Does "Crowd Out" Offset The Stimulus Effect Of Government Deficits? A Large Scale Econometric Study

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ABSTRACT

60 structural models of U.S. consumption, investment and the GDP were tested. Virtually all tests indicate that as deficits grow, private borrowing and spending decline. The cause appears to be a "crowd out": government borrowing undertaken to finance the deficit reduces money available for private parties to borrow and spend. Crowd out was found to dominate the stimulus effect, resulting in a net negative effect on the economy. Crowd out was found in both recessions and nonrecession periods. Results are inconsistent with hypotheses proposed by Krugman that general economic conditions are responsible for the negative relationship, not crowd out.

1.0 INTRODUCTION

Thirty years ago, the distinguished econometrician Otto Eckstein noted the crowd out problem, though much debated, was "still" unresolved:

> …Does fiscal policy work? Or does the financing of deficits "crowd out" private activity? This has been one of the more durable controversies in macroeconomic theory…
>
> (Eckstein, 1983)

One of the most important questions in macroeconomics 30 years ago remains unresolved today. This paper, through extensive testing of the crowd out problem in 60 different models of the GDP, consumption or investment, attempts to provide a satisfactory answer to that question.

"Crowd out" is the reduction in loanable funds available to private borrowers resulting from government borrowing to finance deficits. Consumers and businesses borrow to supplement their current incomes. Crowd out, if it occurs, reduces the funds available to private parties for such borrowing. If private borrowing is reduced, spending is likely to be reduced, since most borrowing is done to finance spending. This spending decline may offset some or all of the stimulus effect of a government deficit. Much borrowing is done for discrete "big ticket" items like cars, houses or machinery. Hence deficits that reduce loanable funds available may cause borrowing and spending to decline even more; if all funds needed can't be borrowed, none may be.

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Private spending may decline more than the deficit's stimulus effects increase it, causing a net negative effect. But of course, this is all theory. Whether it actually does or not is a question for the econometricians to answer. Additionally, as the state of the economy changes, income changes. This changes domestic savings, which largely determine the pool of loanable funds. In recessions, declining income evidence indicates savings decline as much or more than private demand for loans. Flow of Funds data for the 1981-83 recession period suggest savings declined far more than investment demand. If so, any borrowing done to finance government deficits, even in recessions, may still have crowd out effects.

The observed negative relationship between deficits and private spending may also be caused by changing economic conditions. In recessions, deficits rise due to declining tax collections, and private spending falls due to rising unemployment. For crowd out to be the culprit requires that reduced private borrowing, caused by government borrowing to pay for deficits, be the mechanism, and that testing show this to be the case, controlling for the state of the economy. This study tests for crowd out that way.

Sixty tests of structural models of the U. S. economy's components 1960-2010 were undertaken. Fair (1984), Orszag (2005), Eckstein (1968), and others have found structural models are better at explaining the long run behavior of the economy than VAR and DSGE alternatives (see literature review), though the latter are currently more popular. Mankiw (2006) and Solow (2010) appear to share that perspective. Exhaustive endogeneity testing was undertaken to ensure identification issues were fully addressed. Extensive testing was done to ensure instrument strength, stationarity, homoscedasticity, and robustness over time. Results were also robust to model specification, different regression techniques used, and different strong 2SLS instruments used. Testing was done in 1st differences, eliminating most nonstationarity and reducing multicollinearity, and explained 92 -95% of the yearly changes of consumption and investment. Models were found to fit the data equally well for any specific decade examined.

2.0 THEORY OF CROWD OUT

2.1. Traditional Stimulus Models (No Crowd Out)

A typical demand - driven structural model of the macroeconomy, like the Wharton school model of the 1960s and '70s, did not include variables for crowd out in its consumption and investment equations. In such models, the impact of taxes and government spending are shown, but are derived from the GDP identity:

$$GDP = Y = C + I + G + (X-M) \qquad \text{(Eq. 2.1.1)}$$

where a simplified consumption function might be given as a linear function of disposable income (Y-T), and crowd out was assumed not to be a determinant

$$C = \beta(Y-T) \quad \text{(Eq. 2.1.2)}$$

which, when substituted into (2.1) gives

$$Y = \left(\frac{1}{1-\beta}\right)(- \beta T + I + G + (X-M)) \quad \text{(Eq. 2.1.3)}$$

The clear expectation of standard model demand theory is that tax changes in are expected to be negatively related to the GDP, with a multiplier effect -β /(1-β). Changes in government spending and net exports are related to GDP in the positive direction, with a multiplier effect 1/(1-β) and should when tested, have the same coefficients if the theory holds. The coefficient on changes in taxes should have a negative sign, indicating a positive effect on GDP. All expected effects of deficits are effects that stimulate the economy. Testing these expected relationships is necessary to see if actual findings match these predictions.

