The Fable of a Stable Marginal Propensity to Consume (MPC)

Nozar Hashemzadeh and Dan Farhat
nhashemz@radford.edu and dfarhat@radford.edu
Professor of Economics and Assistant Professor of Economics,
Department of Economics
Radford University, Radford, VA 24142

Abstract

John M. Keynes' hypothesis "that the marginal propensity to consume (MPC) is a fairly stable function" (Keynes, 1936, P. 96) is one of the most enduring foundations for exploring and analyzing economic performance. The proposition, that a predictable causal relationship exists between income and consumption, allows researchers to create and test parsimonious models (both theoretical and empirical), making it an attractive and robust assumption to rely upon. Furthermore, a fixed MPC allows for the identification of a constant "multiplier effect" for fiscal policy. Since the idea is both simple and intuitive, it has become a component of introductory economic analysis taught in most undergraduate macroeconomics courses. In this article, we review the robustness of this proposition.

Introduction:

Although it is a dominant conception, Keynes proposition has not gone unchallenged or accepted as a "scientific fact". Since its introduction, moral philosophers and social scientists who rely on the scientific method and objectivity have questioned the Keynesian macroeconomic paradigm and its suitability to economic decision making. Among others, Agnus Deaton who merited the Nobel Prize in 2015, has been being raising serious questions about the relationship between income and consumption in many of his presentations and published works (Deaton 2010, 2011). Deaton's pioneering empirical work has shifted the emphasis away from the behavior of macro aggregates to the decision-making process at the individual and household levels. We can now agree that a fixed aggregate MPC tells us nothing about economic behavior since the impulsive and perhaps random actions of millions of individual agents may "add up" in such a way that the aggregate MPC appears constant.

Empirically, if the Keynesian paradigm was subjected to the more exacting versions of the scientific mythology as articulated by some classical philosophers (Hume, et al), his hypothesis would have been rejected at the outset. In contemporary times, Keynes hypothesis would fail the scientific rubrics so clearly defined by such modern-day philosophers as Karl Popper, Dennis Phillips and other epidemiologists. For instance, in Popper's view, empirical theories such as conjectures about the trajectory of MPC can only be tested and falsified, but never logically verified. Thus, from a pragmatic perspective, we submit that unless Keynes' proposition cannot

be *falsified* through extensive and verifiable tests and validation, it cannot be recognized as a scientific theory.

Casually, the scientific validity of a stable MPC which is based on Keynes inductive methodology is a dubious proposition. Nearly two hundred years before the publication of Keynes' influential work, David Hume had cautioned that the problem of inductive logic is that "instances, of which we have had no experience, must resemble those of which we have had experience, and that the course of nature continues always uniformly the same." (Hume, 1888). Therefore, limited evidence of a stable MPC in short instances at one level (aggregate) cannot logically be worked into a universal theory. In an evolving economy, we should hesitate to presume anything is "fixed"; a constant MPC evident in today's data does not necessarily imply it will remain so indefinitely.

Recently, the irregular behavior of the MPC by income class, regional and country differences and the phase of economic development are being robustly and progressively questioned in the more innovative scientific approaches that have used more consistent and dependable microeconomic data in testing the theory and its implications. This research also has had important implications for the shape and behavior of the utility function, since the value of the MPC emerging from the utility-maximization exercise depends in part on the exact formulation of the utility function. This outcome has contributed to academic debates in the context of the Permanent Income Hypothesis. In the main however, the outdated mundane models of the text-book consumption function and its successive formulations have severely obstructed our academic literacy and policy design.

In this brief article, we review the robustness of the "constant MPC" hypothesis. We begin by reviewing select insights from recent research findings. We extend the discussion by exploring current data on consumption and disposable income for the US. We end the article with implications and recommendations for future research.

Early challengers

While a significant causal relationship between income and consumption is theoretically and empirically sound, there is no scientific foundation to support that changes in the level of income changes consumption spending by a predictable amount at every stage. The failure of Keynes hypothesis in explaining the post-war consumption and saving behavior in the United States and elsewhere in Europe prompted much debate soon after the publication of the "General Theory". In a treatise published in 1947, A.C. Pigou criticized Keynes General Theory for ignoring the "wealth effect" in the consumption function. Pigou submitted that in due time, as a result of a falling price level, the wealth effect would stimulate consumption as well the MPC. Nobel Prize laureate, Paul Samuelsson (1943) questioned the stability of the Keynesian consumption function and proposed a "ratchet model" with the implication that during an economic recession household are reluctant to abandon their consumption habits in response to declining levels of spendable income.

