Spring 2014

Distribution and Debt: How Consumption and Household Debt Can Affect Economic Growth

Jeremy Rees
Trinity College, jeremy.rees@trincoll.edu

Distribution and Debt: How Consumption and Household Debt Can Affect Economic Growth

By

Jeremy Rees

A Thesis Submitted to the Department of Economics
of Trinity College in Partial Fulfillment of the
Requirements for the Bachelor of Science Degree

Economics 498-99

10 April 2014

Table of Contents

Abstract

Over the past 30-40 years, consumer debt has grown substantially faster than income in the United States. As a result, consumption has grown fast relative to national income. The economic growth that we have experienced in the US economy has shown to be unreliable as demonstrated by the Great Recession in 2007-2008. By creating unstable growth, consumer behavior could be an explanation behind the recession as well as the cause of future economic downturns. This paper implements a new theory of consumption practices and tests for the stability of economic growth and sustainability of consumer debt by using a neo-Kaleckian growth model.

1 Introduction

When the Great Recession affected the global economy in 2008, many people wondered what were some of the underlying economic causes of such a crisis. In the US specifically, the housing bubble was one of the major explicit dilemmas that drew attention. While the outward economic issues were obvious, it has become prudent to investigate what some of the possible underlying issues were that caused the Great Recession.

One theory is that the sudden reduction in economic growth was the end result of increased consumer spending. While Keynesian economists argue that increasing consumption actually boosts demand-led growth, there have been innovations to consumption practicies over the past few decades that could have potentially proved hazardous. In the US specifically, consumption has increased at a much faster pace than disposable income over the past half-century or so, while domestic savings have remained relatively constant. One possible explanation for this is a drastic increase in consumption via credit. Thus it is clear that households are consuming outside of their means.

This explanation is related to the aforementioned housing bubble: families were purchasing goods that they could not necessarily afford because there were innovations with regards to mortgaging that allowed them to do so. Similarly, expansion of credit card use has also been a factor that has allowed for consumers to increase spending at a faster rate than their increase in income.

We have built a neo-Kaleckian model of growth that inherently contains a model of consumption that was proposed by Setterfield, Mei, and Kim (Forthcoming A). We have identified aspects of the growth in debt in order to identify if the concurrent economic growth is

stable. If we can identify it to be unstable it could prove to be detrimental to the economy. If we identify unsustainable debt, it would be in the best interest of consumers to adopt new debt accumulation and servicing habits.

While we have discovered that the consumption model we use does not provide unstable growth and/or unsustainable debt, it is important to note that the results Setterfield and Kim (Forthcoming B) find are the opposite, as they use a slightly different model for consumption and debt servicing. This would suggest that further research is necessary and recommended with regards to identifying a possible threshold for the proportion of households that service their debts in the way proposed in this thesis, versus the proportion that service their debts in the manner described by Setterfield and Kim. This threshold could be used to describe the maximum proportion of households that service their debt the way Setterfield and Kim suggest in order for the growth to remain stable and the debt sustainable.

This thesis is organized in the following manner. Chapter 2 is a literature review that addresses issues of income inequality and household debt. Chapter 3 is the construction of the growth and consumption models that we use. Chapter 4 is an analysis of the debt dynamics of the model through a numerical analysis. Chapter 5 is the conclusion. All necessary appendices follow the conclusion.

2 Literature Review

2.1 The Increase in Income Inequality

There has been a long-standing debate on the significance of the distribution of income in the economy. Many mainstream economists have often argued that redistribution towards profits tends to stimulate saving, and hence investment and hence growth. However, Wisman (2009), among others, argues that while the distribution of income has become more unequal since the 1970s, we have seen a decrease in aggregate savings.

The Proposed Benefits of Increased Income Inequality

The majority of thinkers argue that income inequality is not only important, but essential in order to help a society prosper. Adam Smith, widely considered the father of modern economics, is an important reason behind why this thinking exists. Smith developed a classical based economy, which argued for *Laissez-faire* tactics. This passive approach to economics convinced many thinkers that the best way for the economy to run was with as little assistance as possible, and this includes adjusting the distribution of income (Smith 2011 p. 11).

One of the oldest justifications for inequality is the trickle down thesis. This is the idea that savings is automatically equal to investment, which means that if income is redistributed away from profits, it is less likely to be saved and hence invested. This supports the notion that the economy will not grow as fast with a redistribution of income away from profits. We will later argue that savings and investment being equal is not a given, but a necessary condition in order to achieve equilibrium.

As time has gone on, various other theories and explanations have been formed to explain the necessity of income inequality. One of these is the idea that people have a right to keep what they have earned. For example, someone who has earned $3 million in a given year feels that they should not have to give some of that to someone who has earned $3,000. The former feels that he has earned his income through hard work, and that by right it is theirs.

Many economists and others have argued over time that income inequality is essential for a prospering economy, as it promotes competition. Throughout time, the mainstream view has been that income inequality is essential in order for an economy to succeed (Smith 2011). However, the combination of an increase in inequality with increased consumption can no doubt be harmful to the economy.

The Proposed Downsides of Increased Income Inequality

Wisman points out the since the 1970s, we have seen the poorest 20% of Americans' incomes decrease from 5.5% of national income to a mere 4% (p 104, 2009). The same decline in the share of income is shown for the middle 40%, while, in contrast, the most affluent 5% of the nation has seen their income rise from 15.5% to 21.1% of GDP. In addition, he notes that the saving rate for the US has decreased from just over 10% in the early 1980s, to less than 0% (-1.0%) in 2006 (p 90). These results lead to a rejection of the notion that greater disparities in income distribution leads to greater savings/investment.

As Wisman later points out, "wage stagnation and greater inequality created consumption externalities, requiring households to find ways both to meet family needs and to maintain their relative status" (2013, 922). While income inequality has become severe, a growth in wealth inequality is also apparent. Wisman indicates this evidence by noting that mean wealth has grown twice as fast as median wealth in the economy (2013, 923). A growth in wealth and

income inequality throughout the economy would theoretically suppress consumption in the economy. Based on Keynes' theory that consumption increases with income at a decreasing rate, we would expect that as the rich get richer and the poor get poorer, net consumption will fall, namely that the propensity to consume decreases as income increases. This is contrary to the evidence, which we will further investigate later as well.

There are certainly reasons behind the fact that the growth in inequality has been overlooked as a problematic area of the economy. As Palley (2002) points out, the growth in public as well as private debt has caused robust, demand-led growth, which has overshadowed the problems with distribution. In addition, he points out the growth in debt in the household sector, and how financial innovations have allowed for consumption to increase for those households whose relative incomes have decreased.

As I have noted, the growth in income distribution is potentially problematic for the economy. However, it is one of the many rungs on the ladder of the economy that I will outline. We will in turn see how this growth in inequality has helped lead to an increase in household debt accumulation and consumption. We will then see how these two factors simultaneously affect economic growth.

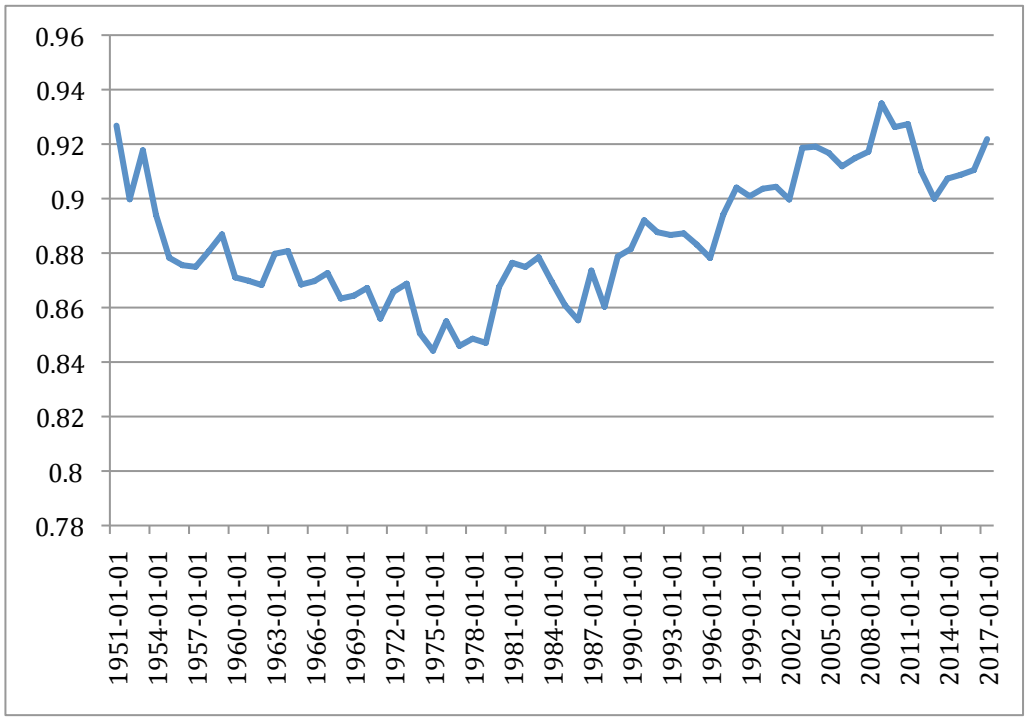
2.2 The Increase in Demand for Credit

Changes In Consumption Behavior

Consumption has always played a prominent role in the macroeconomy. Consumers as a whole are an important component in both the determination of national income, and in economic growth. Prior to the 1970s, consumption accounted for anywhere between 84% and 88% of an individual's personal disposable income (see Figure 2 below). While this ratio

increased steadily, in the 1970s there was an outburst of consumption relative to income. Over the past 40 years or so, namely from 1970-2012 the share of consumption out of personal disposable income has increased from just over 84% to well over 90%, again shown in Figure 2 (Data supporting this information is included in Appendix A). That increase represents an average annual increase of 1.8% per year. In contrast, the prior 23 years represents an annual increase of only 0.29%.

