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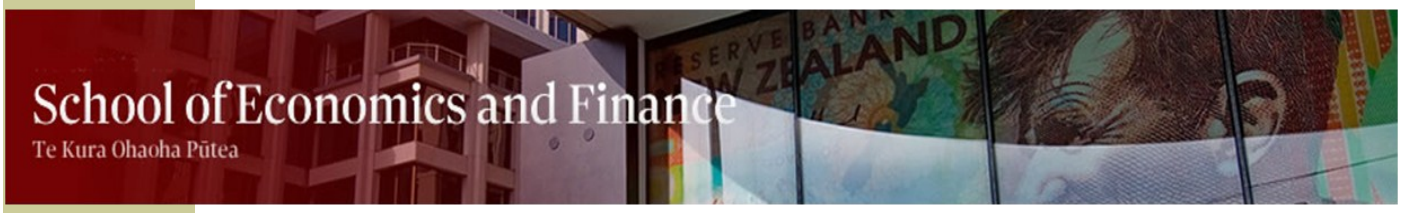

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When banking systems meet currencies

Chia-Ying Chang

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When Banking Systems Meet Currencies

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In this paper, we examine the link of investment portfolio decisions of households and investment on international capital flows. I extend Bencivenga and Smith (1991)'s overlapping generation model to an open economy and combine with capital market imperfections in Kiyotake and Moore (1997) to address how the portfolio decisions of one countrty migh affect that of the other country. In this general equilibrium framework with flexible exchange rate, I find that the investment portfolio deicisions of households are crucial for the directions of capital inflows. In other words, the portfolio decision of individuals in one country is crucial for the deposit and loan rate, which would affect where the capital inflows from the foreign investors.

JEL: E21, E44, F41, G11,

Keywords: international capital markets, capital flows, portfolio decisions, financial intermediaries.

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1. INTRODUCTION

International capital flows have attract broad attention recently, especially the short term capital flows. That is mainly due to the ability of international capital flows in affecting the financial markets and individuals' behaviors or vice versa. In order to look insight the short term capital flows, it is important to look at the capital accounts of a country. Despite difficulties in measuring capital accounts, one agreement is the two main components of the capital accounts: foreign direct investment, and portfolio capital. While foreign direct investment is more likely for long term, the portfolio capital is more likely for short term. In this paper, I am interested in the short term capital flows, so the attention of this paper is paid specially to the protfolio capital in the capital accounts. The goal of this paper is to construct a model to analyze whether the portfolio decisions of households are crucial for international capital flows, whether the portfolio decisions of one country would affect that of another country, and what the implications are in interpreting international capital flows.

In the data, one could only observe the net capital flows between two countries. This observation may not be helpful in explaining the composition of international capital flows. In other words, the net capital flows may remain the same while the foreign capital inflows increase in one financial market but decrease in another. Therefore, in order to analyze the portfolio capital flows across countries, a theoretical model will be useful and helpful in understanding better the international capital flows. Moreover, this theoretical work would require international credit markets, which could fund investment, as addressed by Boyed and Smith (1997). The role of the international credit markets is to provide external and internal finance for investors.

Another theoretical work that includes both internal and external finance is Chevalier and Sharfstein (1996). However, both external and internal finance are treated as dummy variables for firms in a closed economy without explicit capital markets. In order to achieve the goal mentioned above, the existence of international capital markets is important. Moreover, in a general equilibrium analysis, the roles of households firms and financial intermediaries are also significant. This paper comes across various theoretical literature, which includes the research in international capital flows [Chang and Velasco (2001)], in capital market imperfections [Bernanke, Gertler and Gilchrist (1996), Eicher and Turnovsky (1999), Kiyotake and Moore (1997)], in

financial fragility [Chang and Velasco (2000), Kiyotaki and Moore (2002)], in investment portfolio decisions [Ennis and Keister (2006)], and also in financial intermediaries [Bencivenga and Smith (1991), Diamond and Dybvig (1983)]. Among these studies, in order to explain capital flows, Chang and Velaso (2001) extended the Diamond-Dybvig model to an open economy and limit the focus on illiquid banks, in which the role of firms and different capital markets are not taken into account. This paper is to take the step forward to integrate these literature to find how much more we could explain the international capital flows with the existence of international capital markets in the general equilibrium analysis.

In this paper, I extend Bencivenga and Smith (1991)'s three-period-lived overlapping generation model to an open economy with two countries, home and foreign countries. Households deposit their income into financial intermediaries, which would lend it to firms as loan or invest in the equity markets. Firms need to borrow to start their production. Therefore two ways for the firms to obtain the fund: internal or external finance. While the households make decisions to maximize their utility, both the firms and the financial intermediaries make decisions to maximize the profits. The role of financial intermediaries is as a middleman between investors and fund-raisers, and between depositors and loan demanders.