Soon after, other economists including Brady and Milton Friedman (1947) Duesenberry (1948)

Modigliani (1949) and Katona and Mueller (1953, 1956), offered competing hypotheses about consumers' consumption behavior during the post-war era. Friedman's theory of *Permanent Income Hypothesis* which initially gained considerable support in the macroeconomic literature, conjectures that it is the *permanent income* that drives consumption behavior rather than current income. All the same, consumption theories that use "*Permanent Income*" or life cycle income as a determinant of consumption have proved inadequate in explaining the behavior of the MPC over the short horizon. These theories often subsume a world of certainty in which individuals have perfect information about their future income, the direction of interest rates, and availability of credits, life expectancy and so on. James Tobin (1958), a celebrated Keynesian and a Nobel Laureate, questioned aspects of Keynes consumption theory as it related to large expenditures on consumer durables such as cars, boats, etc. and developed a sophisticated model famously known as the "Tobit regression" to better explain the relation between income and consumption. Empirical estimates of the MPC by and Watts (1958) and Bodkin (1959) did not support a predictable and stable MPC. In fact, Watts's statistical study (1958) indicated that the behavior of the MPC was asymmetrical depending on whether changes in income were perceived to be positive or negative. Watts's research is consistent with further evidence reported by Jonathan Parker (1999) and Nicholas S. Souleles (1999). These authors demonstrated that consumers' spending behavior was particularly sensitive to the timing of changes in income.

 In a reevaluation of these theories, Robert Hall (1976) used the Euler Equation[1] (footnote) to argue that the consumption function as it related to data from the United States, could be modelled as a random walk. He proposed that consumers attempt to maximize their intertemporal utility when the real interest rate is assumed to remain constant. Recall that in the context of a random walk model, the best predictor of consumption in the next period is the change in consumption in the previous period. Despite its simple construct, tests of Hall's Hypothesis have been statistically intractable (see Yuan Mei, 2012).

In a more formative study, Princeton economist Chang-Tai Hseih (2003, pp. 397-405) used micro data from "Alaska Permanent Fund" to demonstrate that household spending in response to changes in income was only predictable when income changes were "large and transparent (2003, p. 404).

More recently, C.D. Carrol, J. Slecalek and K. Tokuoka (2014) demonstrate that in developing countries with skewed distribution of wealth, the consumption function is concave which evidently implies that low wealth families have a higher MPC when compared to their wealthier

---

[1] Euler's equation is based on the assumption that consumers typically attempt to equalize the

marginal rate of situation between consumption in the current year and the present value of

consumption in the coming year.

cohorts. Furthermore, they report that the "aggregate MPC is considerably lower than the estimates reported in the empirical literature (p.2). These authors suggest that the aggregate MPC does not vary over the business cycle. Furthermore, they report that" neither the mean value of MPC nor the distribution of MPC changes much when the economy switches from one state to another" (p.5).

Recent Evidence from CES Data

We now seek to evaluate the recent dynamics of the MPC using both the conventional consumption function model as well as our construct. We use annual data from the US Consumer Expenditure Survey [CES]. This data is available from the Bureau of Labor Statistics [BLS] website. The CES measures spending habits, income levels and various characteristics of US households. Two particular series are relied upon: average disposable income (income after taxes) and average total consumer expenditure.

To begin with, we explore properties of these series for the 1985 – 2014 period, but choose to pay particular attention to the 2001 – 2014 time period (where more comprehensive data is available). The BLS data retrieval tool allows us to sort the surveyed households into different categories before extracting their average disposable income and spending levels. We choose to group the households by pre-tax income ranges with an additional group consisting of all the households.

