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FISCAL POLICY AND THE CURRENT ACCOUNT IN A SMALL OPEN ECONOMY*

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This paper analyses the macroeconomic effects of fiscal policy in a small open economy in a flexible exchange rate regime. The key result is that the effects of fiscal policy depend on the size of the elasticity of substitution between traded and nontraded goods. In particular, the sign of the current account response to fiscal policy depends on the interplay between the intertemporal elasticity of aggregate consumption and the elasticity of substitution between traded and nontraded goods. The paper also shows that only permanent fiscal expansions generate current account imbalances while temporary fiscal expansions do not affect the current account. (JEL: E62, F31, F32, F41)

1. Introduction

In recent years, the consequences of fiscal policy on the current account have returned to the forefront of the economic policy debate due to the large US current account deficits of the 2000s. Changes in fiscal policy are seen as an important source of current account deficits and playing a key role in determining the future development of external imbalances (IMF 2004, 2005, 2007, OECD 2004).

Open economy models are often used to study the effects of fiscal policy on the exchange rate and relative traded goods prices and how changes in relative traded goods prices affect the current account. A key parameter that determines current account behavior is the elasticity of substitution between domestic and foreign traded goods because it s a determinant of the magnitude of price responses to quantity adjustments. For example, using a new open economy macroeconomics (NOEM)[1] model, Tille (1999) shows that fiscal expansion causes a current account surplus (deficit) if the elasticity of substitution between domestic and foreign traded goods is greater (smaller) than one. Similarly, a model of the IMF (2005) shows that a low (high) elasticity of substitution between domestic and foreign traded goods implies that external adjustment requires a larger (smaller) real exchange rate depreciation, following fiscal consolidation.

Exchange rate fluctuations not only change the relative price of domestic and foreign traded

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[1] *Lane and Ganelli (2003) and Coutinho (2005) provide surveys on the NOEM literature that focus on fiscal policy issues.*

goods but also affect the relative price of traded and nontraded goods. Furthermore, as emphasized by Obstfeld and Rogoff (2004, 2005), substitution between traded and nontraded goods can be more important empirically than substitution between domestic and foreign traded goods. This is due to the large share of nontraded goods in the consumption basket. Thus, it is worth analysing the role of substitution between traded and nontraded goods in current account determination, making use of a model in which the exchange rate and the current account are jointly determined. The elasticity of substitution between traded and nontraded goods can play a key role in current account determination because it is a determinant of the magnitude of price responses to quantity adjustments.

This paper studies the effects of fiscal policy on the current account and the exchange rate in a small open economy under a flexible exchange rate, assuming that the government spends exclusively on domestically produced goods. The NOEM literature has focused almost solely on two-country global models and the analyses of the macroeconomic effects of fiscal policy on small economies are almost completely ignored. By choosing a small country setting, the present paper focuses on a simpler model yet allows for interesting insights into the effects of fiscal policy in open economies.

The primary focus is to examine how the effects of fiscal policy on the current account and the exchange rate depend on the elasticity of substitution between traded and nontraded goods. To address this research agenda, we develop a simple model in which the elasticity of substitution between traded and nontraded goods is not restricted to a particular value even though the model is numerically solved. The model builds on the monetary policy model developed by Lane (2001a). His model extended the small-country model in the Appendix by Obstfeld and Rogoff (1995) by introducing a utility function that is non-separable between tradables and nontradables consumption. The main advantage of this specification of preferences is that economic shocks to the nontraded goods sector affects tradables consumption and consequently the current account. This framework, therefore, is well equipped to study the effects of fiscal policy on the optimal time path of consumption and external borrowing.

The model illustrates important insights into the macroeconomic effects of fiscal policy in small open economies under flexible exchange rates. The key result is that the macroeconomic effects of fiscal policy depend on the size of the intratemporal elasticity of substitution between traded and nontraded goods and whether this elasticity dominates or is dominated by the intertemporal elasticity of aggregate consumption. In particular, it is demonstrated that the sign of the current account response to permanent fiscal expansion depends on the interplay between these elasticities. It is also shown that only permanent fiscal expansions generate current account imbalances; temporary expansions do not affect the current account. This paper reverses the common result derived from flexible price open-economy models with infinite lived agents that only temporary expansions affect the current account (see e.g. Kim and Roubini 2004). In addition, we show that the elasticity of substitution between traded and nontraded good is also a key variable to explain exchange rate dynamics.

The rest of the paper is organised as follows. Section 2 lays out a two-sector small-country model and then derives the required equilibrium conditions. Section 3 analyses the macroeconomic effects of fiscal shocks using illustrative numerical simulations. The section briefly outlines the parameterisation of the model and then uses the model to analyse the effects of both temporary and permanent fiscal expansion. The section shows how the effects of fiscal expansion vary depending on the elasticity of substitution between traded and nontraded goods. Section 4 provides conclusions.

2. A Small Open Economy Model

In this section, we lay out a small-country two-sector model that is used to analyse the short-run and long-run adjustment of the economy to an exogenous rise in government spending. The model builds on the model by Lane (2001a). Next, we briefly describe the main assumptions

of the model: market structure, preferences, budget constraints, demand functions, and then derive the required optimality conditions. To study the dynamic effects of fiscal policy we employ a log-linear version of the model. We assume that the prices of nontraded goods are sticky in the short run and fully flexible in the long run. The model, therefore, allows for distinguishing between short-run and long-run effects of fiscal policy.

