Issues in Political Economy, Vol 21, 2012, 31-45

Is Consumption in the United States Influenced by Income Inequality? A Cointegration Analysis

Yuan Mei, Trinity College

The effect of inequality of the distribution of income on aggregate consumption has been the subject of considerable debate over decades, especially between the Keynesian economists and the Chicago school economists. In the case of the United States, while income distribution has become more unequal since the 1970s, the country's aggregate consumption growth has been maintained at a relatively high rate. However, Keynesian economists like Palley (2002) and Setterfield (2010) argue that the fast growth of aggregate consumption in the United States can be attributed to an unsustainable process of debt financing. If the impact of debt financing is removed, the relationship between consumption and income inequality will become obvious. This paper examines the validity of this argument from a cointegration approach. The empirical analysis is based on a modified consumption function that includes the Gini Index and debt-income ratio, in addition to disposable income and a measure of wealth. A vector error-correction (VEC) model is constructed to determine the long-run relationship between income inequality and consumption in the United States. It is found that there exists a cointegrating relationship between the Gini Index and consumption. However, the regression results of the VEC model imply that income distribution only affects consumption in the short run.

The paper is organized as follows. Section I gives a brief analysis of the disagreement between the two schools of economists and related literature. Section II presents the methodology used for the regression models in this paper. Section III provides an empirical analysis using a VEC model, and the final section concludes the paper with a summary.

I. Related Literature

The great economic crisis that started in the fall of 2007 terminated a golden period of the United States, a period referred to as "Great Moderation" by Ben Bernanke in a speech at the 2004 meetings of the Eastern Economic Association. It seems that economists do not differ significantly in estimating the scale of destruction of the great recession. However, no consensus has yet been reached about whether the United States is able to have another golden period of economic growth in the future. Felstein (2010) optimistically believes that growth during the 2010s will be the same as the growth during the 2000s, arguing that the economic recovery will raise the rate of GDP growth by more than enough to outweigh the slowdown in the growth of potential GDP. Wray (2009), on the other hand, asserts that a financial structure that promotes stability rather than speculation has to be constructed for the United States to escape from the failed "money manager capitalism".

A group of Keynesian macroeconomists have answered this question from a different perspective. They believe that the American economy experienced a structural flaw in its aggregate demand generating process, a flaw that has been covered up by the debt-financed consumer boom. Indeed, while real personal consumption expenditure increased significantly from $3765 billion in 1980 to $9263 billion in 2007, debt increased at an even more substantial pace: during the same period, household credit market debt outstanding grew ten times from $1352 billion to $13509 billion. Taking this observation into account, Palley (2002) argues that the economic growth of the United States before the great recession had been generated by an increasingly unsustainable process that rested on rising stock prices, rising household debt, mortgage refinancing and falling household saving rates. He claims that these processes have helped cover up the aggregate demand implications of the deteriorating income distribution, but they are now exhausted. Cynamon and Fazzari (2008) attributes a major part of the United States' economic success before 2008 and the mildness of the two recessions in early 1980s and 1990s to the strong growth of American consumption. However, they also notice that this credit-financed consumption would make the economy more fragile and threaten both U.S. and global demand growth. This idea resonates with earlier works of Minsky (1985, 1986). His financial instability hypothesis suggests that over periods of prolonged prosperity, capitalist economies tend to move from a financial structure dominated by stable hedge finance to an unstable structure that increasingly emphasizes speculative and Ponzi finance.

According to Setterfield (2010), the economic downturn is just a short-term incident. A more severe problem that has rooted itself deeply in the American economy is a structural flaw that is related most fundamentally to the stagnation of real wages for the great majority of wage earners and the concomitant increase in household inequality over the last four decades. He contends that the growth of indebtedness has been able to maintain the momentum of America's economic growth despite the violation of the crucial equality between real wage growth and labor productivity growth. Yet, since the very high debt-income ratio of the wage-earners makes further debt accumulation highly unlikely, insufficient real wage growth caused by a more severe unequal distribution of income will eventually lead the U.S. economy into great trouble.

The theoretical foundation of the Keynesian argument that income inequality will hinder aggregate demand growth can be traced back to Keynes' famous *The General Theory of Employment, Interest and Money*:

> "The fundamental psychological law, upon which we are entitled to depend with great confidence both *a priori* from our knowledge of human nature and from the detailed facts of experience, 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 … But, apart from short-period *changes* in the level of income, it is also obvious that a higher absolute level of income will tend, as a rule, to widen the gap between income and consumption. For the satisfaction of the immediate primary needs of a man and his family is usually a stronger motive than the motives towards accumulation, which only acquire effective sway when a margin of comfort has been attained. These reasons will lead, as a rule, to a greater *proportion* of income being saved as real income increases."

On the other hand, Keynes' idea that the marginal propensity to consume is a decreasing function of income has been rejected by the Chicago school economists. Their belief can be summed up by a sentence from Milton Friedman's *A Theory of the Consumption Function*:

> "The wide range of empirical material examined in this monograph turns out to be consistent with a rather simple relation between permanent consumption and permanent income suggested by purely theoretical considerations, namely, a ratio between permanent consumption and permanent income that is the same for all levels of permanent income but

> depends on other variables, such as the interest rate, the ratio of wealth to income, and so on."

