

# Does the maximization principle break down during recessions?

Philip George [India]

Copyright: Philip George 2018

You may post comments on this paper at  
<https://rwer.wordpress.com/comments-on-rwer-issue-no-83/>

## Abstract

This paper shows that the principle of profit maximization by firms does not hold during recessions. It also offers evidence to show that the principle of utility maximization by consumers collapses during recessions.

**JEL Classifications** D11, D21, E12, E13

**Keyword:** profit maximization, utility maximization, Keynesian, asset markets, recessions

## Introduction

The principle of maximization is central to economics. It is what makes economics mathematically tractable. Paul Krugman (Krugman, 1996) speaks for most mainstream economists when he says:

“For there is no question that conventional economics has gone beyond the general ideas of intelligence and interaction to a much harder-edged, extreme formulation. At least since Paul Samuelson published *Foundations of Economic Analysis* in 1947, the overwhelming thrust of conventional theory has been to say that agents are not only intelligent, they maximize — that is, they choose the best of all feasible alternatives. And when they interact, we assume that what they do is achieve an equilibrium, in which each individual is doing the best he can given what all the others are doing.”

And later on, after agreeing that the assumptions of maximization are not often very realistic, Krugman says:

“Personally, I consider myself a proud neoclassicist. By this I clearly don't mean that I believe in perfect competition all the way. What I mean is that I prefer, when I can, to make sense of the world using models in which individuals maximize and the interaction of these individuals can be summarized by some concept of equilibrium. The reason I like that kind of model is not that I believe it to be literally true, but that I am intensely aware of the power of maximization-and-equilibrium to organize one's thinking — and I have seen the propensity of those who try to do economics without those organizing devices to produce sheer nonsense when they imagine they are freeing themselves from some confining orthodoxy.”

In other words, maximization is one of the two principles that set apart true economists from mere pretenders.

In what follows I consider the parallel situations of profit maximization by firms and utility maximization by consumers, and show that both break down during recessions.

## A. Profit maximization by firms

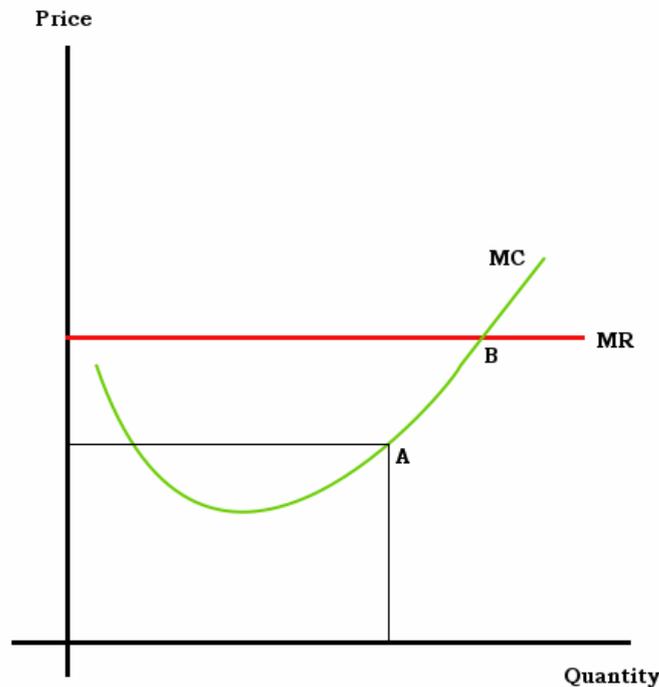


Fig 1. Profit maximization in a perfect market

The figure above depicts the argument for profit maximization by firms under perfect competition. Assume that the firm is currently at point A. Since the marginal revenue (MR) is higher than the marginal cost (MC), the firm can increase its output and its profit to the point B where the marginal cost curve intersects the marginal revenue line. Beyond this point the marginal cost is higher than the marginal revenue and increasing output would reduce its total profit. So the firm should increase its output up to B which is the point of profit maximization.