2.1 Market structure and preferences

Consider a small-country two-sector model in which the nontraded goods sector is monopolistically competitive and where the traded good sector is perfectly competitive. The home country is inhabited by a continuum of individual agents. The home country size is normalized to unity, thus the agents are indexed by $z \in [0, 1]$. Each agent produces a single differentiated perishable nontraded good, using his/her own labour as input. Each agent also receives a constant endowment of a homogeneous traded good in each period. As consumers, they consume all goods produced in the home country.

As standard in the NOEM literature, we motivate the demand for money using the money-in-the-utility function (MIU) approach.[2] The demand for money is the most important determinant of the exchange rate response to a fiscal shock. Steffen (2005) shows that the demand for money can affect the effects of a fiscal shock. However, he demonstrates that, in a MIU model, where real balances enter the utility function logarithmically, the effect of a fiscal shock on the nominal exchange rate is exactly the same as in the case where the demand for money is motivated by the introduction of the cash-in-advance (CIA) constraint and money demand depends on private consumption. He also shows that, under these conditions, the incorporation of the CIA constraint (instead of MIU) into the basic NOEM model does not change the effect of a fiscal shock on the current account.

[2] *The idea of money-in-the-utility function dates back to Sidrauski (1967).*

The representative agent is infinitely-lived and maximises his/her intertemporal utility function

$$(1) \quad U_t(z) = \sum_{s=t}^{\infty} \beta^{s-t} \left[\frac{\sigma}{\sigma - 1} C_s^{\frac{\sigma-1}{\sigma}} + \chi \log\left(\frac{M_s}{P_s}\right) - \frac{\kappa}{2}\left(y_{N,s}(z)\right)^2 \right],$$

where

$$(2) \quad C_t = \left[\gamma^{\frac{1}{\theta}} C_{T,t}^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_{N,t}^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}, \quad \gamma \in (0,1), \theta > 0 \ .$$

In the utility function (1) U_t stands for utility at time t and β ($0<\beta<1$) is the discount factor. The first term in (1) is the utility from consumption, where C is the overall consumption index that aggregates consumption of traded and nontraded goods and σ is the intertemporal elasticity of aggregate consumption. In equation (2) $C_{T,t}$ is consumption of tradables at time t, γ is the share of tradables in total consumption, $C_{N,t}$ is the private nontraded goods consumption index (defined below) and θ is the elasticity of substitution between traded and nontraded goods. In equation (1) χ is a positive parameter, M_s is nominal money balances held by the agent at time s and P_s is the consumption-based price index (defined below). The last term captures the disutility the agent experiences from having to produce output, where $y_s(z)$ is the output of nontraded good z and κ is a positive parameter.

The overall consumption index, given by (2), aggregates consumption of traded and nontraded goods. As mentioned, $C_{T,t}$ is consumption of tradables. The variable $C_{N,t}$ is the private nontraded goods consumption index, a CES aggregator of quantities of different nontraded goods consumed:

$$(3) \quad C_N = \left[\int_0^1 c(z)^{\frac{\mu-1}{\mu}} dz \right]^{\frac{\mu}{\mu-1}},$$

where $c(z)$ is consumption of good z and μ (>1) denotes the elasticity of substitution between

varieties of nontraded goods (the parameter also denotes the price elasticity of the demand of good z). It is assumed that government expenditures do not affect private utility. Per capita government consumption, G_N, is the government consumption index, aggregated in the same manner as private nontraded goods consumption, and with the same elasticity of substitution

$$(4) \quad G_N = \left[\int_0^1 g(z)^{\frac{\mu-1}{\mu}} dz \right]^{\frac{\mu}{\mu-1}}$$

where $g(z)$ is government consumption of good z.

Home tradables are perfect substitutes with foreign tradables and the foreign currency price of tradables is exogenously determined in the world market. There are no costs or impediments to trade between the home country and the world market and thus the law of one price holds in tradables. The foreign currency price of tradables can be normalised to unity, which then implies $P_T = E$, where P_T is the domestic currency price of tradables and E is the nominal exchange rate, defined as the home currency price of the foreign currency. The price of tradables, therefore, also stands for the nominal exchange rate.

Given the level of aggregate consumption, the optimal allocation of expenditure between traded and nontraded goods is given by

$$(5) \quad C_T = \gamma \left(\frac{P_T}{P} \right)^{-\theta} C,$$

$$(6) \quad C_N = (1-\gamma) \left(\frac{P_N}{P} \right)^{-\theta} C.$$

In the preceding equations, P denotes the consumption-based price index and P_N denotes the nontraded goods price index. These equations imply that the demands for goods are proportional to aggregate consumption with a proportionality coefficient that is an isoelastic function of the ratio of the goods' price to the consumption-based price index. The consumption-based price index, defined as the minimum expenditure required to purchase one unit of aggregate consumption, is given by

$$(7) \quad P = \left[\gamma P_T^{\theta} + (1-\gamma) P_N^{1-\theta} \right]^{\frac{1}{1-\theta}}.$$

The nontraded goods price index, defined as the minimum expenditure required to purchase one unit of a basket of nontraded goods, is given by

$$P_N = \left[\int_0^1 p_N(z)^{1-\theta} dz \right]^{\frac{1}{1-\theta}},$$

where $p(z)$ denotes the price of nontraded good z.

