of calculating the labor share that divides real hourly labor compensation by labor productivity. In other words,

$$\text{LS} = \frac{\text{Total Labor Compensation}}{\text{GDP}} \tag{2.1.2}$$

$$= \frac{\text{Real Hourly Labor Compensation}}{\text{Hourly Labor Productivity}} \tag{2.1.3}$$

The latter ratio is used by the Bureau of Labor Statistics (BLS) in their calculation of the labor share. The BLS uses the GDP deflator in its calculation of real hourly compensation.

Apart from the BLS labor share, alternate measures that have been constructed by a number of authors. Namely, Giovannoni (2014b) constructs a number of different measures for the labor share in the United States using NIPA data that adjust for various factors such as the top income shares. Additionally, another term that is used commonly in place of labor share is wage share. The difference between the two terms lies within in the numerator of the functions. The equation for the wage share which corresponds to equation 2.1.2 is:

$$\text{WS} = \frac{\text{Total Wages (Total Labor Income)}}{\text{GDP}} \tag{2.1.4}$$

Labor compensation equals total wages plus total supplements to labor income. Hence the difference between the measures of the labor share and the wage share will ultimately depend on the size of the supplements to labor income.

For the United States, the BLS is the only source for an official measure of the labor share. Despite its merits, there are considerable shortcomings to the BLS measure. A major criticism of the BLS method is the lack of transparency (Giovannoni, 2014b). The method for calculating the labor share listed in the BLS handbook of methods (2014) is LS=$\frac{\text{Current-Dollar Compensation}}{\text{Current-Dollar Output}}$. Unfortunately, replicating the BLS labor share using this method is not possible. Furthermore, even though it is possible to replicate the BLS labor share using the method given in equation 2.1.3; this can only be done using the data

provided by the BLS. Seeing as the BLS employs a combination of both published and unpublished data, it would not be feasible to breakdown the data to examine the behavior of the labor share in a specific sector (Giovannoni, 2014b).

A second crucial criticism of the BLS labor share methodology is that it only calculates the labor share for the non-farm business sector. The BLS justifies this decision by stating that the ambiguity of the value-added within the farm, public and housing sectors. However, by only considering the nonfarm business sector the BLS is effectively excluding sectors that, together, represent approximately 20% of national income (Giovannoni, 2014b).

A third criticism of the BLS labor share is that it would not be possible to calculate the capital share from it. By definition, the sum of the labor share and the capital share is equal to one. The BLS labor share is indexed on the level of GDP in 2009 therefore the labor share in 2009, as calculated by the BLS, is equal to 100. Thus, it would not be possible to derive the capital share from the BLS labor share. However, it is possible to extrapolate the capital share from alternate measures calculated using NIPA data such as the measures derived by Giovannoni (2014b).

A final criticism stems from the use of the GDP deflator. The BLS adjusts hourly labor compensation using the GDP deflator when calculating real hourly labor compensation (Giovannoni, 2014b). While there is nothing wrong with this method, by using the GDP deflator the resulting labor share measure provides little insight to the purchasing power of labor. Therefore, the implications of the falling labor share on the purchasing power of wage earners is unknown.

2.1.3 Alternative Measures of the Labor Share

This section addresses the shortcomings of the BLS labor share measure.[9] One adjustments is to construct the labor share directly from NIPA data using equation 2.1.2. The labor share obtained using this method, as represented by the blue line in figure 2.1.4, is relatively stable. One possible explanation is that the NIPA data used in the calculations includes the public sector, the farm sector and the housing sector, all of which are omitted by the BLS in their calculations.[10] It is highly plausible that these sectors act

[9] Calculations attributed to Giovannoni (2014b) have been replicated by this author.

[10] One can presume that the BLS chooses to report data for the nonfarm business sector (as its largest aggregate) in order to provide an illustration of the capital-labor ratio. Thus the motivation for excluding the housing sector (imputed rents), public sector (capital is not counted) and farm sector (volatile) is that the ratio is not clear cut within those sectors. Our analysis is not so much concerned with the capital-labor ratio as with the sources of demand for bottom incomes. See forthcoming chapters.

as a ”stabilizing” force on the overall labor share, and that the negative trend observed in the BLS measure is a result of their omission.

However, Giovannoni (2014b) also suggests that, in addition to the inclusion of the two omitted sector, one should adjust for top income shares as well. The argument stems from the notion that income earned by those in the top income share (1%) closely resemble capital income, not labor income. Thus, their income should be included in the capital share, and not in the labor share. After adjusting the labor share for *labor* income earned by those in the top 1% income share using data from the World Top Income Database (WTID) the labor share of the bottom 99% is given by the red line in figure 2.1.4.

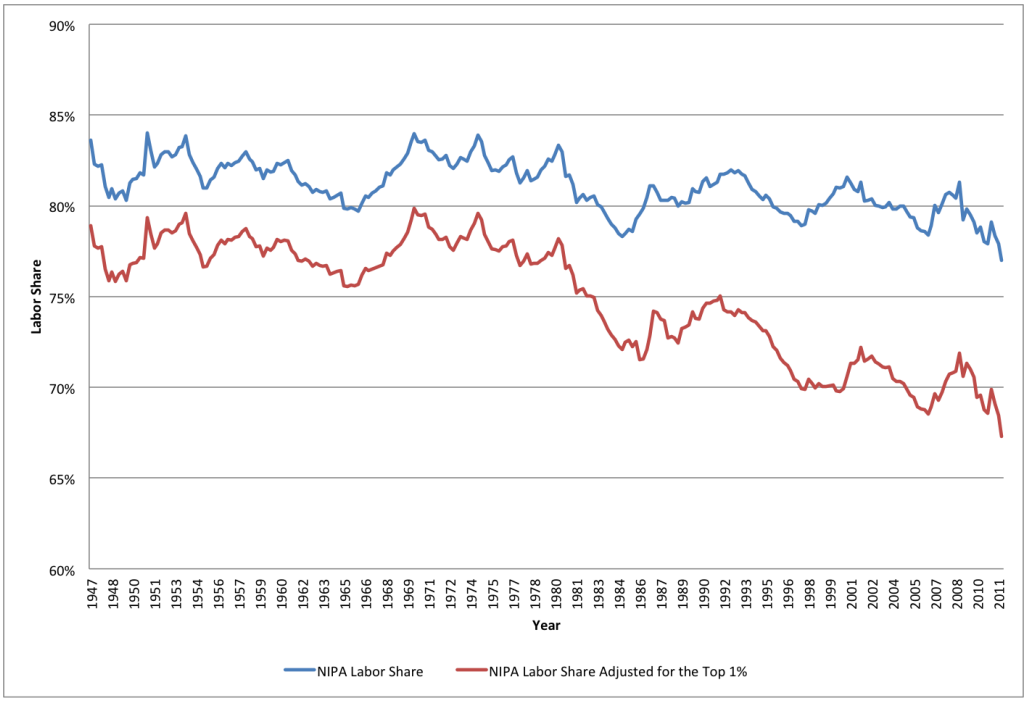
The NIPA labor share adjusted for the top 1% income share in figure 2.1.4 shows that the labor share has been falling in the United States. Specifically, it can be inferred that a major driving force in the falling labor share has been the sharp increase in the share of income held by those in the top 1%. Yet, while the BLS labor share exhibits a steady decline in the U.S. labor share during the post war period followed by a sharp collapse beginning in the early 2000's; the NIPA labor share adjusted for the top 1% income share exhibits relative stability throughout the post war period followed by a constant fall starting in the late 1970's early 80's. Thus, two notable implications of this particular labor share is that: (1) The income earned by labor in the public, farm and housing sectors have acted as a stabilizing force on the U.S. labor share. Omitting the two sizable sectors may result in an over exaggeration of the magnitude of the decline in the U.S. labor share, and its volatility. (2) Income earned by those in the top 1% income share have a similar effect of ”propping up” the U.S. labor share. Yet, since their income should be categorized as capital income, their inclusion masks the fall in the U.S. labor share.

The second adjustment that is suggested by Giovannoni (2014b) entails using the CPI deflator to adjust for inflation instead of the GDP deflator. The motivation behind doing so would being the ability to interpret the falling labor share in terms of purchasing power. This adjusted measure for the labor share is represented by the blue line in figure 2.1.5 while the unmodified NIPA labor share is given by the red line. Figure 2.1.5 shows that while the labor share in the United States has been relatively stable when calculated using the GDP deflator, the same cannot be said for the labor share after being adjusted for the CPI. The blue line indicates is that there has been a sizable fall in the labor share in terms of purchasing power. Adjusting for both top income shares and the CPI, the black line in figure 2.1.6 paints an even bleaker picture. Since the early 1970's the U.S. labor share, in terms of purchasing power, has fallen by over 30 points (nearly half). This indicates

that in the United States capital owners have benefited from the economic growth at an increasingly disproportionate ratio compared to labor.

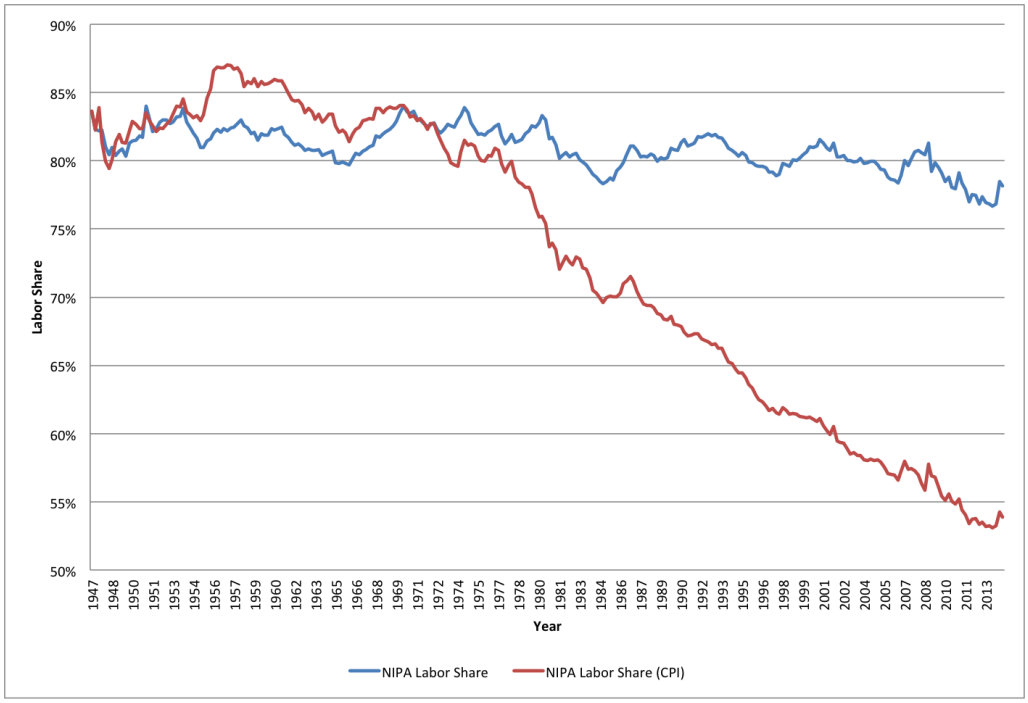
However, the adjusted labor share measures are not without limitations of their own. The WTID constructs their income shares from tax return data. Since individuals within the top income shares have greater access to tax loopholes and tax shelters, the WTID most likely underestimates the size of the top income shares. Consequentially, given this data limitation, adjusting the NIPA labor share for top income shares with high accuracy is near impossible. Another, minor, limitation of adjusting for the top income share is that there will always be a two to three year lag for the most recent top income share data. this is due to the fact that WTID constructs their income shares from tax return data. Thus, while it is possible to calculate the NIPA labor share adjusted for CPI up to the most recent quarter, the same cannot be done when adjusting for the top income share. Overall, the adjusted labor shares presented in these pages are better understood as our best estimates given the data limitations.

Figure 2.1.4: NIPA Labor Share for the Entire Economy Adjusted for the Top Incomes



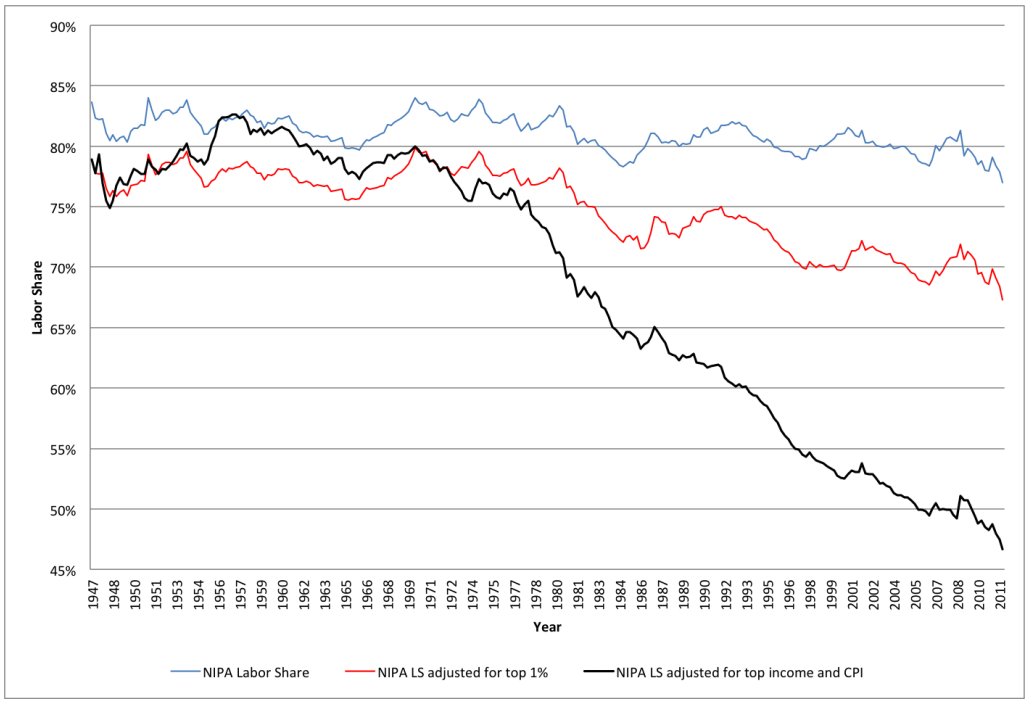
Source: NIPA (2014), WTID (2014), Author's Calculations

Figure 2.1.5: NIPA Labor Share for the Entire Economy Calculated Using the CPI Deflator



Source: BLS (2014), NIPA(2014), Author's Calculations

Figure 2.1.6: NIPA Labor Share for the Entire Economy for the Top Incomes and CPI



Source: BLS (2014), NIPA(2014), WTID (2014), Author's Calculations

2.2 Wage-led and Profit-led Demand Regimes

A number of studies have attempted to examine the relationship between an economy's functional distribution of income and its economic structure. In this context, the term economic regime is used to describe an economy's structure; for example the state of the capital market and the openness of the economy and its institutions, such as welfare programs (Stockhammer, 2011a). A country's economic regime can be analyzed from either the demand-side or the supply-side depending on the variables being examined. Following Post-Keynesian theory, the key demand-side variable is aggregate demand; meanwhile the key supply-side variable is productivity growth (Stockhammer, 2011a). Hence, determining the nature of a country's economic regime is a matter of identifying the sign of the correlation between a change in income shares and the change in the key variables.

Since it is widely accepted that variations in economic growth are endogenous under a demand-side view and exogenous under a supply-side view, the vast majority of existing studies have omitted supply-side considerations (Hein and Vogel, 2008; Onaran and Galanis, 2012; Stockhammer, 2011a, 2012a; Stockhammer, Onaran and Ederer, 2009). Furthermore, while Stockhammer (2011a) discusses the theoretical properties of wage-led and profit-led supply regimes he does not conduct any empirical tests. For the purposes of this paper, we focus on the demand-side as well.

2.2.1 Demand Regimes

For demand to be wage-led, aggregate demand needs to exhibit a positive relationship with the wage share; in other words, an increase in the wage share must lead to an increase in the aggregate demand (Hein and Vogel, 2008; Onaran and Galanis, 2012; Stockhammer, 2011a, 2012; Stockhammer, Onaran and Ederer, 2009). This theory is based off of the Kaleckian assumption that the propensity to consume out of wages is greater than the propensity to consume out of profits, which implies that the wage share is positively correlated to the level of consumption. Thus, the narrative is that if there is an increase in the wage share, then the increase in wages would induce an increase in consumption expenditure (Stockhammer, 2011a; Onaran and Galnis, 2012).

However, the wage share is also negatively correlated with the level of investment since it is a function of expected profits (Stockhammer, 2011a). Therefore, in a wage-led economy, the partial effect of a change in the wage share on consumption will be greater

than the partial effects of the wage share on investment. Strictly speaking, consumption is more sensitive to changes in the wage share than investment when the economy is wage-led (Onaran and Galnis, 2012). Conversely, in the case of a profit-led demand regime, it should be expected that an increase in the wage share will lead to a decrease in aggregate demand (Hein and Vogal, 2007; Onaran and Galanis, 2012; Stockhammer, 2011a, 2012; Stockhammer, Onaran and Ederer, 2009). As the wage share increases, the negative partial effect on investment outweighs the positive partial effect on consumption.

Open vs. Closed Economy

It is also possible for aggregate demand to be wage-led in a closed-economy, but become profit-led under an open economy. Blecker (2002) argues thatin an open economy international competition and capital mobility decrease the likelihood of wage-led demand growth. Specifically, the likelihood of aggregate demand being profit-led is positively related to the degree of price-based competition in domestic and foreign goods markets and the sensitivity of domestic investment to relative profitability (in relation to foreign profitability).

This follows from the fact that net exports are also negatively correlated with the wage share. For any given exchange rate, an increase in the wage share will result in an increase in production costs and reduce the economy's international competitiveness (Blecker, 2002; Stockhammer, 2011a, 2011b). Therefore, aggregate demand will be profit-led if the partial effects on investment and net exports, combined, are greater than the partial effect on consumption (Blecker, 2002; Onaran and Galanis, 2012; and Stockhammer, 2011a). On the other hand, an economy is wage-led if the partial effect of a change in the functional distribution of income on consumption is greater than the partial effects on investment and net exports combined.

However, there are a number of qualifications to be made. First, the relative size of an economy needs to be taken into consideration as the size of trade and foreign investment as a share of GDP will be larger for a small economy relative to a large economy (Blecker, 2002). Another consideration is foreign policy. Blecker posits the trade balance and foreign investment flows of a country with protectionist policies will be relatively inelastic to changes in the wage share. Furthermore, the effects of price-competitiveness may be less significant over the long run compared to the short run.

Blecker (2002) qualifies the implications by arguing that they only applies to individual countries since, as a whole, the world economy is always closed. Similarly, Onaran

and Galanis (2012) also find that profit-led countries will experience a decline in their aggregate demand if a major trading partner experiences a decrease in their wage share. They conclude that this provides evidence that the global economy is wage-led. Furthermore, they warn that this also serves as evidence that the outcome of a race to the bottom can only be detrimental as individual gains in competitiveness will be lost if wage reductions occur simultaneously.

2.2.2 Findings

The findings of existing studies have been mixed. Bowles and Boyer (1995), Hein and Vogel (2008), Onaran, Stockhammer, and Grafl (2011) and Stockhammer and Stehrer (2011a) have identified the United States as being wage-led domestically, and remains so even after allowing for an open economy. Likewise, Onaran and Galanis (2012) also find that the United States is wage-led when allowing for an open economy. On the other hand, Naastepad and Storm (2007) find that the United States is profit-led both domestically and in the open economy. Stockhammer and Onaran (2004) and Barbosa-Filho and Taylor (2006) also find that the United States is profit-led when allowing for an open economy, but wage-led domestically.

However, one limitation of these studies is that, despite using different methods and approaches, they use the private sector which is about 50% of the whole economy (previous section). Looking at BLS and NIPA data (figure B.1) the observed trends support neither the wage-led nor the profit-led regime. Theoretically, the falling U.S. labor share should have been followed by either a decrease in consumption or an increase in investment. However, despite the falling U.S. labor share, personal consumption expenditures as a share of GDP have trended upwards. Additionally, figure B.2 shows that while the falling wage share has coincided with an unprecedented increase in corporate profits, yet the level of nonresidential investments has not increased as much as the theory would suggest. Herein lies the two paradoxes of the Post-Kaleckian model:

1. According to post-Keynesian theories we should expect that a redistribution of income from labor to capital should lead to a decrease in the level of personal consumption expenditures and therefore act as a drag on aggregate demand. Yet, historical trends for the labor share and consumption expenditures exhibit a negative relationship.

2. Theoretically, the profit share should exhibit a strong positive relationship with real investment. However, Onaran and Galanis (2012) find that the relationship between the profit share and real investments is statistically insignificant in the United States. Similarly, Guttmann (2008) and Hein and van Treek (2008) also identifies this decoupling of profits from investments.

2.3 Pro-Capital Policies: Financialization and Globalization

One possible explanation for why the data contradicts the theoretical implications of wage-led and profit-led regimes is the distributional policies that have been implemented in the United States. Stockhammer (2011a) presents two types of distributional policies: pro-labor, and pro-capital. Pro-labor distributional policies are policies that lead to an increase in the wage-share, examples of which include increasing the minimum wage and strengthening collective bargaining power. Pro-labor policies generally have the effect of increasing real wages, maintaining a stable wage share, and decreasing income inequality. Conversely, pro-capital distributional policies generally cause reductions of the wage share through lowering the minimum wage, weakening collective bargaining power and employment protection legislation.[11]

Stockhammer (2011a) argues that while pro-capital and pro-labor distributional policies are not inherently harmful, pursuing a distributional policy that is inappropriate for the economic regime could have dire consequences. If a pro-capital (pro-labor) distributional policy is implemented in a profit-led (wage-led) economy, the reduction (increase) in the labor share will induce a profit-led (wage-led) growth process. However, pro-capital (pro-labor) policies implemented in a wage-led (profit-led) regime will lead to either stagnation, or unstable growth. Furthermore, in this scenerio economic growth will rely solely on external stimulus when there is a mismatch of economic regime and distributional policies.

It follows from the findings of Avaredo, Atkinson, Piketty and Saez (2013) that the United States has employed pro-capital distributional policies since the 1980s. Since the 1980s the United States has passed extensive tax cuts for those at the top of the income distribution. Barba and Pivetti (2009) state that the "bonanza" enjoyed by the wealthiest tax payers in the United States resulted from the belief that capital growth is dependent on the strength of individual savings. In other words, the pro-capital distributional

[11] Generally, advocates of pro-capital policies do not campaign to increase capital income directly. Instead they campaign for wage and labor market flexibility.

policies enacted in the United States were the result of supply-side, or more colloquially trickle-down, economics.

In addition to extensive tax cuts, pro-capital distributional policies also created an environment that facilitated which financialization. Apart from reducing the labor share (chapter 2.1.1), the increased importance of short-term profitability among corporate objectives leads to another notable byproduct of financialization: the decoupling of profits from real (productive) investments (Guttmann, 2008; Hein and van Treek, 2008). Guttmann (2008) postulates that, given the dominance of shareholder value maximization among corporate objectives, the commitment and risk associated with undertaking real investments makes such projects less appealing. Alternatively, firms often choose to purchase existing productive capacity through acquisitions and mergers. Guttman argues that this helps to explain the observed trend of stagnant real investment during a period of historically high profitability.

The decoupling of profits from real investments can be seen in figure B.2. Corporate profits and nonresidential investments have diverged since the early 1970s. Additionally, the rate at which this gap grew increased in the mid 1980s and again in the early 2000s. Figure B.2 also shows that corporate profits have become increasingly volatile. On the other hand the business cycle appears to have a minimal effect on the level of nonresidential investment.

Another factor that could explain the decoupling of profits and real investments is globalization. Given the political economy of trade model, the significant opening of cross border capital flows and both the physical and the political barriers of trade have resulted in a rise in off shoring of production. Since labor in the United States is generally more expensive compared to labor in developing economies there is a net export of capital in the United States. This is to say that profits earned in the United States are not necessarily invested in increasing the productive output of the United States.

The decoupling of profits and real investments is an issue for the wage-led profit-led demand regime model. By definition, demand will be profit-led if a redistribution of income favoring the profit share leads to an increase in aggregate demand through an increase in investment that outweighs the decrease in consumption. Yet, the sizable fall of the U.S. labor share has not led to an increase in investment despite monumental levels of corporate profit.

Conversely, if demand is wage-led in the United States then the falling labor share should have resulted in a fall in consumption, but this too has not occurred (figure

B.1). Thus, it can be argued that a decoupling of income and consumption happened as well. This would indicate that the standard consumption theory based on the marginal propensity to consume out of disposable income (alone) does not capture the consumption dynamics, at least in the United States. Thus, alternative theories need to be considered.

2.4 Household Debt

One trend that has become closely associated with the declining labor share (increasing income inequality) has been the rapid deterioration of the balance sheets of middle- and low-income households. As shown in figure 3.1.1, the declining labor share has coincided with a falling personal savings rate, and a concurrent (unprecedented) rise in the level of private household indebtedness.

A number of authors have identified two channels through which the shift in the distribution of income has affected the level of household debt in the United States. The first channel argues that stagnant, and in some cases, falling real incomes for the majority of U.S. households have led to an increase in the *demand* for credit (Barba and Pivetti, 2009; Cynamon, Fazzari and Setterfield, 2013; Cynamon and Fazzari, 2014; Palley, 2010; van Treek, 2012). The second channel has argued that the rise in household debt has resulted from an increase in the *supply* of credit (Barba and Pivetti, 2009; Coibion, et al., 2014; Cynamon and Fazzari, 2014; Kumhof, Rancière and Winant, 2013). Cynamon, Fazzari and Setterfield (2013) argue that the consumption-led demand regime enjoyed by the United States prior to the Great Recession was financed through the massive accumulation of debt by households outside of the top income share which was spurred on by an increasingly deregulated financial sector. Alternatively, Kumhof and Rancière (2011) posits that the doubling of the private credit to GDP ratio in the United States resulted from the *duality* of the two channels. The greater reliance on debt as a supplement to income by households in the bottom 95% was complemented by the increasing accumulation of wealth of the top 5%.

Furthermore, authors have also identified a number of detrimental macroeconomic effects of excessive debt accumulation, regardless of the process. Even though the rise in household debt had occurred over an extended period of time, Barba and Pivetti (2009) argue that the process of debt-financed consumption is not sustainable. Papadimitriou, et al. (2014) argue that without a change in the distribution of income the United States would face two possibilities depending on the debt behavior of households. First, if households do not begin to finance consumption through acquiring more debt then the

U.S. economy would face stagnation. Second, if households systematically begin to finance consumption with debt (again) then the U.S. would face another period of unstable growth.

2.4.1 The Demand for Debt

The first channel through which a redistribution of income favoring capital owners is able to affect household debt behavior is through the demand for debt. The theoretical basis for this line of argument is derived primarily from the works of Veblen (1899) and Duesenberry (1949). Authors posit that the habitual nature of consumption behavior and the social dynamics of consumption have led the majority of households to rely on household debt in order to maintain a *relative* standard of living.

Barba and Pivetti (2009) argue that households have used debt to supplement either stagnant or falling real income. The authors find that in the United States, the majority of income growth between the 1980s and the 2000s accrued to the top of the income distribution (the top 10%, see also the WTID and Cynamon and Fazzari, 2014). Coincidentally, the rise in household debt has been predominantly concentrated in low- and middle-income households. Barba and Pivetti (2009) explain that given Duesenberry's theory on the habitual nature of consumption, households initially reduced their savings rate, but after a certain point their consumption expenditures exceeded their current income. When households needed to consume in excess of their incomes they relied on the use of either consumer credit or the extraction of equity from their homes.

Authors have also commonly associated the RIH (Relative Income Hypothesis) with the "keeping up with the Joneses" effect (Barba and Pivetti, 2009; Coibion, et al., 2014; Palley, 2010; van Treek, 2012). In addition to maintaining their standard of living relative to their past standards, households also tried to maintain their standard of living relative to that of others. Thus, rising income inequality (falling labor share) has coincided with a significant increase in private household debt. Palley (2010) and van Treek (2012) argue that in addition to consuming out of savings it is also possible under the RIH for individuals to consume beyond their means through the use of credit. Thus, through the narrative of the "keeping up with the Joneses" effect, the relative income hypothesis has been used to explain the rise of private household debt in the United States as a substitute for wages.

This process of debt-financed consumption has also been referred to as the "Rajan hypothesis" after Raghuram Rajan's (2010) book *Fault Lines*. In his book, Rajan posits

that U.S. households have responded to the decline in their *permanent* income by reducing their savings rate and wealth[12] and by increasing debt. The combination of a reduced savings rate, increasing dissavings and increasing debt holdings has allowed for U.S. households to temporarily sustain consumption growth despite either stagnant or falling real incomes.

Iacoviello (2008) also attributes the rise in household debt to the concurrent rise in income inequality. He creates a general (dynamic) equilibrium model with heterogeneous agents to study the trend and cyclical properties of household debt. Iacoviello argues the his model explains why the sharp increases in income inequality was accompanied by a significantly smaller rise in consumption inequality and a larger rise in wealth inequality. Specifically, the trends are explained by household borrowing behavior.

At the cross-sectional (micro) level, Iacoviello (2008) argues that the rise in household debt was a result of households relying on debt as a substitute for real income growth. Accordingly, he also argues that aggregate debt rises when there is an increase in income inequality. However, in addition to the "keeping up with the Joneses" argument, Iacoviello also posits that on the aggregate (macro) level consumer debt behavior is highly cyclical.

Conversely, in a recent study Coibion, et al. (2014) argue against "keeping up with the Joneses" and find that the rise in private household debt in the United States was not a result of increased demand for debt. Using disagregated data from the New York Federal Reserve Bank Consumer Credit Panel/Equifax (CCP) the authors were able to analyze the relationship between local inequality and different forms of debt. Their findings indicate that low-income households in regions with high income inequality borrowed less compared to low-income households in regions with low income inequality. Furthermore, the authors also show that the results are robust.