Figure 2: *Personal Consumption Expenditure as a Ratio to Disposable Income*

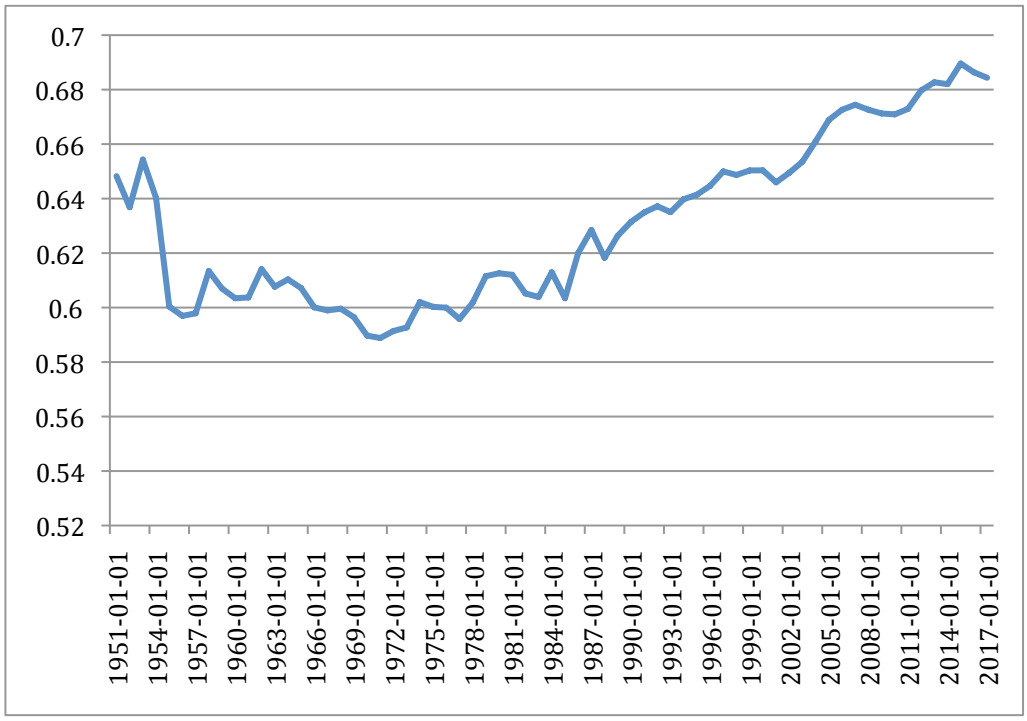


Data Source: http://research.stlouisfed.org/fred2; A067RX1A020NBEA, PCEC

Figure 1, shown above, showcases this information. Prior to 1970, households were decreasing their propensity to consume, although not by much. However, from the mid 1970s on, we see that the propensity to consume is increasing, as consumers are spending more and more relative to the increase in their income.

In addition, consumption now makes up a significantly larger portion of our national income then it once did. From the late 1940s to around the mid 1970s, consumption as a percentage of GDP hovered around 60%. However, since that time, we can clearly see that consumption has taken up a greater portion of our national income, as it now accounts for nearly 70% of GDP. Figure 3 below shows this increase in consumption as a percentage of GDP.

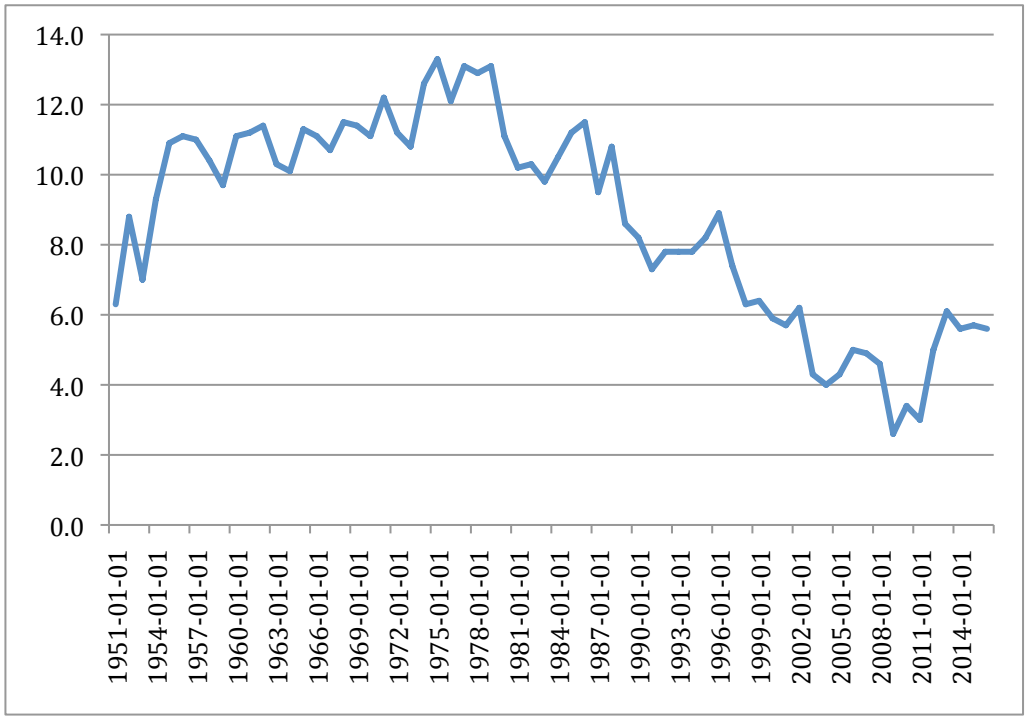
Figure 3: Personal Consumption Expenditures as a Ratio to GDP



Data Source: http://research.stlouisfed.org/fred2/series/GDPCA/downloaddata?cid=106

Most theorists would assume that accompanying such a drastic increase in consumption relative to disposable income would be a drastic reduction in savings. However, the data suggests otherwise. While we have seen a reduction in savings out of income, the reduction has been very slight, as shown in figure 4 below.

Figure 4: Personal Saving as a Percentage of Disposable Income



Data Source: http://research.stlouisfed.org/fred2/series/A072RC1Q156SBEA/downloaddata?cid=110

The figure above clearly shows that up until the 1970s, the United States saw a slow but steady increase in the propensity to save, while following 1970, the propensity to save has decreased. However, this decrease has not been drastic, with the range over the 65 year period going from a low of around 3% to a high of only about 13%. While it is safe to say that Americans have changed their saving behavior in favor of a less cautious attitude, it is also fair to note that this decrease in saving has been accompanied by the aforementioned increase in consumption.

While this increase in consumption is explained by some essential consumption "goods" such as health care and education (Wisman, 2013, p 930), we also notice a change in consumption of luxury goods. The most explanatory reason behind this increase in consumption

relative to income is the more widespread implementation of consumer credit, and debt financed consumption. It is logical to conclude that the remainder of income not being saved or consumed is being used to service the debts that have been accumulated by households. There have been many innovations over the past 40 years or so, which have allowed for a robust increase in household debt. These will be outlined in a later section. It is important to note why this increased demand for credit has taken place. This can be largely attributed to changes in the social nature of consumption.

Social Nature of Consumption

Preferences for consumption have evolved over time. The evidence that consumers are spending more out of income points to this fact in convincing fashion. Despite the growth in the inequality of the distribution of income discussed above, we have seen lower income households attempting to maintain a level of consumption comparable to that of their more affluent counterparts. One of the difficulties in social sciences is identifying the underlying reasons behind changes in behavior. In economics, this issue is no different. There are many reasons for a possible change in consumption preferences, and an increase in the propensity to consume. I will address these reasons below.

Sociologists and economists alike have discussed the social nature of consumption. The concept of 'keeping up with the Joneses' is one that factors into this theory. Robert Frank discussed the implications of this topic in his book *Choosing the Right Pond: Human Behavior and the Quest for Status*. An example Frank outlines to illustrate this point has to do with children drinking juice. He talks about how pouring a glass of juice for two children yields no complaints, but if you pour a taller glass for one of the children, the one with less will complain about not receiving an equal amount. The same is true for consumers. If we give two people

$100, neither one is likely to complain, assuming there are no externalities in effect. But if we give one of these consumers $150, and the other one gets $200, the one who received less will not be happy, regardless of the fact that he still has more than he originally would have.

This problem is heavily prevalent in the United States because of the wide disparity in disposable income. Although the lowest class of consumers still has more than many people in third world countries, they see more affluent citizens with higher income and attempt to mimic the behavior of these families.

The Relative Income Hypothesis

The relative income hypothesis refers to the idea that a person's consumption and saving behavior is not just a function of his or her current income, but rather of his income relative to what it once was, what it is expected to be in the future, and what others around him are earning. Outlined by James Duesenberry in his book *Income, Saving and the Theory of Consumer Behavior* in 1949, the relative income hypothesis argues that consumption choices are made based on conscious decisions by consumers based on their observations of other households. Duesenberry writes:

> For any particular family, the frequency of contact with superior goods will increase primarily as the consumption expenditures of others increase. When that occurs, impulses to increase expenditure will increase in frequency, and strength and resistance to them will be inadequate (p. 27).

Duesenberry continues this argument with a discussion of the social significance of consumption. He says that a goal of society is to improve our standard of living, and one way of achieving this is by consuming nicer goods. As a result, when one person obtains a nicer good, it becomes embedded in societies mind that they should consume the same higher quality product.

He uses this as an explanation behind why we often see consumption increase in households faster relative to income. Robert Frank took this idea and ran with it with his discussion of reference groups.

Reference Groups

Frank discusses the concept of reference groups in *Choosing the Right Pond*. These reference groups refer to groups that individuals are able to compare themselves to in sociological settings. He writes:

> Sociophysiological experiments have demonstrated, for example, that specific measures of autonomic nervous system arousal are strongly influenced by status in social interactions (p. 23)

The point Frank is attempting to convey is that it is human nature for people to compare themselves to those surrounding them. The phrase 'keeping up with the Joneses' is directly relevant to this topic. Many people base their decisions on those of the people close to them. If one person gets a new car, their neighbor is often likely to make a similar expenditure just to be viewed in a comparable light, financially.

Frank is not the only person to make note of these reference groups. Cynamon and Fazzari (2008) discuss these groups in detail and make the connection to economics by referring to positional externalities. The point that they make is that if you observe two families of similar income, one that is secluded and one that exists in a neighborhood with other high-end consumers, the secluded family is likely to spend less of their income because they do not have the reference groups to base their decisions off of. Below are two examples of how externalities can affect a consumer's reference groups.

i. *Mass Media Effect*

As Cynamon and Fazzari (2008) point out, consumers are influenced by the role that the media plays in influencing consumers. Most advertising and marketing campaigns are designed to target those with enough disposable income to purchase the product. For example, imagine a commercial for the iPhone. The Apple smart phones are marketed at anywhere from $200-$600. This means firms are targeting consumers who have an excess of income of this amount. But how does the person who is unable to afford the phone react to the advertisement?