A similar argument is also raised by Romer (2005). He uses a mathematical model that builds upon the life-cycle hypothesis of consumer behavior to show that saving is equivalent to future consumption. In other words, Keynes' claim that poor individuals save a smaller proportion of their income than the wealthy cannot hold, because "the decision about the division of income between consumption and saving is driven by preferences between present and future consumption and information about future consumption prospects."

Few empirical tests have been conducted to determine whether aggregate consumption is independent of the distribution of income. Blinder (1975) utilizes pure mathematical reasoning to prove that even if we assume the marginal propensity to consume of an individual decreases as his disposable income rises, the argument that a larger share of any given disposable income is spent on consumption when income is more equally distributed does not follow automatically. He then conducts a series of econometric tests and claims that equalizing the distribution of income would either leave aggregate consumption unchanged or diminish it slightly. Blinder also uses the *relative income hypothesis* from Duesenburry (1949) to explain why it is possible that greater inequality would increase consumption. According to Duesenburry, utility attaches not to consumption, but to the ratio of one's own consumption to a weighted average of the consumption of others. The weights reflect the frequency of contact with individuals in other consumption classes. Therefore, a greater inequality in income distribution may actually increase the fraction of income that is consumed.

II. Estimation Methodology

The most widely used consumption model is the consumption function developed by Keynes (1936):

(1) $$C = C_0 + C_1 Y^d$$

where C is total consumption, Y^d is disposable income, C_0 is autonomous consumption and C_1 is the marginal propensity to consume. As discussed in the previous section, Keynes argues that as the level of Y^d increases, C_1 will decrease. However, running regression on equation (1) with Ordinary Least Square (OLS) cannot capture the change in the marginal propensity to consume. One of the possible solutions is to include a variable that measures income inequality.

Brown (2004) uses the Theil Index as a measure of income inequality to test whether consumption in the United States is independent of the distribution of income. The time series data of the monthly Theil Index is computed according to the instructions of Conceição & Galbraith (2000). However, one problem concerning the Theil Index is that the index only covers private sector wage and salary inequality. Public sector and supervisory employees are omitted from the sample. According to Palley (2002), since the 1970s, there has been a wage share shift from production and non-supervisory workers to managerial workers. The Theil Index fails to capture this shift, which can contribute to a large portion of income inequality in the United States. An alternative measure of inequality, which is used in this paper, is the Gini Index.

Developed by Italian statistician Corrado Gini, the Gini Index is a commonly used measure of inequality in the distribution of income. A value of zero indicates total equality while a value of one indicates maximal inequality. One advantage of using the Gini Index as compared to the Theil Index is that it is able to capture the wage share shift. Obviously, there are other indices measuring inequality in distribution. For example, Braun (1988) argues that the Nelson ratio is the best measure of inequality when a cross-sectional analysis of family income inequality in different U.S States is conducted. However, one major problem with running time-series regressions that include income inequality comes from the availability of data. Since the Gini Index is one of the very few indices that cover a time period long enough for regression results to be statistically meaningful, it is rather unlikely that we will find a significantly better measure without wasting too much effort.

Clearly, income and a measure of inequality alone are still insufficient in explaining the strong upward trend of aggregate consumption in the United States observed before 2008. As argued by a group of Keynesian economists, the rapid growth of consumption is believed to be sustained by a growth of indebtedness. It seems that their opinion does have some data support: the debt-income ratio in 2000 is 22 percent higher than its previous cyclical peak in 1989 (Palley 2002). Incorporating a measure of debt into the consumption function is not a novel idea. Mishkin (1978) studied data on consumption and household balance sheets during the Great Depression and claims that changes in household liabilities can affect consumer expenditure and consequently, aggregate demand. If the Gini index in the consumption function becomes statistically significant after the debt-income ratio is included, then we may have found empirical evidence to support the Keynesian argument of decreasing consumption accompanied by rising inequality.

Even though current income is the main independent variable that determines the level of consumption in *The General Theory*, Keynes (1936) also states that "The consumption of wealth-owning class may be extremely susceptible to unforeseen changes in the money value of its wealth." Later, Ando and Modigliani (1963) officially include net worth as a determinant of consumption in their famous life-cycle hypothesis of consumer behavior. Gali (1990) derives a similar consumption function that is linear in income and wealth variables from the dynamic optimizing behavior of consumers with finite horizons and life-cycle savings.

(2) $$C = C_0 + C_1 Y^d + \gamma G + \delta D + \beta W$$

Equation (2) is the modified consumption function after the inclusion of the Gini Index, the debt-income ratio and a measure of wealth. This equation is not too different from the one used by Brown (2004). Regression results for his consumption function indicate a significant negative effect of income distribution on consumption. However, it is worth noting that in Brown's paper, all three equations that use data in level form have an extremely high R^2 value (greater than 0.99). This raises doubts about the credibility of his estimations and suggests the presence of non-stationarity in the regression model. The problem with non-stationary data is that the standard OLS regression procedures can easily lead to incorrect conclusions, and it is not uncommon for totally unrelated non-stationary variables to produce a R^2 value higher than 0.95. Because the econometric results from these regressions are totally spurious, they are called spurious regressions (Granger and Newbold 1974).