Methodology

The MPC can be thought of in two ways. First, we might expect the following relationship to hold:

$$C_t = c_0 + MPC_{LR} \times Y_t \qquad (1)$$

where C_t represents consumption spending, c_0 represents an autonomous level of consumption and Y_t represents disposable income. This is often the formulation used in undergraduate textbooks. We might also think of MPC as a part of the following relationship:

$$\Delta C_t = a_0 + MPC_{SR} \times \Delta Y_t \qquad (2)$$

where a_0 is a proxy stochastic parameter. These two formulations differ in that the first equation assumes a fixed level of autonomous consumption, c_0, while the second equation accommodates movements in autonomous consumption within the parameter a_0. Speculation about shifts in autonomous consumption was first raised by Peter Temin's *Did Monetary Forces Cause the Great Depression?* (1976) who posited that shifts in the consumption function was central in the intensification of the contraction from 1929 to 1933. In a paper published by the National Bureau of Economic Research, Robert Hall (1986, pp. 237-266) produced results similar to Taman's work. He showed that significant shifts in the consumption/GNP relation played a decisive role in setting off the great depression. Previously, Temin's critics, Thomas Mayer (1978) and Barry

Anderson, Barry L., and Butkiewicz, James L. (1980)) had demonstrated that consumption functions of various types had important negative residuals in 1930.

We might think of equation (1) as representing aggregate consumption over the longer term which is used in Keynesian economic models. We might think of equation (2) as that reflecting consumer behavior and how spending patterns change in response to immediate income shifts. As such, they produce different estimates of the MPC, with the estimate from equation (1) sometimes called the "long-run MPC" (MPC_{LR}) and the estimate from equation (2) called the "short-run MPC" (MPC_{SR}). If the MPC is constant, we would expect data points for spending and disposable income to fall on a straight line for at least one of the two linear functions. We can construct simple scatter plots (with linear trend lines) to visually identify if this is true and perform simple OLS to construct estimates of the MPC.

Results

Early data (1985 – 2000) covering all income groups shows a strong linear relationship between consumption spending and disposable income (see the left graph of Figure 1). It appears that equation (1) fits the data quite well during this period. The OLS estimate for the long-run MPC at this time is 0.793 and is highly significant (see Table 1). A weaker linear relationship appears to exist between changes in spending and changes in disposable income (see the right graph of Figure 1). We would hesitate to immediately assume equation (2) is an appropriate model. It is highly plausible that a potentially-omitted factor such as a measure of income distribution that influences consumption changes needs to be incorporated. In the second specification. Moreover, stochastic spending/income shocks are quite strong which consistently impact the short-run MPC. Despite the additional variation, our enquiry produces a significant OLS estimate of the short-run MPC of 0.48. These numbers are consistent with the overall expectations of a significant MPC value between 0 and 1.

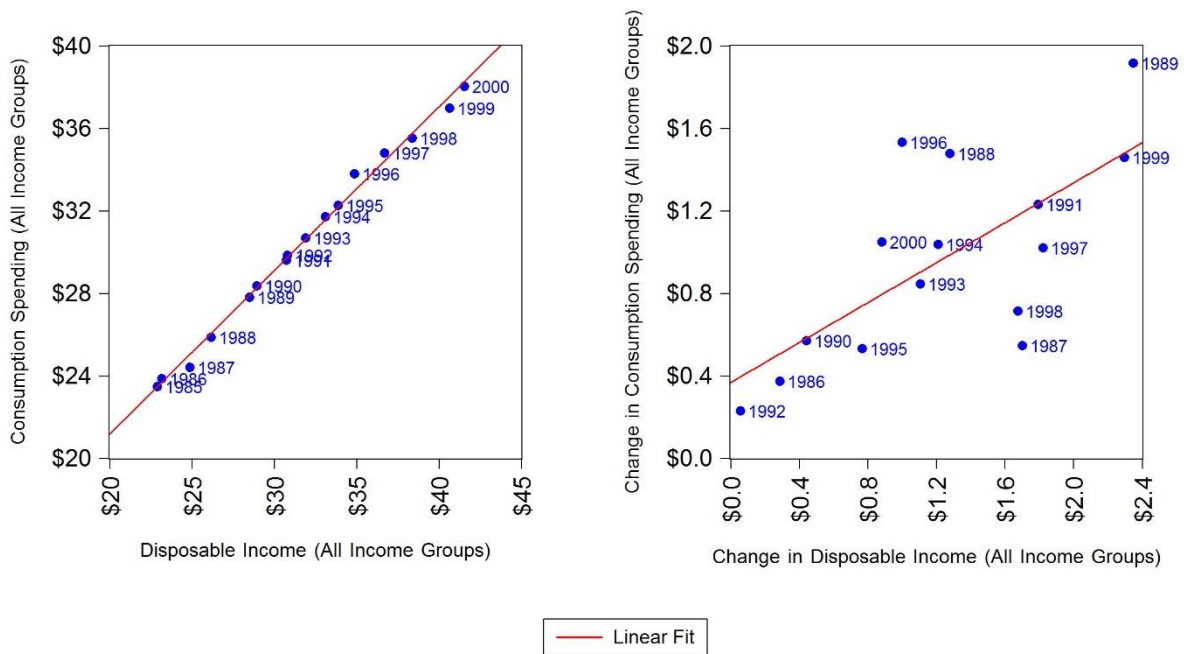*Figure 1: Consumption Spending and Disposable Income in the US, 1985 – 2000, $thousands*


