Financial market integration, labor markets, and macroeconomic policies

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Abstract

We used a dynamic two-country optimizing model featuring a labor–market friction to analyze the implications of financial market integration for the propagation of macroeconomic policies in an open economy. Our main result is that the labor–market friction we analyzed substantially reduces the magnitude of the effect of financial market integration on the propagation of macroeconomic policies.

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1. Introduction

An important research question in international macroeconomics is how and to which extent financial market integration affects the propagation of macroeconomic policies in an open economy. For example, a core result derived from the classic models of Fleming (1962) and Mundell (1963) has been that, in a flexible exchange rate regime, the effect of monetary policy on output is an increasing function of financial market integration. In contrast, the effect of fiscal policy on output is a decreasing function of financial market integration. Conventional wisdom based on the Mundell–Fleming model, therefore, suggests that the degree of financial market integration should play an important role for the propagation of macroeconomic policies in an open economy.

In recent years, the so-called New-Open-Economy Macroeconomic (NOEM) models of the type developed by Obstfeld and Rogoff (1995) have largely replaced the Mundell–Fleming model as the major platform for the analysis of macroeconomic policies in an open economy. A major advantage of using a NOEM model to reassess the propagation of macroeconomic policies is that NOEM models are full-fledged micro-founded general equilibrium models. NOEM models, therefore, allow the intertemporal budget constraints and the dynamic optimization of the private sector to be taken into account when analyzing the effects of macroeconomic policies in an open economy.

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Sutherland (1996) has shown how the prototype NOEM model developed by Obstfeld and Rogoff can be extended to analyze in detail the implications of financial market integration for the propagation of macroeconomic policies. Sutherland has used his NOEM model to demonstrate that, as in the Mundell–Fleming model, financial market integration should increase (decrease) the short-run effect of monetary (fiscal) policy on output. In addition, he has used the microeconomic foundation of his NOEM model to study how financial market integration changes the way monetary policy and fiscal policy affect the intertemporal consumption decisions of households, their bond holdings and their labor supply decisions, and exchange rates and interest rates. Extensions of Sutherland’s model have been analyzed, for example, by Senay (1998) and Pierdzioch (2005).

Our research is motivated by the observation that a key feature of the classic Mundell–Fleming model is the underutilization of resources and, therefore, the existence of labor–market frictions that give rise to equilibrium unemployment. In contrast, the NOEM models that have been recently used to reassess the link between financial market integration and the propagation of macroeconomic policies do not feature labor–market frictions. We, therefore, analyze how Sutherland’s results change when his model is extended to incorporate a labor–market friction. Recent research has shown that labor–market frictions tend to have important implications for the propagation of macroeconomic policies in micro-founded dynamic general equilibrium models (Walsh, 2005).

The specific labor–market friction that we analyzed is built on the assumption that households incur costs when going to work. The analysis of the implications of such costs for households’ labor supply decisions has a long tradition in labor economics (Cogan, 1981). Costs of going to work capture the fact that households, for example, must organize child care and incur transportation and commuting costs when going to work. When households incur such costs, households adjust their labor supply along both the intensive margin (units of labor supplied) and the extensive margin (labor-force participation). In the NOEM models of Sutherland (1996) and his successors, macroeconomic policies only trigger adjustments along the intensive margin.

In qualitative terms, our results corroborate the results documented by Sutherland (1996). For example, our model implies that the effect on output of monetary (fiscal) policy is an increasing (decreasing) function of financial market integration. In quantitative terms, however, our results suggest that, when households’ costs of going to work increase, the effects of financial market integration on the propagation of macroeconomic policies in open economies become substantially smaller. Thus, our results suggest that modeling the interaction of labor–market frictions and financial market integration should be important for assessing the magnitude of changes in the propagation of macroeconomic policies that take place when the world’s financial markets become increasingly more integrated.

We organize the remainder of this paper as follows. In Section 2, we lay out the NOEM model we used to derive our results. The basic structure of our NOEM model resembles the structure of Sutherland’s (1996) model. In Section 3, we report results of numerical simulations of the model. In Section 4, we offer some concluding remarks.

2. The Model

The world is made up of two countries of equal size. Each country is populated by a continuum of infinitely lived utility-maximizing households. Households form rational expectations. Firms produce differentiated traded goods that are sold in a monopolistically competitive goods market. The only production factor is labor.