The idea of non-stationarity is closely related to integration. A series is said to be integrated of order one if the series becomes stationary after first differencing. Since it has been observed that most macroeconomic variables are integrated of order one, one simple way to render the variables stationary is to take the first difference. This is also what has been done in Brown's paper (2004). However, one major problem of differenced regression models is that the regression results only reveal short-run relationship between the variables. The long-run behavior of the model is missing. In order to solve this problem, the error-correction model has been used extensively to examine both short-run and long-run behavior of non-stationary variables.

The error-correction model is based on the idea of cointegration first introduced by Granger (1981) and further formalized by Engle and Granger (1987). The formal definition of cointegration given by Engle and Granger (1987) is as follows:

> "Time series Y_t and X_t are said to be cointegrated of order d, b where $d \geq b \geq 0$, written as $Y_t, X_t \sim CI\ (d, b)$, if (a) both series are integrated of order d, (b) there exists a linear combination of these variables, say $\beta_1 Y_t + \beta_2 X_t$ which is integrated of order $d - b$."

In other words, cointegration is observed when two non-stationary series are actually related: the two trends of the series will be similar to each other, so that it is possible to find a combination of them which eliminates the non-stationarity. Based on this concept, Engle and Granger (1987) construct an error-correction model that extracts the residual of the regression equation of two cointegrated variables and includes it in the difference equation as an "error-correction term". This model resolves the problem of spurious regressions and also captures the adjustment process to the long-run relationship between the two cointegrated variables.

However, one major drawback of this approach is that the model cannot work if there is more than one cointegrating equation among the variables. In addition, the Engle-Granger method is usually used only when the testing model has two variables, even though in theory there is no limit on the number of variables included. In this case, since the number of cointegrating equations in the consumption function is still unknown, using the Engle-Granger error-correction model thus becomes inappropriate. Instead, a VEC model developed by Johansen (1988, 1992) and Johansen and Juselius (1990) will be used to examine the dynamics between consumption, income inequality and the debt-income ratio. The Johansen approach utilizes multiple equations instead of one simple equation. Thus, it is able to estimate cointegrating vectors without constraints on the number of cointegrating equations involved. A general form of the VEC model can be expressed as:

$$\text{(3)} \qquad \Delta\boldsymbol{Z} = \boldsymbol{\gamma_1}\Delta\boldsymbol{Z_{t-1}} + \boldsymbol{\gamma_2}\Delta\boldsymbol{Z_{t-2}} + \cdots + \boldsymbol{r_{k-1}}\Delta\boldsymbol{Z_{t-k+1}} + \boldsymbol{\pi}\boldsymbol{Z_{t-1}} + \boldsymbol{u_t}$$

where all variables are in matrix form. The $\boldsymbol{\pi}$ matrix contains information regarding the long-run relationship.

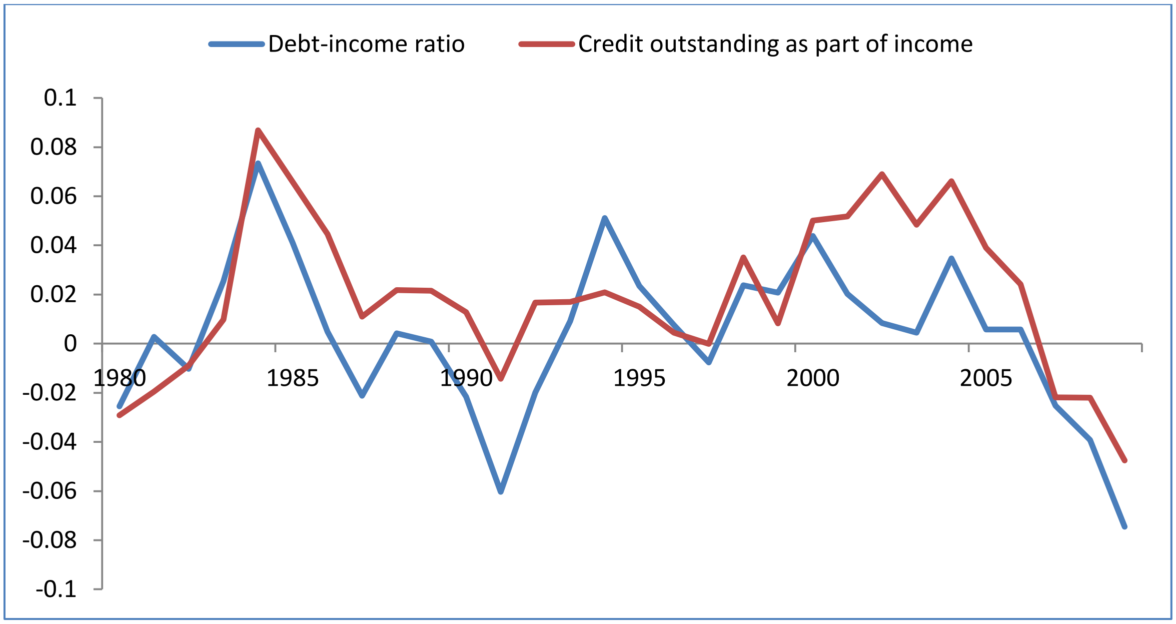
III. Empirical Analysis

The five variables included in the modified consumption function are aggregate consumption, disposable income, the Gini Index for households, the Standard and Poor 500 Index (S&P 500 hereafter) and the debt-income ratio. In addition, three dummy variables are also included in the estimating equations to capture the impact of the oil crisis of 1974, the recession in the early 1980s, and the financial crisis of 2008. The time period covered in this study is from 1967 to 2009. All data used are in annual form. Consumption is measured as the natural logarithm of real personal consumption expenditure. Disposable income is the natural logarithm of real personal disposable income. Time series data of these variables are available from the database of the Federal Reserve Bank of St. Louis. Data for the Gini Index of households, on the other hand, are obtained from U.S. Census Bureau.