Table 1: OLS Estimates of MPC

	Level [Equation (1)]			Difference Level [Equation (1)]		
	OLS Estimate of Long-run MPC	SE	Significance	OLS Estimate of Short-run MPC	SE	Significance
1985 - 2000:						
All	0.793	0.016	***	0.484	0.140	***
2001 - 2014:						
Income Group						
All	0.662	0.093	***	0.325	0.104	***
< $5K	-0.459	0.341		-0.085	0.400	
$5K - $10K	7.196	1.486		1.113	2.522	
$10K - $15K	1.923	0.756	**	0.275	1.266	
$15K - $20K	2.065	0.763	**	0.836	1.470	
$20K - $30K	1.368	0.384	***	-0.255	0.562	
$30K - $40K	0.733	0.525		-0.500	0.582	
$40K - $50K	-0.616	0.465		-0.393	0.556	
$50K - $70K	-0.333	0.201		-0.103	0.281	
$70K - $80K	-0.143	0.181		0.120	0.250	
$80K - $100K	-0.165	0.145		0.080	0.234	
$100K - $120K	-0.190	0.107		-0.091	0.145	
$120K - $150K	-0.133	0.121		-0.010	0.205	
> $150K	-0.018	0.070		0.089	0.058	

*** = Significant at 1% level, ** = Significant at 5% level, * = Significant at 10% level.

When we focus only on the most recent period (2001 – 2014), a somewhat different picture emerges. Visual inspection of the data again shows a strong relationship between consumption and disposable income described by equation (1), but there is much more additional variation in consumption to explain, with particularly extreme movements in 2009 – 2010 and 2013 – 2014 (see the left graph in Figure 2). We might hesitate to adopt equation (1) for this period without further testing. Results for changes in consumption and changes in disposable income are similar to those for the early period. Because of too much variation in the data, it is implausible that equation (2) captures the real but unobserved relationship between the two variables. (See the right graph in Figure 2).

Estimates of the long-run and short-run MPCs (covering all households) are 0.66 and 0.33 respectively (see Table 1). Both are highly statistically significant, but they are lower than those from the 1985 – 2000 period. This suggests that the MPC has drifted. A simple t-test that the long-run MPC estimate from this latter period equals that from the earlier period can be rejected at the 5% level (but not at the 10% level). For the short-run MPC, we can reject the hypothesis that the latter period estimate equals the earlier period estimate at the 1% level (but not at the 5% level). The different estimates contradict the hypothesis that the MPC is fixed.