2.1. Households’ preferences

Households are large in the sense that they consist of a large number of members. The proportion \( e_t \) of members participates in the work force, and the proportion \( 1 - e_t \) does not participate (Dotsey & King, 2006). Some members do not participate in the work force because households incur costs when going to work. The convex cost function is of the format \( \phi(e) = \alpha e^{\omega}/\omega \), where \( \alpha > 0 \) and \( \omega > 1 \). The costs are denominated in terms of consumption. Households maximize

\[
U_t = \mathbb{E}_t \sum_{s=t}^{\infty} \beta^{s-t} \left[ e_s u(C_s^e, N_s) + (1 - e_s)u(C_s^n, 0) + v(M_s/P_s) \right],
\]  

(1)
with $0<\beta<1$. $E_t$ denotes the conditional expectation operator, $C_t$ ($C_t^*$) denotes real consumption of the members of the household who (do not) participate in the work force and supply $N_t$ ($0$) units of labor, and $M_t/P_t$ denotes real money holdings. Felicity is defined as

$$
u(C_t, N_t) = \frac{\sigma}{\sigma - 1} \left( C_t \right)^{\frac{1}{\mu}} - \frac{1}{\mu} N_t^{\mu},$$

$$v(M_t/P_t) = \frac{1}{(1 - \varepsilon)} \left( M_t/P_t \right)^{1 - \varepsilon},$$

where $\sigma > 0$, $\mu > 1$, $\chi > 0$, and $\varepsilon > 0$. Real consumption is defined as the usual CES index of differentiated goods $c_t(z)$, $z \in [0, 1]$, where the elasticity of substitution is given by $\theta > 1$. The consumer price index, $P_t$, is defined as the minimum expenditure required to buy one unit of $C_t$. The optimal consumption allocation is given by $c_t(z) = \left[ \frac{P_t(z)}{P_t^*} \right]^{\theta} C_t$, where $p_t(z)$ denotes the price of good $z$.

There are no transaction costs for transporting goods across countries. With households’ preferences being the same across countries, these assumptions imply that both the law of one price and purchasing power parity hold, the latter being defined as $P_t = S_t P_t^*$, where $P_t^*$ denotes the aggregate foreign price index and $S_t$ denotes the price of a unit of foreign currency in terms of units of domestic currency.

2.2. The structure of financial markets

In order to analyze the implications of financial market integration for the propagation of macroeconomic policies, we assumed that households have free access to the domestic market for nominal risk-free one-period bonds, but incur intermediation costs when trading in foreign bonds. As in Sutherland (1996), the real intermediation costs are given by $Z_t = 0.5 \psi I_t^2$, where $\psi > 0$ and $I_t$ denotes the level of real funds that households transfer abroad. The dynamics of households’ holdings in domestic bonds are given by

$$D_t = (1 + R_{t-1}) D_{t-1} + M_t - M_t + e_t w_t N_t - e_t P_t C_t^* - (1 - e_t) P_t C_t^* - P_t I_t - P_t Z_t + \Pi_t + P_t T_t - P_t \phi(e),$$

where $D_t$ denotes the quantity of domestic nominal bonds, $R_t$ denotes the nominal interest rate, $T_t$ denotes real lump-sum transfers, $w_t$ denotes the nominal wage rate, and $\Pi_t$ denotes the profit income the households receive from firms. The dynamics of households’ holdings in foreign bond, $F_t$, are given by

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

where $R_{t-1}^*$ denotes the foreign nominal interest rate.

2.3. First-order conditions

Households maximize their intertemporal utility function given in Eq. (1) subject to the budget constraint given in Eq. (2) and the dynamics of holdings in foreign bonds given in Eq. (3). The first-order conditions for this maximization problem are given by

$$e_t (C_t^*)^{-1/\sigma} - \lambda_t e_t P_t = 0,$$

$$\frac{(1 - e_t)}{(C_t^*)^{1/\sigma}} - \lambda_t (1 - e_t) P_t = 0,$$

$$-e_t N_t^{\mu - 1} + \lambda_t e_t w_t = 0,$$

$$\lambda_t \left( M_t/P_t \right)^{\varepsilon} \frac{1}{P_t} - \lambda_t + \beta E_t \lambda_{t+1} = 0,$$

$$(1 + R_t) \beta E_t \lambda_{t+1} - \lambda_t = 0,$$
\[
\dot{\lambda}_t S_t - \beta (1 + R^*_t) E_t (\dot{\lambda}_{t+1} S_{t+1}) + \psi \dot{\lambda}_t S_t I_t - \beta (1 + R^*_t) \psi E_t (\dot{\lambda}_{t+1} S_{t+1} I_{t+1}) = 0,
\]

