Debt-deflation traps within small open economies: a stock-flow consistent perspective

Stephen Kinsella,
University of Limerick.[1]
Saed Khalil,
University of Trento.

Abstract. The aim of this chapter is to map out the macroeconomic effects of a sustained debt-deflation within a small open economy. We build a 2 country stock flow consistent model, and show the effects of a debt-deflation cycle on households, firms, banks, the government, and the central bank in each country. We find price collapses across the economy can sustain a downturn, even as other areas of the economy experience a return to growth. Within a currency union, with one small country experiencing a deflation, only transfers from the larger country, and increased government expenditure, can bring the economy out of a deflationary spiral.

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[1] To appear in a volume honoring the late Wynne Godley, edited by Dimitri Papadimitriou. Corresponding author. Email. Stephen.Kinsella@ul.ie. Thanks to Dimitri Papadimitriou for spearheading this project, and to Wynne Godley for his years of encouragement in macroeconomic modeling. It almost goes without saying this chapter is dedicated to Wynne for the intellectual vista he opened up together with his coauthors. The usual disclaimer applies.

1. Introduction

The goal of this chapter is to build a stock flow consistent model to simulate the macroeconomic effects of a small open economy experiencing a debt-deflation. After the 2007-2010 crisis, many countries are experiencing rapid declines in their price levels, while being overburdened by levels of debt, which constrains their growth (Kinsella and Leddin, 2010, Koo, 2009). This chapter traces out the macroeconomic consequences and recovery options in a two-country model. We assume one country is small, and open to trade, while the other is larger, with trade accounting for a much smaller fraction of its overall economic output.

We simulate the effects of a series of investment shocks on our stock flow consistent macro model under varying assumptions. We find that debt overhangs take close to a decade to recover from, especially when the small open economy is particularly open to trade, and mechanisms to reduce debt can help speed the economy to a recovery following a debt buildup.

A debt-deflation occurs when a fall in the price level raises the real value of nominal debt (Fisher 1933). This phenomenon can exacerbate the costs of a deflation: Households that find themselves heavily in debt do not continue to consume more at the margin, but rather refrain from investing and consuming out of discretionary income in order to pay down loans more quickly. Domestic consumption and non-autonomous investment in productive capacity, as well as import and export demand, all suffer. The economy contracts as a result of the de-leveraging activities of firms and households, which further deepens the crisis. Combined with increases in government expenditure from automatic stabilising mechanisms like social welfare payments, the increase in debt-servicing costs can be punitive for small open economies like Ireland, unable to stimulate their economies in a textbook Keynesian (or new-Keynesian) manner.

Tobin (1980, pg. 58) describes the debt deflation problem in stark terms:

> "When nominal prices and wages are deflated, debt service is a higher proportion of debtors' incomes, and the reduction or elimination of their margins of equity disqualifies them from further access to credit. Bankruptcies and defaults do likewise, and transmit the distress of

debtors to their creditors, threatening the solvency and liquidity of individual lenders and financial institutions."

The issue of stability arises because the relation runs both ways: deflation causes financial distress, and financial distress in turn exacerbates deflation. Negative aggregate price shocks had a significantly negative impact on financial conditions during the Great Depression.

On the debit side of the balance sheet, deflation decreases the purchasing power of the debtor at a time when the economy requires increased levels of consumption and investment, which deepens the downturn, and exacerbates the crisis. The two Depressions of the last one hundred and fifty years--the 1890s and the 1930s--had substantial deflations. Prices fell at up to 15 percent per annum in the 1890s in the United States. Prices fell over 10 percent per annum for two years during the Great Depression (DeLong, 1999). In a deflation, even a relatively low nominal rate of interest become a larger real interest rate, forcing a contraction in economic activity.

On the credit side, deflation increases the value of creditors' assets. However, with a large percentage of Irish firms and households over-indebted--unable to service their debts and meet recurring expenses--the increase in uncertainty associated with an increased likelihood of large scale default (and consequent bad debt write down by public and private banks) outweighs the potential increase in creditors' funds from the deflation.