2.2. Empirical Problems With The Theory

The problem is, in econometric tests, it is nearly impossible to get a negative sign on the tax variable, even in the simplest stimulus model, the so-called "Keynesian Cross":

$$Y = f\ (T, G, Investment,\ X - M) \quad \text{(Eq. 2.2.1)}$$

If we increase the sophistication of the model by replacing investment with two of its most commonly cited determinants, the accelerator (ACC) and interest rates, we get a simple "IS" curve model:

$$Y = f\ (T, G, ACC,\ Int\ Rate,\ X - M) \quad \text{(Eq. 2.2.2)}$$

Tests show the tax variable's sign to be both positive and statistically significant for this model In more sophisticated IS models, which include representatives of most variables commonly thought to affect consumption or investment, results are the same Table 2.1 shows examples taken from 2SLS regression tests of the Eq. 2.3 – 2.5 models.

All models tested in Table 2.2.1 use strong instruments for Hausman - endogenous variables, Wald tests to avoid weak instruments, and Sargan tests to ensure elimination of endogeneity in the instrumented models. First differences are used to reduce stationarity and multicollinearity, etc. Time trend variables were used to control serial correlation if needed. U.S. data was used for 1960 – 2010.

In sophisticated models, the sign of the government spending variable is also opposite what standard stimulus theory predicts. When tested for other sample periods (1960-00, 1970-00 and 1970 -10) these models generally provided the same contra – theoretical results. Even the simplest tests of standard

deficit - driven stimulus variables consistently show them to have the wrong sign. This raises serious questions about the theoretical underpinnings of traditional government stimulus policy.

Table 2.2.1. Tests of Structural Models for the Stimulus Effects of Tax Cuts

Model	Tax coefficient (t-statistic)
Keynesian Cross:	
$Y = f\ (T, G, Investment,\ X - M)$	+.17 (2.2)
Simple IS Curve Model:	
$Y = f\ (T, G, ACC,\ Int\ Rate,\ X - M)$	+.72 (3.4)
Sophisticated IS Curve Model:	
Y = f(T, G, ACC, Int Rates, Dow Jones, Average Exch. Rate, Pop. Growth Rate, Prior Period M2 Growth, Consumer Confidence, Depreciation Allowances, Profits, X)	+.49 (2.7)

2.3 A Stimulus Model With Crowd Out

Borrowing to finance government deficits may reduce loanable funds available to finance consumer spending. If so, the consumption function used in the no-crowd out model must be modified to add the government deficit, taxes minus government spending (T-G):

$$C = \beta (Y-T) + \lambda_1(T-G) \qquad \text{(Eq. 2.3.1)}$$

Or, if taxes and government spending have different crowd out effects,

$$C = \beta (Y-T) + \lambda_{1T}T - \lambda_{1G}G \qquad \text{(Eq. 2.3.2)}$$

Lambda (λ_1) represents the marginal effect of the government deficit on consumer demand (spending). With this function, the simplest model, modified, becomes

We can expand this model to include effects of crowd out on investment spending. Assume a simple investment model in which investment is determined by only three variables: the accelerator (ACC), real interest rates (r), and access to credit, which varies with the government deficit (T-G).

$$I = - \theta_1 r + \theta_2 ACC + \lambda_2 (T-G) \quad \text{(Eq. 2.3.3)}$$

Or, if tax and spending deficits have different crowd out effects

$$I = - \theta_1 r + \theta_2 ACC + \lambda_{2T} T - \lambda_{2G} G \quad \text{(Eq. 2.3.4)}$$

where gamma (γ_{2T} and γ_{2G}) indicates the marginal effect of crowd out (the government deficit) on investment and (θ_1, θ_2) represent the marginal effects of real interest rates and the accelerator. Replacing investment and consumption in the GDP identity with their hypothesized determinants, we obtain a typical equation for determining GDP in structural models:

$$GDP = Y = \left(\frac{1}{1-\beta}\right) [(-\beta + \lambda_{1T} + \lambda_{2T}) T + (1 - \lambda_{1G} - \lambda_{2G}) G - \theta_1 r + \theta_2 ACC + (X-M)] \quad \text{(Eq. 2.3.5)}$$

Table 2.3.1 below compares the net effects on the GDP of tax or spending deficits are presented below for the traditional Keynesian model (stimulus, but no crowd out effects), and the crowd out model (stimulus effects net of crowd out effects).