Thus, it would appear that the results of Coibion, et al., (2014) rejects the social dynamics of consumer behavior posited by Duesenberry's (1949) relative income hypothesis and the "keeping up with the Joneses" effect associated with it. However, the findings of Coibion, et al., (2014) may have resulted from the omission of one major channel through which an individual's consumption behavior may be affected by the consumption behavior of other individuals. In the construction of the RIH, Duesenberry (1949) posited that the "demonstration effect" may induce an individual's consumption expenditure to increase without a corresponding increase in either their income or the

[12]The accumulation of past savings.

prices of the goods they consume. When there is an increase in the frequency to which an individual is exposed to goods superior to those they currently consume that individual's impulse to buy the superior good increases as well. Since the majority of an individual's "exposure" would have been limited to physical interactions at the time of Duesenberry's writing, it would be reasonable to assume that the effect of social dynamics on consumption is limited to an individual's local community.

However, in the digital age, with the permeation of mass media and internet access, contemporary households are not only exposed to local influences, but are influenced by the consumption behavior of individuals outside of their local community as well. An individual may be equally influenced by observing the consumption of someone else indirectly through, for example, a television screen as they would have directly in person. Furthermore, digital media has also led to an unprecedented rise in the exposure an individual has to advertisements. Since advertisements are constructed to "demonstrate" the superiority of the good or service that is being presented, an individual may be swayed into believing that the goods they currently consume are inferior. Thus, while it may have been appropriate to use the methods employed by Coibion, et al. (2014) in 1949, restricting the sphere of influence to only include an individual's local community is theoretically flawed. In that sense, the phrase "keeping up with the Joneses" is just as dated; alternatively, a more appropriate term for describing the social dynamics of consumption in the digital age would be "keeping up with the Kardashians".

2.4.2 Supply (Availability) of Debt

Common supply-side explanations for the rise of debt have been smaller business fluctuations, the reduced cost of borrowing, changes in the regulatory environment for lenders and new technologies that help control credit risk (Iacoviello, 2008). Iacoviello argues that during good times, the credit constraints imposed on households become relaxed. In other words, the level of household debt is pro-cyclical. Thus, credit constraints were significantly relaxed during the run-up of household debt since smaller business fluctuations meant longer periods of "good times".

The reduced cost of borrowing came in the form of falling interest rates. Barba and Pivetti (2009) argue that one of the reasons behind the massive accumulation of household debt over a relatively long period of time in the U.S. were policies that progressively lowered the interest rate. As interest rates fell, the costs of servicing debt also fell; and

since debt servicing costs are the primary cost of financial leveraging, borrowing became more affordable.

Conversely, by accounting identity, an increase in the interest rate might lead to a decrease in the creation of new household debt it could still lead to an increase in the debt-income ratio for households with existing loans. Barba and Pivetti (2009) point out that even if households decide to keep their consumption expenditures equal to their current income, if the interest rate is greater than the rate of income growth their their debt-income ratio will continue to increase. In this scenario, the only way to reduce one's debt-income ratio would be for consumption expenditures to fall below current income.

Barba and Pivetti (2009) also find that a significant portion of the rise in household debt since the 1980s resulted from a growing tendency for households in the low- and middle-income distribution to extract equity from the value of their homes in order to finance consumption. Since this channel of borrowing was only made possible by changes in the regulatory environment for lenders it follows that the rise in household debt accumilation have resulted, in part, from financial deregulation. Likewise, Cynamon and Fazzari (2014) posit that asset accumulation explains a substantial portion of the acceleration in the debt to income ratio for the bottom 95%.[13] They posit that the rise in household debt would not have been possible if not for concurrent asset bubbles, and argue that an individual's access to credit is determined in part by their assets and their ability to maintain their financial net worth.

The increase in the household leveraging of the bottom 95% during the 1990s were made possible by the stock bubble (Cynamon and Fazzari, 2014). The stock price bubble allowed those households to maintain their financial net worth. However, after the stock price bubble burst, it was the housing bubble that helped support further acceleration of the debt growth of the bottom 95%. Coincidentally, Cynamon and Fazzari (2014) also finds that when housing is excluded from the net worth of the bottom 95%, their "financial net worth" fell by more than 40%.

Furthermore, Iacoviello (2008) argues that on the *aggregate level*, the rise in household debt resulted from an increase in the allocative efficiency of the U.S. financial sector. He argues that as a country becomes richer, their financial sector also becomes better at allocating capital from households who have excess funds to households that need

[13] Cynamon and Fazzari (2014) dissaggregates the components of the aggregate household balance sheet between the top 5% and the bottom 95%.

funds. Complementing Iacoviello's argument, Kumhof, et al. (2013) argue that the rise in household indebtedness was enabled by the savings of the rich (capital owners).

Kumhof, et al. (2013) posit that individuals at the top of the income distribution derive utility from the accumulation of wealth. Specifically, the authors argue that top income earners exhibit a preference for wealth, and will therefore have a higher propensity to save. Traditionally, wealth enters the utility function as a representation of two motives: precautionary saving, and the desire to leave an inheritance. However, Carroll (2000) and Kumhof, et al. (2013) suggests top income earners are able to derive direct utility from the social status and power that is associated with wealth.

Therefore, with the rapid rise in income inequality, households at the top of the income distribution have experienced a significant increase in their annual incomes. Given the insights of Dynan, Skinner and Zeldes (2004) both the savings rate and the wealth of top income earners have increased significantly as well. Accordingly, the increases in wealth at the top of the income distribution has in turn lead to an increase in the availability of credit to the bottom of the distribution through the banking sector.

2.4.3 Debt, Stability and the 2008 Crisis

The robust economic growth in the decades preceding the Great Recession was, by large, fueled by the strong and sustained growth of consumption expenditures that was financed by unprecedented household borrowing. Cynamon, Fazzari and Setterfield (2013) dub this process as "consumption-led and debt-financed engine of aggregate demand growth". This period, referred to as the "Great Moderation", created an illusion that the pro-capital distributional policies implemented in the early 1980s had resulted in stable economic growth. However, a number of recent studies have attributed the run up of household debt as the underlying cause of the Great Recession. Kumhof and Rancière (2011) and Mian and Sufi (2014) identify sharp increases in both income inequality and debt to income ratio as two major similarities between the Great Depression and the Great Recession.

Cynamon and Fazzari (2014) find that the rise of inequality was large enough that it could potentially account for the entire increase in debt leveraging by households in the bottom 95%. Cynamon and Fazzari argue that the combination of a lower savings rate and greater indebtedness of households in the bottom 95% lead to increasingly fragile balance sheets for the bottom 95%. Since households in the bottom 95% derived a large portion of their "borrowing power" from their assets, the degree of access households had to credit

and therefore debt growth is severely dependent on asset prices. Likewise, Iacoviello (2008) finds that the accelerated growth of aggregate debt was a result of households extracting equity from their housing assets.

During the 2000s the composition of the assets held by the bottom 95% became predominately housing assets, the health of their balance sheets relied heavily dependent on housing prices. Cynamon and Fazzari (2014) note that compared to the 1990s the financial net worth of households in the bottom 95% had dropped over 40%. On one hand the value of the assets held by the bottom 95% became increasingly volatile, and on the other hand their liabilities increased at an alarming rate as households increased their debt. Additionally, households had insufficient savings due to decades of dissaving and declining savings rates. All these factors would work together to increase the fragility of the aggregate balance sheet of the bottom 95% (Cynamon and Fazzari, 2014).

Similarly, Mian and Sufi (2014) believe that financial crises are not inevitable, but are instead the result of a financial system that fosters too much household debt.[14] Mian and Sufi argue that a major function of any financial market should be to help spread the risk among its users. However, this risk becomes concentrated squarely on the debtor when a financial system relies on the extensive use of debt by households in order to thrive. Jordà, Schularick, and Taylor (2011a) finds that credit growth is the single best predictor of financial instability. The authors find that prior to a financial crisis credit growth has a tendency to be greater than usual. In line with the supply of credit argument, the elevated credit growth is complemented by a tendency for short-term interest rates to be lower than the "natural rate".

In accordance with Minsky's financial instability hypothesis, Cynamon, Fazzari and Setterfield (2013) argue that by the late 2000s economic growth in the United States became dependent on the "ordinary workings of financial markets" in addition to the "ordinary workings of goods markets". In particular, the "ordinary workings of financial markets" necessitated rolling over existing debt, and expanding new credit. However, right before the onset of the Great Recession, a significant number of households were no longer capable of repaying their adjustable mortgages due to rising short-term interest rates (Cynamon, Fazzari and Setterfield, 2013). This would cause the housing bubble to burst. Therefore it follows that the concurrent rise in debt-financed consumption and equity based credit supply resulted in economic growth that became increasingly unstable.

[14] Jordà, Schularick, and Taylor (2011b) finds that the expansion of private household debt preceding a financial crisis is five times greater compared to non-financial crises.

Furthermore, based on a study of 200 recessions occurring in 14 advanced economies between 1870 and 2008 Jordà, Schularick, and Taylor (2011b) find that, compared to non-financial crises, financial crises are far more costly in terms of lost output. However, regardless of whether a crisis is financial in nature or not crises that are preceded by credit-intensive expansions are generally more severe and the subsequent recoveries also tend to be slower.

The end of the housing bubble effectively cut off the availability and accessibility of new credit (Cynamon and Fazzari, 2014). In other words, middle- and low-income households were no longer able to replace earned income with rising home values as a source of purchasing power. Therefore, the onset of the Great Recession was a one-two punch. First, rising short-term interest rates devastated the wealth of middle- and low-income households which in turn limited their ability to borrow. This first blow would cause the "ordinary workings of financial markets" to cease. As the credit supply shrunk, households with lower income growth were forced to reduce consumption in order to satisfy their intertemporal budget constraints. Additionally, Cynamon, Fazzari and Setterfield (2013) find that the end of the housing bubble also caused solvent households to consume less as their confidence was diminished. Hence, the second blow would cause the "ordinary workings of goods markets" to cease.

Thus, Cynamon and Fazzari (2014) posit that the fragility of the balance sheets of households in the bottom 95% prevented any kind of consumption smoothing during the Great Recession. Instead, households with fragile balance sheets were forced to reverse their borrowing and reduce their consumption expenditures. Hence, Cynamon and Fazzari (2014) argue that, "We have no reason to expect a return to trend for the bottom 95 percent consumption in the absence of another debt bubble or a structural change that accelerates bottom 95 percent income." (p.26) This also resonates with the conclusion of Papadimitriou, et al. (2014) that the U.S. economy will face the grim prospects of either volatile growth or stagnation if income inequality is not reduced. Similarly, Kumhof and Rancière (2011) conclude that, "Restoring equality by redistributing income from the rich to the poor would not only please the Robin Hoods of the world, but could also help save the global economy from another major crisis." (p.195)

3. Consumption Theories

In *The General Theory of Employment, Interest and Money*, John Maynard Keynes (1936) famously wrote, "The fundamental psychological law... is that men are disposed, as a rule and on the average, to increase their consumption, as their income increases, but not by as much as the increase in their income" (p.96). The consumption theory assumed within the wage-led/profit-led demand model is based on the implications of this quote. It is assumed that an individual's disposable income and their level of consumption expenditures are positively related, and that the share of income used for consumption decreases as income increases. Additionally, this model also incorporates the Kaleckian assumption that the MPC of wage income is greater than the MPC of profit income. Thus, the Post-Kaleckian model implies that since household incomes fall when there is a decrease in the labor share then consumption should fall too (Hein and Vogel, 2008; Onaran and Galanis, 2012; Stockhammer, 2011a, 2012a; Stockhammer, Onaran and Ederer, 2009). However, the relationship between the labor share and the consumption share of GDP observed in figure B.1 does not support this notion (see "second conundrum" inference). The consumption share of GDP has increased despite the concurrent fall in the labor share. This chapter is devoted to alternative consumption formulations. We present the permanent income hypothesis (along with the life-cycle theory of consumption), the relative income hypothesis and the relative income hypothesis (along with other recent theories of consumption), and propose a formulation of our own.

3.1 The Permanent Income Hypothesis

The First consumption theory that departs from Keynesian propensity to consume argument is Friedman's (1957) permanent income hypothesis (PIH). Friedman argues that households consume a fixed proportion of their permanent income. Friedman defines permanent income to be the annuity of an individual's total lifetime income. Therefore, under the PIH an individual's marginal propensity to consume is constant and equal to their average propensity to consume. In its simplest form, the consumption function under the PIH can be expressed as,

$$C^p = cY^p \tag{3.1.1}$$

where C^p = permanent consumption[15], c = MPC = APC and Y^p = permanent income.

The PIH implies that an individual's consumption decisions will be made based on the annuity of their permanent income, therefore their consumption expenditures remain constant despite temporary fluctuations in their current income level. Hence, neither positive nor negative (temporary) shocks to an individual's income affects that individual's consumption expenditure. In other words, when an individual's current income is greater than their permanent income the proportion of that individual's income that is used for consumption will be lower compared to when their current income is equal to their permanent income. Conversely, when the individual's current income is lower than their permanent income the proportion of their income spent on consumption will be greater than when their current income is equal to their permanent income.

Similar to Friedman's (1957) permanent income hypothesis, Modigliani and Brumberg's (1954) life-cycle theory of consumption argues that individuals will plan their consumption expenditures and savings over the course of their lifetime. Essentially, Modigliani and Brumberg argue that an individual will make consumption decisions based on their expected lifetime earnings in such a way that they would be able to consume at a constant level throughout their lifetime. The individual will also make saving decisions with the goal of accumulating enough savings to continue consuming at that level into retirement. This theory is illustrated by figure B.3. Thus, both the PIH and the life-cycle theory of consumption contend that the potential effects of deviations of an individual's current income from their permanent income will be smoothed out through either a decreased savings rate or dissavings (using past savings or financing consumption through debt).

Figure B.4 shows that the savings rate in the United States has generally traced the behavior of the U.S. labor share as calculated by the BLS. Even though the relationship weakened after the mid-1980s, both the BLS labor share and the personal savings rate are still trending downwards. Figure 3.1.1 shows that the relationship between the personal savings rate and the labor share appears to not only hold when using the adjusted NIPA labor share measure, but is also stronger.[16] Thus, the trends observed in figure B.4 appears to support the premises of both the PIH and the life-cycle theory of consumption that U.S. households decreased their savings rate as a result of consumption smoothing.

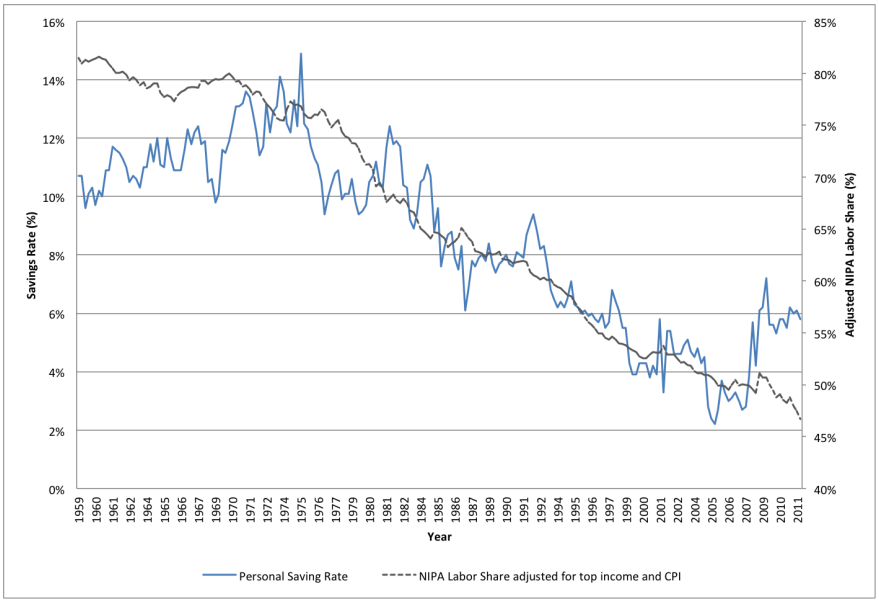
[15]Friedman (1957) defines current consumption C as the sum of the permanent component C^P and the transitory component C^T.

[16]Since the labor share in figure 3.1.1 is deflated using the CPI it effectively measures the labor share in terms of purchasing power.

However, recent studies have found that the shocks to the personal distribution of income was permanent (DeBacker, et al., 2012; Kopczuk, Saez and Song, 2010; Kumhof, et al., 2013). Since the consumption smoothing mechanism occurs in response to a negative transitory shock to an individual's current income it cannot be used to explain the declining savings rate when the shock is permanent. Additionally, even if the shocks were transitory, both the PIH and the life-cycle theory of consumption are unable to explain the increase in the level of personal consumption expenditures . In fact, consumption expenditures should not increase under the life-cycle theory of consumption since it argues that an individual's consumption expenditure is constant throughout their lifetime. On the other hand, the PIH suggests that individuals will consume at a fixed proportion of their permanent income. In other words, while an individual's average propensity to consume may increase due to consumption smoothing their consumption expenditures shouldn't.

Under the PIH, an individual's consumption expenditures is able to increase only if there is an increase in their permanent income. In reality, the declining labor share indicates that the opposite has occurred for the majority of households outside the top income share. However, an individual's current consumption expenditures could increase if they have a rational expectation that their income will increase in the future. Thus,

Figure 3.1.1: U.S. Personal Savings Rate Compared to the Adjusted NIPA Labor Share



*Source:*BLS (2014), FRED (2014), NIPA (2014), WTID (2014) Author's Calculations

it could have been the case that the growth of top incomes led individuals in low- and middle-income households to expect that their incomes would increase in the future as well. As a result of their expectations, these individuals decided to increase their expenditures. Bertrand and Morse (2013) tests this hypothesis using data from University of Michigan's Panel Study of Income Dynamics (PSID). The authors fail to find any support for the theory that middle-income households are consuming more due to future expectations, and concludes that rising top income levels do not predict higher incomes for middle-income households. Hence, both the PIH and the life-cycle theory are unable to explain the household consumption behavior observed in the United States.

3.2 The Relative Income Hypothesis

In his book *Income, Saving and the Theory of Consumer Behavior* Duesenberry (1949) argues that there are two fundamental assumptions of the Keynesian consumption function that are flawed. The first is that an individual's consumption behavior is independent from the behavior of others. The second assumption is that an individual's consumption behavior adjusts automatically to changes in their income.

3.2.1 The Process of Choice

These assumptions stem from the marginal utility theory (or preference theory) on which the Keynesian consumption theory is built upon. It theorizes that human desires are desires for specific goods (Duesenberry, 1949). Alternatively, Duesenberry (1949) argues that, since all individuals have certain physical and "cultural" needs, individuals will desire goods that will fulfill a certain purpose. Be that as it may, individuals are also not indifferent between goods that serve the same purpose. Different goods serving the same purpose present qualitative differences[17] that will make some goods better than others. Based on their qualitative differences goods (that serve the same purpose) are regarded as superior or inferior to one another, and are also ranked on a scale of most to least desirable. A particular good will be considered superior if consumers generally agree that it is the best means of satisfying a particular need.

Hence, the augmented utility theory proposed by Duesenberry (1949) implies that, while it is possible for individuals to increase their utility by consuming more of a

[17] Duesenberry (1949) uses the example of transportation. Even though an individual is able to satisfy their need for transportation through either walking, taking the subway or taking a taxi the level of utility derived from each good.

particular good, increases to an individuals utility will often result from consuming different, higher quality, goods that serve the same purpose.[18]

Duesenberry (1949) also identifies another criticism of standard utility theory. Under the standard utility theory consumers are expected to consider all available goods and services and their respective prices in any given period. After considering all the available goods and services the consumer is then expected to make a number of simultaneous rational decisions in order to maximize their utility given their income for the period. Thus, in any given period an individual's consumption behavior would be the result of a systematic budgeting process that is self-contained [19]. Duesenberry contends that while this is possible, it is also highly unlikely.

Seeing the standard utility function as highly unrealistic, Duesenberry (1949) proceeds to construct a more realistic theory. Given the conclusion that people use goods to either satisfy specific needs or to perform certain activities, Duesenberry argues that there is only one variable that individuals consider when making consumption decisions: the quality of the goods and services used for a given purpose. When an individual desires to fulfill a need a they must decide the quality of the good required to fulfill the need. Furthermore, these quasi-independent decisions are made as needs arise and not simultaneously as suggested by the standard utility theory. Nevertheless, these decisions are not completely independent of each other as the individual still faces a budget constraint.

Duesenberry (1949) posits that these semi-independent decisions are made not through rational planning, but are instead the result of learning and habit formation. Specifically, he presents four elements of the "consumption habit formation process". First, any given individual will have basic needs, both physical and social, that will require the consumption of certain goods to be fulfilled. Second, habits will be formed through experimental behavior.[20] Third, individuals will reflect on the outcomes of their experimental behavior and may end up regretting certain expenditures. Forth, individuals will determine a successful consumption behavior when no expenditure is regretted such that no significant change to their consumption behavior is needed. Thus, an individual's consumption decisions are determined habits formed through a process of error and trial.

[18] The standard utility theory implies that the quality of the good being consumed does not matter, and that individual are able to increases their utility by consuming a greater quantity of the same specific good.

[19] Self-contained is used here to describe the notion that an individual will conduct their budgeting procedure based only their consumption choices, the prices of the good and services available and their income. The individual's past consumption behavior

[20] Individuals will "experiment" by consuming varying quantities of goods that satisfy their needs.

However, the habitual aspect of consumption behavior does not tell the full story. Duesenberry (1949) further argues that all individuals have a desire to consume goods that are of higher quality. Individuals are able to resist the impulses to consume higher quality goods as their desire to save leads them to feel remorse if they give in to too many impulses. However, the degree to which the individual is able to resist their temptations for higher quality also rely on the strength of their desire to save. On the other hand, their degree of resistance will also be negatively affected by the frequency to which they are exposed to superior goods. Furthermore, the frequency to which an individual is exposed to superior goods will increase as the consumption expenditures of others increase.

Thus, Dusenberry (1949) argues that an individual's consumption habits and expenditures are able to change without a corresponding change in either their income or the prices of goods. Within an isolated community with only one consumer the consumption behavior of that individual and the choices they make are determined by habits; but within a community with multiple households the consumption behavior of one household will also have an effect on the consumption behavior of other households. Therefore, Duesenberry (1949) posits that an individual's impulse to consume goods of higher quality will increase and their resistance to these impulses will decrease when the consumption expenditures of others increase. The effect of the two concurring effects will be an increase in consumption expenditures at the expense of saving. Duesenberry (1949) describes this process as the **demonstration effect**. When an individual consumes a particular set of goods habitually, they can become increasingly dissatisfied with them over time as their inferiority is demonstrated by the consumption of superior goods by others. However, consumption habits are only broken through frequent contact with superior goods, and not simply the knowledge of their existence.

Another aspect of the social influence on an individual's consumption habits is the notion of maintaining one's self-esteem and determining one's social status through the consumption of certain "status" goods. As Duesenberry (1949) argues,

> When the attainment of any end becomes a generally recognized social goal, the importance of this goal is instilled in every individual's mind by the socialization process... When this occurs the achievement of a certain degree of success in reaching the goal becomes essential to the maintenance of self-esteem. The maintenance of self-esteem is a basic drive in every individual. (p.28)

Despite the fact that there is an absence of a formal hierarchical class system in the United States, American society is arguably characterized by a system of "differentiated social status" (Duesenberry, 1949, p.29). Thus, a generally recognized social goal within the

United States is being recognized for achieving a relatively high status. Even though an individual's occupational success and income plays a major role in determining their status, a high income alone does not suffice. The attainment of a certain status quo is only a part of the equation as social recognition is also a major determinant in determining one's self-esteem. Hence, an individual will also require a medium through which to display their occupational success.

Due to their higher quality, an individual's status can be reflect through consuming superior goods. However, consuming superior goods will only be able to go so far in elevating one's status. An individual will be required to acquire luxury, or status, goods in order to solidify themselves in the highest social classes.[21] However, such goods will either serve no inherent purpose in fulfilling needs or will be no better than other goods that serve the same purpose (Duesenberry, 1949).

An example of such a good would be Rolex watches. An individual may justify purchasing a Rolex over a Timex by arguing that the Rolex is made using superior materials and handiwork, but a Timex is equally accurate, if not more, in providing the time. Thus, the true premise for purchasing a Rolex is based on reinforcing one's self-esteem and obtaining the status associated with owning a Rolex. Since self-esteem plays an immense role in determining an individual's well being it follows that the acquisition of superior goods, and in certain cases luxury goods, will not only increase an individual's standard of living due to their higher quality, but also through their social implications. Thus, the desire to acquire superior goods and luxury goods is "significantly strengthened in our society by the characteristics of our social structure." (Duesenberry, 1949, p.29)

3.2.2 The Relative Income Hypothesis

Given the critique of the Keynesian consumption function Duesenberry (1949) constructs an alternative consumption function titled the Relative Income Hypothesis (RIH) which accounts for the social dynamics and the habitual nature of an individual's process of choice. Duesenberry posits that an individual's consumption behavior is by large a function of the consumption behavior of other individuals (the demonstration effect) and their prior consumption habits (consumption is inelastic with regards to reduction in income). Under the RIH, an individual's income acts as a limit to the size of

[21] The acquisition of luxury goods will not only play a significant role in displaying the superiority of one's social status, but will also be far more effective in maintaining their self-esteem.

their consumption expenditure. However, this is not to say that an individual is not able to consume more than their current income. Duesenberry argues that it is also possible for individuals to consume more than their current income through either dissaving or borrowing; but the extent to which an individual is able to finance their consumption through past savings and debt is determined both directly and indirectly by past income levels.

Therefore, similar to the PIH, the RIH argues that due to the habitual aspect of consumption behavior an individual's consumption expenditures can remain constant despite a fall in their current income. However, unlike the PIH, under the RIH the influence of social dynamics make it possible for an individual's consumption expenditure to increase even if incomes and prices remain unchanged. Furthermore, the RIH differs from the PIH and the life-cycle theory of consumption as individuals are able to consume beyond their means (when an individual's consumption expenditures exceed their income) by consuming out of their existing savings. Also, under the PIH individual's are assumed to be rational forward looking agents whereas the RIH presents individuals as being retrospective.

Accordingly, it appears as though the trends observed in figure 3.1.1 can be explained through both the permanent income hypothesis and the relative income hypothesis. Households and individuals have reduced their savings rate as a result of the continued, and permanent, decline in the labor share. When the share of purchasing power accruing to labor began to noticeably decrease in the late 1970s, consumers responded by reducing their savings rate in order to maintain their consumption levels. Fluctuations in the savings rate occurred as individuals adjusted their consumption behavior while undergoing a habit forming process. The PIH would interpret the shocks in the personal savings rate to be dissaving by households during recessionary periods and increased savings during expansionary periods due to households replenishing their savings. On the other hand, the RIH narrative would interpret the negative shocks in the personal savings rate as momentary lapses in an individual's resistance to increasing their expenditures at the expense of their savings rate; and, spikes in the savings rate may have represented remorse towards their increased expenditure in past periods.

However, when looking beyond short run trends, the PIH is unable to explain the sustained decline in the personal savings rate since the late 1970s early 80s. Conversely, the negative medium and long run trend of the personal savings rate observed in figure 3.1.1 could be explained by the RIH. Despite the significant reduction in the purchasing

power of the labor share, individuals are still subject to physical and cultural needs. Since an individual's consumption behavior is habitual, a decision is made to reduce their savings rate instead of reducing either the quality or quantity of the goods they consume.

Additionally, unlike the PIH, the RIH is able to explain not only the increased average propensity to consume (reduced savings rate), but the increase in the level of consumption expenditures as well. Bertrand and Morse (2013) finds that the rise of top income levels between 1980 to 2005 corresponds with an increase in the supply of "rich" goods (superior goods). It follows that increases in the supply of superior goods increases the frequency individuals from low- and middle-income households are exposed to goods superior to the ones that they were currently consuming. In turn, the increased exposure to superior goods erodes the utility the individual derives from their existing consumption set. This increases the individual's impulse to consume goods of higher quality and reduces their resistance to such impulses. The resulting change in the consumption behavior causes the individual's consumption expenditures to increase since it is reasonable to assume that the price of superior goods is greater than that of inferior goods. Thus, the demonstration effect can be used to explain the increases in consumption expenditures among low- and middle-income households that occurred since the late 1970s early 80s.

3.3 Conspicuous Consumption: The Emulation Effect

The social dynamics of consumption is also emphasized by Veblen (1899). Similar to the argument put forth by Duesenberry (1949), Veblen posits that in advanced economies[22] the motivation for consuming a particular good or service is not limited to fulfilling one's physical needs. Instead, consumers also consume goods in order to fulfill their "higher wants". [23] Furthermore, economies with social classes and private property, individuals derive self-esteem from the accumulation of wealth, and that individuals display their wealth through the goods and services that they consume. Veblen uses the term "luxury goods" to describe goods and services that are consumed primarily for their prestige and status value, and **conspicuous consumption** as the act of consuming such goods and services.

[22] Veblen (1899) defines an advanced economy as one where subsistence is easily achieved such that a majority of the economy's population is able to be exempt from the production of food.

[23] Veblen's (1899) "higher wants" are the equivalent of Duesenberry's (1949) "cultural needs".

Veblen (1899) argues that through the process of industrialization and the gradual disappearance of formal social classes an informal social hierarchy has emerged in advanced economies were individuals have the right to own private property. An individual's wealth has usurped official titles as the most recognizable evidence of one's success and social status. Accordingly, Veblen (1899) posits that,

> Since the consumption of these more excellent goods is an evidence of wealth, it becomes honorific; and conversely, the failure to consume in due quantity and quality becomes a mark of inferiority and demerit. (p.53)

Therefore, Veblen argues subsistence and physical comfort never plays a considerable role in consumption decisions for the majority of individuals within advanced economies.[24] Therefore, in an advanced economy with private property the motive for consumption, and the incentive for accumulating wealth revolves around a status-seeking motive.

Under this framework an individual's success is therefore measured by the quantity and quality of the goods they consume; however, their relative success and position in the informal social hierarchy is determined through comparisons with the consumption expenditures of those around them. This is the basis of the **emulation effect**. An individual is motived is to achieve the highest social status possible through the conspicuous consumption of luxury goods with the frame of reference being other consumers that they come into contact with. In order to improve their perceived social status an individual must emulate the consumption behavior of those ranked higher than them. Simultaneously, all individuals are also at risk of moving down the hierarchy if they fail to increase their own consumption when the consumption of others, equal or lower in rank, increases. Hence, both conspicuous spending and the emulation effect is characterized by competitive consumption.

