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SCEPA Working Paper 2009-1

**Re-specifying the Keynesian Income-Expenditure Model to Properly Account for
Imports: Implications for Fiscal Policy**

WORKING PAPER SERIES

February 2009

Re-specifying the Keynesian Income-Expenditure Model to Properly Account for Imports: Implications for Fiscal Policy

Abstract

The current paper provides a modification of the standard textbook income – expenditure model that better accounts for the effect of imports. This modification shows that increased government spending has an even larger relative impact compared to tax cuts than is conventionally thought. It also shows that increased government spending can have a smaller adverse impact on the trade deficit than tax cuts despite the fact spending has a larger multiplier effect on income. That means spending may be doubly advantaged over tax cuts as a means of reflating economic activity.

Keywords: income – expenditure model, multiplier, imports, fiscal policy.

JEL ref.: E10, E12, E20, E60

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February 2009

I Introduction

After years of neglect fiscal policy is back. For the past twenty-five years interest rate policy has been the preferred tool of stabilization policy. However, with the Federal Reserve's target federal funds rate at near-zero there is now no room to stimulate the economy with conventional interest rate policy. That has restored the official standing of fiscal policy – albeit by default rather than intellectual conversion.

Not only is fiscal policy back, but so too is Keynesianism. Suddenly, economists everywhere are Keynesian and using Keynesian economic logic, based on shortfalls of aggregate demand and the expenditure multiplier, to justify expansionary fiscal policy.

The income – expenditure model is the simplest Keynesian model, and its virtues are once again being seen in terms of providing a simple account of the underlying economic problem and providing clear back of the envelope calculations of the likely economic impact of fiscal stimulus.

The current paper provides a modification of the standard textbook income – expenditure model that better accounts for the effect of imports. This modification shows that increased government spending has an even larger relative impact compared to tax cuts than is conventionally assumed. It also shows that increased government spending can have a smaller adverse impact on the trade deficit than tax cuts despite the fact spending has a larger multiplier effect on income. That means spending may be doubly advantaged over tax cuts as a means of reflating economic activity.

II The income – expenditure model revisited

The conventional textbook income - expenditure model is described by the following seven equations:

$$(1) y = AD$$

$$(2) AD = C + I + G + X - M$$

$$(3) C = c_0 + c_1[[1 - t]y - T] \quad c_0 > 0, 0 < c_1 \leq 1, 0 < t < 1$$

$$(4) I = I_0$$

$$(5) G = G_0$$

$$(6) X = X_0$$

$$(7) M = m_0 + m_1y \quad m_0 > 0, m_1 > 0$$

Where y = output, AD = aggregate demand, C = consumption spending, I = investment spending, G = government spending, X = exports, M = imports, c_0 = autonomous consumption spending, c_1 = marginal propensity to consume, t = rate of income tax, T = lump sum taxes, I_0 = autonomous investment spending, G_0 = autonomous government spending, X_0 = exogenous exports, m_0 = autonomous spending on imports, and m_1 = marginal propensity to import.

Solving the model yields an equilibrium level of output given by

$$(8) y^* = [c_0 + I_0 + G_0 + X_0 - c_1T - m_0]/[1 - [1 - t]c_1 + m_1]$$

The equilibrium trade deficit is given by

$$(9) D^* = X_0 - m_0 - m_1[c_0 + I_0 + G_0 + X_0 - c_1T - m_0]/[1 - [1 - t]c_1 + m_1]$$

The government expenditure and tax multipliers are given by

$$(10) H_G = 1/[1 - [1 - t]c_1 + m_1]$$

$$(11) H_T = -c_1/[1 - [1 - t]c_1 + m_1]$$

$$(12) H_t = -yc_1/[1 - [1 - t]c_1 + m_1]$$

Assuming $c_1 = 0.9$, $t = 0.2$, and $m_1 = 0.2$, yields an expenditure multiplier (H_G) of 2.08 and a tax multiplier (H_T) 1.87.

III Re-specifying the income-expenditure model

A problem with the standard income – expenditure model is it fails to properly account for imports and the import leakage. This is because it only accounts for the import leakage resulting from induced expenditures and fails to account for any import leakage related to first rounds of spending.

Correcting this problem begins with recognizing that imports consist of spending by households on consumption goods, spending by firms on investment goods, spending by government on imported inputs, and spending on imported inputs that are then re-exported as part of exports. This in turn calls for re-specifying equation (7) determining imports as follows:

$$(7.a) M = M_C + M_I + M_G + M_X$$

$$(7.b) M_C = \alpha C \quad 0 < \alpha < 1$$

$$(7.c) M_I = \beta I \quad 0 < \beta < 1$$

$$(7.d) M_G = \gamma G \quad 0 < \gamma < 1$$

$$(7.e) M_X = \phi X \quad 0 < \phi < 1$$

where M_C = imports of consumption goods, M_I = imports of investment goods, M_G = imports by government, and M_X = imports embodied in exports. The coefficients α , β , γ , and ϕ represent the import content in consumption, investment, government spending, and exports respectively.