Most people, regardless of whether they can afford the more expensive product or not, feel the need to maintain a level of consumption comparable to that which the media dictates is necessary. It is human nature to want to feel equal, and the media is able to generate feelings of inferiority for those who do not own these luxury goods. Technology advances in recent history is a perfect example of this effect. Laptops and smartphones were at one point a luxury good, but they have become so heavily advertised that they are now virtually a necessity.

ii. *Two-Earner Effect*

The two-earner effect pertains to households in which both adults have jobs. This effect is relevant more to the households that do not have two incomes but are in contact with families that do. Consider a situation where there are two neighboring families. One of these families consists of two parents with jobs, while the other one has a stay-at-home parent and a working parent. The two-earner family is likely to have a higher net income and is more likely to consume more. However, they factor into the reference group of the single-earner family. The single-earner family sees the increase in consumption of the two-earner household and is likely to attempt to mimic this behavior. This could potentially lead to consuming outside of their means. As Cynamon and Fazzari point out:

> As the neighbors next door, the couple's siblings, or the families of the employed spouse's co-workers move toward two earners in their households, the pressure on the single-earner family rises, likely driving the desired consumption up faster than income (pp. 11-12)

The importance of these reference groups is clearly evident in this example. If there is a single-earner household living in a community comprised almost exclusively of other single-earner households, we will not see this effect. However, because the abundance of two-earner households has increased, this has become an increasingly more relevant factor in explaining the drastic increase in consumption.

One of the biggest problems with these causes of increased consumption pertains to the idea of consumption through habit formation. Take the two-earner effect described above. A household with two employed adults is more likely to consume more. However, let's say one of the earners of the family loses his or her job. This would substantially decrease the income of said family, however, more often than not, the family would attempt to maintain certain consumption standards because they have grown accustomed to a certain level. This habit formation is fueled by some of the social aspects outlined above. People feel like they need to consume what is dictated to them by various media outlets or their reference groups.

The concept of keeping up with the Joneses has been around for over half a century. It is no secret that those who cannot afford as much as their more affluent neighbors struggle to maintain a level of consumption that causes them to appear equally successful financially. The materialism in our society is a driving force behind this effect. However, while we have now discussed some causes of why consumers feel the need to make purchases beyond their means,

we must now identify what financial regulations have allowed for this increased consumption to occur.

Materialism and the Effect on Debt

Materialism in the United States is prevalent in day-to-day life. Name brand clothing, popular smart phones, and other luxury goods are becoming normal goods as time goes on. Even many families that have a lower household income are purchasing products that are outside of their price range as noted above. In a study of materialism and debt, Watson (2003) notes that those with high levels of materialism are more likely to spend more. Watson then points out that these same households are likely to have more relaxed feelings towards taking on increasing amounts of debt. A number of other hypotheses were tested concerning the materialistic nature of certain households and the likelihood of these households in taking on various types of debt:

> People with high levels of materialism (in comparison to people with low levels of materialism) are more likely to exhibit behaviors consistent with positive attitudes toward debt – use of installment credit and outstanding debt. (Watson 735).

In an increasingly materialistic society, Watson shows that the prospect of debt becoming a problem among households is not only a possibility, but a probability.

This notion is supported in an empirical study by Brown et. al. (2013). In this paper, the authors note that households are far more likely to accept the risk of debt accumulation, especially lower income households:

> The risk attitudes measure is found to have a larger impact at the bottom end of the debt distribution, i.e. the influence of risk attitudes diminishes as the debt burden of the household increases (Brown et. al 299).

Tying these two studies together, it is clear that lower income households are more likely to accept risk, and thus more likely to accumulate debt.

It seems evident that households are in fact increasing their materialism in the United States. The consumption evidence outlined above supports this notion. Because of this increasing desire for luxury goods, households are more likely to attempt to accumulate debt. However, purchasing on credit is not a one-way street. While increased materialism certainly explains why households want (so to speak) to increase their debt, in order for this to take place, there must be creditors that are willing to satisfy this increase.

2.3 The Increase in Supply of Credit

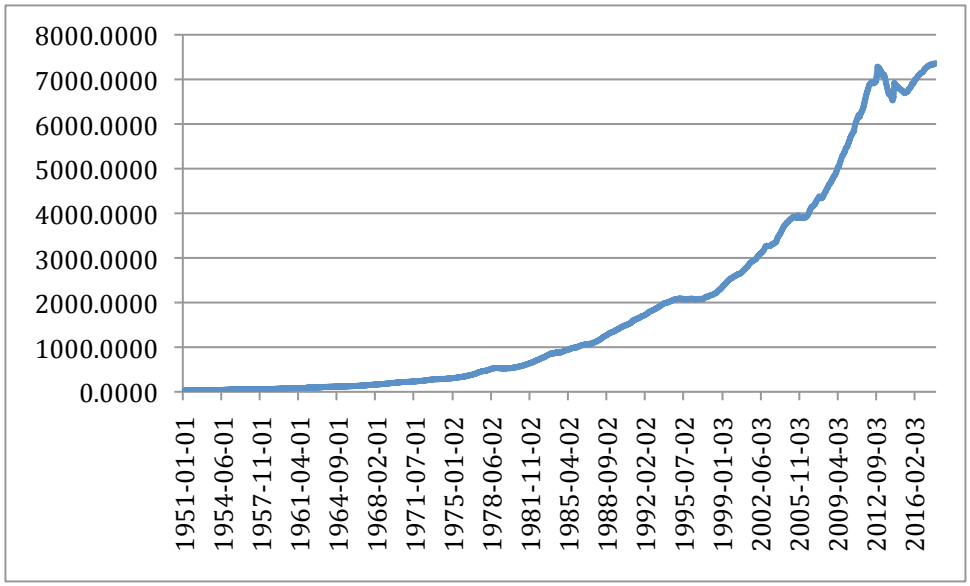
Availability of Credit

In order for debt to actually be accumulated, creditors must make this debt available to common households. Households must be able to purchase on credit in order for debt to actually increase. Cynamon and Fazzari make a note in their paper about this increase in availability of debt: "Between 1970 and 1998, [credit] card ownership in the lowest income quintile went from 2 percent to over 25 percent, and the highest quintile went from 33 percent to 95 percent" (Cynamon and Fazzari 2008 15). Not only were borrowers requesting more and more credit, but lenders were clearly facilitating this increase by granting more credit applications. This two-way relationship has allowed for household debt to increase to staggering levels, which could prove to be detrimental to the economy.

Figure 5 (shown below) shows the amount of loans that were granted on a monthly basis over the past half-century or so. It is clear from looking at the graph that more and more credit requests were being granted up until the Great Recession. This supports the notion that creditors

were becoming more and more lenient with their credit applications and hence contributed to the accumulation of household debt.

Figure 5: *Number of Loans on Bank Credit*



Data Source: http://research.stlouisfed.org/fred2/series/LOANS/downloaddata?cid=33078

As a result of the increase in consumption relative to income, consumers have responded not simply by decreasing the propensity to save, but by increasing the amount of consumption that is financed by debt. Consumer debt has become increasingly more utilized over the past 40 years or so. Financial innovations, mortgaging options and wider availability of credit are some of the driving factors behind this increase in debt. The real issue lies when we look at the relationship between aggregate household debt and national income. As shown in Figure 6, the debt to income ratio has increased substantially over the last 40 years. While in the 1940s, 50s and 60s, consumers maintained a relatively constant debt to income ratio, we can see that as the availability of consumer credit exploded in the 1970s and 80s, the ratio of outstanding household debt to disposable income exploded as well. We will go into the underlying implications of this

problem in a later section. For now, we will investigate some of the causes of this increase in the willingness to supply debt.

The distribution of income is an important contributor to the explosion of debt relative to income. As noted in the previous section, many families attempt to emulate more affluent families in an effort to seem of a higher social class. This emulation effect often leads to families consuming beyond their means. Due to changes in availability of personal financing, many people are able to use credit and other debt accumulation techniques for financing these consumption expenditures.

Changes in Household Mortgaging

Mortgage financing options also played a major role in allowing for an increased level of household debt. The introduction of cash-out financing allowed for households to purchase houses that were out of their price range, based on the assumption that housing prices would continue to rise and they could remortgage the house a few months down the line, before the payments became too steep. While again, this was partly the result of consumers attempting to take on a greater debt then they could afford, banks contributed to this issue as well by willingly supplying the necessary loans.

However, the problem lies in the use of these loans. Banks were allowing households to borrow against the equity they already owned on their houses in order to finance consumption goods. For example, now instead of refinancing the house for living purposes, households were borrowing money to finance vacations or pay for holiday gifts. This method of debt accumulation can clearly be attributed to lack of due diligence on the part of the creditors.

