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Capital Mobility, Consumption Substitutability, and the Effectiveness of Monetary Policy in Open Economies

by

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Capital Mobility, Consumption Substitutability, and the Effectiveness of Monetary Policy in Open Economies*

Abstract

This paper uses a dynamic general equilibrium two-country optimizing model to analyze the consequences of international capital mobility for the effectiveness of monetary policy in open economies. The model shows that the substitutability of goods produced in different countries plays a central role for the impact of international capital mobility on the effectiveness of monetary policy. Paralleling the results of the traditional Mundell-Fleming model, a higher degree of international capital mobility increases the effectiveness of monetary policy only if the Marshall-Lerner condition, which is linked to the cross-country substitutability of goods, holds.

Keywords: Monetary policy; Capital mobility

JEL classification: F32, F36, F41

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1. Introduction

Since the publication of the classic model of Fleming (1962) and Mundell (1963) it has been generally acknowledged in the international macro and finance literature that the international mobility of capital plays a key role for the effectiveness of monetary policy in open economies. In its basic form, the Mundell-Fleming model implies that, in a flexible exchange rate system and with capital being mobile internationally, a monetary expansion brings about a depreciation of the exchange-rate and, thereby, stimulates aggregate demand. Because this effect tends to be stronger the higher is the degree of international capital mobility, a key result of the model is that the effectiveness of monetary policy, as measured in terms of its short-run effects on output, is an increasing function of the degree of international capital mobility.

Recently, Sutherland (1996) and Senay (2000) have argued that this key result of the Mundell-Fleming analysis in principle also holds if one uses a modern micro-founded dynamic monetary general equilibrium macroeconomic model to study the output effects of monetary policy in open economies. Using variants of the two-country sticky-price 'new-open economy macroeconomics' (NOEM) model developed by Obstfeld and Rogoff (1995), they show that moving from imperfect to perfect capital mobility increases the effectiveness of monetary policy. Hence, as in the Mundell-Fleming model, the effectiveness of monetary policy tends to be higher the higher is the degree of international capital mobility.

When drawing policy conclusions from the Mundell-Fleming model, one has to bring to mind that the implications of this model for the effectiveness of macroeconomic policies under different degrees of international capital mobility hinge upon a number of crucial assumptions. One important assumption is that the sum of the export and import elasticity with respect to the terms of trade, in absolute value, exceeds unity (see, e.g. Niehans (1975)). If this is the case the Marshall-Lerner condition holds and the trade balance shows a ‘normal’ reaction to real exchange rate changes, i.e., a real depreciation (appreciation) causes a trade balance surplus (deficit). If the Marshall-Lerner condition did not hold in the Mundell-Fleming model, a monetary policy induced depreciation of the real exchange rate would give rise to a temporary deterioration of the trade balance which, in turn, would hamper the short-run effectiveness of an expansionary domestic monetary policy.

In this paper, I show that a similar result obtains if one uses a modern stochastic NOEM model of the type developed by Sutherland (1996) to analyze the implications of international capital mobility for the effectiveness of monetary policy in open economies. To derive this result, I draw on the modeling strategy advanced by Tille (2001) and extend Sutherland's model by assuming that the elasticity of substitution between goods produced in different countries is different from the elasticity of substitution between goods produced in the same country. Using a variant of the prototype NOEM model developed by Obstfeld and Rogoff (1995), Tille has shown that the elasticity of substitution between goods produced in different countries is directly linked to the Marshall-Lerner condition and, thus, to the response of the trade balance to macroeconomic policy shocks. He has shown that a monetary expansion improves the trade balance if the Marshall-Lerner condition holds and worsens the trade balance if this condition does not hold.

In this paper, I explore the implications of this result for the impact of international capital mobility on the effectiveness of monetary policy. I find that the short-run effect of a monetary policy shock on the trade balance plays an important role for the impact of capital mobility on the effectiveness of monetary policy in open economies. The reason is that, in the model analyzed in this paper, the dynamics of the trade balance and, thus, international capital flows exert a direct effect on international relative asset returns when the integration of international financial markets is incomplete. International relative asset returns, in turn, are a major determinant of the real exchange rate and, in consequence, of output.

Upon varying the elasticity of substitution between goods produced in different countries, I find that a higher degree of international capital mobility decreases the effectiveness of monetary policy if this elasticity is so small that the Marshall-Lerner condition is not satisfied. In contrast, if the elasticity of substitution is large enough so that the Marshall-Lerner condition is satisfied, higher capital mobility results in a higher effectiveness of monetary policy. Thus, as in the traditional Mundell-Fleming model, the Marshall-Lerner condition plays a central role in the NOEM model analyzed in this paper for the implications of international capital mobility for the effectiveness of monetary policy.