(9)

\[
\frac{\sigma}{\sigma - 1} \left( \left( C^0_t \right)^{\frac{1}{1+\rho}} - \left( C^1_t \right)^{\frac{1}{1+\rho}} \right) - \frac{1}{\mu} N^0_t + \dot{\lambda}_t \left( w_t N_t - P_t C^0_t + P_t C^\alpha_t - P_t \sigma \xi^0_t \right) = 0,
\]

(10)

where \( \dot{\lambda}_t \) denotes the Lagrange multiplier.

2.4. Price setting

The production function of firms is given by \( y_t(z) = e_t N_t(z) \). Their demand curve is given by \( y_t(z) = \left( \frac{p_t(z)}{P_t} \right)^{\gamma t} Q_t \), where \( Q_t \) denotes the total world demand. As in Calvo (1983), firms can change in every period the price of their good with probability \( b(1 - \gamma) \). Therefore, firms set prices of goods so as to maximize the expected present discounted value of current and future real profits. Defining \( R^{*s} = \prod_{s=1}^t d_s \) and \( d_t = 1/(1 + R_t) \), profit maximization implies

\[
p_t(z) = \left( \frac{\theta}{\theta - 1} \right) \frac{E_t \sum_{s=1}^{\infty} \gamma^{t-s} R^{*s} (Q_s/P_s) (1/P_s)^{\gamma t} w_s}{E_t \sum_{s=1}^{\infty} \gamma^{t-s} R^{*s} (Q_s/P_s) (1/P_s)^{\gamma t}}.
\]

(11)

2.5. The government sector

The government sector consists of a single central bank and a fiscal authority. The budget constraint of the fiscal authority is given by

\[
P_t G_t = M_t - M_{t-1} - P_t T_t.
\]

(12)

Money supply and government spending, \( G_t \), evolve according to first-order autoregressive processes with persistence parameter \( \phi \in [0, 1] \).

2.6. Solution and calibration of the model

We log-linearized the model around a symmetric flexible-price steady state in which bond holdings and government spending in the domestic and foreign country are zero. We then simulated the calibrated model using the algorithm developed by Klein (2000) and McCallum (2001). Our calibration of the model is identical to the one used by Sutherland (1996) in order to facilitate comparisons of our results with his results (Table 1). As regards the calibration of the cost function, \( \phi \), we assumed \( \alpha = 1 \) and \( \omega = 1.5 \), implying a steady-state labor-force participation of 67%. In Section 3, we shall analyze the robustness of our simulation results to changes in the calibration of the model.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The calibrated parameters</th>
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<tr>
<td>Parameter</td>
<td>Value</td>
</tr>
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<td>( \beta )</td>
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</tr>
<tr>
<td>( \sigma )</td>
<td>0.75</td>
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<tr>
<td>( \theta )</td>
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</tr>
<tr>
<td>( \mu )</td>
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<tr>
<td>( \varepsilon )</td>
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</tr>
<tr>
<td>( \psi )</td>
<td>5 (0)</td>
</tr>
<tr>
<td>( \gamma )</td>
<td>0.5</td>
</tr>
<tr>
<td>( \eta )</td>
<td>0.5</td>
</tr>
<tr>
<td>( \phi )</td>
<td>1.0</td>
</tr>
<tr>
<td>( z )</td>
<td>1.0</td>
</tr>
<tr>
<td>( \omega )</td>
<td>1.5</td>
</tr>
</tbody>
</table>
3. Simulation results

In order to analyze how financial market integration affects the propagation of macroeconomic policies, we followed Sutherland (1996) and analyzed a monetary policy shock and a fiscal policy shock that are permanent and

![Fig. 1. Monetary and fiscal policy with high and with low capital mobility. Note: solid (circled) lines obtain when the degree of capital mobility is low (high). All variables are measured as percentage deviations from the steady state.](image)
perfectly negatively correlated across countries. Fig. 1 illustrates that our results are qualitatively similar to those reported by Sutherland.