Solving the model using equations (7.a) – (7.d) in place of equation (7) then yields the following solutions for equilibrium income and the trade deficit:

$$(13) y^* = \{[1 - \alpha][c_0 - c_1T] + [1 - \beta]I_0 + [1 - \gamma]G_0 + [1 - \phi]X_0\} / [1 - [1 - \alpha][1 - t]c_1]$$

$$(14) D^* = [1 - \phi]X_0 - \alpha[c_0 + c_1[1-t]y^* - c_1T] - \beta I_0 - \gamma G_0$$

The government expenditure and tax multipliers now become:

$$(15) H_G' = [1 - \gamma] / [1 - [1 - \alpha][1 - t]c_1]$$

$$(16) H_T' = - [1 - \alpha]c_1 / [1 - [1 - \alpha][1 - t]c_1]$$

The important feature is that in both cases the multiplier is reduced because of an import leakage in the first round of spending. This leakage appears in the numerator of equations (15) and (16), and it holds for both household and government spending. It also holds for firms in the event of an increase in autonomous investment spending or exports.

The proposed re-specification of the model makes the marginal propensity to import an even more important parameter. But instead of a single marginal propensity to import, as assumed in the conventional income-expenditure model, there is now a marginal propensity to import for each component of aggregate demand - consumption, investment, government purchases, and exports.

This re-specification adds an additional structural dimension to the model with the different propensities to import depending on a combination of final demand factors plus an input-output dimension. With regard to consumption, imports consist of imported final consumption goods and imported inputs used in the production of domestically produced final consumption goods. Both types of imports must be subtracted from aggregate consumption to get the true demand for domestically produced consumption goods. This

also holds for investment and government spending. Exports are a contribution to final demand (X_0) from which must be deducted the imports used in their production (ϕX_0).

Government's import propensity is likely very low since most government spending goes directly on wages and salaries. With regard to consumption, spending on durables likely has the largest import component; spending on non-durables has a lower import component; and spending on services has the lowest import component, being significantly labor costs.

The new model makes clear the economic logic of policies restricting government to purchase domestically produced goods - such as the "Buy American" provision included in the American Recovery and Reinvestment Act, 2009, passed by the U.S. House of Representatives. Such policies reduce the coefficient γ , thereby increasing the government expenditure multiplier and adding even greater "bang for buck" to government spending. The drawback is that such proposals may elicit retaliation that reduces exports, in which case their net effect is unclear.

Lastly, the above structural specification is also useful for capturing aspects of developing economies. Thus, some developing countries (for instance Mexico with its maquiladora region) act as assemblers of goods, importing components and re-exporting the assembled goods. For such countries the coefficient ϕ can be very high.

IV Some back of the envelope multiplier calculations

By way of getting a sense of the implications of the re-specified model, it is worth comparing multipliers under the two different models. A standard parameterization for the conventional income – expenditure model might involve assuming $c_1 = 0.9$, $t = 0.2$,

and $m_1 = 0.2$. Substituting these parameter values in equations (10) and (11) yields an expenditure multiplier (H_G) of 2.08 and a tax multiplier (H_T) 1.87. The ratio of these multipliers (H_G/H_T) is 1.11, suggesting that government expenditures are roughly ten percent more effective at stimulating economic activity compared to lump sum tax cuts.

Now consider the following parameterization for the alternative model of $c_1 = 0.9$, $t = 0.2$, $\alpha = 0.3$, and $\gamma = 0.05$. The assumption that $\alpha = 0.3$ assumes approximately one third of the marginal dollar of consumer spending leaks directly into imports, while the assumption that $\gamma = 0.05$ assumes five percent of the marginal dollar of government spending leaks directly into imports.

The logic of government spending is clear because such spending is largely made up of wages and salaries (e.g. teachers, firemen, police, armed forces), and defense goods also tend to have a higher domestic content. However, the consumption leakage requires additional explanation.

Spending on durables and non-durables comprise forty percent of total consumption spending, while spending on services is sixty percent of consumption spending. However, approximately two-thirds of spending on services is non-discretionary on housing, housing operation, and medical care. Stripping out this non-discretionary means discretionary marginal consumption is split one-third on durables, one-third on non-durables, and one-third on services. One-third of this discretionary consumption is then assumed to leak into imports. That is higher than the average propensity to import of 0.20 because the average propensity to import is a weighted

average of the propensity to import in consumption, investment, government spending, and exports.¹

Substituting values of $\alpha = 0.30$, $\gamma = 0.05$, $t = 0.20$ and $c_1 = 0.9$ in equations (15) and (16) yields a new value for the government expenditure multiplier (H_G') of 1.92 and a new value for the tax multiplier (H_T') of 1.27. In both cases the multiplier is reduced by the new specification and the ratio of the multipliers (H_G' / H_T') is 1.5. Thus, the re-specified model increases the relative efficacy of government spending relative to tax cuts. Interestingly, this is the ratio used by current policymakers to assess the relative impact of government spending and tax cuts, though policymakers also assume a spending multiplier of 1.5 and a tax multiplier of 1 that is slightly lower (Romer and Bernstein, 2009).