This argument assumes that there are no barriers to increasing output from point A to point B. However, by definition, recessions are periods in which demand is falling. So the typical firm that attempted to increase its output from A to B during a recession would find the additional output remaining unsold. If it tried to attain the point where theoretically its profit is greatest it would instead find its profit falling drastically. The argument for profit maximization implicitly assumes that output is always at a point where it can be freely increased. This assumption is invalid during a recession and hence the principle of profit maximization collapses during recessions.

This is irrespective of other possible lines of critique, for example matters of actual firm practice and the construction of curves (early Sraffa) or the structure and strategies within markets based on imperfect competition (Joan Robinson and so forth), or the varieties of alternative accounts of capitalist firms and strategy (in a spectrum spanning Baran and Sweezy, Dunning, Hymer, Vernon and others).

It is interesting to look at how General Equilibrium theory deals with the idea of profit maximization. *Theory of Value* (Debreu, 1959), one of the classics of GE theory, simply states that firms act so as to maximize profits. But Kenneth Arrow (Arrow, 1972) in his Nobel Prize

speech, in arguing that part of a particular equation signals profit maximization, says that the assumption is that production is independent of consumption (George, 2016). This is exactly the condition depicted in Fig 1. Profits can be maximized only if it is assumed that consumption does not place any restrictions on expanding production. If enhanced production cannot be consumed the principle of profit maximization fails.

Early in his Nobel lecture, Arrow asks rhetorically: “The fundamental question remains, how does an overall total quantity, say demand, as in the Keynesian model, get transformed into a set of signals and incentives for individual sellers?” To every capitalist who experiences a recession the answer is clear. When he finds that part of his output remains unsold and that lowering prices does not help to clear his unsold inventory, he realizes that the market is signaling him to reduce output. In asking his question, Arrow’s assumption is that production is independent of consumption, an assumption that he states explicitly later in the speech.

To understand why increased production is not consumed one must turn to the other half of the maximization principle, utility maximization.

## B. Utility maximization by consumers

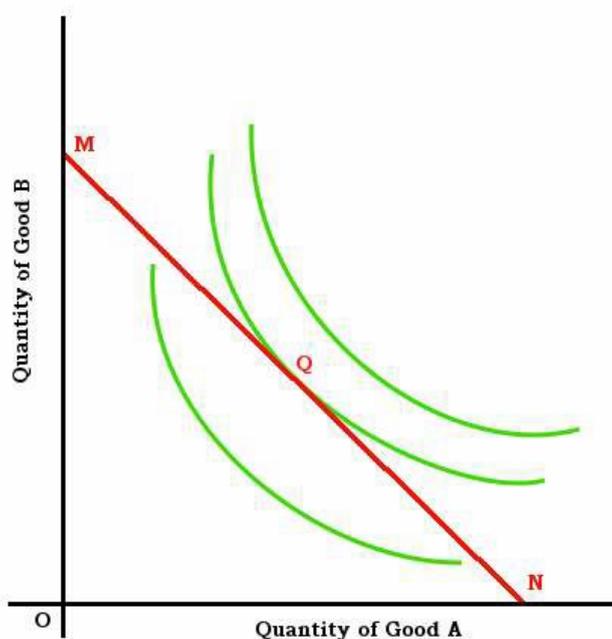
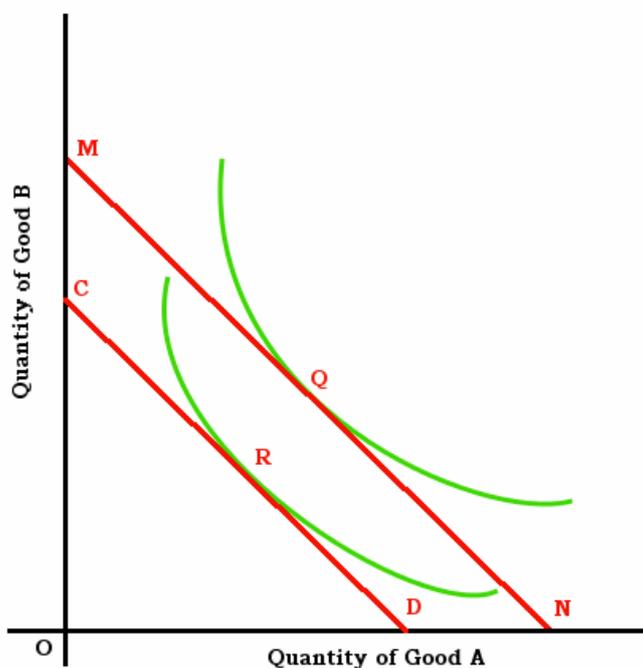


