How Much Does "Crowd Out" Reduce the Effects of Keynesian Stimulus

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ABSTRACT

This paper econometrically examines whether government deficits financed by borrowing reduce credit availability, thereby "crowding out" business and consumer spending. Deficit variables are added to consumption and investment models and tested to see if they negatively impact private spending, are statistically significant, and increase explained variance. U.S. data for 1960 - 2000 is used. A demand-driven econometric model, patterned after the work of Klein and Fair and containing eight behavioral equations is used to estimate effects. This study finds strong statistical evidence, even from within traditional Keynesian models, deficits crowd out private consumption and investment.

INTRODUCTION

The first question we need to ask when analyzing how crowd out affects the economy, is In what theoretical context should we examine this question? What kind of model shall we use to establish the parameters within which we evaluate the effects of crowd out?

In this study, a demand-driven econometric model, patterned after the work of Klein and Fair and containing eight behavioral equations is used to estimate crowd out effects. Demand models are used to provide the context within which crowd out is evaluated because they (1) "provide the foundation of much of our current understanding of economic fluctuations " (Mankiw (2007), (2) because demand fluctuations appear to have caused the recent economic decline (Romer 2010), and (3) because the fiscal policy prescriptions invariably found in demand models are the ones that lose much of their validity if deficits cause offsetting private consumption and investment spending by reducing private credit availability.

In a typical demand driven model of the economy *without* crowd out, the impact of taxes and government purchases can be derived using the GDP identity:

$$GDP = Y = C + I + G + (X-M) \quad (1)$$

where a simple consumption function is given as a linear function of disposable income (Y-T)

$$C = \beta(Y-T)$$

substituting C into (1) gives

$$Y = [1/(1-\beta)]*[-\beta T + I + G + X-M]$$

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The clear expectation of Keynesian demand theory is that tax changes are 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. In Section 2 below, we will test these expected relationships to see if actual econometric estimates yield the predicted results for variables.

HOW CROWD OUT MAY IMPACT BOTH CONSUMER AND INVESTMENT SPENDING

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

$I = \gamma(T-G) - i_{nt} r$

where gamma (γ) indicates the marginal effect of crowd out (the government deficit) on investment spending, and (i_{nt}) represents the marginal effect of interest rates (r).

If we replace investment in the GDP identity with its hypothesized determinants, we obtain a typical Keynesian IS equation:

$GDP = Y = = [1/1- \beta] [(-\beta+ \lambda+ \gamma) T + (1- \lambda-\gamma) G - i_{nt} r + (X-M)]$

In this IS equation, the normal stimulating impact of tax cuts on the GDP (-β) is offset in part by the effects of deficit – induced changes in credit availability (λ+γ). Tax effects may switch from negative to positive if the crowd out effects (λ+ γ) are larger than the disposable income effect (-β). The effect of a change in government spending is also reduced per dollar of expenditure from (1) to (1- λ-γ) times the spending multiplier (1/1- β). Again, the net exports multiplier effect stays the same, now becoming an even stronger stimulus relative to government spending or tax cuts. Results are shown in Table 1.

Table 1: Effects Of Consumer And Investment Credit Crowd Out On The Effectiveness Of Taxes And Government Spending Stimulus

	Without Crowd Out	With Crowd Out		Without Crowd Out	With Crowd Out
Tax coefficient	(-β)	(-β+ λ+ γ)	Government Spending Coefficient	1	(1- λ- γ)
Tax Multiplier	$\frac{(-\beta)}{(1-\beta)}$	$\frac{(-\beta+ \lambda+ \gamma)}{(1- \beta)}$	Government Spending Multiplier	$\frac{(1)}{(1-\beta)}$	$\frac{(1-\lambda- \gamma)}{(1-\beta)}$

The model we shall use for testing later in this paper is equivalent to the model above, but slightly different in form. The model above was based on the usual formulation of the GDP identity

$Y = C + I + G + (X-M)$

We can alternatively write

$Y = C_{D+M} + I_{D+M} + G_{D+M} + (X-M)$, where $M = C_M + I_M + G_M$, or $Y = C_D + I_D + G_D + X$.