Comparing the Demonstration Effect and the Emulation Effect

The positive relationship between top income levels, the supply of "rich" goods" and the consumption expenditures of low- and middle-income households can also be explained by Veblen's emulation effect. In this scenario, top income earners responded to their higher incomes by increasing their conspicuous consumption which, in turn, led to an increase in the supply of luxury goods as well. Given the social (status) implications attached to luxury goods, the increase in conspicuous consumption had the added effect of widening the perceived social status gap between those belonging to the

[24] Veblen (1899) acknowledges that there are exceptions to this rule as even the most advanced and prosperous economy will still have individuals, at the bottom of the income distribution, whom consume purely to provide subsistence.

top income share and those who are not. Consequentially, in order to keep up with top income earners and reduce this gap individuals from low- to middle-income households increased their own consumption expenditures to emulate the consumption behaviors of the top income earners. Hence, both the demonstration effect and the emulation effect explains the mechanism through which increased consumption at the top of the income distribution induces increased consumption throughout the rest of the distribution using social dynamics. However, even though both narratives appear to be nearly identical there are subtle, but import, differences.

First, the basis of the emulation effect is a competition between individuals over social status through conspicuous spending. Veblen (1899) posits that individuals at the top of the social hierarchy are motivated to spend more in order to maintain their position, whereas others are incentivized to increase their spending as to emulate them with the hopes of improving their own status. In the case of Duesenberry's (1949) demonstration effect, even though certain goods convey status and helps to bolster the consumer's self-esteem, the predominant channel through which social dynamics affect an individual's consumption behavior is the frequency to which the individual is exposed to superior goods. In other words, the mechanism through which top income consumption affects the consumption of others is not so much based on status-seeking, but rather frequency of exposure. Therefore, even though both theories posit that an individual's consumption behavior is a function of the ratio of their own expenditures to the expenditures of others they come into contact with the competitive nature of conspicuous consumption that underscores the emulation effect is absent under the demonstration effect. Furthermore, whereas the emulation effect implies that individuals respond with almost instantaneously, even if it is an isolated incident, to the consumption of others. However, the demonstration effect requires repeated exposures with relatively great frequency.

Second, there is also a discrepancy in the nature of the goods covered by the two theories. The interpersonal comparisons hypothesized by Veblen (1899) pertain exclusively to luxury goods, and the only difference between two luxury goods that serve the same purpose is the level of status attached to each good. These goods are also present in Duesenberry's (1949) demonstration effect and are alluded to as status goods. However, unlike the emulation effect, the demonstration effect goods serving the same purpose can also be based on quantifiable differences in quality. Thus, in addition to status goods there are also superior goods. What's more superior goods can also be non-status goods.

For example, with a few exceptions, there is little prestige attached to one's primary education; yet a parent whose children are currently enrolled in school a may wish to send them to school b if the superiority of b over a demonstrated to them repeatedly. Thus, it follows that even without any status based incentives interpersonal comparisons can induce an individual to change their consumption behavior if the inferiority of the good they are currently consuming is demonstrated by the consumption of superior goods by others.

Furthermore, it is not necessarily the case that a superior good conveys a greater degree of status than the respective inferior good. It is even possible for an individual to switch from a good that is associated with a greater degree of status to one that is lower in status. Take for example an individual residing in Manhattan that decides to trade in their luxurious Range Rover SUV for a Toyota Prius. Even though the Range Rover is far more prestigious than a Prius it is also inferior to it in a number of quantifiable measures such as fuel economy, reliability and maneuverability. Through repeated exposure to the superiority of the Prius, the owner of the Range Rover may become increasingly dissatisfied with their current vehicle despite the status associated with it. Hence, the demonstration effect allows for the possibility of a step backwards in terms of status whereas the emulation effect does not.

3.4 Recent Advances in Behavioral Consumption Theories

Recent studies have attempted to explain the paradoxical relationship between incomes and personal consumption expenditures observed in low- and middle-income households in the United States by reexamining the social dynamics of consumption put forth by Duesenberry (1949) and Veblen (1899). A number of these studies use the principles of the emulation effect and the demonstration effect casually in order to identify the link between the rise in income inequality and the rise in household leveraging among low- and middle-income households in that preceded the Great Recession (Barba and Pivetti, 2009; Iacoviello, 2008; van Treek, 2012). However, there have also been attempts to employ the theories of Duesenberry and Veblen in the construction of alternative consumption theories. This includes the relative permanent income hypothesis (RPI) by Palley (2008), trickle-down consumption by Bertrand and Morse (2013) and expenditure cascades by Frank, Levine and Dijk (2014).

3.4.1 The Relative Permanent Income Hypothesis

Palley's (2008) RPI is a synthesis of the consumption theories of Keynes, Duesenberry and Friedman. Palley combines the three theories by amending Keynes' fundamental law,

> ...men are disposed, as a rule and on the average, to increase their consumption as their permanent income increases. The share that they spend out of their permanent income depends on their relative permanent income, and the greater their relative income the smaller that share. (p.6)

Palley then constructs an individual household consumption function, and the corresponding MPC function based on the restated fundamental law,

$$C_{i,t} = c\left(\frac{Y_{i,t}}{Y_t}\right) Y_{i,t} \tag{3.4.1}$$

$$\frac{\delta C_{i,t}}{\delta Y_{i,t}} = c\left(\frac{Y_{i,t}}{Y_t}\right) + c'\left(\frac{Y_{i,t}}{Y_t}\right)\frac{Y_{i,t}}{Y_t} \tag{3.4.2}$$

where $C_{i,t}$ = consumption of household i in period t, $c\left(\frac{Y_{i,t}}{Y_t}\right)$ = the marginal propensity to consume, $Y_{i,t}$ = disposable permanent income of household i in period t and Y_t = average disposable permanent income in period t.[25] Equations 3.4.1 and 3.4.2 assumes that there are only two types of households (low-income and high-income) and that there is no income uncertainty, such that actual income is equal to permanent income.

Palley's (2008) consumption function (equation 3.4.1) bears a strong resemblance to the consumption function under the PIH, but due to the differences in the MPC the implications are drastically different. Whereas the MPC is constant under the PIH, the MPC in equations 3.4.1 and 3.4.2 depends on the household's disposable permanent income relative to the average disposable permanent income. This implies that a change in the average permanent disposable income can cause an individual's MPC to change without a corresponding change in their own permanent income. Similarly, it is possible for an individual's consumption to remain constant despite an increase in their income if their relative income position is increased. Thus, Palley argues that an individual's MPC and RPI are negatively related. An improvement in an individual's RPI will result in a decreased MPC, whereas a deterioration of their RPI will induce an increase in their MPC.

It follows that a rise in income inequality will lead individuals from high-income households to experience an increase in their income relative to the incomes of

[25] Where i=1,2 and $0 < c\left(\frac{Y_{i,t}}{Y_t}\right) < 1$, $c' < 0$, $c'' > 0$ or $c'' < 0$ (Palley, 2008).

low-income households.[26] However, the effect of widening inequality on aggregate consumption will depend on the shape of the MPC curve. Palley (2008) derives the following equation for the aggregate consumption function,

$$C_t = qc\left(\frac{a}{[1+qa-q]}\right)\frac{aY_t}{[1+qa-q]} + \frac{[1-q]\,c\left(\frac{1}{[1+qa-q]}\right)Y_t}{[1+qa-q]} \tag{3.4.3}$$

where a = relative income parameter, q = household composition parameter and Y_t = exogenous average income.

In the case of a strictly concave MPC, Palley (2008) posits that widening inequality will lead to the gap between the two groups MPC such that there is a fall in the average (weighted) MPC. In turn, this will result in a fall in aggregate consumption expenditures. Hence, if the MPC curve is concave, widening inequality is bad for consumption. However, Palley argues that if the MPC is convex then there is a tendency for widening inequality to raise the average MPC such that the net effect of widening inequality on aggregate consumption is mitigated. Consequentially, if the "keeping up with the Joneses" effect is strong then widening income inequality could, in theory, also lead to an increase in aggregate consumption expenditures as well.

Critique

The formulation of the RPI was timely to say the least. At the time of conception, the prevailing consumption theories employed by most economists were at odds with the actual consumption behavior observed among the majority of American households. By integrating Duesenberry's RIH into the consumption theories put forth by Keynes (1936) and Friedman (1957), Palley (2008) was able to introduce the behavioral aspect of consumption into a familiar framework. However, while the RPI is an intriguing take on the consumption theories, representing a much needed departure from the consumption theories employed by most economists towards one that places a greater emphasis on the behavioral aspect of consumption, it is not without fault.

The first criticism involves the use of Friedman's PIH, specifically the method of measurement. In order to calculate an individual's permanent income one would need to be able to predict their lifetime income since permanent income is, by definition, the annuity of their lifetime income. Palley (2008) accounts for this by assuming that there is no uncertainty in regards to one's income such that an individual's actual income is

[26] In other words, the relative income of high-income households increases while the relative income of low-income households decreases.

equal to their permanent income. Given that assumption, we question whether or not it is even necessary to use permanent income if it is assumed that it is equal to current income. Furthermore, in its strictest form, permanent income is constant over one's lifetime. Hence, it would not be possible for an individual's permanent income to fluctuate over time in the manner posited by the RPI.

The second criticism has far greater implications and involves the fundamental mechanism through which one's consumption is affected by others. Palley's (2008) incorporates Duesenberry's (1949) RIH into the RPI in the form of $c\left(Y_{i,t}/Y_t\right)$. This implies that an individual's consumption behavior is influenced by the income of others rather than the consumption of others. This is a critical misinterpretation of the demonstration effect, and therefore the RIH. It is our belief that an individual's consumption behavior will not be affected by changes in the income of others alone. While an individual's consumption behavior may be affected indirectly by changes in the incomes of others as it leads to either changes in the consumption expenditures of others or the availability of "luxury goods" (Bertrand and Morse, 2013), a direct income effect is highly improbable.

3.4.2 Expenditure Cascades

An alternative behavioral consumption function has been suggest by Frank, et al. (2014). The theoretical basis of expenditure cascades is that changes in the spending of one income group shifts the frame of reference that defines consumption standards for others just below them on the income scale. This shift results in changes in the consumption expenditures by the second group which will again shift the frame of reference for the third group (others just below the second group on the income scale), and so forth. As a result, this chained effect gives rise to expenditure cascades (Frank, et al., 2014). Hence, the model that underpins the expenditure cascades theory implies that the evaluative judgements of any given consumer depends heavily on context and relativity. This is again a departure from the traditional models of consumption that assumes that the consumption of each individual is completely independent of the spending of others.

Based on this idea, Frank et al. (2014) hypothesize that, in the United States, the observed decline in the personal savings rate is a result of growing income inequality. Accordingly, the authors present a original consumption function in the form of,

$$C_i = k(1-\alpha)Y_i + \alpha C_{i+1} \tag{3.4.4}$$

where C_i = current consumption of the i^{th} consumer, Y_i = the permanent income levels of the i^{th} consumer, k = parameter unrelated to permanent income or rank, α = the extent of influence the consumption of others have and C_{i+1} = the current consumption level of the individual whose permanent income ranks above i's.

The expenditure cascades theory has two major implications. First, the comparisons that matter the most are highly localized in time and space. Second, people generally look to others above them on the income scale rather than those below them. Unlike Palley's (2008) RPI, the mode of comparison in the expenditure cascades theory is based on consumption expenditures instead of permanent income. Additionally, the notion that individuals compare themselves to others above them on the income scale echoes the basis of Veblen's emulation effect. However, Frank, et al., (2014) admit that a more realistic model would allow explicitly for the possibility that consumers are influenced by others more distant from them. We shall return to the idea of expenditure cascades in section 3.5.

3.4.3 Trickle-Down Consumption

Similar to the conclusions of Palley (2008) and Frank et al., (2014), Bertrand and Morse (2013) argue that the MPC of middle-income households will increase when exposed to higher income and consumption at the top of the income distribution. However, unlike the two aforementioned studies, Bertrand and Morse rely mostly on data gathered from the Bureau of Labor Statistics' Consumer Expenditure Survey (CEX) for the period of 1980-2008. Consequentially, due to the nature of survey data, Bertrand and Morse's study is strictly microeconomic; thus their study focuses on the effect of widening income inequality on personal consumption expenditures at the household level. Conversely, the studies of Palley and Frank et al. are macroeconomic in nature, and are therefore focused on the effect of widening income inequality on aggregate consumption expenditures. Additionally, whereas Palley and Frank et al. focus on constructing a single model Bertrand and Morse tackle a number of different, but interrelated, questions regarding household consumption.

The first hypothesis that Bertrand and Morse (2013) tests is Friedman's (1957) PIH. Specifically, the authors test the theoretical argument that the rise in top income levels led individuals from middle-income households to form a rational expectation that their incomes would rise as well in the future, and increased their consumption accordingly based on this expectation. Using data from University of Michigan's Panel Study of

Income Dynamics (PSID) the authors fail to find any evidence that would support this line of argument. Likewise, the authors also fail to find evidence that rising top incomes lead low- and middle-income households to take on more optimistic views of the future. Furthermore, the PSID data also fails to provide evidence supporting the precautionary savings motive explanation.

The authors then turn to behavioral explanations. The first theory Bertrand and Morse (2013) test is, in essence, the habitual nature of consumer behavior of Duesenberry's (1949) RIH. The authors argue that it is possible that consumers with strong habitual consumption patterns maintained their consumption composition even if prices increased and incomes remained stagnant. The authors find evidence indicating that top income levels are positively correlated with the CPI. However, the relationship between top income levels and middle-income household consumption still holds even after controlling for the CPI. Thus, the authors argue that while the habitual nature of consumer behavior may have played a role in the observed trend it is not the definitive cause.

Bertrand and Morse (2013) then consider other behavioral explanations. One possible explanation is that rising top income levels led to an increase in the effect of social comparisons on consumption. This line of argument is consistent with the theories put forth by Veblen (1899), Duesenberry (1949) and Frank et al. (2014). This is similar to the social comparison argument, but involves the supply of luxury goods (whereas the former involves the demand for luxury goods). The authors argue that, within a given market, the supply of luxury goods is positively related to top income levels such that rising top income levels will induce an expansion in the supply of luxury goods. In turn, an increase in the supply of luxury goods will lead to greater consumption expenditures by middle-income households within that market. The authors finds evidence that supports both of the above theories using data gathered from the CEX. However, the results testing the supply of luxury goods theory were more robust than the results obtained from testing the social comparison hypothesis. Thus, the authors argue that, on the microeconomic level, the supply of luxury goods has a larger effect on the MPC of middle-income households.

Additionally, Bertrand and Morse (2013) also present two qualitative measures that can be used to not only identify whether or not a good is a luxury good or not, but can also be used to measure the extent to which a good is a luxury good. These two measures

are income elasticity and the visibility of the good.[27] A luxury good is therefore a good that is both income elastic and highly visible, and the degree of luxury a good possesses is positively related to the income elasticity and visibility of the good. Accordingly, the authors' results indicate that the positive change in their budget shares[28] middle-income households undertake in response to higher top income levels will be greater for goods and services that are more income elastic and more visible.

For example, Bertrand and Morse (2013) find that a 10% increase in the variation in top income levels increases[29] the budget share of middle-income households dedicated to shelter by 5%. Conversely, the same increase in the variation in top income levels led to middle-income households reducing the budget share dedicated to education by 11%. Therefore, the authors argue that the increase in consumption by middle-income households may be the result of increases in the supply of luxury goods within their market, and a desire to emulate the consumption of their richer co-residents through visible consumption spending.

Bertrand and Morse (2013) also test the hypothesis that expansions of the credit supply enabled individuals from middle-income households to increase consumption expenditures based on their behavioral response to rising inequality. The authors find indirect evidence supporting the hypothesis that consumers from middle-income households relied on their greater access to credit, as a supplement to their earned income, in order to "keep up with the Joneses". The findings also suggest that the use of credit was greater among middle income households living in (closer) proximity to top income earners.

3.5 Reconsidering Consumption Theories

The observed trends in consumer behavior, specifically the behavior of low- and middle-income households, since the early 1980s bare a close resemblance to the behavioral consumption theories put forth by Duesenberry (1949) and Veblen (1899) than the standard consumption theories of Keynes (1936) and Friedman (1957). However, the works of Duesenberry and Veblen are not perfect. The relative income hypothesis and the theory of conspicuous consumption preceded the conformation of mass media and the

[27] The term visibility is used here to indicate the degree of social recognition a consumer receives from using a particular good (Bertrand and Morse, 2013).

[28] The share of disposable income allocated to the consumption of a particular category of goods (Bertrand and Morse, 2013).

[29] Converting the top income level variable into log form and then taking the differences (Bertrand and Morse, 2013).

financialization of the U.S. economy. Palley (2008), Frank et al. (2014) and Bertrand and Morse (2013) maintain that the effect of rising top income levels on the consumption behavior of individuals from low- and middle-income households only occurs through direct contact, and is therefore a strictly local phenomenon.[30] Moreover, while Bertrand and Morse entertained the notion that increased consumption expenditures among low- and middle-income households was financed in part by debt, the implications of an advanced credit market have yet to be examined in depth.

We argue that in order to improve the accuracy of behavioral consumption theories significant modifications are needed to account for recent developments in mass media and financial markets. Specifically, there are three notable modifications that are to be made. First, due to the introduction of digital media, the frame of reference for consumption standards is no longer confined to physical proximity. Therefore, consumers compare their own consumption expenditures with others on a national basis, if not international, instead of a local basis. Second, innovations in advertising and branding have made it so that the demonstration effect can occur through both direct and indirect exposure to goods that are perceived to be superior. Third, an individual's access to credit enters the consumption function as a supplement to income. Accordingly, this theory will be broken down into two parts: first a revision of the theory on behavioral consumption behavior and second the role of wealth and unearned income in consumption decisions.

3.5.1 Keeping Up with the Kardashians

In their original form, Veblen's (1899) emulation effect and Duesenberry's (1949) demonstration effect are both local effects; hence the influence of a top income earner's consumption behavior is confined to only those within their local community. Thus it follows that an individual's frame of reference is limited to an individual's local community. For example, the emulation effect implies that it is possible for an individual to be at the top of the social hierarchy when their frame of reference is limited to their local community, but, holding everything else constant, their status could fall to the middle of the social hierarchy when their frame of reference is expanded. Similarly, in the case of the demonstration effect, a good that is considered to be the most "superior" within a local community may be inferior to a number of goods when exposed to comparisons on a national level.

[30] While Frank et al. (2014) acknowledges that, realistically, consumers can be are influenced by the consumption of others outside of their local community, their model maintains the implied assumption that consumers are only influenced by those within their local community.

The localized nature of comparative consumption that underscores the two effects is the result of the assumption that the interpersonal comparisons affecting consumption decisions pertains exclusively to direct, physical, social interactions. Thus, both theories imply that an individual will only emulate and compete with others of whom they have personal relationships with.[31] Conversely, it is our belief that in addition to direct contact with the consumption of others, both the emulation effect and the demonstration effect can occur through indirect contact as well. This is to say that comparative consumption can occur through both interpersonal and impersonal exposure to either status goods or superior goods.

The mediums through which impersonal exposure occurs is ever growing. Coincidentally, the magnitude of the effect impersonal exposure has on consumption decisions also grows as each medium becomes increasingly advanced. In particular, a number of notable examples of media content through which impersonal exposure to superior goods occurs are: advertisements, television programs, movies and various forms of internet content.[32]Furthermore, with the exception of advertisements[33], these mediums are also universal in nature. The contents of a particular television program, movie or website seen by an individual in California will be identical to the content seen by an individual in New York.

Conversely, it could be argued mass media is not a new phenomenon. Advertisements, televisions and radio programming had all existed at the time of Duesenberry's (1949) writings. Moreover, Duesenberry posited himself that simply knowing about a superior good was not enough to induce a change in an individual's consumption habits. However, the mass media of yesterday is not equal to that of today. Most importantly, technological advancements have enabled the visual stimuli of these mediums to become near lifelike. Therefore, all four mediums have benefited from constant innovations that have allowed the mediums to become increasingly realistic and therefore relatable. Furthermore, technological advances have also led to significant reductions in the cost of accessing these mediums as well. It follows that, given the increasing accessibility and realism of these mediums, it can be argued that individuals are able to empathize and form

[31] Personal relationships is used fairly liberally in this context. The term encompasses relationships that range anywhere from close friends to casual acquaintances.

[32] "The American Time Use Survey" that is conducted by the BLS found that 79.4% of Americans watched on average 2.77 hours of television per day. Similarly, for the same year, the U.S. Census Bereau's "Computer and Internet Use" survey found that 83.8% of American households owned computers and 74.4% had internet access.

[33] It is common for companies to tailor advertisements for specific markets, and not all advertisements are broadcasted nationally.

relationships with others even without any direct personal interactions. Moreover, this bond can just as easily induce the consumer to undergo impersonal consumption comparisons as well.

Advertisements, Television Programs and Movies

The fundamental role of advertisements is to sell the goods and services that they promote. Cochrane and Bell (1956) note that advertisements informs consumers of the availability of a new good or service through exaggerated depictions as a purposeful method of creating wants. However, Cochrane and Bell also posit that the goal of advertisements is not always to increase the overall size of the market,

> The nature of advertising, moreover, shows that it is designed to get the firm a larger share of total sales rather than to expand total demand and sales. Hence, most advertising emphasizes product differences and reinforces nonprice competition. (p.386)

Thus, it can be argued that the effect of advertisements is essentially a demonstration effect of sorts. In other words, through frequent exposure an advertisement for good A has the potential of convincing its viewers that their product is superior to the one they are currently consuming. In turn, the perceived superiority of good A will reduce the utility the viewers derive from their current consumption, thus inducing the viewers to switch to good A.

Additionally, advertisements may not be explicit, and can come in the form of product placements in television programs and movies. In this instance, the effect of advertisements can be a combination of the demonstration effect and the emulation effect. On one hand, audiences that are exposed to the use of a particular product placed within visual media may believe that the specific product is used due to its superiority to similar products. On the other hand, audiences may feel an urge to purchase the product in order to emulate the character that uses it. Similarly, advertising can also come in the form of celebrity endorsements. In this case, fans of the celebrity may be induced to purchase the product in order to emulate them.

There has also been an evolution in the nature of television programing as well. Even though traditional programing is still prevalent there has been an emergence of reality television. These shows had led to further ambiguity in the line that separates real interpersonal relationships and impersonal relationships between the cast of television shows and their viewers. Unlike traditional television programing, reality shows offer greater intimacy and insight into the lives of the cast members.

Accordingly, due to the nature of reality television it is conceivable that viewers are able to form a strong sense of affinity to cast members. Hence, there is a greater probability that viewers of such shows will exhibit a greater inclination to emulate the lifestyle of the cast members presented in such shows. An example of a reality television show is "Keeping up with the Kardashians" which captures the extravagant lifestyle of the Kardashian family. Since this is a internationally syndicated show, the consumption expenditures that are depicted in the show are capable of affecting the consumption behavior of viewers internationally even though the majority of the show is filmed in Los Angeles.

Therefore, advancements in advertisements, television and movies have allowed the social dynamics of consumption to transcend the physical constraints that existed at the time of Duesenberry's (1949) and Veblen's (1899) writing. In other words, it is now possible for the demonstration effect and the emulation effect to occur without any direct physical interactions between two individuals. Furthermore, this also indicates that digital media has led to a standardization of consumption standards. Hence, in our contemporary society, the phrase "keeping up with the Joneses" is an inaccurate description of the social dynamics of consumption. Instead, a more appropriately colloquial phrase for capturing the social influences that affect an individual's consumption behavior would be "keeping up with the Kardashians".

The Internet

Similar to advertisements, television programs and movies, the advent of the internet has also allowed for comparative consumption to be undertaken on the global scale. Two major mechanisms through which the demonstration effect and the emulation effect occur over the internet are: online reviews, and social media. In addition, advertising and digital media (television programs and movies) has also become integrated with internet content as well. The effects of online advertising and digital media on consumption decisions are similar to the effects of their offline counterparts. Online advertising and digital media can affect consumers through the demonstration effect and the emulation effect. On the other hand, the narrative for how online reviews and social media affects consumer behaviors is considerably different.

Apart from the specific mechanisms that were listed above the internet has also had a general effect of granting consumers access to greater information on goods and services. Before the widespread adoption of the internet the methods through which consumers were able to compare prices for a particular good or service was limited to either visiting

different merchants physically or calling each merchant individually. This process was both time-consuming and laborious. However, the internet allows consumers to "cross shop" between different merchants near instantaneously.

In addition to being able to compare the prices offered by different merchants for a particular good, the internet also enables consumers to compare similar goods with far greater ease as well. Whereas, before the internet, one would have had to physically visit different stores in order to compare all the products available (since the majority of stores would not have had every single product). Accordingly, with the emergence of both professional and amateur reviews, it is probable that consumers are increasing their use of the internet to compare different products that serve the same function. In that sense, the internet has allowed for consumers to make far more educated consumption decisions: a consumer is able to choose the best good given their budget through the information obtained online. However, the ability to access information on a vast range of products has another effect on consumption behavior as well. In particular, online reviews are especially conducive in affecting an individual's consumption behavior through the demonstration effect.

Online reviews are readily accessible and plentiful since the internet essentially allows for anyone to post their opinions on their experience with a certain product. Furthermore, reviews generally use comparisons to create a frame of reference and assign ratings. Thus, consumers can be exposed to frequent demonstrations of a goods superiority or inferiority relative to similar goods. Each positive review reinforces the perception of a good's superiority while each negative review reinforces its perceived inferiority. It is highly conceivable for one's perception of a good to affect their consumption decisions. For example, assume that an individual purchases computer A due to outstanding reviews, but after a year a new computer (B) is introduced and the unanimous consensus among reviewers is that it is far superior to computer A. Through repeated exposure to reviewers demonstrating the inferiority of A compared to B the consumer may become increasingly dissatisfied with using computer A. As a result, the individual will wish to purchase computer B even if they were initially completely satisfied with computer A and its performance prior to the reviews. Hence the demonstration effect.

Conversely, the emulation effect closely relates to the influence of social media on consumption decisions. Online social network are an extension of the local communities depicted by Veblen (1899) and Duesenberry (1949): they allow communities of individuals to maintain personal relationships despite physical limitations. Therefore,

the localization of the effect that status-seeking motives have on consumption decisions no longer applies. Through the advent of social media individuals compare their consumption with both others within their local community and those within their online social networks. Hence, social media allows for indirect interpersonal comparative consumption.

Given the standardization of consumption (standards) and the frame of reference for comparative consumption, the nature of the social dynamics of consumption behavior put forth by Veblen (1899) and Duesenberry (1949) evolve from being microeconomic to macroeconomic. Hence, income inequality enters the behavioral analysis of consumption as aggregate income inequality instead of local inequality. Furthermore, the effect of widening income inequality also shifts from household consumption to aggregate consumption. It follows that under a macroeconomic framework, widening income inequality leads to an increase in both the the average MPC and aggregate consumption expenditures of low- and middle-income households, given that top income earners increase their visible consumption when their incomes increases and that low- and middle-income households exhibit a relatively strong inclination to comparative consumption. Therefore, one working assumption is that widening income inequality will lead to an increase in aggregate personal consumption expenditures and a concurrent fall in the aggregate personal savings rate.

3.5.2 The role of Wealth and Credit (Debt) in Consumption Decisions

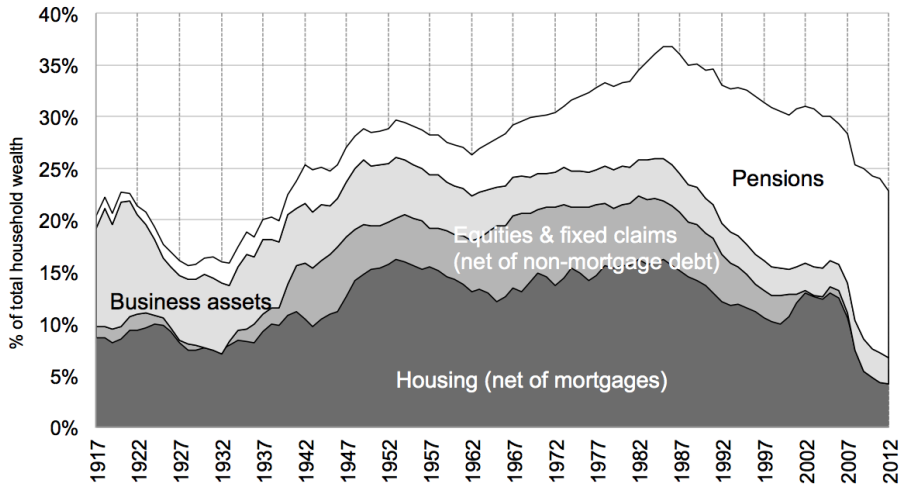
Under the standard consumption theories an individual's budget constraint is limited by their income. While Duesneberry (1949) posits that an individual is able to consume through dissaving, this feature is largely absent from contemporary behavioral consumption theories. The act of dissaving is, by definition, the use of past savings in financing consumption expenditures. The act of consumption financed through dissaving is in essence wealth-financed consumption since accumulated savings enters an individual's balance sheet as their wealth. However, an individual's wealth is comprised of two different types of assets: liquid assets and illiquid assets. Since liquid assets are assets that can be quickly converted into cash without losing their value liquid assets can be used directly in the financing of consumption.[34]

[34] Examples of liquid assets can include the balance of an individual's checking account, savings account and treasury bills.

On the other hand, illiquid assets cannot be used directly to finance consumption. However, it is still possible to finance one's consumption using funds derived from their illiquid assets. For example, Barba and Pivetti (2009) found that the significant rise in household debt was accumulated due to a growing tendency for low- and middle-income households to extract equity from the value of their homes in order to finance consumption. It follows that while an individual is able to use liquid assets either directly or almost directly in the financing of consumption, generally illiquid assets can only be used indirectly. Thus, we hypothesize that in addition to financing consumption using one's income it is also possible for households to undertake both wealth-financed consumption and debt-financed consumption as well.