The remainder of the paper is organized as follows. In Section 2, I lay out the theoretical model I use to derive the results reported in this paper. In Section 3, I use impulse response functions and numerical simulations to analyze the effectiveness of monetary policy under alternative assumptions regarding the degree of international capital mobility. Section 4 concludes.

2. The Model

The model I use in this paper is an extension of the NOEM model developed by Sutherland (1996). I extend Sutherland's model by assuming that the elasticity of substitution between goods produced in different countries is different from the elasticity of substitution of goods produced in the same country. To make Sutherland's model more realistic, I further build into his model two features which are fairly standard in the literature. First, as suggested by Taylor (1997), I assume that monetary policy targets the short-term interest rate rather than the money supply. Second, I assume that firms set prices according to a variant of the price setting mechanism advanced by Fuhrer and Moore (1995) which assures a reasonable degree of inflation persistence.

The structure of the model is as follows: The world is made up of two countries, Home and Foreign. Each country is inhabited by infinitely-lived identical households. The households form rational expectations and maximize their expected lifetime utility. In addition, each country is populated by a continuum of firms. Each countries' households own the respective domestic firms. The firms sell differentiated products in a monopolistically competitive goods market. When changing the price of their product, firms incur menu costs, implying that prices are sticky. The only production factor used by the firms is labor. Firms hire labor in a perfectly competitive labor market. Labor is immobile internationally.

2.1 Households' Preferences and Goods Market Structure

Home and Foreign households have identical preferences and seek to maximize the present value of their expected lifetime utility. The expected lifetime utility of a Home household is defined as $U_t = E_t \sum_{s=t}^{\infty} \beta^{s-t} u_s$, with $0 < \beta < 1$ being the households' subjective discount factor and E_t denoting the conditional expectations operator. The period-utility function, u_t, is of the form:

$$u_t = \left(\sigma/(\sigma-1)\right)(C_t)^{(\sigma-1)/\sigma} + \chi(M_t/P_t)^{1-\varepsilon}/(1-\varepsilon) - N_t^{\mu}/\mu\,, \tag{1}$$

where $\mu > 1$, $\sigma > 0$, $\varepsilon > 0$, and $\chi > 0$. In Eq. (1), C_t denotes a real consumption index, N_t is the households' labor supply, and M_t/P_t denotes the end-of-period real money holdings, where M_t is the supply of Home outside money and P_t is the aggregate Home price index defined below. Households hold only the money issued by the central bank of the country in which they reside, i.e., there is no currency substitution.

The aggregate consumption index, C_t, is a CES aggregate of an index of Home consumption goods, C_t^h, and of an index of Foreign consumption goods, C_t^f:

$$C_t = \left[n^{1/\rho}(C_t^h)^{(\rho-1)/\rho} + (1-n)^{1/\rho}(C_t^f)^{(\rho-1)/\rho}\right]^{\rho/(\rho-1)}, \tag{2}$$

where $\rho > 0$ denotes the elasticity of substitution between the Home and Foreign consumption index. As in Tille (2001), the index C_t^h (C_t^f) is defined as a CES aggregate over a continuum of differentiated, perishable Home (Foreign) consumption goods. These goods are sold by Home and Foreign firms in a monopolistically competitive goods market and are indexed by z with $z \in [0, n)$ denoting Home and $z \in (n,1]$ denoting Foreign goods. The indices C_t^h and C_t^f can be expressed as:

$$C_t^h = \left[n^{-1/\theta} \int_0^n \{c_t^h(z)\}^{(\theta-1)/\theta} dz \right]^{\theta/(\theta-1)} \quad , \quad C_t^f = \left[(1-n)^{-1/\theta} \int_n^1 \{c_t^f(z)\}^{(\theta-1)/\theta} dz \right]^{\theta/(\theta-1)} ,$$

where $c^j(z)$, $j = h, f$ denotes consumption of good z and $\theta > 1$ denotes the elasticity of substitution between consumption goods produced within the same country. The fact that in general $\theta \neq \rho$ implies that the elasticity of substitution between goods produced in different countries is different from the elasticity of substitution of goods produced in the same country. Tille (2001) proves that the elasticity of substitution between goods produced in different countries, ρ, is equal to the sum of the absolute export and import elasticity with respect to the terms of trade. This implies that the Marshall-Lerner condition holds if $\rho > 1$ and is violated if $\rho < 1$.