Making use of the constant-elasticity of substitution nontraded goods consumption index, equation (3), and adding up private and government demands yields the demand curve. The total demand for each nontraded good, therefore, is given by

$$(8) \quad y_N(z) = \left(\frac{p_n(z)}{P_N} \right)^{-\theta} \left(C_N^A + G_N^A \right).$$

This equation states that the demand for each nontraded good depends on its relative price, the elasticity of demand, and aggregate private and government (per-capita) expenditures.

2.2 Budget constraints

The intertemporal budget, in nominal terms, for the representative agent is written as

$$(9) \quad \begin{aligned} P_{T,t} B_t + M_t = {} & P_{T,t}(1+r_t) B_{t-1} + M_{t-1} \\ & + p_{N,t}(z) y_{N,s}(z) + P_{T,t} \bar{y}_{T,t} - P_t C_t - P_{N,t} \tau, \end{aligned}$$

where B_t denotes the stock of riskless real bonds (denominated in tradables) held by the agent entering period $t+1$. M_t denotes the agent's money balances entering period $t+1$, r denotes the world real interest rate earned on bonds between periods $t-1$ and t, $\bar{y}_{T,t}$ is the exogenously given quantity of tradables and τ denotes per capita taxes (in units of nontraded goods).

As Ricardian equivalence holds in this framework, we assume that the government balances its budget each period. The government financ-

es its purchases through lump-sum taxes. The government budget constraint, expressed in per capita terms and in units of nontraded goods, can be written as $G_t = \tau_t$.

2.3 Optimality conditions

The representative agent solves an intertemporal maximisation problem, choosing the levels of consumption, money holding, bond holding and the output of nontraded goods that maximises the discounted lifetime utility. The representative household maximises the utility function (1) subject to the budget constraint (9) taking into account the demand curve (8). The optimal behavior of the representative agent is characterised by the following optimality conditions (the indexes denoting the agents are dropped):

$$\frac{C_{T,t+1}}{C_{T,t}} = \left(\frac{P_t/P_{T,t}}{P_{t+1}/P_{T,t+1}}\right)^{\sigma-\theta}, \tag{10}$$

$$\frac{C_{N,t}}{C_{T,t}} = \left(\frac{1-\gamma}{\gamma}\right)\left(\frac{P_{T,t}}{P_{N,t}}\right)^{-\theta}, \tag{11}$$

$$y_{N,t}^{\frac{\mu+1}{\mu}} = C_t^{-\frac{1}{\sigma}} \frac{(1-\gamma)(\theta-1)}{\theta\kappa} (C_N^A + G_N^A)^{\frac{1}{\mu}}, \tag{12}$$

$$\frac{M_t}{P_t} = \left[\chi C_t^{\frac{1}{\sigma}} \left(\frac{1+i_t}{i_t}\right)\right], \tag{13}$$

where i is the domestic nominal interest rate defined by the Fisher identity

$$1 + i_t = (1 + r_t)\frac{P_{T,t+1}}{P_{T,t}}.$$

Since the price of tradables also denotes the nominal exchange rate, the Fisher identity implies uncovered interest parity. Equation (10) is the Euler equation governing the optimal *intertemporal* allocation of tradables consumption. As noted by Dornbusch (1983), the relevant real interest rate, for a small country with a nontraded goods sector, is not the world interest rate but the interest rate stated in terms of the domestic consumption basket. For example, if the consumption-based price index relative to the price of tradables is temporarily low relative to its future ratio, the consumption-based real interest rate is also temporarily low. This favours short-run over long-run consumption and increases short-run consumption with elasticity σ. However, as the consumption-based price index rises, consumption of tradables becomes relatively dearer and consequently consumption of tradables falls as a fraction of aggregate consumption with elasticity θ [recall equation (5)]. The interplay between σ and θ determines whether consumption of tradables increases or drops. Equation (11) governs the optimal *intratemporal* allocation of expenditures between traded and nontraded goods. The optimal allocation of expenditures depends on the openness of the economy, the relative price ratio and the elasticity of substitution between traded and nontraded goods. Equation (12) is the labour-leisure trade-off condition. It states that the marginal disutility of producing an extra unit of a nontraded good is equal to the marginal utility from consuming the added revenue that the extra unit of the nontraded good brings. Equation (13) is the money market equilibrium condition, which shows that the demand for real balances is an increasing function of aggregate consumption and a decreasing function of the interest rate.

2.4 The current account

The current account is defined as the sum of the trade balance and net factor income from abroad. The trade balance is the difference between the output of tradables and their consumption. Net factor income is defined as interest payments from abroad. As typically assumed in the literature, we consider the initial steady state in which the stock of net foreign assets is zero. The short-run current account identity, therefore, can be written as

$$\Delta B_t = \bar{y}_{T,t} - C_{T,t} \tag{14}$$

Since the optimal intertemporal consumption of tradables is tilted by changes in prices and the output of tradables is constant, fiscal expansion can generate current account imbalances. Thus the economy (the representative agent) either

accumulates net foreign assets or issues foreign bonds in response to fiscal expansion.