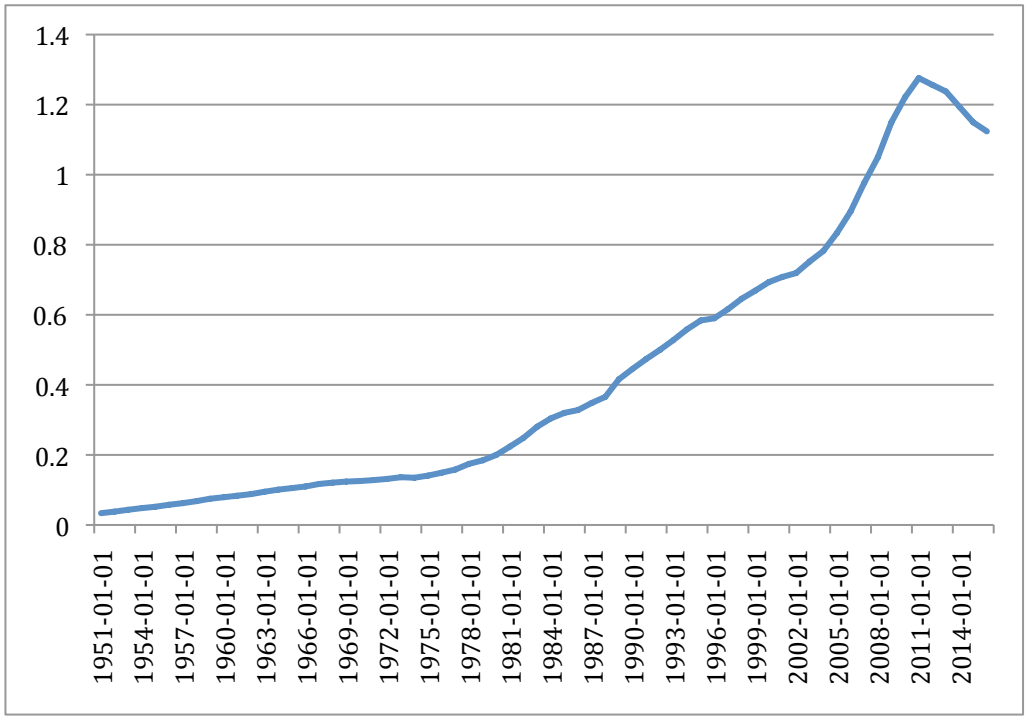
Increased Use of Credit Cards

The use of credit cards has also helped households to accumulate debt. By allowing consumers to make purchases on credit, consumers have become more comfortable accumulating debt for the benefit of their consumption practices. Credit card companies have been willing to oblige this increased demand for credit cards. As noted earlier, we have seen a drastic increase in the use of credit cards in recent decades. This phenomenon has occurred, not just because more people are applying for credit cards, but because credit card companies are, as rational firms, more and more willing to supply these cards.

If banks are allowing for more and more debt to build up, the risk of mass default was clearly becoming more and more likely. It was not a coincidence that so many households were unable to service these debts, but in reality, it was a product of the financial sector taking on the risk as well.

Figure 6 below shows the largest underlying issue that lies within this increase in debt. The debt:income ratio in the United States has increased to the point that it was well over 1 prior to the start of the Great Recession. This is one of the most important motivating statistics behind this thesis, and something we will analyze in greater detail later.

Figure 6: Outstanding Household Debt to Disposable Income Ratio



Data Source: Haver Analytics

3 Theoretical Model

3.1 Neo-Kaleckian Growth Model

In this thesis, we use a Neo-Kaleckian growth model as the basis for investigating growth and debt dynamics. Neo-Kaleckian growth economists are followers of the Post-Keynesian growth school. Specifically, the model is built off of Joan Robinson's contributions to the field (Lavoie 1992). In Robinson's theory there are two vital equations: the determination of the rate of profit and the determination of the rate of accumulation. Her rate of profit equation is consistent with the equilibrium assumption that investment is equal to savings, and hence can be expressed as follows:

$$I = S$$
$$S = s_\pi \Pi$$
$$\Rightarrow \Pi = \frac{1}{s_\pi} I$$
$$\frac{\Pi}{K} = \frac{1}{s_\pi} \frac{I}{K}$$
$$r = \frac{1}{s_\pi} g$$

Where r is the rate of profit, s_π is the propensity to save out of profits, and g is the actual accumulation rate. It is useful to note that this is essentially the same as Karl Marx's equation for growth ($g = s_\pi r$). The only difference is that here, the direction of causality is different, as Robinson argues that growth is demand led, in the typical Keynesian fashion. We can think of Robinson's model being written as:

$$g^s = s_\pi r$$

for simplicity, making g^s the required accumulation behavior that is necessary under the conditions $I = S$. This same assumption and derivation holds in the neo-Kaleckian model.

The second important equation that Robinson uses is the determination of the rate of accumulation. Robinson argues that the utilization rate is constant in the long run (for simplicity u = 1). Robinson's desired accumulation is thus g = g(r), namely the expected rate of profit determines the amount of accumulation. Here is where Neo-Kaleckians differ in their determination of growth. We assume that the utilization rate of capacity is variable, making g*=g*(π,u), or equivalently (according to Stockhammer (1999)):

$$g_k = \gamma_0 + \gamma_1 r$$

Note, that here, γ_0 is a parameter that is used to measure the state of confidence of investors, while γ_1 is a parameter that measures how sensitive the desired rate of accumulation is to the actual profit rate.

In order to complete the model, we must determine a representation of the rate of capacity, as it is variable. Traditionally, *u* is defined as

$$u = \frac{K_u}{K}$$

namely, the amount of capital that is being used expressed as a ratio to the amount of total capital. However, we will assume a fixed coefficient production function such that:

$$Y = \min\{K/v_1, L/v_2\}$$

In this fashion, the capital:output ratio is defined as constant, and equal to v_1 and the labor:output ratio is v_2. Thus, we can think of Y/K_u as a constant as well, which leads us to create our formula for *u*, where:

$$u = \frac{Y}{K_u} * \frac{K_u}{K} = \frac{Y}{K}$$

We can move forward and recognize that the profit rate (defined as $r = \prod/K$) is equal to the capacity utilization rate times the profit share ($\pi = \prod/Y$), so that we can express the rate of profit as

$$r = \pi u$$

which gives us a final expression for our rate of accumulation in terms of our capacity utilization rate:

$$g_k = \gamma_0 + \gamma_1 \pi u$$

A diagram depicting this model is included in Appendix 2.

It is important to note that in the basic model format, a stable equilibrium exists if we make some underlying assumptions. The first of which, is that our intercept for g_k, namely γ_0, is positive. In addition to this, we need the slope of the g_k schedule to be shallower than the slope of the g^s schedule ($s_\pi > \gamma_1 \pi$). If both of these conditions hold, we have a stable equilibrium.

This equilibrium is determined by the intersection of the g_k and g^s schedule. If this is the case then we have:

$$g^s = g_k$$
$$s_\pi r = \gamma_0 + \gamma_1 \pi r$$
$$r^* = \frac{\gamma_0}{s_\pi - \gamma_1 \pi}$$
$$\Rightarrow g^* = \frac{s_\pi \gamma_0}{s_\pi - \gamma_1 \pi}$$
$$\Rightarrow u^* = \frac{v_r r^*}{\pi}$$

The above values for r*, g*, and u* are the equilibrium values for our three variables. It may also be useful to note some comparative statics in this relationship. For *u*, when s_π increases, *u*,

decreases, because an increase in s_π negatively affects our rate of profit, which will decrease the utilization rate. Similarly, if the profit share increases, the utilization rate also decreases. These derivatives are spelled out below.

$$\frac{dr^*}{ds_\pi} = \frac{-\gamma_0}{(s_\pi - \gamma_1\pi)^2}$$

$$\Rightarrow \frac{du^*}{ds_\pi} = \frac{v_r}{\pi} * \frac{-\gamma_0}{(s_\pi - \gamma_1\pi)^2} < 0$$

$$\frac{du^*}{d\pi} = -\frac{v_r r^*}{\pi^2} < 0$$

3.2 Aggregate Consumption Theory

In the manner proposed by Kim et. al (forthcoming A), there are essentially two methods in which households consume, save, and service their debts out of their incomes. As has been previously indicated, houses have been borrowing at an increasing speed over the last few decades, so we can no longer think of consumption as being a function solely of wealth, income, or wages. Now that debt accumulation has become a factor, the idea of household borrowing must be interpreted as a facilitator of consumption.

The interesting issue here lies in how households service their debts. If households borrow without being able to repay their loans, there is a strong possibility of default on those loans, which, as Minsky (1978) notes, could result in financial fragility. This is exactly what seems to have occurred in 2008, as banks were giving out mortgages to families that were unable to service their debts and hence resulted in the loss of numerous houses as well as a credit crunch, as identified by Setterfield and Fontana (2009). It is important to note, that we use the term debt servicing to refer to repaying the interest on loans at a bare minimum.

However, households do not merely consume and service their debts, taking up the entirety of their disposable income. In a Keynesian world with an uncertain future, rational consumers will save a proportion of their income in order to assist their family during future trials and tribulations. In addition, we assume that all households are homogeneous to their specific groups, which I will outline below.

The growth in the distribution of income is evidence to not just a disparity between the capitalists (profit earners) of the US and everyone else. We are actually able to distinguish between 3 groups of households: production workers, supervisor/managerial workers, and capitalists. For our purposes, we will assume that debt servicing is exclusively an issue with production workers. Capitalists often do not even take on debt, as they are primarily the ones providing the loans, and we assume (and reasonably so) that supervisor workers are able to service their debts without issue (if and when they do take on debt). Thus, we concern ourselves with two types of consumption households: workers and rentiers. Working households refer to production workers and make up about the bottom 80% of the income distribution (as noted by Palley 2013). Rentier households are the remaining houses, composed of managerial workers and capitalists.

In order for our model to be theoretically accurate as well as plausible, there are certain assumptions we will make. First, we make the assumption that the propensity to consume for production workers is greater than that of rentiers. In addition, we will assume that all working households and only these households finance part of their consumption through borrowing, while rentier households do not. In addition, we have made the assumption that due to uncertainty within the financial markets, it is only natural for working households to save in

accordance with their debt accumulation and consumption so as to protect themselves against unforeseen financial struggles.

Our model for consumption is as follows:

$$C = C_W + C_R + \dot{D}$$

Here, D-dot refers to the accumulation of debt. As noted in a previous section, households' consumption behaviors are influenced by consumption behaviors of their reference groups. Specifically, more often than not, production workers attempt to mimic the consumption behaviors from rentier households, as these households represent a greater level of financial success. Thus, D-dot can be expressed in this form:

$$\dot{D} = \beta(C^T - C_W)$$

where C^T refers to some target level of consumers wish to emulate based on the factors outlined above such as reference groups. In addition, we will assume that production workers naturally wish to target a level of consumption that is comparable to that of the rentiers, namely that:

$$C^T = \eta C_R \quad 0 < \eta \leq 1$$

Essentially, the way working households operate is in this manner: they observe the consumption behavior of the rentiers, they choose a target level of consumption that is based on this and is greater than their consumption, they accumulate debt based on bank loans, credit cards, etc. and they consume after the fact.

Kim et. al theorize that the debts that production workers accumulate will be serviced in one of two ways. The first concerns the type of household that is more materialistic, and thus consumption is of a greater priority. This type of household takes their disposable income, and consumes a portion of it based on their propensity to consume, c_W. From whatever is left over, the household will choose to save a proportion of their income, or to service their debts from it.