Initially, the natural logarithm of household debt service payments as a percent of disposable personal income is used as a measure of debt to income ratio. However, the time series data provided by the Federal Reserve Bank of St. Louis only starts in 1980. Including this set of data would lead to insufficient data points in the regression. Instead, household credit market debt as a percent of disposable personal income is chosen to represent debt to income ratio. Comparing the plots of percentage change of the two series over time in figure 1, we can see that their trends are very similar.

The natural logarithm of S&P 500 is used to track changes in the wealth of American households. First published in 1957, S&P 500 measures the prices of the 500 largest common stocks actively traded either in the New York Stock Exchange or the NASDAQ. It should be noted that economists have not reached a consensus about whether stock market wealth effect contributes significantly to the consumption pattern in the United States. For example, Poterba (2000) believes that wealth accumulation from rising stock prices translates to a substantial increase in consumer spending. Case, Quigley and Shiller (2005), on the other hand, conduct a panel-data analysis and claim that the empirical evidence that supports a stock market wealth effect in the United States is weak.

Figure 1 Change in debt-income ratio and credit outstanding as part of income, 1980-2010



It is reasonable to first plot the variables over the time period 1967-2009 to examine whether they are stationary. From Figure 1 (see appendix) we observe that plots of all variables over time resemble a random walk. Unlike the plot of a stationary series in which white noise is observable, these plots all possess a positive drift. Next the augmented Dickey-Fuller (ADF) test is conducted to test for non-stationarity in these variables. Here we follow the procedure suggested by Doldado, Jenkinson and Sosvilla-Rivero (1990). First, the ADF test is conducted with the most general test equation, including both an intercept and a trend. The test results are exhibited in Table 1. We can see that the null hypothesis of a unit root cannot be rejected for all five variables. In addition, the time trends in the test equations are significant at the 5% level. The only exception is the S&P 500, in which the time trend is significant at the 10% level. According to the procedure, the next step is to test for the time series data of S&P 500 with two less general equations. It is shown that the null hypothesis of a unit root in S&P 500 still cannot be rejected at 5%. Thus we conclude that unit root exists in all the variables in level form.

Table 1 ADF Test with Intercept and Trend

	C	**Y^d**	**G**	**D**	**W**
ADF	-3.174	-2.587	-3.058	-3.174	-1.999
Time Trend	3.120*	2.498*	-2.292*	3.062*	1.871**

* Significant at 5%, **Significant at 10%

Since we have confirmed the existence of a unit root in all five variables, the next step is to find their orders of integration. After conducting the ADF test for various times of differencing, it is found that disposable income is integrated of order two, while the other variables are integrated of order one. Even though the Engle-Granger approach prohibits the use of variables integrated to different orders, the Johansen approach does allow for this possibility (Harris 1995).

After setting the optimal number of lags to be three by the results of the VAR model, the next step is to decide whether an intercept and trend should be included in either the short-run or the long-run model, or both. The Johansen cointegration test has five possible test models, three of which are compatible with economic observations: Model 2 has an intercept in the long-run cointegration equation but does not have an intercept or trend in the short-run VAR model; Model 3 has an intercept in both the cointegrating equation and the VAR model, but a trend is not included in either model; Model 4 has an intercept in both models with a trend in the cointegration equation. Model 1 does not have an intercept or trend in either the cointegrating equation or the VAR model. This is quite unlikely to occur in practice. Model 5, on the other hand, includes a linear trend in the VAR. This is also unlikely from an economic perspective, as the linear trend implies an ever-increasing or ever-decreasing rate of change. Johansen (1992) suggests that the Pantula Procedure can be applied to determine which model should be used. Briefly speaking, the procedure comprises moving from the most restrictive model, at each stage comparing the trace test statistic to its critical value and stopping only the first time that the null hypothesis of cointegration cannot be rejected. The trace test statistics for different models are shown in Table 2. We can see that the procedure is stopped at Model 3, so Model 2 should be used for the Johansen cointegration test if we follow the Pantula Procedure.

Table 2 the Pantula Principle Test Results

Cointegration Relations	**Model 2**	**Model 3**	**Model 4**
0	155.723	135.805	171.001
1	84.605	73.737	99.994
2	36.295	25.788*	49.059
3	13.345	5.621	18.044

* Indicates the first time that the null cannot be rejected.