We believe that households primarily finance their consumption using their current incomes. However, an individual will turn to dissaving when their desired consumption expenditure exceeds their current income. However, if the individual's desired consumption expenditure exceeds their current income continuously over an certain period of time they will deplete their stock of liquid assets. If one's liquid assets are depleted and their desired consumption expenditure still exceeds their current income than that individual will be forced to finance their excess consumption through debt.

Figure 3.5.1: Composition of the Bottom 90% Wealth Share



*Source:*Saez and Zucman (2014)

Given the social effects of widening inequality on consumption, this theory indicates that low- and middle-income households have experienced a decline in their liquid wealth and increase in their indebtedness since the early 1980's. This implication is in line with

observed trends. In a study of the wealth distribution in the United States, Saez and Zucman (2014) finds that widening income inequality has also coincided with widening wealth inequality. However, the authors also find that the composition of the bottom 90% wealth share has also changed significantly. Figure 3.5.1 indicates that illiquid assets have become an increasingly large part of wealth for households in the bottom 90%. On the other hand, the only category for liquid assets have shrunk significantly starting in the late 1980s to the point where they are almost nonexistent by the late 1990s. Furthermore, Barba and Pivetti (2009), Cynamon, Fazzari and Setterfield (2013), Cynamon and Fazzari (2014), Kumhof, Rancière and Winant (2013), Palley (2010), and van Treek (2012), among others have all identified the concurrent trends of widening income inequality and rising household indebtedness specifically in low- and middle- income households.

3.6 A Revised Model of Behavioral Consumption

The observed trends in the consumption behavior of low- and middle-income households since the early 1980s does not match the consumption behavior hypothesized by traditional consumption theories: the majority of American households have continued to increase their consumption expenditures despite either falling or stagnating real incomes. Even though behavioral consumption theories, such as Duesenberry's (1949) relative income hypothesis, are more readily adept in explaining this paradoxical trend they also face a number of theoretical limitations. The localization of both the demonstration effect and the emulation effect fail to capture the influence mass media has on consumer behavior. Additionally, the standard budget constraint employed by existing consumption theories also fails to account for past savings and debt as a method of financing one's consumption. Accordingly, we will present theoretical models of consumption that account for the "keeping up with the Kardashians" effect and the inclusion of past savings and debt in the budget constraint on both the microeconomic and macroeconomic level.

3.6.1 Microeconomic Model

Our microeconomic consumption model is a modified version of the equation $C_i = k(1-a)Y_i + aC_{i+1}$ from the "expenditure cascades" theory of consumption by Frank, et al. (2014). This model implies that the consumption expenditure of household i is strongly influenced by local consumption comparisons, and the magnitude of this effect is governed by the parameter a. Additionally, an individual's budget constraint

is determined by their permanent income. The second half of the equation, which is where the effects of local comparisons appears, is not restricted by any budget constraints whatsoever.

Alternatively, we argue that the social dynamics of consumption behavior is not restricted by physical proximity. Instead, in addition to direct interpersonal comparative consumption the social dynamics of consumption should also include: indirect interpersonal comparative consumption (social media), impersonal comparative consumption (mass media) and indirect demonstration effect (advertising and online reviews). The additional social influences can be represented in a vector of influences,

$$\Gamma_{i,t} = \begin{pmatrix} C_{j,t}^{\text{loc}} \\ C_{j,t}^{\text{soc}} \\ C_{j,t}^{\text{mm}} \\ \Phi_{j,t} \end{pmatrix} \tag{3.6.1}$$

where each influence has a weight captured in,

$$\alpha = \begin{pmatrix} a & b & c & d \end{pmatrix} \tag{3.6.2}$$

such that,

$$\alpha\, \Gamma_{i,t} = aC_{j,t}^{\text{loc}} + bC_{j,t}^{\text{soc}} + cC_{j,t}^{\text{mm}} + d\Phi_{j,t} \tag{3.6.3}$$

where:

- $\Gamma_{i,t}$ = the total exposure to social influences that household i has.
- α = parameter that captures the magnitude of the overall effect that social influences have on the consumption behavior of household i.
- $C_{j,t}^{\text{loc}}$ = the consumption of others (j) that are in households i's local community.
- $C_{j,t}^{\text{soc}}$ = the consumption of others that are in households i's social network.
- $C_{j,t}^{\text{mm}}$ = the consumption of others that household i is exposed to through mass media.
- $\Phi_{j,t}$ = household i's exposure to superior goods through advertising and online reviews.
- a, b, c and d are parameters that capture the magnitude of their respective variable's effect on household i's consumption behavior.

The second notable modification that we will make is to the budget constraint. While Frank, at el. (2014) only includes permanent income in their budget constraint, the previous section argues that the budget constraint should also include past savings in the form of liquid assets and the supply of consumer credit. The additional components of the budget constraint are incorporated in the following manner,

$$\Psi_{i,t} = Y_i + S_i^{liquid} + Credit_i^{supply} \tag{3.6.4}$$

where Ψ_i is household i's budget constraint, Y_i is household i's current income, S_i is household i^{liquid}'s stock of liquid assets and $Credit_i^{supply}$ is the credit supply available to household i. Additionally, the findings of Bertrand and Morse (2013) indicate that the proposed relationship between an individual's expectations for their future incomes plays no role in determining their current consumption behavior.

Based on these modifications, the original equation of $C_i = k(1-a)Y_i + aC_{i+1}$ by Frank, et al. (2014) becomes,

$$C_{i,t} = k(1-\alpha)\Psi_{i,t} + \alpha\Gamma_{i,t} \tag{3.6.5}$$

where k is a parameter that is unrelated to rank or the income.[35] While it is not explicit in equation 3.6.5, the value of an individual's consumption expenditures that results from social influences ($\alpha\Gamma_{i,t}$) is assumed to be limited by $k(1-\alpha)\Gamma_i$. In other words, while individuals are able to consume in excess of their current income through dissaving and credit, their total consumption expenditures are unable to exceed the sum of their current income, stock of existing liquid assets and the supply of credit that is available to them.

There are a number of significant differences between equations 3.6.5 and 3.4.4. First, the theory of expenditure cascades (Frank, et al., 2014) assumes that the effect of comparative consumption is restricted to one's local community. Conversely, equation 3.6.5 allows for both indirect interpersonal comparisons and impersonal comparisons as well. Furthermore, whereas the social effect in equation 3.4.4 is mostly based on the emulation effect, equation 3.6.5 also allows for the possibility that social dynamics can influence an individual's consumption behavior through the demonstration effect.

Second, like equation 3.4.4, equation 3.6.5 also implies that widening inequality can lower one's savings rate. However, in addition to a lower savings rate, equation 3.6.5 also implies that widening inequality can result in a reduction in an individual's stock of liquid assets (dissaving). Furthermore, equation 3.6.5 indicates that if an individual depletes their stock of liquid assets, and their consumption expenditures still exceeds their current income, then they can also finance their excess consumption using credit that is available to them.

Yet financing consumption using debt is different from consuming out of savings and income. In the following periods, debt servicing will effectively serve as an obligatory non-consumption expenditure. Therefore, without an increase in either the individual's income or their stock of liquid assets, the individual will be forced to acquire additional

[35] Keynes' (1936) exogenous spending and Duesenberry's (1949) habitual spending effect are captured in parameter k.

debt in order to maintain their consumption levels. It follows that equation 3.4.4 indicates that financing consumption using credit can lead to a vicious cycle of debt accumulation. Moreover, the rate at which an individual accumulates debt will be even greater if they wish to not only maintain their consumption levels, but increase them as well.

However, if the share of consumption that is financed using debt is significant relative to the share of consumption out of both current income and savings then the individual in question will not be able to sustain their consumption patterns indefinitely. We hold that the supply of credit available to households should exhibit a curve similar to a logarithmic function. It follows that while the credit supply available to an individual can expand rapidly during the initial periods the rate of growth will fall significantly over time. Concurrently, the individual's existing debt obligations and debt servicing costs will effectively reduce the amount of their budget that is available for consumption expenditures. Thus, with accelerating costs associated with their existing debt holdings, and a decelerating growth of available credit there will be a point in time when the individual will be forced to reduce their consumption expenditures unwillingly. At such a point the only way for the individual to maintain their consumption levels would be through increases in their current income or stock of liquid assets.

3.6.2 Macroeconomic Model

Expanding the microeconomic consumption function given by equation 3.6.5 to the macroeconomic level can be achieved through the aggregation of the consumption function $C_{i,t}$ for all households within a given income group.[36] For all households i in income group p, the summation of all $C_{i,t}$ becomes $C_{p,t}$,

$$C_{p,t} = \sum C_{i,t} \tag{3.6.6}$$

where p = income group p and $i = 1, 2, ..., n$, such that n is the n^{th} household in income group p. It follows that $C_{p,t}$ is the (total) consumption expenditures made by households in income group p. Expanding the variable $C_{i,t}$ in equation 3.6.6 results in the following,

$$C_{p,t} = \sum \left[k_i(1-\alpha_i)\Psi_{i,t} + \alpha_i\Gamma_{i,t}\right] \tag{3.6.7}$$

$$= \sum \left[k_i(1-\alpha_i)\Psi_{i,t} + \left(a_i C^{\text{loc}}_{j,t} + b_i C^{\text{soc}}_{j,t} + c_i C^{\text{mm}}_{j,t} + d_i\Phi_{j,t}\right)\right] \tag{3.6.8}$$

where $j = 1, 2, ..., n$ such that n is the n^{th} household in income group q. Given income group p, income group q is defined such that group q is positioned higher on the income

[36] We distinguish between income groups, because of the social dynamics of consumption behavior (such as the demonstration and emulation effects) that result in comparative consumption.

distribution scale compared to p, p+q=1 and $p \neq q$. For example, p can denote the bottom 90% of the income distribution, and q the top 10% of the income distribution.

It is possible to reduce equation further. At the macroeconomic level the variables $C^{\text{loc}}_{j,t}$, $C^{\text{soc}}_{j,t}$ and $C^{\text{mm}}_{j,t}$ can be aggregated into a single variable $C_{j,t}$. First, the physical limitation that necessitated differentiation between direct physical comparative consumption and indirect comparative consumption within the microeconomic household consumption function is removed due to the nature of the macroeconomic aggregate consumption function. In the aggregate, domestic physical restrictions are irrelevant. Similarly, there is also no need for distinguishing between comparative consumption between interpersonal comparative consumption ($C^{\text{loc}}_{j,t}$ and $C^{\text{soc}}_{j,t}$) and impersonal comparative consumption ($C^{\text{mm}}_{j,t}$). Assuming that the effects of advertising and online reviews are captured by parameter k at the macroeconomic level, equation 3.6.2 is adjusted accordingly to,

$$C_{p,t} = \sum [k_i(1-\alpha_i)\Psi_{i,t} + (a_i C_{j,t} + d_i \Phi_{j,t})] \tag{3.6.9}$$

$$= \sum [k_i(1-\alpha_i)\Psi_{i,t} + \alpha_i C_{j,t}] \tag{3.6.10}$$

The sum of multiple linear functions is not linear. However, for simplicity's sake we assume that $C_{p,t}$ is a linear approximation of income group p's consumption function. Given this assumption, equation 3.6.10 can be expand to,

$$C_{p,t} = k_p(1-\alpha_p)\Psi_{p,t} + \alpha_p \text{AC}_{q,t} \tag{3.6.11}$$

As before, the first half of this consumption function ($k_p(1-\alpha_p)\Psi_p$) represents non-social consumption, or consumption that would have been undertaken without any social influences. Likewise, $\alpha_p \text{C}_{q,t}$ represents the social, or comparative, consumption of income group p. Lastly, it is implied that income group p's consumption is limited by their budget constraint.

Interpreting the Macroeconomic Model of Behavioral Consumption

Equation 3.6.11 indicates that income group p's desired level of consumption ($\text{C}^D_{p,t}$) can increase if any, or combination, of the following occurs:

1. There is an increase in the consumption of income group q ($\text{C}_{q,t}$)
2. There is an increase in the social consumption effect parameter (α_p)
3. There is an increase in the non-rank and non-income parameter (k_p)

While α_p and k_p are assumed to be exogenous, $\text{C}_{q,t}$ is endogenous as it is determined by the aggregate consumption function of income group q. Thus, one way $\text{C}_{q,t}$ can

increase is if there is an increase in the budget constraint of income group q. Specifically, equation 3.6.11 implies that widening income inequality will cause households outside of the top income groups (income group p) to experience an increase in their desired level of consumption.

The increase in group p's level of desired consumption is able to translate directly to an increase in the level of their actual consumption up to the point where their desired level of consumption is less than or equal to their current budget constraint such that $C_{p,t} = C^D_{p,t}$ *iff* $C^D_{p,t} \leq \Psi_{p,t}$. However, it is not possible for the increase in income group p's desired level of consumption to be realized if it exceeds their current budget constraint. Thus, $C_{p,t} < C^D_{p,t}$ if $C^D_{p,t} > \Psi_{p,t}$. In this case, income group p's consumption expenditures will remain stagnant at $C_{p,t} = \Psi_{p,t}$ until their budget constraint is expanded. In other words, income group p can only consume more if there is an increase in either their disposable income, savings or the credit supply available to them.

3.7 Working Hypothesis

There are two possible demand regimes under the standard Post-Kaleckian growth model: wage-led and profit-led. Under a wage-led demand regime, an increase in the labor share of national income will result in an increase in aggregate consumption, and a decrease in aggregate investment; however, since the partial effect of the redistribution of functional income towards wage income (labor share) is greater on aggregate consumption is greater than that on investment the overall effect would be an increase in aggregate demand. On the other hand, a decrease in the labor share will result in a reduction in aggregate demand if an economy's demand is wage-led. Conversely, the opposite is true if demand is profit-led as the partial effect on investment would be greater than that on consumption. Thus, an increase in the capital share of national income would lead to an increase in aggregate demand while a decrease would reduce it. Empirically speaking, Bowles and Boyer (1995), Hein and Vogal (2007) and Onaran, Stockhammer, and Grafl (2011), among others, conclude that the United States has a wage-led demand regime. However, there is a paradox: aggregate demand for the U.S. has risen since the 1980s even though there has been a concurrent fall in the labor share. This paradoxical relationship between rising aggregate demand and falling labor income share within a wage-led demand regime cannot be explained within the confines of the standard Post-Kaleckian model. Thus, amendments must be made to account for the observed trends since the early 1980s.

We theorize that there is a third demand regime in addition to the standard wage-led and profit-led demand regimes: a debt-led demand regime. Whereas wages and profits act as the obvious sources of income, debt accumulation acts an an external supplemental source of funds. For example, debt allows for sustained investment growth in a profit-led economy despite a falling capital share, because it is an external source of finance that is available to firms. Firms are able to undertake investments using both retained profits and debt. Our focus, however lies in the role of household debt, particularly consumer credit, on consumption growth.

We use the flowchart presented in figure 5.0.1 as an illustration of our theoretical narrative. Synthesizing the aforementioned theories on the sources of the declining labor share, the augmented behavioral consumption theory and the implications of debt on macroeconomic stability, we postulate that a systematic decline in the labor share could result in one of four macroeconomic outcomes: unstable growth, sluggish growth, stagnation or economic contraction.

The first of the flowchart represents the the sources of the declining labor share, while the second stage represents the observed trends in both the personal and functional distribution of income. In turn, the third stage depicts the augmented behavioral consumption theory presented in sections 3.6.1 and 3.6.2.The simultaneous tilting of factor shares towards capital and widening of income inequality has led to an increase in the consumption of households whose income is most aligned with capital income (profits). Since these individuals are also most likely the top income earners in the United States their increased consumption has also led to an increase in the desired consumption of low- and middle-income households as well.

Since the real incomes of low- and middle-income households have either stagnated or fallen due to the decline in the labor share, the increase in the desired level of consumption at the bottom can only be realized if it is financed using either dissaving or consumer credit (stage four). Thus, the savings and debt decisions that are made here determines the final outcome. Assuming that there is no government intervention:

1. Unstable Growth: If low- and middle-income households decide to either dissave or consume out of debt then there will be an increase in the level of (bottom) consumption. The increase in consumption will result in economic growth, however due to the increase in household leveraging, growth will be unstable.

2. If low- and middle-income households decide to neither dissave, nor consume out of debt then there will be no change in the level of (bottom) consumption.

    a Sluggish Growth: Growth rate of top consumption is greater than the inflation rate.

   b Stagnation: If the growth rate of top consumption is equal to the inflation rate.

3. If low- and middle-income households decide to either increasing their savings, or reduce the amount of debt they acquire then there will be a fall in the level of (bottom) consumption.

   a Sluggish Growth: If the decrease in bottom consumption is less than the increase in top consumption, and the growth rate of top consumption is greater than the inflation rate.

   b Stagnation: If the decrease in bottom consumption is less than the increase in top consumption, but the growth rate of top consumption is equal to the inflation rate.

   c Economic Contraction: If the decrease in bottom consumption is greater than the increase in top consumption.

Accordingly, given that real incomes for low- and middle-income households have either stagnated or fallen since the 1980s, the household budget constraint Ψ_i[37] could not have shifted without an external source of finance. Hence, the acquisition of debt was necessary to increase their consumption. It follows that under this scenario consumption growth in the United States became heavily dependent on both the availability and the use of private household debt. Thus, we hypothesize that while it is possible that the U.S. economy is wage-led in nature, demand growth has become increasingly debt-led during the most recent periods of expansion.

We test this hypothesis using two different approaches. The first is a modified version of the traditional structural Vector Autoregression (VAR) model approach that has been used in past Post-Kaleckian growth model studies. The second approach involves constructing two separate models. The first model within the second approach aims to identify the relationships between the components of aggregate demand. The second models the component of aggregate demand that "leads" aggregate demand[38] in order to identify underlying relationships. The standard VAR model is the more direct approach of the two as fewer inferences are needed in identifying the relationship between the functional distribution of income and economic growth. However, the indirect two-step approach could arguably offer greater insights into the exact economic relationships between functional income distribution and growth.

[37] $\Psi_i = Y_i + S_i^{liquid} + Credit_i^{supply}$. The budget constraint is equal to the sum of current income, liquid assets and the supply of credit.

[38] This is to say the component of aggregate demand that has the largest effect on the other components

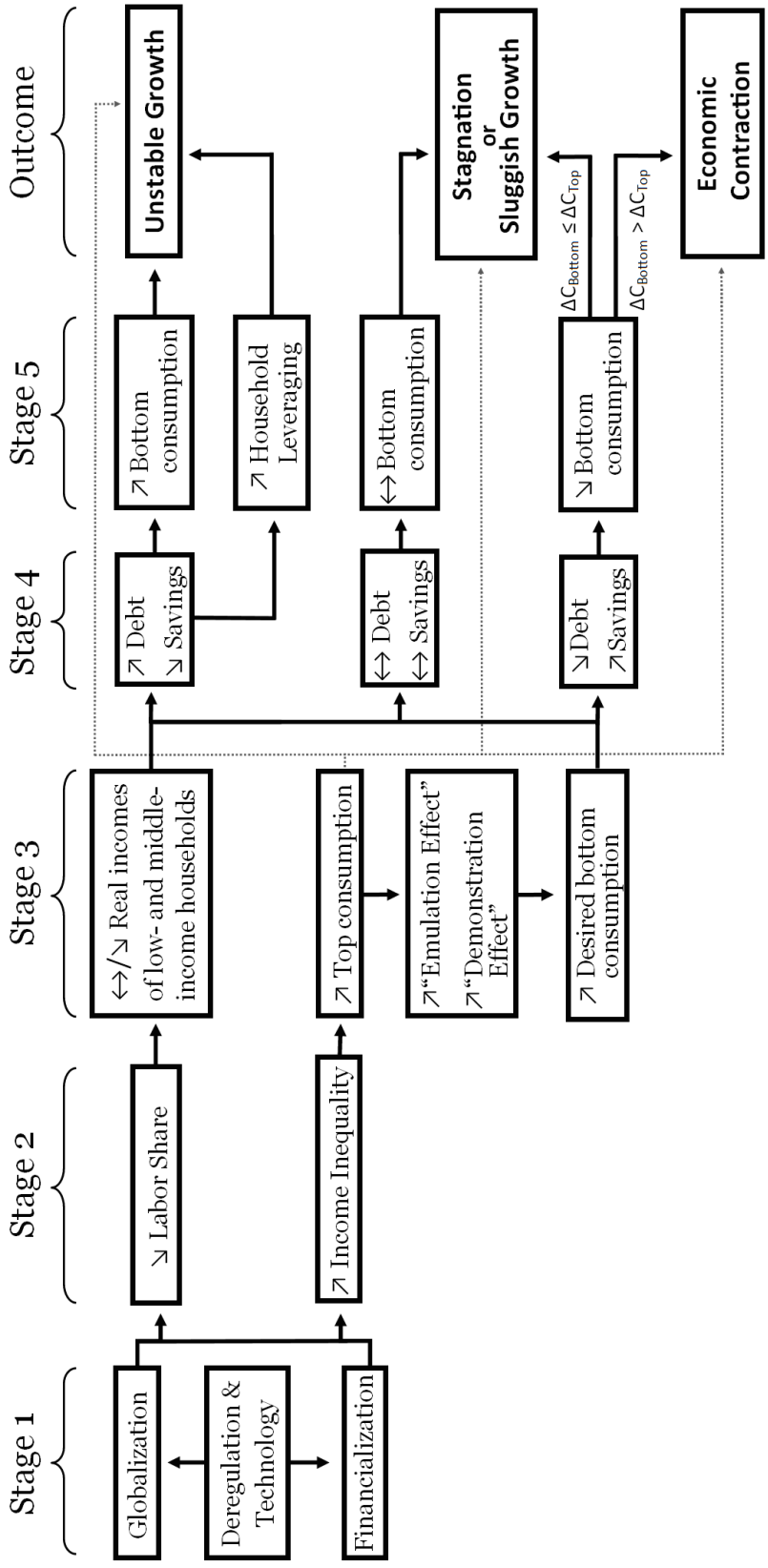


Figure 3.7.1: Theory Flowchart

4. An Indirect Two-Step Approach

An alternative approach that is, to our knowledge, unique to this study would be to first identify the nature of economic growth within the components of aggregate demand. We need to identify whether aggregate demand is consumption-led or investment-led.[39] While it is also possible for aggregate demand to be either export-led or government-led, we theorize that aggregate demand in the United States is most likely either consumption-led or investment-led.

After determining whether aggregate demand in the United States is consumption–led or investment-led the second step in this approach is to determine the respective mechanisms. For example, if aggregate demand is consumption-led then we would follow by constructing a model for the aggregate consumption function that incorporates both income distribution and consumer debt. Conversely, if aggregate demand is investment-led then the first model would be followed by a model for the investment function.

4.1 Consumption-led or Investment-led

A standard stationary VAR model is used to identify whether aggregate demand in the United States is consumption-led or investment-led.[40] The variables used in the model are the components of aggregate demand: aggregate consumption expenditures, investment, government spending, exports and imports.[41] Quarterly data for these variables is available in real terms for the period of 1947q1 to 2014q 4 from the BEA's National Income and Product Accounts (NIPA) table 1.1.6.

With the exception of the variable "residuals", all other variables used in this model are in differences of logarithms form (Δlog). This is done to avoid spurious regressions as it is well-known that the components of aggregate demand are non-stationary I(1) variables (see Granger and Newbold, 1973). Thus log-differentiating the data, which is tantamount to specifying a model in growth rates, leads to the correct OLS inference. Furthermore, despite the availability of data for the period 1947q1 to 2014q4, we choose to trim our

[39] The term "growth regime" had been previously used in the context of the functional distribution of income, whereas here it is used in the context of the components of aggregate demand. In order to avoid confusion the latter term will be forgone in favor of either consumption-led or investment-led aggregate demand.

[40] Giovannoni (2014c) presents the same argument in a cointegrated, non-stationary VAR model.

[41] Due to discrepancies in the reporting of the data (chained dollars), a final variable, "residuals", is also included.

sample period to 1954Q1-2007Q4 to avoid the effects of World War II, the Korean War, the Treasury-Fed Accord, the Marshell Plan and etc,[42] as well as the immediate and lingering effects of the 2008 recession.

Our VAR model takes the form of,

$$Y_t = A_0 + A_1 Y_{t-1} + ... + A_n Y_{t-n} + \epsilon_t \tag{4.1.1}$$

which, when written explicitly, is,

$$\begin{aligned}\begin{pmatrix} \Delta log\,(C_t) \\ \Delta log\,(I_t) \\ \Delta log\,(G_t) \\ \Delta log\,(X_t) \\ \Delta log\,(IM_t) \end{pmatrix} = \beta_0 + \begin{pmatrix} a_{1,1} & a_{1,2} & a_{1,3} & a_{1,4} & a_{1,5} & a_{1,6} \\ b_{1,1} & b_{1,2} & b_{1,3} & b_{1,4} & b_{1,5} & b_{1,6} \\ c_{1,1} & c_{1,2} & c_{1,3} & c_{1,4} & c_{1,5} & c_{1,6} \\ d_{1,1} & d_{1,2} & d_{1,3} & d_{1,4} & d_{1,5} & d_{1,6} \\ e_{1,1} & e_{1,2} & e_{1,3} & e_{1,4} & e_{1,5} & e_{1,6} \end{pmatrix} \begin{pmatrix} \Delta log\,(C_{t-1}) \\ \Delta log\,(I_{t-1}) \\ \Delta log\,(G_{t-1}) \\ \Delta log\,(X_{t-1}) \\ \Delta log\,(IM_{t-1}) \end{pmatrix} \\ + ... + \begin{pmatrix} a_{n,1} & a_{n,2} & a_{n,3} & a_{n,4} & a_{n,5} & a_{n,6} \\ b_{n,1} & b_{n,2} & b_{n,3} & b_{n,4} & b_{n,5} & b_{n,6} \\ c_{n,1} & c_{n,2} & c_{n,3} & c_{n,4} & c_{n,5} & c_{n,6} \\ d_{n,1} & d_{n,2} & d_{n,3} & d_{n,4} & d_{n,5} & d_{n,6} \\ e_{n,1} & e_{n,2} & e_{n,3} & e_{n,4} & e_{n,5} & e_{n,6} \end{pmatrix} \begin{pmatrix} \Delta log\,(C_{t-n}) \\ \Delta log\,(I_{t-n}) \\ \Delta log\,(G_{t-n}) \\ \Delta log\,(X_{t-n}) \\ \Delta log\,(IM_{t-n}) \end{pmatrix} + \epsilon_t \end{aligned} \tag{4.1.2}$$

where:

- β_0 = a vector of constants
- C = aggregate consumption
- I = total investment
- G = government spending
- X = exports
- IM = imports
- $Resid$ = residual.
- ϵ = the vector of residuals

Information criteria are used to set the lag length n. It may seem intuitive to interpret the estimation results for a model where there are n number of lags to indicate that aggregate demand is consumption-led if the sum of all the statistically significant coefficients $b_{1,1}...b_{n,1}$ is greater than the sum of all the statistically significant coefficients $a_{1,2}...a_{n,2}$. However, interpreting the estimation results in this manner may be erroneous as it is a static analysis that does not take into account the dynamics of the model, i.e the cross-relationships between the variables.

If this model is dynamic and indeed accounts for the interrelationships between the variables, then the correct method of qualifying the impact of shocks in one variable on the others is through an impulse-response analysis.[43] It follows that aggregate demand is consumption-led if the magnitude of the effect of a shock in consumption on investment is greater than that of investment on consumption. On the other hand, aggregate demand

[42] see King, Plosser, Stock and Watson (1991).

[43] The idea behind impulse-response functions (IEFs) is to trace out the (accumulated) effect of a one-standard deviation shock to one variable on another variable, ceteris peribus. In essence IRFs are dynamic (accumulated) partial derivatives.

is investment-led if the effect of a shock in investment on consumption is greater than that of consumption on investment.

Hence, determining whether aggregate demand is consumption-led or investment-led within a dynamic VAR model will require an impulse-response analysis. To confirm the correct method of interpretation a Granger causality test will be conducted to identify whether the variables are exogenous or endogenous. Thus, presuming that the model is indeed dynamic, our procedure has two steps. The first step is to estimate the likelihood of variable A "causing" variable B using the Granger causality test. The second step is to qualify the magnitude of the impact of variable A on variable B using IRFs.

4.1.1 Results

The VAR model that is given by equation 4.1.2 is estimated over 1954Q1 to 2007Q4. Information criteria, given by table A.1.1 in appendix A, indicate that the appropriate lag length is one. Before we begin to interpret the results it is necessary to first conduct a Granger causality test as to determine the appropriate method of interpretation. The results of the VAR Granger causality/block exogeneity Wald tests (table 4.1.1) indicate that there are no exogenous variables within the estimated VAR model for the sample of 1954Q1-2007Q4. Additionally, we are unable to determine an exclusive direction of Granger causality between consumption and investment, which indicates that there is bi-directional causality between consumption and investment.[44] Thus, the Granger causality test indicates that the model is dynamic and the correct method of interpretation is through an impulse-response analysis, and not through comparing the coefficients of the estimation results.

Table 4.1.1: 1954Q1-2007Q4 Granger Causality/ Block Exogeneity Wald Tests

Sample: 1954Q1 2007Q4
Included observations: 216

Dependent variable: DLOG(I)			
Excluded	Chi-sq	df	Prob.
All	73.07914	5	0.0000

Dependent variable: DLOG(X)			
Excluded	Chi-sq	df	Prob.
All	84.51348	5	0.0000

Dependent variable: DLOG(C)			
Excluded	Chi-sq	df	Prob.
All	82.78267	5	0.0000

Dependent variable: DLOG(G)			
Excluded	Chi-sq	df	Prob.
All	24.73656	5	0.0002

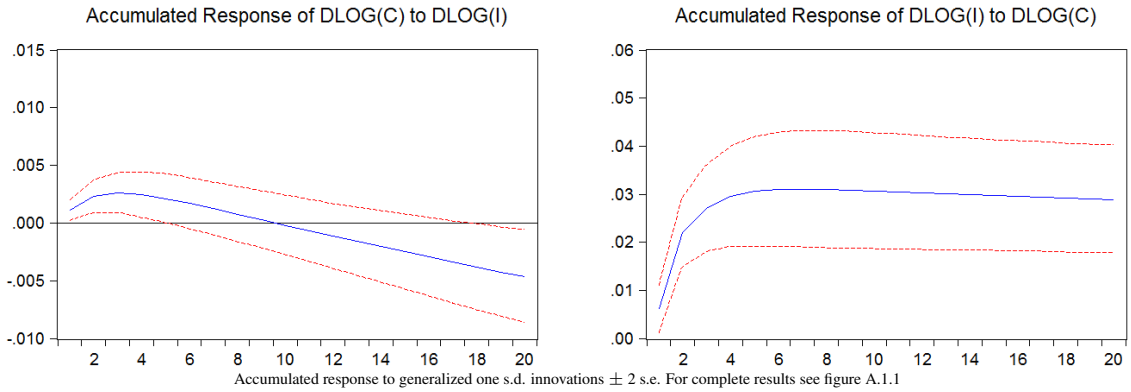
Dependent variable: DLOG(IM)			
Excluded	Chi-sq	df	Prob.
All	175.1847	5	0.0000

For complete results see table A.1.2 in appendix A

The results for the impulse response test (figure 4.1.1) show that the magnitude of investment's response to a shock to consumption is noticeably greater than that of

[44] However, the complete results of the Granger causality test (table A.1.2 in appendix A) show that the degree of causality is stronger for consumption on investment than that of investment on consumption.

