Does Crowd Out Hamper Government Stimulus Programs In Recessions?

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In well controlled statistical tests, crowd out was found related to government deficits financed by borrowing. Roughly equal effects were found for both recession and non-recession periods. Tax cut deficits were found were found more detrimental than spending deficits Private borrowing systematically declined with the growth of government deficits, and explained most variation in consumer and investment spending. Crowd out may be avoided by foreign borrowing or if M2 money increases prior to the deficit. These findings offer a plausible explanation for the failure of recent U.S. government stimulus programs to offset the 2008 recession.

INTRODUCTION

When government finances deficits by borrowing from the savings pool, the reduction in loanable funds available to consumers and businesses is "crowd out". Borrowing by both consumers and businesses is extensively used even in recessions to supplement the purchasing power of income, for example, when buying a house or new machinery. Government borrowing to finance deficits may crowd out private borrowing, and hence, spending, offsetting some or all of the deficit's stimulus effects. Whether it actually does or not is an empirical issue, examined in this paper.

The paper tests whether consumer or business borrowing is negatively impacted by deficits, in either recessions or non-recession periods. It also tests if any declines in spending are systematically related to declines in borrowing, as theorized in the crowd out model. U.S. data for the period 1960-2000 are tested. Findings are tested for robustness by dropping the first or last ten year period from the sample, and then retesting.

THE NO - CROWD OUT MODEL

Standard simple models of the economy do not allow for borrowing - related crowd out. In such models the impact of taxes and government spending are derived using the GDP identity:

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

A simple consumption function might be given as a linear function of disposable income (Y-T)

$$C = \beta(Y-T) \quad (2)$$

substituting C into (1) gives

$$Y = \left| \frac{1}{(1-\beta)} \right| * [\, -\beta T + I + G + X - M \,] \quad (3)$$

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).**

THE CROWD OUT MODEL

However, to test the hypothesis that savings otherwise used to finance consumer credit is diverted to finance government deficits, the consumption function must be modified to add the crowd out - causing factor, the deficit (T-G), where (T-G) = taxes minus government spending:

$$C = \beta (Y-T) + \lambda(T-G) \quad (4)$$

where lambda (λ) represents the marginal effect of deficit spending on consumer demand. With this function, the model becomes

$$\begin{aligned} GDP = Y &= \beta (Y-T) + \lambda(T-G) + G + I + (X-M) \\ &= [1/(1-\beta)] \, [\, (-\beta+\lambda) T + (1-\lambda) G + I + (X-M) \,] \end{aligned} \quad (5)$$

The impact of a change in T or G on the GDP depends on **λ** as well as **β**. The tax multiplier, is now **(-β+ λ)/ (1- β)**. The spending multiplier, is now **(1-λ)/(1-β)**. *Both T and G marginal effects on the GDP will be smaller (in absolute terms) than they would have been without crowd out effects.*

If crowd out has different effects in recession (Rec) and non-recession periods (NonRec), the formulation becomes

$$\begin{aligned} GDP = Y &= \beta (Y-T) + \lambda_{Rec}(T-G) + \lambda_{NonRec}(T-G) + G + I + (X-M) \\ &= [1/(1-\beta)] \, [\, (-\beta+\lambda_{Rec})T + (-\beta+\lambda_{NonRec})T + (1-\lambda_{Rec}) G + (1-\lambda_{NonRec}) G + I + (X-M) \,] \end{aligned} \quad (6)$$

We can see the impact of a change in T or G on the GDP depends on λ_{Rec} or λ_{NonRec} as well as **β**. The tax multiplier, is now $\mathbf{(-\beta+ \lambda_{Rec})/ (1- \beta)}$ in recessions or $\mathbf{(-\beta+ \lambda_{NonRec})/ (1- \beta)}$ in non-recessions. If crowd out is less in recessions, the tax cut multiplier effects will be larger than in non-recessions. The spending multiplier, is now $\mathbf{(1-\lambda_{Rec})/(1-\beta)}$ or $\mathbf{(1-\lambda_{NonRec})/(1-\beta)}$ and if crowd out is less in recessions, the spending multiplier will be larger in recessions than in non-recessions.

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 real interest rates (r) and access to credit, which varies with the government deficit (T-G).

$$I = \gamma(T-G) - \theta r \quad (7)$$

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

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

$$GDP = Y = = [1/1-\beta] \, [\, (-\beta+\lambda+\gamma) T + (1-\lambda-\gamma) G - \theta r + (X-M) \,] \quad (8)$$

In this IS equation, the normal stimulating impact of tax cuts on the GDP **(-β)** is offset by the effects of deficit – induced changes in credit available to consumers and investors **(λ+γ)**. Tax stimulus effects may switch from negative to positive if the crowd out effects **(λ+ γ)** are larger than the disposable income

effect **(-β)**. The normal stimulating effect of government spending is reduced from **(1)** to **(1- λ-γ)**, and stimulus effects are either reduced or become negative. 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. Crowd out reduces the stimulus of spending deficits less than tax cut deficits, because the spending stimulus effect **(1)** to be offset by crowd out is larger than the tax stimulus effect **(-β)**. Results are shown in Table 1.

Crowd out may or may not be a problem in recessions. It can be argued consumers and businesses borrow less in recessions, leaving savings available to finance new government deficits without causing crowd out. However, national savings may also drop in recessions due to falling incomes. If savings decline as much or more that private borrowing demand, new deficits will still cause new crowd out. Hence, arguments for and against crowd out in recessions can be made theoretically.

If crowd out effects are different in recessions than in non-recessions, the investment and IS functions change as follows:

$$I = - \theta r + \gamma_{Rec} (T-G) + \gamma_{NonRec} (T-G) \quad (9)$$

$$Y = [1/1- \beta] [(-\beta+ \lambda_{Rec}+ \gamma_{Rec}) T \text{ or } (-\beta+ \lambda_{NonRec}+ \gamma_{NonRec}) T + (1- \lambda_{Rec}-\gamma_{Rec}) G \text{ or } (1- \lambda_{NonRec}-\gamma_{NonRec}) G - \theta r + (X-M)] \quad (10)$$

Hence, the stimulus effect of tax cuts **(-β)** is offset by either the recession effect of crowd out **(λ_{Rec}+ γ_{Rec})** or the non-recession effect **(λ_{NonRec}+ γ_{NonRec}).** The stimulus effect of government spending **(+1)** is offset by either the recession effect of crowd out **(-λ_{Rec}- γ_{Rec})** or the non-recession effect **(-λ_{NonRec}- γ_{NonRec}).** These results are also summarized in Table 1.