In the short run the nominal prices of nontraded goods are predetermined: they are set one period in advance and can be adjusted fully after one period. This assumption implies that it takes one period to reach the new steady state after a fiscal shock hits the economy. The steady-state current account equation can be written as

$$0 = \bar{y}_{T,t+1} - C_{T,t+1} + rB_t. \quad (15)$$

The current account imbalances in the short run determine the stock of net foreign assets in the steady state. Should an economic shock induce a current account deficit in the short run, the economy must run a trade balance surplus in the steady state in order to service the accumulated external debt. Should the economy, however, accumulate net foreign assets in the short run, it uses interests earned on bonds for steady-state consumption of tradables.

2.5 A Symmetric Steady-State Equilibrium

Following Obstfeld and Rogoff (1995), the model is log-linearised around the flexible price steady state, in which all exogenous variables are constant and the initial stock of net foreign asset and government spending are both zero. In addition, we assume a symmetric equilibrium, in which all agents consume and produce the same amount of all differentiated nontraded goods and all prices are equal. In the symmetric equilibrium, equation (8) implies that the demand for nontraded goods is given by

$$y_N = C_N + G_N. \quad (16)$$

The endowment of tradables is normalised so that the relative price of nontraded goods in terms of tradables is unity. In this symmetric steady state $y_{N,t}=(1-\gamma)C_t$, the labour-leisure trade-off condition (12), can therefore be solved to yield the steady-state output of nontraded goods [the same as in Lane (2001a)]

$$y_{N,0} = \left(\frac{\mu-1}{\mu\kappa}\right)^{\frac{\sigma}{\sigma+1}} (1-\gamma)^{\frac{1}{1+\sigma}}. \quad (17)$$

This equation implies that due to monopolistic competition in the nontraded goods sector the output of nontraded goods is suboptimally low in the decentralised competitive equilibrium. As the elasticity of demand increases, the differentiated nontraded goods become closer substitutes, and consequently the monopoly power decreases.

The log-linearisation is implemented by expressing the model in terms of percentage deviations from the initial steady state. As mentioned, the nominal prices of nontraded goods are fixed in the short run. The assumption of sticky prices introduces a typical Keynesian feature into the model: output becomes entirely demand-determined in the short run. The labour-leisure trade-off condition, therefore, is required to hold only in the steady state. Fourteen variables are to be determined. The 14 equations that jointly determine them are the log-linearised versions of equations (2), (7), (8) and (10)–(16). Equations (2), (7), (8), (11) and (12) have both short-run and long-run versions. The log-linearised versions of equation (2) are, for example, given by

$$\hat{C} = \gamma\hat{C}_T + (1-\gamma)\hat{C}_N,$$
$$\tilde{C} = \gamma\tilde{C}_T + (1-\gamma)\tilde{C}_N,$$

where short run percentage changes from the initial steady state are denoted by hat ($\hat{C}=dC_t/C_0$, where C_0 is the initial steady-state value) and new steady state percentage changes are denoted by tilde ($\tilde{C}=dC_{t+1}/C_0$).

3. The macroeconomic effects of fiscal shocks

3.1 The parameterisation of the model

In order to solve the model numerically, values for five parameters are required: the intertemporal elasticity of aggregate consumption, the share of tradables in total consumption, the elasticity of substitution between traded and nontraded goods, the elasticity of substitution between varieties of nontraded goods and the real interest rate. We focus attention on how the effects of fiscal expansion depend on the marginal rate of substitution between traded and

nontraded goods. This parameter, therefore, is not restricted to a particular value. It is, rather, analysed how the solution of the model depends on this parameter value. Mendoza (1991) estimated this elasticity of substitution to be 0.74, Ostry and Reinhart's (1992) estimates are in the range of 0.66 to 1.3 (for developing countries) and Stockman and Tesar's (1994) estimate is 0.44. We allow this elasticity of substitution to be between 0.4 and 4. We assume a logarithmic utility for consumption, which corresponds to σ=1. This is a standard assumption, and one that would render the model compatible with a balanced growth path if trend technological progress was introduced (see e.g. King, Plosser and Rebelo 1988). Stockman and Tesar (1995) estimated that nontraded goods make up approximately half of output, and thus γ is set to 0.5. Based on the estimates of Rotenberg and Woodford (1992), the elasticity of substitution between varieties of nontraded goods is set to 6. Finally, the real interest rate is chosen to be 4 percent and χ is set to 1.

3.2 The effects of a permanent rise in government spending

Figures 1 and 2 illustrate the effects of a 1 percent rise in government spending (relative to initial consumption of nontraded goods). In all diagrams, the horizontal axis marks the elasticity of substitution between traded and nontraded goods and the vertical axis marks the variable's percentage deviation from the initial steady state.[3] To illuminate how the interplay between σ and θ influences the current account and nominal exchange rate responses to a rise in government spending, three cases can be distinguished to be considered: (i) $\theta = \sigma = 1$, (ii) $\theta > \sigma = 1$ and (iii) $\theta < \sigma = 1$.