However, the Pantula Procedure is just a generalized guide that may or may not select the most appropriate model for the cointegration relationship. In this case, even though the Procedure indicates that Model 2 should be used, theories about consumption function suggest otherwise: it has been accepted that autonomous consumption constitutes an important component of total consumer expenditure. However, in Model 2 there is no intercept in the short-run VAR model, which implies that autonomous consumption in the short-run is assumed to be zero. Model 3 and Model 4, on the other hand, are consistent with conventional consumption theories. The only difference between the two models is that Model 4 takes into account possible long run exogenous growth. Since the time series data for consumption has an upward trend, Model 4 is selected as the model for the Johansen Cointegration Test. If Model 3 is chosen instead, omitting the trend variable may render the long run estimators biased and inconsistent.

Table 3 Summary of Johansen Cointegration Test, Model 4

No. of relations	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
None	171.001*	88.803	71.007*	38.331
At most 1	99.994*	63.876	50.935*	32.118
At most 2	49.059*	42.915	31.014*	25.823
At most 3	18.044	12.517	15.122	19.387

* Significant at 5%

Table 3 is the summary of the test results of the Johansen Cointegration Test using Model 2. We can see that both the trace statistic and the max-eigen statistic indicate a maximum of three cointegrating equations. However, such results still cannot guarantee that there exists a cointegrating relationship. Only when the equations suggested by the Johansen Cointegration Test make both economic and statistical sense, then we can construct a valid VEC model. Fortunately, one of the three suggested equations, as shown in Table 4 and Table 5, does look like a meaningful VEC equation. The cointegrating equation term in Table 4 has a negative sign and is statistically significant. The speed of adjustment is also within a reasonable range. In addition, results in Table 5 show that all independent variables in the modified consumption function that are statistically significant have the correct sign. Thus, the next step would be constructing a VEC model based on this cointegrating equation.

Table 4 Suggested Error Correction Equation, Adjustment Coefficients and Standard Errors

	D(consumption)	D(disposable income)	D(Gini)	D(debt ratio)	D(S&P 500)
Coefficient	-0.583*	-0.603*	0.050	-0.656*	-5.266*
S. E	0.183	0.209	0.078	0.224	2.120

* Significant at 5%

Table 5 Suggested Cointegrating Equation, Normalized Coefficients and Standard Errors

	Consumption	Disposable income	Gini	Debt ratio	S&P 500	Trend
Coefficient	1.000	0.154	-0.741	-0.101*	-0.050*	-0.028*
S.E		0.220	0.606	0.029	0.011	0.007

* Significant at 5%

Estimates of the VEC model are presented in Table 6. The first part of the table is a normalized cointegrating equation that describes the long-run relationship among the variables included. We notice that all the significant variables have the correct sign. The Gini Index, however, is not statistically significant. Contrary to what is expected, disposable income is also not significant in the long-run. Since the development of the life-cycle hypothesis and permanent income hypothesis, it has been argued that current disposable income may not affect consumption substantially. However, the relationship between disposable income and consumption in the long-run has rarely been challenged. One possible explanation for the insignificant disposable income term is that its explanatory power is masked by the significant trend variable: the significant upward trend of consumption is actually the result of increasing disposable income.

Table 6 Estimates of the Vector Error-Correction Model

Variable	Coefficient	t-Statistic	Variable	Coefficient	t-Statistic
Cointegrating Equation					
C_{-1}	1.000		C	-8.656	
D_{-1}	-0.101*	[-3.452]	Y_{-1}	0.154	[0.699]
W_{-1}	-0.050*	[-4.393]	G_{-1}	-0.741	[-1.222]
Trend	-0.028*	[-3.730]			
Error Correction					
Correction Term	-0.583*	[-3.185]	C	0.016	[1.495]
ΔC_{-1}	0.553	[1.798]	ΔY_{-1}	0.141	[0.541]
ΔC_{-2}	0.370	[1.124]	ΔY_{-2}	-0.301	[-0.784]
ΔC_{-3}	-0.991*	[-2.926]	ΔY_{-3}	0.760*	[2.406]
ΔD_{-1}	0.429	[1.799]	ΔG_{-1}	-1.561*	[-2.305]
ΔD_{-2}	-0.186	[-0.874]	ΔG_{-2}	-0.901	[-1.811]
ΔD_{-3}	0.281	[1.870]	ΔG_{-3}	-0.612	[-1.225]
Oil Crisis	-0.060*	[-4.381]	ΔW_{-1}	-0.019	[-0.868]
1982 Recession	-0.011	[-1.158]	ΔW_{-2}	-0.037	[-1.942]
2008 Recession	-0.023*	[-2.210]	ΔW_{-3}	0.053*	[2.494]
Adjusted R^2	0.670		*F-Statistic*	5.065	

* Significant at 5%

The second part of Table 6 consists of an error correction equation that contains information about the short-run relationship of the variables. The first variable in the equation, the error correction term, is significant and has the correct sign. In addition, its value is also within the expected range (less than one). A coefficient of -0.583 tells us that in every period, 58.3% of the deviation from the long-run relationship in the previous period is corrected.

The three variables representing short-run changes of the Gini Index exhibit a very interesting trend: while the coefficient has the correct sign, the variable becomes less significant as the number of lags increases. This pattern is actually congruent with the insignificant Gini Index variable in the long-run cointegrating equation. This trend of diminishing significance tells us that the impact of income distribution on consumption can only be found in the very short-run. While such observation is compatible with Keynes' argument that the rich tends to have a smaller marginal propensity to consume, no theory can explain why the impact of income distribution on consumption disappears in the long-run. In fact, this result is more of an intermediation of Keynes' and Friedman's hypotheses: Keynes is correct in the short-run but Friedman's argument holds in the long-run.

