International Finance Discussion Papers

Number 159

April 1980

PRIVATE SECTOR EFFECTS OF GOVERNMENT EXPENDITURES ON NONTRADED GOODS VERSUS DIRECT EMPLOYMENT OF LABOR IN A SMALL OPEN ECONOMY

by

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Private Sector Effects of Government Expenditures on Nontraded Goods versus Direct Employment of Labor in a Small Open Economy

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In this paper an examination is made of the employment and private sector output effects of a tax-financed increase in government purchases of nontraded goods versus an increase in direct government employment. The investigation is made in the context of a small open economy model where the government sector pays a higher real wage than does the private sector. The conclusions are that an increase in government purchases of nontraded goods will lead to higher private sector employment, higher total employment, and higher production in the private sector than an increase in government employment.

1. Introduction

The OECD (1978) reported the existence of positive government-private sector wage differentials in most of the industrial countries. Gunderson (1978a,b, and 1979) and Smith (1977a and b) provide additional evidence for the cases of Canada and the United States, respectively, that pure economic rents represent an important part of the surplus of the government wage over the private sector wage. The presence of such sectoral wage distortions can alter the effectiveness of an increase in government employment as a method of fiscal stimulus.

The purpose of the present study is to examine the effects on employment and private sector output of a tax-financed increase in real government purchases of nontraded goods versus an increase in direct government employment when the government sector maintains a high rigid wage.[1/2/] The analysis entails an extention of the traditional tradables-nontradables model of a small open economy where the nontraded goods sector is separated into a government sector and a private industry sector.[3/] This dichotomy is in keeping with the spirit of the traded-nontraded goods formulation and is necessary to distinguish the effectiveness of the two alternative forms of fiscal stimulus.

It is assumed that the government sector wage is institutionally determined and is higher than the wage in the private sector. This formulation converts the traditional tradables-nontradables model into a behavioral model where queue or wait unemployment exists.[4/] There is a fairly large literature examining and supporting the argument that wage differentials lead to higher unemployment (e.g. Harris and Todaro (1970), Bhagwati and Srinivasan (1974), Hall (1975), Welch (1976), Mincer (1976), and Calvo (1979)).

The unemployment in this model is due to search behavior on the part of workers, who are seen to quit working in the private sector and line up for high wage government jobs. The line of unemployed workers will grow until the expected wage in the high wage sector is just equal to the wage in the lower wage sector.

Some preliminary conclusions are that increases in government purchases of nontraded goods are more expansionary than increases in government employment. An increase in government purchases of nontradables will lead to higher private sector employment, higher total employment, and higher private sector production than increases in government employment.

2. The Model

2.1. Assumptions

The usual small open economy assumptions are made, however, there is no consideration of money or wealth in the following analysis. Assume that the nontraded goods sector consists of a high rigid wage government sector and a private industry sector. Also assume that the price of the private nontraded goods sector output is flexible and production in this sector is labor intensive. Finally, in order to focus solely on the effects of differing tax-financed expenditures government produced goods are excluded from the analysis and taxes are assumed to be lump-sum.[5/]

2.2. The Labor Market

Assume that the tradable and the private nontradable sector use neo-classical production functions that relate their respective outputs to inputs of labor.[6/] These short-run production functions can be represented as follows:

(1) $X_T = X_T(L_T)$, $\quad X'_T > 0, X''_T < 0,$

(2) $X_N = X_N(L_N)$, $\quad X'_N > 0, X''_N < 0.$

Also assume that both sectors are competitive, and hence that firms in the private sector are seen to maximize profits at the point where the value of the marginal product of labor in each sector is equal to the private sector wage (Wp). This profit maximizing activity of firms yields the following demand for labor functions:

$L_T = L_T(Wp/P_T), \quad L'_T < 0,$

$L_N = L_N(Wp/P_N), \quad L'_N < 0.$

Where L_T and L_N are the demands for labor in the tradables and non-tradables sector respectively, and P_T and P_N are the prices of these goods.

Assuming that labor demands are homogeneous of degree zero in prices and wages, the above labor demand equations may be divided by P_T and summed to get the total real effective private sector demand for labor.[7/] This demand function can be written as follows:

(3) $Lp = Lp(\underset{-}{W}, \underset{+}{P}),$

where W is the real wage in the private sector and P is the relative price of nontradables to tradable goods.

Assume that the total supply of labor (L^S) is fixed and that it is allocated between government sector employment (Lg), unemployment (U), and private sector supply ($L^S p$). Thus we have:

(4) $L^S = Lg + U + L^S p.$

Since the government offers a higher wage than the private sector it is seen to hire any amount of labor that it wishes. Some portion of the remaining labor force will form unemployment queues in response to the wage differential between the private and the government sectors. Thus, the supply of labor to the private sector will be the residual after government employment and unemployment are

determined. The private sector money wage (Wp) is assumed to adjust so that the total private sector demand for labor is just equal to its supply. Therefore:

(5) $Lp \equiv L^{s}p$.