3.2.1 A Special Case: $\theta = \sigma = 1$

In the case where $\theta = \sigma = 1$, the utility function is log-separable in consumption of traded and nontraded goods. Equation (10) implies that in this case the optimal intertemporal profile of tradables consumption is perfectly flat. Since the output of tradables is constant and initial net foreign assets are zero, the economy has a balanced current account regardless of shocks to the output or consumption of nontraded goods. This result is consistent with Obstfeld and Rogoff (1996, Section 4), Lane (2001a) and Corsetti and Pesenti (2001) who found that if the elasticity of substitution between traded and nontraded goods is equal to the intertemporal elasticity of consumption, economic shocks do not generate current account imbalances.

Figure 1 shows that in the case where $\theta = \sigma = 1$ a rise in government spending increases the output of nontraded goods. Furthermore, in this case the "balanced budget multiplier" is exactly one in the short run and thus fiscal expansion does not crowd out private consumption. A rise in government spending does not affect the nominal exchange rate (the price of tradables also denotes the nominal exchange rate). The money demand function (13) shows that in the case of $\sigma = 1$ the short-run money demand is proportional to aggregate consumption. Since aggregate consumption does not change, the unchanged money demand leaves the nominal exchange rate unaffected. Since neither traded nor nontraded goods consumption changes the ratio of the marginal utilities of traded and nontraded goods equals the relative price ratio without an adjustment in the price of tradables.

Figure 2 illustrates that the steady-state output of nontraded goods increases as the agents respond by substituting into work out of leisure. Consequently, private consumption falls by less than the rise in government spending. Higher government spending leads to an outward shift in the demand curve facing the agents, therefore allowing them to raise their prices. Figure 1 shows that a rise in government spending does not affect the nominal exchange rate in the steady state. The economic intuition behind this result is as follows: the allocation of total con-

[3] *As noted previously, the model is log-linearised around the steady state, in which net foreign asset holdings are zero and the change in net foreign assets is normalised by consumption of tradables. The current account diagram, therefore, shows by how much the current account changes relative to initial consumption of tradables. In addition, the real exchange rate is defined as the relative price of tradables in terms of nontraded goods.*

Figure 1. The effects of a permanent rise in government spending. The horizontal axes mark the elasticity of substitution between traded and nontraded goods and the vertical axes mark the variables' percentage deviations from the initial steady state.