The economic logic behind this multiplier pattern is the smaller initial leakage into imports from government spending. The traditional model has the tax multiplier being smaller because part of a tax cut is saved. The new model further reduces the relative size of the tax multiplier by having a larger proportion of a tax cut be immediately spent on imports. This creates an additional import leakage that yields no expansionary benefit.

¹ The average propensity to import from the conventional model can be thought of as a weighted average of the propensity to import in consumption, investment, government spending, and exports. Import behavior in the two models can therefore be related as follows:

$$m_1 = s_C\alpha + s_I\beta + s_G\gamma + s_X\phi$$

where s_C = consumption goods share of imports, s_I = investment goods share of imports, s_G = government's share of imports, and s_X = exported goods share of imports. Additionally spending shares are governed by the following constraints: $s_C + s_I + s_G + s_X = 1$ and $1 > s_C, s_I, s_G, s_X > 0$. For the U.S. after adding back imports to GDP, the consumption share of AD is 60 percent, the investment share is 12 percent, the export share is 12 percent, and the government share is 16 percent.

Another feature of the re-specified model is that the government spending multiplier will be greater than the tax multiplier even if households are liquidity-constrained ($c_1 = 1$). This is because liquidity-constrained households also direct part of their spending on imports. Consequently, as long as $\alpha > \gamma$ then $H_G' > H_T'$ as can be seen from inspection of equations (15) and (16).

V Trade deficit effects

The above re-specification of the income – expenditure model also has significant implications for understanding the trade deficit effects of fiscal policy. Differentiating equation (9) with respect to G and T and expressing as absolute values, yields

$$|\delta D^*/\delta G| = |m_1/[1 - [1 - t]c_1 + m_1]|$$

$$|\delta D^*/\delta T| = |m_1c_1/[1 - [1 - t]c_1 + m_1]|$$

$$|\delta D^*/\delta G| > |\delta D^*/\delta T|$$

In the conventional model both increases in government spending and lower taxes increase the trade deficit because they stimulate income, thereby raising imports.

However, a one dollar change in government spending has a larger effect on the trade deficit because it has a larger multiplier, which raises income and imports by more.

In the re-specified model the absolute effects of government spending and tax cuts on the trade deficit are given by

$$|\delta D^{*'}/\delta G| = |\gamma_0 + \alpha c_1[1-t][1 - \gamma]/\{1 - [1 - \alpha][1 - t]c_1\}|$$

$$|\delta D^{*'}/\delta T| = |\alpha c_1 + \alpha c_1[1-t][1 - \alpha]c_1/\{1 - [1 - \alpha][1 - t]c_1\}|$$

$$|\delta D^{*'}/\delta G| > |\delta D^{*'}/\delta T|$$

Now, the change in the trade deficit has two components. The first is the direct initial leakage into imports, while the second is the effect of induced expansion of income on imports. The effect of increased government spending on the trade deficit can be smaller than the effect of a tax cut, even though spending has a larger impact on income. This is because the initial direct import leakage from government spending is smaller than that from a tax cut ($\gamma_0 < \alpha c_1$), which can compensate for the larger multiplier effect on imports ($\alpha c_1 [1-t] [1 - \gamma] / \{1 - [1 - \alpha] [1 - t] c_1\} > \alpha c_1 [1-t] [1 - \alpha] c_1 / \{1 - [1 - \alpha] [1 - t] c_1\}$). This potentially gives government spending a further advantage over tax cuts. Not only does it provide more stimulus than tax cuts, it may also have a smaller adverse impact on the trade deficit.

VI Conclusion

The income - expenditure model is a basic workhorse of Keynesian economics. This paper has provided a modification of the model to better account for the impact of imports. That is important given the increase in trade that has resulted from globalization.

Additionally, the proposed modification is relevant for the debate whether it is better to provide fiscal stimulus by increased government spending or tax cuts. The income – expenditure model is the classic Keynesian model and it has again acquired policy relevance because of current conditions. The model is appropriate for conditions of deep recession and depression when the economy has plenty of spare capacity, there is little danger of higher prices or inflation, and the risk free interest rate is stuck in the liquidity trap. Moreover, given that exchange rates are largely independent of trade deficits, being determined by capital flows or government intervention (in the case of

China and other East Asian economies), it has a reasonable fit with current open economy circumstances. Given these conditions, the model has current real world policy relevance and the modified model shows that fiscal stimulus based on increased spending is even more expansionary relative to tax cuts than conventionally thought.

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