Now assume that the government sector is a sector with a high rigid real wage such that initially the following holds:

$$Wg > W,$$

where Wg is the real government sector wage. Workers are seen to prefer employment at the high wage in the government sector over employment in the private sector. Assume for purposes of information gathering on job openings that workers will spend full-time searching for government employment as long as the ratio of the expected real government sector wage (Wg^{e}) to the private sector wage is greater than unity. Thus, it is assumed that workers cannot queue for a government job by holding a private sector job.

The expected wage in the government sector is equal to the institutionally determined real government wage (Wg) adjusted for the proportion of new job openings to presently unemployed workers, i.e.,

(6) $Wg^{e} = Wg\lambda Lg / (\lambda Lg + U)$,

where λ is the job turnover rate in the government sector.[8/] The total or aggregate labor market is in long-run equilibrium when the following holds:

(7) $W = Wg^{e}$.

The level of unemployment (U) is a state variable and at any point in time is given and fixed. This is akin to saying at any point in time the queue of unemployed has a given number of workers. Although U is given and fixed at any point in time, only in the long-run steady state will it be unchanging.

Assume that the rate of change in the level of unemployment ($\dot{U}$) can be written as a function of the ratio of the expected real government sector wage to the real private sector wage:

(8) $\dot{U}=f(WgLg\lambda/W(\lambda Lg+U))$,

where $f'>0$ and $f(1)=0$. This implies that job vacancies are filled as soon as they appear and that workers will join the lines of the already unemployed until the expected real wage from government employment is equal to the real wage in the private sector.

Equation 8 describes the movement of the state variable U over time. Only in the long-run steady state, i.e., when $\dot{U}=0$, with no further flows of workers to unemployment will the equilibrium level of unemployment (U^*) be determined. Assume that the flow of workers to unemployment takes time, and hence it is possible to be away from the steady state level of unemployment for some period of time.

Using the assumption that the private sector money wage adjusts to keep private sector labor demands and supplies equal to one another we may then use equation 4 to solve for W. When this is done we get the following relationship:

(9) $W=W(\underset{+}{P};\underset{+}{Lg};\underset{+}{U};\underset{-}{L^S})$.

If equation 9 is incorporated into equation 8, $\dot{U}$ can then be written in the following functional form:

$$(10)\quad \dot{U}=f(\underset{?}{P};\underset{+}{Lg};\underset{+}{Wg};\underset{+}{U};\underset{+}{L^S};\lambda).$$

The partial derivative sign of $\dot{U}$ with respect to Lg will depend on the size of the elasticity of the real private sector wage (W) with respect to government employment (Lg). When this elasticity is greater than or equal to one, a rise in government employment will decrease the flow of workers to unemployment. This result obtains because the extreme responsiveness of W will lower the wage differential sufficiently to offset the increased probability of government sector employment occasioned by the rise in Lg.

When government sector employment is both small and large with respect to the private nontradable sector employment we would expect the responsiveness of W to an increase in Lg to be small. It shall be assumed that government employment is less than the private nontradable sector employment, and hence, the marginal impact on the private sector wage due to an increase in government employment should be small. If this were the case it would seem plausible that an increase in Lg would lead to a rise in $\dot{U}$ because the chances of getting a job have improved while the wage differential is relatively unaffected. Throughout the analysis it will be assumed this case holds, and therefore, the effect of a rise in Lg on $\dot{U}$ will be positive.

2.3. Commodities Market Equilibrium

We now turn to a specification of the equilibrium in the commodities market. Since by Walras' law the excess demands for tradables and nontradables must sum to zero we may focus solely on the private nontraded goods sector.[9/] Equations 11 and 12 can be combined to yield the following supply function for nontradables:

(11) $X_N = X_N(\underline{W}, \underline{P})$.

As mentioned earlier, we are abstracting from the use and value of government produced public goods and all taxes are assumed to be lump-sum. The government is assumed either to hire labor or to purchase nontraded goods and will adjust real taxes (T) such that the following always holds:

(12) $T \equiv WgLg + G_N$,

where Wg, Lg, G_N are all government policy variables. G_N is real government expenditures on nontraded goods. The output values of tradables and nontradables can be summed to get the total real private sector output (I).[10/] Total real private income less real taxes T plus the real income of government workers (WgLg) yields real disposable income (D), i.e.,

$D = I - T + WgLg$ or

(13) $D = I - G_N$.