Figure 4.1.1: 1954Q1-2007Q4 Impulse Response



Accumulated response to generalized one s.d. innovations ± 2 s.e. For complete results see figure A.1.1

consumption's response to investment. Furthermore, whereas the effect of investment on consumption becomes statistically insignificant around the fifth quarter, the effect of consumption on investment remains statistically significant through twenty periods (5 years). We interpret the results of the impulse response test to indicate that aggregate demand in the U.S. is consumption-led over the entire sample of 1954Q1-2007Q4.

4.1.2 Robustness

We investigate the robustness of our results by breaking down the sample into subsamples, and repeat our analysis using the Granger causality test and IRFs for each subsample. The subsamples, which are chosen on economic grounds, are: 1954Q1-1979Q4, 1980Q1-2007Q4 and 1990Q1-2007Q4. The subsamples of 1954Q1-1979Q4 and 1980Q1-2007Q4 are chosen the reflect the trends in both the functional and personal distribution of income.[45]

The information criteria given by table A.1.4 (appendix A) indicate that the appropriate lag length for the 1954Q1-1979Q4 subsample is one. Additionally, the Granger causality tests for this subsample (table A.1.5) indicates that, with the exception of the government spending variable, the variables are again endogenous between 1954Q1 and 1979Q4.[46] It follows that the VAR model for this subsample is dynamic, hence the appropriate method of interpretation is through an impulse-response analysis.

The results of the impulse-response analysis for the subsample of 1954Q1-1979Q4, given by figure 4.1.2 and A.1.2. Figure 4.1.2 indicates that aggregate demand is

[45]The concurrent processes of a declining labor share and widening income inequality began between the late 1970s and the early 1980s.

[46]This indicates that G is an (exogenous) driving force behind aggregate demand.

consumption-led during this subsample: the magnitude of investment's response to a shock to consumption is noticeably greater than that of consumption's response to investment. Similar to the results for the entire sample, the response of consumption to a shock in investment becomes statistically insignificant after five periods while the response of investment to a shock in consumption remain statistically significant up until the seventeenth quarter after the simulated shock.

Table A.1.7 in appendix A indicates that the appropriate lag length for the 1980Q1-2007Q4 subsample is one. As before, the results of the Granger causality test given by table A.1.8 indicate that the model is dynamic for the 1980Q1-2007Q4 subsample (with the exception of exports the variables are endogenous). Therefore, the appropriate method of interpretation for this subsample is through an impulse-response analysis.

The results of the impulse-response analysis in figure 4.1.3 also indicates that aggregate demand was consumption-led for the 1980Q1-2007Q4 subsample. While initially statistically insignificant the response of investment to a shock in consumption becomes statistically significant and positive after period two and remains so up to period twenty. On the other hand the response of consumption to a shock in investment is statistically insignificant throughout, and the magnitude of consumption's response is therefore interpreted as zero.

Additionally, figure A.1.3 indicates that the only statistically significant impulse-response relationships (and therefore the only relationships with a non-zero magnitude) for the 1980Q1-2007Q4 subsamplle other than the investment to consumption relationship and relationships between the same variable (i.e. the response of consumption to a shock in consumption) are: the response of consumption to imports, the response of investment to imports, the response of imports to consumption and the response of imports to investments. However, the results in figure A.1.3 indicate that aggregate demand is not import-led as the magnitude of import-consumption is greater than the magnitudes of consumption-investment, imports-investment and investments-imports. Hence, figure A.1.3 confirms the interpretation of figure 4.1.3 that aggregate demand is consumption-led during the 1980Q1-2007Q4. Furthermore, due to the statistical insignificance of the consumption-investment relationship (magnitude of zero) figures 4.1.3 and A.1.3 also indicate that the consumption-led nature of aggregate demand is even greater in the 1980Q1-2007Q4 subsample than that of the 1954Q1-1979Q4 subsample.

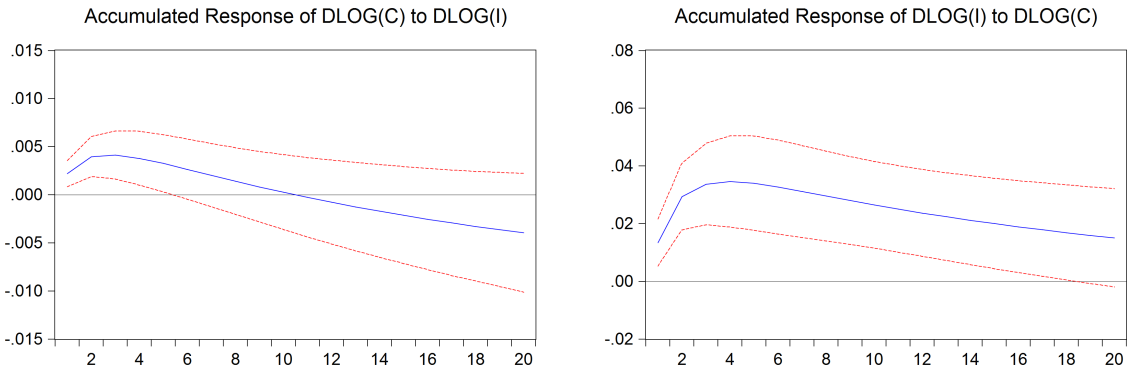
The final subsample we consider is 1990Q1 to 2007Q4. This subsample was chosen to see if the increase in the consumption-led nature of aggregate demand between

the subsamples of 1954Q1-1979Q4 and 1980Q1-2007Q4 continued within the latter subsample. As before, table A.1.10 in appendix A indicates that the appropriate lag length for the 1990Q1-2007Q4 subsample is again one. Similarly, the results of the Granger causality test (table A.1.11) indicate that the model is dynamic for the 1990Q1-2007Q4 subsample as well since all variables are endogenous. Thus, the appropriate method of interpretation for this subsample is once again through an impulse-response analysis.

The results of the impulse-response analysis in figure 4.1.4 indicates that aggregate demand continued to be consumption-led over the 1990Q1-2007Q4 subsample. Similar to the results of the impulse-response analysis for the 1980Q1-2007Q4 subsample, the response of investment to a shock in consumption is initially statistically insignificant, but becomes statistically significant and positive after period two and remains so up to period twenty. The response of consumption to a shock in investment is again statistically insignificant throughout. It follows that aggregate demand between 1990Q1 and 2007Q4 is more consumption-led compared to aggregate demand between 1954Q1 and 1979Q4.

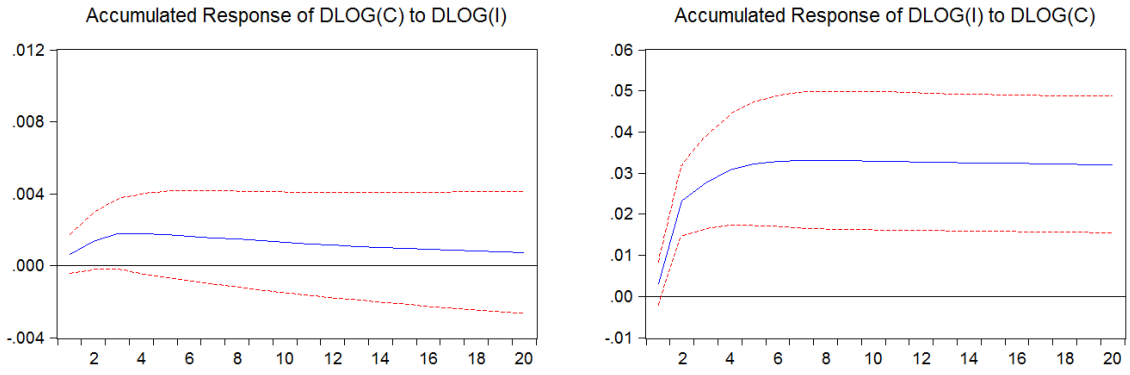
Given the results of estimating the VAR model using the three different subsamples we are able to conclude that the results for the entire sample are robust. Between 1954Q1 and 2007Q4 aggregate demand in the United States is consumption-led. Furthermore, our robustness tests also indicate that aggregate demand became even more consumption-led after 1980Q1. In other words, the period where consumption played an greater role in aggregate demand growth was also the period in which the labor share was declining and income inequality was widening. Hence, it follows that since aggregate demand is consumption-led the second step in our two-step approach will be constructing a model for the aggregate consumption function.

Figure 4.1.2: 1954Q1-1979Q4 Impulse Response



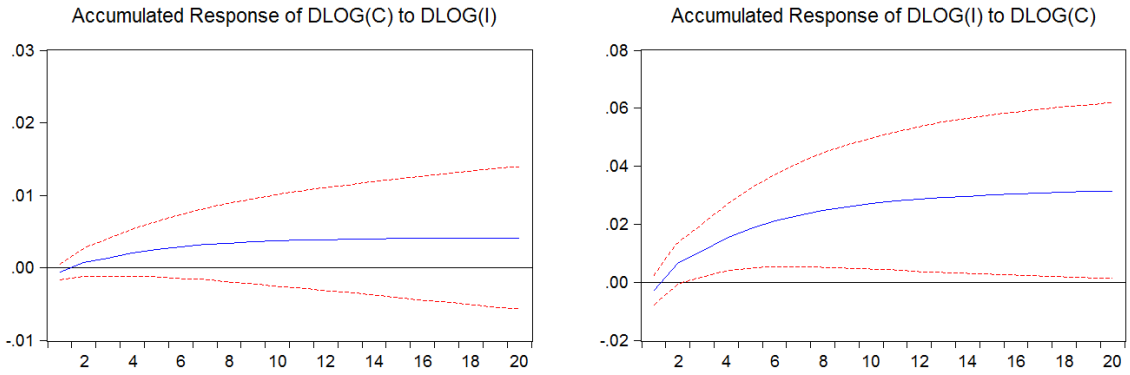
Accumulated response to generalized one s.d. innovations ± 2 s.e. For complete results see figure A.1.2 in appendix A

Figure 4.1.3: 1980Q1- 2007Q4 Impulse Response



Accumulated response to generalized one s.d. innovations ± 2 s.e. For complete results see figure A.1.3 in appendix A

Figure 4.1.4: 1990Q1- 2007Q4 Impulse Response



Accumulated response to generalized one s.d. innovations ± 2 s.e. For complete results see figure A.1.4 in appendix A

4.2 Behavioral Aggregate Consumption Function

We construct an original aggregate consumption function which not only disaggregates consumption by income groups, but also incorporates consumer debt. The theoretical basis of this augmented consumption function is derived from the behavioral consumption function presented in the previous chapter (equation 3.6.11).

The derivation of the model follows from the standard Keynesian aggregate consumption function,

$$AC_t = \beta_0 + \beta_1 Y_t^D + \mu_t \tag{4.2.1}$$

where:

- AC_t is aggregate personal consumption expenditures in period t
- Y_t^D is total (current) disposable income in period t
- μ_t is the error term
- β_0 is a constant capturing autonomous consumption
- β_1 is the marginal propensity to consume.

Incorporating the social dynamics of consumption into equation 4.2.1 requires disaggregating both total disposable income and total personal consumption expenditures into different groups along the personal income distribution scale. The methods used to disaggregate the variables are covered in subsection 4.2.1. Given the disaggregated variables, it follows that,

$$AC_t = C_{p,t} + C_{q,t} = \beta_0 + \beta_1 Y_{p,t}^D + \beta_2 Y_{q,t}^D + \mu_t \tag{4.2.2}$$

$$C_{p,t} = \beta_0 + \beta_1 Y_{p,t}^D + \beta_2 Y_{q,t}^D + \beta_3 C_{q,t} + \mu_t \tag{4.2.3}$$

where p = income group p and q = income group q such that $p \neq q$. Similar to the notation in equation 3.6.11, income groups p and q are define so that income group q holds a higher position on the income distribution scale than group p, and that $i + j = 1$. For example, if i denotes the bottom 90% of the income distribution, then j would denote the top 10% of the distribution. Similarly, if i denotes the bottom 99% of the income distribution, then j would denote the top 1% of the distribution.

The next step in the derivation of the behavioral aggregate consumption model is the introduction of the modified budget constraint. Starting from the standard Keynesian consumption function given by equation 4.2.1 the standard budget constraint variable (Y^D) is expanded to include savings and debt. The resulting consumption function takes

the form,

$$C_t = \beta_0 + \beta_1(Y_t^D + S_t + Credit_t^S) + \mu_t \tag{4.2.4}$$

$$C_t = \beta_0 + \beta_1 Y_t^D + \beta_1 S_t + \beta_1 Credit_t^S + \mu_t \tag{4.2.5}$$

where S_t is the level of past savings (liquid assets) and $Credit_t^S$ is the credit supply. Combining equations 4.2.3 and 4.2.5 we get,

$$\begin{aligned} C_{p,t} = \beta_0 + \beta_1 Y_{p,t}^D + \beta_2 S_{p,t} + \beta_3 Credit_{p,t}^S + \beta_4 Y_{q,t}^D \\ + \beta_5 S_{q,t} + \beta_6 Credit_{q,t}^S + \beta_7 C_{q,t} + \mu_t \end{aligned} \tag{4.2.6}$$

From an Ideal Model to a Tractable, Estimable Model

The following variables are omitted from equation 4.2.6,

- $S_{p,t}$ and $S_{q,t}$ are omitted, because of the method through which we construct $C_{p,t}$ and $C_{q,t}$. Since the average propensity of groups p and q are derived directly from their respective savings rate, including both the savings variable and consumption variable would result in a singular matrix (see subsection 4.2.1).

- $Y_{q,t}^D$ is omitted on the basis that top consumption $C_{q,t}$ already contains that information. In other words, we assume that $C_{q,t} = aY_{q,t}^D + b$

- The equation $C_{q,t} = aY_{q,t}^D + b$ also assumes that consumer credit extended to top incomes is negligible (or at least that $\Delta Credit_{q,t}^S$ is constant). To our knowledge, data for the borrowing patterns of top income earners is not available at the macroeconomic level.

Given the omitted variables equation 4.2.6 becomes,

$$C_{p,t} = \beta_0 + \beta_1 Y_{p,t}^D + \beta_2 Credit_{p,t}^S + \beta_3 C_{q,t} + \mu_t \tag{4.2.7}$$

In other words, the consumption of income group p is a function of their current disposable income, the supply of credit available to them and the consumption of income group q. The coefficient β_1 measures group p's marginal propensity to consume out of disposable income, while β_2 measures their marginal propensity to consume out of borrowing.[47] Lastly, the coefficient β_3 measures the magnitude of the effects of social

[47] Since we had to assume that all credit is held by the bottom income group p, β_2 is not necessarily unity.

influence on the aggregate consumption behavior of income group p.[48] In essence, the β_3 in equation 4.2.7 represents the α in equation 3.6.11.

There are a few final adjustments and assumptions that need to be made to equation 4.2.7 before being able to run a regression. All the variables in equation 4.2.7 are given in levels. However, due to the strong autocorrelation that is exhibited in each variable, the variables must be converted from levels into differences of logarithms form (Δlog). Secondly, we must make the assumption that the supply of credit is fully utilized such that the growth rate of the credit supply is equal to the growth rate of credit outstanding. Finally, it is not possible to disaggregate total credit outstanding data according to income groups on the macroeconomic level. Thus, it is also necessary to assume that $Credit_t$ is an appropriate proxy for $Credit^S_{p,t}$. However, it is possible to disaggregate total credit outstanding between non-revolving credit and revolving credit.[49] With these adjustments and assumptions, equation 4.2.7 becomes,

$$\Delta log(C_{p,t}) = \beta_0 + \beta_1 \Delta log(Y^D_{p,t}) + \beta_2 \Delta log(Credit_t) + \beta_3 \Delta log(C_{q,t}) + \mu_t \tag{4.2.8}$$

$$\begin{aligned} \Delta log(C_{p,t}) = \beta_0 &+ \beta_1 \Delta log(Y^D_{p,t}) + \beta_2 \Delta log(Credit^R_t) \\ &+ \beta_3 \Delta log(Credit^{NR}_t) + \beta_4 \Delta log(C_{q,t}) + \mu_t \end{aligned} \tag{4.2.9}$$

where $Credit^R_t$ = revolving credit and $Credit^{NR}_t$ = non-revolving credit. We will use the Bai-Perron breakpoint regression method to estimate equation 4.2.9. Based on the OLS regression method, the Bai-Perron breakpoint regression is a set of multiple linear regressions that accounts for structural breaks in the data.[50] In line with standard practice, we will use White heteroskedasticity-consistent standard errors and Covariances. Furthermore, we will also allow for heterogeneous error distributions across breaks.

4.2.1 Data

Data for aggregate consumption and total disposable income are retrieved from the BEA's NIPA tables. Data for income shares with capital gains (ISwCG) are from the World Top Income Database (WTID) while data for the disaggregated savings rates are from Saez and Zucman (2014). Finally, data for total, revolving and non-revolving credit outstanding are retrieved from the Federal Reserve Bank of St. Louis' Federal Reserve Economic Data (FRED).

[48] Stated differently, β_3 measures the magnitude of income group p's comparative consumption.

[49] An example of revolving credit is a credit card, while examples of non-revolving credit are auto loans and student loans.

[50] See Bai and Perron (2003)

Converting Annual Data into Quarterly Data

Aggregate consumption and total disposable income are the only variables that are available on a quarterly basis. Data for total, revolving and non-revolving credit outstanding are available on either a monthly or annual basis. We decide to retrieve the monthly data, and "quaterize" it by using an average aggregation method. On the other hand, data for the income share and disaggregated savings rates are only available on an annual basis.

Two separate "quaterization" methods can be used to convert the frequency of the annual data into quarters: the constant-match average method and the quadratic-match average method. The constant-match average method assumes that the quarterly values for a given year are equal to their respective annual value. On the other hand, the quadratic-match average method assumes that there is a quadratic pattern underlying the annual data and conducts a local quadratic interpolation of the annual data to fill the quarterly data.

Disaggregating Total Disposible Income

The following equation is used to disaggregate the total disposable income according to the income distribution:

$$Y_p^D = Y^D \times \frac{Y_p}{Y} \tag{4.2.10}$$

Where:

- Y_p^D = income group p's disposable income
- Y^D = total disposable income **(NIPA)**
- Y_p/Y = group p's share of income including capital gains **(WTID)**

The WTID's income share including capital gains (ISwCG) measure is used to measure the pre-tax income share of a given income group. Therefore, it is necessary to assume that the distribution of pre-tax income including capital gains (ISwCG) is an accurate approximation of the distribution of disposable income. Additionally, the WTID's ISwCG is only available as annual data, and was therefore converted into quarterly data using both "quaterization" methods. Given the above assumptions, equation 4.2.10 becomes,

$$Y_p^D = Y^D \times \frac{Y_p^D}{Y^D} \tag{4.2.11}$$

where $Y_p^D/Y^D = Y_p/Y$ is group p's share of disposable income.

Disaggregating Consumption by Income Groups

The following equation is used to construct a measure for aggregate consumption that is disaggregated by groups along the income distribution scale:

$$C_p = \left[Y_p^D \left(1 - SR_{p'}\right)\right] = Y_p^D \times CP_{p'} \tag{4.2.12}$$

Where:

- C_p = income distribution group p's consumption expenditures
- Y_p^D = income distribution group p's disposable income as calculated by equation 4.2.10
- $SR_{p'}$ = wealth distribution group p''s savings rate **(Saez and Zucman, 2014)**
- $CP_{p'}$= wealth distribution group p''s propensity to consume

The savings rate that is calculated by Saez and Zucman (2014) is for groups along the wealth distribution scale and not the income distribution. Thus it is necessary to assume that the wealth distribution is an accurate approximate for the income distribution such that if household i is a member of income group p they are also members of wealth group p'. It is relatively safe to assume that households in the bottom 90% and top 1% of the wealth distribution are also in the bottom 90% and top 1% of the income distribution, respectively. However, this may not necessarily be the case for the top 10-5% and the top 5-1%. One solution to this issue is to aggregate the top 10-5% and the top 5-1% together into the top 10-1%, or to even aggregate the groups into the top 10%. Additionally, another alternative is to aggregate the groups into the bottom 95% and the top 5%. Given these assumptions, equation 4.2.12 becomes:

$$C_p = \left[Y_p^D \left(1 - SR_p\right)\right] = Y_p^D \times CP_p \tag{4.2.13}$$

Where:

- SR_p = $SR_{p'}$ = income distribution group p's savings rate
- CP_p= $CP_{p'}$ = income distribution group p's propensity to consume

4.2.2 Results

We begin by estimating the standard Keynesian aggregate consumption function (equation 4.2.1) using the Bai-Perron (1998) breakpoint regression method. The variables for aggregate consumption (C_{total}) and total disposable income (Y_{total}^D) are placed in differences of logarithms form due to the presence of autocorrelation in levels.

Bali and Perron (1998) present a battery of structural break tests to choose from, and all tests conclude that there are no breaks in in the coefficients between 1954Q1 and 2007Q4, thus the model is stable. The reported Durbin-Watson statistic indicates that there is no

residual autocorrelation. Since β_1 is the short term elasticity of aggregate consumption to the short term elasticity of total disposable income (ε_{C/Y^D})[51] it follows that,

$$\varepsilon_{C/Y^D} = \frac{\Delta C/C}{\Delta Y^D/Y^D} = \frac{\Delta C}{C} \times \frac{Y^D}{\Delta Y^D} \tag{4.2.14}$$

$$= \frac{\Delta C}{\Delta Y^D} \times \frac{Y^D}{C} \tag{4.2.15}$$

where $\frac{\Delta C}{\Delta Y^D}$ is the marginal propensity to consume, and $\frac{Y^D}{C}$ is the inverse of the average propensity to consume. It follows from equation 4.2.15 that the MPC can be defined as:

$$MPC = \frac{\Delta C}{\Delta Y^D} = \varepsilon_{C/Y^D} \times \frac{C}{Y^D} = \beta_1 \times APC \tag{4.2.16}$$

Thus, it follows from the estimation results in table 4.2.1 that we are able to estimate the marginal propensity to consume in the United States between 1954Q1 and 2007Q4 under the standard aggregate demand function using the equation:

$$MPC_t = 0.948769 \times APC_t \tag{4.2.17}$$

Equation 4.2.17 indicates that during the period of 1954Q1 to 2007Q4 the aggregate marginal propensity to consume out of disposable income is approximately 94.87% of the average propensity to consume out of disposable income.

Standard Aggregate Consumption Function

Dependent Variable: DLOG(C)
Method: Least Squares with Breaks
Sample: 1954Q1 2007Q4
Included observations: 216
Break type: Bai-Perron tests of 1 to M globally determined breaks
Break selection: Sequential evaluation, Trimming 0.15, Max. breaks 5,
No breakpoints selected
White heteroskedasticity-consistent standard errors & covariances
Allow heterogeneous error distributions across breaks

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(Y)	0.948769	0.042175	22.49590	0.0000
C	0.001906	0.001234	1.544192	0.1240

R-squared	0.699102	Mean dependent var	0.025593
Adjusted R-squared	0.697696	S.D. dependent var	0.014402
S.E. of regression	0.007918	Akaike info criterion	-6.830020
Sum squared resid	0.013418	Schwarz criterion	-6.798767
Log likelihood	739.6421	Hannan-Quinn criter.	-6.817394
F-statistic	497.2041	Durbin-Watson stat	2.027496
Prob(F-statistic)	0.000000		

Table 4.2.1: Estimation Results

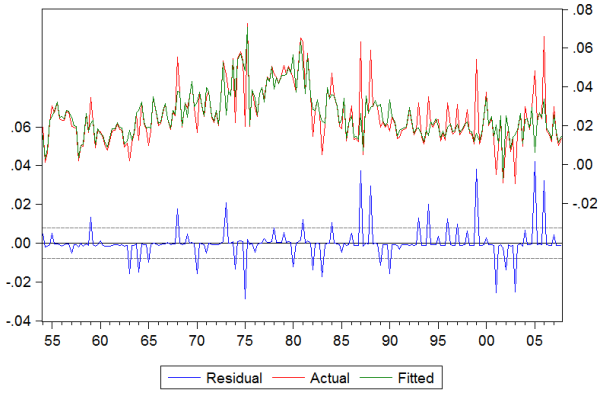


Figure 4.2.1: Residuals

Even though both the overall fit and the standard errors of regression for this model are acceptable, figure 4.2.1 shows that sizable spikes in the residuals occur with increasing

[51] While the differences of logarithmic form is interpreted as change in elasticities the summation of the differences in elasticities is equal to elasticities such that:
$\sum \left[\Delta log(C_{total}) = \beta_0 + \beta_1 \Delta log(Y^D_{total}) + \epsilon\right] \rightarrow log(C_{total}) = \beta_0 + \beta_1 log(Y^D_{total}) + \sum \epsilon$

frequency over the sample period. This suggests that even though aggregate consumption is strongly correlated with total disposable income, the latter periods are marked by the emergence of other non-income variables that affect aggregate consumption. Therefore, we introduce the adjustments to the standard aggregate consumption function that were outlined by equations 4.2.2 to 4.2.9. We continue to use the Bai-Perron breakpoint regression method, and employ the "Sequential tests all subsets" structural break test. Many models and specifications were tested, however only the results of the final specification are reported below.

The Specification Process

The first adjustment follows from equation 4.2.3. Aggregate consumption is disaggregated by income groups between the bottom 90% (income group p) and the top 10% (income group q). With this adjustment the dependent variable being estimated is the consumption of the bottom 90%, the disposable income of the bottom 90% is the independent variable and the consumption of the top 10% is the control variable.[52] Additional income group combinations that were tested include: bottom 95%/top 5%, bottom 99%/top 1% and bottom 90%/top 10-1%/top 1%.[53] The reason behind selecting these specific income groups is due to specifics in the construction of the dataset (see subsection 4.2.1). The values for both R-squared and adjusted R-squared improve while the standard errors of regression decrease as a result for all income group combinations, which therefore justifies adjusting the standard aggregate consumption function for different income groups.

The second adjustment follows from equations 4.2.6 and 4.2.7. Control variables for consumer credit are added to the regression model. The first version of this adjustment is controlling for total credit(equation 4.2.8), whereas the second disaggregates total credit into non-revolving credit and revolving credit (equation 4.2.9). Similar to the case of the first adjustment, the values for both R-squared and adjusted R-squared improve while the standard errors of regression decrease as a result for both versions of the second adjustment. While we decide to use the latter version of this adjustment, the first version of this adjustment will be used as a robustness test. One notable limitation of controlling for non-revolving credit and revolving credit is that the data for revolving credit does not exist before 1968Q1. Conversely, data for total credit exists for the entire sample period.

[52] We do not control for the disposable income of the top 10% since controlling for both the disposable income and consumption of the top 10% would lead to issues with multicollinearity.

[53] Such that the dependent variable is the consumption of the first income group listed in each combinations.

As a result of this data limitation, the first possible observation for revolving credit when in differences of logarithms form is 1968Q2.

The Final Specification

The final specification of the model disaggregates total consumption between the bottom 90%, top 10-1% and the top 1%, and can be represented by the following equation,

$$\Delta log(C_{90,t}) = \beta_0 + \beta_1 \Delta log(Y^D_{90,t}) + \beta_2 \Delta log(C_{101,t}) + \beta_3 \Delta log(C_{1,t}) + \beta_4 \Delta log(Credit^R_t) + \beta_5 \Delta log(Credit^{NR}_t) + \mu_t \quad (4.2.18)$$

where:

- $C_{90,t}$= consumption of the bottom 90%
- $Y^D_{90,t}$= disposable income of the bottom 90%
- $C_{101,t}$= consumption of the top 10-1%
- $C_{1,t}$= consumption of the top 1%
- $Credit^R_t$= revolving credit outstanding
- $Credit^{NR}_t$= non-revolving credit outstanding

As before, the Bai-Perron breakpoint regression method is used to estimate equation 4.2.24. We considered all possible Bai-Perron structural break tests and employ the "Sequential tests all subsets" test[54] since it leads to the most economically significant break dates. We also have a large sample size of 159 observations. White heteroskedasticity-consistent standard errors and covariances, allowing for heterogeneous error distributions across breaks and the break selection specifications used are standard economic practices.

The estimation results (table 4.2.2) finds that there are four significant structural breaks for the sample of 1968Q2 to 2007Q4. The R-squared and adjusted R-squared values indicate that the overall fit of the model is excellent, and the standard errors of regression are very small. Additionally, the Durbin-Watson statistic indicates that autocorrelation in the residuals is not present within our regression. [55]

Overall, the estimation results indicate that the relationship between the consumption of the bottom 90% and their disposable income (β_1) is statistically significant at the 99.99% confidence level throughout the entire sample. We calculate that the average value of β_1 over the entire sample to be approximately 1.0715. Employing the same derivation method (equations 4.2.14 to 4.2.16), we are able to estimate the bottom 90%'s marginal propensity to consume out of disposable income using the equation:

$$MPC_{B90} = 1.0715 \times APC_{B90} \quad (4.2.19)$$

[54] This structural break test method is also referred to as the "Bai test of breaks in all recursively determined partitions".