On the other hand, a trend of increasing significance is also observed among the lagged S&P 500 variables, with the variable lagged one period least significant and the one in the cointegrating equation most significant. Since this variable captures the wealth effect on consumer expenditure in the United States, this observation is consistent with the wealth effect described in the life-cycle model of consumer behavior: consumers will spend more only if they are assured that the increase in their wealth is not transitory.

Among the three disposable income variables, only the one with three lags is significant. It does make economic sense for consumers to adjust their consumption few periods after their income changes. Similarly, consumption with three lags is significant, but those with one and two lags are insignificant. The coefficient of the significant consumption variable is negative, which implies some correction mechanism in consumer spending. However, the value of the coefficient, even though still within a reasonable range, is extremely high. Moreover, none of the debt-income ratio variables is significant, which contradicts the argument of post-Keynesian economists. Last but not least, two of the three dummy variables are significant. Since the 1982 recession is milder than the other two, the insignificance of that dummy variable is reasonable.

IV. Conclusion

Various tests conducted in this paper provide suggestive empirical evidence in arbitrating the disagreement between Keynesian economists and their Chicago school colleagues. First, the ADF tests have confirmed the existence of unit root in the test variables. Thus, any regression model using the OLS estimation would lead to spurious results. More advanced time-series econometric models have to be used to analyze the factors that can determine consumer expenditure in long run. In this paper, a model based on error-correction is adopted to trace the long run behavior of consumption in the United States. The Johansen cointegration test shows that cointegrating equations are present among the five variables in the modified consumption function. This enables us to establish a VEC model to empirically test Keynes' argument.

However, the VEC model constructed based on the results of the Johansen test only partially supports the idea of incorporating a measure of income distribution into the consumption function: while the Gini Index with one lag is significant, its significance diminishes with more lags. This result resonates with Keynes' argument in the *General Theory* to a certain degree, since he mainly focuses on the short run behavior of consumer. On the other hand, the result also does not contradict Friedman's conjecture, as his permanent income hypothesis is a long run model.

Admittedly, some regression results cannot be easily explained by conventional consumer theories. For example, the negative coefficient of the lagged consumption variable indicates some form of feedback effect. However, it is rather unlikely for such effect to take place only after three years. In addition, the extremely high value of the coefficient is also not expected. It is possible that the limited amount of data points partially jeopardizes the reliability of the regression results. Nevertheless, regression results of other variables do make economic sense. The Adjusted R^2 value is also relatively high, partly reflecting the overall credibility of the regression model. Purely based on the results of the empirical analysis in this paper, it appears that income inequality does not play a crucial role in determining consumer expenditure in the United States.

V. References

Ando, Albert., and Franco Modigliani. 1963. “The ‘Life-Cycle’ Hypothesis of Saving: Aggregate Implications and Tests” The *American Economic Review*, Vol. 53 NO. 1 Part 1, pp. 55-84

Blinder, Alan S. 1975. "Distribution Effects and the Aggregate Consumption Function” *The Journal of Political Economy*, Vol. 83, No. 3, pp. 447-475

Braun, Denny. 1988. “Multiple Measurements of U.S. Income Inequality” *The Review of Economics and Statistics*, Vol. 70, No. 3 (Aug., 1988), pp. 398-405

Brown, Christopher. 2004. “Does Income Distributin Matter for Effective Demand? Evidence from the United States” *Review of Political Economy*, Volume 16, Number 3, 291–307

Case, Karl E., John M. Quigley, and Rober J. Shiller. 2005. “Comparing Wealth Effects: The Stock Market versus the Housing Market” *Program on Housing and Urban Policy Working Paper Series,* Volume 5, Issue 1, Article 1

Conceição, Pedro. and James K. Galbraith. 2000. “Constructing long and dense time series of inequality using the Theil Index,” University of Texas Inequality Project Working Paper No. 1

Cynamon, Barry Z., and Steven M. Fazzari. 2008. “Household Debt in the Consumer Age: Source of Growth—Risk of Collapse,” Capitalism and Society, 3, 2, Article 3

Doldado, Juan J., Tim Jenkenson, and Simon Sosvilla-Rivero. “Cointegratoin and Unit Roots,” *Journal of Economic Surveys*, 4, pp. 249-73

Duesenberry, James S. 1949. *Income, Saving, and the Theory of Consumer Behavior.* Cambridge, Mass: Harvard Univ. Press

Engle, Robert F., and C.W. J. Granger. 1987. “Co-Integration and Error Correction: Representation, Estimation and Testing” *Econometrica*, Vol. 55, No. 2 (March, 1987), 251-276

Felstein, Martin S. 2010. “U.S. growth in the decade ahead,” *National Bureau of Economic Research (NBER) Working Paper 15685*

Friedman, Milton. 1957. *A Theory of the Consumption Function.* Princeton, N J: Princeton Univ. Press. Princeton.