As a result, the equilibrium deposit rate is increasing in equity rate and in the proportion of investors, but decreasing in the proportion of domestic investors. Not surprisingly, the loan rate is increasing in deposit rate. The shift of reinvestment by domestic investors and foreign investors towards to domestic saving accounts rather than investment accounts would stimulate the deposit rate and the loan rate in the domestic country. This increase in the deposit rate and loan rate could appreciate domestic currency and attract capital inflow from foreign investors to the domestic loan market. A portfolio decisions moving towards to short run accounts which including both saving and investment accounts, however, tend to reduce the deposit and the loan rates, which might depreciate domestic currency and discourage the capital inflows by the foreign investors to the domestic loan market. However, this decrease in loan rate might drive up the wage rate and the capital investment by the entrepreneurs. To conclude, the portfolio decisions of households and investors are very important in determining the deposit and the loan rate, which are crucial for the directions of the capital inflows to the domestic country. This model can be extended in several ways in helping understanding the international capital flows

in different aspects. The extensions could include the redistribution of the fund by financial intermediaries, the effects of restrictions on capital account liberalization.

The rest of the paper is organized as follows. Section 2 describes the environment of the model, followed by results in Section 3. Discussions and Conclusions are in Sections 4 and 5, respectively.

2. THE MODEL

This paper extends the three-period-lived overlapping generation framework of Bencivenga and Smith (1991) to an open economy combined with the capital market imperfections in Kiyotake and Moore (1997, 2002) to discuss how individuals' investment portfolio decision in one country could affect the portfolio decisions of individuals in another country, and hence the composition of international capital flows. In this open economy, there are two countries, home and foreign. In the benchmark model, the populations are assumed to be constant and the same in both countries, $N = N^*$. These two countries are assumed symmetric to begin with. Each country contains households, firms and financial intermediaries. The credit markets in each country are the loan market and the equity market. Without losing generality, it is assumed that financial intermediaries are the only institutions with the access to invest in the loan and equity markets. Therefore, the households would have to invest via financial intermediaries, and firms could request loans from the financial intermediaries or raise funds from the equity market. In other words, the financial intermediaries serve as middlemen between firms and households in the loan and equity markets. While households maximize the utility, both firms and financial intermediaries maximize profits. The details are below.

2.1. Households

Each individual lives for three periods: young, middle-aged and old, and is identical ex ante. That is, each young is endowed with one unit of labour, and values only the consumption at middle-aged ($c_{2,t+1}$) and at old ($c_{3,t+2}$). The utility of an individual is in the form of

$$U(c_{2,t+1}, c_{3,t+2}) = -\frac{(c_{2,t+1} + \sigma^i c_{3,t+2})^{-\phi}}{\phi}, \tag{1}$$

where $\sigma^i = \sigma^I$ for investors, $\sigma^i = \sigma^E$ for entrepreneurs, and $0 < \sigma^I < \sigma^E < 1$. In other words, investors are less impatient than entrepreneurs. Therefore, each individual earns income by supplying labour for production when young save the income by allocating between different accounts offered by the financial intermediaries since having no direct access to the loan and equity markets.

The accounts available in the financial intermediaries can be divided into short-run and long run accounts. The short run accounts take one period to mature, while the long run accounts take two periods to mature. There are two types of short run accounts: saving accounts and investment accounts, and one type of long run accounts: term deposit accounts. The saving accounts earn the net interest rate $\left(i_t^D\right)$, which is pre-determined by the financial intermediaries at the time of opening an account. The investment account would earn the net return rate $\left(i_{t+1}^E\right)$, which is determined by the equity market at the beginning of the period before individuals learn about their own type. The term deposit accounts would earn the net interest rate $\left(i_t^{LR}\right)$ at the mature time. The value of i_t^{LR} is also determined by the financial intermediaries at the time of opening the account, and an early liquidation of the term deposit account would lower the net interest rate to i_t^{EL}, where $i_t^{EL} < i_t^E < i_t^{LR}$, and $i_t^{EL} < i_t^D < i_t^{LR}$.

Let α^S denote the proportion of income a young individual would save into short run accounts, and let α^I denote the proportion of the short run accounts that is allocated in the investment accounts. Therefore, the fraction of income placed in the saving account by a young individual is $\alpha^S\left(1-\alpha^I\right)$, the fraction in the investment account is $\alpha^S\alpha^I$, and the fraction in the term deposit account is $\left(1-\alpha^S\right)$. The total repayment an individual could receive from the short run accounts at the beginning of middle-aged at period t is

$$W_t^M \equiv \left(1+i_{t-1}^D\right)\alpha^S\left(1-\alpha^I\right)w_{t-1} + \left(1+i_t^E\right)\alpha^S\alpha^I w_{t-1} \tag{2}$$

At the beginning of middle-aged, each individual learns its own type: an investor or an entrepreneur. With probability λ, the individual turns to an investor, and probability $(1-\lambda)$, the individual turns to an entrepreneur, who have the skills to finance projects and to operate firms. Each individual's type is private information. The distribution of types, however, is

publicly known. The investors and the entrepreneurs are different in the way they spend the repayment from the short run accounts, both saving and investment accounts. An investors would decide whether to re-invest, and where to re-invest while an entrepreneur would start operating a firm.