This is an important distinction in calculating multipliers because only spending on domestically produced consumer goods generates the multiplier effect on the GDP. Similarly, for investment, a variable like the Samuelson accelerator is likely to affect spending on both domestic and imported investment goods (I). But accelerator effects will only be felt though the growth in domestic investment (I_D). Hence, the last formulation of the GDP identity may be the better form to use when calculating IS curve parameter estimates, since multiplier effects are more correctly estimated. (We abstract from effects on exports of growth in import demand).

Because the data available to us does not allow division of government purchases of goods and services into purchases of domestic and imported goods, the approximate form of the theory we will actually test is

$Y = C_D + I_D + G + X)$

This then presents the standard model of Keynesian mechanics, with crowd out added. Should the problem exist in reality as well as in theoretical conjecture, testing this model should reveal it. Only science and testing can show theoretical conjectures are consistent with empirical reality. After examining some previous efforts to test crowd out theory, we will test the models above, with and without crowd out.

LITERATURE REVIEW

Opinions in the mass media are popularly held, but are not science. To examine the science has to say, a number of prior professional studies examining this topic were reviewed. Some have been entirely, or principally, been reports on other people's science, i.e., literature reviews. Spencer and Yohe, (1970), in reviewing the literature, found that the dominant view the past two hundred years has been that government deficits cause crowding out. Friedman's work (1978), is principally theoretical. He shows portfolio theory suggests the LM curve may shift in response to an IS shift due to a fiscal stimulus like a government deficit. Therefore crowd out effects are indeterminate theoretically: it depends on how much LM shifts relative to IS. Friedman's found his own empirical tests ,based on money demand models, were ambiguous. Gale and Orszag's work (2004) was principally a review of other work, concluding most studies do show a positive relationship between interest rates and deficits (which may cause crowd out), and that most studies that don't show this relationship are VAR types. They note that VAR projections have been shown to be inferior to projections produced by OMB and DRI (p.152). Their paper does includes some empirical testing of a model of the determinants of a consumption, also indicating crowd out matters. In the model demand was hypothesized to be a function of current and one period lagged Net National Product (NNP), government purchases, taxes, transfer payments, interest payments and the size of the government debt. Results of tests of whether tax cuts stimulated consumption were determined by the sign and statistical significance of the coefficient on the tax variable. A negative and statistically significant coefficient on the tax variable was taken as evidence tax cuts were not just saved;

i.e., that Ricardian Equivalence does not hold. (However, the same finding affirms traditional Keynesian theory regarding the stimulus effect of tax cuts without complete crowd out). Other tests indicated a positive relationship between deficits and interest rates, further providing proof for crowd out.

TESTING THE MODEL

If crowd out influences consumption or investment spending

- The deficit should be found to be a statistically significant variable in functions that attempt to include all other factors that can significantly influence consumption and investment, and increases the amount of variance explained in these functions.
- Tests should find the tax variable has a negative coefficient smaller than predicted from traditional Keynesian theory of consumption and investment (which ignores crowd out effects), because reduced spending due to crowd out partially offsets the stimulus effect. If crowd out completely offsets the stimulus, the tax variable will have a positive coefficient.
- The government spending multiplier should be smaller than the exports multiplier if spending generated deficits cause crowd out.

We shall proceed to undertake these tests in the remainder of the paper below.

