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## Discussion

Discussion on “gross capital flows: Dynamics and crises”  
by Broner, Didier, Erce, and Schmukler

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## 1. Introduction

International capital flows have always been an important topic in international economics. Capital flows help a country exploit better investment opportunity and smooth consumption. Over the past few years, global current account imbalances have been at the forefront of policy debates. Large amount of research devotes to the study of net capital flows, while fewer works put their focus on gross capital flows. This paper fills the gap.

This paper provides a systematic analysis over business cycle behavior of gross capital flows. It looks at 103 countries between 1970 and 2009. The countries are divided into three groups, lower-midder-income, upper-midder-income, and high-income countries. Three forms of capital flows are examined, direct investment, portfolio, and other investments. To study impact of crisis over gross capital flows, it also classifies financial crisis into different types: banking crisis, currency crisis, and domestic debt and external debt crisis.

The paper has the following key findings. First, both gross capital inflows and outflows increase relative to GDP trend over period of time. Second, gross flows are larger and more volatile than net flows. Third, gross inflows and outflows are positively correlated, especially for high-income countries. Lastly, both inflows and outflows are procyclical and shrink during crises. Decline of capital flows during crises is observed in all forms, direct investment, portfolio, and other investments.

Broner et al. raise a new challenge for the international literature. Standard international real business cycle model as in Backus et al. (1992) mostly has one asset and cannot address issues related to global capital flows. This paper calls for a unified theory to model gross capital flows and to account for the key findings in this paper. One candidate is the literature on portfolio choices. This literature mainly focuses on long-run composition of portfolios, the so-called home bias puzzle in asset. French and Poterba (1991) first pointed out American held roughly 94% of their equity wealth in the US stock market. Heathcote and Fabrizio (2007) give a review over the findings in this literature. Two exceptions, Hnatkovska (2010) and Tille and Wincoop (2010), study cyclicalities of gross capital flows. Their models, however, generate counterfactual capital flows as pointed out by Broner et al. In this discussion, I focus on new theories that have the potential to explain co-movement of capital inflows and outflows.

## 2. Potential theories

Here I sketch three new theories. These theories in design are aimed to explain other observations but all have the potential to account for dynamics of gross capital flows. The first one is a model with spillover of technology capital by McGrattan and Prescott (2010). Note that there are no frictions in this model. The second one is a model with financial frictions by Bianchi et al. (2012). The last one links capital flows with trade flows.

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### 2.1. A model with technology capital

McGrattan and Prescott (2010) develop a model with multinational firms and intangible capital. One important intangible capital is *technology capital* that can be used in multiple locations. Examples of technology capital include R&D and brands. Here I present a simpler version of McGrattan and Prescott (2010), assuming no taxes and debt flows and perfect financial integration. The output  $Y_j^i$  of a multinational firm from country  $j$  operating in country  $i$  in period  $t$  is given by

$$Y_{it}^j = A_{it}(M_{it}^j)^\phi [(K_{it}^j)^\alpha (L_{it}^j)^{1-\alpha}]^{1-\phi}$$

where  $A_{it}$  is the technology parameter of country  $i$ ,  $M_{it}^j$  is the technology capital used by multinationals from country  $j$ ,  $K_{it}^j$  is the capital input, and  $L_{it}^j$  is the labor input. Note that the multinational firm can use its technology capital  $M_{it}^j$  in multiple locations, and so  $M_{it}^j$  is independent of country  $i$  for  $i \neq j$ . The multinational firm from country  $j$  chooses inputs of labor, investment in tangible capital, and investment in technology capital to maximize its total dividend  $\sum_t p_t \sum_i D_{it}^j$ . Dividend from country  $i$  is given by

$$D_{it}^j = Y_{it}^j - W_{it}L_{it}^j - [K_{it+1}^j - (1-\delta)K_{it}^j] - X_{M,t}^j$$

where  $X_{M,t}^j$  denotes the investment for technology capital and  $W_{it}$  is the wage rate of country  $i$ . Technology capital evolves according to  $M_{t+1}^j = (1-\delta_M)M_t^j + X_{M,t}^j$  with  $\delta_M$  denoting the depreciation rate of technology capital. We can define foreign direct investment inflow and outflow of country  $i$  as

$$\text{FDI inflow} = \sum_{\ell \neq i} (K_{t+1}^i - K_{t+1}^\ell), \quad \text{FDI outflow} = \sum_{\ell \neq i} (K_{t+1}^\ell - K_{t+1}^i)$$

A positive productivity shock of country  $i$  (increase in  $A_{it}$ ) leads to both capital inflows and capital outflows. First, higher  $A_i$  generates capital inflows of country  $i$  because multinational firms across all the world inject capital to country  $i$  to chase the higher return in country  $i$ . Second, higher  $A_i$  leads to more investment in technology capital of multinational firms from country  $i$ . An increase in  $M^i$  has positive spillover effect and increases returns of subsidiaries in any country  $j$  of multinational firms from country  $i$ . Multinational firms from country  $i$  in turn increase their tangible investment worldwide. In summary, this model with spillover in technology capital has the potential to generate procyclical capital flows and the co-movement of capital inflows and outflows.

### 2.2. A model with sovereign debt and reserve

The recent work by Bianchi et al. (2012) provides another explanation on co-movement of capital inflows and outflows. Bianchi et al. (2012) incorporates foreign reserve into a sovereign default model with long-term bond. In the model, a sovereign government can issue long-term bond with the option of default. Default comes with penalties of output loss and denial of access to international financial market. The government can also save internationally with risk free rate. These foreign reserves cannot be seized by international lenders during default. A sovereign country faces income shock and sudden stop shock, under which the government cannot issue new long-term bond internationally.