Gali, Jordi. 1990. “Finite Horizons, Life-Cycle Savings and Time-Series Evidence on Consumption,” *Journal of Monetary Economics*, vol. 26. pp. 433-52

Granger, C. W. J., and Paul Newbold. 1973. “Spurious Regressions in Econometrics” *Journal of Econometrics* 2 (1974) 111-120

Granger, C. W. J. 1981 “Some Properties of Time Series Data and Their Use in Econometric Model Specification” *Journal of Econometrics* 16 (1981) 121-130

Harris, Richard. 1995. *Using cointegration analysis in econometric modeling.* London; New York and Toronto: Simon and Schuster International; Prentice Hall/Harvester Wheatsheaf

Johansen, Soren. 1988. "Statistical analysis of cointegration vectors" *Journal of Economic Dynamics and Control*, 12, 231-254

Johansen, Soren. 1991. "Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models." *Econometrica*, 59, 1551-1580

Johansen, Soren, and Katarina Juselius. 1990. "Maximum likelihood estimation and inference on cointegration with application to the demand for money" *Oxford Bulletin of Economics and Statistics*, 52, 169-210

Keynes, John M. 1936. *The General Theory of Employment, Interest and Money.* London: Macmillan.

Mehra, Yash P. 2001. "The Wealth Effect in Empirical Life-Cycle Aggregate Consumption Equations," *Economic Quarterly*, Vol. 87/2

Minsky, Hyman P. 1985. "The Financial Instability Hypothesis" in Philips Arestis and Thanos Skouras, eds., *Post Keynesian Economic Theory*. Sussex, England: Wheatsheaf Books.

Minsky, Hyman P. 1986. *Stabilizing An Unstable Economy.* New Haven, C T: Yale University Press.

Mishkin, Frederic S. 1978. "The Household Balance Sheet and the Great Depression" *Journal of Economic History,* Vol. XXXVIII, No. 4

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

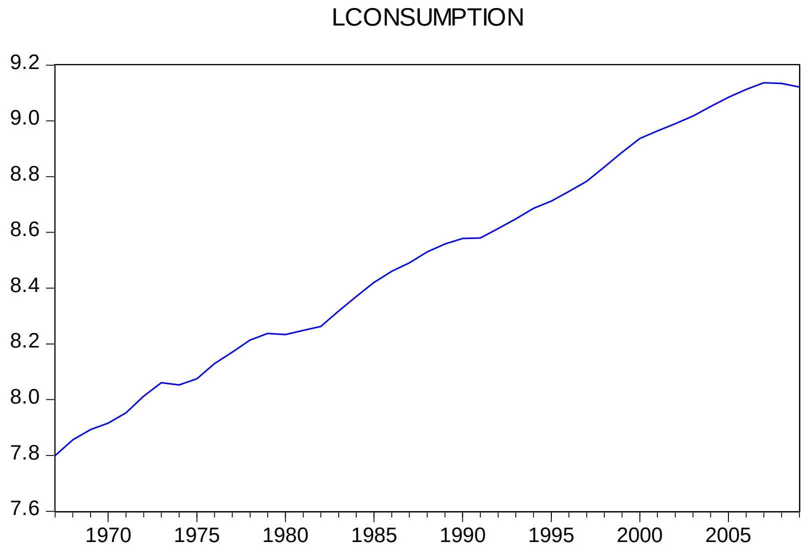
Poterba, James M. 2000. "Stock Market Wealth and Consumption" *Journal of Economic Perspectives,* Number 2-Spring 2000-Page 99-118

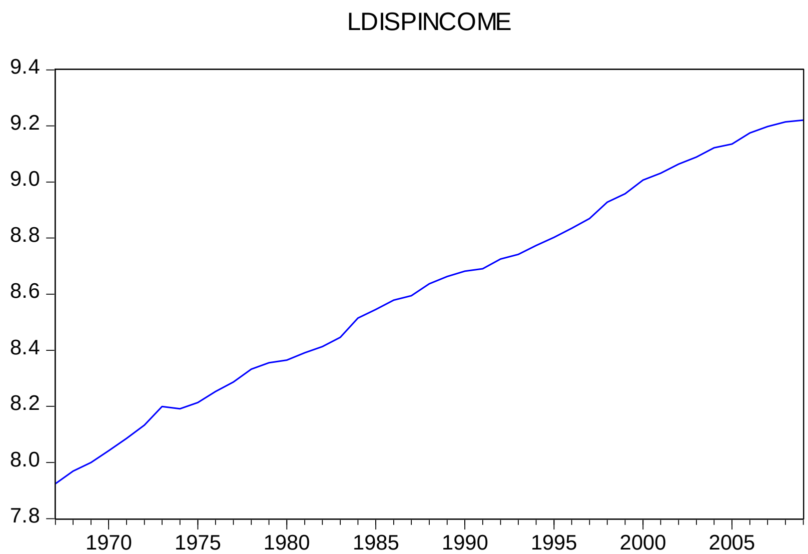
Romer, David. 2005. *Advanced Macroeconomics*. New York, NY: McGraw-Hill/Irwin

