



A Realistic Neoclassical Multiplier

Suitably modified, a neoclassical model with flexible prices can generate accurate fiscal multipliers

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ABSTRACT

Standard neoclassical models are unable to generate large values for the fiscal multiplier, the aggregate economic response to increased government spending. Empirical estimates place the multiplier between 0.7 and 1.0. Standard models deliver figures close to zero. In an earlier policy paper, we modified the standard model, with features of demand-based productivity. These modifications raised the figure to just 0.17, still very far from the range found in the empirical literature.

In this note, we introduce a further modification that *does* produce a fiscal multiplier as large as the empirical estimates. The previous set of modifications involved the disutility of having to search for desired goods and services. We now introduce a feature that amplifies this search process: product *variety*. When households desire many varieties and search is costly, it creates the possibility of excess capacity.

With excess production capacity available, government expenditure can rise without rivaling private spending for goods and services, a crowding out that would otherwise undercut the multiplier effect of higher fiscal spending. Firms faced with greater aggregate demand are able to increase production, sell more and generate higher profits. Firms will then search for more workers, raising employment, household income and private consumption.

Several conditions maximize the multiplier effect. Most importantly, government spending focused on nontradable goods ensures that demand taps domestic production, not imports. Secondly, shifting labor to the nontradable sector should be low cost, enabling workers to move easily from unemployment to nontradable jobs. Third, wages subject to a search friction will adjust slowly so that employment rises when labor demand increases.

With these modifications and conditions in place, otherwise standard neoclassical models can generate fiscal multipliers as high as 1.09, solidly consistent with empirical estimates.

Introduction

Fiscal and monetary policymakers have long debated the impact on aggregate economic growth of increased fiscal expenditure, and as the U.S. economy struggles to emerge from the Great Recession, the issue has gained considerable attention in Washington. If the federal government were to increase spending on infrastructure, national defense, education or other public goods, to what degree would that expenditure stimulate the greater economy?

Any benefits from this policy must, of course, be weighed against the additional tax revenue eventually needed to pay for the fiscal outflows. But the key policy question has been: What is the actual macroeconomic impact of such “stimulative” spending?

Empirical estimates of this so-called fiscal multiplier, defined as the response of gross domestic product to an exogenous change in government expenditure—lie in the range of 0.7 to 1.0. (See Hall 2009 for a review of the empirical literature.) Thus, a \$1 billion increase in federal spending, other things equal, would result in a \$700 million to \$1 billion increase in GDP. Some economists suggest that when nominal interest rates are extremely low and unemployment is high, as is currently the case, the fiscal multiplier might well be higher (Christiano, Eichenbaum and Rebelo 2011).

Unfortunately, conventional economic models for macroeconomic and public financial analysis based on real business cycle theory—commonly referred to as “standard neoclassical models”—have failed to provide results anywhere near these empirical estimates. Rather, they deliver figures close to zero. That is, the standard model predicts that temporary increases in government expenditure will have essentially no aggregate economic effect, in strong contrast to a wide range of empirical findings. Simply put, theory has not matched reality.

In a previous policy paper, we analyzed the roots of this failure (see Dyrda and Ríos-Rull 2012) and sought to improve the standard model’s results through a set of modifications.

Unfortunately, while the multiplier figures obtained with these variations were somewhat greater than zero, they still fell far short of reality.

In this paper, we review those findings—the basic reasons for the standard models’ failure as well as the modifications that (just) slightly improved results—and then build upon both to create a new model that holds real promise: a modified standard neoclassical model that generates fiscal multiplier predictions close to the estimates of empirical researchers.

Failure of the standard model

Close analysis of the standard model suggests that its inability to produce a realistic multiplier stems from the interplay of four factors: (1) diminishing returns to labor productivity, (2) wealth effects on labor supply, (3) elasticity (or sensitivity) of investment to interest rates and (4) elasticity of labor to both wages and interest rates.