TABLE 1
EFFECTS OF CROWD OUT ON TAXES AND GOVERNMENT SPENDING STIMULUS

	Without Crowd Out	With Crowd Out		Without Crowd Out	With Crowd Out
Tax coefficient	(-β)	-β+ (λ+ γ)	Spending Coefficient.	1	1-(λ+γ)
	(-β)	-β+ $(\lambda+ \gamma)_{Rec}$		1	$1-(\lambda+\gamma)_{Rec}$
	(-β)	-β+ $(\lambda+ \gamma)_{NonRec}$		1	$1-(\lambda+\gamma)_{NonRec}$
Tax Multiplier (Average-All Per.)	$\frac{(-\beta)}{(1-\beta)}$	$\frac{-\beta+ (\lambda+ \gamma)}{(1- \beta)}$	Spending Multiplier	$\frac{1}{(1-\beta)}$	$\frac{1-(\lambda+\gamma)}{(1-\beta)}$
Tax Multiplier (Recession Period)	$\frac{(-\beta)}{(1-\beta)}$	$\frac{-\beta+ (\lambda+ \gamma)_{Rec}}{(1- \beta)}$	Spending Multiplier	$\frac{1}{(1-\beta)}$	$\frac{1-(\lambda+\gamma)_{Rec}}{(1-\beta)}$
Tax Multiplier (Non-Recession)	$\frac{(-\beta)}{(1-\beta)}$	$\frac{-\beta+ (\lambda+ \gamma)_{NonRec}}{(1- \beta)}$	Spending Multiplier	$\frac{1}{(1-\beta)}$	$\frac{1-(\lambda+\gamma)_{NonRec}}{(1-\beta)}$

Several conclusions follow from Table1:

a) If the signs of the crowd out variable coefficients (λ, γ) are positive, the stimulus effect of tax cuts on the GDP will be smaller than a standard model would predict. Reducing taxes has a net stimulus effect only if **(β)** is larger than the appropriate variant of **(λ+γ)**. If **(λ+γ)** is equal to or greater than **(β)**, there is complete, or more than complete, crowd out.

b) The government spending multiplier of (1/1- β) in the "no - crowd out" model, also declines in the presence of crowd out. It is now **(1-λ)/(1- β)**, **(1-λ_{Rec})/(1- β)**, or **(1-λ_{NonRec})/(1- β).** Stimulus due

to increased government spending is now partially or wholly offset by reductions in consumer spending caused by crowd out

c) The multiplier effect of net export spending stays the same. Relatively speaking, this means that if crowd out exists, a dollar increase in net exports should have a larger multiplier effect than a dollar of government spending, a testable hypothesis.

The model we shall test later in this paper is a slightly different form of the model shown above. The model above was based on the GDP identity

$$Y = C + I + G + (X-M) \quad (11)$$

But we can just as accurately write

$$Y = C_D + I_D + G_D + X \quad \text{(where subscript d denotes domestically produced goods)} \quad (12)$$

This is an important distinction in calculating multipliers because only spending on domestically produced consumer or investment goods generates the multiplier effect on the GDP. Hence, the last formulation of the GDP identity may be the better form to use when calculating IS curve parameter estimates, since multiplier effects inherent in the coefficients are more correctly estimated. (We abstract from effects on exports of growth in import demand).

Because the data available does not allow separation of government purchases into domestic produced goods and imports, the form of the model we test is:

$$Y = C_D + I_D + G + X) \quad (13)$$

OTHER STUDIES

The ability of deficits to stimulate the economy hangs heavily on whether or not the government borrowing to finance deficits crowds out private borrowing, and therefore private spending. No macroeconomic models were found which directly tested borrowing for this relationship. No studies were found that specifically test for differences in effects in recession and non-recession periods. Recession periods are when deficits are most commonly adopted tools for stimulating the economy.

Some work, discussed below, has been done to test crowd out indirectly, by testing the average relationship between private spending and deficits over the course of the business cycle. If a negative relationship was found, it was assumed to be due to crowd out.

The popular press is full of discussion of crowd out effects that are based on the *assumption* that crowd out does or does not work. For example:

1. *Chan, S.* (*NY Times,* 2/7/10, p.A16): reported the I.M.F. warned on Jan. 26 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 is likely to dominate any crowd out effect, leaving a net stimulus effect of government spending increases or tax cuts.

In the professional literature, studies examining crowd out have been entirely, or principally literature reviews. For example, Spencer and Yohe, (1970), in reviewing the literature, found that the dominant view the past two hundred years from all types of studies has been that government deficits cause crowding out. Friedman's work (1978) is largely theoretical, though it contains some references to his and

others' empirical work. 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, and that elasticity of substitution between bonds and stocks when interest rates rise (due to deficit borrowing) is key: elasticities less than one lead to crowd out; greater than one: crowd in. Therefore crowd out effects are indeterminate theoretically. Friedman's own empirical results, based on money demand models, were ambiguous.

Gale and Orszag's work (2004) does include some empirical testing indicating crowd out matters. Consumer 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. A negative relationship between taxes and GDP were taken as a sign that crowd out, if it existed, was not complete. That said, their tested hypothesis did not include the government deficit as an explanatory variable. This can result in stimulus effects of tax cuts being overstated (Heim 2010). Other tests also indicated a positive relationship between interest rates and deficits. This was taken as an indicator of crowd out. However, some studies show the interest rates most systematically related to the GDP are not supply and demand driven rates, but exogenously determined: the federal funds and prime interest rates, (Heim, 2007). These would not systematically move upward as deficits increased, and in fact might move in the opposite direction, if the controllers of these rates followed some sort of Taylor Rule, since deficits seem most likely to grow in recessions.

Using a VAR methodology, Montford and Uhlig (2008) found investment falls in response to both spending *and tax* increases*, a* finding inconsistent with both standard stimulus theory and crowd out theory. The VAR specified consumption or investment as being a function of six lagged values of each of ten variables: GDP, C, G, Taxes, real wages, private non-residential I, adjusted reserves, the PPI index and the GDP deflator. Since the tested hypotheses in VAR models are somewhat atheoretical, findings can be difficult to interpret. Blanchard and Perrotti (2002), also using a VAR model, obtained the same result for investment when testing taxes and government spending, but more Keynesian results for total output, and non-Keynesian results for consumption.

Furceri and Sousa (2009) examine 145 countries using a VAR methodology to determine if government spending as a % of GDP was related to consumption and investment spending as a % of GDP, They conclude government spending is adversely related. Fundamentally the model tests consumption and investment spending against right - side variables fixed effects variables for the individual countries and the current and four lagged values of the government spending/ GDP variable. While many of the government spending variables had statistically significant adverse effects, the lack of controls for other structural variables makes it difficult to be sure the finding truly represent the government spending effect, and not perhaps be proxying for non-included variables.