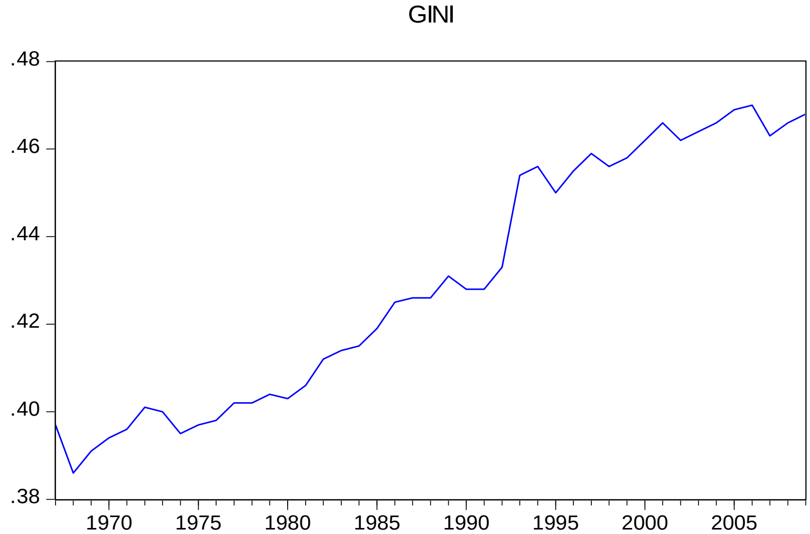
Setterfield, Mark. 2010. "Real Wages, Aggregate Demand, and the macroeconomic Travails of the US Economy: Diagnosis and Prognosis." *Trinity College Department of Economics Working Paper* 10-05

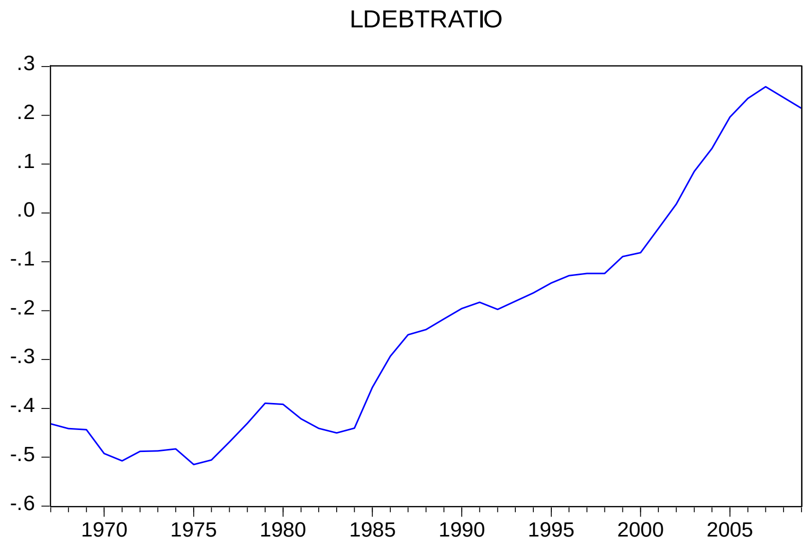
Wray L. Randall. 2009. "The rise and fall of money manager capitalism: a Minskian approach." *Cambridge Journal of Economics* 2009, 33, 807-828

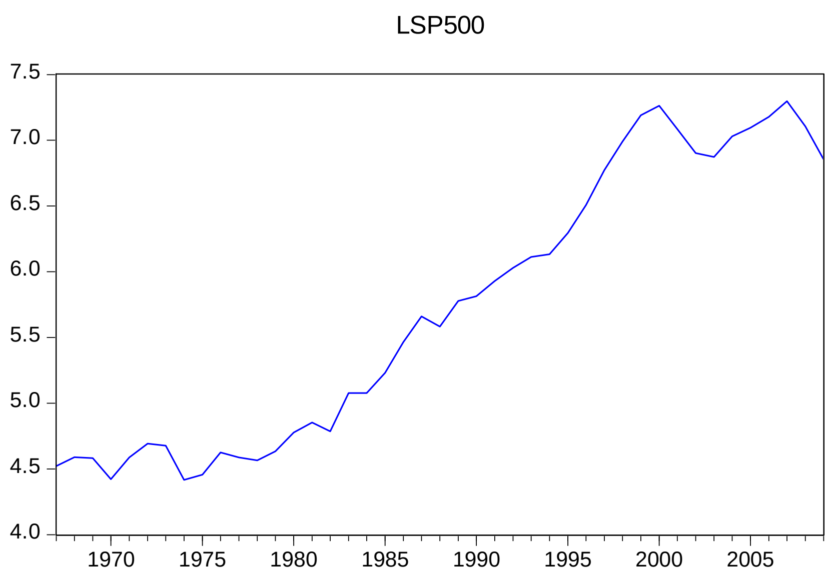
VI. Appendix


LCONSUMPTION
9.2
9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
1970
1975
1980
1985
1990
1995
2000
2005


LDISPINCOME
9.4
9.2
9.0
8.8
8.6
8.4
8.2
8.0
7.8
1970
1975
1980
1985
1990
1995
2000
2005


GINI
.48
.46
.44
.42
.40
.38
1970
1975
1980
1985
1990
1995
2000
2005


LDEBTRATIO
.3
.2
.1
.0
-.1
-.2
-.3
-.4
-.5
-.6
1970
1975
1980
1985
1990
1995
2000
2005


LSP500
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1970
1975
1980
1985
1990
1995
2000
2005