Fig 2. Utility maximization by a consumer

The figure above shows utility maximization by an individual who consumes only two goods, A and B. The line segment MN is his budget line. At M he spends his entire budget on good B. At N he spends his entire budget on good A. At intermediate points he buys some of both goods.

The green lines are his indifference curves, which are curves of constant utility. Points above the budget line are financially unachievable. Points below the budget line are sub-optimal.

Utility is maximized at point Q where an indifference curve is tangent to the budget line. Next we examine what happens when the budget line moves.



**Fig 3. Movement of the budget line**

In the above figure the budget line has fallen from its initial position MN to CD. (Prices have remained unchanged which is why CD is parallel to MN.) In response the consumer adjusts his consumption of the two goods so that his new indifference curve is tangent to the new budget line at R. If the budget (income) decreases and the consumer responds by cutting his consumption so as to be tangent to the new budget line the principle of utility maximization is not negated. However, if the consumer reduces his consumption even when his budget (income) has not shrunk we can conclude that he is not maximizing utility.

There are thus two possibilities. The first is that income falls and the consumer reduces his consumption accordingly. In this case utility maximization continues to hold. In the second situation the consumer reduces his consumption even when his income has not fallen. In this case the consumer is obviously not maximizing utility.

When can these two situations arise?

There are two possible models. The first is the Keynesian model. For some reason, the animal spirits of capitalists get deranged and they reduce their investment. This reduces the income paid out to workers who reduce their consumption accordingly.

The second is the asset price collapse model. A collapse of one or more asset markets (e.g. the housing and equity markets) knocks a big hole in the accumulated saving of consumers who then increase their current saving (reduce consumption) in order to rebuild their lost accumulated saving. This happens even when their income has not fallen.

In many conventional new classical models agents have infinitely long lives. In reality agents have finite lives and finite working lives. During their working life they save money in order to prepare for large planned and unplanned expenses and, most importantly, to provide for that part of their lives (retirement) during which they will not receive wages. Agents invest their savings in various financial assets, including housing. When asset markets rise, the value of their accumulated saving (after considering increases in asset prices) increases, and they may feel confident enough to reduce their current saving. When asset markets collapse, their accumulated saving (net worth) takes a big hit. There is only one way they can repair the damage to their accumulated saving and that is by increasing current saving (or reducing consumption). They cannot opt for credit because that would further reduce their net worth; credit constraint is not the problem. Accumulated saving, net worth and wealth are thus synonyms in the above model.

Which of these two models is the correct one? Or to put it another way, is the fall in consumption caused by a fall in income (which in turn is caused by a fall in investment by firms) or is the fall in aggregate income caused by a fall in consumption by individuals? In the rest of this paper I examine the evidence on both sides.

### **C. The evidence**

When a sizeable number of individuals respond to a collapse in their accumulated saving by reducing their consumption the effect on the macro economy is a contraction in aggregate demand. In response capitalists reduce both output and investment which in turn results in a cut in factor payments which further reduces consumption. And so on.