Let α^{IM} denote the fraction of reinvestment placed in the investment account by a middle-aged investor, so the fraction $\left(1-\alpha^{IM}\right)$ is the fraction of investment placed in the saving account. Therefore, the incentive constraint for a middle-aged investor at period t not to early liquidate term deposit accounts and to re-invest is

$$\begin{aligned} & c_{2,t}+\sigma^{I}\left\{\left[\left(1+i_{t}^{D}\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^{E}\right)\alpha^{IM}\right]\left(W_{t}^{M}-c_{2,t}\right)+\left(1+i_{t-1}^{LRD}\right)\left(1-\alpha^{S}\right)w_{t-1}\right. \\ \geq\ & W_{t}^{M}+\sigma^{I}\left(1+i_{t-1}^{LRD}\right)\left(1-\alpha^{S}\right)w_{t-1} \\ \geq\ & W_{t}^{M}+\left(1+i_{t-1}^{EL}\right)\left(1-\alpha^{S}\right)w_{t-1}, \end{aligned} \tag{3}$$

where the first line represent the present value of lifetime consumption with reinvestment and without early liquidation from the term deposit accounts, the second line is without reinvestment and without early liquidation from the term deposit account, and the third line is without reinvestment and with early liquidation from all in the term deposit accounts.

Moreover, as a middle-aged investor, one could decide whether to re-invest in either domestic or foreign financial intermediaries, but not both. This assumption may be relaxed later.

Let Π_{t+1}^{F} denote the profit an entrepreneur could earn at period $t+1$ by undertaking a project a project at period t, the strong incentive constraint for an entrepreneur to undertake a project and operate a firm is:

$$\Pi_{t+1}^{F}\geq\left[\left(1+i_{t}^{D}\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^{E}\right)\alpha^{IM}\right]W_{t}^{M}. \tag{4}$$

Equation (4) states that the capital gain from production is higher than re-investment even without counting for middle-aged consumption.

2.2. The Firms

After learning the type, an entrepreneur obtains the skills to transform output goods into capital goods for production and the skills to operate a firm. The production requires both capital goods and labour as inputs, and it takes one period to complete production. In order to start production, an entrepreneur must transform part of W_t^M into capital goods, and hire labours. It is assumed that the labours would start working after getting the payment. However, the entrepreneurs do not have sufficient fund to pay the labour costs. Thus, in order to operate a firm, the entrepreneur must borrow sufficient amount (S_t)

$$S_t \geq w_t L_t + K_t + c_{2,t} + B_t - W_t^M, \tag{5}$$

where K_t is the amount of capital goods transformed by an entrepreneur, L_t is the amount of labour united hired by the firm, and B_t is the amount of goods used as collateral to get the loan from the financial intermediaries. $B_t = 0$, if the entrepreneur raises the fund in the equity market. The capital goods can last only one period, then fully depreciate. There is no market for trading capital goods.

The production is in the form of Cobb-Douglas with constant return to scale, and it takes one period to complete production: $Y_{t+1} = A_t K_t^{\theta} L_t^{1-\theta}$, where $0 < \theta < 1$, A_t and Y_t represent the production technology, and the amount of output produced at period t, respectively. It is after the production, the entrepreneurs have the ability to repay the loan. So the debt here is one-period short-term debt. To simplify the model, we assume that there is no default risk for firms' production, so the loan can always be repaid. This assumption can be relaxed later.

There are two financial methods available for firms. One is to borrow from the domestic financial intermediaries, and the other is to raise fund in domestic equity market by issuing equities. The available loanable fund in the financial intermediaries is limited, and only a proportion of firms (β) could obtain it. These firms are called debt-finance firms. The rest of firms ($1 - \beta$), which obtains the fund in the equity market, is called equity-finance firms.

By choosing the amount of L_t to hire and the amount of K_t to transform, a debt-finance firm maximizes the profit: $\Pi_{t+1}^{DF} = Y_{t+1} - \left(1 + i_t^{Loan}\right) S_t$, and an equity-finance firm maximizes the profit: $\Pi_{t+1}^{EF} = Y_{t+1} - \left(1 + i_{t+1}^{E}\right) S_t$. Both types of firms are subject to equations (4) and

(5). As soon as obtaining the fund, both the debt- and equity-finance firms hire labours and start production. However, this is before the realization of i_{t+1}^{E}. Thus, in order to decide the amount of L_t to hire, the equity-finance firms form their expectation of i_{t+1}^{E}at period t, and it is assumed $E_t\left(i_{t+1}^{E}\right) = i_t^{Loan}$. This implies that the amount of L_t hired by an equity-finance firm would be the same as that hired by a debt-finance firm.

