Journal of Development Economics 102 (2013) 128–147

Contents lists available at SciVerse ScienceDirect

Journal of Development Economics

journal homepage: www.elsevier.com/locate/devec

# Monetary and exchange rate policy under remittance fluctuations ☆

Federico S. Mandelman *

*Federal Reserve Bank of Atlanta, Research Department, 1000 Peachtree Street, N.E., Atlanta, GA 30309-4470, United States*

ARTICLE INFO

*Article history:*
Received 30 June 2011
Received in revised form 27 January 2012
Accepted 14 February 2012

*JEL classification:*
F40
F41
O10

*Keywords:*
Remittances
Small open economy
Exchange rate regimes

ABSTRACT

Using data for the Philippines, I develop and estimate a heterogeneous agent model to analyze the role of monetary policy in a small open economy subject to sizable remittance fluctuations. I include "rule-of-thumb" households with no access to financial markets and test whether remittances are countercyclical and serve as an insurance mechanism against macroeconomic shocks. When evaluating the welfare implications of alternative monetary rules, I consider both an anticipated large secular increase in the trend growth of remittances and random cyclical fluctuations around this trend. In a purely deterministic framework, a nominal fixed exchange rate regime avoids a rapid real appreciation and performs better for recipient households facing an increasing trend for remittances. A flexible floating regime is preferred when unanticipated shocks driving the business cycle are also part of the picture.



## 1. Introduction

Money that migrants send home is playing an increasing role in many countries and dramatically changing the composition of international financial flows. To put some numbers: net private capital flows to developing countries (including FDI, portfolio equity and private debt) reached $707bn in 2008, just below the average of $793bn for the period from 2004 to 2008.[1] In the same year, workers' remittances to these countries accounted for $338bn. That is, remittances represented the equivalent of 48% of total net private capital flows to emerging economies. These data cover not only low income countries but also lower and upper middle income countries (144 in total). In addition, these numbers only account for recorded remittance flows and fail to take into account informal money transfers, which are believed to be sizable.

Particularly impressive is the growth of remittances in the past few years. For instance, remittances to this group of countries accounted for less than $85bn in 2000. This phenomenon is closely associated with an increase in migration flows, widespread capital account liberalization and, in particular, technological advances in communications that facilitate international money transfers. Similarly impressive is the volatility of these financial flows. After growing at double digit rates, the financial flows came to a stall in the aftermath of the global financial crisis, falling 5.5% in 2009 but rapidly recovering in 2010.

All this evidence suggests that different monetary and exchange rate arrangements can play an important role in countries prone to receiving remittances that increase at a breakneck pace and also are very volatile. However, most of the existing research on remittances has predominantly focused on microeconomic aspects. In particular, no research studies the macroeconomic dynamics and welfare implications of different monetary and exchange rate arrangements under remittance fluctuations.

In this paper, I develop and estimate a dynamic stochastic general equilibrium (DSGE) model using data for the Philippines for the period from 1995 to 2009. The Philippines is a particularly interesting case study. One of the most populated countries in the world (92m approx.), remittances now account for about 11% of total GDP there, posting a 431% increase in real terms during the last 15 years. The country is characterized for having a floating exchange regime with highly volatile remittances but relative macroeconomic stability, and the data available cover remarkable episodes including the 1998 Asian panic episode and the recent global financial crisis.

In the model, I consider heterogeneous households to account for the empirical evidence that highlights the potential insurance role of remittances. Namely, I include two groups which are respectively defined as "Ricardian" and "rule-of-thumb" households. The first group is integrated to the financial markets where they can intertemporally self-insure. The remaining households consume all of their income

☆ I thank Kaivan Munshi and Hillel Rapoport (the editors), two anonymous referees, Jeffrey Frankel and seminar participants at the Fourth Migration and Development Conference, American University at Sharjah, California State University at Fullerton and San Diego State University for helpful comments. The views expressed here are those of the author and do not necessarily reflect those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. The usual disclaimer applies.