Kim and Setterfield have written a paper describing the stability and sustainability affects of this method of debt servicing behavior in which there is a stable, equilibrium value of growth, but the debt:capital ratio that is consistent with equilibrium is unsustainable (Kim, forthcoming B).

For our purposes, we will assume the validity of a second type of consumption behavior, namely that production workers service their debts before deciding whether to consume or save. This is the more conventional approach, where households shave off a portion of their income to service their debts, before they practice saving and consumption behaviors. An equation representing the consumption of production workers can be expressed as follows:

$$C_W = c_W(W_P \varphi N - iD_R)$$

Here, W_P is the wages of production workers, φ is the proportion of workers that are production workers versus supervisory workers, and N is the level of employment. This means that $W_P \varphi N$ is the aggregate income of production workers in the economy. D_R is equivalent to the debt accumulated by workers, which is equal to the loans received by workers, with the removal of deposits made, with i being the interest rate.

In addition, we can derive from this an expression for the consumption of rentiers, which, as a reminder are composed of supervisory workers and capitalists, who, for simplicity, we will assume consume equal proportions of their income:

$$C_R = c_\pi(W_R(1-\varphi)N + \Pi + iD_R)$$

where ∏ is total profits in the economy. Notice also that we have $W_R(1-\varphi)N$ equal to the aggregate income of managerial workers. Thus, we can build a model for aggregate consumption as follows, by substituting the previous equations into the consumption equation, we get the following.

$$C = (1-\beta)c_W(W_P\varphi N - iD_R)$$
$$+(1+\beta\eta)c_\pi(W_R(1-\varphi)N + \Pi + iD_R)$$

The derivation of this consumption model is shown in Appendix 2.

3.3 Growth Model with Consumption Built In

We can create a temporary equilibrium such that:

$$Y = C_W + C_R + \dot{D} + I$$

where, in the absence of an external sector and a public sector, we can think of this as the goods market clearing conditions. Based on our determinations for consumption out of wages, by rentiers, debt accumulation and investment, we can substitute in and create an expression for Y where:

$$Y = (1-\beta)c_W(W_P\varphi N - iD_R) + (1+\beta\eta)c_\pi(W_R(1-\varphi)N + \Pi + iD_R) + I$$

If we normalize, by K, we can obtain an expression for the utilization rate of capacity, where:

$$u = \frac{(1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0}{(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

This allows us to express the rate of profit and accumulation as well:

$$r = \frac{\pi[(1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0]}{(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

$$g_k = \gamma_0 + \frac{\gamma_1\pi[(1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0]}{(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

3.4 Comparative Statics

Based on our calculations, we can create a table that shows the effects on our equilibrium growth rate, rate of profit and rate of utilization of changes in some of our variables. Table 1 shows these changes:

Table 1:

Variables	γ_0	π	i	d_R	η
u	+	?	?	?	+
r	+	?	?	?	+
g_k	+	?	?	?	+

With the exception of our intercept term, which is a confidence variable that is determined by what Keynes referred to as the animal spirits of investors, and our η variable, which accounts for our emulation parameter, all of our variables have an ambiguous effect on any of our three equilibrium outcomes.

It makes sense that our partial derivatives with respect to η are unambiguously positive. If working households attempt to emulate a higher proportion of consumption among rentier households, then more debt will be accumulated, so consumption will increase as well, spurring economic growth.

The ambiguity of our partial derivatives with respect to the other three independent variables is useful to analyze as well. With an increase in the profit share, the directional change of u, r, and g_k is not made clear based on my calculations and assumptions. The same holds true with a change in the interest rate or the debt:capital ratio. However, in the next section we will investigate how these variables may change when we use plausibly hypothesized parameters for our independent variables.

4 Debt Dynamics

4.1 Calculation of d_R

Finally, we will address the issue of stability of growth and sustainability of consumer debt. Based on how we defined d_R, we can identify an expression for the rate of change of d_R as follows:

$$\dot{d}_R = \frac{\beta(C^T - C_w) - \dot{D}_w}{K} - g_k d_R$$
$$\dot{d}_R = \beta(\eta C_R / K - C_w / K) - \dot{D}_w / K - g_k d_R$$
$$\dot{d}_R = \beta\eta c_\pi(\omega_r u + \pi u + i d_R) - (1 + \beta c_w - c_w)(\omega_p u - i d_R) - g_k d_R$$

By substituting the previously obtained expressions for u and g_k, we can identify an expression for $\dot{d}_R$. Once we have this expression, we can identify steady state values of d_R by setting $\dot{d}_R = 0$. We will investigate this further in the numerical analysis.

Because a change in d_R results in an ambiguous change in g_k, we will need to analyze the equilibrium values further with a numerical analysis (addressed later). However, obtaining an expression such as the one shown above allows us to determine the equilibrium values of the debt:capital ratio. When the rate of change of d_R is 0, we would be at equilibrium and the stability of this equilibrium is determined by the shape of the $\dot{d}_R$ curve. Because our equation for g_k is as follows:

$$g_k = \gamma_0 + \frac{\gamma_1\pi[(1-\beta)c_W i d_R + (1+\beta\eta)c_\pi i d_R + \gamma_0]}{(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

We can see that there are two values of d_R in the numerator. Thus, when we multiply g_k by d_R as shown in the expression for the rate of change of d_R, we would end up with a quadratic equation.

It is therefore important to identify parameter values so that we can determine the concavity of the resulting parabola.

Although the concavity of our expression for $\dot{d}_R$ is not yet determined, we can see that it is clearly a quadratic, as multiplying d_R by g_k gives us a product of two d_R terms (discussed above). This is important because it means that, assuming there are two x-intercepts for the parabola, there are two equilibrium values for the rate of change of d_R. One of these is the stable equilibrium namely, temporary disequilibrium simply results in a movement along the curve back towards the stable value. The other equilibrium is unstable, meaning that the same disequilibrium will result in further diversion from equilibrium. Thus, once we determine the stable and unstable equilibrium values, we can identify whether stability and sustainability is achieved by looking at the maximum feasible level of debt relative to the value associated with equilibrium.

We define this maximum level of debt as the largest value of the debt:capital ratio that is sustainable based on the theory of consumption that we have been implementing. By assuming that households place a first priority on servicing their debts, it is clear that

$$iD_{R_{\max}} - W_p N = 0$$

where D_{Rmax} represents the maximum amount of debt that households could take on while still being able to service these debts. It follows from this that:

$$d_{R_{\max}} = \frac{\omega_p u}{i}$$

If the value of d_{Rmax} lies above the stable equilibrium value, then we can determine that the debt is sustainable in equilibrium.

4.2 Numerical Analysis

In order to develop an expression for $\dot{d}_R$ as a function of d_R, we must identify plausible values for all of our other parameters. Information showing what these values are as well as where they come from is included in Table 2. It is important to note that many of these values are based on previous studies and real world data, while others are more arbitrary. For example, the value γ_0, a measurement of the level of confidence, is almost purely speculative. It is important to note that the value of γ_0 has been calibrated around the expectation that firms attempt to achieve a utilization rate of around 80%, given the values of all other parameters shown below. This was done because 80% is the average rate of capacity utilization in the US economy over the last several decades.

Table 3: Parameter Values

	Neo-Liberal Parameters	Source
γ_0	0.095	Authors' Calculations[1]
γ_1	0.5	Lavoie and Godley (2001-2002)
c_W	0.94	Authors' Calculations Based on Bunting (1998)
β	0.1	Authors' Calculations[2]
i	0.481	Authors' Calculations based on World Bank Data[3]
π	0.34	Authors' Calculations[4]
η	21.7181	Authors' Calculations[5]
c_π	0.2	Setterfield and Budd (2011)
ω_p	0.42	Authors' Calculations based on Mohun (2006)
Φ	0.567	Authors' Calculations[6]

[1]: Set in accordance with other parameters in order to yield a capacity utilization rate of around 0.8
[2]: Set in accordance with other parameters in order to satisfy the Keynesian stability condition
[3]: See data.worldbank.org
[4]: Set in accordance with $\pi=1-(1+\Phi)\omega_p$
[5]: Calculated based on $\eta = \delta\lambda$, where λ is an emulation parameter (Ravina 2007) and δ is a scaling parameter based on Mishel and Sabadish (2012)
[6]: Calculated based on $\Phi = \alpha\varphi$

The distributional parameters are based in correspondence with a Neoliberal growth regime. Many Keynesian economists identify the Neoliberal growth parameters as a consequence of income distribution: "Between 1973 and 2006, the average annual real income of the bottom 90 percent of households fell while that of the top 1 percent increased 3.2 fold" (Kim Forthcoming B p. 20). This growth in the distribution of income is captured by the parameters from row 1 in Table 4.

Evaluating our $\dot{d}_R$ function with these parameter values gives us the result that g_k decreases with an increase in d_R. Evaluating and simplifying the expression gives us:

$$\dot{d}_R = 0.16439 - 0.234134 d_R + 0.016054 d_R^2$$

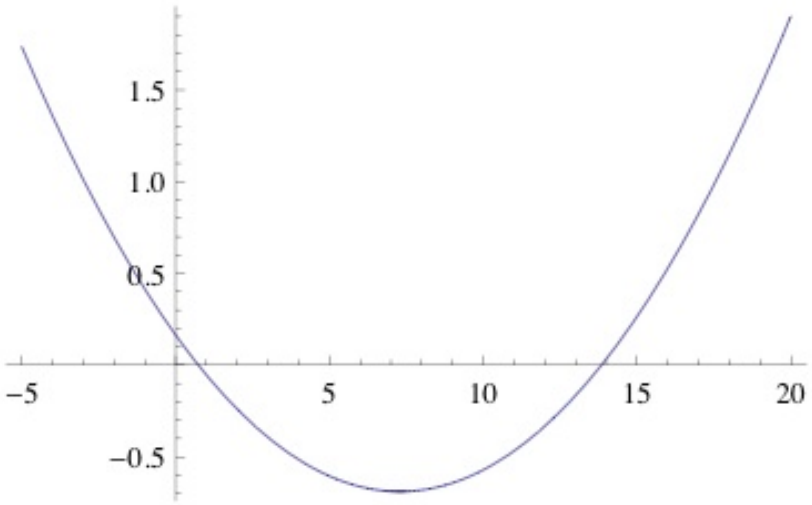
A graph illustrating this equation is shown below in Figure 8. Using Mathematica, we are able to identify the stable and unstable equilibrium points by the x intercepts[1]. Our x-intercepts in the graph are points of interest for our purposes. As figure 8 expresses the rate of change of the debt:capital ratio as a function of the debt:capital ratio itself, we can see that when the graph is negative, the rate of change is negative which results in a leftwards movement along the x-axis. Similarly, if the graph is positive, we will move to the right along the x-axis as the rate of change is now positive. We will refer to the stable equilibrium, the left-most x-intercept, as d_{R1}. We know that this is the stable steady state because if we revert a little outside of equilibrium, the force of the rate of change will pull us towards it. In contrast, d_{R2} is also an equilibrium value, but it is unstable.