A higher level of debt finance imposes obligatory interest and principal repayments on firms and households. At the firm level, if a firm buys assets with borrowed money, then under extreme market conditions it may owe more money than it has, and with reduced cash flow, its expectation of paying off its loans goes down, and the firm defaults. If this happens on a sufficiently wide scale, then it can severely stress creditors and cause them to fail. High personal debt also inhibits the formation of new businesses and the expansion of existing small enterprises, since the balance sheet of owners is an important determinant of the ability of a firm to obtain credit. A common defensive reaction of firms that have suffered an adverse income shock is to reduce discretionary expenses, for example, investment, employment, wages, and/or dividend payments. A highly

indebted set of firms can more easily fail or go into liquidation under the weight of debt service costs that cannot be met out of current income or cash reserves, increasing unemployment.

At the macroeconomic level, modern monetary systems require relatively stable price levels. Financial institutions and contracts are based on the prescription of reasonable price level stability. There are asymmetric affects of variations in the price level. Unexpected jumps in inflation, say, can in principle provide a temporary stimulus, as wealth is redistributed from creditors to debtors--who include most entrepreneurs. Deflation does the opposite, and in fact undermines the financial stability of many businesses, which undermines the institutional structures upon which successful economies are built (Nell, 2003).

The remainder of this chapter is as follows: section 1.2 describes several 'channels' through which a debt-deflation can operate, then moves on to a description of the model in section 2, a discussion of the results in section 3 , and section 4 concludes. An appendix contains the full description of the model[2].

1.2 Debt-Deflation Channels: Directions for Modeling

The link between financial distress to deflation (and back again) takes place through several channels. Different authors have, naturally, focused on different channels. For our work in modeling debt-deflation, clearly understanding and delineating these channels is important.

Fisher (1933), who originated the modern theory of debt-deflation, argued that borrowers attempting to reduce their burden of debt engage in *distress selling* to raise money for repaying debt. But repayment in aggregate causes a contraction in the money supply, and price level deflation. Fisher's finding was echoed by Kindleberger (1996), who expanded Fisher's analysis to other crises in economic history.

Keynes (1936) argued that a downward spiral of prices (and especially nominal wages) in an economy suffering from substantial unemployment would increase the real interest rate and the burden of servicing debts, and would

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[2] This model was built and simulated in *EViews*. The software is available from the authors upon request.

discourage businesses from beginning new investments, making the liquidity constraint facing the economy worse. Keynes also argued that a fall in nominal (he used the term `money') prices and wages would indirectly *increase* liquidity in the economy if the central bank maintained the nominal quantity of money, since when prices and wages are lower, the same nominal quantity of money represents relatively more purchasing power, relaxing the liquidity constraint on households and firms.

Keynes held that this roundabout way is the most painful way to create more liquidity in the economy, since the central bank could achieve the same thing by simply increasing the nominal money supply.}. Keynes held that nominal wage cuts could not bring about a fall in the real wage, because nominal wages are a large part of the costs of production. As nominal wages fall in the economy, all producers find their costs lowered, and competition will force them to lower the prices of goods and services bought by workers in proportion. This movement keeps the real wage constant, and leaves the economy with involuntary unemployment. A downward spiral of money wages and money prices is the last thing an economy suffering from substantial unemployment needs.

A modern Keynesian story for a small open economy like Ireland in a highly globalised international financial system runs like this: periods of persistent consumption growth can foster investment booms and output expansion, which in turn reinforces optimistic outlooks for permanent income and further stimulate consumption demand. So a mild consumption expansion triggered by optimism may turn into prolonged periods of over-expansion, and via a simple multiplier-accelerator process, the economy becomes destabilised. When borrowers have strong incentives to accumulate assets, and lenders are willing to supply credit elastically, endogenous boom-bust cycles can emerge, and such cycles result in excessive investment and over accumulation of capital during the boom and under investment in the slump.

Minsky (1986) elaborated and extended Fisher's original concept to incorporate deflation in the asset market. Minsky recognised that distress selling reduces asset prices, causing losses to agents with maturing debts and, importantly, to highly leveraged agents with new debts. This reinforces distress

selling, and reduces consumption and investment spending, which deepens deflation. Bernanke (1983) argued that debt-deflation involves wide-spread bankruptcy, impairing the process of credit intermediation. The resulting credit contraction depresses aggregate demand, thus exacerbating the crisis.