Assume that all disposable income is spent and that the demands for both tradables and nontradables depend on their relative prices and the level of real disposable income. We may write the demand for nontraded goods in the following way:

(14) $PX_N^d = \gamma(P)D + G_N$,

where γ is the marginal propensity to consume nontraded goods out of disposable income and G_N represents the direct government demand for nontradables.[11/]

Substitute equation 13 into equation 14, and then subtract X_N from X_N^d. Once this is done, the market clearing condition for the nontraded goods markets may be written as follows:

$$(15) \quad N=\gamma(\underline{P})X_T(\underline{W})+(1-\gamma(\underline{P}))(G_N-X_N(\underline{W},P))=0,$$
$$+$$

where N is the excess demand for nontraded goods.

The price of nontradables is assumed to adjust instantaneously to clear the market for nontraded goods. The relationship between N and P is likely to be decreasing. That is an increase in the price of nontraded goods will lead to a fall in the excess demands for such goods. Lars Calmfors (1975) shows that this result requires the condition that the "income" effect of a change in P, at constant outputs in the tradables and nontradables sectors, does not dominate the "substitution effect of a change in P and the "income" effect of a change in the output of traded goods.

The relationship between N and the state variable U depends on the size of the marginal propensity to consume nontradables. If the marginal propensity to consume nontraded goods is large then the demand effect of a change in U will dominate the supply effect. Thus, an increase in U will lead to a fall in the excess demand for nontraded goods. In the case where the marginal propensity to consume nontraded goods is small the supply effect will dominate.

2.4 Equilibrium

The economy achieves short-run equilibrium when both the nontraded goods market and the private sector labor market clear. Thus, in short-run equilibrium both P and W are determined. As mentioned above, the economy

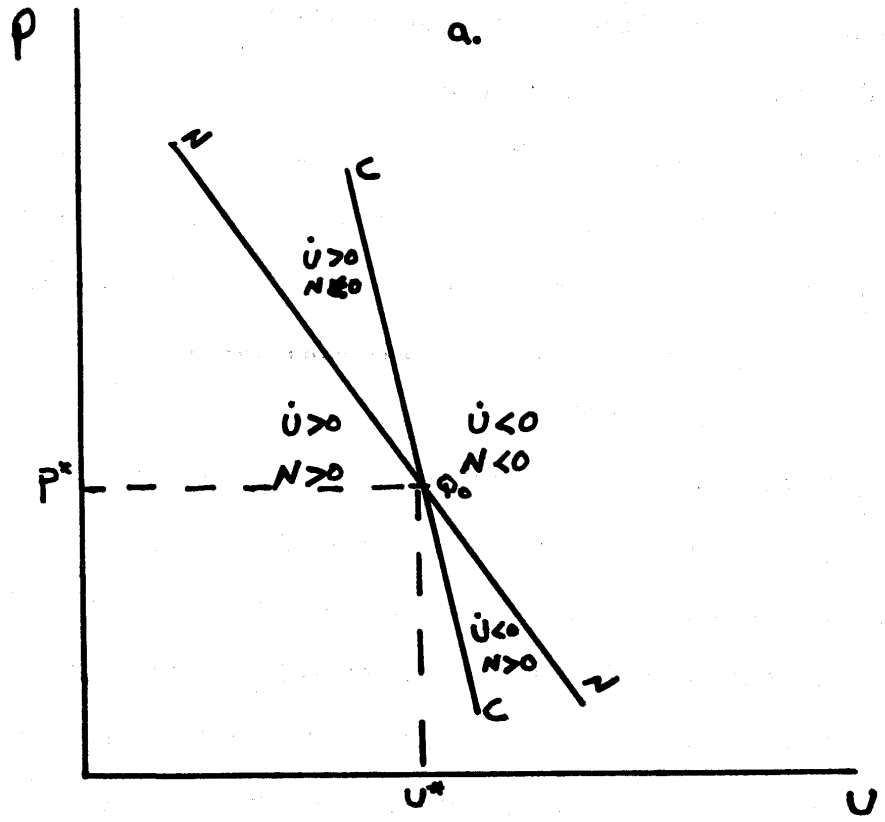
reaches long-run steady state equilibrium only when the flow of workers to the queue of the unemployed is equal to zero. It is only when $\dot{U}=0$ that the equilibrium level of unemployment (U^*) is determined.

In Figure 1a below we assume that the marginal propensity to consume nontraded goods is large, and present the locus of combinations of P and U which just keeps the nontraded goods market in equilibrium. Figure 1b presents the case where the marginal propensity to consume nontraded goods is small. In either case the locus is called the NN schedule. Points above this schedule represents excess demands for nontraded goods and surpluses in the balance of trade. Points below this schedule represent excess supplies of nontraded goods and balance of trade deficits.

In these same figures we present the locus of combinations of P and U such that there will be a zero flow into unemployment. This locus is called the UU schedule. It will be downward sloping because a rise in U decreases the probability of getting a job, and, therefore, there will be a flow of workers away from unemployment. In order to offset this outflow of workers from unemployment, P must fall, lowering W.