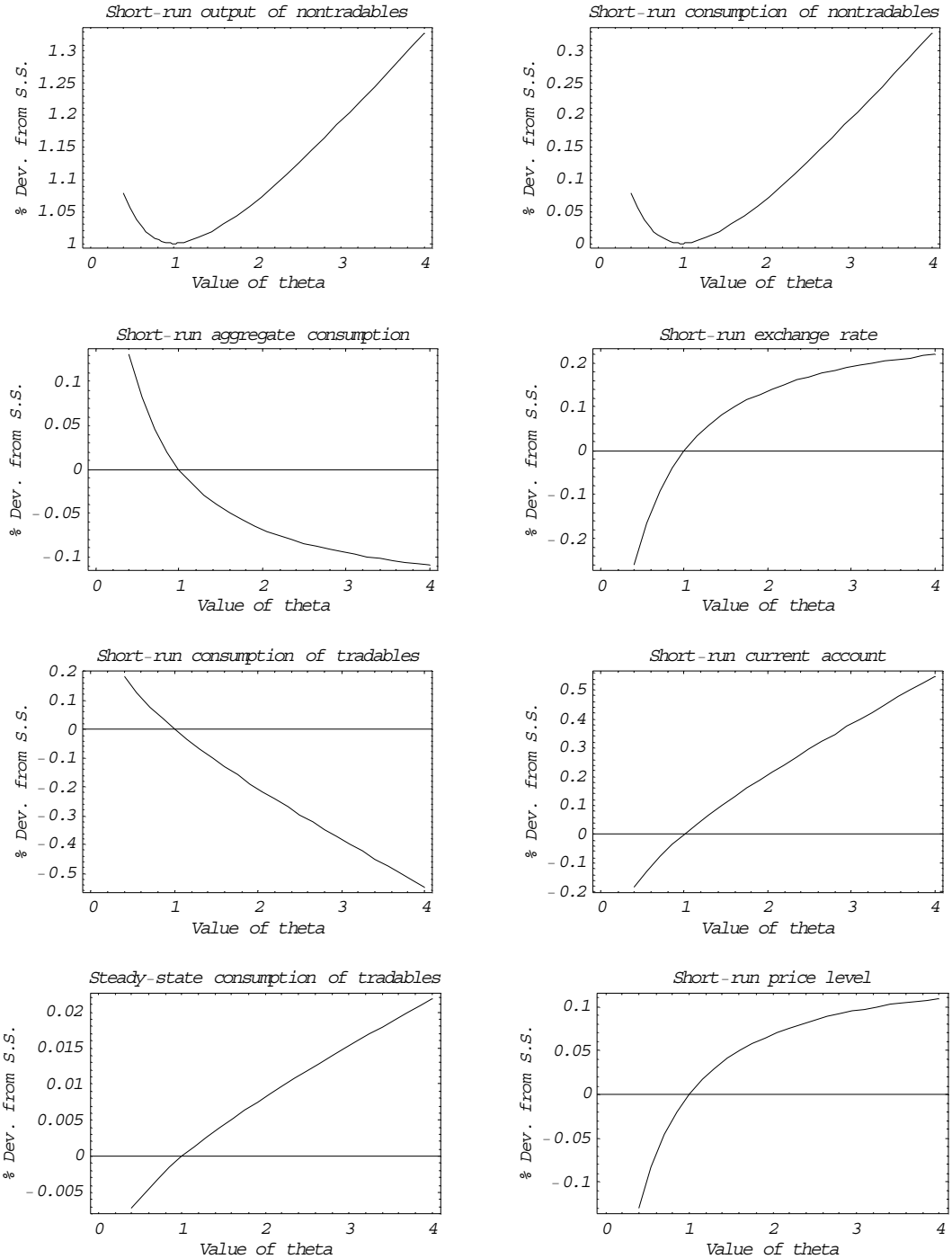
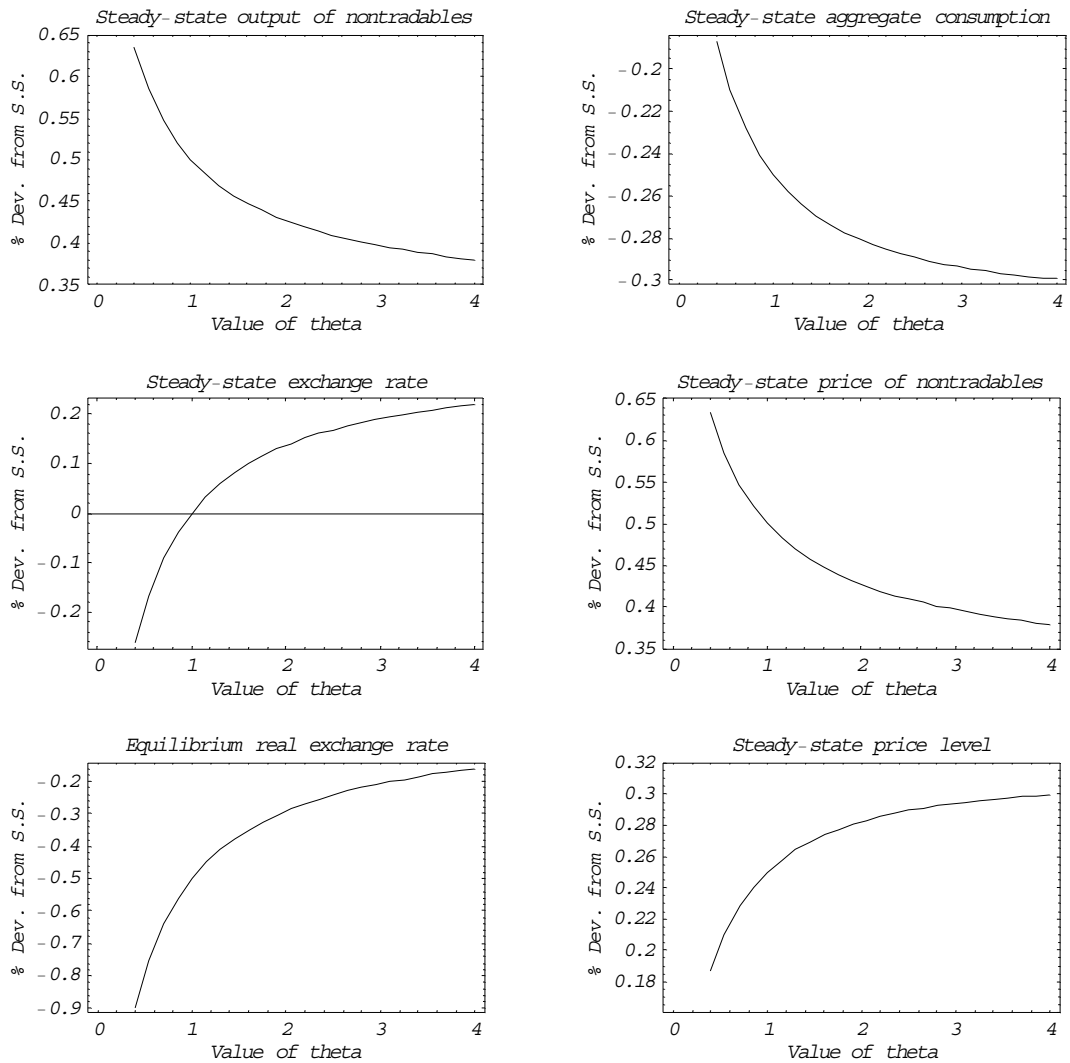


Figure 2. The effects of a permanent rise in government spending.



sumption spending between traded and nontraded goods implies that in an optimal case the ratio of the marginal utilities of traded and nontraded goods equals the relative price of tradables in terms of nontraded goods. Consumption of tradables does not change, consequently the marginal utility of tradables consumption is constant. The fall in nontraded goods consumption increases the marginal utility of nontraded goods consumption. Therefore, an adjustment in the relative price ratio is needed in order to maintain the allocation of total consumption in optimum. As shown, a rise in government spending raises the price of nontraded goods and crowds out nontraded goods consumption. These effects guarantee that the ratio of marginal utilities equals the relative price ratio without an adjustment in the price of tradables.