For an increase in government spending to generate additional economic growth, workers must be induced to supply additional labor, and this can occur either through a wealth effect or in response to changes in interest rates and in wages. The wealth effect is that households might supply more labor if they decide that the higher taxes needed to finance additional government spending will cut into their earnings; to maintain their standard of living, they'll therefore need to earn more income. Secondly, if interest rates rise because of additional government spending, households may decide to save more and reduce both current consumption and leisure; the result, more work effort now. An increase in wages could increase people's willingness to work, but with decreasing returns to scale in labor, the effect of the fiscal policy will be to increase labor somewhat, which reduces wages, so this mechanism works the wrong way.

Analyzed in a calibrated neoclassical model, however, it appears that neither the wealth effect nor the interest rate response is of much significance in household labor supply decisions. So, an increase in government expenditure has minimal impact on the supply of work hours and, consequently, little to no impact on economic growth.

It's also important to judge the impact of increased government spending on consumption and investment. How do household and business expenditures respond to an increase in government purchases? The key concern is whether private spending is essentially "crowded out" (that is, replaced or pushed out) by government spending. Indeed, the results generated by the neoclassical model suggest that while consumption declines just slightly, investment falls considerably. The sum of consumption declines and investment declines essentially offsets the rise in government purchases, resulting in a net output effect of zero.

A shopping model

The main contribution of the earlier paper was to modify the standard neoclassical model with an additional feature: shopping. The notion is that to buy the goods and services they want, consumers must spend time and effort, as well as money. Like work, shopping is a disutility—individuals would rather not do it; leisure and consumption are preferable.

The disutility derives from the search process that shopping requires. To find the products and services they want, consumers must engage in a sometimes lengthy, perhaps arduous process of finding them, and this feature introduces substantial friction into the model economy.

In contrast, increased search also leads to greater consumption, and in the model, production is only achieved, in a sense, when a product or service is purchased. Government statistics measure the purchase as an increase in output and therefore higher productivity—neglecting the fact that the consumer, not the producer, expended the search effort that made the purchase happen.

As Dyrda and Ríos note (2012, p. 9):

Consequently, output can increase even if there are no changes in measured inputs (since search effort itself is unmeasured). ... We include all forms of hassle associated with searching for consumption goods, such as receiving worse service in restaurants at capacity. ... All of these hassles are greater when the economy is in an expansion, generating higher productivity as a result of higher demand. During recessions, hassles diminish. ... This dynamic applies to firms, as well, since they have to search for investment goods.

When government purchases rise, fewer goods are available to the private sector, and consumers and firms must search more, leading to higher productivity. Crucially, higher productivity allows for the possibility of more labor and higher wages, which induces people to work harder.

With this feature in place, three factors that induce people to work harder all move in the same direction: (1) the negative wealth effect from having to pay higher taxes, (2) the substitution effect that moves people to work harder today relative to tomorrow due to the higher interest rates that come from lower investment and (3) the substitution effect that induces people to work more and enjoy leisure from higher wages.

Including this shopping feature does indeed increase the fiscal multiplier significantly—a sevenfold increase of the 0.023 figure generated by the standard neoclassical model. However, this multiplier estimate is just 0.172, still quite far from the 0.7 to 1 range found in the empirical literature.

Spice of life

In the current paper, we analyze an additional feature developed in Huo and Ríos-Rull (2013), an amplification of the search mechanism: *variety*. That is, households desire and consume many varieties of goods and services. And with greater variety, the search process becomes more complex and friction rises. Because search is costly—a disutility that households and firms would prefer to avoid—each household purchases only a subset of the range of varieties that exist of any given good or service. This creates the possibility of excess capacity: For each variety, more can be produced than is consumed.

This excess capacity is precisely what the model needs to generate a more realistic multiplier. Now, when the government expenditure increases, private spending—and the search market—is not crowded out even without increases in labor. That is to say, government purchases don't simply take the place of private expenditure on consumption and investment, eliminating whatever boost to aggregate output might occur when overall demand increases.

Faced with greater aggregate demand—the sum of existing private demand and higher government purchases—firms increase production, sell more and become more profitable. Voilà: Greater aggregate output is generated by an increase in government expenditure—a fiscal multiplier.