Table 2.3.1 Simple Structural Model Mechanics With And Without Crowd Out

	Without Crowd Out	With Crowd Out		Without Crowd Out	With Crowd Out
Tax coefficient	$(-\beta)$	$(-\beta + \lambda_{1T} + \lambda_{2T})$	Gov't Spending Coef.	(1)	$(1 - \lambda_{1G} - \lambda_{2G})$
Tax Multiplier	$\frac{(-\beta)}{(1-\beta)}$	$\frac{(-\beta + \lambda_{1T} + \lambda_{2T})}{(1-\beta)}$	Gov't Spending Mult.	$\frac{(1)}{(1-\beta)}$	$\frac{(1 - \lambda_{1G} - \lambda_{2G})}{(1-\beta)}$

3.0 LITERATURE REVIEW

When stimulus programs are proposed, they generate much discussion of possible crowd out effects in the popular press. Rarely is data introduced to support theories about whether crowd out does or does work. Examples include:

1. *Chan, S.* (*NY Times,* 2/7/10, p. A16): the I.M.F. warned on Jan. 26, 2010 that rising sovereign debt "could crowd out private sector credit growth, gradually raising interest rates for private borrowers and putting a drag on the economic recovery."

2. *Barley, R.* (*Wall Street Journal*, 2/24/10 p. C14): "any government-bond buying by banks is another form of crowding out, potentially reducing supply of consumer and corporate lending"

3. Krugman (*New York Times*, 9/28/09) notes that in recessions, the accelerator effect on investment is likely to dominate crowd out effects, leaving a net stimulus effect of government spending increases/tax cuts. Alternatively, private borrowing may have declined so much that money is available for government to borrow without causing crowd out. (New York Times, 4/28/13)

4.0 METHODOLOGY

4.1. DATA USED

1960 - 2010 data from the *Economic Report of the President* (2011 and 2002) and the *Flow of Funds Accounts* of the Federal Reserve (2011) were used to estimate the effects of 11 -12 variables on consumption and 12 variables on investment spending and borrowing. A substantial review of the economic literature found these variables, or variants of them, cited as the major determinants of consumer or investment demand. Specific variables used in consumption and investment models are described in detail in sections 5 and 6. They are summarized in Table 4.1.1

Table 4.1.1 Determinants Of Consumption And Investment

Consumption	Investment
Disposable Income ($Y-T_T$)	Samuelson's Accelerator (ACC)
Deficit Variables ($T_T - G_{T\&I}$)	Deficit Variables ($T_T - G_{T\&I}$)
Wealth (DJAV)	Depreciation Allowances (DEP)
Interest rates (PR or r)	Interest Rates
Exchange rates (XR_{AV})	Tobin's q (DJAV
Consumer Confidence (ICC_{-1})	Profits (PROF)
Population Size (POP)	Exchange rates (XR_{AV})
Population Age Composition (POP_{16})	Population Size (POP)
Money supply (M2 - M1, $M2_{AV}$))	
Consumer borrowing ($C_{B\ or\ B2}$)	Business Borrowing ($I_{B(-1)}$)

4.2. Specific Methods Used

Key aspects of the methodology are summarized n the Introductory section of this paper. (Section 1).

5.0 TEST RESULTS: CONSUMER SPENDING AND BORROWING MODELS

Table 5.0.1 summarizes all 39 consumption spending and borrowing test results.

Table 5.0.1 Summary Of All Consumption OLS And 2SLS Spending And Borrowing Results

A.) 2SLS Borrowing Model Findings Summarized:

Model#	$\Delta(T_T\text{-}G_{T\&I})$ β (t-stat.)	Bus. Cycle Control
Average (All)	.74 (2.2)	
Av. (Str. Inst.)	.81 (2.2)	

OLS Borrowing Model Findings Summarized:

Model#	$\Delta(T_T\text{-}G_{T\&I})$ β (t-stat.)	Bus. Cycle Control
Average	.61 (2.4)	

B.) 2SLS Spending Model Findings Summarized:

Model#	$\Delta(T_T\text{-}G_{T\&I})$ β (t-stat.)	Δ(Bor) β (t-stat.)	Bus. Cycle Control
Average (All):	.45 (6.2)	.12(2.3)	
Av.(Str.Inst.Only)	.46 (5.5)	.12(2.4)	

OLS Spending Findings Summarized:

Model#	$\Delta(T_T\text{-}G_{T\&I})$ β (t-stat.)	Δ(Bor) β (t-stat.)
Average:	.46(7.4)	.12 (3.2)

Mean results of OLS and 2SLS tests were virtually identical for spending models, and reasonably close for borrowing. In the borrowing models, 2SLS results show a larger crowd out effect than the OLS results. Within each group, the results for different models tested generally cluster closely around the group mean

Statistically significant negative relationships between deficits and consumer spending (and borrowing) hold even controlling for state of the economy. This is contrary to the Krugman hypothesis that normal business cycle effects that cause the observed negative relationship between deficits and consumer spending.