3.2.2 The current account and the nominal exchange rate

In case (ii), as illustrated by Figure 1, a rise in government spending increases nontraded goods

consumption and production, decreases tradables and aggregate consumption, depreciates the nominal exchange rate and induces a current account surplus in the short run. A fall in aggregate consumption tends to lower money demand requiring a depreciation of the nominal exchange rate in order to maintain equilibrium in the money market. On the one hand this depreciation and the sticky prices in the nontraded goods sector imply that the relative price of tradables rises, which encourages the agents to switch their consumption towards nontraded goods. The strength of this effect depends on the intratemporal elasticity of substitution between traded and nontraded goods. On the other hand the consumption-based real interest rate is temporarily low, since the aggregate price level relative to the price of tradables is currently low relative to its future ratio. This low consumption-based real interest rate induces the agents to switch consumption from the future to the present. The strength of this effect depends on the intertemporal elasticity of substitution. The intra- and intertemporal substitution effects on short-run consumption of tradables pull in opposite directions. Since $\theta > \sigma$, the intratemporal substitution effect dominates and consequently consumption of tradables decreases. This reduction in consumption of tradables in turn induces a short-run current account surplus, which implies a permanent improvement in the economy's net foreign assets. In the steady state, positive net income from abroad is used to finance a trade balance deficit. This deficit allows consumption of tradables to remain permanently above the endowment of tradables. Nonetheless, the increase in steady-state consumption of tradables is fairly small.

In case (iii), a rise in government spending, contrary to the previous case, appreciates the nominal exchange rate, increases tradables and aggregate consumption and generates a current account surplus in the short run. An increase in aggregate consumption increases money demand, which tends to increase the interest rate. An appreciation of the nominal exchange rate, therefore, is required to balance money demand and supply. This appreciation raises the relative price of nontraded goods, which favours substitution from traded to nontraded goods. However, this negative effect on consumption of nontraded goods is more than offset by the positive effect. As in the previous case, the aggregate price level relative to the price of tradables is low relative to its future value. The consumption-based real interest rate, therefore, is temporarily low, which induces the agents to switch consumption from the steady state to the short run. Thus consumption of nontraded goods also increases. Since θ is now low, implying little substitutability in consumption between traded and nontraded goods, the relative strength of the intratemporal substitution is low. The intertemporal effect, therefore, dominates increasing consumption of nontraded goods in spite of the appreciation of the nominal exchange rate. It should be clear from the above discussion that the intratemporal and intertemporal substitution effects increase consumption of tradables thereby generating a short-run current account deficit. This in turn induces a permanent reduction in net foreign assets. In the steady state, the economy must run a trade balance surplus in order to service the accumulated external debt. In order to achieve a trade balance surplus, consumption of tradables must remain permanently below the endowment of tradables.

3.2.3 The output of nontraded goods

Figure 2 illustrates that a rise in government spending raises the steady-state output of nontraded goods. The Figure illustrates that in case of (i), a 1 per cent rise in government spending increases the output of nontraded goods by 0.5 per cent. Output rises as the agents respond to a rise in government spending by substituting into work out of leisure. There can be, in some cases, negative effects on labour supply, as explained in a moment, but they are more than offset by the positive effects.

As stressed by Lane (2001a), net foreign assets have an effect on the level of desired consumption of nontraded goods and on the optimal labour supply and these effects pull in opposite directions. Firstly, due to the nonseparability between traded and nontraded goods consumption the change in steady-state consumption of tradables affects the desired consumption of nontraded goods. For example, in the case

where $\theta < \sigma$ the declined steady-state consumption of tradables induces a decline in desired consumption of nontraded goods, which tends to lower the output of nontraded goods. However, this effect plays only a minor role in this case, since output increases the most in the case where the effect tends to reduce output. Secondly, short-run current account imbalances have a wealth effect on the optimal labour supply: As equation (12) shows, higher consumption induces a reduction in labour supply. Therefore, if the economy accumulates net foreign assets in the short run, higher wealth leads to some reduction in labour supply. For this reason, output increases by less than in the case where the current account remains in balance in the short run. On the other hand, if a rise in government spending generates a current account deficit in the short run, lower wealth leads to some increase in labour supply and output.

It is also worth observing that the findings on the output effects of a rise in government spending are quite consistent with the range of multipliers obtained using a variety of macroeconometric models. Hemming, Kell and Mahfouz (2002) survey the empirical literature on the effectiveness of fiscal policy. They conclude that: "The range of estimated short-run multipliers is wide, (…), but most expenditure multipliers are in the range of 0.6 to 1.4." The results surveyed by the authors also support the view that long-run multipliers are smaller than short-run multipliers.