METHODOLOGY

1960 - 2000 data on the determinants of consumption and investment spending were taken from the *Economic Report of the President 2002* and *2010. Flow of Funds Accounts* of the Federal Reserve were used to obtain data on consumer and business debt, changes in which were taken as measures of net consumer or business borrowing. The specific variables are identified in later sections.

Two -stage least squares regression was used since both consumption and investment are driven in part by income related variables (disposable income or the accelerator), and therefore 2SLS was needed to avoid issues of simultaneity. The remaining variables in the consumption and investment equations are lagged, or considered exogenous (e.g. the prime interest rate is rigidly set to reflect the federal funds rate, which is exogenously determined by the Fed; depreciation allowances are determined by prior year investment levels, etc.). They were used as 1st Stage regressors. Variables were tested in first differences instead of levels to address nonstationarity, serial correlation and multicollinearity issues commonly found in time series data. Newey West corrections to standard errors were used to avoid heteroskedasticity problems. Durbin - Watson measures of serial correlation are shown with each regression. Hausman endogeneity tests failed to show significant endogeneity between the government spending and tax variables, and either consumption or investment. The 2SLS form of instrumental

variables and the D.W. test for serial correlation are considered the most appropriate for use with time series data (Griffiths, Hill, Lim, 2011).

It is difficult to separate consumer imports out of total imports in the *Economic Report of the President*. The Bureau of Economic Analysis (BEA) has confirmed it does not categorize import and export data into same "C" and "I" and "G" categories used elsewhere in the national GDP accounts. Absent official determinations by BEA, economists must make their own evaluations of how to divide the data. For example, it is not clear from Table 104 in the *Economic Report of the President* how much of the value of motor vehicle imports or petroleum imports should be treated as inventory investment vs. sales to consumers. Data on imported services (Table B-106) does not distinguish between imports of services by businesses and consumers, though one might suspect the former dominate. Nor do the services data extend back beyond 1974. Hence, no deduction from total imports for business services imports could be made in calculating consumer imports.

Following Heim (2010), we take as our definition of consumer imports all imports except imports of capital goods and industrial supplies and materials. The theory behind this choice was that the best definition of "consumer" imports was the one whose variation was best explained (highest R^2) by the variables theoretically thought to drive demand for consumer imports. Other definitions of consumer imports, did not explain consumer behavior as well.

To obtain separate deficit, tax or government spending variables for recession periods, they are multiplied by a dummy variable taking the value (1) when there is a depression at some time during the data year, and (0) in non-recession years. For non-recession years, the dummy variable is reversed. National Bureau of Economic Research estimates (NBER 2009) were used to define recession years.

VARIABLES INCLUDED IN CONSUMPTION AND INVESTMENT MODELS

Theory suggests a wide range of variables are determinants of consumer demand. Individual studies have provided some empirical support for many variables, though not always controlling adequately for the rest. The consumption functions tested in this paper control for an extensive list of possible factors that might influence consumption, including crowd out, thereby helping ensure the correctness of the crowd out results. Lagged or average values are used with some of these variables, reflecting the findings of earlier studies. The variables used include:

C_T = real consumer goods and services
(Y-T) = real disposable income
(T-G) = real government deficit, defined as one variable
PR = real prime interest rate
DJ_{-2} = a measure of wealth (Dow Jones Composite Index), lagged two years
XR_{AV} = exchange rate average for current and past three years
POP_{16} = ratio of young (16 -24 year olds) to old (over 65) in population
POP = population size
ICC_{-1} = Index of Consumer Confidence (Conference Board), lagged one year
$M2_{AV}$ = real M2 money supply, average of past three years
(C_{BOR}) = Net annual consumer borrowing = change in consumer debt (ΔC_{DEBT}) that period.

Theory also suggests many variables are determinants of investment demand. Here again, individual studies have provided some empirical support for many different variables, though results are not always obtained controlling adequately for other possible factors. The variables used here include:

I_T = total spending on investment goods, both domestically produced and imported
I_M = Spending on imported investment goods
I_D = Spending on domestically produced investment goods
ACC = a Samuelson accelerator variable measuring the economy's growth rate (Δ Real GDP)

DEP = real business depreciation allowances
CAP_{-1} = industrial capacity utilization, lagged one period
r_{-2} = real Prime interest rate, lagged two periods
DJ_{-2} = Dow Jones Composite Average, a proxy for Tobin's q
$PROF_{-2}$ = real corporate profits, lagged two periods
B_{BOR} = Net annual business borrowing = change in business debt (ΔB_{DEBT}) that period.

Other variables in the investment model are as defined in the consumption function.

TEST RESULTS, FINDINGS

Overview

The below equations develop "no crowd out" and "average crowd out" models and their test results for the 40 year period 1960-2000. Average crowd out models have coefficients on the deficit variable that represent the average effect on consumption or investment over the period tested. No separate recession/non-recession coefficients are estimated.

In addition, the same models allowing for different crowd out effects in recession and non-recession (R/NR) period effects are compared to no crowd out models. Such models will include crowd out variables: $\Delta(T\text{-}G)_{Rec}$, and $\Delta(T\text{-}G)_{NoRec}$.

Lastly, we compare average crowd out results to (R/NR) models results to see which of these two models better predict actual IS curve coefficients.

Baseline Comparisons: "Average Crowd Out" Versus "No Crowd Out" Models

The "no crowd out" model and the average crowd out model ($\Delta(T\text{-}G)$) are tested below. Results are shown for domestically produced consumer and investment goods models, because they are used to predict IS curve coefficients. Results are presented for total consumption and investment, which includes imports, and compared with total consumption and business borrowing. Separate results for consumer and investment imports can be obtained by subtracting domestic production coefficients from total model coefficients.

The regression results for consumer and investment spending are:

Consumption Functions - No Crowd Out)

$$\mathbf{\Delta C_D = .43\Delta(Y\text{-}T_G) - .80\Delta PR + .46\,\Delta DJ_{-2} + .63\,\Delta XR_{AV} - 414.54\Delta POP_{16} + .006\Delta POP + .37\Delta ICC_{-1} + 32.45\Delta M2_{AV}} \quad \mathbf{R^2 = 81.3\%} \quad (14)$$

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

where C_D represents spending on domestically produced consumer goods.

Investment Functions - No Crowd Out

$$\mathbf{\Delta I_D = .36\Delta ACC + .83\Delta DEP + 2.21\Delta CAP_{-1} - 11.07\Delta r_{-2} + .07\,\Delta DJ_{-2} + .51\,\Delta PROF_{-2} + 4.55\,\Delta XR_{AV0123} - .00\Delta POP} \quad \mathbf{R^2 = .75} \quad (15)$$

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

where I_D represents spending on domestically produced investment goods.