What comes first, a cut in aggregate income or a cut in aggregate consumption? Unfortunately, we cannot just measure these two variables to arrive at an answer because one person's cut in consumption means an immediate fall in some other person's income. The two occur simultaneously. We must look elsewhere for evidence.

#### **1. *The ineffectiveness of near-zero interest rates***

For years after the financial crisis of 2007-09 the Federal Reserve Board of the US (and the central banks of other countries) held the Federal Funds Rate (and related rates in other countries) close to zero. But the economic response has been far less positive than expected and economies have not returned to their former growth path.

In theory, since recessions are caused by a fall in investment, pushing interest rates down should make investment in otherwise unviable projects viable. But cutting interest rates hasn't helped much in reality. Nor have huge injections of cash through the medium of asset purchases by the central bank. Keynesians usually explain this by drawing on the liquidity trap, although Keynes himself expressed doubt about whether it ever comes into play.

But the simplest explanation for the lack of response of investment to near-zero interest rates is that the recession was caused not by a fall in investment but by a fall in consumption, and the latter is not very responsive to interest rates.

## **2. The long-drawn-out recoveries that follow asset market collapses**

In textbook presentations of macroeconomics  $Y = C + I + G + X$ , where  $Y$  is the GDP and  $C$ ,  $I$ ,  $G$  and  $X$  stand for aggregate consumption, aggregate investment, government expenditure and net exports.

Since a recession, in the Keynesian model, is set off by a drop in investment, all one needs to do is to compensate for the fall in investment by raising government expenditure. Time does not enter into the above equation at all. But the reality is that time is very much a factor in recoveries that follow asset market collapses. These tend to be long-drawn-out, the Great Depression and the Great Recession being classic examples.

For an explanation we need to look at the effect of the asset market collapse on accumulated saving. According to the Federal Reserve Board's Survey of Consumer Finances (Federal Reserve, 2012) the median family net worth after the crash fell in 2010 to levels not seen since the 1992 survey. The median family thus lost 18 years of accumulated saving. To recover that lost wealth, the median family would have had to double its saving rate for 18 years, all else remaining equal.

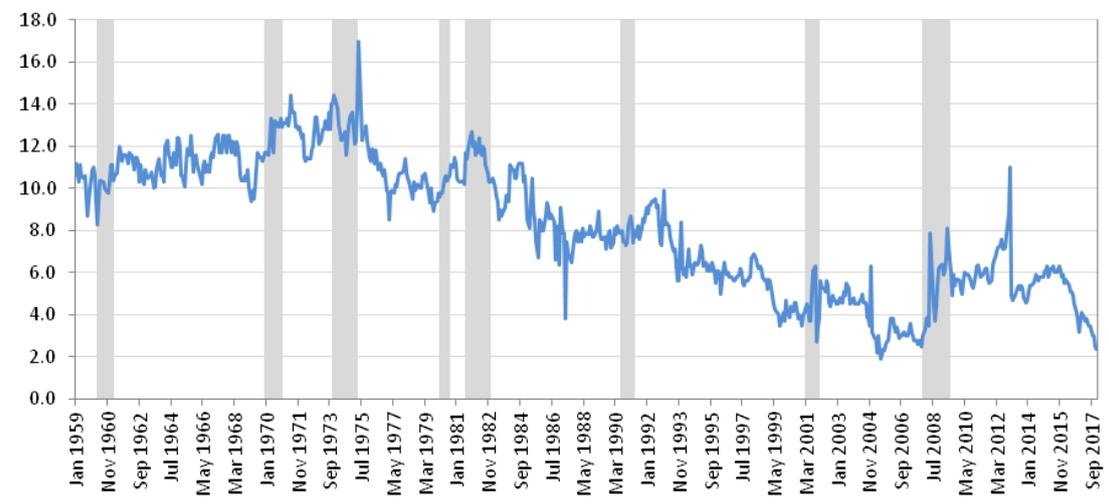
In the equation  $Y = C + I + G + X$ , a drop in consumption has the same effect as a drop in investment. Mathematically, the two are indistinguishable so far as their effects are concerned. In neither case does time figure as a factor. However, the result of a large and sustained collapse in asset markets is not a one-time drop in consumption but a drop in the *rate of consumption* as a percentage of income (which is what an increase in the saving rate translates into) for a sustained period. That is where the element of time comes in. That is why recoveries following asset market collapses are long drawn-out.