For example, consider a situation where we start at a value of d_R such that $d_R < d_{R1}$. It is clear that $\dot{d}_R > 0$, so d_R will have a positive rate of change, meaning as time goes on, d_R will increase and move towards d_{R1}. Similarly, if we start at a point d_R such that $d_R > d_{R1}$ we can see

[1] Table 4 provides this information as well as identifying the changes that would occur under a Golden Age distributional parameter set.

that $\dot{d}_R < 0$, so d_R will have a negative rate of change, meaning as time goes on, d_R will decrease and move towards d_{R1}. It is because of this that we can identify d_{R1} as the stable equilibrium. However, if we start at a value of d_R such that $d_R > d_{R2}$, than $\dot{d}_R > 0$. This will result in a movement of d_R further away from d_{R2} making it the unstable equilibrium.

Figure 8:



We have already noted that d_{R1} is the stable equilibrium and d_{R2} is unstable. Now we need to examine the sustainability of consumer debt in equilibrium. We can do this by looking at our calculations for the feasibility coefficent, c:

$$c = \omega_p u - i d_{R_1}$$

If c is positive, it means that our value for d_{Rmax} is above the stable equilibrium value, d_{R1}, which means that the debt level at d_{R1} is sustainable. Calculations for c are also included in Table 4. We can see that under the plausible, Neo-Liberal conditions, not only does the stable equilibrium

exist (as evidenced by figure 8), but the level of debt that is concurrent with this equilibrium is sustainable. We can see this in two ways. One, as mentioned is identifying the value of *c*, and whether it is positive or not. The second method is by simply looking at the d_{R1} column of table 4 and making sure the d_{Rmax} column is a larger value. This leads to the assertion that while there are certainly negative drawbacks to consumers accumulating mass amounts of debt, we can not assert that it would be problematic for the economy based on the assumptions we have made.

It is useful to identify how changing the parameters to fit a golden age regime would affect this result. A Golden Age regime is a term coined by Keyensian economist that captures the growth of income prior to the 1970s, when all income grew at roughly the same rate (~3 percent) according to Kim (Forthcoming B). This phenomenon prevented income inequality from increasing substantially. Golden Age distributional parameters are captured by row 2 of Table 4.

Table 4: Change in Distribution: Golden Age and Neoliberal Regimes

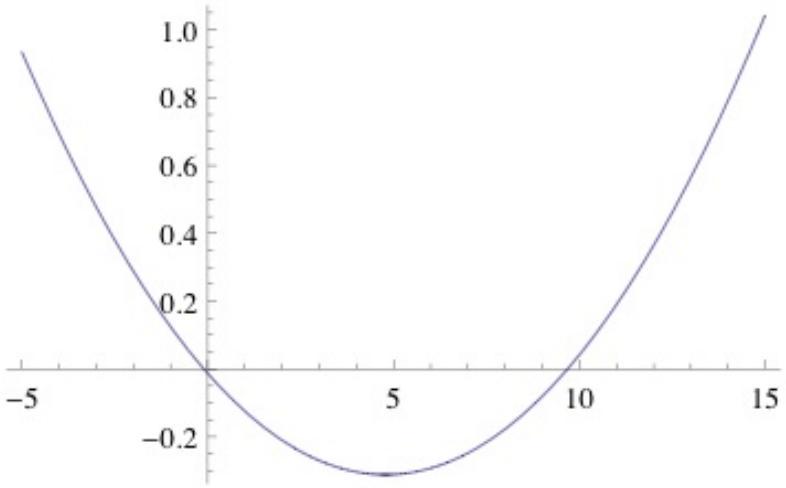
	ω_r	ω_p	π	η	d_{R1}	d_{R2}	d_{Rmax}	c
Neo-Liberal	0.24	0.42	0.34	21.72	0.7396	13.8446	7.08535	0.305
Golden Age	0.23	0.48	0.2896	2.92	-0.1044	9.6854	3.1055	0.1544

From the above table, we can see that regardless of the parameter make up, based on the implemented theory of consumption and debt servicing our debt is sustainable in the steady state equilibrium. Under both distributional regimes, our value for *c* is positive which supports this notion. Interesting to note, however, is the fact that in Golden Age system, d_{R1} is negative (shown in figure 9). Our equation for the rate of change of the debt:capital ratio as a function of d_R itself is shown below:

$$\dot{d}_R = -0.01314 - 0.1246 d_R + 0.13 {d_R}^2$$

The above equation gives us the stable equilibrium of d_R = -0.1. This means that with a redistribution of income, we would see working households change from net debtors to net creditors.

Figure 9:



Although both situations described above support the same result (that being that a stable equilibrium growth rate is obtainable and that the debt:capital ratio accompanying it is sustainable), the results are based on the assumption that all households service their debts in exactly the same way. As a result of this, the results in this thesis are different than those obtained in Setterfield and Kim's paper, where the debt servicing behavior is markedly different. In this paper, we considered households that service their debts out of their disposable income and then choose whether to consume or spend whatever is left over. In the preceding paper, Setterfield and Kim discuss a situation where households consume first, and then delegate the remaining disposable income towards saving and debt servicing.

In Setterfield and Kim, the resulting parabola from the rate of change equation is concave down, which means that the larger of the two intercepts is the stable equilibrium. It is because of this important difference that the results differ between the two papers.

Further research could prove to be worthwhile, namely an investigation into what proportion of those servicing their debts behave the way that Setterfield and Kim suggest, and what proportion behave the way I have alluded to. Furthermore, it would be interesting to find what threshold this proportion would need to cross in order for the results to change from sustainable debt, to unsustainable.

5 Conclusion

In this thesis, we have investigated some reasons behind the growth in consumption and household debt, specifically in the United States. We have taken a look at the growth in income inequality and how that has helped fuel the desire among households to consume, and how financial innovations have allowed for this consumption to be accomplished through debt accumulation. We then constructed a theoretical model of growth and consumption and, through a numerical analysis, have identified the stability of growth and sustainability of debt that results from our assumptions.

From our results, we can see that while there is not unstable growth and unsustainable debt, a redistribution of income would not cause a reversal effect. In fact, a redistribution that is proposed with the golden age parameter set would actually result in working households becoming net creditors instead of debtors. The model of debt servicing that we have used has proven to not be detrimental to the growth of an economy using a neo-Kaleckian growth model. However, these results are contradictory to those obtained by Setterfield and Kim (Forthcoming B), which suggests additional research would be both beneficial and necessary. This research could identify a threshold value for the proportion of households that service their debts one way versus the proportion that service their debts the other way. However, all that we can say for certain after this thesis is that identifying causes of the Great Recession is still up in the air, and one that economists can look forward to tackling in the future.

Works Cited

Blecker, Robert (2002) *Distribution, demand, and growth in neo-Kaleckian macro models*. Found in Setterfield, Mark (ed.) The Economics of Demand Led Growth: Challenging the Supply-Side Vision of the Long Run, pp 129-152. Cheltenham: Edward Elgar.

Brown, Sarah, Gaia Garino, and Karl Taylor (2013) *Household Debt and Attitudes Toward Risk*. Found in Review of Income and Wealth. Series 59, Number 2. Pp 283-303. Blackwell Publishing.

Bunting, David (1998) *Distributional Basis of Aggregate Consumption*. Found in Journal of Post Keynesian Economics. 20(3), 389-413

Cynamon, Barry Z. and Fazzari, Steven M. (2008) *Household Debt in the Consumer Age: Source of Growth – Risk of Collapse*. Found in Capitalism and Society, Vol 3, Issue 2. Article 3. Pp 1-30. Berkeley Electronic Press.

Duesenberry, James (1949) *Income, Saving, and the Theory of Consumption Behavior*. Cambridge, MA: Harvard University Press

Fontana, Giuseppe and Mark Setterfield (2009) *Macroeconomics, endogenous money, and the contemporary financial crisis: a teaching model*. Found in Int. J. Pluralism and Economics Education. Vol. 1, Nos. 1-2. Pp 130-147

Frank, Robert H. (1985) *Choosing the Right Pond: Human Behavior and the Quest for Status*. New York, NY, Oxford University Press. Print.

Kim, Yun K. Mark Setterfield, and Yuan Mei (Forthcoming A) *A theory of aggregate consumption*. Found in European Journal of Economics and Economic Policies: Intervention.

Kim, Yun K. Mark Setterfield (Forthcoming B) *Debt Servicing, Aggregate Consumption, and Growth*.

Lavoie, M. (1992) *Foundations of Post-Keynesian Economic Analysis*, Aldershot, Edward Elgar, Ch 6, pp 297-318, 332-344.

Lavoie, Marc and Wynne Godley (2001-2002) *Kaleckian Models of Growth in a Coherent Stock-Flow Monetary Framework*. Found in Journal of Post Keynesian Economics. 24(2), 277-311.

Minsky, Hyman P. (1978) *The Financial Instability Hypothesis: A Restatement*. Found in Thames Papers in Political Economy. Pp 1-24.

Mishel, Lawrence and Natalie Sabadish (2012) *CEO pay and the top 1 percent: How Executive Compensation and Financial-sector pay have fueled Income Inequality*. Issue brief 331, Economic Policy Institute

Mohun, Simon (2006) *Distributive Shares in the US Economy, 1964-2001*. Found in Cambridge Journal of Economics 25, 9-32

Palley, Thomas I. (2002) *Economic contradictions coming home to roost? Does the U.S. economy face a long-term aggregate demand generation problem?* Found in Journal of Post Keynesian Economics. Vol. 25, No. 1 Pp 9-32.