Every period, there are $(1-\lambda)N$ middle-aged households turning new entrepreneurs, who could start operating firms. With full employment assumption, by combining the first order condition with respect to L_t and the labour market clearing condition, $L_t = 1/(1-\lambda)$, the equilibrium wage rate can be solved:

$$w_t = (1-\lambda)^{\theta} K_t^{\theta} \left[\frac{A_t(1-\theta)}{\left(1+i_t^{loan}\right)}\right]. \tag{6}$$

The amount of K_t an entrepreneur would transform is:

$$K_t = \frac{1}{1-\lambda}\left[\frac{A_t\theta}{1+i_t^{loan}}\right]^{1/(1-\theta)}. \tag{7}$$

$$\begin{aligned} w_t &= \left(\frac{A_t\theta}{1+i_t^{loan}}\right)^{\theta/(1-\theta)} \frac{A_t(1-\theta)}{\left(1+i_t^{loan}\right)} \\ w_t &= \frac{A_t^{1/(1-\theta)}\theta^{\theta/(1-\theta)}(1-\theta)}{\left(1+i_t^{loan}\right)^{1/(1-\theta)}} \end{aligned}$$

2.3. The Financial Markets

As mentioned above, the firms could finance its operation expenses in two ways, loan or equity, but not both. So the two financial markets in this model are the loan market and the equity market. The role played by the financial intermediaries is very important in this model. The financial intermediaries serve as a middleman between the firms and the depositors, and between the investors and the equity market. Among three types of accounts offered to households, the idea of demand deposit applies to only saving, and term deposit accounts. That is, by failing

to repay the depositors for their saving and term deposit accounts as promised in the deposit contracts, the financial intermediary is subject to run.

One strong assumption we made for the benchmark model is that the financial intermediaries would restrict the loanable fund to the sum of saving accounts, and not any other accounts. This assumption could later be relaxed to discuss more complicated matters.

Debt finance and equity finance in this model are different in several ways. First, debt finance is between domestic entrepreneurs and domestic financial intermediaries. Equity issuance, however, can be extended to foreign equity market, depending on the capital account openness. In the benchmark model, we have symmetric capital account liberation for both countries. Second, with limited resources, the available loanable fund cannot satisfy all firms. The firms would either obtain the amount required or none. This is what so called the first type credit rationing. The equity market, however, is open to all firms who do not obtain the loan from the financial intermediaries. Third, a collateral is required for debt finance but not for equity finance. Fourth, the loan rate $\left(i_t^{Loan}\right)$ is set by the financial intermediaries at the time of signing the loan contract. The return rate to pay the equity holders who purchase the equity at period t, $\left(i_{t+1}^{E}\right)$, however, is determined by the equity market clearing condition after the production is complete.

A financial intermediary would maximize its own profit by choosing (i) the deposit rates for the saving accounts $\left(i_t^{D}\right)$ (ii) the deposit rate for the term deposit accounts $\left(i_t^{LRD}\right)$, (iii) the loan rate $\left(i_t^{loan}\right)$ for firms, and (iv) the proportion of long-term investment to liquidate prematurely (χ) to prevent bank runs. Let γ and $(1-\gamma^*)$ denote the proportion of domestic and foreign middle-aged investors, who re-invest via domestic financial intermediaries, respectively. The profit of domestic financial intermediaries Π_t^B is:

$$\Pi_{t+1}^{B} = \left\{ \begin{array}{c} \left[\alpha^S\left(1-\alpha^I\right)w_t N - \beta\left(1-\lambda\right)NS_t\right] + \left(1-\alpha^S\right)\left(1-\chi\right)\left[\left(1+i_{t-2}^{LR}\right) - \left(1+i_{t-2}^{LRD}\right)\right]w_{t-2}N \\ + \left[\left(1+i_{t-1}^{loan}\right)S_{t-1}\left(1-\lambda\right)\beta N - \left(1+i_{t-1}^{D}\right)\alpha^S\left(1-\alpha^I\right)w_{t-1}N\right] \\ +\lambda\gamma\left(1-\alpha^{IM}\right)N\left[\left(W_t^M - c_{2,t}\right) - \left(1+i_{t-1}^{D}\right)\left(W_{t-1}^M - c_{2,t-1}\right)\right] \\ +\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)N^*\left[\left(W_t^{M*} - c_{2,t}^*\right) - \left(1+i_{t-1}^{D}\right)\left(W_{t-1}^{M*} - c_{2,t-1}^*\right)\right] \end{array} \right\} \tag{8}$$

where the first term is the saving accounts for the generation t that is loan out to the new

entrepreneurs, the second term is the profit from matured term deposit accounts, the third term is the repayment of the loan to repay the saving accounts, the fourth term is about the middle-aged domestic investors and the fifth term is about the middle-aged foreign investors. The details of the capital flow is shown in Figure 2.