The Volcker-induced recession too was severe but it was caused by firms not having money to produce goods and services. This in turn affected the incomes paid out to worker-consumers and thus their consumption. But since it was not accompanied by a collapse in asset markets consumers did not have to reduce their rate of consumption for an extended period. Once the Fed loosened its grip on money, firms got access to funds and raised production, so consumers regained their old income and resumed their old rate of consumption.

Fig 4 shows the saving rate for the US from 1959 onwards. From 2.5% just before the start of the 2007-09 recession, it stays at 6% for an extended period thereafter. After the Volcker recessions, in contrast, the saving rate quickly returned to normal because consumers did not need to save more to compensate for losses from a sustained asset market collapse. The shaded columns in the graph indicate periods of recession. The data source is the St Louis Federal Reserve Bank web site.

According to the Federal Reserve Board's Survey of Consumer Finances (Federal Reserve, 2017), the median family net worth rose 16% between 2013 and 2016. This compares with a decline of 40% between 2007 and 2010 and a decline of 2% between 2010 and 2013. In terms of thousands of 2016 dollars, median net worth in 2016 was 97.3 which compares with 90.6 in 1995 and 105.8 in 1998. Therefore the median family net worth is still roughly what it was 20 years ago. The past ten years have made no difference at all to the real net worth of half the US population. We may therefore expect the consumption rate (as a proportion of income) of the median US family to remain depressed for a very long time to come, with a

concomitant effect on the growth rate of the US economy. The mean net worth, however, has recovered and is now at its highest ever. The contrast between the median and mean measures is of course a reflection of growing inequality. Whether increased consumption by the wealthy will compensate for the depressed consumption of the rest of the population remains to be seen.



**Fig 4. Saving rate in the US from 1959 to 2017**

In the Great Depression, the immediate effect of the stock market crash was a steep fall in the consumption of consumer durables (Romer, 1990). The reason for the initial fall in consumption being restricted to consumer durables probably lay in the structure of stock ownership at the time of the crash; although 74% of stocks were owned by households (Green, 1971), fewer than 2% of households owned stock (Romer, 1990). By the end of 1933 stock ownership by households had fallen to 56%.

The fall in consumption was followed by a precipitous fall in investment with consequent effects on aggregate demand. But a full understanding of the depression requires a look at monetary factors, especially the large scale bank failures. To an individual, it would not matter whether he lost a substantial part of his saving in the stock market crash or in a bank failure. The effect on his consumption would be the same.

### **3. The ineffectiveness of fiscal stimulus**

Between 2005 and now, the cumulative fall in private residential fixed investment in the US (the putative cause of the recession) has been less than \$4 billion. During the same period, the cumulative increase in the budget deficit compared with 2005 is more than \$4 billion. The fall in residential fixed investment has been more than compensated by additional government expenditure. But in addition there is also supposed to be a multiplier in operation, though there is some dispute about its value.

Mathematically, the value of the Keynesian multiplier is  $1/(1- MPC)$ , where MPC is the marginal propensity to consume. The MPC is the ratio of the change in consumption to the change in income for a given period. During a recession, aggregate income falls, by definition. At the same time the saving rate increases, as seen in Fig 4. Thus, the fall in consumption is

greater than the fall in income. Therefore the MPC is greater than 1. Hence the Keynesian multiplier during a recession is negative, which is not at all what conventional wisdom holds.