[55] However, figure A.2.1 in appendix A does shows that there are a number of sizable spikes in the regression residuals between the mid-1970s to the early 1990s. Whereas these spikes would be treated through the use of dummy variables under a standard OLS regression, the Bai-Perron regression method prevents us from doing so as it would lead to a near singular matrix in at least one of the subsamples.

Equations 4.2.17 and 4.2.19 suggests that the aggregate MPC out of total disposable income is lowered by the MPC of the top 10%. In other words, the MPC of the top 10% is lower than the MPC of the bottom 90%.

Another interesting observation emerges if we look at the values of the coefficient for the bottom 90%'s disposable income (β_1) over the four subsamples. The values of β_1 begin to fall starting after the second subsample. A general inference of this trend is that the elasticity of the bottom 90%'s consumption with respect to their disposable income decreases over the subsamples of 1987Q1-1994Q1, 1994Q2-2002Q1 and 2002Q1-2007Q4. Moreover, this trend is even stronger when we look at the values of β_1 when the coefficients are scaled such that the variance of all the independent variables is equal to one. The motivation for standardizing the coefficients is so that we are able to obtain the relative magnitudes of the regression coefficients.

Table A.2.1 in appendix A indicates that once standardized the decline in the value of β_1 starts following the first subsample, and becomes even more pronounced as well. The values of the standardized regression coefficients are to be interpreted as the magnitude of the corresponding independent variable's effect relative to the magnitudes of the other independent variables. Hence, the results shown in table A.2.1 indicates that over the four subsamples there was a concurrent fall in the role of disposable income in consumption decisions, and an increase in the role of non-income variables. Thus, it is necessary to

Table 4.2.2: Bottom 90% Consumption Function Estimation Results

Dependent Variable: DLOG(C90)
Method: Least Squares with Breaks
Sample (adjusted): 1968Q2 2007Q4
Included observations: 159 after adjustments
Break type: Bai tests of breaks in all recursively determined partitions
Break selection: Trimming 0.15, Max. breaks 5, Sig. level 0.05
Breaks: 1987Q1, 1994Q2, 2002Q2
White heteroskedasticity-consistent standard errors & covariances
Allow heterogeneous error distributions across breaks

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1968Q2 - 1986Q4 -- 75 obs				
DLOG(Y90)	1.082661	0.049540	21.85442	0.0000
DLOG(C101)	-0.054532	0.028894	-1.887326	0.0613
DLOG(C1)	-0.072223	0.004081	-17.69574	0.0000
DLOG(RCREDIT)	0.009325	0.007830	1.190910	0.2358
DLOG(NRCREDIT)	0.058270	0.036286	1.605875	0.1106
C	-0.001754	0.001731	-1.013315	0.3127
1987Q1 - 1994Q1 -- 29 obs				
DLOG(Y90)	1.126159	0.090958	12.38104	0.0000
DLOG(C101)	-0.020891	0.058090	-0.359632	0.7197
DLOG(C1)	0.004693	0.008396	0.558984	0.5771
DLOG(RCREDIT)	-0.046732	0.119281	-0.391778	0.6958
DLOG(NRCREDIT)	-0.250122	0.159037	-1.572732	0.1181
C	0.001549	0.004485	0.345414	0.7303
1994Q2 - 2002Q1 -- 32 obs				
DLOG(Y90)	1.083863	0.082115	13.19930	0.0000
DLOG(C101)	0.131418	0.037472	3.507062	0.0006
DLOG(C1)	-0.103482	0.023361	-4.429621	0.0000
DLOG(RCREDIT)	-0.025602	0.029588	-0.865307	0.3884
DLOG(NRCREDIT)	-0.020686	0.046332	-0.446483	0.6560
C	0.000135	0.002012	0.067167	0.9465
2002Q2 - 2007Q4 -- 23 obs				
DLOG(Y90)	0.949282	0.105834	8.969523	0.0000
DLOG(C101)	0.173778	0.048998	3.546667	0.0005
DLOG(C1)	-0.008863	0.007952	-1.114562	0.2670
DLOG(RCREDIT)	0.428039	0.124398	3.440869	0.0008
DLOG(NRCREDIT)	0.083501	0.178423	0.467994	0.6405
C	-0.011375	0.003533	-3.219533	0.0016

R-squared	0.928473	Mean dependent var	0.025976
Adjusted R-squared	0.916287	S.D. dependent var	0.018400
S.E. of regression	0.005324	Akaike info criterion	-7.495078
Sum squared resid	0.003826	Schwarz criterion	-7.031847
Log likelihood	619.8587	Hannan-Quinn criter.	-7.306965
F-statistic	76.19096	Durbin-Watson stat	2.067548
Prob(F-statistic)	0.000000		

examine the estimation result for the non-income variables (control variables) for each subsample in greater depth.

For the first subsample of 1968Q2-1986Q4, the coefficients for revolving credit (β_4) is statistically insignificant, thus we take their values as zero. On the other hand the coefficients β_2 (the consumption of the top 10-1%), β_3 (the consumption of the top 1%) and β_5 (non-revolving credit) are statistically significant at the 93.87%, 99.99% and 88.94 confidence levels respectively. However, these coefficients are so small that we ought to consider them zero. In a similar fashion, β_5 is marginally significant and close to zero. This implies that consumption is credit-inelastic. Thus, what mattered most for consumption in the post war period was disposable income.

In the following 1987Q1-1994Q1 subsample, the coefficients β_2 (the consumption of the top 10-1%), β_3 (the consumption of the top 1%) become statistically insignificant while β_4 (revolving credit) remains insignificant. β_5 (non-revolving credit) remains statistically significant at the 88.19% confidence interval), but its value becomes negative. This result is not intuitive, but could possibly reflect the fact that non-revolving credit is commonly used to buy "big ticket" items, and that consumers in the bottom 90% would reduce their consumption expenditures after purchasing such items using non-revolving credit as to remain solvent.

In the 1994Q2-2002Q1 subsample, credit remains insignificant ($\beta_4 = \beta_5 = 0$), while both top consumption variables (β_2 and β_3) are statistically significant. The coefficient for the consumption of the top 10-1% is positive, and is therefore in line with our comparative consumption theory (the emulation and demonstration effects). However, interpreting the coefficient for the consumption of the top 1% is not intuitive since it is negative. Nevertheless, the estimation results for the third subsample will still indicate the presence of comparative consumption since the combined effect is positive. In order to do this we must look at the standardized coefficients given by table A.2.1 in appendix A. Since the sum of the standardized coefficients is approximately 0.0487, it follows that between 1994Q2 and 2002Q1 the consumption of the bottom 90% increased when consumption expenditures at the top increased. Furthermore, it stands to reason that since the credit variables are insignificant, then increases in consumption resulting from social dynamics were financed mostly by dissavings.[56]

In the final subsample (2002Q2-2007Q4), β_3 (the consumption of the top 1%) and β_5 (non-revolving credit) are statistically insignificant. The value of the coefficient

[56]The real disposable income of the bottom 90% were either stagnanting or falling during this period.

for the consumption of the top 10-1% (β_2) increases from 0.131418 to 0.173778, and is now statistically significant at the 99.95% confidence interval. More importantly, revolving credit (β_4) is statistically significant at the 99.92% confidence interval in the final subsample. Employing a method of derivation similar to the one used in the construction of equation 4.2.16, the bottom 90%'s marginal propensity to consume out of revolving and non-revolving credit can be estimated using the following equations:

$$MPC_{90,t}^{credit^R} = \varepsilon_{C/credit^R} \times \frac{C}{credit^R} = \beta_4 \times APC_{90,t}^{credit^R} \tag{4.2.20}$$

$$MPC_{90,t}^{credit^{NR}} = \varepsilon_{C/credit^{NR}} \times \frac{C}{credit^{NR}} = \beta_5 \times APC_{90,t}^{credit^{NR}} \tag{4.2.21}$$

Plugging in the values for the first subsample (table 4.2.2) into equation 4.2.20 we get:

$$MPC_{90,t}^{credit^R} = .197944 \times APC_{90,t}^{credit^R} \tag{4.2.22}$$

Equation 4.2.22 indicates that from 2002 to 2007Q4 the consumption of the bottom 90% exhibited a positive relationship with outstanding revolving credit.

Furthermore table A.2.1 in appendix A shows that the magnitude of the standardized regression coefficient for revolving credit (.197944) is more than half of that for disposable income (.350012). These results indicate that the social influences on consumption of the bottom 90% increased noticeably between the last two subsamples[57], and that increases in consumption resulting from social dynamics between 2002Q2 and 2007Q4 were financed increasingly through debt. We interpret this to mean that the bottom 90% consumed more when the credit supply increased, an interpretation that is in line with our behavioral consumption function (specifically the modified budget constraint).

Robustness

To assess the robustness of our results we conducted two additional estimations using different modifications of equation 4.2.24. The same structural break test method and break selection criteria that were used in the above estimation are used in the robustness tests as well. The first test entails replacing the revolving and non-revolving credit outstanding variables with total credit outstanding. The regression equation for these tests is,

$$\begin{aligned}\Delta log(C_{90,t}) = \beta_0 + \beta_1 \Delta log(Y_{90,t}^D) + \beta_2 \Delta log(C_{101,t}) \\ + \beta_3 \Delta log(C_{1,t}) + \beta_4 \Delta log(Credit_t^T) + \mu_t\end{aligned} \tag{4.2.23}$$

[57] We take β_3 as zero since it is statistically insignificant. Therefore based on the standardized coefficients the magnitude of the overall social effect in the final subsample is 0.134099 compared to 0.0487 in the prior subsample.

where $Credit_t^T$ is total credit outstanding. Even though data for total credit outstanding is available from 1954Q1, we choose to restrict the sample to the period of 1968Q2 to 2007Q4 in order to remain consistent with the sample used in our original estimation.

The results of the first robustness test are presented in table A.2.2 in appendix A. The overall fit of this model improves slightly as there is a small improvement in both the adjusted R-squared and standard errors of the regression. The structural break test finds that between 1968Q1 to 2007Q4 there are three breaks in the data. Additionally two of the break dates 1987Q1 and 2002Q2 remain unchanged, but the third break date changes from 1994Q2 to 1993Q2.

With the exception of the credit variable becoming statistically significant in the first and second subsample, the statistical significance of the variables remains unchanged (there are only slight variations in the degree of significance). Similarly the general implications of our original model also remains unchanged when revolving and non-revolving credit is aggregated into total credit. Table A.2.3 indicates that the relative magnitude (standardized regression coefficients) of the bottom 90%'s disposable income in determining their consumption decisions still declines throughout the entire sample, and that there is a concurrent increase in the relative magnitude of the control variables.

The second estimation used in our robustness analysis modifies the original estimation specification by introducing a control for the consumer price index (CPI). The reason for adding the CPI as a control variable follows from Bertrand and Morse's (2013) finding that there is a positive relationship between the CPI and top income levels. Therefore it could be the case that the positive relationship between top consumption and the consumption of the 90% is actually due to a positive relationship between the CPI and bottom 90% consumption. Thus, it follows that the rise in debt financed consumption could have resulted from higher prices of the goods that were already being consumed rather than increases in comparative consumption. The regression equation for the second robustness test is,

$$\begin{aligned}\Delta log(C_{90,t}) = \beta_0 &+ \beta_1 \Delta log(Y_{90,t}^D) + \beta_2 \Delta log(C_{101,t}) \\ &+ \beta_3 \Delta log(C_{1,t}) + \beta_4 \Delta log(Credit_t^R) \\ &+ \beta_5 \Delta log(Credit_t^{NR}) + \beta_6 \Delta log(CPI_t) + \mu_t\end{aligned} \tag{4.2.24}$$

where CPI_t is the consumer price index in period t.

The estimation results for the second robustness test, which are presented in table A.2.4 in appendix A, indicate that controlling for the CPI results in a notable improvement in the fit of the model. Both the R-squared and adjusted R-squared increase over that of the original specification. Furthermore, the standard errors of the regression also decrease.

The structural break test finds that all three break dates when controlling for the CPI are identical to those found without controlling for the CPI.

The coefficient for the CPI (β_6) is negative throughout the entire sample, but is only statistically significant in the last two subsamples of 1994Q2-2002Q1 and 2002Q2-2007Q4 at the 93.14% and 99.93% confidence intervals respectively. We construct the following equation in order to interpret β_6 in terms of changes in the consumption of the bottom 90% and changes in the CPI:

$$\Delta C_{90,t} = \Delta CPI_t \left(\varepsilon_{C/CPI} \times \frac{C_t}{CPI_t} \right) = \Delta CPI_t \left(\beta_{6,t} \times \frac{C_t}{CPI_t} \right) \tag{4.2.25}$$

Plugging in the values of β_6 into equation 4.2.25 indicates that increases in the CPI led to decreases in the consumption of the bottom 90% during the last two subsamples. Furthermore tables A.2.4 and A.2.5 shows that this negative relationship was greater in the final subsample compared to the third subsample.

Overall, the implications of this estimation remains consistent with the original. The only notable change in statistical significance occurs in the final subsample where the coefficient for the consumption of the top 1% becomes statistically significant. However, the standardized coefficients shows that the relative magnitude of this coefficient is very small and negligible. In fact, the sum of the standardized coefficients for the consumption of the top income groups is approximately 0.1283, which is only slightly lower than the original estimation's .1341. The standardized coefficients still show that the role of disposable incomes in the bottom 90%'s consumption decisions declined steadily throughout the sample, and that the role of the other variables increased. However, the relative magnitude of disposable income are slightly higher after controlling for the CPI. Nevertheless, the estimation results of the second robustness test are in strongly support the original findings and their implications.

In summary, the estimation results of the two specifications used in our robustness analysis indicate that our results are indeed robust. All three of the break dates identified in the original estimation are robust, but the 1987Q1 and 2002Q4 breaks are more robust than the 1994Q2 break. The results of both specifications used in our robustness analysis confirms the notable implication that the magnitude of the standardized disposable income coefficient undergoes a sustained decrease between 1968Q2 and 2007Q4. Furthermore, our analysis indicates that the preference order for the components of the budget constraint indicated by the original estimation is also robust.

4.3 Summary and Implications

The results of our VAR model indicate that the aggregate demand in the United States is consumption-led, and increasingly so over time. In other words, during the same period in which the labor share has been declining, the role of consumption in determining aggregate demand growth has increased. Since we find that aggregate demand is consumption-led and not investment-led, we follow up with an analysis of the aggregate consumption model.

The estimation results for our final specification indicates that the role of disposable income in determining the consumption of the bottom 90% decreases consecutively from subsample to subsample for the entire sample. On the other hand beginning from the third subsample (1994Q2-2007Q4) we see a rise in the influence of consumption at the top on the bottom 90%'s consumption behavior. However, the coefficient for consumer credit (revolving) does not become statistically significant until the final subsample (2002Q2 to 2007Q4). We interpret this as evidence supporting our hypothesis that there is an order of preferences among the components in the budget constraint. Starting in the early 1980s households who were facing either stagnant or falling real incomes initially increased their consumption expenditures by reducing their savings rate (second subsample). When households were unable to increase their consumption expenditures through increasing their average consumption propensity they would increase their consumption expenditures by consuming out of their savings (third subsample). Households only begin to use credit in the financing of consumption after their savings are depleted (subsample 4).

We interpret the combination of the findings from the two models as an indication that aggregate demand in United States is wage-led. However, since the 1990s growth has become increasingly dependent on non-wage and non-profit variables as well. Specifically, we find that growth in the 1990s was characterized by a wage-led regime that was supplemented by dissavings. Then in the 2000s growth became characterized by a wage-led regime that was supplemented by consumer credit. Therefore, even though growth is still wage-led, due to the fact that real wages for the majority or American households are either stagnating or falling, growth has become increasingly dependent on the deleveraging of the bottom 90%. This indicates that economic growth in the post-crisis period requires either growth in the disposable income of the bottom 90% or a combination of further dissavings and increasing use of consumer credit. However,

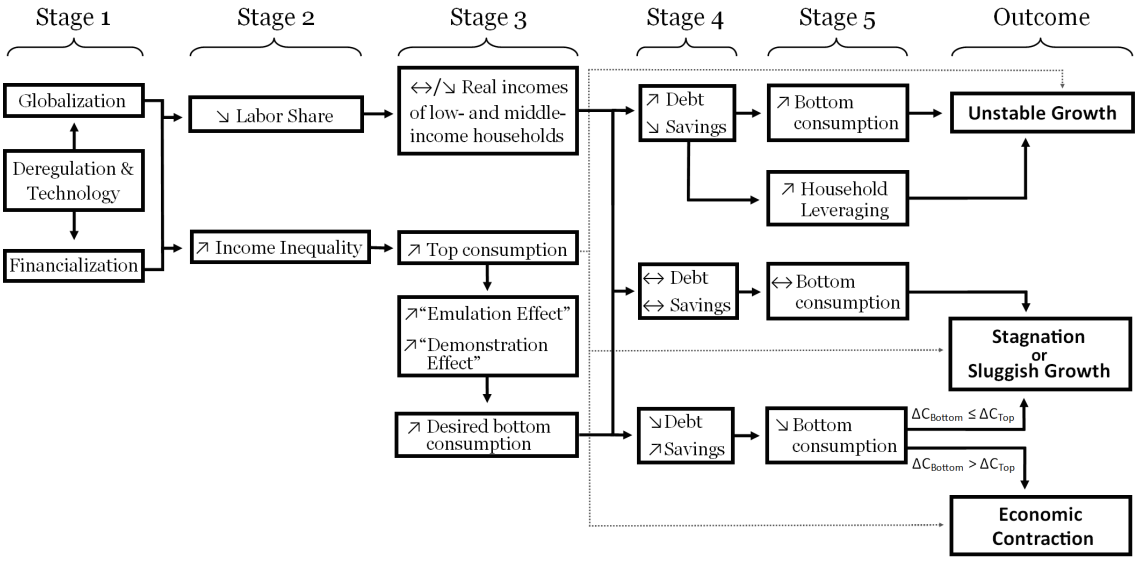
since savings were depleted in the 1990s our findings indicate that meaningful economic growth in the post-crisis period will necessitates either a reversal of the trends in both the functional and personal distribution of income that began in the early 1980s or a continuation of the debt-fueled consumption growth of the 2000s.

5. Conclusion and Policy Implications

The objective of this senior project has been to investigate the macroeconomic consequences of changes in both the functional and personal distribution of income. The analysis towards tis goal began with identifying two theoretical paradoxes that are present in existing macroeconomic growth model. Specifically, the constant distribution of income that is featured in the Harrod-Domar and Solow growth models, and the inconsistency between the theoretical implications of the Post-Kaleckian growth model and reality.

To circumvent the conundrums we investigated various specifications of the consumption function, and devised a new consumption function based on the social dynamics of consumption (RIH) and the role of consumer borrowing. Chapter 3 presented an economic investigation of our extended consumption function with the primary findings being that, without government intervention, a declining labor share in conjunction with worsening income inequality can result in one of four possible outcomes: unstable growth, sluggish growth, stagnation and economic contraction. Our theoretical narrative is outlined by the following flow chart,

Flowchart: Theoretical Narrative



Our empirical work was based on the insights of our theoretical model, and uses original measures. Specifically, in our empirical analysis we disaggregate total disposable income and consumption using methods that are, to our knowledge, both unique and original. Our results indicate that aggregate demand in United States is wage-led, buthas become increasingly dependent on household debt. Specifically, we find that growth in the 1990s was characterized by a wage-led regime that was supplemented by dissavings, which in the 2000s, transitioned into a wage-led regime supplemented by consumer credit. Therefore, even though growth is still wage-led, the consequence of a declining labor share is that growth has become increasingly dependent on the financial deleveraging of the bottom 90%.

In a sense our work relates to the works of political economists who, as Ricardo would say, emphasize that "[income distribution] is the principle problem", and that power relations are at the core of inequality. As such, our findings support the conclusions of economists such as Atkinson (1999) and Piety (2015) to bring income distribution back in from the cold and to place the debate in terms of income, or wealth, inequality.

Accordingly, our work on the implications that the changes to the functional and personal distribution of income have on macroeconomic growth and stability is closest in spirit and findings to Bowles and Boyer (1995), Hein and Vogal (2007) and Onaran, Stockhammer, and Grafl (2011). Like the aforementioned studies, the results of our study show that aggregate demand in the United States is primarily wage-led. However, unlike prior studies, our results show evidence that aggregate demand, while wage-led, is becoming increasing dependent on household debt.

Additionally, our work on the relationships between income inequality, debt and household consumption behavior is closest in spirit and findings to Barba and Pivetti (2009), Cynamon and Fazzari (2014), Cynamon, Fazzari and Setterfield (2013), Iacoviello (2008), Kumhof and Rancière, Kumhof, et al. (2013), Palley (2010) and Papadimitriou, et al. (2014). However, even though the implications of our findings are in line with the aforementioned studies, our methods and interpretation differ from those previously used. Moreover, the method of interpretation employs a synthesis of microeconomic and macroeconomic theories. Conversely, the interpretation used in prior studies were either exclusively microeconomic or exclusively macroeconomic.

However, this study has only scratched the surface as there are numerous avenues for future research. Some of the possabitlies for future research include:

- The consumption function of top income groups (our study focuses on the consumption function of bottom income groups, namely the bottom 90%).
- Introducing additional controls into the consumption model, such as:
  - equity extraction
  - making the savings rate more prominent as a stand alone variable
- Construct VAR($W, \Pi, Credit$) to confirm whether aggregate demand growth is credit-led or wage-led.
- Study the implications of debt servicing cost when aggregate demand growth is debt-dependent.

Policy Implications

The most notable policy implication that is suggested by our work here is that in the case of the United States stable economic growth is analogous to equitable growth. Since aggregate demand is unquestionably consumption-led, growth will only be stable when consumption is financed solely by disposable income. Stated differently, growth will be unstable as long as consumption is financed through debt and dissaving. Thus, stable growth necessitated a reversal of the widening inequality and declining labor share. However, the correct approach to reducing inequality is not so much cutting top incomes, but rather raising the bottom. Increase income at the bottom will allow households to reduce their reliance on debt and dissavings, and will enable them to consume out of their disposable income.

Furthermore, our findings also indicates that government intervention is imperative in the face of another crisis. Our theoretical model shows that, when aggregate demand growth is debt-dependent, unless there is sufficient government intervention an initial negative shock (crisis) could lead to a period of sustained economic contraction. After the 2008 recession, there was a prominent shift in aggregate savings and household indebtedness in the U.S. Thus, in the context of our model, it was thanks to timely government intervention that prevented the U.S. economy from entering a depression.

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A. Results

A.1 Consumption-led or Investment-led in Aggregate Demand

Entire Sample: 1954Q1-2007Q4

Table A.1.1: 1954Q1 to 2007Q4 Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DLOG(C01) DLOG(I) DLOG(G) DLOG(X) DLOG(IM) RES
Exogenous variables:
Sample: 1954Q1 2007Q4
Included observations: 216

Lag	LogL	LR	FPE	AIC	SC	HQ
1	1982.768	NA	5.98e-16*	-18.02563*	-17.46308*	-17.79836*
2	2007.193	46.13722	6.66e-16	-17.91846	-16.79336	-17.46392
3	2032.997	47.30737	7.33e-16	-17.82405	-16.13641	-17.14224
4	2056.499	41.78011	8.26e-16	-17.70832	-15.45813	-16.79924
5	2082.822	45.33553	9.08e-16	-17.61873	-14.80599	-16.48238
6	2114.335	52.52049	9.54e-16	-17.57717	-14.20189	-16.21355
7	2147.605	53.60143	9.90e-16	-17.55189	-13.61407	-15.96100
8	2181.533	52.77745	1.02e-15	-17.53271	-13.03234	-15.71455
9	2218.457	55.38565	1.04e-15	-17.54127	-12.47835	-15.49583
10	2254.781	52.46849*	1.06e-15	-17.54427	-11.91880	-15.27157

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table A.1.2: 1954Q1-2007Q4 Granger Causality/ Block Exogeneity Wald Tests

VAR Granger Causality/ Block Exogeneity Wald

Sample: 1954Q1 2007Q4
Included observations: 216

Dependent variable: DLOG(I)

Excluded	Chi-sq	df	Prob.
DLOG(C)	45.93396	1	0.0000
DLOG(G)	10.60763	1	0.0011
DLOG(X)	1.304679	1	0.2534
DLOG(IM)	3.707273	1	0.0542
All	73.07914	5	0.0000

Dependent variable: DLOG(X)

Excluded	Chi-sq	df	Prob.
DLOG(C)	5.654039	1	0.0174
DLOG(I)	22.87795	1	0.0000
DLOG(G)	0.750069	1	0.3865
DLOG(IM)	7.266479	1	0.0070
All	84.51348	5	0.0000

Dependent variable: DLOG(C)

Excluded	Chi-sq	df	Prob.
DLOG(I)	5.951892	1	0.0147
DLOG(G)	0.000143	1	0.9905
DLOG(X)	0.430332	1	0.5118
DLOG(IM)	0.716244	1	0.3974
All	82.78267	5	0.0000

Dependent variable: DLOG(G)

Excluded	Chi-sq	df	Prob.
DLOG(C)	1.197133	1	0.2739
DLOG(I)	0.027548	1	0.8682
DLOG(X)	0.38561	1	0.5346
DLOG(IM)	1.675258	1	0.1956
All	24.73656	5	0.0002

Dependent variable: DLOG(IM)

Excluded	Chi-sq	df	Prob.
DLOG(C)	53.77031	1	0.0000
DLOG(I)	19.74587	1	0.0000
DLOG(G)	1.925878	1	0.1652
DLOG(X)	13.36209	1	0.0003
All	175.1847	5	0.0000

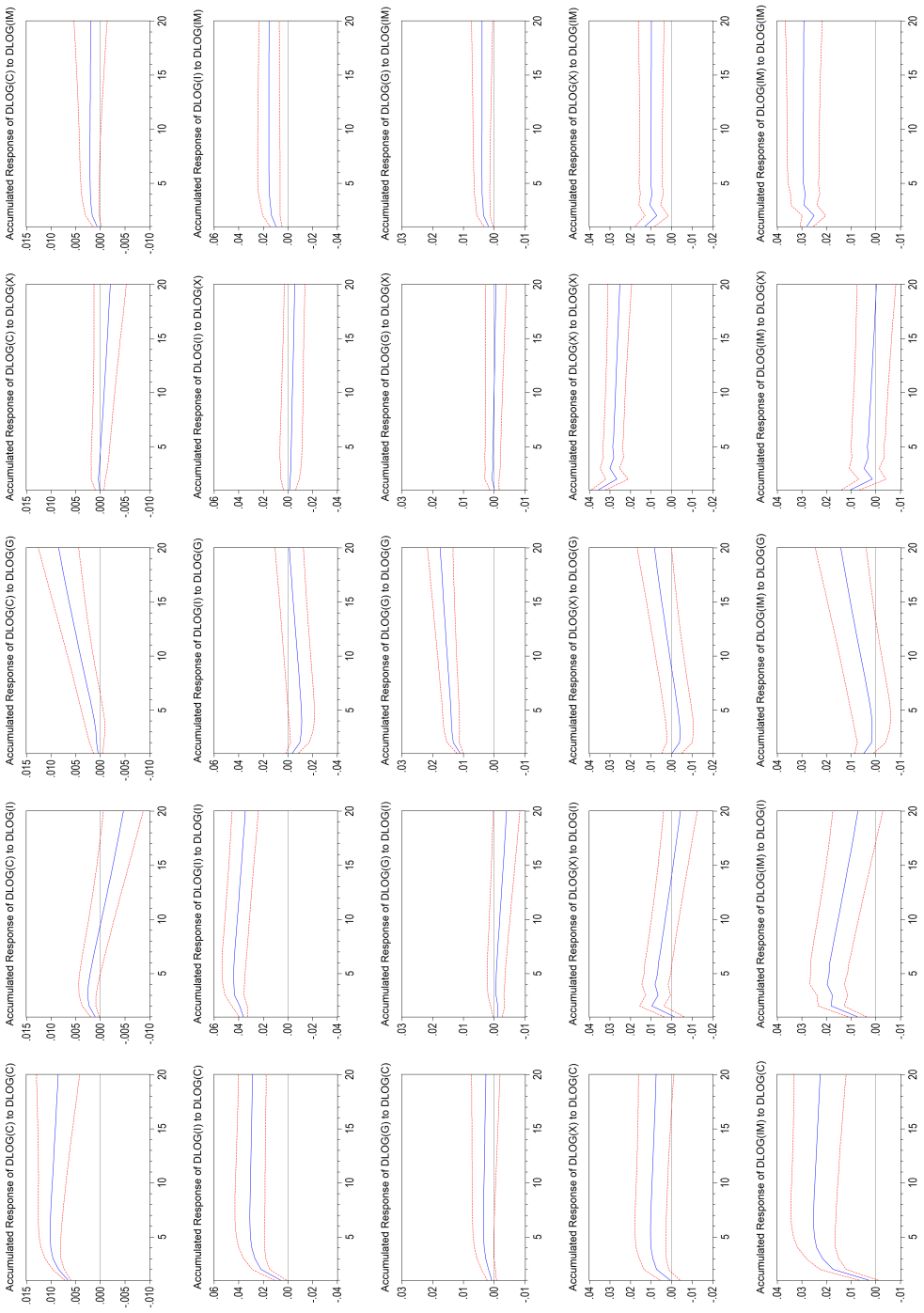
Table A.1.3: 1954Q1 to 2007Q4 VAR Estimation Output

Vector Autoregression Estimates
Sample: 1954Q1 2007Q4
Included observations: 216
Standard errors in ( ) & t-statistics in [ ]

	DLOG(C)	DLOG(I)	DLOG(G)	DLOG(X)	DLOG(IM)
DLOG(C(-1))	0.254538	2.477423	0.122278	0.852482	2.072181
	(0.06644)	(0.36554)	(0.11176)	(0.35851)	(0.28259)
	[3.83086]	[6.77746]	[1.09414]	[2.37782]	[7.33282]
DLOG(I(-1))	0.030923	-0.066828	-0.003539	0.327129	0.239551
	(0.01268)	(0.06973)	(0.02132)	(0.06839)	(0.05391)
	[2.43965]	[-0.95834]	[-0.16598]	[4.78309]	[4.44363]
DLOG(G(-1))	-0.000494	-0.739099	0.175223	-0.192760	-0.243462
	(0.04125)	(0.22693)	(0.06938)	(0.22257)	(0.17544)
	[-0.01197]	[-3.25694]	[2.52554]	[-0.86606]	[-1.38776]
DLOG(X(-1))	0.008890	-0.085158	0.014154	-0.162643	-0.210685
	(0.01355)	(0.07455)	(0.02279)	(0.07312)	(0.05764)
	[0.65600]	[-1.14223]	[0.62098]	[-2.22427]	[-3.65542]
DLOG(IM(-1))	0.014435	0.180666	0.037131	-0.248075	-0.125024
	(0.01706)	(0.09383)	(0.02869)	(0.09203)	(0.07254)
	[0.84631]	[1.92543]	[1.29432]	[-2.69564]	[-1.72353]
R-squared	0.103307	0.243295	0.024228	0.185916	0.357881
Adj. R-squared	0.081957	0.225278	0.000995	0.166533	0.342593
Sum sq. resids	0.009171	0.277561	0.025944	0.266995	0.165884
S.E. equation	0.006608	0.036355	0.011115	0.035657	0.028106
F-statistic	4.838776	13.50381	1.042832	9.591755	23.40847
Log likelihood	780.7474	412.4646	668.4339	416.6560	468.0578
Akaike AIC	-7.173587	-3.763562	-6.133647	-3.802371	-4.278313
Schwarz SC	-7.079830	-3.669804	-6.039889	-3.708613	-4.184556
Mean dependent	0.008863	0.010541	0.005028	0.015257	0.015352
S.D. dependent	0.006897	0.041304	0.011121	0.039057	0.034664

Determinant resid covariance (dof adj.)	5.07E-16
Determinant resid covariance	4.29E-16
Log likelihood	1982.768
Akaike information criterion	-18.02563
Schwarz criterion	-17.46308

Figure A.1.1: 1954Q1-2007Q4 Impulse Response



Accumulated response to generalized one s.d. innovations $\pm$ 2 s.e.