Figure 2: Consumption Spending and Disposable Income in the US, 2001 – 2014, $thousands
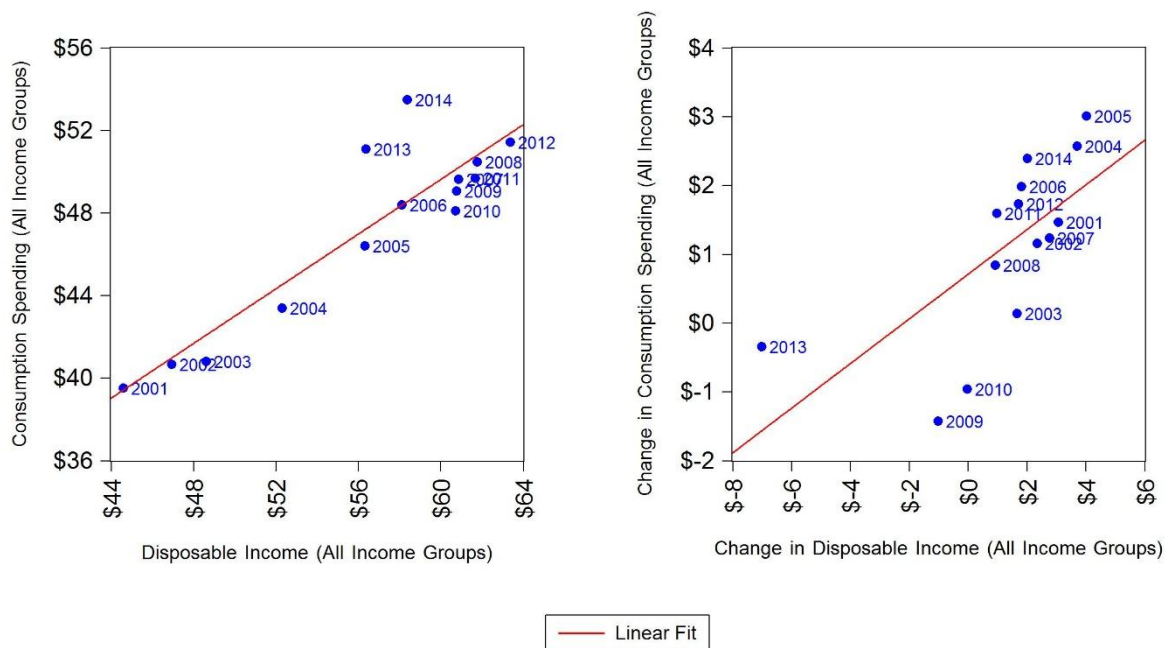
When we evaluate equation (1) and equation (2) for separate income groups, we fail to achieve consistent and, in many cases, significant estimates of the long-run and short-run MPCs. For simplicity, we focus only on the latter 2001 – 2014 period for this exercise. Table 1 reports the OLS estimates. Notably, estimates of the long-run MPC generally decline with income level (see

Figure 3a for a visual assessment). Significant, positive estimates are found only for low income levels ($10,000 - $30,000 in pre-tax income). These MPC estimates all exceed 1 (likely due to the role of credit for low-income households). For income levels greater than $30,000, estimates of long-run MPC are not statistically different from zero. As shown in figure 3b, MPC for higher income groups have turned negative in recent years.

Note that estimates for the short-run MPC are never statistically different from zero. Once again, either there are more explanatory variables to consider, extremely volatile stochastic shocks to consumption/income, or the MPC is not constant. We would not immediately accept equation (1) or equation (2) at a more "micro" level without further analysis. This exercise also shows that the relationship between spending and disposable income evident at more "micro" levels (outside the 0-1 range, to be statistically insignificant in many cases. By contrast, estimates of MPC at more "macro" levels (within the 0-1 range) turn out to be highly significant. Once again, it is apparent from our investigation that modeling the behavior of the whole fails to provide an objective understanding of the behavior of the constituting parts.

Conclusion

Our research contradicts the prevalent view that the MPC can be assumed to remain fixed either in the short-run or the long run. Decades after the publication of the General Theory, macroeconomic theorists and practitioners appear to have reached some consensus that there is a critical need for a paradigm shift in macroeconomic theory and application of policy. As Professor Deaton (2010) has put it there is no assurance that a fiscal and monetary experiment that worked once will produce the same results if tried again. The evidence presented in our paper questions the validity of some fundamental aspects of the Keynesian Consumption theory. Several noted economists, among them the former Governor of the Federal Reserve System (the Fed) admitted to a global audience that "we were wrong". Appearing before a US Senate banking Committee, Alan Greenspan, was uncharacteristically clear when he stated that *"an ideology is a conceptual framework with the way people deal with reality. Everyone has one. You have to — to exist, you need an ideology. The question is whether it is accurate or not. And what I'm saying to you is, yes, I found a flaw. I don't know how significant or permanent it is, but I've been very distressed by that fact."*

Since the crash of 2008, governments and central banks in the U.S. the European Union, China, Japan and elsewhere, have been using unprecedented fiscal and monetary stimulus to revive their respective economies. Although marginally effective, these interventions do not seem to have turned the corner. The recession that began in late 2007, has resulted in massive income and wealth redistribution from the lower and middle brackets with high MPC to high income earners who have been reluctant to put their newly gained fortune to work. As a result, there has been little progress in revitalizing consumption, formation of high-wage jobs and real economic growth. What is worse, these policies have produced more uncertainty, fear, loss of confidence in government and in some cases total anarchy.