Woodford (2003) has argued that macroeconomic outcomes are largely independent of the performance of the financial system, and, in a bubble, simple wage-cost deflation towards trend is in fact desirable. Von Peter (2004) has emphasised the need for a removal of equilibrium constraints in modeling the current crisis. A stock flow consistent perspective offers us the ability to produce models that incorporate these insights.

For an economy with an independent monetary policy, the standard policy prescription is for the central bank to credibly commit to being expansionary for a considerable period of time, by keeping interest rates near zero even after the economy has emerged from deflation (Eggertsson and Woodford, 2003). The notion of unstable debt-deflation ultimately relies on reasons why agents try to contain or reduce their indebtedness. Margin requirements can be one such reason. A credit crunch, which interferes with the accommodation necessary for stability, can be another, as discussed by (King, 1994).

The `modern' debt-deflation process therefore encompasses falling asset prices, debt repayment difficulties, a reluctance to lend, a financial crisis, the impact on the banks, and the inter- dependency of the financial system. Recent debt-deflations have been aborted by lender-of-last-resort intervention and government support of the financial system during a crisis.

2. Model

Our debt-deflation mechanism is as follows. A macroeconomic shock occurs following a buildup of debt in the form of Bills, Bonds, and Equities, which causes debt liquidation leading to distressed selling. This distressed selling of assets leads to a contraction of deposit currency and of its velocity. The small economy experiences a fall in the level of prices, and a still greater fall in the net worth of

businesses. Business record falls in their profits. There follows a reduction in output, in trade, and in employment of labour, leading to pessimism and loss of confidence (Importantly, consumers and producers may lose or gain confidence at the beginning or the middle of this causal chain). The decline in prices leads to an increase in debt servicing, and this offset levels of debt liquidation. The economy experiences hoarding and a further slowing down of the velocity of circulation of money. We see complicated disturbances in the rates of interest on our financial goods. These interactions are summarized in figure 1 below.

[Insert Figure 1 about here.]

The model itself takes Godley and Lavoie (2007) as its starting point. The stock-flow consistent models they build are based on national income and product accounts and flow of funds accounts. Godley and Lavoie (1999, 2004, 2007) emphasize the dynamic interaction between price formation and functional income distribution. Godley and Lavoie's models are set up in such a way as to facilitate the construction of behavioural macroeconomic models in the tradition of Keynes (1936) and Kalecki (1971). This model building results in aggregate dynamics that can be described as business cycles, that is, the models replicate observed empirical regularities when parameterised. The extended accounting scheme underpinning any aggregate dynamics simulated in a stock flow consistent model summarizes the transactions taking place within a realistic and modern financial sector that contains securities and financial facilities.

Each model divides the economy into five sectors: firms, households, government, the central bank, and private banks. These sectors are designed in such a way that the income inflows to one sector are outflows from other sectors. The same is true for financial transactions. These flows, when they accumulate over time, as they must in a dynamic context, become stocks; thus, the models are stock flow consistent (Taylor 2004, 2008). Ours is no different, and has 5 sectors also, which we describe briefly below.

First, let us discuss the balance sheets for this model. The table below describes the interactions between different sectors. In reading the table, the subscript *b* refers to a bank. The subscript *cb* refers to a central bank. The

subscript *d* refers to demand. The superscript *e* refers to the expected value or volume. The subscript *f* denotes firms. The subscript *h* denotes households. The superscript or subscript *i* refers to 1 for country one and 2 for country two. The subscript *l* refers to loans. The subscript *m* refers to deposits. The superscript *T* refers to target value or volume. The superscript $z = 1$ for country one and 2 for country 2, such that $z \neq j$. $xr = e$ when $z = 1$ and $1/e$ when $z = 2$.

[Insert tables 1 and 2 about here]

We assume two countries and five sectors in each country. Country 1 is assumed to be large relative to country 2, in terms of population, trade flows, and overall economic output. The exchange rate, *E* mediates between the two nations in the usual way. We assume a floating exchange rate. All assets are in monetary units. Households and firms in this model hold several assets: treasury bills, *B*, bonds, *BL*, and equities, *e*. Subscripts denote countries 1 and 2, respectively. For ease of reading, we sketch the interaction of the five sectors below, and relegate the complete algebraic description of the model to an appendix.