3.2.4 The equilibrium real exchange rate

Figure 2 shows that a rise in government spending appreciates the equilibrium real exchange rate which is defined as the price of tradables in terms of nontraded goods. Defined this way the equilibrium real exchange rate represents an internal terms of trade measuring how much of nontraded goods must be given up for one unit of tradables in the steady state. A rise in government spending raises the nontraded goods price index in the steady state. Higher demand allows the agents to raise the prices of nontraded goods. Thus the equilibrium real exchange rate appreciates, regardless of whether the nominal exchange appreciates or depreciates, improving the economy's steady-state terms of trade. The change in the equilibrium real exchange rate is required to lead the agents to revise their consumption allocation between traded and nontraded goods in a consistent way. Since the steady-state trade balance needs to change to reach a particular value, the equilibrium exchange rate has to change accordingly. It has to appreciate sufficiently to induce the agents to change their consumption allocation in a way consistent with the required change in the steady-state trade balance.

3.2.5 On the robustness of the results

As emphasised by Lane (2001b, 261), many results of NOEM models are sensitive to the choice of parameter values. A natural next step would be to analyse how sensitive the main predictions of the model are to changes in parameter values. The results of this paper, however, are not sensitive to the choice of parameter values. The most important determinant of the macroeconomic effects of a fiscal shock is the interplay between σ and θ. The effects of varying the share of tradables in total consumption or the interest rate would cause only quantitative changes. In addition, the elasticity of substitution between varieties of nontraded goods affects only the initial steady state [equation (17)], but not the response of the economy to a fiscal shock.

3.3 The effects of a temporary rise in government spending

We now turn to examining the effects of a temporary rise in government spending. The temporary rise in government spending is assumed to last for one period, and as before, the prices of nontraded goods are sticky in the short run and the economy reaches the new steady state after one period. A temporary rise in government spending can have effects on the steady state, because of induced wealth changes through short-run current account imbalances. If fiscal policy induced short-run wealth changes, these changes would affect the optimal labour supply and output in the steady state. Consequently, fiscal policy would affect the econo-

my well beyond the time frame of a temporary rise in government spending.

Surprisingly, a 1 per cent temporary rise in government spending increases the short-run output of nontraded goods by 1 percent (for all values of the elasticity of substitution between traded and nontraded goods consumption) but it leaves all other endogenous variables unaffected both in the short run and in the steady state. Therefore, even though a temporary rise in government spending induces a tilt into the time profile of aggregate demand, it does not introduce a tilt into the time profile of the output net of government consumption. It is interesting to note that the effects of a rise in government spending in the short run differ depending on whether a rise in government spending is permanent or temporary. The effects of a temporary rise in government spending are only the same as those of a permanent rise in the special case where $\theta = \sigma$.

The intuition behind the result, that a temporary rise in government spending affects nothing other than the short-run output of nontraded goods, is rather straightforward. Unaffected aggregate consumption implies that the unchanged money demand leaves the nominal exchange rate unaffected. Because the nominal exchange rate is unaffected and the price of nontraded goods fixed, the relative price ratio (P, P_T) also remains constant in the short run. This relative price ratio also remains constant in the steady state. A temporary rise in government spending does not affect this price ratio either today or tomorrow and consequently the optimal intertemporal profile of consumption of tradables is perfectly flat for all values of the elasticity of substitution between traded and nontraded goods. The constant consumption of tradables has two implications. Firstly, with no effect on consumption of tradables the assumption that the government spends exclusively on nontraded goods isolates the shock to the nontraded goods sector and thus the short-run output of nontraded goods increases one-to-one. Secondly, a temporary rise in government spending does not induce short-run current account imbalances that would affect the optimal labour supply and output in the steady state. Fiscal policy, therefore, does not affect the economy beyond the time frame of a temporary rise in government spending.

Temporary and permanent changes in government spending can have different effects in the short run. In the baseline case, a permanent rise in government spending increases output more than a temporary one. In a closed economy model, Hall (1980) argues that temporary changes in government spending have larger effects than permanent ones while Aiyagari, Christiano and Eichenbaum (1992) and Baxter and King (1993) find the opposite result. In the above models, the main reason for the result of the effects of permanent changes having larger effects is that they cause a larger increase in investment in the short run. In this model, the optimal consumption and labour supply responses explain why permanent changes might have bigger effects than temporary ones.

4 Summary and concluding remarks

This paper analyses the macroeconomic effects of fiscal policy in a small open economy. We show that the effects of fiscal policy, under a flexible exchange rate regime, depend on the substitutability between traded and nontraded goods. An advantage of the model is that it allows fiscal policy to induce tilts into the time profile of output and relative prices. Two factors determine the extent to which changing relative prices affect consumption: one is the intratemporal elasticity of substitution between traded and nontraded goods and the other is the intertemporal elasticity of consumption. The results demonstrate that the interplay between these two elasticities determines the sign of the current account response to fiscal policy. If the intertemporal elasticity exceeds (is below) the intratemporal elasticity, fiscal expansion induces an increase (decrease) in tradables consumption and thus generates a current account deficit (surplus). These results are in line with Lane's conclusions (2001a), since the sign of the current account response to monetary expansion depends on the same condition. These results are also consistent with the findings of Obstfeld and Rogoff (1996), reaffirming the claim that the interplay between these two elasticities de-

termines the current account response to other economic disturbances. It is also demonstrated that temporary fiscal expansions do not generate current account imbalances. The common result derived from models, that assume flexible prices and infinitelived agents, is that permanent expansions do not affect the current account; only temporary expansions generate current account imbalances. The conclusion from this paper is the opposite.

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