The sudden stop shock generates rollover risk and thus gives the government incentives to hold both long-term bond and foreign reserves. As is in Arellano (2008), the government is less patient than lenders and would like to transfer future resources to the current period. To avoid the risk of sudden stop of transferring future resources to current, the government borrows long-term bonds and saves them into foreign reserves. This way, when bad time happens, the government can still use foreign reserves to smooth consumption.

Under a sudden stop shock, capital inflows decrease since foreign lenders refuse to purchase new debt issued by the government. At the same time, capital outflows also decrease as the government has to reduce foreign reserves and uses them for consumption smoothing. Thus retrenchment happens in both directions during crisis. Fig. 1 from Bianchi et al. (2012) shows co-movement of capital flows during crisis in both the model and the data. One caveat is that Bianchi et al. (2012) only includes part of the capital flows, debt and reserve, while the data includes other forms of capital flows like direct investment and equity.

### 2.3. A model linking capital flows with trade flows

Asset trade links with goods trade. If a home country exports more to a foreign country than the foreign country exports to the home country, the net differences must be paid by the foreign country with assets. In the data, export and import tend to co-move. For example, Alessandria et al. (forthcoming) document the correlation between import and export as 0.85 using the US quarterly data from 1995 to 2010. They extend the standard two-country model in Backus et al. (1992) with monopolistic competition and inventory. In their model, households derive utility from both home and foreign goods. The model generates positively correlated export and import with or without inventory. The intuition is clear. When home country experiences a positive productivity shock, its demand over imported foreign good increases due to income effect. Positive productivity shock also lowers the price of home exported good and boosts export. Hence import and export are positively correlated.

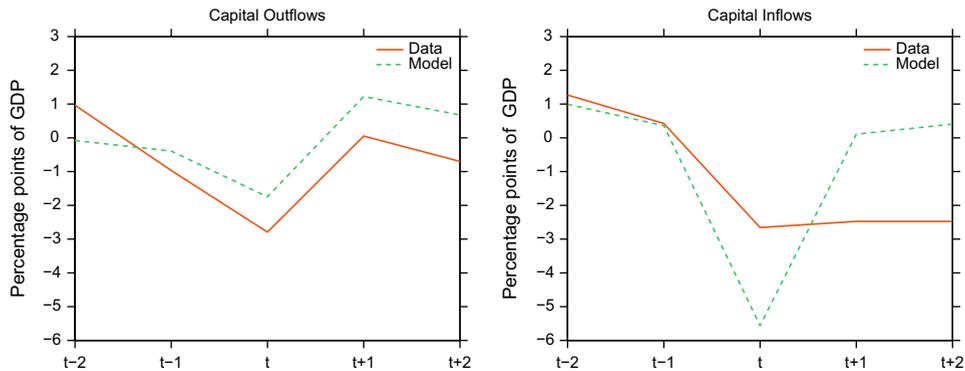


Fig. 1. Results from Bianchi et al. (2012).

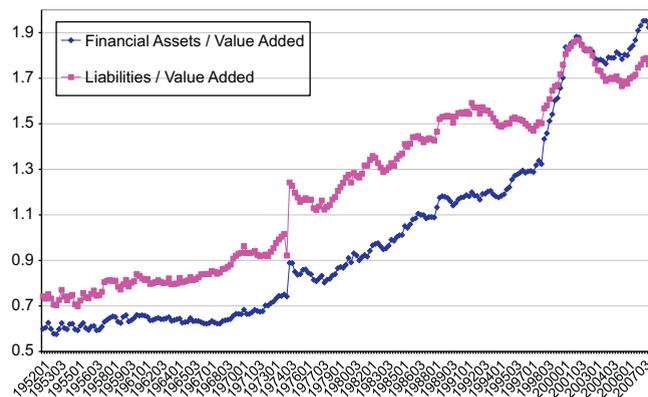


Fig. 2. Co-movement of assets and liabilities in US.

Co-movement of import and export can be transferred to co-movement of capital inflows and outflows through trade credit, i.e. financing by suppliers. Trade credit is one of the most important source of short-term financing for firms in the US. Petersen and Rajan (1997) document that trade credit, measured with account payable, composed of 11.6% of sales for Compustat firms. Obstfeld (1999) points out that short-term credit is the lifeblood of international trade. Suppose we supplement the model by Alessandria et al. (forthcoming) with trade credit: a fraction of export and import has to be financed through trade credit. According to double-entry bookkeeping of the Balance of Payment, an increase in export financed with trade credit shows up both in current account surplus and financial account deficit. It enters financial account deficit because foreigners purchase domestic assets through trade credit. This will be counted as capital outflows (COD) in Broner et al. Meanwhile, an increase in import shows up both in current account deficit and financial account surplus, which will be counted as capital inflows (CIF). Given that import and export are positively correlated, capital inflows and outflows also tend to be positively correlated.

The results in Table 3 in Broner et al. provide empirical evidence over this story. Table 3 shows that an increase in trade balance surplus, i.e. increase in export or decrease in import, is associated with a decrease in CIF and an increase in COD, for all income groups.

### 3. Conclusion

This paper raises a new challenge in the literature on international portfolio choices. It calls for new theories to account for both steady state and short-run behavior of portfolios. For steady state, the theory has to be able to solve the home bias puzzle in asset and get the observed composition of international portfolios. For short run, the theory has to be able to account for the business cycle dynamics of gross capital flows. The co-movement of gross capital flows has its counterpart within the domestic economy. Fig. 2 plots the financial assets and liabilities as a share of value added for the US corporate sector. The data series are from flow of funds. These two series also co-move together. The theory on gross international capital flows would shed light on co-movement of asset and liabilities in the US.

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