6. INVESTMENT SPENDING AND BORROWING RESULTS

In this section, we test the relationship between government deficits and both business borrowing (I_B) and spending (I_T) in 40 models. 35 spending models are tested, 12 OLS and 23 2SLS. In addition, Four OLS borrowing models and one 2SLS borrowing model are tested. Only one 2SLS model was tested because most borrowing models showed no statistically significant Hausman endogeneity. Crowd out findings will be examined, controlling for a wide range of other variables beside the government deficit) that may affect investment. The variables hypothesized as determinants of Investment spending

6.1. SUMMARY OF ALL OLS AND 2SLS INVESTMENT SPENDING AND BORROWING FINDINGS

Table 6. 1.1 below summarizes of all 40 investment spending and borrowing model test findings

Table 6.1.1 Summary Of All Investment OLS And 2SLS Spending And Borrowing Findings

2SLS Spending Model#	Deficit Var. $\Delta(T_T-G_{T\&I})$ β (t-stat.)	Specific Method	OLS Spending Model#	Deficit Var. $\Delta(T_T-G_{T\&I})$ β (t-stat.)	Specific Method
Spending Models:					
Average	.34 (5.6)	2SLS weak instr.	Average	.33 (5.5)	(w/o "a")
Average	.35 (5.5)	2SLS str. instr.(Alt)			
Average	.30 (3.4)	2SLS str.Instr (Alt.a)	Average	.30 (3.6)	("a"only)
Average	.34 (3.9)	2SLS str.Instr (Alt.a2)			
Borrowing Models:					
Average	1.11 (3.3)		Averaqe	.96 (3.4)	

All 35 OLS and 2SLS spending tests show a very strong negative, statistically significant relationship between the government deficit and investment spending, even controlling for the level of the economy. The same tests also showed some evidence that borrowing is a separate factor affecting investment spending, and not just a financial manifestation of the desire to invest due to other investment determinants. However the statistical significance of this finding was marginal, apparently because of multicollinearity with the deficit variable. Remove the deficit variable and borrowing becomes highly statistically significant.

The similarity of findings for different 2SLS instruments suggests model results are robust to moderate changes in the components of the instruments. Whichever set of 2SLS models are used, results are nearly identical to the OLS results.

Dropping the business cycle control made no significant difference in the results. Investment spending was estimated to decline $0.33 per dollar of deficit incurred (Strong Instrument 2SLS results). ($0.32 for OLS results)

As was the case with spending models, in all 5 OLS and 2SLS borrowing models, the evidence indicates a systematic, highly statistically significant, negative relationship between government deficits and business borrowing, and that this relationship is nearly a one to one relationship, where business borrowing declines approximately $1.00 for every $1.00 increase in the deficit.

As was the case for consumer spending and borrowing, estimates of crowd out effects remain about the same whether the state of the economy is controlled for or not. Results show little support for the

Krugman hypothesis that it is just normal business cycle effects, not deficits themselves that cause the observed negative relationship between deficits and investment spending or borrowing.

7.0 SUMMARY OF FINDINGS AND CONCLUSIONS

The models within which crowd out was tested seem to comprehensively control for most if not all the key factors thought to affect consumption or investment. These models, which expand the standard structural stimulus models traditionally used to include the deficit variable, explain virtually all of the variation in consumer and investment spending that has occurred the past 50 years. They also explain consumer or investment behavior about equally as well in one decade as another of the fifty years studied, as shown in graphs 5.13.a and 6.13.Alt presented earlier.

The 60 models tested indicate the crowd out effects of government deficits overwhelms their stimulus effects, resulting in (so called) stimulus programs having a net negative effect on the GDP and raising the unemployment rate. Both econometric and accounting data from the Flow of Funds Accounts suggest this is true in both recession and nonrecession periods. At least for consumption, the crowd out effect occurred regardless of type of tax cut or spending stimulus. These results provide a factual basis for understanding why results of past stimulus programs have failed to convince many, though not all, economists that they are worthwhile.

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