The optimal consumption allocation is standard and can be derived as in Tille (2001). The result is:

$$C_t^h(z) = \left[p_t^h(z) / P_t^h \right]^{-\theta} \left[P_t^h / P_t \right]^{-\rho} C_t , \tag{3}$$

$$C_t^f(z) = \left[p_t^f(z) / P_t^f \right]^{-\theta} \left[P_t^f / P_t \right]^{-\rho} C_t . \tag{4}$$

Analogous expressions can be derived for the consumption allocation of Foreign households. In Eqs. (4) and (5), $p_t^h(z)$ denotes the home currency price of the Home good $z \in [0, n)$ and $p_t^f(z)$ denotes the foreign currency price of the Foreign good $z \in (n,1]$. The price index P_t^h (P_t^f) is defined as the minimum expenditure required to buy one unit of the index of Home (Foreign) consumption, C_t^h (C_t^f). These price indices are given by:

$$P_t^h = \left[n^{-1} \int_0^n \{p_t^h(z)\}^{1-\theta} \, dz \right]^{1/(1-\theta)} \quad , \quad P_t^f = \left[(1-n)^{-1} \int_0^n \{p_t^f(z)\}^{1-\theta} \, dz \right]^{1/(1-\theta)} .$$

The aggregate domestic price index is then of the form:

$$P_t = \left[n(P_t^h)^{1-\rho} + (1-n)(P_t^f)^{1-\rho} \right]^{1/(1-\rho)} \tag{5}$$

With identical preferences at home and abroad and the law-of-one-price holding for each differentiated good, it immediately follows that purchasing power parity holds: $P_t = S_t P_t^*$, where P_t^* denotes the aggregate Foreign price index. The Foreign index is given by a formula similar to that given in Eq. (5).

2.2 The Structure of Financial Markets

When choosing the optimal allocation of their wealth, households have to take into account that international financial markets are not perfectly integrated. Whereas Home households have free access to the domestic capital market, they incur intermediation costs when undertaking positions in the international asset market. Similarly, Foreign households can trade foreign currency denominated bonds without incurring transaction costs but incur intermediation costs when trading in Home currency denominated bonds.

The real intermediation costs, Z_t, of undertaking positions in the international asset market incurred by Home households are given by:

$$Z_t = 0.5\psi_1 I_t^2 + 0.5\psi_2[(F_t - \overline{F})/P_t^*]^2, \tag{6}$$

where $\psi_1 > 0$ and $\psi_2 > 0$ are positive constants, F_t denotes the stock of foreign currency denominated assets held by domestic households, $\overline{F}$ is the steady state level of the foreign asset holdings of Home households, and I_t denotes the level of real funds transferred by Home households from the Home to the Foreign bond market and corresponds to the trade balance. Both Z_t and I_t are denominated in terms of the consumption aggregator, C_t.

The first term on the right-hand side of Eq. (6) reflects convex adjustment costs and is identical to the transaction cost technology used by Sutherland (1996). The second term on the right-hand side of Eq. (6) is introduced to ensure that the foreign asset position and, thus, the steady state around which the model is log-linearized is stationary (Schmitt-Grohe and Uribe (2001)). The stationarity of the steady state will serve useful in the stochastic simulations of the model presented in Section 3.

Total income received by Home households consists of the yield on their holdings of Home and Foreign bonds, the profit income for the ownership of Home firms (i.e., dividend income), and the labor income. Given total income, households determine their optimal consumption, decide on their preferred Home and Foreign bond holdings, and determine their preferred holding of domestic outside money. In addition, they receive transfers from the government and incur the transaction costs for undertaking positions in the international asset market. The dynamics of Home households' Home bond holdings, therefore, obey the following flow budget constraint:

$$D_t = (1+R_{t-1})D_{t-1} + M_{t-1} - M_t + w_t N_t - P_t C_t - P_t I_t - P_t Z_t + \Pi_t + P_t T_t, \tag{7}$$

where D_t stands for the quantity of Home currency denominated nominal bonds, R_t denotes the nominal interest rate on Home bonds between period t and $t+1$, T_t stands for real lump-sum transfers (denominated in terms of the consumption aggregate, C_t), w_t is the nominal wage rate earned in a perfectly competitive domestic labor market, and Π_t denotes the nominal profit income the household receives from domestic firms.