Figure 3a: Consumption Spending and Disposable Income in the US, 2001 – 2014, $thousands, Lower Pre-tax Income Levels ($0 - $40,000).
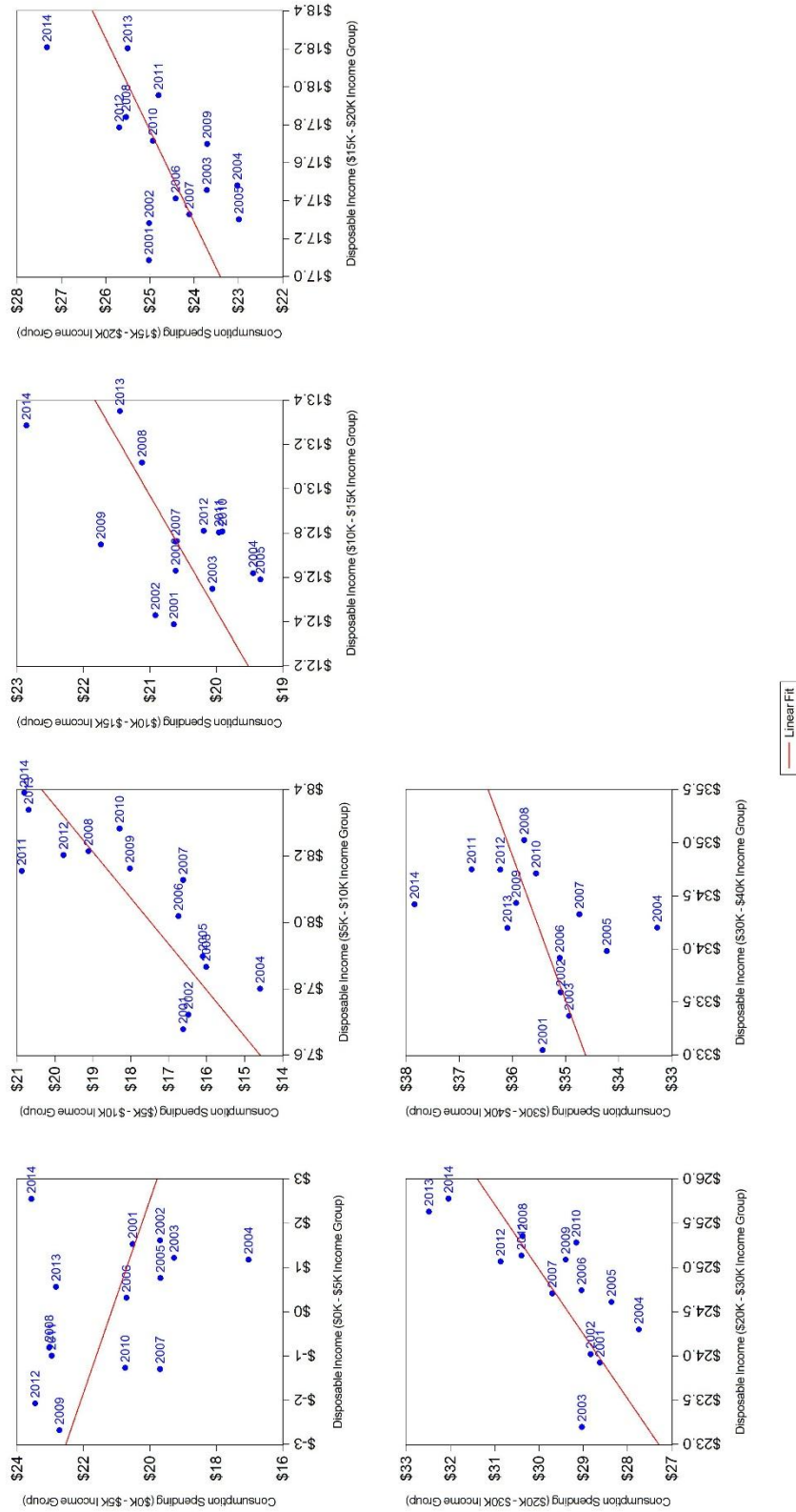