2.1 Households

There are many households in this sector, and in the aggregate, we consider the household 'sector'. Households take loans *L* from the financial sector to finance consumption, as well as consuming out of their wages *WB* in each period and their savings from past periods *V*. Disposable income YD is the difference between the value of personal income YP, Taxes, T, and servicing interest *r* on loans *L*:

$$YD^i = YP^i - T_I^i - r_{l-1}^i . L_{h\,d-1}^i$$

Households are assumed to consume the amount *c* in each period according to

$$c^i = \alpha_0^i + \alpha_1^i . (yd^{ei} + nl^i) + \alpha_2^i . v_{-1}^i$$

Where each α^i represents the propensity to consume, inter alia, from current income and loans *nl*, and from past income *v*. In addition to loans, households can hold many types of assets in varying proportions: Households' financial portfolios may consist of domestic and foreign bills *B*, domestic and foreign bonds *BL*, deposits *M*, and equities, *e*. The balancing equations for the portfolio choice of each household are given in the appendix.

Households are also assumed to own the private banks in the system via (OF), hold cash money, and taking loans from these private banks.

In addition to using loans for movement of financial assets through the system is assured because both countries trade treasury bills, domestic and foreign bills, domestic and foreign bonds, deposits, and equities, all of which are held by households.

2.2. Firms

Each firm *i* in this economy follow a recursive mark up pricing rule based around their inventory flows, in, and unit costs, UC. The firm also takes account of total economic output *y*, sales volume *s*, and import volumes, *im*.

$$in^i = in^i_{-1} + (y^i - s^i + im^i)$$

Firms take loans, *L*, supply equities, *e*, and keep part of profits to cover their inventories *in*, and investment in capital *k*. Inflation in the system is driven by sales price increases p^i_s from period to period via

$$\pi^i = \frac{p^i_s}{p^i_{s-1}} - 1$$

The level of real fixed capital k is a linear function of the growth rate of capital, gr_k^i, such that $k^i = k_{-1}^i.(1 + gr_k^i)$. The growth rate of capital is determined by the real interest rate on loans *rr* and the rate of capacity utilization *u* by the firm. Each firm *i* sets its wage rate *W* in each period according to $W^i = W_{-1}^i + \Omega_3^i.\left(\omega^{Ti}.p_{s-1}^i - W_{-1}^i\right)$, where ω^{Ti} represents the target real wage.

The target wage is given by

$$\omega^{Ti} = \left(\frac{W^i}{P_s^i}\right)^T$$

$$= \Omega_0^i + \Omega_1^i.Pr^i + \Omega_2^i\left\{ER^i + z_3^i.(1 - ER^i) - z_4^i.bandT^i + z_5^i.bandB^i\right\}$$

Here worker productivity *Pr* and the employment rate *ER* largely determine the target real wage, with Tax bands *bandT* and bond funding *bandB* also playing a role. We assume firms default part of their loans, around 5%. Firms also attempt to save out of retained earnings and issue equities, *e*.

2.3 Government

As in most stock flow consistent models, the government 'initiates' the model by introducing some amount of spending, G, into the system. The government in this model supplies bills *B* and bonds *BL* to cover its spending requirements, in addition to levying taxes, *T*. The public sector borrowing requirement of each government PSBR is given by

$$PSBR^i = G^i + r_{b-1}^i.B_{s-1}^i + BL_{s-1}^i - \left(T^i + F_{cb}^i\right)$$

Here the government must service its debts from taxes T and from the profits of the central bank F_{cb}^i. The government's spending is a combination of revenues from taxation, borrowing on the bond market, *B*, and bill issuance *BL*.

2.4 Banks

Private banks in this model accept deposits, H_{hd} give loans L_{hs}, take advances A_s, and acquire bills B_{bid}. The interest rate on advances and banks' liquidity ratio

determines each deposit rate in each bank. Each banks' lending rate depends upon the deposit rate. As mentioned above, all bank capital *OF* is held by households. Profits of banks *Fb* are given by

$$F_b^i = r_{l-1}^i.\left(L_{h\,s-1}^i + L_{f\,s-1}^i - NPL_{-1}^i\right) - r_{a-1}^i.A_{d-1}^i + r_{b-1}^i.B_{b\,d-1}^i - r_{m-1}^i.M_{s-1}^i$$

Here the nominal interest rate *r* is conditioned on Loans sold to households *Lh* and firms *Lf*, as well as advances to the government A, repayments of debt, and the level of deposits in the banks M.