* Tel.: +1 404 498 8785.
*E-mail address:* Federico.Mandelman@atl.frb.org.

[1] See World Bank Global Development Finance, 2009.

0304-3878/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
doi:10.1016/j.jdeveco.2012.02.006

every period, which is made of wages and remittances. For the last group, data confirm that migrants appear to be altruistic as they send countercyclical remittances that are useful for households' consumption smoothing. In turn, the model microfoundations justify this pattern.

Finally, I perform a welfare analysis of different policy arrangements. Here, not only do I consider remittance fluctuations triggered by stochastic shocks working at business cycles fluctuations, but also long-run anticipated permanent changes in remittances that affect the balanced-growth path of the economy (and thus the equilibrium level of the real exchange rate). The idea here is to capture the large secular increase in the trend growth of remittances and the transitory fluctuations around this stable trend. Results indicate that, absent business cycles fluctuations, a nominal fixed exchange rate regime avoids a rapid real appreciation and performs better for recipient households facing an increasing trend for remittances. However, a floating regime is preferred when macroeconomic disturbances driving the business cycle are also in place.

This paper is related to models that include remittances in DSGE frameworks (Acosta et al., 2009; Chami et al., 2006; Durdu and Sayan, 2010; Mandelman and Zlate, 2010; Vacaflores and Jansen, 2009). Essentially, these are real models where prices are completely flexible, and thus monetary and exchange rate policies play no meaningful stabilization roles.[2] The study is related to Ravenna and Natalucci (2008), which introduces anticipated productivity shocks that permanently affect the balanced-growth path; and to Galí et al. (2004), which studies the role of rule-of-thumb consumers in the design of monetary policy rules. Empirical studies that are related to this paper include Yang (2008), which shows that positive shocks affecting the exchange rate in countries where Filipino workers reside can result in an increase in remittances that alleviate liquidity constrained recipient households. This increase in remittances leads to an increase in education and a reduction in child labor. Singer (2010) finds that remittances increase the likelihood that policy makers adopt fixed exchange rate regimes. Finally, Yang and Choi (2007) document the insurance role of remittances in response to negative shocks in the Philippines, while Amuedo-Dorantes and Pozo (2006) and Frankel (2010) find similar results for Mexico and a large set of countries, respectively.

The rest of the paper is organized as follows. Section 2 presents the model, including an extension with Greenwood–Hercowitz–Huffman (GHH) preferences that suppresses the wealth effect of remittances. Section 3 presents the data and proceeds with the Bayesian estimation. Section 4 discusses the model fit and the role of remittances. Section 5 discusses the relative empirical importance of various shocks. Section 6 quantifies the effect of transitory shocks. Section 7 presents a historic evaluation of the Philippines' data. Section 8 introduces permanent shocks and performs the welfare analysis, followed by the conclusion in Section 9.

## 2. Model

The baseline model is a small open-economy framework with monopolistic competition and nominal rigidities. The novel feature is the inclusion of heterogeneous households and remittances.

### 2.1. Households

I assume a continuum of infinitely-lived households indexed by $i \in [0,1]$. A fraction $1-\lambda$ of households have access to capital markets where they can trade deposits in the local financial system and foreign securities. I refer to this subset of households as Ricardian (or optimizing). The remaining fraction $\lambda$ of households neither own any assets nor have any liabilities. Rather the households just consume their current disposable income made of labor income and remittances. I refer to them as rule-of-thumb consumers.

#### 2.1.1. Ricardian households

The household's utility function is represented by a Cobb–Douglas specification featuring an endogenous subjective rate of time preference and given by:

$$E_0\left\{\sum_{t=0}^{\infty}\exp\left[-\sum_{\tau=0}^{t-1}\kappa\log\left(1+\left(C_{i,t}^{o}\right)^{(1-\omega)}\left(1-L_{i,t}^{o}\right)^{\omega}\right)\right]u\left(C_{i,t}^{o},L_{i,t}^{o}\right)\right\},\quad u\left(C_{i,t}^{o},L_{i,t}^{o}\right) \quad (1)$$
$$=\frac{\left[\left(C_{i,t}^{o}\right)^{(1-\omega)}\left(1-L_{i,t}^{o}\right)^{\omega}\right]^{1-\gamma}-1}{1-\gamma}.$$