Assuming for simplicity that the production function for good z is of the form $y_t(z) = N_t(z)$, the nominal profit income of firm z is given by $\Pi_t(z) = p_t^h(z) y_t(z) - w_t y_t(z)$.

The dynamics of the Home households' Foreign bond holdings are given by:

$$F_t = (1 + R_{t-1}^*) F_{t-1} + P_t^* I_t \, , \tag{8}$$

where R_t^* denotes the nominal foreign interest rate paid for holding a nominal Foreign bond between period t and $t+1$.

2.3 Individual Maximization

The first-order conditions for the households' intertemporal optimization problem are:

$$C_t^{-1/\sigma} = \lambda_t P_t \, , \tag{9}$$

$$\chi (M_t / P_t)^{-\varepsilon} + \beta P_t E_t(\lambda_{t+1}) = \lambda_t P_t \, , \tag{10}$$

$$y(z)^{\mu - 1} = \lambda_t w_t \, , \tag{11}$$

$$(1 + R_t) \beta E_t(\lambda_{t+1}) = \lambda_t \, , \tag{12}$$

$$\lambda_t S_t - \beta(1+R_t^*)E_t(\lambda_{t+1}S_{t+1}) + \psi_1\lambda_t S_t + \psi_2\lambda_t S_t(F_t - \overline{F})/P_t^* = \beta(1+R_t)E_t(\lambda_{t+1}S_{t+1}I_{t+1}), \tag{13}$$

where λ_t denotes the Lagrange multiplier. Analogous first-order conditions can be derived for Foreign households.

Eq. (13) shows that the intermediation costs for undertaking positions in international financial markets ($\psi_1 > 0$, $\psi_2 > 0$) imply that the no-arbitrage condition of uncovered interest rate parity, that equates the rate of returns on Home and Foreign bonds, includes terms accounting for the costs incurred when transferring funds between the Home and the Foreign bond market.

2.4 Price Setting

Each firm has monopoly power on the market for the differentiated good it produces. It, therefore, treats the price it charges for its product as a choice variable. In consequence, one has to specify a price setting mechanism. In this paper, I assume that firms behave according to a price-setting mechanism similar to the one introduced by Fuhrer and Moore (1995). The advantage of this price-setting mechanism is that it assures an empirically reasonable degree of inertia in inflation dynamics.

Following McCallum and Nelson (2000), I assume that firms' price setting decisions can be described as a function of the output gap, measured as the deviation of actual output from its long run flexible price steady state level, and of the weighted arithmetic average of lagged and expected inflation. Letting a variable with a hat denote percentage deviation from the steady state, the price setting equation for a Home firm can be expressed as:

$$d\hat{p}_t^h(z) = 0.5[d\hat{p}_{t-1}^h(z) + \mathbb{E}_t d\hat{p}_{t+1}^h(z)] + \Psi\hat{y}_t\,, \tag{14}$$

where Ψ is a positive constant.

Given the price of the differentiated good, the quantity produced by the firm can be derived from the demand function for this good:

$$y_t(z) = \left[p_t^h(z) / P_t^h\right]^{-\theta} \left[P_t^h(z) / P_t\right]^{-\rho} Q_t\,, \tag{15}$$

where $Q_t = nC_t + (1-n)C_t^* + nZ_t + (1-n)Z_t^*$ is the aggregate world-demand function.

2.5 The Government Sector

As regards monetary policy, I follow Taylor (1993) and assume that the central bank sets the nominal interest rate in response to deviations of inflation and output from their respective target levels. I use a standard specification for the Taylor-type monetary policy rule:

$$\hat{R}_t = \mu_0 + (1-\mu_3)[d\hat{P}_t + \mu_1(d\hat{P}_t - \overline{\pi}) + \mu_2\hat{y}_t] + \mu_3\hat{R}_{t-1} + \varepsilon_{R,t}\,, \tag{16}$$

where $\varepsilon_{R,t}$ is a serially uncorrelated stochastic disturbance term with standard deviation $\sigma_{R,t}$, $\bar{\pi}$ denotes the inflation target of the central bank, and μ_1 and μ_2 are parameters that capture the reaction of the central bank to deviations of the inflation rate from its target level and to the output gap, defined as the deviation of actual output from its flexible price steady state output. The interest rate smoothing objective of central banks (Goodfriend (1991)) is reflected in the parameter μ_3.