Moreover, as firm productivity increases, firms search for more workers and employment rises. Household incomes therefore rise, leading to greater search effort and higher consumption. The result is a cycle—à la Keynesian multiplier—of rising production, productivity, profit, employment and consumption. The difference is that in our modified neoclassical model, prices and wages remain flexible, not rigid as in a Keynesian world, and firms continue to maximize profits and households maximize utility.

Maximizing the multiplier

In our model, several conditions are conducive to a greater multiplier effect; they concern the sector of increased government spending, the cost of allocating labor into different sectors, and the size and source of wage frictions. Of these conditions, the first is perhaps the most important for maximizing the multiplier effect.

The first condition: *Government expenditure should focus on “nontradables,” not “tradables.”* *Tradables* are goods such as agricultural and mining products that can be readily imported and exported so they typically do not have much unutilized capacity. If the government were to increase its purchases of such goods, they would easily be provided by a reduction in exports, or by increasing imports from foreign firms. Either way, the attempt to increase domestic output fails, at least in the short term.

Nontradable goods do not have this property. By definition, they can be neither exported nor imported. If there is idle capacity in domestic production of nontradables, therefore, the government can increase output through an increase in nontradable purchases. Nontradables include many services, of course, such as restaurants and health care, as well as some manufacturing goods and construction.

The second condition: *Shifting labor to the nontradable sector should be low cost.*

This condition allows workers to move easily from unemployment to jobs in nontradable production when firms boost their hiring efforts. In contrast, labor adjustment costs in the tradable sector need to be high enough so that this is the ultimate cause of higher than normal unemployment. Moreover, the tradable sector shouldn't shrink dramatically when wages increase in the nontradable sector competing for workers when it expands. There is ample evidence for this (Alessandria, Pratap and Yue 2013).

The third condition: *Wages should be subject to some friction that prevents fast increases. The search friction of the Mortensen-Pissarides model suffices.*

Wages are flexible, but they *adjust slowly* as firms and workers seek appropriate matches. This job search function is a key feature in our model: Firms post vacancies, and those vacancies and unemployed workers are matched through a neoclassical mechanism that is subject to labor market tightness. The search-and-match framework (the Mortensen-Pissarides model) ensures that wages rise relatively slowly when labor demand increases, resulting in higher employment.

Nonrival expenditure, through variety

While the three conditions just discussed allow increased government expenditure to have greater impact on aggregate output and employment, the broad lesson of our model is that the multiplier will be larger to the extent that government spending focuses on goods and services that don't substitute for spending by households and firms. That is, government spending is "nonrival" with private spending.

This effect might be clearest in the case of infrastructure spending. If government boosts its spending on roads and parks, or on building factories at a time of very low housing construction, construction companies can use their idle resources (heavy equipment, construction workers, engineers, architects) to expand output without crowding out production of goods demanded by the private sector.

That ensures the increased productivity and profits that lead to aggregate economic expansion. The government could also increase expenditures in sectors that are both hurt by the recession and not capable of exporting by substituting for the private consumption that goes down in the recession, perhaps providing unemployed people with higher unemployment compensation so that they boost their consumption.

In our model, product variety introduces this nonrival condition. When people cut consumption, they reduce both the *number* of varieties of goods they consume and the *amount* of each variety. It is the former—reduction in *number* of varieties—that creates idle capacity by having fewer consumers meet each firm. Our model—in contrast to previous capacity utilization research—does not require that factors of production be used more heavily in order to increase capacity.

Quantifying the multiplier

Calibrating the model with standard values and exploring its response to increases in government expenditure, we find that it generates a fiscal multiplier of 1.05—far larger than previous neoclassical models and close to empirical estimates. The increase in output is equal to the increase in productivity (1.01), plus labor share (0.6) times the increase in employment (0.07)—that is, $1.01 + (0.6 \times 0.07)$.

Seeing these relative contributions of productivity and employment highlights the importance of targeting increased government expenditure where it will have the greatest impact: the nontradable goods sector where excess capacity can manifest in a slack economy. In this sector, greater government spending will increase production without crowding out (rivaling) private sector production, leading to a maximum aggregate output boost.