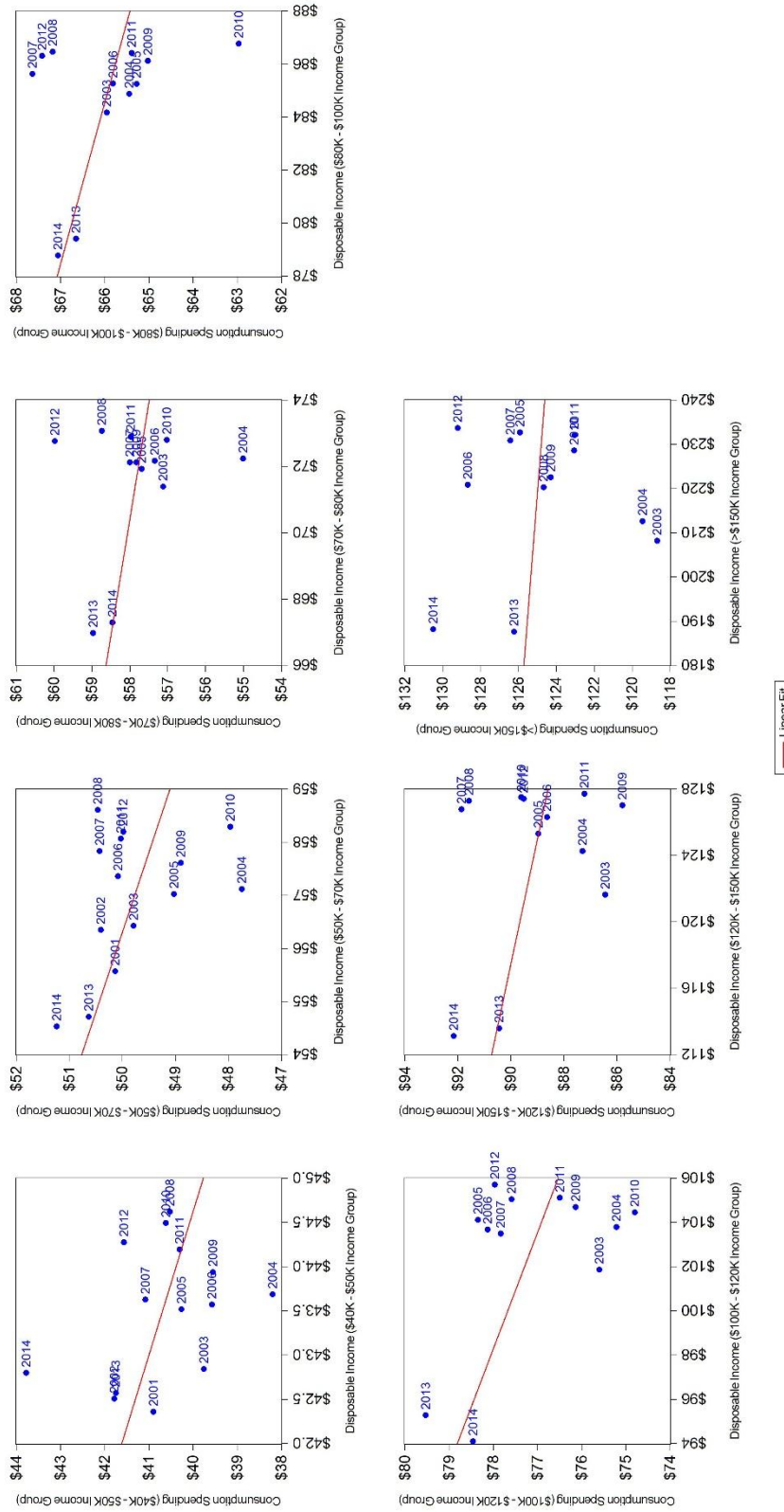
Figure 3b: Consumption Spending and Disposable Income in the US, 2001 – 2014, $thousands, Higher Pre-tax Income Levels (> $40,000).