Figures 1a and 1b present the only feasible relationships between the NN and the UU schedules. The long-run stability conditions for the case where the marginal propensity to consume nontradables is large requires that the slope of the NN schedule be greater than the slope of the UU schedule. This case is represented in Figure 1a. In the case where this marginal propensity to consume is small, the long-run system is always stable. This case is represented in Figure 1b. At the point where the UU curve intersects the NN curve the long-run equilibrium P^* and U^* are determined.

Figure 1


a.
P
N
C
$\dot{U}>0$
$N\leq 0$
$\dot{U}>0$
$N\geq 0$
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$N<0$
P^*
Q_0
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C
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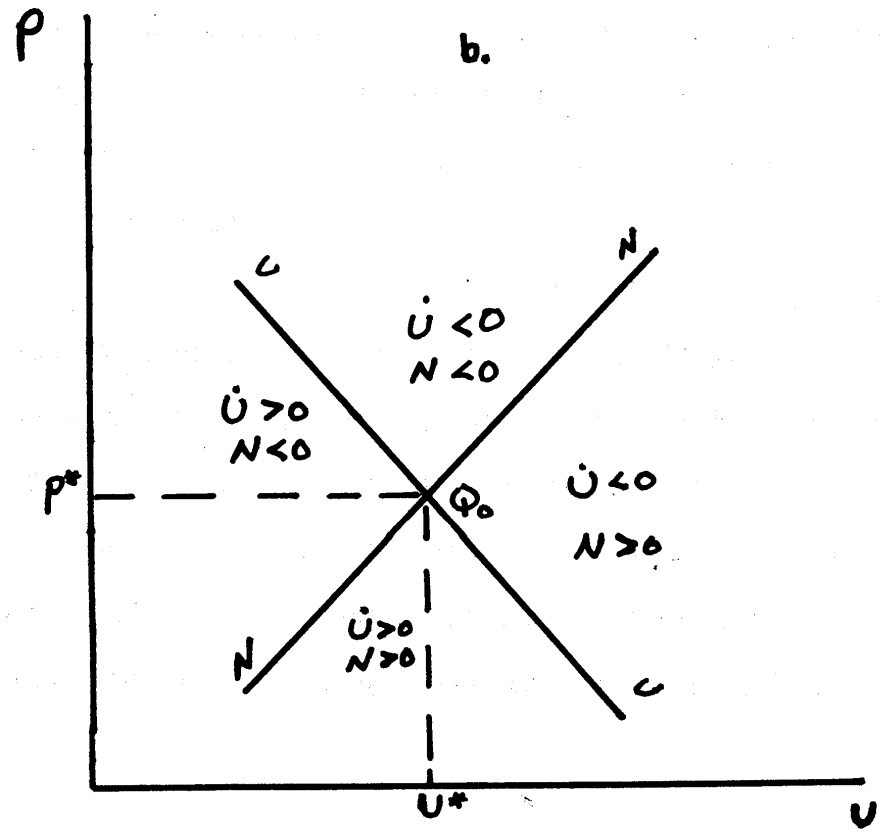
U^*
U


b.
P
C
N
$\dot{U}<0$
$N<0$
$\dot{U}>0$
$N<0$
P^*
Q_0
$\dot{U}<0$
$N>0$
$\dot{U}>0$
$N>0$
N
C
U^*
U

3. The Effectiveness of Two Alternative Methods of Fiscal Stimulus

3.1 Government Purchases of Nontraded Goods

An increase in G_N at the initial P leads to an excess demand for nontraded goods. The excess demand for nontraded goods will lead to an increase in P which allows firms in this sector to offer higher money wages. Since the price of tradables is fixed, this means that the real wage in the private sector will be rising.

There will be two effects of the rising real private sector wage. First, the rise in W will serve to reduce the differential between this wage and the unchanged government sector wage. This will lead to a flow of workers from unemployment to employment in the private sector. There will also be some incentive for workers already employed in the traded goods sector to quit and seek work in the private nontradables sector. There will be a decrease in the supply of domestically produced tradables which will serve to lessen the expansionary impact on private sector output of the increased government expenditures.[12/] As more and more people get employed in the nontraded goods sector private sector output will rise and disposable income will rise. The rise in disposable income will lead to a further rise in P until the economy achieves long-run equilibrium.

In Figure 2a and 2b the effects of an increase in G_N on both P and U are shown for the cases where the marginal propensity to consume nontradables is large and small respectively. In both cases an increase in G_N at the initial Po and Uo leads to an excess demand for nontradables. Thus, the NN curve shifts upward while the UU curve remains unchanged because a change in G_N does not directly affect the flow of workers to unemployment. At the new equilibrium,

represented by point Q_1 in both figures, the level of P, which is designated by P_1, is higher than the initial Po. U is lower than it was before the increase in G_N.