Consumption Functions With "Average" Crowd Out

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

(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

Investment Functions With "Average" Crowd Out

$$\Delta I_D = \mathbf{+.51\,\Delta(T\text{-}G)} + .23\Delta ACC + .16\Delta DEP - .37\Delta CAP_{-1} - 8.22\Delta r_{-2} - .28\,\Delta DJ_{-2} + .44\,\Delta PROF_{-2} + 5.59\Delta XR_{AV} + .008\Delta POP \quad R^2 = .90 \quad (17)$$

(t =) **(7.6)** (9.0) (0.5) (-0.3) (-6.6) (-1.3) (4.1) (5.6) (3.6) DW =2.3

Predicted IS Curve (No Crowd Out)

$$\Delta Y = \mathbf{-.75\Delta T + 1.75\Delta G + 1.75\Delta X} - 1.40PR + .93\Delta DJ_{-2} + 9.07XR_{AV0123} - 725.45\ \Delta POP_{16} + .01\Delta POP + .65\Delta ICC + 56.79\Delta M2 + .63\Delta ACC + 1.45\Delta DEP + 3.87\Delta CAP_{-1} - 19.37r_{-2} + .89\Delta PROF_{-2} \quad (18)$$

Predicted IS Curve (With Average Crowd Out)

$$\Delta Y = \mathbf{+.65\Delta T + .34\Delta G + 1.56\Delta X} - 7.00PR - .06\Delta DJ_{-2} + 10.75XR_{AV0123} - 585.14\ \Delta POP_{16} + .03\Delta POP + .36\Delta ICC_{-1} + 58.89\Delta M2 + .36\Delta ACC + .25\Delta DEP - .58\Delta CAP_{-1} - 12.82r_{-2} + .69\Delta PROF_{-2} \quad (19)$$

Actual test Results (The Same Hypothesis Tests No Crowd Out and Average Crowd Out)

$$\Delta Y = \mathbf{+.78\Delta T - .20\Delta G + .61\Delta X} - 6.69\Delta PR + .30\Delta DJ_{-2} + 4.38XR_{AV} + 505.70\Delta POP_{16} + .05\Delta POP + 1.42\Delta ICC_{-1} + 45.43\Delta M2$$

(t=) (6.0) (-0.6) (-2.1) (2.4) (0.8) (2.4) (1.4) (6.7) (2.8) (3.0)

$$+.58\Delta ACC + .16\Delta DEP + 7.97\Delta CAP_{-1} + .04r_{-2} + .21\Delta PROF_{-2} \quad R^2 = 97.6\% \quad (20)$$

(10.0) (0.3) (2.2) (0.0) (0.8) DW=2.3

The predicted IS curve coefficients for these two models, as well as the actual regression estimates obtained testing the IS curve are summarized in Table 2 below:

Findings

- Adding crowd out to the consumption model increases explained variance from 81.3% to 86.0%. For investment, explained variance increases from 75% to 90. Crowd out variables are significant at the 1% level.
- IS curve predictions from the no - crowd out model show positive net economic effects for both tax cut and spending deficits (as expected)
- IS curve predictions from the crowd out model indicate *more* than complete crowd out for tax cut and partial crowd out for spending deficits. Actual regression results match predictions, showing more than complete crowd out for tax cut deficits, and complete crowd out for spending deficits.
- The crowd out model predicted actual IS curve test results far better than the no crowd out model, as shown in Table 2.

TABLE 2
IS CURVE COEFFICIENTS ON TAX AND GOVERNMENT SPENDING VARIABLES

	Tax	Spending
No Crowd Out model Prediction	- 0.75	+ 1.75
Av. Crowd Out Model Prediction	+0.65	+ 0.34
Actual Regression Result	+0.78	- 0.20
	(6.0)	(-0.6)

- The government spending variable in the IS curve test has a smaller coefficient than the exports coefficient, as predicted by crowd out theory in earlier. In no crowd out models, these predicted coefficients are the same and equal to the multiplier.
- The average crowd out model predicts 10 of 15 actual IS coefficients more than by the no crowd out model, including the crowd out variable coefficients.
- The predicted IS curve results indicate a $0.65 drop in GDP for every dollar of deficit-financed tax cut financed by borrowing. The predicted IS curve results also show a net stimulus effect of $+0.34 per dollar of government spending deficit incurred if financed by borrowing. The actual IS curve regression results show nearly the same effect for tax cuts ($0.78), but a result for net spending deficits of ($-0.20), a result insignificantly different from zero.

Conclusion

Average crowd out models explain substantial variance in consumption, investment and GDP that no-crowd out models leave unexplained. Average crowd out models are much better at predicting IS curve coefficients, the key determinants of GDP effects. Findings indicate that the crowd out effects of tax cut

deficits more than fully offset stimulus effects, resulting in net negative economic effects. Regression results for government spending deficits indicate full crowd out, with no net economic effect of the deficit either way, though predicted results were for a small positive net effect, about one third the size of the stimulus.

Baseline Comparisons: "Recession/No Recession" Versus "No Crowd Out" Models

Below, consumption and investment models are tested for separate recession and non - recession crowd out effects. The domestic consumption and investment models tested are the same as previously used. Regression results for the crowd out model are:

Domestically Produced Consumer Goods

$$\Delta C_D = .36\Delta(Y-T_G) \mathbf{+.20\Delta(T-G)_{Rec} + .35\Delta(T-G)_{NonRec}} - 4.07\Delta PR + .22\,\Delta DJ_{-2} + 1.24\,\Delta XR_{AV} - 410.32\Delta POP_{16} + .01\Delta POP \quad (21)$$

(t =) (6.8) **(2.2)** **(2.2)** (-1.5) (1.1) (1.5) (-2.4) (2.3)

$$+.13\Delta ICC_{-1} + 40.02\Delta M2_{AV} \quad R^2=86.4\%$$

(0.4) (4.2) D.W.= 2.1

Domestically Produced Investment Goods:

$$\Delta I_D = \mathbf{+.50\,\Delta(T-G)_{Rec} \; +.52\,\Delta(T-G)_{NonRec}} + .23\Delta ACC + .13\Delta DEP - .35\Delta CAP_{-1} - 8.15\Delta r_{-2} - .27\,\Delta DJ_{-2} + .44\,\Delta PROF_{-2} + 5.58\Delta XR_{AV} \quad (22)$$

(t =) **(8.3)** **(3.5)** (9.0) (0.5) (-0.3) (-7.0) (-1.4) (4.0) (5.7)

$$+ .008\Delta POP \quad R^2=89.8\%$$

(3.7) DW =2.3

Using the parameter estimates from these domestic consumption (C_D) and investment (I_D) equations, the IS curve parameters are predicted to be:

Predicted IS Curve (Separate Crowd Out Variable (T, G) For Recessions/Non-recessions)

$$\Delta Y = \mathbf{+.53\Delta T_{rec} + .80\Delta T_{NonRec} + .47\Delta G_{Rec} + .20\Delta G_{NonRec} + 1.56\Delta X} - 6.35PR - .08\Delta DJ_{-2} + 10.64XR_{AV0123} - 640.10\,\Delta POP_{16}$$
$$+.03\Delta POP + .20\Delta ICC_1 + 62.43\Delta M2 + .36\Delta ACC + .20\Delta DEP - .55\Delta CAP_{-1} - 12.71r_{-2} + .69\Delta PROF_{-2} \quad (23)$$

Actual IS Curve Test Results (With Separate (T) And (G) Variables For Recession/Non-Recessions)

$$\Delta Y = \mathbf{+.87\Delta T_{Rec} + .60\Delta T_{NonRec} - .65\Delta G_{Rec} - .23\Delta G_{NonRec} + .63\Delta X} - 8.00\Delta PR + .24\Delta DJ_{-2} + 4.97XR_{AV} + 445.43\Delta POP_{16} \quad (24)$$

(t=) **(5.3)** **(2.3)** **(-1.1)** **(-0.6)** **(2.0)** (2.2) (0.6) (2.6) (1.3)

$$+.05\Delta POP + 1.59\Delta ICC_{-1} + 44.51\Delta M2 + .59\Delta ACC + .68\Delta DEP + 8.36\Delta CAP_{-1} - .40r_{-2} + .22\Delta PROF_{-2} \quad R^2=97.8\%$$

(5.6) (3.5) (2.3) (10.4) (0.7) (2.3) (-0.1) (0.8) DW=2.5

The results indicate that

- Adding crowd out to the consumption model increases explained variance from 81.3% to 86.4%, slightly more than the average effect model (86.0%). For investment, adding crowd out increased explained variance about the same as the average crowd out model: from 75% to 89.8%, slightly less than the average model (90.0%). Though there are differences in specific recession/non-recession coefficients for taxes and spending, they are each within the confidence intervals of the other, suggesting they may be the same. This indicates dividing crowd out into recession and non-recession variables adds little information not already available in the average crowd out model. This actual IS curve results again suggest more than complete crowd out for tax cut deficits, and complete crowd out for spending deficits. The predicted IS curve results again indicate the same for tax cuts, but only partial crowd out for spending deficits. The lack of a significant difference in crowd out effects in the two periods is further explored below.
- All four crowd out variables in the consumption and investment models are statistically significant at the 1% or 3% level. Statistical significance in both recession and non-recession periods strongly supports the hypothesis crowd out has negative effects in both periods.
- Deficits appears to have about the same marginal effect in recession and non-recession periods on investment (.50 vs.52). For consumption, point estimates of effects are larger for non-recession periods, but well within the other estimates confidence intervals, suggesting the differences may not be significant.

- The recession/non-recession crowd out model, predicted 9 of 17 IS curve coefficients more accurately than the no crowd out model. The no crowd out model predicted 7 better. The standard for judging results was an IS model tested with separate (T) and (G) variables for recession and non-recessions.
- When the standard for judging results was an IS model tested with only one set of (T) and (G) variables (average crowd out), the recession/non-recession model predicted 10 of 17 coefficients better than the no crowd out model.
- The regression coefficient estimates of IS curve crowd out effects, indicate more than complete crowd out of government spending deficit stimulus, but the coefficient is insignificantly different from zero, suggesting only full crowd out. Results do indicate tax cuts more than fully crowd out stimulus effects. Results are shown in Table 3 below. R/NR model predictions of actual IS coefficients were also found to be far more accurate than no crowd out model predictions.

TABLE 3
IS CURVE COEFFICIENTS FOR TAX AND GOVERNMENT SPENDING VARIABLES

	Tax		Spending	
	Rec.	No Rec.	Rec.	No Rec.
No Crowd Out model Prediction	- 0.75	- 0.75	+ 1.75	+ 1.75
R/NR Crowd Out Model Prediction	+ 0.53	+ 0.80	+ 0.47	+ 0.20
Actual Regression Result	+ 0.87	+ 0.60	- 0.65	- 0.23
(t=)	(5.3)	(2.3)	(-1.1)	(-0.6)

- Actual IS curve regression coefficients suggest substantially different recession and non-recession period effects ($+.87\Delta T_{Rec} + .60\Delta T_{NonRec} - .65\Delta G_{Rec} - .23\Delta G_{NonRec}$), *with deficits causing a substantially worse crowd out problem in recession than non-recessions.* This may occur because savings fall faster than borrowing in recessions, necessitating a much larger cutback in credit based spending by both consumers and businesses than just that caused by the crowd out effects. This decline would be *coincidental with, but not part of, the crowd out effect.* Our models do not provide an easy way of disentangling the two effects. That said, these differences also cannot be considered different with any statistical certainty; 5% confidence intervals around each estimate contain the other as a possibility.

Conclusions

The findings indicate crowd out has a statistically significant negative effect on domestic consumer and investment spending in both recession and non-recession periods.

Though the IS curve coefficients indicate both tax cuts and government spending had larger crowd out effects in recessions than non-recessions, the confidence intervals around these estimates were large enough to indicate there may not be a real difference. The likely reason we find crowd out in recessions is because loanable funds availability (savings) drops as much or more than borrowing demand, a topic more fully examined later. *This is a key finding, for it is sometimes argued that crowd out is not a problem in recessions, when deficit stimulus is needed most, because private demand for loanable funds declines.*

Actual regression results for the IS curve in both recession and non-recession periods indicate crowd out *more than* fully offset all tax stimulus, but *only* fully offset government spending stimulus in both periods. Predictions were the same for tax cuts, but only suggested partial crowd out for spending deficits.

IS curve coefficients are predicted more accurately from crowd out models than from no crowd out models.

Crowd Out Comparisons: "Average" Versus "Recession/No Recession" Models

In preceding sections, both average and recession/non-recession (R/NR) crowd out models show deficits to be negatively related to private spending, better at predicting IS curve parameters, and better at explaining variance in consumer and investment spending than no - crowd out models. Is either the average or R/NR model a better crowd out model than the other? Does one explain economic activity significantly better than the other?

To evaluate this, two sets of consumption and investment regressions, and there IS curve predictions, are compared to actual IS curve coefficients. One set contain the average crowd out, taken from previous equations and the other has recessions and non-recession variables, also seen earlier.