The single - variable formulation of the government deficit (T-G) should have a positive, statistically significant regression coefficient if crowd out matters. It does in all our tests. However, the single - variable specification implies that if (T) and (G) are estimated separately (the two variable formulation of the deficit), they should be found to have the same coefficients, except for sign: T should be positive, G negative. This is approximately what the investment findings show. However, in the total (C_T) consumption functions, the government spending component (G) typically has a coefficient that is positive in sign, though close to zero in value, and is statistically insignificant. This problem is not found with the tax variable in the same equation. Does this indicate a flaw in the theory of crowd out, i.e., is there some reason crowd out is caused by tax cut deficits, but not government spending deficits? Alternatively, is some variable which affects consumption whose effects are correlated negatively with, increased spending missing from the consumption function? If so, the government spending coefficient should be the net of the two effects, and therefore perhaps close to zero and insignificant. Adding the missing variable (if it exists) to the equation should correct the problem.

There is significant evidence there is such a variable exists: the money supply. The M2 money supply was found to grow in and immediately preceding periods when deficits increased due to government spending. It was not found related to tax cut induced deficits. This M2 growth appears to have offset deficit - related reductions in private consumer credit available. The problem did not appear to affect crowd out coefficients in the investment function, which were close to equal except for sign, as expected.

Heim (2009c) expanded the range of variables found significant in both the consumption and investment equations, finding the following variables also to be significant determinants of consumption:

- **Population Growth (POP)**: a factor found systematically related to growth in consumer demand in addition to the factors previously cited
- **Percentage of Americans 16-24 relative to adults 65 and over ($POP_{16\text{-}24/65}$):** a factor reflecting the fact that younger populations, with lesser incomes, have less to spend on consumer goods, particularly services which account for over half of all consumer spending. They also need to be saving more out of current income for retirement and children's education costs than older adults.
- **Spending on New Housing (HSE):** though an investment item itself, it is an important determinant of consumer durables demand (household appliances).
- **Consumer Confidence Levels (CCI)**: as measured by the Conference Board's Monthly consumer survey (Conference Board, 2009), added because consumer confidence was strongly related to consumer spending, even controlling for income and wealth.

In addition, preliminary testing in this study indicated that that lagged values of the savings components of the M2 money supply, when added to the consumption function, significantly added to the consumption function's explained variance, and restored the negative sign and magnitude of the coefficient on government spending to levels closer to those predicted from one variable (T-G) formulations of the deficit.

- **M2 Money Supply**: Testing indicated that two or three year average M2, particularly the non-M1 parts (savings account deposits, small CD's, money market mutual funds held by individuals and money market deposit accounts) were systematically related to consumer spending. This build up of savings (liquidity) prior to a spending - generated deficit was systematically related to the deficit's effect on consumption. M1 was not found significant. This non-M1 component of M2 probably reflects a dimension of consumer wealth not picked up by our use of the stock market average. It appears that both affect consumption after a lag.

THE COMPLETE MODEL

If the hypothesized IS curve is retested deleting the housing variable (HSE), results are even stronger. The deletion of the housing variable (HSE) seems reasonable on the grounds that though appropriate in the consumption function, we have already accounted for it by including the determinants of investment in the IS curve function. (Housing is the second largest component in investment data).

For the 2 variable deficit model, we have the following consumption function: (the "complete model"). It is estimated without the HSE variable because we use these C estimates (and later I estimates) to predict the IS curve. But HSE is about a third of total I, and the determinants of I are already fully included in the determinants of GDP in the IS function, therefore, including HSE would duplicate variables already in the formulation, and create simultaneous equations bias because HSE is a component of the dependent variable GDP.

Domestically Produced Consumer Goods

$\Delta C_D = .34\Delta(Y-T_G)$ **$+.27\Delta T_G$ $-.74\Delta G$**$-5.56\Delta PR + .34\ \Delta DJ_{-2} + 2.17\ \Delta XR_{AV} + (NA)\Delta HSE - 668.59\Delta POP_{16} + .013\Delta POP + .36\Delta ICC_{-1} + 46.94\Delta M2_{AV}$

(t =) (6.4) **(3.1)** **(-3.2)** (-2.0) (1.4) (2.5) (-2.2) (4.0) (1.1) (5.6)

R^2=88.0% D.W.= 2.0

(C_D - No Crowd Out)