In summary a rise in government direct purchases of nontraded goods will lead to an expansion of the private industry nontradables sector while having a net contractionary effect on the traded goods sector. The net effect on the private sector will be to increase private sector employment and output.

3.2 Government Direct Employment of Labor

An increase in government employment amounts to an increase in Lg with Wg held fixed. In this case it will prove useful to analyze separately the situations where the marginal propensity to consume nontraded goods is large and small.

In the case where the marginal propensity to consume nontraded goods is large a rise in Lg at the initial P and U will lead to a fall in the supply of labor to the private sector. Consequently, firms will bid up W and will be forced to cut back production. The fall in the production of both traded and nontraded goods will lead to a fall in expenditures. Since the marginal propensity to consume nontraded goods is large, the fall in demand for nontradables will be greater than the fall in supply of these goods. Thus, there will be an excess supply of nontraded goods at the initial P and U.

In Figure 3a below point Qo is the intial long-run equilibrium. The increase in Lg shifts the NN curve downward because in order for the nontraded goods market to clear at the initial level of unemployment P must fall to induce a greater demand for nontradables. Thus the NN curve shifts down to N'N'.

Figure 2

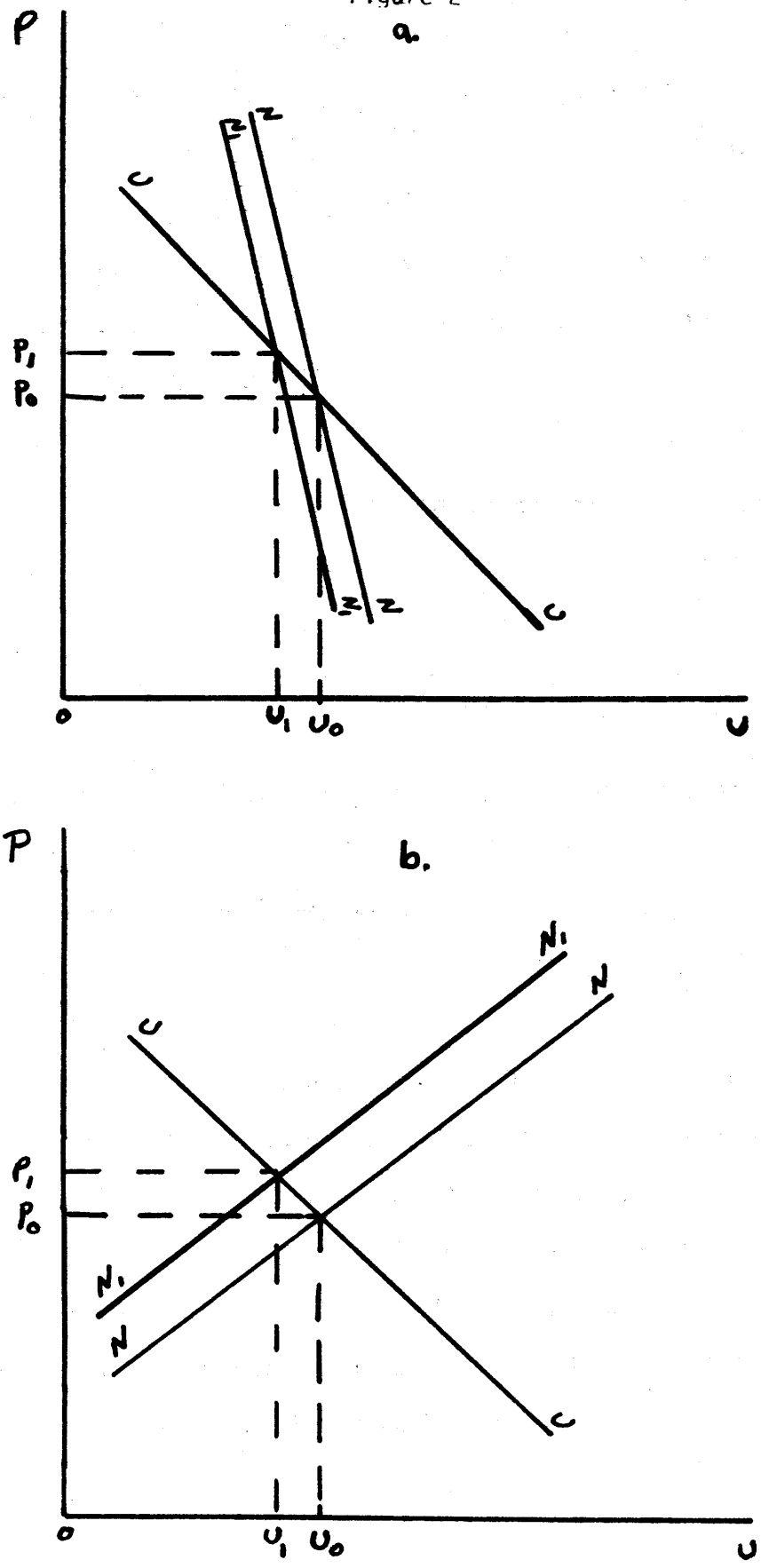
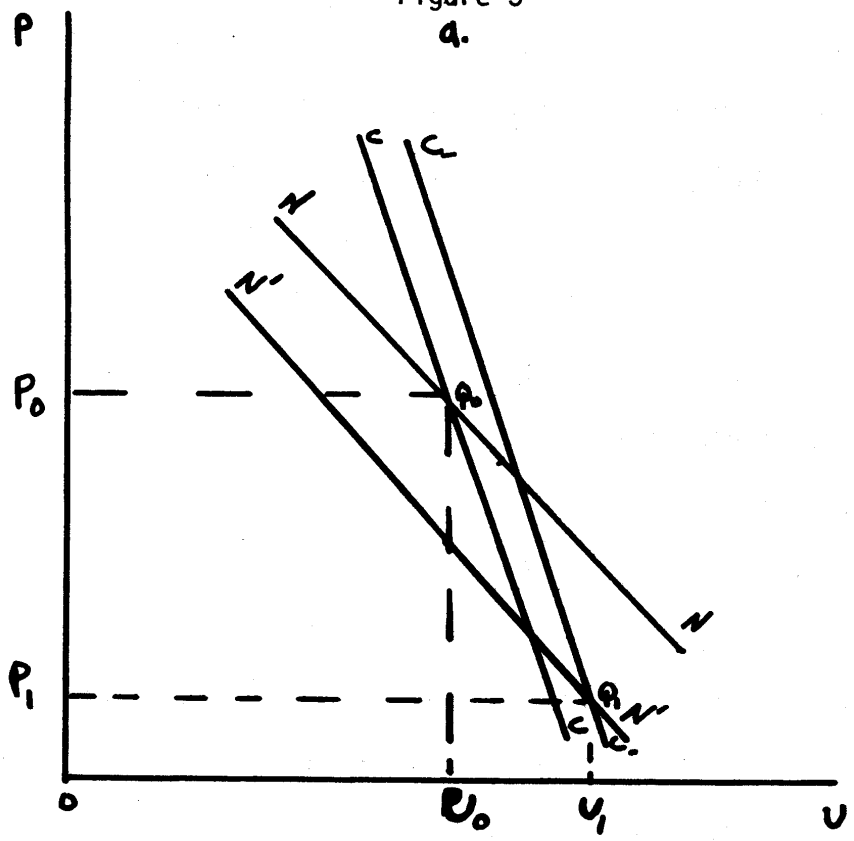
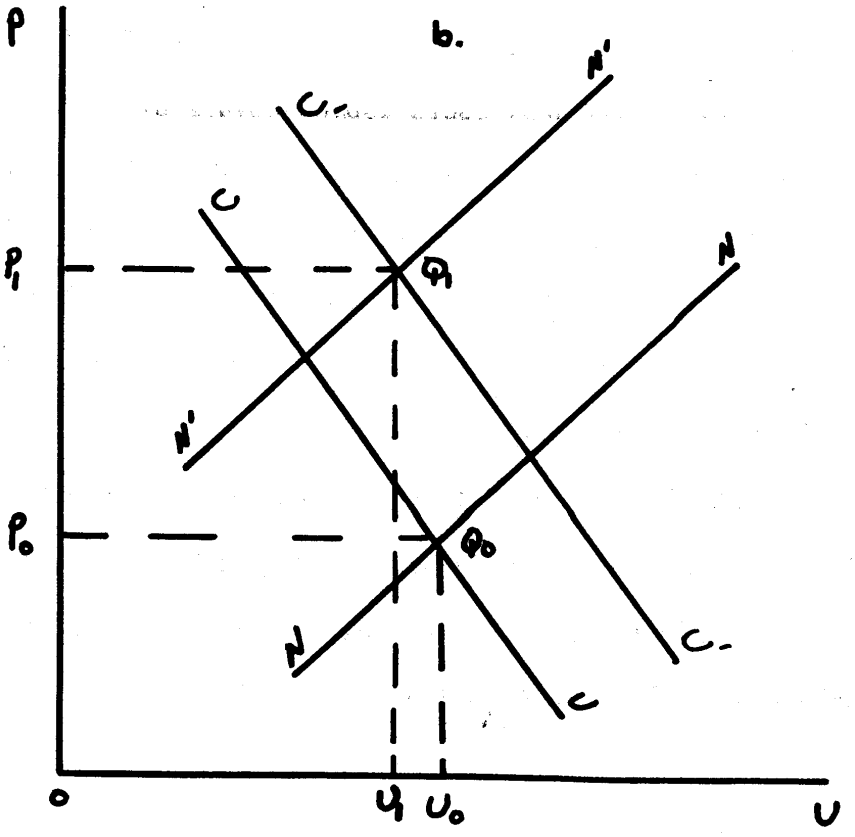


Figure 3





The increase in Lg also affects $\dot{U}$. As was argued earlier, we would expect an increase in Lg to lead to a rise in $\dot{U}$ because the increased probability of gaining employment in the government sector will overshadow the effect of a rise in Lg on lowering the real wage differential.