Which actual IS curve coefficients to use as the standard for judging the success of predictions is a problem: we could use either the average or R/NR regression coefficients. Will we bias results if we use one instead of the other? To deal with this, we shall evaluate each set of predictions separately against each set of actual regression results, to see if there are significant differences in the results. Predicted and actual regression results, repeated from earlier sections, are given below:

IS Curve Predictions (Repeated From Previous Section):

Predicted IS Curve (With Average Crowd Out)

$$\Delta Y = \mathbf{+.65\Delta T + .34\Delta G + 1.56\Delta X} \text{ -7.00PR } - .06\Delta DJ_{-2} + 10.75XR_{AV0123} + (NA)\Delta HSE - 585.14\ \Delta POP_{16} + .03\Delta POP + .36\Delta ICC_{-1} + 58.89\Delta M2 + .36\Delta ACC + .25\Delta DEP - .58\Delta CAP_{-1} - 12.82r_{-2} + .69\Delta PROF_{-2} \quad (25)$$

Predicted IS Curve (Separate Crowd Out Variable (T-G) Included For Recessions/Non-recessions)

$$\Delta Y = \mathbf{+.53\Delta T_{rec} + .80\Delta T_{NonRec} + .47\Delta G_{Rec} + .20\Delta G_{NonRec} + 1.56\Delta X} \text{ -6.35PR } - .08\Delta DJ_{-2} + 10.64XR_{AV0123} - 640.10\ \Delta POP_{16} + .03\Delta POP + .20\Delta ICC_{1} + 62.43\Delta M2 + .36\Delta ACC + .20\Delta DEP - .55\Delta CAP_{-1} - 12.71r_{-2} + .69\Delta PROF_{-2} \quad (26)$$

Actual IS Curve Test Results (From Previous Section):

Actual Test Results (The Same Hypothesis Tests No Crowd Out and Average Crowd Out Models)

$$\Delta Y = \mathbf{+.78\Delta T - .20\Delta G + .61\Delta X} \text{ -6.69}\Delta PR + .30\Delta DJ_{-2} + 4.38XR_{AV} + 505.70\Delta POP_{16} + .05\Delta POP + 1.42\Delta ICC_{-1} + 45.43\Delta M2 \quad (27)$$

(t=) (6.0) (-0.6) (-2.1) (2.4) (0.8) (2.4) (1.4) (6.7) (2.8) (3.0)

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

(10.0) (0.3) (2.2) (0.0) (0.8) DW=2.3

Actual Test Results (With Separate T And G Variables For Recession/Non-Recessions)

$$\Delta Y = \mathbf{+.87\Delta T_{Rec} + .60\Delta T_{NonRec} - .65\Delta G_{Rec} - .23\Delta G_{NonRec} + .63\Delta X} \text{ -8.00}\Delta PR + .24\Delta DJ_{-2} + 4.97XR_{AV} + 445.43\Delta POP_{16} \quad (28)$$

(t=) (5.3) (2.3) (-1.1) (-0.6) (2.0) (2.2) (0.6) (2.6) (1.3)

$$+.05\Delta POP + 1.59\Delta ICC_{-1} + 44.51\Delta M2 + .59\Delta ACC + .68\Delta DEP + 8.36\Delta CAP_{-1} - .40\Delta r_{-2} + .22\Delta PROF_{-2} \quad R^2=97.8\%$$

(5.6) (3.5) (2.3) (10.4) (0.7) (2.3) (-0.1) (0.8) DW=2.5

The average crowd out model predicted 8 of 17 coefficients more accurately than the R/NR model, even *using the R/NR regression coefficients as the measure of correctness*. The R/NR better predicted 5, *using the R/NR coefficients as the standard of correctness*. Differences in predicted values generally were small and tended to be closer to each other than to actual regression coefficients, suggesting differences in predictive power were minor, at best.

The R/NR model better predicted 7 of 17, the average model 6, *using the average coefficients as the standard of correctness*. Again, predictions from both models were closer to each other than to the actual results, indicating they are more alike than different in predicting IS curve coefficients.

These results indicate that separating the single average estimate of the deficit's effect on private spending into recession and non-recession parts adds little to our total information, implying crowd out effects are the same in both periods. (R^2 only increased from 97.6% to 97.8% using the R/NR IS model)

Conclusions

Because recession and non - recession effect estimates were reasonably close, this model does not predict actual IS curve coefficients significantly better than average crowd out models, which assume crowd out effects are the same in both periods.

There may be differences in crowd out effects in recession and non-recession periods, but the effects are more alike than different. In both periods, government tax cut deficits are associated with declines in the economy, and spending deficits result in no net effect on the economy, positive or negative.

- The findings are robust to the time period selected for testing. Dropping either the first or last ten years from the sample and re-estimating total consumption and investment, yields statistically significant crowd out effects for both recession and non-recession periods. Estimates of marginal effects are similar in the different samples.
- Average crowd out coefficients for consumption, are generally more significant (1% level) than the statistical significance of the R/NR coefficients (3%).
- Average and R/NR crowd out coefficients for investment were both significant at the 1% level.
- Virtually no additional variance is explained in the IS curve using the recession/non-recession model (97.8%) of crowd out compared to average crowd out model (97.6%).
- Adding crowd out in its average form to a no crowd out model increases explained variance in consumption from 81.3% to 86.0%. When R/NR is added, it grows slightly more to 86.4%. Average crowd out and R/NR add about the same amount to investment's explained variance: raising it from 75% to 90%.
- These results suggest using the R/NR form adds little additional information to our knowledge of crowd out behavior, compared to average model results. This suggests crowd out significantly negatively affects the economy in recession and non-recession periods, and to about the same extent. Therefore, the average crowd out formulation probably provides as accurate an estimate of crowd out impact as the formulation with separate R/NR variables.
- The results do indicate crowd out is a significant factor offsetting stimulus in both recession and non-recession phases of the business cycle, as shown by t-statistics on crowd out variables in the domestically produced consumption and investment goods spending equations above, reproduced in Table 4 below:

TABLE 4
t-STATISTICS FOR CROWD OUT VARIABLES*,**

	$(T\text{-}G)_{Rec}$	$(T\text{-}G)_{NonRec}$	$(T\text{-}G)_{Average}$
Consumption "t"	(2.2)	(2.2)	(3.0)
Investment "t"	(8.3)	(3.5)	(7.6)

*1.5=15% level; t = 1.7 =10% level; 1.8=8% level; t=2.0 = 5% level; t= 2.7 = 1% level.
**t-statistics taken from equations 16, 17, 21, and 22 above

In addition, the average crowd out model better predicted actual IS curve coefficients (from IS curve tested with average crowd out) than the R/NR model, and even did nearly as well when the standard used was the R/NR model, as shown in Table 5

TABLE 5
AVERAGE CROWD OUT VS. R/NR PREDICTION RECORD

Average Crowd Out (C/O) Predicts Better Than R/NR When Tested Against	
Actual IS, Using Average Crowd Out Standard	(8,5,4)*
Actual IS, Using R/NR Crowd Out Standard	(6,7,4)*

* Variables better predicted given in the following order: (Av., R/NR, Tie). Results from Equations 25 - 28.