Palley, Thomas I. (2013). *The Middle class in macroeconomics and growth theory: a three class neo-Kaleckian-Goodwin model*. Paper presented at the Meetings of the Eastern Economic Association, New York, NY. May 2013

Ravina, Enrichetta (2007) *Habit Formation and Keeping Up with the Joneses: Evidence from Micro data*. Found in Quarterly Journal of Eonomics 118(1), 1-39.

Schor, Juliet (2004). *Born to Buy:The Commercialized Child and the New Consumer Culture*. Simon and Schuster.

Setterfield, Mark and Andrew Budd (2011) *A Kenes-Kalecki Model of Cyclical Growth with Agent-based Features*. Found in Philip Arestis, ed., Microeconomics, Macroeconomics and Economic Policy: Essays in Honour of Malcolm Sawyer, pp 228-50. London: Palgrave Macmillan.

Skott, Peter and Soon Ryoo (2008) *Macroeconomic Implications of Financialization*. Found in Cambridge Journal of Economics. 32. Pp 827-862.

Smith, James F. and Jon D. Wisman (2011) *Legitimating Inequality: Fooling Most of the People all of the Time*. Found in American Journal of Economics and Sociology. Vol. 70, No. 4. Pp 974-1013.

Stockhammer, Engelbert (1999) *Robinsonian and Kaleckian Growth. An Update on Post Keynesian Growth Theories*. Working Paper 67, Vienna University of Economics and Business Administration. http://ideas.repec.org/p/wiw/wiwwuw/wuwp067.html.

Watson, John J. (2003) *The Relationship of Materialism to Spending Tendencies, Saving and Debt.* Found in Journal of Economic Psychology. Vol. 24. Pp 723-739. Elsevier.

Wisman, Jon D (2009) *Household Saving, Class Identity, and Conspicuous Consumption*. Found in Journal of Economic Issues, Vol. 43, No. 1, March 2009. Pp 89-114.

Wisman, Jon D (2013) *Wage Stagnation, rising inequality and the financial crisis of 2008*. Found in Cambridge Journal of Economics. Issue 37. Pp 921-945. Oxford University Press.

Appendix 1: Data

Personal Disposable Income, Consumption and Saving

DATE	PCE	PDI	PCE:PDI	Saving	Saving:PDI	MPC+MPS
1947-01-01	162.0	174.8	0.926773455	11.0	0.062929062	0.989702517
1948-01-01	175.0	194.5	0.899742931	17.2	0.088431877	0.988174807
1949-01-01	178.5	194.5	0.917737789	13.6	0.069922879	0.987660668
1950-01-01	192.2	215.0	0.893953488	20.0	0.093023256	0.986976744
1951-01-01	208.5	237.4	0.878264532	25.9	0.109098568	0.9873631
1952-01-01	219.5	250.7	0.875548464	27.8	0.110889509	0.986437974
1953-01-01	233.0	266.3	0.87495306	29.2	0.10965077	0.98460383
1954-01-01	239.9	272.4	0.880690162	28.2	0.103524229	0.984214391
1955-01-01	258.7	291.7	0.886870072	28.2	0.096674666	0.983544738
1956-01-01	271.6	311.8	0.871071199	34.7	0.111289288	0.982360487
1957-01-01	286.7	329.6	0.869842233	36.9	0.111953883	0.981796117
1958-01-01	296.0	340.9	0.868289821	38.9	0.11410971	0.982399531
1959-01-01	317.5	360.9	0.879745082	37.1	0.102798559	0.982543641
1960-01-01	331.6	376.5	0.880743692	37.8	0.100398406	0.981142098
1961-01-01	342.0	393.8	0.868461148	44.4	0.112747588	0.981208735
1962-01-01	363.1	417.5	0.869700599	46.4	0.111137725	0.980838323
1963-01-01	382.5	438.3	0.872689938	46.7	0.106548026	0.979237965
1964-01-01	411.2	476.3	0.863321436	54.8	0.115053538	0.978374974
1965-01-01	443.6	513.2	0.864380359	58.3	0.113600935	0.977981294
1966-01-01	480.6	554.2	0.867195958	61.4	0.110790328	0.977986287
1967-01-01	507.4	592.8	0.855937922	72.2	0.121794872	0.977732794
1968-01-01	557.4	643.8	0.865796831	72.1	0.111991302	0.977788133
1969-01-01	604.5	695.8	0.868784133	75.0	0.107789595	0.976573728
1970-01-01	647.7	761.5	0.850558109	96.1	0.126198293	0.976756402
1971-01-01	701.0	830.4	0.844171484	110.1	0.132586705	0.976758189
1972-01-01	769.4	899.9	0.854983887	109.2	0.121346816	0.976330703
1973-01-01	851.1	1006.1	0.845939767	131.8	0.131000895	0.976940662
1974-01-01	932.0	1098.3	0.848584176	141.7	0.129017573	0.977601748
1975-01-01	1032.8	1219.3	0.847043386	159.0	0.13040269	0.977446076
1976-01-01	1150.2	1325.8	0.867551667	147.3	0.11110273	0.978654397
1977-01-01	1276.7	1456.7	0.876433034	148.2	0.101736802	0.978169836
1978-01-01	1426.2	1630.1	0.874915649	166.6	0.102202319	0.977117968
1979-01-01	1589.5	1809.3	0.878516553	177.5	0.098104239	0.976620793
1980-01-01	1754.6	2018.0	0.869474727	213.2	0.105649158	0.975123885
1981-01-01	1937.5	2250.7	0.860843293	252.5	0.11218732	0.973030613
1982-01-01	2073.9	2424.7	0.855322308	277.7	0.114529633	0.96985194
1983-01-01	2286.5	2617.4	0.873576832	247.0	0.094368457	0.967945289
1984-01-01	2498.2	2903.9	0.860291332	312.1	0.107476153	0.967767485
1985-01-01	2722.7	3098.5	0.878715508	265.1	0.085557528	0.964273035
1986-01-01	2898.4	3287.9	0.881535327	269.4	0.081936799	0.963472125
1987-01-01	3092.1	3466.3	0.892046274	252.1	0.072728846	0.96477512
1988-01-01	3346.9	3770.4	0.8876777	294.7	0.078161468	0.965839168
1989-01-01	3592.8	4052.1	0.886651366	316.5	0.078107648	0.964759014
1990-01-01	3825.6	4311.8	0.887239668	335.4	0.077786539	0.965026207
1991-01-01	3960.2	4484.5	0.883086186	365.9	0.081592151	0.964678336
1992-01-01	4215.7	4800.3	0.878215945	426.0	0.088744453	0.966960398
1993-01-01	4471.0	5000.2	0.894164233	367.6	0.073517059	0.967681293
1994-01-01	4741.0	5244.2	0.904046375	331.4	0.063193623	0.967239998

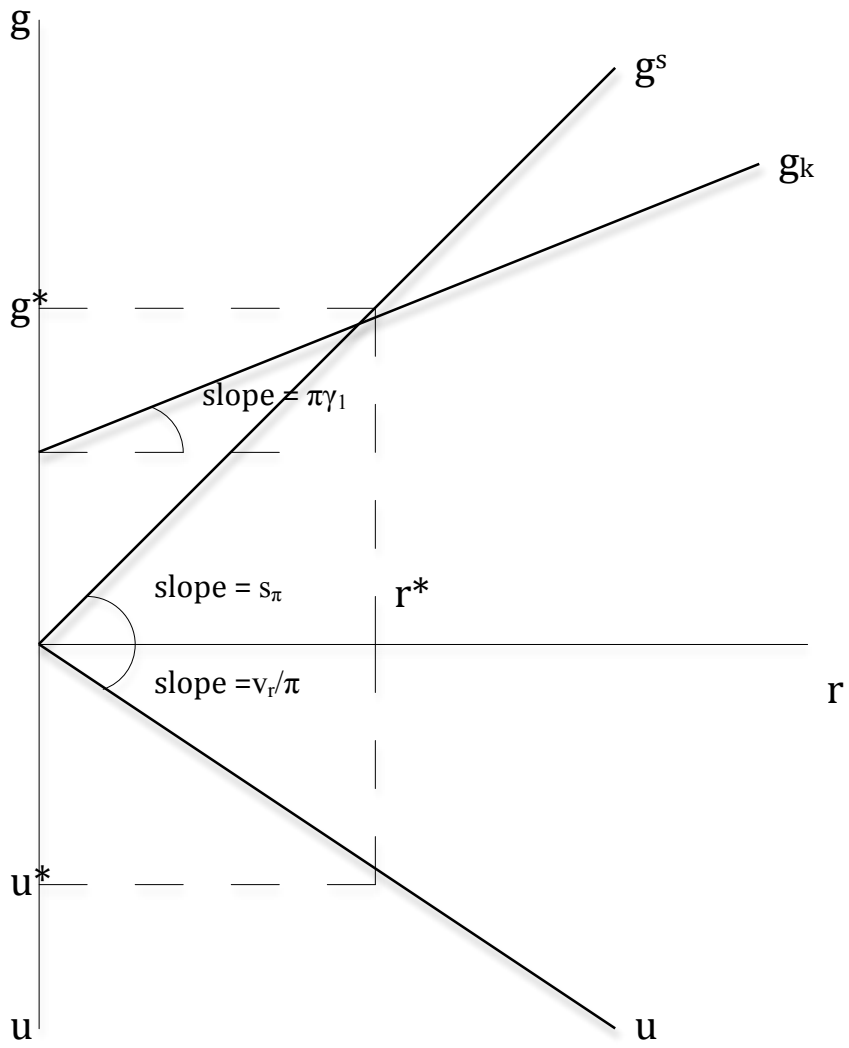
1995-01-01	4984.2	5532.6	0.90087843	352.9	0.063785562	0.964663992
1996-01-01	5268.1	5829.9	0.903634711	345.2	0.059211993	0.962846704
1997-01-01	5560.7	6148.9	0.904340614	352.2	0.057278538	0.961619151
1998-01-01	5903.0	6561.3	0.899669273	405.3	0.061771295	0.961440568
1999-01-01	6316.9	6876.3	0.91864811	293.0	0.042610125	0.961258235
2000-01-01	6801.6	7400.5	0.919073036	297.9	0.040254037	0.959327072
2001-01-01	7106.9	7752.3	0.916747288	331.2	0.042722805	0.959470093
2002-01-01	7385.3	8099.2	0.911855492	403.9	0.049869123	0.961724615
2003-01-01	7764.4	8486.7	0.914890358	410.8	0.048405152	0.963295509
2004-01-01	8257.8	9003.2	0.917207215	413.2	0.045894793	0.963102008
2005-01-01	8790.3	9401.8	0.934959263	242.7	0.025814206	0.960773469
2006-01-01	9297.5	10037.7	0.926258007	336.9	0.033563466	0.959821473
2007-01-01	9744.4	10507.9	0.927340382	317.2	0.030186812	0.957527194
2008-01-01	10005.5	10995.4	0.909971443	551.3	0.050139149	0.960110592
2009-01-01	9842.9	10937.2	0.89994697	670.7	0.061322825	0.961269795
2010-01-01	10201.9	11243.7	0.907343668	634.2	0.05640492	0.963748588
2011-01-01	10711.8	11787.4	0.908750021	668.2	0.05668765	0.965437671
2012-01-01	11149.6	12245.8	0.910483594	687.4	0.056133531	0.966617126
2013-01-01	11499.3	12474.2	0.921846692		0	