The new long-run equilibrium will be at point Q_1 in Figure 3a. The economy will adjust to this equilibrium by the price cutting activity of firms in the nontraded goods market. When P falls the wage that firms in the nontraded goods market will offer will be lower. The lower W will lead to a greater wage differential, and hence, an increased flow of workers to the queue of unemployed. This process will continue until the economy reaches the new long-run steady state equilibrium represented by point Q_1. At the new equilibrium the relative price of nontraded goods with respect to traded goods will be lower and the level of unemployment will be higher.

When the marginal propensity to consume nontraded goods is small and Lg is increased there will be an excess demand for nontraded goods at the initial P and U. This result obtains because a rise in Lg serves to decrease the supply of labor to the private sector in the same way it did in the case where the marginal propensity to consume nontraded goods was large. Thus, private output will fall and W will be bid up. In this case, however, the fall in private sector output will induce a fall in the demand for nontraded goods that is less than the fall in the supply of these goods.

In Figure 3b the initial equilibrium is represented by point Qo. This increase in Lg will lead to the NN curve shifting up to $N'N'$ because in order for the nontraded goods market to clear, at the initial U, P must rise. In this case the UU curve will be seen to shift up to $U'U'$.

The location of the new long-run equilibrium depends on which schedule shifts more relative to the other. If it is assumed that the NN curve shifts up by more than the UU curve does, the new long-run equilibrium will be represented by point Q1 in Figure 3b. At this new long-run equilibrium P will be higher and U lower than initially. U in this case is expected to be higher than in the case where G_N was increased because in this case private sector output is lower with a higher probability of getting a government job due to the increase in Lg.

In summary, an increase in government employment will on balance expand total employment less than an equivalent increase in G_N. There will be a reduction in private sector output, with the nontraded goods sector expanding relative to the traded goods sector.

4. Conclusions

In this paper I have developed a model of a small open economy with a government sector that is a high rigid wage sector. This model consisted of an extension of the traditional tradables-nontradables model to include explicitly the government sector as a part of the nontradables sector of the economy. I added a behavioral model of the labor market in which workers are seen to queue up for jobs in the high wage government sector.

I then used the above model to evaluate the impact of two alternative methods of fiscal stimulus. The first method was an increase in government direct purchases of nontraded goods. It was shown that this policy is, on balance, expansionary although it does reduce output and employment in the tradable goods sector.

The other method of fiscal stimulus was an increase in government employment. It was shown that the effect of this method depended on whether the marginal propensity to consume nontradable goods is large or small. In both cases, however, this policy was shown to be, on balance, contractionary for private sector output. In the case where the marginal propensity to consume nontraded goods was large unemployment was seen to rise. In the case where the marginal propensity to consume nontraded goods was small unemployment fell but not by as much as in the case where G_N is increased. These results came about because an increase in government employment limits the supply of labor to the private sector and hence raises costs of production. This form of government expansion also serves to increase the probability of government employment and therefore it serves to increase the flow of workers to the queue of the unemployed.

In conclusion policy-makers should be aware that government purchases of nontraded goods and government employment have different effects on the economy. It may be possible to alter these impacts by combining these policies with exchange rate changes, wage subsidies in the traded goods sector, and other forms of incomes or structural policies. Such considerations become most important in the face of today's seemingly recalcitrant high inflation rates which are coupled with equally high unemployment.

* International Finance Division, Board of Governors of the Federal Reserve System. This paper is based on a chapter of the author's doctoral dissertation completed at Stanford University. The author is grateful to his dissertation advisor, Ronald I. McKinnon, as well as, Paul Evans and John Cuddington. I have also been the recipient of helpful suggestions and comments from Richard Freeman, Robert Hall, and Dale Henderson. The views expressed are those of the author and do not necessarily reflect those of the Federal Reserve System.

1/ Government expenditures are measured per unit of foreign exchange as a way of standardizing, for comparative purposes, the two methods of fiscal stimulus. That is we are interested in examining the differential impact of a per unit of foreign exchange increase in government purchases of nontradable commodities versus an equivalent increase in the government wage bill by way of direct employment.

2/ Government expenditures on traded goods are excluded from the analysis because, as McKinnon (1975) has shown, an increase in such expenditures in a small open economy will lead to a balance of trade deficit of equal magnitude with no improvement in domestic employment and output. The balance of trade offset to government expenditures on traded goods occurs because this sector in a small open economy faces an unlimited world aggregate demand and based on its costs of production, the exchange rate, and the relative price of home goods to the price of traded goods the maximal sectoral output will be produced. As long as government activity is not geared toward changing one of these underlying variables there will be no net fiscal stimulus from such purchases.