As regards fiscal policy, I abstract from government purchases of consumption goods, implying that real transfers are financed by seignorage.

2.6 Definition of Equilibrium and Model Solution

In a symmetric monopolistic competition equilibrium in the world economy, output, consumption, the exchange rate, prices, interest rates and wage rates, domestic and foreign bond holdings follow stochastic processes such that (i) the labor markets in each country clear, (ii) the optimality conditions for consumption and asset holding are satisfied, (iii) the intertemporal budget constraint for each country is satisfied, (iv) the markets for domestic and foreign bonds are in equilibrium, and, (v) inflation dynamics and central bank policy satisfy Eqs. (14) and (16), respectively.

To solve the model, I follow Obstfeld and Rogoff (1995) and Sutherland (1996) and log-linearize the model around a symmetric flexible-price steady state in which the Home and Foreign foreign asset positions are zero. I then use the algorithm developed by Klein (2000) to numerically simulate the calibrated log-linearized model. The calibration of the model is given in Table 1 and closely follows Sutherland (1996).

— Insert Table 1 about here.—

When simulating the model, I assume that the innovation terms, $\varepsilon_{R,t}$, in the Home and Foreign Taylor rules are perfectly negatively correlated, i.e., monetary policy shocks are asymmetric.

3. Capital Mobility and the Effectiveness of Monetary Policy

The impulse response functions depicted in Figure 1 visualize the impact of a unit monetary policy shock on key Home variables. To compute the impulse responses plotted in Figure 1, I assume that the elasticity of substitution between Home and Foreign goods takes on the value $\rho = 5.0$, implying that the Marshall-Lerner condition is satisfied. This specification corresponds to the case analyzed in the traditional Mundell-Fleming model. It also corresponds to the case analyzed by Sutherland (1996).

— Insert Figure 1 about here.—

The monetary policy shock implies that the international nominal yield differential becomes positive so that Home bonds become more attractive than Foreign bonds. The ensuing appreciation of the nominal exchange rate implies that, as required by the uncovered interest rate parity condition, the positive international nominal yield differential corresponds to depreciation expectations for the Home currency. Because the prices of the differentiated goods adjust sluggishly, the nominal appreciation implies a real appreciation of the Home currency, where the real exchange rate is defined as

$\hat{q} \equiv \hat{s} + \hat{p}^f * - \hat{p}^h$. The real appreciation of the domestic currency makes Home goods more expensive relative to Foreign goods. Because the Marshall-Lerner condition holds, the real appreciation deteriorates the trade balance and home output declines. In consequence, the foreign asset position of the Home economy starts to decline.

Why does the degree of international financial market integration matter for the dynamics of the model in the aftermath of a monetary policy shock? With international financial markets being imperfectly integrated ($\psi_1 > 0$), the impact of the monetary policy shock on the dynamics of the foreign asset position is directly reflected in the condition of uncovered interest rate parity. Neglecting the influence of the second component of the intermediation cost function, Z_t, this condition stipulates that, at any point in time, the international nominal interest rate differential, $\hat{R}_t - \hat{R}_t^*$, is proportional to the sum of the expected rate of change of the Home currency, $E_t(\Delta\hat{S}_{t+1})$, and the expected rate of change of the cross-border flow of funds, $E_t(\Delta\hat{I}_{t+1})$. This direct effect of the change in the foreign asset position on the international nominal yield differential is absent in a world of high capital mobility ($\psi_1 = 0$).

It follows from the dynamics of the trade balance depicted in Figure 1 that the expected rate of change of the cross-border flow of funds is positive in the aftermath of a monetary policy shock if the Marshall-Lerner condition holds. To see this, note that the trade balance deficit realized in the immediate aftermath of the monetary policy shock gradually turns into a surplus as the domestic currency starts to depreciate. From this it immediately follows that the expected rate of change of the cross-border flow of funds is positive, $E_t(\Delta\hat{I}_{t+1}) > 0$. This, in turn, implies that, for any given interest rate differential, the expected rate of depreciation of the domestic currency must be smaller with segmented international financial markets. As a result, the initial appreciation of the domestic currency will be less pronounced when international financial markets are segmented. It follows that the output effect of the monetary policy shock is larger in the case of high capital mobility than in the case of low capital mobility.