National Income and Debt

Date	Outstanding Debt	Debt:PDI	Real GDP	Consumption as a Percentage of GDP	Debt:GDP
1947-01-01	44.16	0.033635463	1937.6	0.083608588	2.279108175
1948-01-01	52.7	0.038127623	2018.0	0.086719524	2.611496531
1949-01-01	60.53	0.043443623	2007.0	0.088938714	3.015944195
1950-01-01	73.3	0.04816348	2181.9	0.088088363	3.359457354
1951-01-01	81.86	0.052030763	2357.7	0.088433643	3.472027824
1952-01-01	94.02	0.057758938	2453.7	0.089456739	3.831764274
1953-01-01	106.22	0.062229773	2568.9	0.0907003	4.134843707
1954-01-01	117.69	0.067973894	2554.4	0.09391638	4.60734419
1955-01-01	138.35	0.074925535	2736.4	0.094540272	5.055912878
1956-01-01	153.2	0.079181311	2794.7	0.097183955	5.481804845
1957-01-01	165.79	0.083525618	2853.5	0.100473103	5.810057824
1958-01-01	176.55	0.088015355	2832.6	0.104497635	6.232789663
1959-01-01	198.54	0.094899861	3028.1	0.104851227	6.556586638
1960-01-01	216.49	0.100838418	3105.8	0.106767982	6.970506794
1961-01-01	233.87	0.105218878	3185.1	0.107374965	7.342626605
1962-01-01	255.81	0.109832124	3379.9	0.107429214	7.568567117
1963-01-01	282.91	0.117074281	3527.1	0.108446032	8.021037113
1964-01-01	312.66	0.120806769	3730.5	0.110226511	8.381182147
1965-01-01	340.57	0.123893194	3972.9	0.111656473	8.572327519
1966-01-01	363.1	0.125423143	4234.9	0.11348556	8.573992302
1967-01-01	386.81	0.12805734	4351.2	0.116611509	8.889731568
1968-01-01	415.2	0.131500602	4564.7	0.122132889	9.09588801
1969-01-01	444.96	0.136306825	4707.9	0.128401198	9.451347735
1970-01-01	460.26	0.134839163	4717.7	0.137291477	9.756025182
1971-01-01	503.25	0.140950594	4873.0	0.143853889	10.32731377
1972-01-01	558.23	0.149207495	5128.8	0.150015598	10.88422243
1973-01-01	628.21	0.158295117	5418.2	0.157100144	11.59444096
1974-01-01	684.53	0.174460331	5390.2	0.172906386	12.69952877

1975-01-01	741.52	0.184448535	5379.5	0.191988103	13.78418069
1976-01-01	828.54	0.199937259	5669.3	0.20288219	14.61450267
1977-01-01	956.13	0.223666604	5930.6	0.215273328	16.12197754
1978-01-01	1111.21	0.248565037	6260.4	0.227812919	17.74982429
1979-01-01	1278.54	0.280516916	6459.2	0.246083106	19.79409215
1980-01-01	1395.96	0.304090969	6443.4	0.27230965	21.66495949
1981-01-01	1505.94	0.320024651	6610.6	0.293089886	22.78068557
1982-01-01	1575.79	0.328057209	6484.3	0.319834061	24.30162084
1983-01-01	1731.09	0.348237779	6784.7	0.337008269	25.51461376
1984-01-01	1943.12	0.365660519	7277.2	0.343291376	26.70147859
1985-01-01	2277.66	0.415912203	7585.7	0.358925346	30.02570626
1986-01-01	2534.22	0.445545808	7852.1	0.369124183	32.2744234
1987-01-01	2752.52	0.473665915	8123.9	0.380617684	33.8817563
1988-01-01	3039.85	0.499654827	8465.4	0.395362298	35.90911239
1989-01-01	3309.16	0.527877744	8777.0	0.4093426	37.70263188
1990-01-01	3571.56	0.558614865	8945.4	0.427661144	39.92621906
1991-01-01	3758.49	0.583752427	8938.9	0.443029903	42.04644867
1992-01-01	3961.66	0.590033213	9256.7	0.455421478	42.7977573
1993-01-01	4203.46	0.616017938	9510.8	0.470097153	44.1967027
1994-01-01	4527.04	0.645723741	9894.7	0.479145401	45.75217035
1995-01-01	4846.07	0.668801667	10163.7	0.490392278	47.68017553
1996-01-01	5183.84	0.693378989	10549.5	0.499369638	49.138253
1997-01-01	5489.37	0.708177878	11022.9	0.504467971	49.79968974
1998-01-01	5902.88	0.719135509	11513.4	0.512706933	51.26965102
1999-01-01	6377.63	0.752274175	12071.4	0.52329473	52.83256292
2000-01-01	6962.89	0.782127492	12565.2	0.541312514	55.41408016
2001-01-01	7628.5	0.833779633	12684.4	0.560286651	60.14080288
2002-01-01	8440.92	0.89495213	12909.7	0.572073712	65.38432342
2003-01-01	9463.53	0.976527706	13270.0	0.585109269	71.31522231
2004-01-01	10535.33	1.049680672	13774.0	0.599520836	76.4870771
2005-01-01	11719.49	1.150040724	14235.6	0.61749417	82.3252269
2006-01-01	12941.04	1.2212676	14615.2	0.636152772	88.54507636
2007-01-01	13807.13	1.275862611	14876.8	0.655013175	92.80981125
2008-01-01	13805.81	1.256398566	14833.6	0.674515964	93.07120321
2009-01-01	13533.87	1.237416341	14417.9	0.682693041	93.86852454
2010-01-01	13196.8	1.193114422	14779.4	0.69027836	89.29185217
2011-01-01	13016.98	1.149442806	15052.4	0.711634025	86.47777099
2012-01-01	12979.7	1.123627896	15470.7	0.720691371	83.89859541

Appendix 2: Diagram of neo-Kaleckian growth model



Appendix 3: Derivation of consumption model

$$C = C_W + C_R + \dot{D}$$

$$C = C_W + C_R + \beta(C^T - C_W)$$

$$C = C_W + C_R + \beta\eta C_R - \beta C_W$$

$$C = (1-\beta)C_W + (1+\beta\eta)C_R$$

If we assume that production workers' wages are a fraction of supervisory workers' wages,

namely:

$$W_R = \phi W_P$$

Then it is clear that:

$$C = (1-\beta)c_W(W_P\varphi N - iD_R) + (1+\beta\eta)c_\pi(\phi W_P(1-\varphi)N + \Pi + iD_R)$$

Appendix 4: Derivation of growth model with previous consumption model

If we impose a temporary equilbrium condtion with the absence of the public sector, we can see

that Y = C + I so:

$$Y = (1-\beta)c_W(W_P\varphi N - iD_R) + (1+\beta\eta)c_\pi(\phi W_P\varphi N + \Pi + iD_R) + I$$

In addition, it is useful to note that:

$$W_P\varphi N = \frac{W_P\varphi N}{Y} * Y = \omega_P Y$$

and

$$\frac{\Pi}{Y} * Y = \pi Y$$

Where ω_P is the production workers' share of income, and π is the profit share of income. Once

we do this, if we divide both sides by K to obtain a formula for the utilization rate of capacity,

we get:

$$u = (1-\beta)c_W\omega_P u - (1-\beta)c_W id_R + (1+\beta\eta)c_\pi\phi\omega_P u + (1+\beta\eta)c_\pi\pi u + (1+\beta\eta)c_\pi id_R + \gamma_0 + \gamma_1\pi u$$

$$u - (1-\beta)c_W\omega_P u - (1+\beta\eta)c_\pi\phi\omega_P u - (1+\beta\eta)c_\pi\pi u - \gamma_1\pi u = (1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0$$

$$u(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi) = (1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0$$

$$u = \frac{(1-\beta)c_W id_R + (1+\beta\eta)c_\pi id_R + \gamma_0}{(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

Appendix 5: Calculation of d_{Rmax}

We start with the relationship the assumption that the most a consumer can use to service their

debts is 100% of their given income, namely:

$$iD_{R_{\max}} - W_P N = 0$$

Dividing through by k we get

$$d_{R_{\max}} = \frac{\omega_P u}{i}$$

If we plug-in for u, we get a relationship that requires a u that is dependent on the maximum

value of dR, so we can solve for dR:

$$d_{R_{\max}} = \frac{(1-\pi)(-c_W d_{R_{\max}} i(1-\beta) + \gamma_0 + c_\pi d_{R_{\max}} i(1+\beta\eta))}{i(1+\phi)(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}$$

$$d_{R_{\max}}(1+\phi)(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi) + (1-\pi)(c_W(1-\beta) - c_\pi(1+\beta\eta)$$

$$= \frac{\gamma_0(1+\phi)(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}{i}$$

$$d_{R_{\max}} = \frac{\gamma_0(1+\phi)(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi)}{i(1+\phi)(1-(1-\beta)c_W\omega_P - (1+\beta\eta)c_\pi\phi\omega_P - (1+\beta\eta)c_\pi\pi - \gamma_1\pi) + (1-\pi)(c_W(1-\beta) - c_\pi(1+\beta\eta)}$$