In order to explain our results, we start with the analysis of monetary policy. Monetary policy, as represented by a unit increase in money supply, results in a depreciation of the nominal exchange rate. Because prices of goods adjust sluggishly, the depreciation of the nominal exchange rate gives rise to an increase in the terms of trade. This increase results in an expenditure switching effect, which, in turn, results in an increase in output. As prices of goods adjust, the effect of monetary policy on output decreases. When financial markets are integrated, the temporary stimulating effect of monetary policy on output also increases. The reason for this is that, when financial markets are integrated, monetary policy strongly affects the nominal exchange rate. Because the short-run effect of monetary policy on output exceeds the effect in the long run, households start accumulating foreign bonds.

The increase in output caused by monetary policy is accompanied by an increase in both the units of labor that households supply and their labor-force participation. Households adjust the units of labor they supply in order to assure that the disutility of adjusting along the intensive margin is just equal to the utility value of the additional income \((-u_N=(w/P)(u_C)).\) Moreover, households adjust their labor-force participation in order to balance the disutility of adjusting along the extensive margin to the utility value of the additional income \((u_C(\rho e−(u(C^*,N)−u(C^*,0)))=u_C((w/P)N).\) This also implies that the disutility of adjusting along the intensive margin is just equal to the disutility of adjusting along the extensive margin times the units of labor supplied.

Fiscal policy, as represented by a unit increase in government spending, implies that households reduce consumption. The reduction in consumption reflects that the government finances the increase in government spending by lump-sum taxation. The cross-country asymmetry of the change in government expenditure implies that consumption at home decreases and consumption abroad increases. As a result, money demand decreases at home and increases abroad, requiring the exchange rate to depreciate. The resulting change in the terms of trade, in turn, gives rise to an increase in output. Output also expands because the increase in taxes reduces households’ wealth. Given the adverse wealth effect, households expand labor supply along the extensive and intensive margin. Hence, the units of labor that households supply and their labor-force participation increase. As in the case of monetary policy, households balance the disutility of adjusting along the intensive margin to the disutility of adjusting along the extensive margin times the units of labor supplied.

Figs. 2 and 3 illustrate that, when financial markets are integrated, increasing the costs households incur when going to work, as measured in terms of parameter \(\alpha,\) hardly changes the magnitude of the short-run effects of monetary policy and fiscal policy on key macroeconomic variables (output, consumption, labor-force participation, units of labor supplied, exchange rate, holdings in foreign bonds). However, when financial markets are imperfectly integrated, increasing the households’ costs of going to work has a noticeable effect on the short-run effects of monetary policy and fiscal policy. Moreover, the differences between the short-run effects of monetary policy and fiscal policy in a world with integrated financial markets and a world with imperfectly integrated financial markets tend to decrease as the households’ costs of going to work become larger.

In a world with imperfectly integrated financial markets, consumption smoothing is costly and consumption closely tracks output. This implies that the variation in the marginal utility of consumption is larger in a world with imperfectly integrated financial markets than in a world with integrated financial markets. At the same time, steady-state labor-force participation decreases when the costs of going to work increase. Thus, in the steady state, the households’ marginal costs of adjusting labor supply along the extensive margin, \(\phi_e,\) are relatively low. The result is that, when the households’ costs of going to work are large, a given variation in the marginal utility of consumption \(ceteris paribus\) results in a larger change in labor-force participation, and, for households’ first-order conditions to hold, in the units of labor supplied. This result holds irrespective of whether financial markets are integrated. However, in a world with imperfectly integrated financial markets, the variation in the marginal utility of consumption is relatively large, implying that an increase in the households’ costs of going to work transmits into a larger change in labor-force participation. Because households balance the disutility of adjusting along the intensive margin to the disutility of adjusting along the extensive margin, this triggers a relatively large change in the units of labor supplied.