Figure 2 shows impulse responses for a model in which the Marshall-Lerner condition is not satisfied. To compute the impulse responses depicted in this figure, I change the elasticity of substitution between Home and Foreign goods from $\rho = 5.0$ to $\rho = 0.5$. Because the Marshall-Lerner condition does not hold, the monetary policy-induced real appreciation of the Home currency does not lead to 'normal' reaction of the trade balance. The result is that Home starts to accumulate foreign assets in the aftermath of the monetary policy shock. In the case of imperfectly integrated financial markets, the resulting asset accumulation again exerts a direct effect on international relative asset returns via the condition of uncovered interest rate parity. The result is that the monetary policy induced real appreciation of the Home currency is relatively strong in imperfectly integrated financial markets. Hence, the output effect and, thus, the effectiveness of monetary policy is larger the lower is the degree of international capital mobility.

Also note that the lower is the cross-country substitutability of goods the stronger is the real appreciation of the Home currency required to bring about goods market equilibrium. Further note that in the case considered in Figure 2, a monetary contraction results in an increase of Home consumption. Though the rise of the nominal and, because of sticky prices, of the real interest rate forces households to decrease current consumption, the real appreciation of the Home currency and, thus, the resulting increase in the purchasing power of Home households is so large that they start to increase their consumption spending. Because Households purchasing power is higher in the short run than in the long run they smooth consumption through a trade balance surplus.

— Insert Figure 2 about here.—

Running stochastic simulations of the model is an alternative way of illustrating that the implications of capital mobility for the effectiveness of monetary policy depend upon the elasticity of substitution between goods produced in different countries. Here, I simulate the model using four alternative specifications of the monetary policy rule given in Eq. (16). In addition to the benchmark Taylor rule used in the above analyses, I consider a monetary policy regime of strict inflation targeting ($\mu_2 = 0.0$), a monetary policy regime in which the central banks react strongly to the output gap ($\mu_2 = 3.0$), and a monetary policy regime in which the central banks respond to real exchange rate fluctuations. In the latter monetary policy regime, I add a term $\mu_4 \hat{q}_t$ to the Taylor rule given in Eq. (16), where the coefficient μ_4 assumes the numerical value $\mu_4 = 0.15$ ($\mu_4 = -0.15$) in the Taylor rule describing Home (Foreign) monetary policy. A similar monetary policy rule has been studied, e.g., by Ball (1999).

The results of the numerical simulations are given in Table 2. Panel A contains the simulation results for the case $\rho = 5.0$ and Panel B gives the simulation results for the case $\rho = 0.5$.

— Insert Table 2 about here.—

The message conveyed by the table is that the main result derived in this paper does not depend on the specific parameterization of the monetary policy rule. In all cases considered in the table, higher capital mobility increases the effectiveness of monetary policy if the Marshall-Lerner condition is satisfied. In contrast, higher capital mobility diminishes the effectiveness of monetary policy if the elasticity of substitution between Home and Foreign goods is so small that the Marshall-Lerner condition is not satisfied.

4. Conclusions

In recent years, resorting to the class of so called NOEM models in the tradition of the model developed by Obstfeld and Rogoff (1995) has become a popular way of analyzing the effectiveness of macroeconomic policies in open economies. The approach taken in the NOEM literature differs radically from that of the traditional Mundell-Fleming model in that it allows policy issues to be analyzed by means of full-fledged micro-founded dynamic general equilibrium models. Despite the differences, NOEM models and the Mundell-Fleming model share some implications. The NOEM model analyzed in this paper and the Mundell-Fleming model have in common that they predict that a higher degree of international capital mobility enhances the short-run effectiveness of monetary policy in open economies only if the Marshall-Lerner condition holds.

The key feature of the NOEM model studied in this paper is that the elasticity of substitution between goods produced in different countries can be different from the elasticity of substitution between goods produced in the same country. The results of numerical simulations showed that higher capital mobility increases the effectiveness of monetary policy if the elasticity of substitution between goods produced in different countries exceeds unity, implying that the Marshall-Lerner condition holds. Thus, as in the Mundell-Fleming model, the Marshall-Lerner condition turned out to be an important determinant of the implications of international financial market integration for the effectiveness of monetary policy in open economies.