3/ This traditional model traces its origins to Meade (1956), Swan (1960), and Salter (1959). It has since been expanded and used throughout the literature on small open economies. This model is used because one sector and open economy models with an import and an export sector do not provide a broad enough framework. In the case of the one sector model the important relative price effects of government activities are absent. In the case of the import-export sector model, the effects of the government on the level of economic activity are absent because in this model of the small open economy domestic output is determined by world and not domestic demands.

4/ The queue form of unemployment should be regarded as a stylization for time lost due to the taking of civil service exams, underemployment that arises while waiting to be called from lists of eligibles, and general bureaucratic inefficiencies. Thus, it is a voluntary form of supply side unemployment caused by a wage distortion and is not caused by deficient demand conditions. Although, queue unemployment is structural in nature, its level will be procyclical if private sector wages are flexible and the growth in employment demand exceeds that of the labor force.

This form of unemployment differs in form and causation from the supply side unemployment that is generated in the Scandinavian model of inflation. In the Scandinavian model unemployment arises when wage settlements overshoot the "room"

for wage increases in the tradable goods sector. The "room" for wage increases consists of the sum of the exogenous increases in the world market price for tradables and the rate of productivity increase in the tradable sector at the "desired" size of that sector. When wage setting exceeds this allowance, less efficient firms in that sector will be forced out of business. The workers that lose their jobs in this sector must then be absorbed in the nontradables sector, which includes the government, or remain unemployed. (For more details on the Scandinavian model see Lindbeck (1978)).

5/ Floyd (1979) also uses the tradable-nontradable model to examine the effects of tax-financed disaggregated expenditures for fiscal policy purposes in a small open economy. His focus differs from my own in that he is interested in the effect of the government produced public good on employment, output, and expenditures. He examines under alternative exchange rate regimes the case when the government good is nontradable and the case when it is tradable.

6/ The time frame of the analysis is assumed short enough so that all other factors of production are unchanged.

7/ All real variables are expressed in terms of the price of traded goods.

8/ λ is determined by both institutional and demographic factors. It will depend on such factors as the prescribed retirement age, the number of government workers at the retirement age, and the number of deaths, among other things. The assumption that λ is a constant implies that the age distribution and other demographic features of the newly hired, in the case of an increase in government employment (Lg), will be the same as those presently employed. If the government randomly chooses workers from the pool of unemployed and if all workers have the same incentive to be unemployed, then λ being constant will not lead to a mis-statement of wait unemployment. For simplicity we assume that workers are homogeneous as to incentives or preferences for unemployment and that workers are hired in the order in which they reach the queue.

In reality, however, we may find a greater representation of younger workers in the unemployment pool due to differing incentives and experience between the young and the old. In this case λ would be seen to fall in the face of an increase in Lg and then to rise to some new lower demographically determined value over time. This implies that the present formulation may tend to overstate the level of unemployment in the case of an increase in Lg.

Eaton and Neher (1975) attempt to capture the effect of the different incentives to wait for employment, across age and sex groupings on the composition of the unemployed. They, however, neglect to take into account the effect of a changing population of unemployed on the job turnover rate in the government sector.

9/ This only holds true when there is no saving and/or inventory accumulation in the economy.

10/ Private sector output equals total income in this case because it is assumed that there are no private sector benefits gained from government production. This is equivalent to assuming that the government good is shipped off to war or thrown into the sea.

11/ These demand functions are derived from a CES utility function. The marginal rates of substitution (MRS) will be:

$$\frac{1-\delta}{\delta}\left(\frac{X_T}{X_N}\right)^{1+\psi}=P.$$

Using the MRS and the budget constraint we can solve for both X_T and X_N demands. In doing so, we get;

$$X_T=I\left(1-\frac{1}{(1+(P)^{-\psi/1+\psi}(\delta/1-\delta)^{1/1+\psi}}\right)=(1-\gamma(P))I \text{ and}$$

$$PX_N=I\left(\frac{1}{(1+(P)^{-\psi/1+\psi}(\delta/1-\delta)^{1/1+\psi}}\right)=\gamma(P)I.$$

12/ If the analysis is separated into two stages it will become evident that total private sector output rises unambiguously. In the first stage the increase in G_N leads to a rise in P. If we assume for the moment that the supply of labor to the private sector doesn't change, then there will be an expansion of output and employment in the private nontraded goods sector and a contraction in the tradable goods sector. In the second stage the supply of workers to the private sector increased at the new P ratio and higher W. The flow of workers into the private sector will serve to lower W somewhat and lead to increased employment in both sectors. Hence, total private sector employment and output must necessarily rise.

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