$\Delta C_D = .43\Delta(Y-T_G) - .80\Delta PR + .46\ \Delta DJ_{-2} + .09\ \Delta XR_{AV} + (NA)\Delta HSE - 414.54\Delta POP_{16} + .006\Delta POP + .37\Delta ICC_{-1} + 32.45\Delta M2_{AV}$ R^2=81.3%

(t =) (7.1) (-0.3) (2.3) (0.4) (-1.5) (1.7) (1.1) (4.2) D.W.= 1.8

And the investment equation for the complete model with C-O,

$\Delta(I_D) = .23\Delta ACC + .18\Delta DEP + .18\Delta CAP_{-1}$ **$+.50\ \Delta T$ $-.64\Delta G$** $- 7.54\Delta r_{-2} - .27\ \Delta DJ_{-2} + .44\ \Delta PROF_{-2} + 5.88\ \Delta XR_{AV} + .009\Delta POP$ R^2=.90

(t =) (9.6) (0.6) (0.1) **(7.6)** **(-3.8)** (-6.9) (-1.2) (4.0) (4.8) (3.5) DW =2.3

The revised investment function for the complete model without C-O, also is:

$\Delta(I_D) = .36\Delta ACC + .83\Delta DEP + 2.21\Delta CAP_{-1} - 11.07\Delta r_{-2} + .07\ \Delta DJ_{-2} + .51\ \Delta PROF_{-2} + 4.55\ \Delta XR_{AV0123} - .00\Delta POP$ R^2=.74

(t =) (8.7) (1.5) (1.2) (-3.9) (0.3) (2.9) (4.8) (-0.2) DW =2.5

Predicted IS Curve (No Crowd Out, And No HSE)

$\Delta Y =$ **$-.75\Delta T$ $+1.75\Delta G$$+1.75\Delta X$** $-1.40\Delta PR + .93\Delta DJ_{-2} + 8.12XR_{AV0123} + (NA)\Delta HSE - 725.45\ \Delta POP_{16} + .01\Delta POP + .65\Delta ICC_{-1} + 56.79\Delta M2 + .63\Delta ACC + 1.45\Delta DEP + 3.87\Delta CAP_{-1} - 19.37r_{-2} + .89\Delta PROF_{-2}$

Predicted IS Curve (With Crowd Out, But No HSE)

$\Delta Y =$ **$+.65\Delta T$ $-.57\Delta G$$+1.51\Delta X$** $-8.40\Delta PR + .11\Delta DJ_{-2} + 12.16XR_{AV0123} + (NA)\Delta HSE - 1009.57\ \Delta POP_{16} + .03\Delta POP + .54\Delta ICC_{-1} + 70.88\Delta M2 + .35\Delta ACC + .27\Delta DEP + .27\Delta CAP_{-1} - 11.39r_{-2} + .66\Delta PROF_{-2}$

Actual test Results

$\Delta Y =$ **$+.78\Delta T$ $-.20\Delta G$ $+.61\Delta X$** $-6.69\Delta PR + .30\Delta DJ_{-2} + 4.37XR_{AV} + (NA)\Delta HSE + 505.70\Delta POP_{16} + .05\Delta POP + 1.42\Delta ICC_{-1} + 45.43\Delta M2$

(t=) (6.0) (-0.7) (-2.1) (2.4) (0.8) (2.4) (1.4) (6.7) (2.8) (3.0)

$+.58\Delta ACC + .16\Delta DEP + 7.97\Delta CAP_{-1} + .04r_{-2} + .21\Delta PROF_{-2}$ R2=97.6%

(10.0) (0.3) (2.2) (0.1) (0.8) DW=2.3

9 of 15 IS coefficients in this complete model (without HSE) are better predicted by the 2-variable crowd out model than by the no crowd out model.

For completeness, we also provide estimates of the consistency of IS predictions with actual IS regression results for the 1-variable crowd out case.