Selected References

Anderson, Barry L., and Butkiewicz, James L. (1980). Money, spending, and the great depression. *Southern Economic Journal* 47: 388—403.

Bodkin, R. (1959). Windfall Income and Consumption. *The American Economic Review*, *49*(4), 602-614.

Bureau of Labor Statistics [BLS] (2015). *Consumer Expenditure Survey*. Available at www.bls.gov/cex.

Carroll, C., Slacalek, J., & Tokuodka, K. (2014). The Distribution of Wealth and the Marginal Propensity to Consume. Working paper, No. 1655, European Central bank.

Deaton, A. (2010). Instruments, Randomization, and Learning about Development. *Journal of Economic Literature*, 48(2), 424-55.

Deaton, A. (2010). Understanding the Mechanisms of Economic Development. *Journal of Economic Perspectives*, 24(3), 3-16.

Deaton, A. & Laroque, G. (1992). On the Behavior of Commodity Prices. *Review of Economic Studies* 59(1), 1-23.

Duesenberry, J. (1949). Income, Saving and the Theory of Consumer Behavior. *Harvard Economic Studies*, Vol. 87. Cambridge, Mass.: Harvard Univ. Press.

Friedman, M. (1957). A Theory of the Consumption Function. National Bureau of Economic Research, General Series, No. 63. Princeton Univ. Press.

Friedman, M. (1957). A Theory of Consumption Function. Princeton University Press.

Greenspan, A. (2008). Cited in http://www.distressedvolatility.com/2008/10/dissecting-alan-greenspans-testimony.html

Hall, R. (1978). Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence. *Journal of Political Economy*, 86 (6), 971–987.
Hall, R. E. (1986). The role of consumption in economic fluctuations. In *The American business cycle: Continuity and change* (pp. 237-266). University of Chicago Press.

Hsieh, C. (2003). Do Consumers React to Anticipated Income Changes? Evidence from the Alaska Permanent Fund. *The American Economic Review*, 93(1), 397-405.

Hume, D. (1888). Hume's Treatise of Human Nature, edited by L. A. Selby Bigge, Oxford, Clarendon Press.

Katona, G. & Mueller, E. (1953). Consumer Attitudes and Demand, 1950–1952. Survey Research Center, Ann Arbor: Univ. of Michigan.

Katona, G. & Mueller, E. (1956). Consumer Expectations 1953–1956. Survey Research Center, Ann Arbor: Univ. of Michigan.

Keynes, J. M. (1936). The General Theory of Employment, Interest and Money. London: Macmillan.

Laroque, G. (1992). On the Behavior of Commodity Prices. R*eview of Economic Studies*, 59(1), 1-23.

Mayer, T. (1978). Consumption in the Great Depression. *Journal of Political Economy*, 86(1), 139-45.

Mei Y. (2012). U. S. Consumption Function: An Empirical Test of the Life-Cycle Hypothesis. Senior Thesis, Trinity College, Harford, CT.

Modigliani, F. (1949). Fluctuations in the saving-income ratio: a problem in economic forecasting. In *Studies in Income and Wealth* (pp. 369-444). National Bureau of Economic Research.

Office of Management and Budget (1983). *Federal Government/Finances: 1984 budget data.* Washington, D.C.: Office of Management and Budget.
Parker, J. (1999). The Reaction of Households Consumption to Predictable Changes in Social Security. *American Economic Review*, Vol 89(4), 959-73.

Phillips, Dennis, C. (2000). The Expanded Social Scientist's Bestiary: A Guide to Fabled Threats to, and Defenses of, Naturalistic Social Science. Rowman & Littlefield Publishers.

Pigou, A. C. (1947). Economic Progress in a Stable Environment. *Economica,* 14(55), 180–188.

Popper, K. (2002). *The Logic of Scientific Discovery*. London: Routledge.

Rosenberg, A. (2000). *Philosophy of Science A Contemporary Introduction.* New York: Routledge.

Samuelson, P. (1943). Full Employment after the War. In S. E. Harris (ed.), *Postwar Economic Problems* (pp. 27-53). New York: McGraw-Hill.

Souleles, N. S. (1999). The Household of Household Consumption to Income Tax Refunds. *American Economic Review*, 89(4), 947-958

Temin, P. (1976). *Did Monetary Forces Cause the Great Depression?* New York: Norton.

Tobin, J. (1951). Relative Income, Absolute Income, and Saving. In E. C. Simmons (ed.), *Money, Trade, and Economic Growth: Essays in Honor of John Williams*. New York: Macmillan.

Watts, H. (1958). *Long-run Income Expectations and Consumer Saving.* Cowles Foundation for Research in Economics at Yale University.