The constraints faced by the financial intermediaries include liquidity constraints for each period and the incentive constraints to attract both the middle-aged domestic and foreign investors. There are several ways to manage different accounts. One way is to separate the short term and long term accounts, and to allow early premature liquidation on long term accounts to take care of the shortage of short-term repayment. Therefore, the liquidity constraints are as follows:

$$\begin{bmatrix} \alpha^S\left(1-\alpha^I\right)w_tN+\lambda\gamma\left(1-\alpha^{IM}\right)N\left(W_t^M-c_{2,t}\right)+\left(1+i_{t-1}^{loan}\right)S_{t-1}\left(1-\lambda\right)\beta N \\ +\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)N^*\left(W_t^{M*}-c_{2,t}^*\right)+\chi(1+i_{t-2}^{EL})\left(1-\alpha^s\right)w_{t-2}N \end{bmatrix} \tag{9}$$

$$\geq \begin{bmatrix} \beta\left(1-\lambda\right)NS_t+\lambda\gamma\left(1-\alpha^{IM}\right)N\left(1+i_{t-1}^D\right)\left(W_{t-1}^M-c_{2,t-1}\right)+\left(1+i_{t-1}^D\right)\alpha^S\left(1-\alpha^I\right)w_{t-1}N \\ +\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)N^*\left(1+i_{t-1}^D\right)\left(W_{t-1}^{M*}-c_{2,t-1}^*\right) \end{bmatrix},$$

$$\left(1-\chi\right)\left(1+i_{t-2}^{LR}\right)\geq\left(1+i_{t-2}^{LRD}\right), \tag{10}$$

where equation (9) and (10) are for the short term and the long term accounts, respectively.

When counting for the return of the foreign investment, it is important to count for the exchange rate. Let e_t denote the real exchange rate at period t, defined as $e_t=\upsilon_t/\upsilon_t^*$, where υ_t (υ_t^*) represents the real value of the domestic (foreign) country's currency. The domestic and foreign investors would reinvest in domestic financial intermediaries if the following conditions hold, respectively.

$$\left(1+i_t^D\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^E\right)\alpha^{IM} \geq (1/e_t)\left[\left(1+i_t^{D*}\right)\left(1-\alpha^{IM*}\right)+\left(1+i_{t+1}^{E*}\right)\alpha^{IM*}\right] \tag{11}$$

$$\left(1+i_t^D\right)\left(1-\alpha^{IM*}\right)+\left(1+i_{t+1}^E\right)\alpha^{IM*} \geq (e_t)\left[\left(1+i_t^{D*}\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^{E*}\right)\alpha^{IM}\right]. \tag{12}$$

In equilibrium, both the loan market and the equity market will be clear. The loan market

clearing condition is:

$$\begin{aligned} & \alpha^S\left(1-\alpha^I\right)w_tN+\lambda\gamma\left(1-\alpha^{IM}\right)N\left(W_t^M-c_{2,t}\right)+(1/e_t)\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)N^*\left(W_t^{M*}-c_{2,t}^*\right) \\ = \quad & \beta\left(1-\lambda\right)NS_t \end{aligned} \tag{13}$$

where the left hand side is the loan supply, and the right hand side is the loan demand. The equity market clearing condition is:

$$\begin{aligned} & \alpha^S\alpha^I w_tN+\gamma\lambda\alpha^{IM}N\left(W_t^M-c_{2,t}\right)+(1/e_t)\lambda^*\left(1-\gamma^*\right)\alpha^{IM*}N^*\left(W_t^{M*}-c_{2,t}^*\right) \\ = \quad & S_t\left(1-\lambda\right)\left(1-\beta\right). \end{aligned} \tag{14}$$

3. EQUILIBRIUM

There are multi equilibria in this model. We are interested in the case in which the investors reinvest and the entrepreneurs operate firms and conduct production. Take the extreme case, if $c_{2,t}<\sigma^I\left[\left(1+i_t^D\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^E\right)\alpha^{IM}\right]c_{2,t}$, then the investors would choose $c_{2,t}=0$, and $c_{3,t+1}=\left[\left(1+i_t^D\right)\left(1-\alpha^{IM}\right)+\left(1+i_{t+1}^E\right)\alpha^{IM}\right]W_t^M+\left(1+i_{t-1}^{LRD}\right)\left(1-\alpha^S\right)w_{t-1}$. Due to the returns for long term accounts, $i_t^{LR}>i_t^{EL}$, the financial intermediaries would not want to liquidate long term accounts prematurely if not necessary. Therefore, without unexpected withdrawals, the values of $\chi=0$,