Subsample 1: 1954Q1 to 1979Q4

Table A.1.4: Lag Order Selection Information Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DLOG(C01) DLOG(I) DLOG(G) DLOG(X) DLOG(IM) RES
Exogenous variables: C
Sample: 1954Q1 1979Q4
Included observations: 104

Lag	LogL	LR	FPE	AIC	SC	HQ
0	701.6998	NA	6.23e-14	-13.37884	-13.22628	-13.31704
1	995.9937	548.9714*	4.35e-16*	-18.34603*	-17.27811*	-17.91338*
2	1015.347	33.86848	6.03e-16	-18.02591	-16.04261	-17.22242
3	1039.731	39.85867	7.66e-16	-17.80252	-14.90387	-16.62819
4	1068.532	43.75432	9.09e-16	-17.66407	-13.85004	-16.11890
5	1089.391	29.28354	1.28e-15	-17.37291	-12.64351	-15.45689
6	1120.795	40.46320	1.53e-15	-17.28453	-11.63977	-14.99767
7	1149.853	34.08673	1.97e-15	-17.15102	-10.59089	-14.49332
8	1194.934	47.68161	1.96e-15	-17.32565	-9.850159	-14.29711
9	1240.967	43.37742	2.03e-15	-17.51859	-9.127738	-14.11921
10	1287.855	38.77282	2.26e-15	-17.72798	-8.421758	-13.95776

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Subsample 1: 1954Q1 to 1979Q4

Table A.1.5: Granger Causality/ Block Exogeneity Wald Tests

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1954Q1 1979Q4
Included observations: 104

Dependent variable: DLOG(G)

Excluded	Chi-sq	df	Prob.
DLOG(C)	0.002342	1	0.9614
DLOG(I)	0.003235	1	0.9546
DLOG(X)	0.936869	1	0.3331
DLOG(IM)	0.270483	1	0.6030
All	4.321569	5	0.5041

Dependent variable: DLOG(C)

Excluded	Chi-sq	df	Prob.
DLOG(I)	6.214087	1	0.0127
DLOG(G)	0.217618	1	0.6409
DLOG(X)	1.243560	1	0.2648
DLOG(IM)	0.016295	1	0.8984
All	13.06411	5	0.0228

Dependent variable: DLOG(X)

Excluded	Chi-sq	df	Prob.
DLOG(C)	1.151845	1	0.2832
DLOG(I)	8.638991	1	0.0033
DLOG(G)	1.501511	1	0.2204
DLOG(IM)	1.881838	1	0.1701
All	18.89508	5	0.0020

Dependent variable: DLOG(I)

Excluded	Chi-sq	df	Prob.
DLOG(C)	16.73498	1	0.0000
DLOG(G)	2.569113	1	0.1090
DLOG(X)	0.507658	1	0.4762
DLOG(IM)	2.370203	1	0.1237
All	24.81302	5	0.0002

Dependent variable: DLOG(IM)

Excluded	Chi-sq	df	Prob.
DLOG(C)	17.38125	1	0.0000
DLOG(I)	4.183714	1	0.0408
DLOG(G)	0.699718	1	0.4029
DLOG(X)	9.644113	1	0.0019
All	48.83401	5	0.0000

Subsample 1: 1954Q1 to 1979Q4

Table A.1.6: 1954Q1 to 1979Q4 VAR Estimation Output

Vector Autoregression Estimates
Sample: 1954Q1 1979Q4
Included observations: 104
Standard errors in ( ) & t-statistics in [ ]

	DLOG(C)	DLOG(I)	DLOG(G)	DLOG(X)	DLOG(IM)
DLOG(C(-1))	0.154615	2.476312	-0.009060	0.688316	2.103532
	(0.10030)	(0.60533)	(0.18721)	(0.64134)	(0.50456)
	[1.54156]	[4.09084]	[-0.04840]	[1.07324]	[4.16908]
DLOG(I(-1))	0.043238	-0.097699	0.001841	0.325991	0.178473
	(0.01735)	(0.10468)	(0.03238)	(0.11091)	(0.08726)
	[2.49281]	[-0.93328]	[0.05688]	[2.93922]	[2.04541]
DLOG(G(-1))	-0.024799	-0.514255	0.233954	-0.416533	-0.223699
	(0.05316)	(0.32084)	(0.09923)	(0.33993)	(0.26743)
	[-0.46650]	[-1.60285]	[2.35778]	[-1.22536]	[-0.83649]
DLOG(X(-1))	0.019125	-0.073748	0.030984	-0.332052	-0.267922
	(0.01715)	(0.10351)	(0.03201)	(0.10966)	(0.08627)
	[1.11515]	[-0.71250]	[0.96792]	[-3.02793]	[-3.10550]
DLOG(IM(-1))	-0.002699	0.196462	0.020526	-0.185470	-0.110115
	(0.02114)	(0.12761)	(0.03947)	(0.13520)	(0.10637)
	[-0.12765]	[1.53955]	[0.52008]	[-1.37180]	[-1.03526]
R-squared	0.198488	0.214500	0.093998	0.286022	0.354201
Adj. R-squared	0.148909	0.165912	0.037957	0.241859	0.314254
Sum sq. resids	0.004883	0.177853	0.017012	0.199645	0.123565
S.E. equation	0.007095	0.042820	0.013243	0.045367	0.035691
F-statistic	4.003533	4.414691	1.677297	6.476431	8.866914
Log likelihood	370.6858	183.7321	305.7797	177.7219	202.6703
Akaike AIC	-6.993957	-3.398694	-5.745763	-3.283113	-3.762890
Schwarz SC	-6.815969	-3.220706	-5.567775	-3.105126	-3.584902
Mean dependent	0.009593	0.012276	0.004565	0.016711	0.014897
S.D. dependent	0.007691	0.046886	0.013502	0.052104	0.043100

Determinant resid covariance (dof adj.)	2.94E-16
Determinant resid covariance	1.94E-16
Log likelihood	995.9937
Akaike information criterion	-18.34603
Schwarz criterion	-17.27811

Subsample 1:

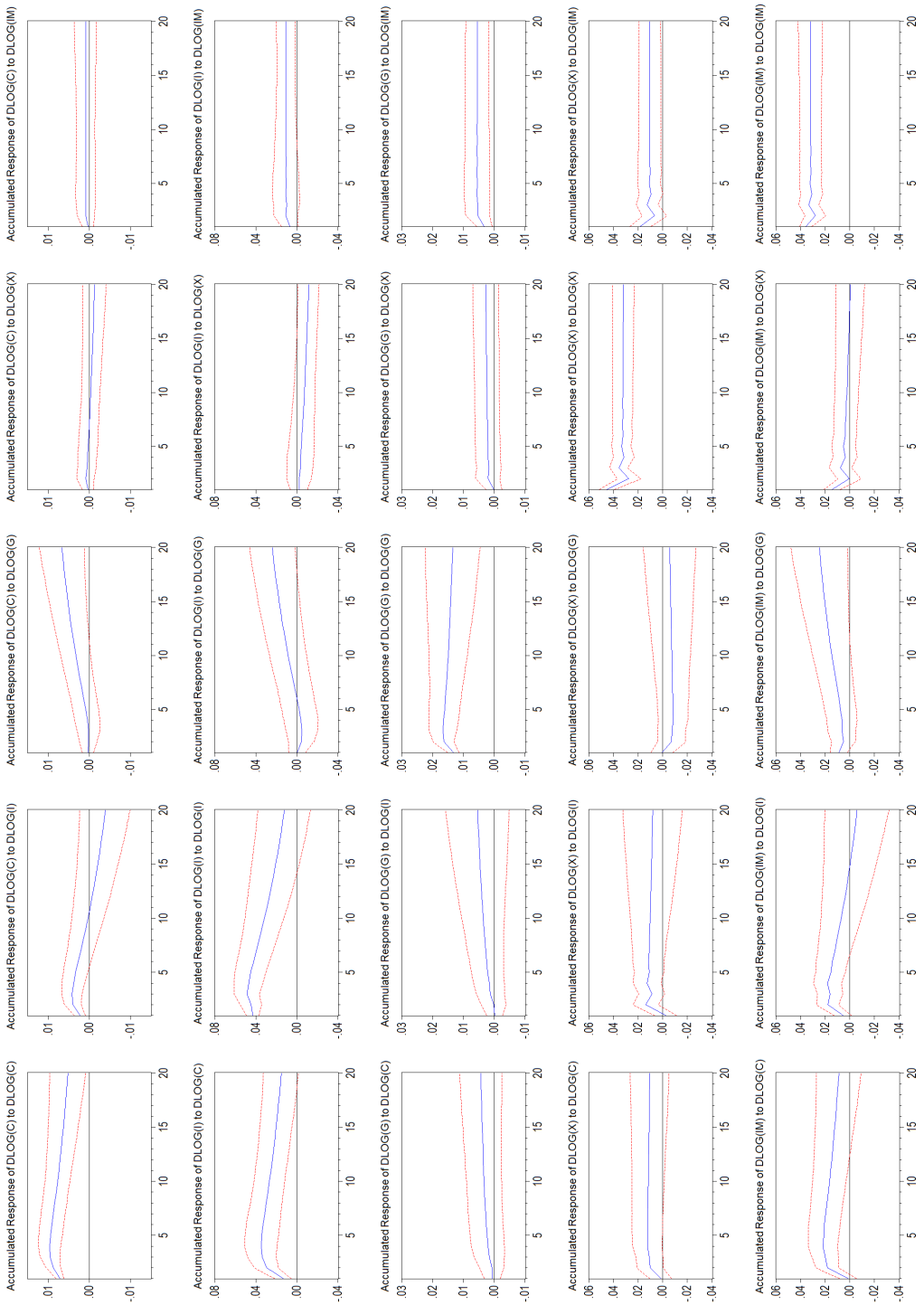


Figure A.1.2: 1954Q1 to 1979Q4 Impulse Response Analysis

Accumulated response to generalized one s.d. innovations $\pm$ 2 s.e.

Subsample 2: 1980Q1 to 2007Q4

Table A.1.7: Lag Order Selection Information Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DLOG(C01) DLOG(I) DLOG(G) DLOG(X) DLOG(IM) RES
Exogenous variables: C
Sample: 1980Q1 2007Q4
Included observations: 112

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1030.141	NA	4.60e-16	-18.28823	-18.14260	-18.22915
1	1226.656	368.4661	2.62e-17*	-21.15458*	-20.13514*	-20.74096*
2	1249.131	39.73108	3.35e-17	-20.91305	-19.01980	-20.14490
3	1282.662	55.68563*	3.55e-17	-20.86896	-18.10191	-19.74628
4	1313.084	47.26313	4.03e-17	-20.76936	-17.12851	-19.29215
5	1339.142	37.69121	5.02e-17	-20.59182	-16.07717	-18.76008
6	1362.773	31.64833	6.69e-17	-20.37094	-14.98249	-18.18468
7	1391.709	35.65351	8.34e-17	-20.24480	-13.98255	-17.70401
8	1420.224	32.07971	1.09e-16	-20.11115	-12.97509	-17.21582
9	1463.164	43.70602	1.15e-16	-20.23506	-12.22520	-16.98521
10	1504.372	37.52884	1.32e-16	-20.32807	-11.44440	-16.72368

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Subsample 2: 1980Q1 to 2007Q4

Table A.1.8: Granger Causality/ Block Exogeneity Wald Tests

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1980Q1 2007Q4
Included observations: 112

Dependent variable: DLOG(G)

Excluded	Chi-sq	df	Prob.
DLOG(C)	0.120294	1	0.7287
DLOG(I)	0.044073	1	0.8337
DLOG(X)	7.145820	1	0.0075
DLOG(IM)	2.078046	1	0.1494
All	10.13392	5	0.0715

Dependent variable: DLOG(C)

Excluded	Chi-sq	df	Prob.
DLOG(I)	0.088911	1	0.7656
DLOG(G)	0.000281	1	0.9866
DLOG(X)	2.556843	1	0.1098
DLOG(IM)	3.430538	1	0.0640
All	10.21395	5	0.0694

Dependent variable: DLOG(X)

Excluded	Chi-sq	df	Prob.
DLOG(C)	2.666598	1	0.1025
DLOG(I)	3.127272	1	0.0770
DLOG(G)	0.340398	1	0.5596
DLOG(IM)	0.703762	1	0.4015
All	8.632651	5	0.1246

Dependent variable: DLOG(I)

Excluded	Chi-sq	df	Prob.
DLOG(C)	55.95985	1	0.0000
DLOG(G)	8.569044	1	0.0034
DLOG(X)	1.197152	1	0.2739
DLOG(IM)	0.294616	1	0.5873
All	65.82706	5	0.0000

Dependent variable: DLOG(IM)

Excluded	Chi-sq	df	Prob.
DLOG(C)	51.79140	1	0.0000
DLOG(I)	22.65940	1	0.0000
DLOG(G)	3.342964	1	0.0675
DLOG(X)	0.807711	1	0.3688
All	78.51976	5	0.0000

Subsample 2: 1980Q1 to 2007Q4

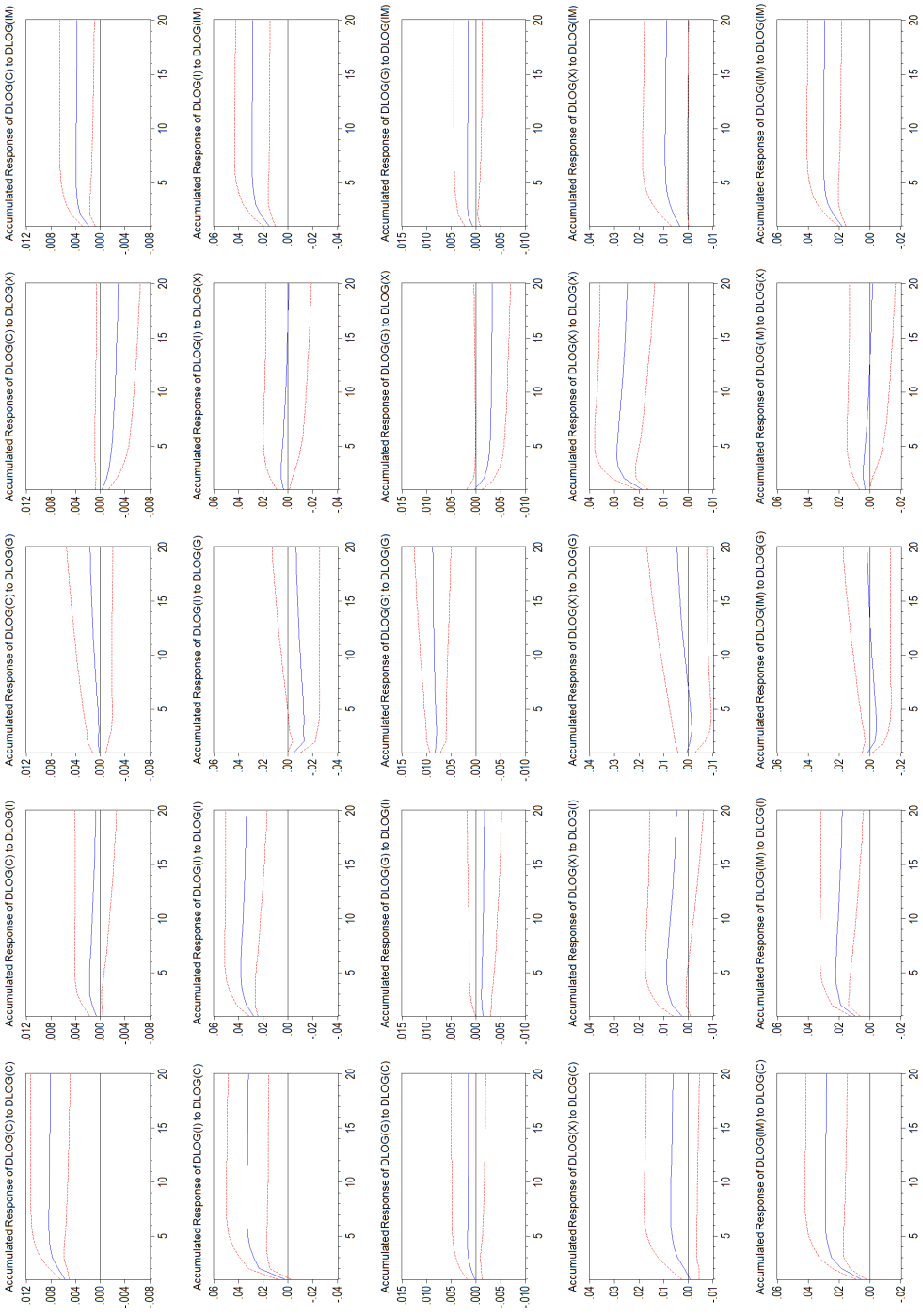
Table A.1.9: 1980Q1 to 2007Q4 VAR Estimation Output

Vector Autoregression Estimates
Sample: 1980Q1 2007Q4
Included observations: 112
Standard errors in ( ) & t-statistics in [ ]

	DLOG(C)	DLOG(I)	DLOG(G)	DLOG(X)	DLOG(IM)
DLOG(C(-1))	0.113084	3.623158	0.049434	0.532034	2.252006
	(0.09970)	(0.48434)	(0.14253)	(0.32581)	(0.31293)
	[1.13424]	[7.48063]	[0.34683]	[1.63297]	[7.19662]
DLOG(I(-1))	0.006636	0.099133	-0.006679	0.128602	0.332484
	(0.02225)	(0.10811)	(0.03181)	(0.07272)	(0.06985)
	[0.29818]	[0.91699]	[-0.20994]	[1.76841]	[4.76019]
DLOG(G(-1))	0.001148	-0.973529	-0.044307	-0.130523	-0.392862
	(0.06846)	(0.33257)	(0.09787)	(0.22371)	(0.21487)
	[0.01677]	[-2.92729]	[-0.45272]	[-0.58344]	[-1.82838]
DLOG(X(-1))	-0.044102	0.146599	-0.105399	0.389073	0.077800
	(0.02758)	(0.13399)	(0.03943)	(0.09013)	(0.08657)
	[-1.59901]	[1.09414]	[-2.67317]	[4.31680]	[0.89873]
DLOG(IM(-1))	0.065008	-0.092548	0.072330	-0.096219	-0.214936
	(0.03510)	(0.17051)	(0.05018)	(0.11470)	(0.11016)
	[1.85217]	[-0.54279]	[1.44154]	[-0.83891]	[-1.95110]
R-squared	0.139419	0.414685	0.088063	0.227485	0.489976
Adj. R-squared	0.090242	0.381239	0.035952	0.183342	0.460831
Sum sq. resids	0.003467	0.081814	0.007085	0.037021	0.034152
S.E. equation	0.005746	0.027914	0.008214	0.018777	0.018035
F-statistic	2.835088	12.39845	1.689921	5.153290	16.81209
Log likelihood	422.5290	245.5000	382.5026	289.9057	294.4238
Akaike AIC	-7.420161	-4.258929	-6.705403	-5.051887	-5.132568
Schwarz SC	-7.250255	-4.089023	-6.535497	-4.881981	-4.962661
Mean dependent	0.008185	0.008930	0.005457	0.013907	0.015776
S.D. dependent	0.006024	0.035486	0.008366	0.020778	0.024561

Determinant resid covariance (dof adj.)	1.82E-17
Determinant resid covariance	1.24E-17
Log likelihood	1226.656
Akaike information criterion	-21.15458
Schwarz criterion	-20.13514

Figure A.1.3: 1980Q1 to 2007Q4 Impulse Response



Accumulated response to generalized one s.d. innovations $\pm$ 2 s.e.

Subsample 3: 1990Q1 to 2007Q4

Table A.1.10: Lag Order Selection Information Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DLOG(C01) DLOG(I) DLOG(G) DLOG(X) DLOG(IM) RES
Exogenous variables: C
Sample: 1990Q1 2007Q4
Included observations: 72

Lag	LogL	LR	FPE	AIC	SC	HQ
0	758.9038	NA	3.33e-17	-20.91400	-20.72427	-20.83847
1	875.4356	210.4046*	3.57e-18*	-23.15099	-21.82293*	-22.62229*
2	892.2462	27.55074	6.20e-18	-22.61795	-20.15156	-21.63607
3	924.3764	47.30271	7.28e-18	-22.51046	-18.90573	-21.07540
4	949.6141	32.94926	1.09e-17	-22.21150	-17.46845	-20.32328
5	978.4058	32.79053	1.59e-17	-22.01127	-16.12988	-19.66987
6	1012.089	32.74740	2.27e-17	-21.94691	-14.92719	-19.15234
7	1058.154	37.10826	2.69e-17	-22.22651	-14.06845	-18.97876
8	1112.414	34.66579	3.25e-17	-22.73372	-13.43733	-19.03280
9	1180.686	32.23967	4.00e-17	-23.63017	-13.19545	-19.47607
10	1283.579	31.43962	4.12e-17	-25.48831*	-13.91526	-20.88105

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Subsample 2: 1990Q1 to 2007Q4

Table A.1.11: Granger Causality/ Block Exogeneity Wald Tests

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1990Q1 2007Q4
Included observations: 72

Dependent variable: DLOG(G)

Excluded	Chi-sq	df	Prob.
DLOG(C)	0.526002	1	0.4683
DLOG(I)	1.299326	1	0.2543
DLOG(X)	4.979184	1	0.0257
DLOG(IM)	2.937350	1	0.0866
RES	2.819096	1	0.0931
All	19.39017	5	0.0016

Dependent variable: DLOG(C)

Excluded	Chi-sq	df	Prob.
DLOG(I)	3.980040	1	0.0460
DLOG(G)	1.116096	1	0.2908
DLOG(X)	0.597858	1	0.4394
DLOG(IM)	1.896827	1	0.1684
RES	10.92380	1	0.0009
All	27.26872	5	0.0001

Dependent variable: DLOG(X)

Excluded	Chi-sq	df	Prob.
DLOG(C)	0.398958	1	0.5276
DLOG(I)	0.187310	1	0.6652
DLOG(G)	0.325712	1	0.5682
DLOG(IM)	0.640778	1	0.4234
RES	1.291732	1	0.2557
All	10.86161	5	0.0542

Dependent variable: DLOG(I)

Excluded	Chi-sq	df	Prob.
DLOG(C)	10.32018	1	0.0013
DLOG(G)	0.456693	1	0.4992
DLOG(X)	0.402994	1	0.5255
DLOG(IM)	3.657340	1	0.0558
RES	4.188011	1	0.0407
All	37.75968	5	0.0000

Dependent variable: DLOG(IM)

Excluded	Chi-sq	df	Prob.
DLOG(C)	12.01149	1	0.0005
DLOG(I)	4.290335	1	0.0383
DLOG(G)	0.162583	1	0.6868
DLOG(X)	1.851675	1	0.1736
RES	0.668350	1	0.4136
All	22.05719	5	0.0005

Subsample 2: 1990Q1 to 2007Q4

Table A.1.12: 1990Q1 to 2007Q4 VAR Estimation Output

Vector Autoregression Estimates
Sample: 1990Q1 2007Q4
Included observations: 72
Standard errors in ( ) & t-statistics in [ ]

	DLOG(C)	DLOG(I)	DLOG(G)	DLOG(X)	DLOG(IM)
DLOG(C(-1))	0.126308	2.523738	-0.282061	-0.348285	1.215984
	(0.12413)	(0.62033)	(0.20289)	(0.54661)	(0.39834)
	[1.01751]	[4.06837]	[-1.39022]	[-0.63717]	[3.05262]
DLOG(I(-1))	0.053444	-0.124690	-0.060656	0.040322	0.176811
	(0.02652)	(0.13255)	(0.04335)	(0.11680)	(0.08512)
	[2.01487]	[-0.94070]	[-1.39913]	[0.34523]	[2.07729]
DLOG(G(-1))	0.040384	-0.122881	-0.044710	-0.275503	-0.076372
	(0.07174)	(0.35852)	(0.11726)	(0.31591)	(0.23022)
	[0.56290]	[-0.34275]	[-0.38130]	[-0.87210]	[-0.33174]
DLOG(X(-1))	-0.062082	0.003268	-0.171707	0.254484	0.145969
	(0.03203)	(0.16005)	(0.05235)	(0.14103)	(0.10278)
	[-1.93834]	[0.02042]	[-3.28011]	[1.80443]	[1.42024]
DLOG(IM(-1))	0.077637	0.497651	0.153596	0.183055	0.167768
	(0.05051)	(0.25244)	(0.08256)	(0.22244)	(0.16210)
	[1.53692]	[1.97139]	[1.86035]	[0.82295]	[1.03497]
R-squared	0.255738	0.375292	0.166093	0.177442	0.413647
Adj. R-squared	0.187037	0.317626	0.089117	0.101514	0.359522
Sum sq. resids	0.001138	0.028425	0.003041	0.022071	0.011721
S.E. equation	0.004185	0.020912	0.006840	0.018427	0.013429
F-statistic	3.722474	6.508095	2.157720	2.336963	7.642441
Log likelihood	295.8134	179.9733	260.4403	189.0826	211.8655
Akaike AIC	-8.022593	-4.804815	-7.040009	-5.057849	-5.690708
Schwarz SC	-7.801251	-4.583472	-6.818667	-4.836507	-5.469365
Mean dependent	0.008140	0.010114	0.004143	0.014400	0.016631
S.D. dependent	0.004641	0.025315	0.007166	0.019440	0.016779

Determinant resid covariance (dof adj.)	2.04E-18
Determinant resid covariance	1.11E-18
Log likelihood	875.4356
Akaike information criterion	-23.15099
Schwarz criterion	-21.82293

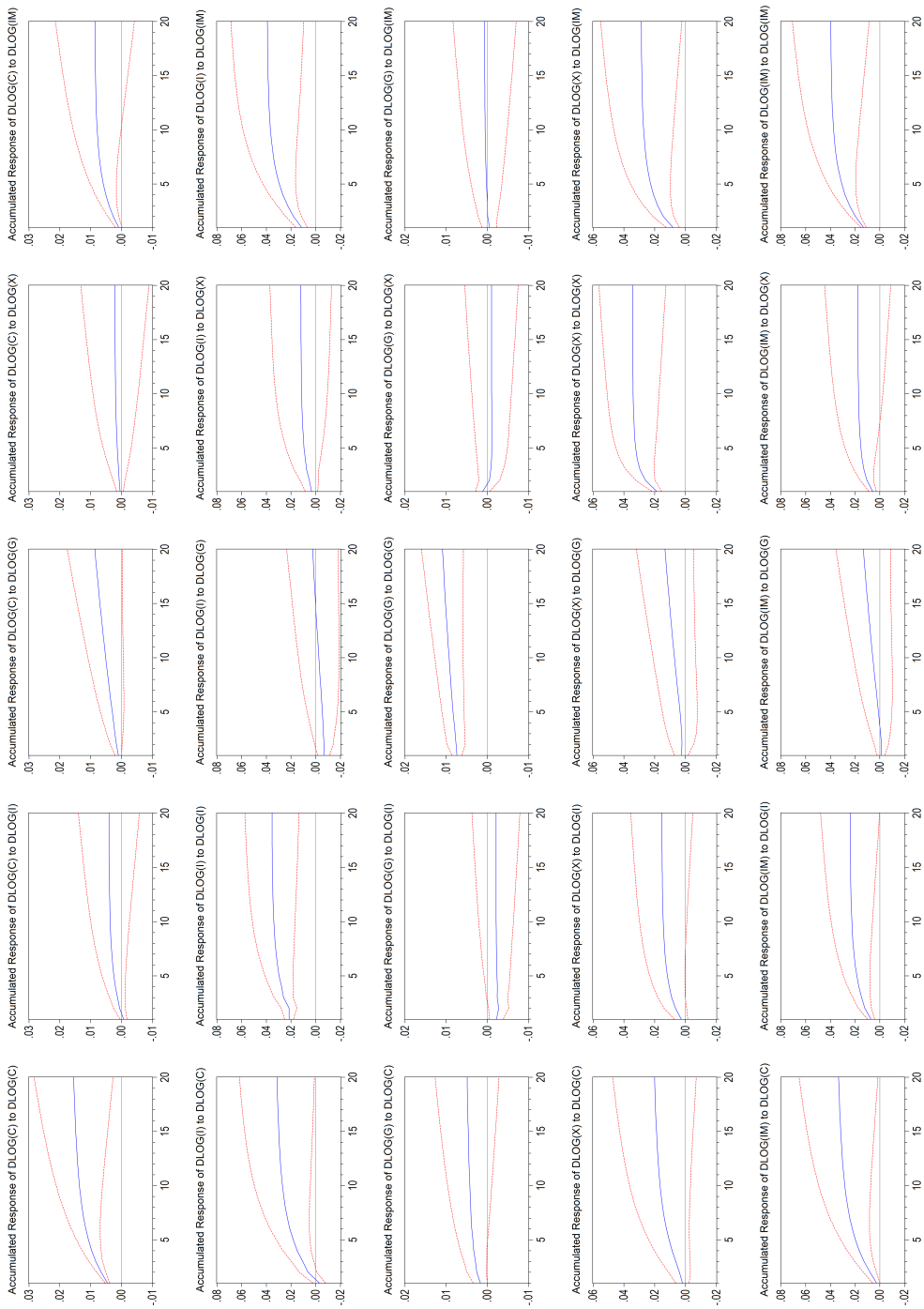


Figure A.1.4: 1990Q1 to 2007Q4 Impulse Response

Accumulated response to generalized one s.d. innovations $\pm$ 2 s.e.