To sum up, the main result illustrated by Figs. 2 and 3 is that the interaction of a labor–market friction in the form of costs of going to work and financial market integration has substantial quantitative implications for the propagation of macroeconomic policies in an open economy. The differences between the short-run effects of macroeconomic policies in a world with imperfectly integrated financial markets and a world with integrated financial markets decrease as the costs households incur when going to work increase.
Fig. 2. Labor–market friction, financial market integration, and the propagation of monetary policy. Note: the figure summarizes on the vertical axis the short-run effects on key macroeconomic variables of a unit asymmetric permanent monetary policy shock. All macroeconomic variables are measured as percentage deviations from the steady state. Parameter $\alpha$ is shown on the horizontal axis. The column on the left-hand side shows the results for a world with integrated financial markets. The middle column shows the results for a world with imperfectly integrated financial markets. The column on the right-hand side shows the difference between the results shown in the column on the left-hand side and the middle column. To generate the figure, parameter $\alpha$ was changed in discrete steps. The resulting short-run effects of macroeconomic policies were then transformed into a continuous function by fitting a third-order polynomial.
Fig. 3. Labor–market friction, financial market integration, and the propagation of fiscal policy. Note: the figure summarizes on the vertical axis the short-run effects on key macroeconomic variables of a unit asymmetric permanent fiscal policy shock. All macroeconomic variables are measured as percentage deviations from the steady state. Parameter $\alpha$ is shown on the horizontal axis. The column on the left-hand side shows the results for a world with integrated financial markets. The middle column shows the results for a world with imperfectly integrated financial markets. The column on the right-hand side shows the difference between the results shown in the column on the left-hand side and the middle column. To generate the figure, parameter $\alpha$ was changed in discrete steps. The resulting short-run effects of macroeconomic policies were then transformed into a continuous function by fitting a third-order polynomial.
Fig. 4. Results of robustness checks. Note: the figure summarizes on the vertical axis the difference between the short-run output effects of a unit asymmetric permanent monetary policy and fiscal policy shock in a world with integrated financial markets and a world with imperfectly integrated financial markets. Output is measured as percentage deviations from the steady state. Parameter $\alpha$ is shown on the horizontal axis. To generate the figure, parameter $\alpha$ was changed in discrete steps. The resulting short-run effects of macroeconomic policies were then transformed into a continuous function by fitting a third-order polynomial.
We analyzed the robustness of our main result to empirically plausible changes in the calibration of the model. To this end, we changed the calibration of the parameter, \( \omega \), that governs the convexity of the cost function, \( \phi(e) \). We also changed the calibration of the probability, \( 1 - \gamma \), that firms can change the price of their good. In addition, we changed the calibration of the intertemporal elasticity of substitution, \( \sigma \), the calibration of the elasticity of substitution, \( \theta \), between differentiated goods, and the calibration of the elasticity of labor supply, \( \mu \). We changed the calibration of one parameter at a time, fixing the other parameters at their benchmark values given in Table 1. The results of the robustness checks are summarized in Fig. 4. This figure shows, as a function of parameter \( \alpha \), the difference between the short-run output effects of monetary policy and fiscal policy in a world with integrated financial markets and a world with imperfectly integrated financial markets. Corroborating the results summarized in Figs. 2 and 3, the difference becomes smaller as the households’ costs of going to work, measured in terms of parameter \( \alpha \), increase. It follows that the main result of our analysis is robust to changes in the calibration of our model.

4. Conclusions

We have used a NOEM model featuring a labor–market friction to analyze how financial market integration affects the propagation of macroeconomic policies in an open economy. In qualitative terms, our results confirm results that have been derived in the earlier literature based on the Mundell–Fleming and NOEM models. In quantitative terms, however, our results suggest that the labor–market friction we analyzed implies that the magnitude of the effects of financial market integration on the propagation of macroeconomic policies becomes substantially smaller than in an open economy without a labor–market friction.

Of course, before general policy-relevant conclusions can be drawn from the type of analysis we have undertaken in this paper, much more research on the link between labor markets, financial market integration, and the propagation of macroeconomic policies needs to be done. For example, the labor–market friction we built into our NOEM model is a simple one. This assured that our results are directly comparable to results derived in the earlier NOEM literature. Interesting additional insights could be gained by extending our model to incorporate richer labor–market frictions like, for example, search frictions.

References