$$W^M=\frac{\left\{\begin{array}{c}\left(1-\alpha^{IM}\right)\left[\varphi_1\lambda\gamma N\alpha^S\left(1-\alpha^I\right)w+\varphi_3\right] \\ +\varphi_4\left(1-\alpha^{I\ M}\right)-\alpha^S\left(1-\alpha^I\right)wN\left(1+\varphi_1\right) \\ +\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)N^*\left[\varphi_1\alpha^{S*}\left(1-\alpha^{I*}w^*-W^{M*}\right)\right]\end{array}\right\}}{\lambda\gamma\left(1-\alpha^{IM}\right)N\left(1+\varphi_1\right)} \tag{15}$$

$$i^{loan}=\frac{i^D\left[\lambda\gamma\left(1-\alpha^{IM}\right)W^M+\alpha^S\left(1-\alpha^I\right)w+\lambda^*\left(1-\gamma^*\right)\left(1-\alpha^{IM*}\right)\left(N^*/N\right)W^{M*}\right]}{\beta\left(1-\lambda\right)S_t} \tag{16}$$

$$i_t^{LRD}=i^{LR} \tag{17}$$

As shown in equations (15) and (16), the equilibrium deposit rate is increasing in equity rate and in the proportion of investors, but decreasing in the proportion of domestic investors. Not

surprisingly, the loan rate is increasing in deposit rate. The shift of reinvestment by domestic investors and foreign investors towards to domestic saving accounts rather than investment accounts would stimulate the deposit rate and the loan rate in the domestic country. This increase in the deposit rate and loan rate could appreciate domestic currency and attract capital inflow from foreign investors to the domestic loan market. A portfolio decisions moving towards to short run accounts which including both saving and investment accounts, however, tend to reduce the deposit and the loan rates, which might depreciate domestic currency and discourage the capital inflows by the foreign investors to the domestic loan market. However, this decrease in loan rate might drive up the wage rate and the capital investment by the entrepreneurs. To conclude, the portfolio decisions of households and investors are very important in determining the deposit and the loan rate, which are crucial for the directions of the capital inflows to the domestic country. This model can be extended in several ways in helping understanding the international capital flows in different aspects. The extensions could include the redistribution of the fund by financial intermediaries, the effects of restrictions on capital account liberalization.

In might be worth mentioning that in the closed economy, without the effects of foreign investors, domestic deposit and loan rate would be lower than the open economy [equations (19) and (20)].

$$W^M = \frac{\left\{ \begin{array}{c} \left(1-\alpha^{IM}\right)\left[\varphi_1 \lambda\gamma N \alpha^S \left(1-\alpha^I\right) w + \varphi_3\right] \\ +\varphi_4 \left(1-\alpha^{I\ M}\right) - \alpha^S \left(1-\alpha^I\right) wN\left(1+\varphi_1\right) \end{array} \right\}}{\lambda\gamma\left(1-\alpha^{IM}\right) N\left(1+\varphi_1\right)} \tag{18}$$

$$i^{loan} = \frac{i^D\left[\lambda\gamma\left(1-\alpha^{IM}\right) W^M + \alpha^S\left(1-\alpha^I\right) w\right]}{\beta\left(1-\lambda\right) S_t} \tag{19}$$

The effects of the portfolio decisions on the deposit rate and loan rate remain similar to the case of an open economy.

4. CONCLUSION & EXTENSIONS

As shown in equations (15) and (16), the equilibrium deposit rate is increasing in equity rate and in the proportion of investors, but decreasing in the proportion of domestic investors. Not surprisingly, the loan rate is increasing in deposit rate. The shift of reinvestment by domes-

tic investors and foreign investors towards to domestic saving accounts rather than investment accounts would stimulate the deposit rate and the loan rate in the domestic country. This increase in the deposit rate and loan rate could appreciate domestic currency and attract capital inflow from foreign investors to the domestic loan market. A portfolio decisions moving towards to short run accounts which including both saving and investment accounts, however, tend to reduce the deposit and the loan rates, which might depreciate domestic currency and discourage the capital inflows by the foreign investors to the domestic loan market. However, this decrease in loan rate might drive up the wage rate and the capital investment by the entrepreneurs. To conclude, the portfolio decisions of households and investors are very important in determining the deposit and the loan rate, which are crucial for the directions of the capital inflows to the domestic country.

This model can be extended in several ways in helping understanding the international capital flows in different aspects. The extensions could include the redistribution of the fund by financial intermediaries, the effects of restrictions on capital account liberalization. Moreover, it is possible to allow for default risk on repaying the loan and the possibility of bank runs.