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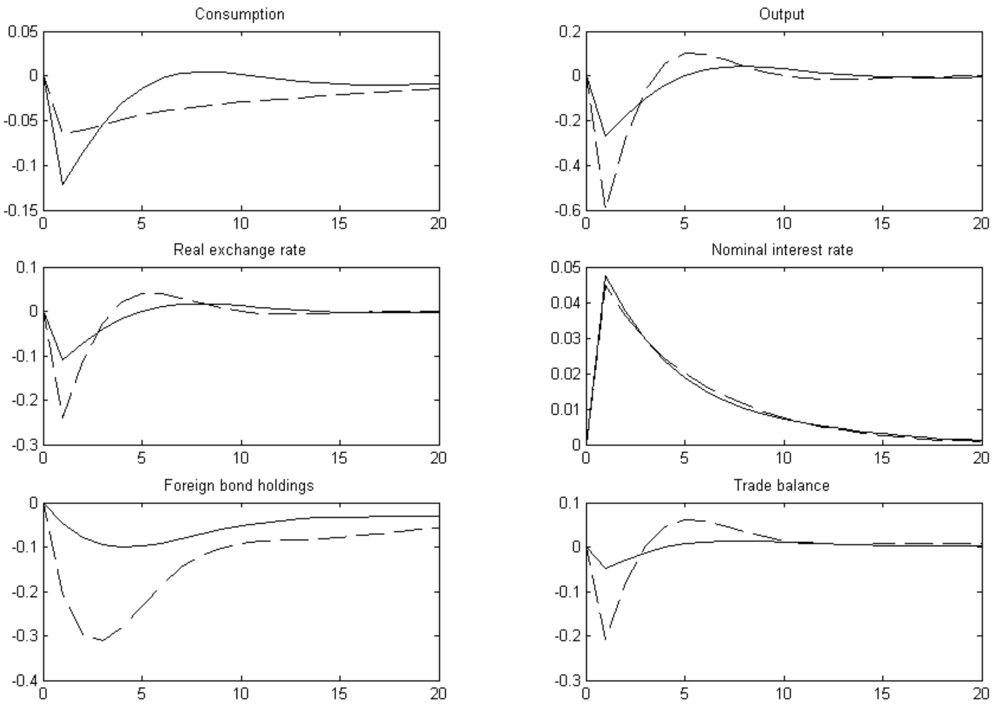
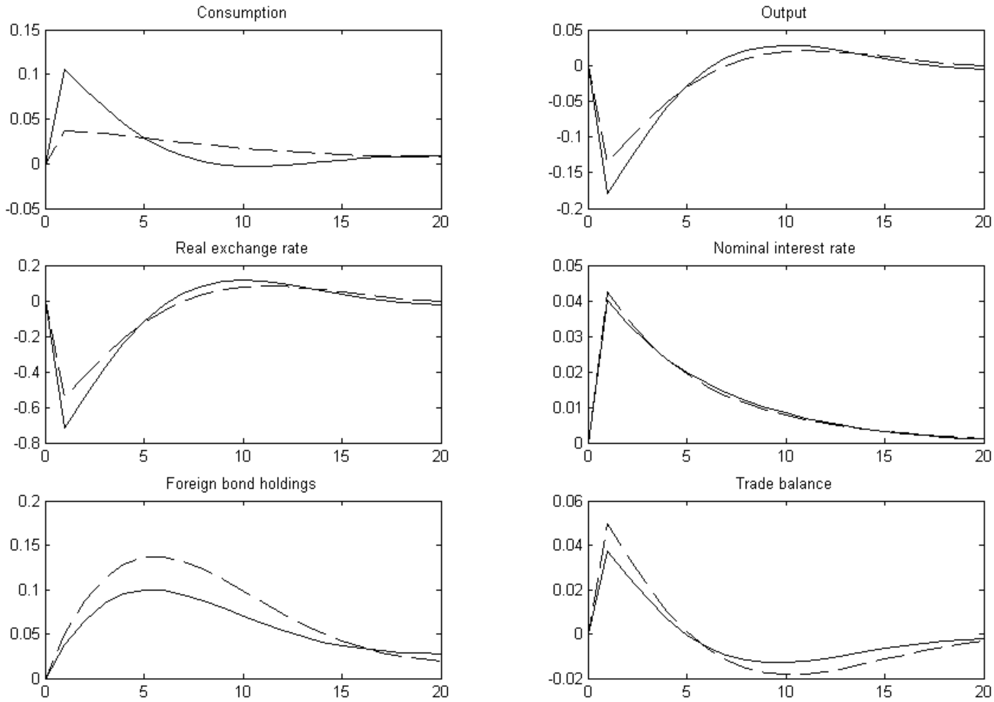
Figures and Tables

Figure 1 – International capital mobility and the dynamic macroeconomic effects of a unit monetary policy shock ($\rho > 1$)



Note: Dashed lines obtain when setting $\psi_1 = 0.0$ and solid lines obtain when setting $\psi_1 = 5.0$. The elasticity of substitution between Home and Foreign goods assumes the value $\rho = 5.0$. Consumption, output and the real exchange rate are measured as percentage deviations from the steady state. Bond holdings are measured as percentage deviations from the steady state consumption level. The interest rate is measured in terms of percentage point deviations from the steady state.