DIRECT EVIDENCE OF CROWD OUT: THE IMPACT OF DEFICITS ON PRIVATE BORROWING

Developed models clearly show a negative relationship between deficits and spending, *ceteris paribus*. It has been *assumed* that the mechanism causing the negative relationship between deficits and private spending is government borrowing to finance deficits, reducing the amount of national savings left for consumers and businesses to borrow. Hence, crowd out theory hangs on whether the data on consumer and business *borrowing* show the same decline we see in *spending* in the presence of deficits. To test the relationship of deficits to borrowing, Federal Reserve Flow of Funds data on business and consumer debt is used. Changes in debt measure net borrowing. Using borrowing, not spending, as the dependent variable, we retest the same consumption and investment models previously tested. Theory suggests some or all of the same factors that drive consumer *spending* drive consumer *borrowing*, since borrowing is but one way of manifesting desired spending. If the decline in spending is caused by the decline in borrowing, we should find spending and borrowing have about the same relationship to deficits, and in the same period.

Relationship of Borrowing to Average Crowd Out

Below are regression results for models of consumer and business spending on domestically produced and imported goods. They include estimates of crowd out's average effect over the course of the business cycle. Consumers and businesses borrow money because they intend to spend it, but not all variables that influence spending necessarily influence borrowing. However, we expect to find some similarities

Total Investment Spending Function With "Average" Crowd Out

$$\Delta I_T = \mathbf{+.60\ \Delta(T\text{-}G)} + .27\Delta ACC + .29\Delta DEP + .72\Delta CAP_{-1} - 6.79\Delta r_{-2} + .08\ \Delta DJ_{-2} + .32\ \Delta PROF_{-2} + 5.16\Delta XR_{AV0123} + .011\Delta POP \quad (28)$$

(t =) **(6.4)** (8.2) (0.9) (0.6) (-4.0) (0.3) (1.9) (6.2) (4.0)

R^2=91%; DW =2.5

Total Consumption Spending Function With "Average" Crowd Out

$$\Delta C_T = .50\Delta(Y\text{-}T_G)\ \mathbf{+.54\Delta(T\text{-}G)}\ -10.28\Delta PR + .59\ \Delta DJ_{-2} + 4.32\ \Delta XR_{AV} - 360.95\Delta POP_{16} + .01\Delta POP + .55\Delta ICC_{-1} + 30.34\Delta M2_{AV} \quad (29)$$

(t =) (14.7) **(11.3)** (6.1) (3.6) (5.1) (-1.9) (4.7) (2.2) (4.7)

R^2=96.2% D.W.= 2.1

The estimated total negative effect on private consumption and investment spending per dollar of deficit incurred is $1.14*, ceteris paribus, i.e., holding stimulus effects on income constant. Unlike IS curves estimates, which combine stimulus and crowd out effects, and therefore show smaller net effects of changes in deficits, the consumption and investment function estimates measure crowd out effects alone.*

The same functions, with borrowing, not spending, as the dependent variable, yielded the following results:

Total Investment Borrowing Function (ΔI_B) With "Average" Crowd Out

ΔI_B = **+.48 Δ(T-G)** + .09ΔACC +1.43ΔDEP - .59ΔCAP_{-1} - 13.64Δr_{-2} -1.10 ΔDJ_{-2} +.56 $\Delta PROF_{-2}$ +12.39ΔXR_{AV0123} +.006ΔPOP (30)

B) **(2.6)** (0.7) (1.1) (-0.2) (-2.7) (-1.9) (1.4) (4.0) (-0.5)

R^2=.91; DW =1.9

Total Consumption Borrowing Function (ΔC_B) With "Average" Crowd Out

ΔC_B =.39Δ(Y-T_G) **+.42Δ(T -G)** -9.28ΔPR -.91 ΔDJ_{-2}+7.89 ΔXR_{AV} +223.05ΔPOP_{16}-.02ΔPOP+.88ΔICC_{-1}+11.55$\Delta M2_{AV}$ (31)

(t =) (4.5) **(1.8)** (1.9) (-2.8) (4.3) (0.5) (-3.1) (1.1) (0.4)

R^2=63.2% D.W.= 1.7

The total estimated drop in consumer and business borrowing per dollar of tax cut induced deficit is \$0.90, compared to the spending drop of \$1.14. The confidence intervals around the borrowing estimates, are calculated from the estimated standard error of the total borrowing point estimate (.90) (Var .48 +Var .42). = .30. The 5% level confidence intervals do not allow us to reject the hypothesis the drop in borrowing and spending are equal. *This suggests crowd out of private borrowing is either the major or only monetary channel through which deficits negatively affects consumer and business spending.*

Relationship of Borrowing to Crowd Out in Recession and Non-Recession Periods

Below are regression results for models of total consumer and business spending. We expect to later find some of them are also key determinants of borrowing.

Total Investment Spending Function With Recession/Non-Recession Crowd Out

ΔI_T = **+.57 $\Delta(T-G)_{Rec}$** **+.65 $\Delta(T-G)_{NonRec}$** + .27ΔACC + .15ΔDEP + .84ΔCAP_{-1} - 6.46Δr_{-2} + .10 ΔDJ_{-2} +.31 $\Delta PROF_{-2}$ + 5.10ΔXR_{AV} (32)

(t =) **(6.3)** **(3.5)** (8.1) (0.5) (0.6) (-3.4) (0.5) (1.8) (6.2)

+ .01ΔPOP R^2=.90.7

(3.9) DW =2.6

Total Consumption Spending Function With Recession/Non-Recession Crowd Out

ΔC_T =.50Δ(Y-T_G) **+.51$\Delta(T-G)_{Rec}$ + .59$\Delta(T-G)_{NonRec}$** - 10.06ΔPR+.58 ΔDJ_{-2}+4.29 ΔXR_{AV} - 379.52ΔPOP_{16} +.01ΔPOP (33)

(t =) (15.7) **(10.0)** **(7.0)** (-5.9) (3.5) (5.5) (-2.0) (4.3)

+.50ΔICC_{-1}+ 31.54$\Delta M2_{AV}$ R^2=96.3%

(1.9) (4.4) D.W.= 2.2

and the borrowing functions for the same models are as follows:

Total Investment Borrowing Function With Recession/Non-Recession Crowd Out

ΔI_B = **+.13 $\Delta(T-G)_{Rec}$** **+.99 $\Delta(T-G)_{NonRec}$** + .09ΔACC - .02ΔDEP + .65ΔCAP_{-1} - 10.08Δr_{-2} - .89 ΔDJ_{-2} +.51 $\Delta PROF_{-2}$ + 11.80ΔXR_{AV} (34)

(t =) **(0.5)** **(3.3)** (0.9) (-0.0) (0.2) (-2.0) (-1.8) (1.4) (4.5)

+ .00ΔPOP R^2=.615

(0.0) DW =2.0

Total Consumption Borrowing Function With Recession/Non-Recession Crowd Out

ΔC_B=.41Δ(Y-T_G) **+.59$\Delta(T-G)_{Rec}$ + .19$\Delta(T-G)_{NonRec}$** - 10.44ΔPR-.85 ΔDJ_{-2}+8.05 ΔXR_{AV} + 320.12ΔPOP_{16} -.01ΔPOP (35)

(t =) (4.4) **(2.5)** **(0.8)** (-2.0) (-2.6) (5.3) (0.6) (-2.5)

+1.16ΔICC_{-1}+5.27.54$\Delta M2_{AV}$ R^2=65.1%

(1.4) (0.2) D.W.= 1.8

In recession periods, the deficit's effect on combined consumption and investment borrowing compared to spending is somewhat similar (\$0.72 vs. \$1.08), but the spending decline is noticeably larger. The larger drop in private spending in recessions, about equal to the increase in deficit, suggests there may be factors not adequately controlled for in the model affecting spending on consumption and investment in recessions more severely than borrowing (or affects borrowing less severely). In non-recessions, the combined borrowing and spending effects are very close: (\$1.18 vs. 1.24).

The relatively small negative impact deficits have on investment in recessions may be because loanable funds are freed up because consumer borrowing in recessions is reduced to a much greater degree (\$0.59) than in non-recessions (\$0.19).

Conclusion

Crowd out affects borrowing and spending in recession and non recession periods. Deficits were negatively related to spending and borrowing in both periods. The decline in borrowing explains virtually all the decline in spending associated with crowd out deficits in non-recessions. However, the decline in borrowing explains most of the decline in spending in recessions (2/3), but not all of it. The divergence suggests something else beside crowd out , not controlled for in the model, may be causing the additional spending decline. It is not clear what this might be, and warrants further research.

Evidence also shows from the 1981-83 recession period, that the reason crowd out also occurs in recessions, when loan demand by consumers and investors is relatively low, may be that national savings declines at least as much. Therefore, any recession deficit financed by borrowing, i.e., by drawing on remaining savings, will create a crowd out effect.

OTHER WAYS TO FINANCE DEFICITS

Foreign Borrowing as a Means of Supplementing Domestic Savings

The NIPA accounts require public and private investment must always equal saving. That said, foreign saving borrowed by the U.S. government or U.S. private parties is included as part of the available savings pool. For example, during the 1981-83 recession period, domestic saving fell considerably more than investment, but was more than offset by the growth in foreign borrowing to compensate for lost domestic savings (Economic Report of the President, 2010, Table 32). Adjusting for the statistical discrepancy between savings and investment numbers, the actual figures (in billions) were

$$\$ - 8.1\ \Delta(\text{Private Investment}) + 16.0\ \Delta(\text{Government Investment}) = \$ + 7.9\ \Delta(\text{Investment}) \quad (36)$$

$$\$ + 38.4\ \Delta(\text{Foreign Borrowing}) - 30.5\ \Delta(\text{Domestic Saving}) = \$ + 7.9\ \Delta(\text{Savings}) \quad (37)$$

Hence, government deficits may *not* cause crowd out if the government can borrow foreign funds to finance the deficit, thereby avoiding tapping the domestic savings pool, or if private borrowers can borrow foreign funds to replace domestic savings used to pay for government deficits.

Financing Deficits by Monetary Expansion as a Means of Avoiding Crowd Out

In theory, deficits can be financed by monetary expansion as well as by borrowing. This should avoid the crowd out problem. In fact, (Heim 2010) showed that if we do not hold M2constant when examining the effect of spending deficits on consumption, we do not see an effect, i.e., there is evidence money expansion can offset crowd out. However, when tested directly, M1 did not seem to have this effect. Regression effects on variables in the consumption and IS models varied little using an (M2-M1) formulation for the money variable instead of (M2), i.e., controlling for M1 alone did not seem to make a difference. This suggests M2 affects the crowd out problem only through its non-M1 components, i.e., the parts that represent savings growth. Monetary expansion, to finance a deficit, may only offset crowd out effects if it is saved in advance of the deficit occurring and used to replace savings lost to financing the deficit. This was the formulation used in this study successfully, taken from the Heim (2010), where it is noted that without M2 controlled for, government spending deficits seem to have no effect on consumption. Only when (the savings component of) M2 is controlled for - held constant - do we see government spending deficits have a crowd out effect.

SUMMARY AND CONCLUSIONS

This paper has attempted to bring the best science possible to bear on the issue of whether crowd out exists, and whether it occurs in recessions as well as non-recession periods. To do so, we have explicitly controlled extensively for variables (or reasonable proxies for them) other studies have found might affect consumption, investment and GDP. The test results indicate

- Crowd out is a statistically significant problem in both recessions and non-recession periods.
- Declines in private borrowing were found to occur in the same period deficits increased. Investment spending declined about as much as borrowing, consumption spending actually declined more. This is evidence crowd out is the underlying mechanism responsible for the negative relationship between private spending and deficits observed in this study and others.
- The IS curve regression tests showed crowd out completely offsets the stimulus effects of government *spending* deficits, resulting in the stimulus attempt having no net effect on the economy, though predicted IS curve results only suggested partial crowd out from government spending deficits.
- Crowd out *more than completely* offsets stimulus effects of *tax cut* deficits, resulting in the stimulus attempt having a net negative effect on the economy, consistent with predictions of crowd out theory and IS curve predictions resulting from actual consumption and investment function regression models.
- Point estimates from actual IS curve tests(eq. 28) indicate crowd out has a more negative effect in recessions than non recession periods, but the confidence intervals around the estimates are large enough that we cannot reject the hypothesis they are equal. If effects are more severe in recessions, this may be because national savings drops as much or more than private loan demand in recessions. It may leave only enough savings to cover reduced private borrowing needs. Any additional borrowing by government to finance a deficit will have crowd out effects.
- Foreign borrowing appears to be an alternative way of financing deficits which does not have domestic crowd out effects. Monetary expansion is more problematic, depending on a pre-deficit build up of savings that can be used to offset the decline in loanable funds associate d with the deficit.

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