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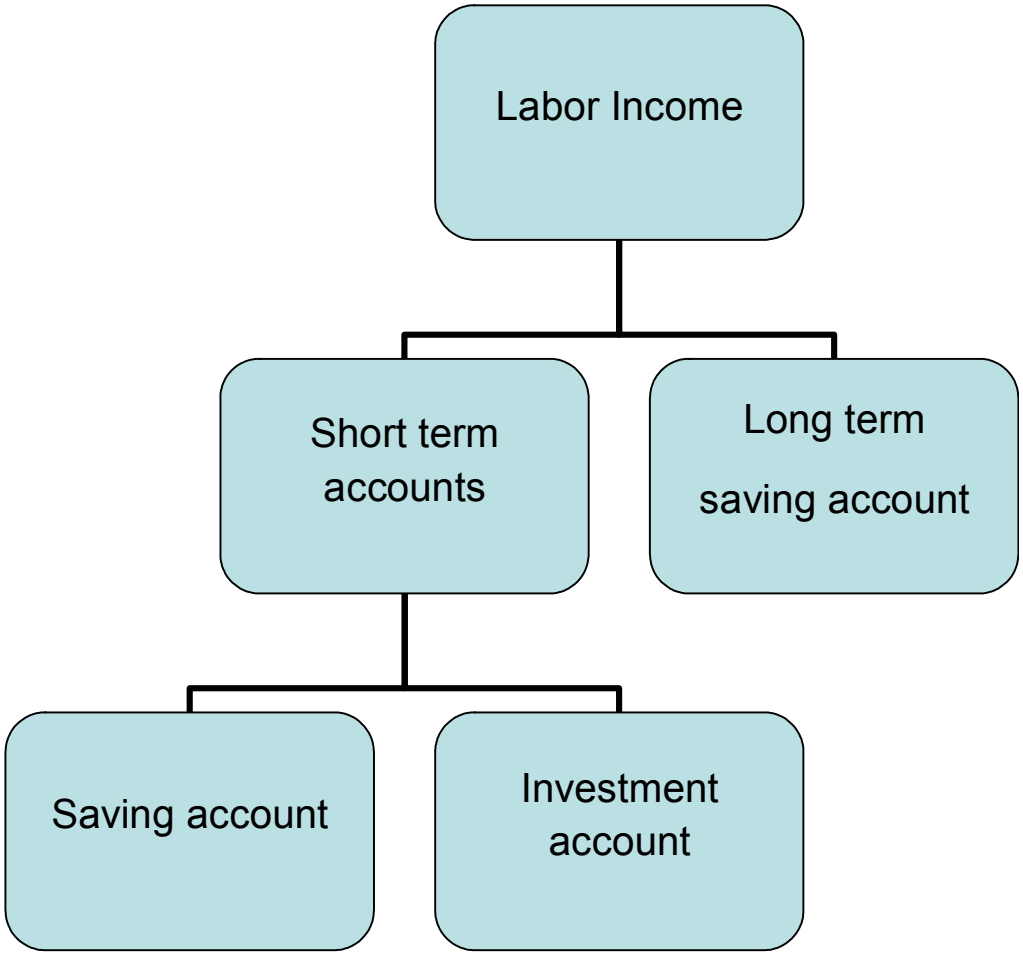