The budget constraint is:

$$C_{i,t}^{o}=\frac{W_t}{P_t}L_{i,t}^{o}+\Pi_{i,t}^{o}-\frac{D_{i,t+1}^{o}-(1+i_{t-1})D_{i,t}^{o}}{P_t}-\frac{S_tB_{i,t+1}^{o,*}-S_t(1+i_{t-1}^{*})B_{i,t}^{o,*}}{P_t}. \quad (2)$$

Henceforth, I use an "$o$" superscript to refer to optimizing households' variables. $C_{i,t}^{o}$ is a composite of tradable final consumption goods; $L_{i,t}^{o}$ is labor supply; $W_t$ denotes the nominal wage; $P_t$ is the consumer price index (CPI); $\Pi_{i,t}^{o}$ are real dividend payments from ownership of retail firms; $D_{i,t}^{o}$ are deposits in the local financial system and are denominated in domestic currency; $B_{i,t}^{o,*}$ are foreign nominal bonds in foreign currency; and $S_t$ the nominal exchange rate. $(1+i_t)$ and $(1+i_t^{*})=(1+i^{*})\varepsilon_t^{i^{*}}$ are the gross domestic and foreign nominal interest rates, where $\varepsilon_t^{i^{*}}$ is a foreign interest rate (country borrowing) shock.

In the utility specification, $\omega$ represents the weight of leisure and $\gamma$ is the inverse of the elasticity of inter-temporal substitution. This last parameter characterizes the sensitivity of consumption growth to the real interest rate. $\kappa$ is the elasticity of the subjective discount factor with respect to consumption.[3]

*2.1.1.1. Optimality conditions.* The optimality conditions for the consumption/saving decision and labor supply are conventional:

$$\exp\left[-\kappa\log\left(1+\left(C_{i,t}^{o}\right)^{(1-\omega)}\left(1-L_{i,t}^{o}\right)^{\omega}\right)\right]E_t\left[\frac{\varsigma_{i,t+1}^{o}}{\varsigma_{i,t}^{o}}(1+i_t)\frac{P_t}{P_{t+1}}\right]=1, \quad (3)$$

$$\frac{\omega}{1-\omega}\frac{C_{i,t}^{o}}{\left(1-L_{i,t}^{o}\right)}=\frac{W_t}{P_t}, \quad (4)$$

where $\varsigma_{i,t}^{o}$, the marginal utility of the consumption index, is: $\varsigma_{i,t}^{o}=(1-\omega)C_{i,t}^{o(\gamma-1)(\omega-1)-1}(1-L_{i,t}^{o})^{\omega(1-\gamma)}$.

[2] Chami et al. (2006) introduces a closed-economy flexible-price model with cash-in-advance constraints and shows that the presence of remittances alters the standard optimal Friedman Rule. In this model, unexpected inflation plays no other role than a lump-sum tax on financial wealth, which is an automatic absorber of unexpected innovations in the fiscal deficit. Vacaflores and Jansen (2009) extend this same framework to an open economy. My model is based in a New Keynesian framework where an independent central bank uses the interest rate as a policy rule to achieve macroeconomic stability and/or fulfill some exchange rate targets.

[3] In this model, the subjective discount factor is assumed to be decreasing in consumption. Put it differently, agents become more impatient the more they consume. Mendoza (1991) introduces this type of preferences, which plays a determinant role in small open economies that feature incomplete insurance markets, since foreign asset holdings diverge to infinity with the standard assumption of an exogenous rate of time preference. These preferences are particularly suitable for frameworks that aim to capture non-linear adjustments (Arellano and Mendoza, 2002), which are critical to assess the welfare implications of different monetary arrangements. I assume that the endogenous discount factor does not depend on the agent's own consumption and effort but on the average per capita level of these variables.