Domestically Produced Consumer Goods

$\Delta C_D = .36\Delta(Y-T_G)$ **$+.27\Delta(T-G)$** $-4.49\Delta PR + .24\ \Delta DJ_{-2} + 1.30\ \Delta XR_{AV} + (NA)\Delta HSE - 375.09\Delta POP_{16} + .01\Delta POP + .23\Delta ICC_{-1} + 37.75\Delta M2_{AV}$

(t =) (6.4) **(3.0)** (-1.6) (1.3) (1.3) (-1.9) (2.8) (0.9) (4.9)

R^2=86.0% D.W.= 1.9

Domestically Produced Investment Goods

$\Delta(I_D) = .23\Delta ACC + .16\Delta DEP - .37\Delta CAP_{-1}$ **$+.51\ \Delta(T-G)$** $- 8.22\Delta r_{-2} - .28\ \Delta DJ_{-2} + .44\ \Delta PROF_{-2} + 5.59\Delta XR_{AV0123} + .008\Delta POP$ R^2=.90

(t =) (9.0) (0.5) (-0.3) **(7.6)** (-6.6) (-13) (4.1) (5.6) (3.6) DW =2.3

Predicted IS Curve (No Crowd Out, And No HSE)

$\Delta Y =$ **$-.75\Delta T$ $+1.75\Delta G$$+1.75\Delta X$** $-1.40\Delta PR + .93\Delta DJ_{-2} + 8.12XR_{AV0123} + (NA)\Delta HSE - 725.45\ \Delta POP_{16} + .01\Delta POP + .65\Delta ICC + 56.79\Delta M2 + .63\Delta ACC + 1.45\Delta DEP + 3.87\Delta CAP_{-1} - 19.37r_{-2} + .89\Delta PROF_{-2}$

Predicted IS Curve (With 1-Var. Crowd Out, But No HSE)

ΔY**=+.65**Δ**T + .34**Δ**G+1.56**Δ**X** -7.00PR - .06ΔDJ_{-2} +10.75XR_{AV0123} +(NA)ΔHSE -585.14 ΔPOP_{16} + .03ΔPOP +.36ΔICC_{-1}+58.89ΔM2 +.36ΔACC+ .25ΔDEP - .58ΔCAP_{-1} -12.82r_{-2} + .69$\Delta PROF_{-2}$

Actual test Results (Repeated From Above)

ΔY=	**+.78**Δ**T -**	**.20**Δ**G +**	**.61**Δ**X**	-6.69ΔPR	+.30ΔDJ_{-2}	+ 4.37XR_{AV}	+(NA)ΔHSE	+505.70ΔPOP_{16}	+.05ΔPOP	+1.42ΔICC_{-1}	+ 45.43ΔM2	
(t=)	(6.0)	(-0.7)	(-2.1)	(2.4)	(0.8)	(2.4)		(1.4)	(6.7)	(2.8)	(3.0)	
							+.58ΔACC+	.16ΔDEP	+7.97ΔCAP_{-1}	+ .04r_{-2}	+.21$\Delta PROF_{-2}$	R2=97.6%
							(10.0)	(0.3)	(2.2)	(0.1)	(0.8)	DW=2.3

10 of 15 IS coefficients in this complete model (without HSE) are better predicted by the 1-variable crowd out model than by the no-crowd out model. The empirical tests strongly support the hypothesis that credit crowd out strongly reduces and may completely crowd out the positive effect of fiscal stimulus

However, results do indicate that spending-induced deficits can be offset by increasing the non-M1 components of M2, particularly its savings account and other time deposits, like small CDs, and money market components. To be effective, it must be in the second, third and fourth years preceding the deficit. If done in the deficit year, this implies the M2 offset to crowd out won't be felt until the second, third and fourth years forward.

This summarizes the best science we have been able to bring to bear on the issue of crowd out. The science indicates crowd out systematically reduces or eliminates the anticipated positive impact of Keynesian fiscal stimulus obtained from no-crowd out models.

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