In the tradable goods sector, by contrast, an increase in government expenditure will actually create a *negative* multiplier. In fact, by our model's estimates, a 1 percent increase in government expenditure decreases total output by 0.008 percent and decreases total employment by 0.002 percent. Why? It's the flip side of the coin. There is no direct increase in output when the government expenditures reduce net exports, but higher taxes (to pay for these expenditures) reduce the consumption in the nontradable sector and with it employment and productivity, albeit by a small amount.

Two features are worth special mention:

First, that additional public expenditure is spent on domestically produced goods wouldn't be sufficient to generate the positive multiplier. It must be spent expressly on *nontradable* domestically produced goods. (In other words, the familiar slogan "Buy American" would not be specific enough.)

Second, because productivity increased more than 1 percent, the funds needed to pay for the extra public expenditures are obtained, in a sense, "for free." By that we mean that the funds are generated without requiring extra work. True, the tax rate must be higher to pay for the goods, but the private sector gets extra output, partly by working harder, but also because of the extra productivity increase beyond 1 percent.

Sensitivity to alternatives

To see how "robust" these results are—how sensitive they are to particular choices of various parameters in the design of the model economy—we run the model with alternative figures for several parameters, such as the stage of the business cycle, staggered labor contracts and the strength of household preferences for leisure instead of work.

We find that boosting government expenditure when the economy is in a mild recession (say, 3 extra percentage points in the unemployment rate) rather than in "steady-state," average times, changes the multiplier very little, going to 1.06. Hence, the status of the economy's business cycle has little impact on our estimate of the fiscal multiplier.

Introducing a measure of wage rigidity by restricting wage adjustment to annual changes (a staggered labor contract) boosts the multiplier somewhat, to 1.07 from 1.05 in our baseline model. The contribution of employment to this result increases from 8 percent to 14 percent, since firms will hire more workers if wages adjust gradually, not immediately, in response to

greater demand. A combination of wage rigidity *and* a severe recession (say, an additional 5 percentage points in the unemployment rate) raises our assessment of the multiplier a bit more, to 1.09.

If worker preferences for leisure are set at a higher level, we find that small changes in wages can affect labor supply significantly. Raising the value of leisure in our model economy boosts the fiscal multiplier from 1.05 to 1.08, and the contribution of employment is nearly double that of the 8 percent in the baseline model.

In sum, however, we find that while the model is somewhat sensitive to adjustments in a few key parameters, the multiplier estimate ranges narrowly between 1.0 and 1.1.

Conclusion

Because standard neoclassical models—including those with additional features we’ve explored in previous research—have been unable to generate a fiscal multiplier anywhere close to the figures estimated empirically, economists have generally concluded that, outside the zero lower bound, Keynesian assumptions of sticky wages and/or prices are necessary for realistic depiction of aggregate economic response to a boost in government expenditure. Our paper shows that that conclusion is not accurate. A model with flexible prices and wages can produce multiplier figures wholly consistent with estimates in the empirical literature.

Nevertheless, several conditions must be met for this to be the case:

First and foremost, government purchases must be targeted toward products and services consumed domestically rather than exchanged among nations—nontradables—so that government spending doesn’t cancel out demand for production generated by the households and firms that constitute the economy’s private sector. In this sense, government demand should be nonrival to private demand, focusing on public goods.

Secondly, several frictions must exist in the economy. In particular, our model includes job search frictions in labor markets such that wages adjust slowly while remaining flexible. Thus, when fiscal expenditure increases, leading to greater firm productivity and higher labor demand, wages rise gradually rather than instantly and employment rises.

Third, shifting labor and capital toward the production of nontradable goods and services should be low cost, but reallocation costs into production of tradables must *not* be too low, so that competition for resources remains somewhat in check and factor prices don’t adjust so quickly as to cut off rising labor demand in particular.

With these prerequisites satisfied, however, realistic fiscal multiplier estimates can comfortably coexist within the framework of standard neoclassical economics, including flexible prices and wages—a détente that has heretofore seemed unattainable.

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