A negative value of the Keynesian multiplier does not mean that fiscal stimulus is useless. Rather, it means that the fall in accumulated saving as a result of the asset market collapse is so large that any additional government spending is, in aggregate, completely saved. Even after the recession, the Keynesian multiplier is lower than it was before the recession.

#### **D. Conclusion**

It is easy to show that the principle of profit maximization by firms cannot hold during recessions. Purely from considerations of symmetry, one would guess that the principle of utility maximization too cannot be valid during recessions. And as we have shown above, there is considerable macroeconomic evidence to conclude that this is the case.

But even when there is no recession there is reason to doubt the principle of maximization. We argued that if the budget line falls and the consumer reduces his consumption as a consequence, the principle of utility maximization holds. But as we have seen, what is commonly taken to be an objective budget line is actually a subjective spending line. The consumer first decides how much to spend from extraneous considerations (such as the value of his accumulated saving) and then decides how to derive the best results from the subjective decision so made. So even during non-recessionary periods the principle of utility maximization can be questioned.

Similarly there is no reason to believe that every firm during non-recessionary periods is free to expand its output right up to the point where marginal cost equals marginal revenue.

The principle of maximization is best thought of as a useful mathematical device when the economy is growing at a rapid clip.

We may mention in passing that if the principle of utility maximization does not hold, the Euler equation, which is one of the fundamentals of new classical economics, would have to be abandoned.

#### **References**

- Krugman, Paul (1996) 'What Economists Can Learn from Evolutionary Theorists', (A talk given to the European Association for Evolutionary Political Economy), November, <http://web.mit.edu/krugman/www/evolute.html>
- Debreu, Gerard (1959) *Theory of Value: An Axiomatic Analysis of Economic Equilibrium*, John Wiley and Sons Inc.
- Arrow, Kenneth (1972) 'General Economic Equilibrium: Purpose, Analytic Techniques, Collective Choice', Nobel Memorial Lecture, December 12, [http://www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/1972/arrow-lecture.pdf](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/1972/arrow-lecture.pdf)
- George, Philip (2016) 'The Mathematical Equivalence of Marshallian Analysis and "General Equilibrium" Theory', *Real-world economics review*, 77: 73-84, <http://www.paecon.net/PAERReview/issue77/George77.pdf>

Federal Reserve (2012) 'Changes in U.S. Family Finances from 2007 to 2010: Evidence from the Survey of Consumer Finances;' *Federal Reserve Bulletin* 98 (2)  
<http://www.federalreserve.gov/pubs/bulletin/2012/pdf/scf12.pdf>

Federal Reserve (2017) 'Changes in U.S. Family Finances from 2013 to 2016: Evidence from the Survey of Consumer finances;' *Federal Reserve Bulletin* 103 (3)  
<https://www.federalreserve.gov/publications/files/scf17.pdf>

Romer, Christina D (1990), 'The Great Crash and the Onset of the Great Depression', *Quarterly Journal of Economics* 105(3): 597-624.

Green, George D (1971), 'The Economic Impact of the Stock Market Boom and Crash of 1929', paper presented to the Federal Reserve Bank of Boston, Conference Series No 5, Monetary Conference, June), <https://www.bostonfed.org/-/media/Documents/conference/5/conf5e.pdf> and Table 4, [https://www.federalreserve.gov/econres/files/scf2016\\_tables\\_internal\\_real\\_historical.xlsx](https://www.federalreserve.gov/econres/files/scf2016_tables_internal_real_historical.xlsx)

**Author contact:** [philip.george@gmail.com](mailto:philip.george@gmail.com)

---

SUGGESTED CITATION:

Philip George, "Does the maximization principle break down during recessions?", *real-world economics review*, issue no. 83, 20 March 2018, pp. 138-146, <http://www.paecon.net/PAEReview/issue83/George83.pdf>

**You may post and read comments on this paper at** <https://rwer.wordpress.com/comments-on-rwer-issue-no-83/>