Figure 2 – International capital mobility and the dynamic macroeconomic effects of a unit monetary policy shock ($\rho < 1$)



Note: Dashed lines obtain when setting $\psi_1 = 0.0$ and solid lines obtain when setting $\psi_1 = 5.0$. The elasticity of substitution between Home and Foreign goods assumes the value $\rho = 0.5$. Consumption, output and the real exchange rate are measured as percentage deviations from the steady state. Bond holdings are measured as percentage deviations from the steady state consumption level. The interest rate is measured in terms of percentage point deviations from the steady state.

Table 1 — The calibrated parameters

Parameter	*Value*	*Description*
β	1/1.05	Subjective discount factor
σ	0.75	Intertemporal elasticity of substitution
ρ	5.0 (0.5)	Elasticity of substitution between Home and Foreign goods if the Marshall-Lerner condition holds (does not hold)
μ	1.4	Labor supply elasticity
Ψ	0.02	Output-gap coefficient in price-setting equation
ψ_1	5.0 (0.0)	First component of costs for undertaking positions in international financial market in the case of low (high) capital mobility
ψ_2	0.05	Second component of costs for undertaking positions in international financial market
n	0.5	Country size
σ_r	0.002	Standard deviation of the monetary policy shock
μ_1	0.5	Weight on inflation in the monetary policy rule
μ_2	0.25	Weight on the output gap in the monetary policy rule
μ_3	0.8	Interest rate smoothing parameter in the monetary policy rule

Note: The habit persistence parameter and the output-gap coefficient in the price-setting equation are taken from McCallum (2001). The parameters of households' period-utility function are as in Sutherland (1996).

Table 2 — Capital Mobility and the Effectiveness of Monetary Policy in Alternative Monetary Policy Regimes

	Low capital mobility	High capital mobility
	Panel A ($\rho = 5.0$)	
Model 1	0.0704	0.1368
Model 2	0.0721	0.1416
Model 3	0.0689	0.1323
Model 4	0.0694	0.1359
	Panel B ($\rho = 0.5$)	
Model 1	0.0521	0.0409
Model 2	0.0531	0.0413
Model 3	0.0512	0.0402
Model 4	0.0495	0.0392

Note: The table reports standard deviations for Home output for alternative Taylor-rule specifications. To compute the standard deviations, 100 time series of the endogenous variables of the model were generated, each time series consisting of 500 observations. In the simulations it was assumed that Home and Foreign monetary policy shocks are perfectly asymmetric. To simulate the models with a low (high) degree of international capital mobility, it was assumed that $\psi_1 = 5.0$ ($\psi_1 = 0.0$). The Taylor-rule specifications considered in the table are:

– In *Model* 1, the Home and the Foreign central bank set the nominal interest rate according to the Taylor rule $\hat{R}_t = (1-0.8)[1.5\,d\hat{P}_t + 0.25\hat{y}_t] + 0.8\hat{R}_{t-1}$. The numerical values of the structural parameters of the model are as given Table 1.

– *Model* 2 differs from *Model* 1 in that the Home and the Foreign central bank follow a policy of strict inflation targeting. The Taylor rule is, thus, of the form: $\hat{R}_t = (1-0.8)[1.5\,d\hat{P}_t + 0.0\hat{y}_t] + 0.8\hat{R}_{t-1}$.

– *Model* 3 differs from *Model* 1 in that it is assumed that the weight on the output gap in the Taylor rule is relatively high. The Taylor rule is given by: $\hat{R}_t = (1-0.8)[1.5\,d\hat{P}_t + 3.0\hat{y}_t] + 0.8\hat{R}_{t-1}$

– In *Model* 4, the Home and the Foreign central bank set the nominal interest rate according to the Taylor rule: $\hat{R}_t = (1-0.8)[1.5\,d\hat{P}_t + 0.25\hat{y}_t] + 0.8\hat{R}_{t-1} - 0.15\hat{q}_t$, where $\hat{q}_t$ denotes the real exchange rate defined as $\hat{q} \equiv \hat{s} + \hat{p}_t^f * - \hat{p}_t^h$.