A.2 Aggregate Behavioral Consumption Function

Figure A.2.1: Bottom 90% Consumption Function Regression Residuals

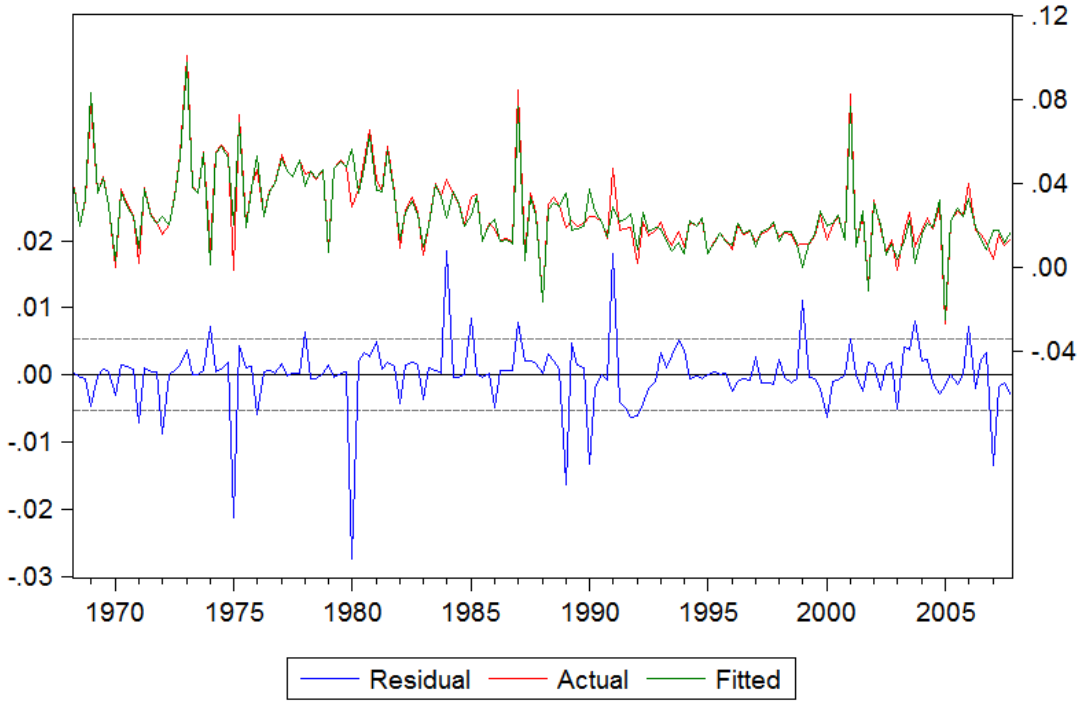


Table A.2.1: Bottom 90% Consumption Function Estimation Results with Standardized Coefficients

Scaled Coefficients
Sample: 1962Q1 2007Q4
Included observations: 159

Variable	Coefficient	Standardized Coefficient	Elasticity at Means	Variable	Coefficient	Standardized Coefficient	Elasticity at Means
1968Q2 - 1986Q4 -- 75 obs				1994Q2 - 2002Q1 -- 32 obs			
DLOG(Y90)	1.082661	1.197203	0.683101	DLOG(Y90)	1.083863	0.530161	0.131384
DLOG(C101)	-0.054532	-0.115123	-0.038520	DLOG(C101)	0.131418	0.153920	0.023285
DLOG(C1)	-0.072223	-0.621745	-0.031328	DLOG(C1)	-0.103482	-0.105257	-0.010217
DLOG(RCREDIT)	0.009325	0.034750	0.012766	DLOG(RCREDIT)	-0.025602	-0.019097	-0.005752
DLOG(NRCREDIT)	0.058270	0.063580	0.036644	DLOG(NRCREDIT)	-0.020686	-0.012557	-0.004166
C	-0.001754	-0.047745	-0.031855	C	0.000135	0.002955	0.001047
1987Q1 - 1994Q1 -- 29 obs				2002Q2 - 2007Q4 -- 23 obs			
DLOG(Y90)	1.126159	0.609145	0.169223	DLOG(Y90)	0.949282	0.350012	0.069542
DLOG(C101)	-0.020891	-0.021351	-0.003575	DLOG(C101)	0.173778	0.134099	0.023304
DLOG(C1)	0.004693	0.017183	0.002145	DLOG(C1)	-0.008863	-0.027685	-0.001650
DLOG(RCREDIT)	-0.046732	-0.036044	-0.011409	DLOG(RCREDIT)	0.428039	0.197944	0.046930
DLOG(NRCREDIT)	-0.250122	-0.093074	-0.017526	DLOG(NRCREDIT)	0.083501	0.032825	0.009092
C	0.001549	0.032616	0.010877	C	-0.011375	-0.218138	-0.063341

Robustness Tests

Table A.2.2: Bottom 90% Consumption Function Regression Estimation Results (Using Total Credit)

Dependent Variable: DLOG(C90)
Method: Least Squares with Breaks
Sample: 1968Q2 2007Q4
Included observations: 159
Break type: Bai tests of breaks in all recursively determined partitions
Break selection: Trimming 0.15, Max. breaks 5, Sig. level 0.05
Breaks: 1987Q1, 1993Q2, 2002Q2
White heteroskedasticity-consistent standard errors & covariances
Allow heterogeneous error distributions across breaks

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1968Q2 - 1986Q4 -- 75 obs				
DLOG(Y90)	1.081380	0.048167	22.45055	0.0000
DLOG(C101)	-0.057621	0.028310	-2.035332	0.0437
DLOG(C1)	-0.072304	0.003910	-18.49265	0.0000
DLOG(CREDIT)	0.079160	0.038803	2.040057	0.0432
C	-0.001849	0.001461	-1.265495	0.2078
1987Q1 - 1993Q1 -- 25 obs				
DLOG(Y90)	1.181329	0.104350	11.32079	0.0000
DLOG(C101)	-0.006834	0.063680	-0.107315	0.9147
DLOG(C1)	0.002459	0.007684	0.320015	0.7494
DLOG(CREDIT)	-0.409028	0.179065	-2.284241	0.0239
C	0.002320	0.004912	0.472250	0.6375
1993Q2 - 2002Q1 -- 36 obs				
DLOG(Y90)	1.092768	0.093473	11.69069	0.0000
DLOG(C101)	0.122985	0.033233	3.700679	0.0003
DLOG(C1)	-0.074534	0.023375	-3.188545	0.0018
DLOG(CREDIT)	-0.012835	0.041055	-0.312617	0.7550
C	-0.000982	0.001727	-0.568899	0.5703
2002Q2 - 2007Q4 -- 23 obs				
DLOG(Y90)	0.877020	0.122161	7.179227	0.0000
DLOG(C101)	0.125684	0.051439	2.443388	0.0158
DLOG(C1)	-0.011803	0.010268	-1.149512	0.2523
DLOG(CREDIT)	0.754692	0.261181	2.889539	0.0045
C	-0.013903	0.004923	-2.824171	0.0054

R-squared	0.927594	Mean dependent var	0.025976
Adjusted R-squared	0.917697	S.D. dependent var	0.018400
S.E. of regression	0.005279	Akaike info criterion	-7.533185
Sum squared resid	0.003873	Schwarz criterion	-7.147160
Log likelihood	618.8882	Hannan-Quinn criter.	-7.376425
F-statistic	93.72304	Durbin-Watson stat	2.095578
Prob(F-statistic)	0.000000		

Figure A.2.2: Bottom 90% Consumption Function Regression Residuals (Controlling for CPI)

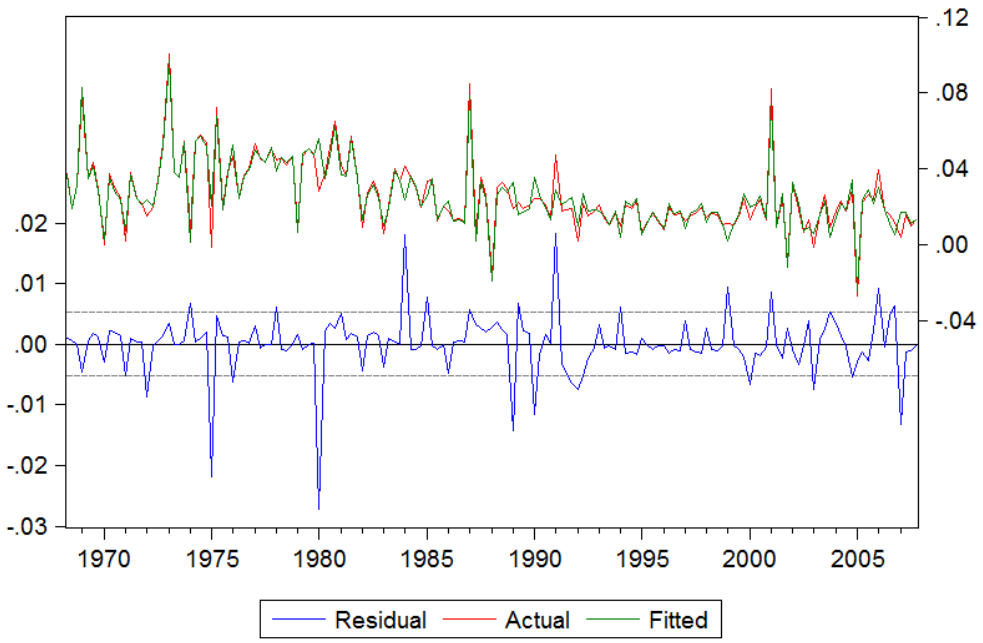


Table A.2.3: Bottom 90% Consumption Function Estimation Results with Standardized Coefficients (Using Total Credit)

Scaled Coefficients
Sample: 1968Q2 2007Q4
Included observations: 159

Variable	Coefficient	Standardized Coefficient	Elasticity at Means	Variable	Coefficient	Standardized Coefficient	Elasticity at Means
1968Q2 - 1986Q4 -- 75 obs				1993Q2 - 2002Q1 -- 36 obs			
DLOG(Y90)	1.081380	1.195786	0.682293	DLOG(Y90)	1.092768	0.542172	0.146458
DLOG(C101)	-0.057621	-0.121642	-0.040701	DLOG(C101)	0.122985	0.146035	0.024449
DLOG(C1)	-0.072304	-0.622441	-0.031363	DLOG(C1)	-0.074534	-0.096678	-0.011502
DLOG(CREDIT)	0.079160	0.089609	0.054152	DLOG(CREDIT)	-0.012835	-0.008456	-0.003005
C	-0.001849	-0.050320	-0.033573	C	-0.000982	-0.022415	-0.008563
1987Q1 - 1993Q1 -- 25 obs				2002Q2 - 2007Q4 -- 23 obs			
DLOG(Y90)	1.181329	0.632326	0.162385	DLOG(Y90)	0.877020	0.323369	0.064249
DLOG(C101)	-0.006834	-0.006847	-0.001022	DLOG(C101)	0.125684	0.096986	0.016854
DLOG(C1)	0.002459	0.008805	0.000987	DLOG(C1)	-0.011803	-0.036868	-0.002198
DLOG(CREDIT)	-0.409028	-0.158677	-0.038913	DLOG(CREDIT)	0.754692	0.305011	0.082393
C	0.002320	0.046037	0.014041	C	-0.013903	-0.266627	-0.077421

Table A.2.4: Bottom 90% Consumption Function Regression Estimation Results (Controlling for CPI)

Dependent Variable: DLOG(C90)
Method: Least Squares with Breaks
Sample (adjusted): 1968Q2 2007Q4
Included observations: 159 after adjustments
Break type: Bai tests of breaks in all recursively determined partitions
Break selection: Trimming 0.15, Max. breaks 5, Sig. level 0.05
Breaks: 1987Q1, 1994Q2, 2002Q2
White heteroskedasticity-consistent standard errors & covariances
Allow heterogeneous error distributions across breaks

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1968Q2 - 1986Q4 -- 75 obs				
DLOG(Y90)	1.115760	0.050621	22.04131	0.0000
DLOG(C101)	-0.050874	0.028281	-1.798892	0.0743
DLOG(C1)	-0.071809	0.004269	-16.82173	0.0000
DLOG(RCREDIT)	0.010198	0.008993	1.134002	0.2589
DLOG(NRCREDIT)	0.065651	0.039567	1.659237	0.0995
DLOG(CPI)	-0.103193	0.169756	-0.607892	0.5443
C	-0.001765	0.001744	-1.011659	0.3136
1987Q1 - 1994Q1 -- 29 obs				
DLOG(Y90)	1.161574	0.085692	13.55518	0.0000
DLOG(C101)	-0.028051	0.056294	-0.498301	0.6191
DLOG(C1)	0.004702	0.008375	0.561400	0.5755
DLOG(RCREDIT)	0.033895	0.121088	0.279921	0.7800
DLOG(NRCREDIT)	-0.261100	0.165869	-1.574129	0.1179
DLOG(CPI)	-0.465883	0.428517	-1.087199	0.2789
C	0.002828	0.005003	0.565305	0.5728

Variable	Coefficient	Std. Error	t-Statistic	Prob.
1994Q2 - 2002Q1 -- 32 obs				
DLOG(Y90)	1.152480	0.093546	12.31998	0.0000
DLOG(C101)	0.153086	0.039787	3.847640	0.0002
DLOG(C1)	-0.113026	0.020395	-5.541886	0.0000
DLOG(RCREDIT)	0.010751	0.032466	0.331161	0.7411
DLOG(NRCREDIT)	-0.012030	0.046239	-0.260175	0.7951
DLOG(CPI)	-0.585097	0.318655	-1.836149	0.0686
C	0.000951	0.001664	0.571745	0.5685
2002Q2 - 2007Q4 -- 23 obs				
DLOG(Y90)	1.031187	0.070502	14.62635	0.0000
DLOG(C101)	0.205263	0.033606	6.108020	0.0000
DLOG(C1)	-0.009620	0.004780	-2.012471	0.0462
DLOG(RCREDIT)	0.464281	0.091135	5.094441	0.0000
DLOG(NRCREDIT)	0.115425	0.141630	0.814977	0.4166
DLOG(CPI)	-0.644874	0.186324	-3.461030	0.0007
C	-0.009832	0.002951	-3.331719	0.0011

R-squared	0.932935	Mean dependent var	0.025976
Adjusted R-squared	0.919112	S.D. dependent var	0.018400
S.E. of regression	0.005233	Akaike info criterion	-7.509180
Sum squared resid	0.003587	Schwarz criterion	-6.968744
Log likelihood	624.9798	Hannan-Quinn criter.	-7.289714
F-statistic	67.49365	Durbin-Watson stat	2.091872
Prob(F-statistic)	0.000000		

Figure A.2.3: Bottom 90% Consumption Function Regression Residuals (Controlling for CPI)

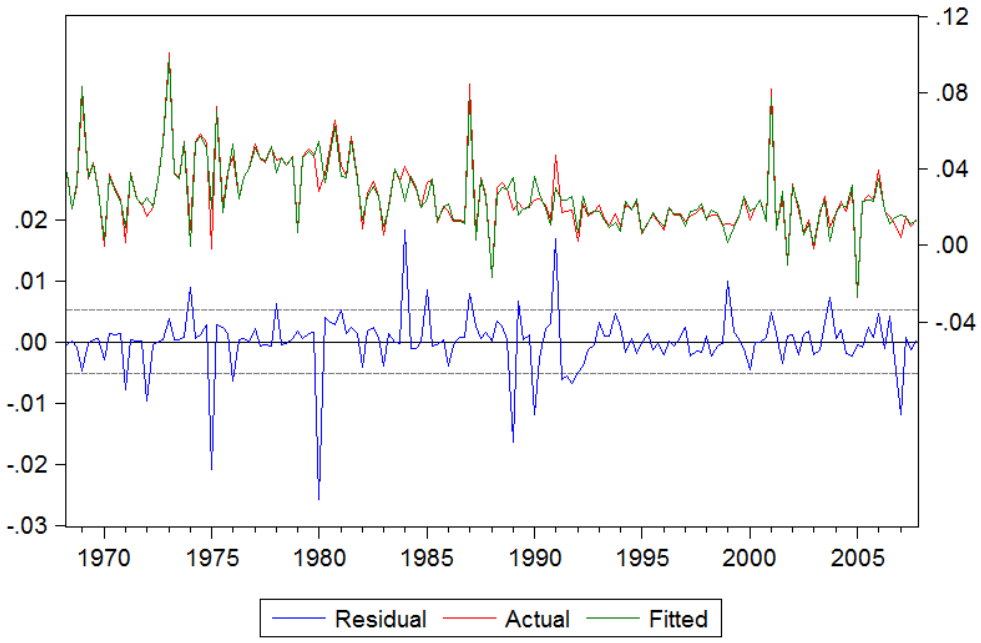


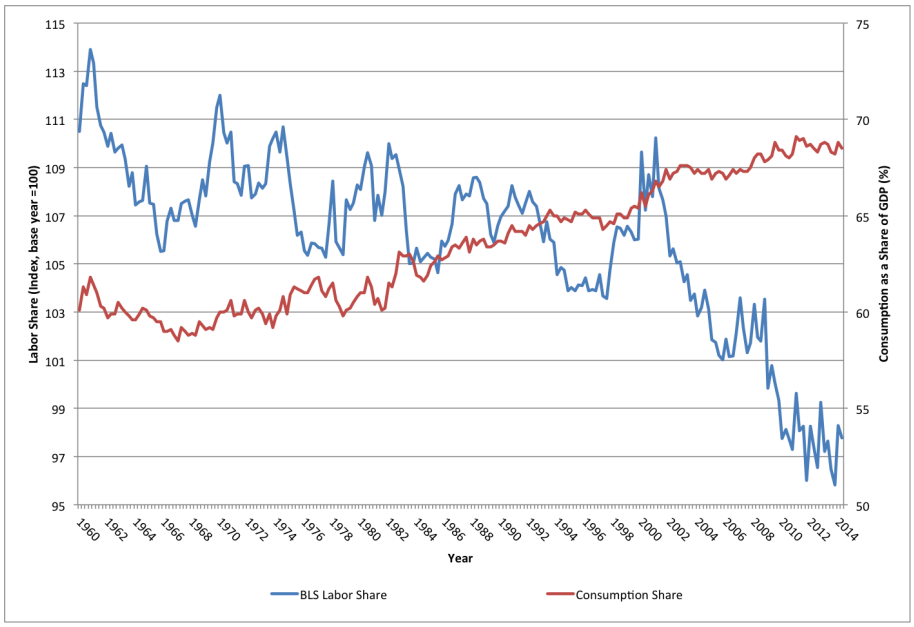
Table A.2.5: Bottom 90% Consumption Function Estimation Results with Standardized Coefficients (Controlling for CPI)

Scaled Coefficients
Sample: 1968Q1 2007Q4
Included observations: 159

Variable	Coefficient	Standardized Coefficient	Elasticity at Means	Variable	Coefficient	Standardized Coefficient	Elasticity at Means
1968Q2 - 1986Q4 -- 75 obs				1994Q2 - 2002Q1 -- 32 obs			
DLOG(Y90)	1.115760	1.233804	0.703985	DLOG(Y90)	1.152480	0.563725	0.139702
DLOG(C101)	-0.050874	-0.107400	-0.035936	DLOG(C101)	0.153086	0.179298	0.027124
DLOG(C1)	-0.071809	-0.618174	-0.031148	DLOG(C1)	-0.113026	-0.114965	-0.011160
DLOG(RCREDIT)	0.010198	0.038002	0.013961	DLOG(RCREDIT)	0.010751	0.008020	0.002416
DLOG(NRCREDIT)	0.065651	0.071633	0.041285	DLOG(NRCREDIT)	-0.012030	-0.007303	-0.002423
DLOG(CPI)	-0.103193	-0.054624	-0.029294	DLOG(CPI)	-0.585097	-0.085225	-0.027450
C	-0.001765	-0.048029	-0.032045	C	0.000951	0.020798	0.007372
1987Q1 - 1994Q1 -- 29 obs				2002Q2 - 2007Q4 -- 23 obs			
DLOG(Y90)	1.161574	0.628301	0.174545	DLOG(Y90)	1.031187	0.380212	0.075542
DLOG(C101)	-0.028051	-0.028670	-0.004800	DLOG(C101)	0.205263	0.158394	0.027526
DLOG(C1)	0.004702	0.017214	0.002149	DLOG(C1)	-0.009620	-0.030050	-0.001791
DLOG(RCREDIT)	0.033895	0.026143	0.008275	DLOG(RCREDIT)	0.464281	0.214704	0.050904
DLOG(NRCREDIT)	-0.261100	-0.097159	-0.018295	DLOG(NRCREDIT)	0.115425	0.045374	0.012568
DLOG(CPI)	-0.465883	-0.102793	-0.031998	DLOG(CPI)	-0.644874	-0.105033	-0.026118
C	0.002828	0.059548	0.019859	C	-0.009832	-0.188565	-0.054754

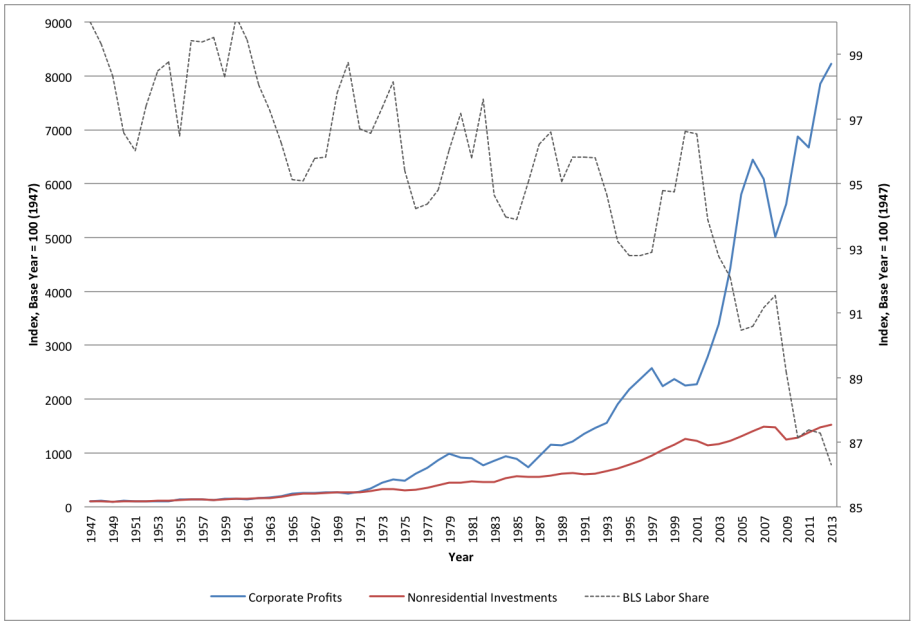
B. Figures

Figure B.1: Labor Share and Consumption Share of GDP



Source: BLS (2014), NIPA (2014)

Figure B.2: Corporate Profits and Nonresidential Investments



Source: FRED (2014), NIPA (2014), Author's Calculations

Figure B.3: Life-cycle Theory of Consumption

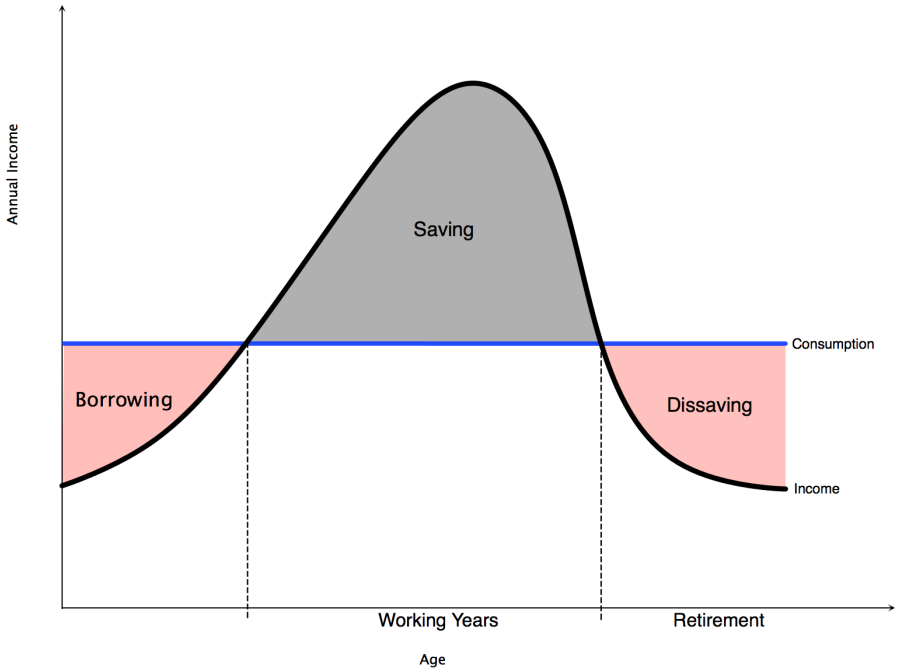
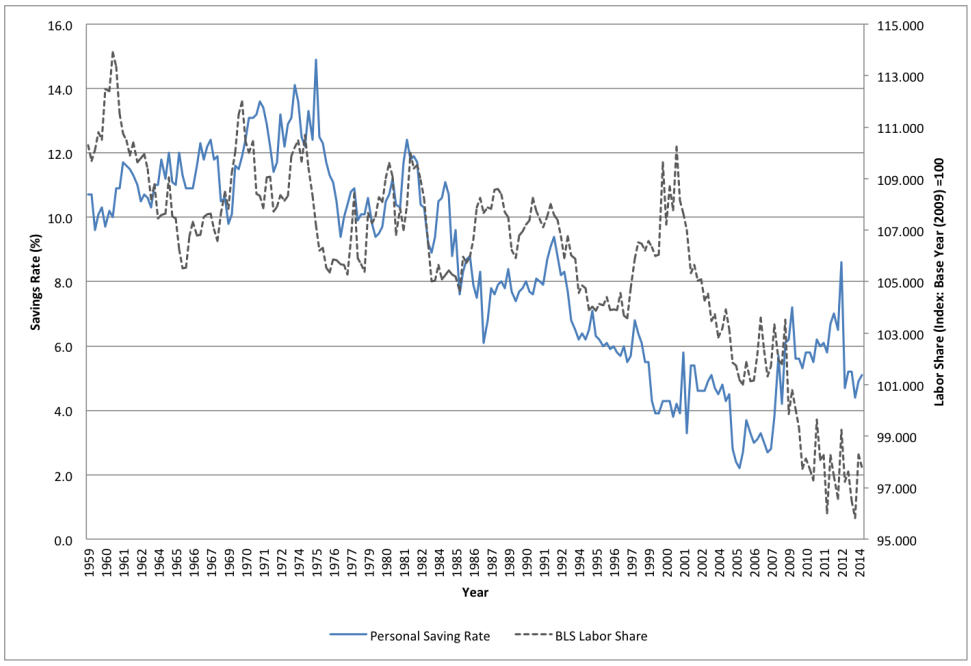
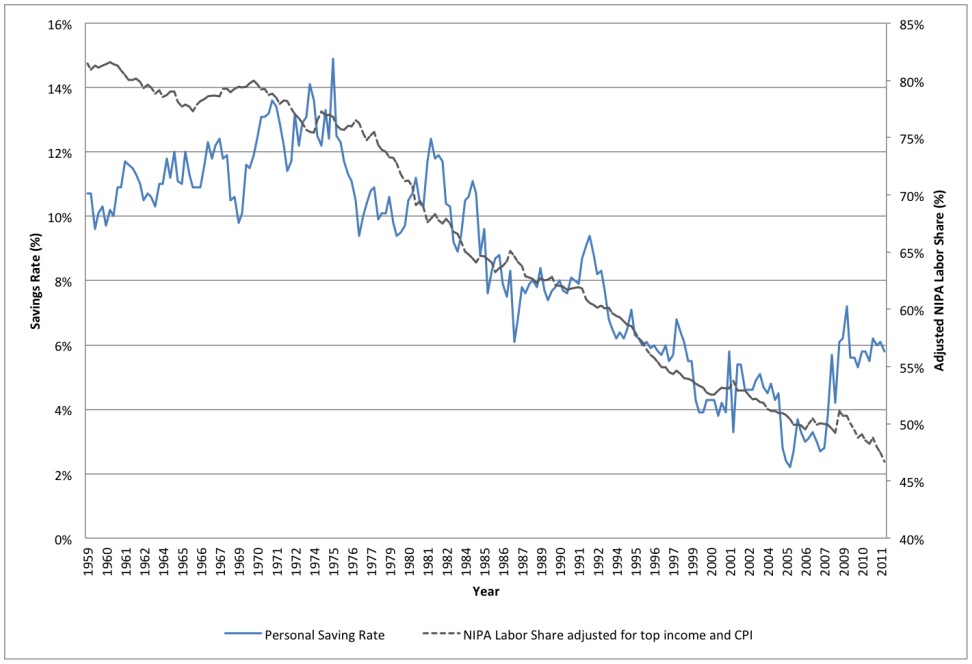


Figure B.4: U.S. Personal Savings Rate Compared to the BLS Labor Share



*Source:*BLS (2014), FRED (2014)

Figure B.5: U.S. Personal Savings Rate Compared to the Adjusted NIPA Labor Share



*Source:*BLS (2014), FRED (2014), NIPA (2014), WTID (2014) Author's Calculations