Figure one: the decisions of households

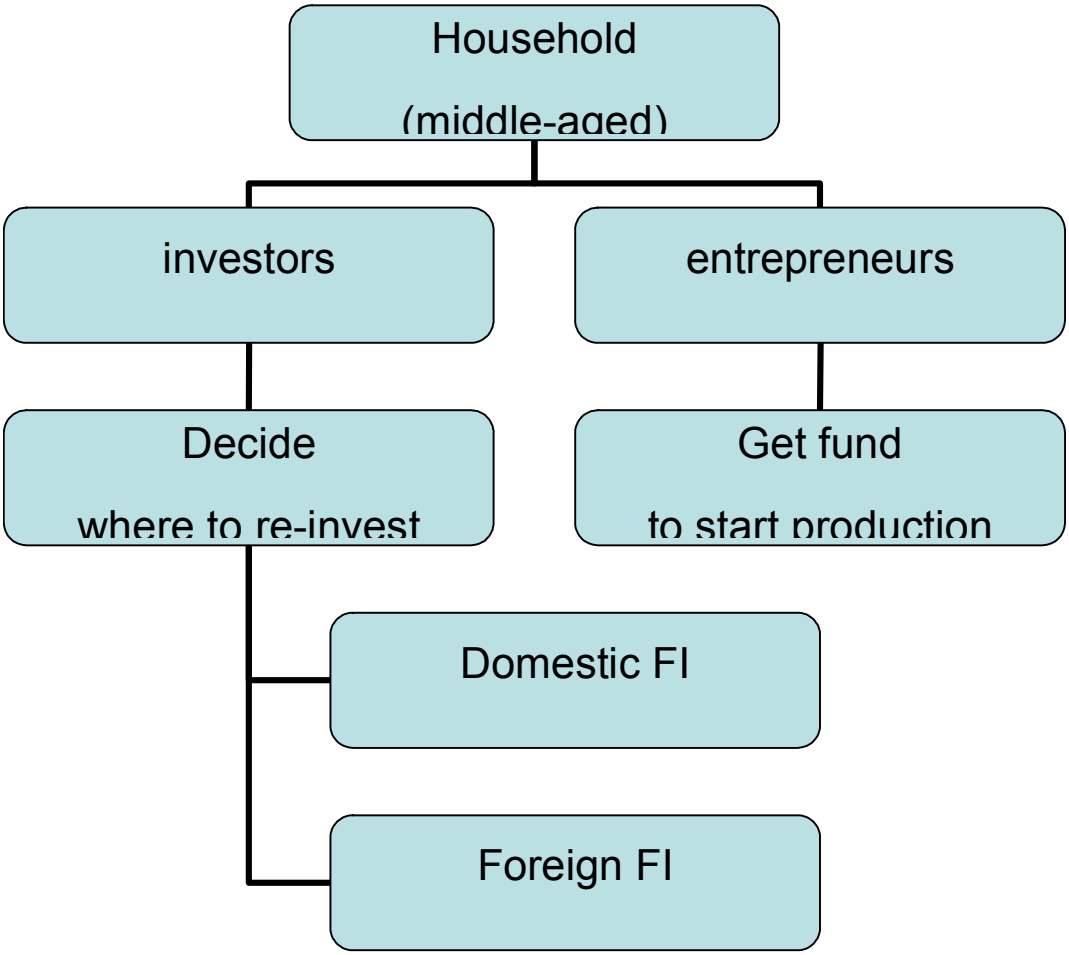

Figure two: the decisions of investors

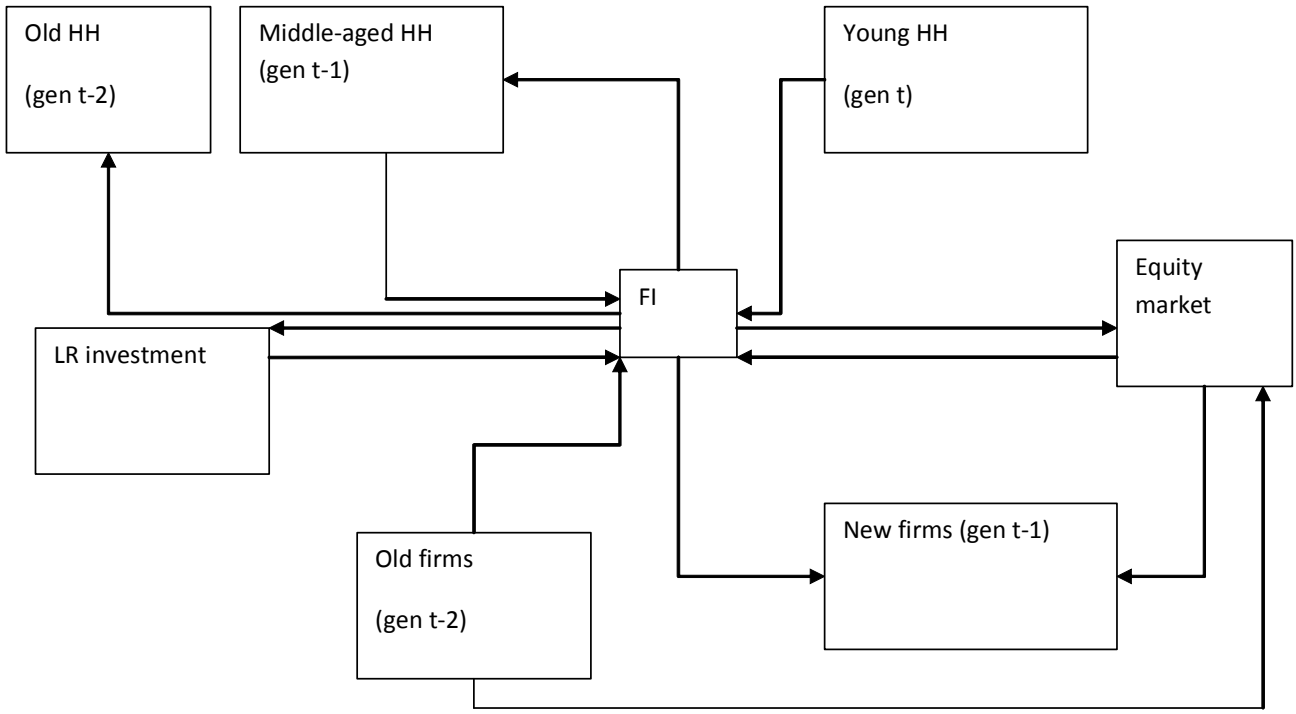

Figure three: the flows of fund