Banks have a capital adequacy ratio CAR given by

$$CAR^i = \frac{OF_b^i}{L_{h\,s}^i + L_{f\,s}^i}$$

where OF is the level of 'own funds' held by the banks.

2.5 Central Bank

The central bank supplies money endogenously to the system, as well as issuing private banks with liquidity upon demand, *A*. Importantly, each country's central bank can generate off balance sheet funds *R* in order to ensure the economy continues to function.

$$F_{cb}^1 = r_{a-1}^1.A_{s-1}^1 + r_{b-1}^1.B_{cb\,1\,d-1}^1 + r_{b-1}^2.B_{cb\,1\,d-1}^2$$

The central bank's profits F are determined by interest payments on advances *A* to private banks, and to the interest earned on bonds issued in previous periods.

We simulate each country for 150 periods.

3. Results

3.1 Investment shock with a floating exchange rate

First, we simulate the effects of a domestic shock in the smaller country. What happens when investment levels drop by 33% in country 1? The asymmetric effect is picked out in figures 2 and 3 below. We clearly see investment falling in country 1, while country 2 remains unchanged. Similarly Real GDP is reduced in country 1, and remains increasing in country 2

[Insert figures 2 and 3, 4 and 5, 6, and 7 about here, in panel form.]

Now, to stay afloat, firms begin borrowing from the central bank, and public and private debt ramps up (figures 6 and 7). There is a deflation, but it is short lived, as we see in figure 8, because we choose to shock the economy once only. To keep firms and banks afloat, the government in country 1 borrows from abroad, increasing its public sector borrowing requirement substantially, and permanently. The capital account balance moves in opposite directions for each country. Government spending is the anchor in this model, keeping the system from experiencing a decline in overall GDP over time. The circulation of money increases as central banks print money to keep the system going, and figure 9 shows Tobin's Q for country 1 increases linearly, while remaining constant in country 2. The exchange rate initially dips, and then returns to normal, as one would expect.

[Insert Figures 7, 8, 9, 10, 11, 12 in panel form.]

In summary, this model seems quite capable of simulating the effects described in figure 1 above.

Importantly, employment suffers in both economies as a result of the investment drop, but country 2 recovers much more quickly.

[Insert figure 13, 14 here]

3.2 Investment shock within a currency union

We examine the effects of a currency union formation. We assume an external shock to real investment in country one by 33% in period 25 with both our economies inside a currency union. Care must be taken in interpreting the figures, as the debt allocation might be different. The structures of each economy are different from scenario 1 with regard to government and private debt, but of course each country's debt/GDP ratio is comparable. We see clearly from these scenarios that the existence of a currency union exacerbates the debt-deflation occurring in the small economy, as country 1experiences a large shock with respect to its sovereign debt levels. The current account balance of country 1 also clearly experiences a large shock.

[Insert figures 15, 16, 17, 18, 19, 20 here, in panel form]

4. Conclusion

This chapter examines debt-deflation within a stock flow consistent framework. Drawing on the seminal work of Godley and Lavoie (2007). We construct a 2-country stock flow consistent model, where one small country experiences a large investment shock leading to a debt-deflation, as the larger country in turn 'bails out' the smaller country by borrowing from abroad.

We simulate the effects of a series of investment shocks on our stock flow consistent macro model under varying assumptions. We find that debt overhangs take close to a decade to recover from, especially when the small open economy is particularly open to trade, and mechanisms to reduce debt can help speed the economy to a recovery following a debt buildup.
The government in the smaller country tries to keep government spending high to 'keep the show on the road', and so public sector and private sector borrowing increase.

The price level collapses as investment in the real economy drags down aggregate demand. The level of private and government debt increases, as does the cost of debt servicing.

The model simulates an investment shock in the small economy, country 1. We consider a floating exchange regime, and a monetary union. In the case of the monetary union, the investment shock prolongs and extends the debt-deflation of the small open economy.

Future research will concentrate on calibration of stock flow consistent models of this type for small open economies.

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Baseline scenario: 2 growing economies

Scenario 1: An external shock to real investment in country one by 33% in period 25 with floating exchange rate.

Scenario 2: An external shock to real investment in country one by 33% in period 25 with currency union.

Figure 1: Real investment in country 1 before and after shocks

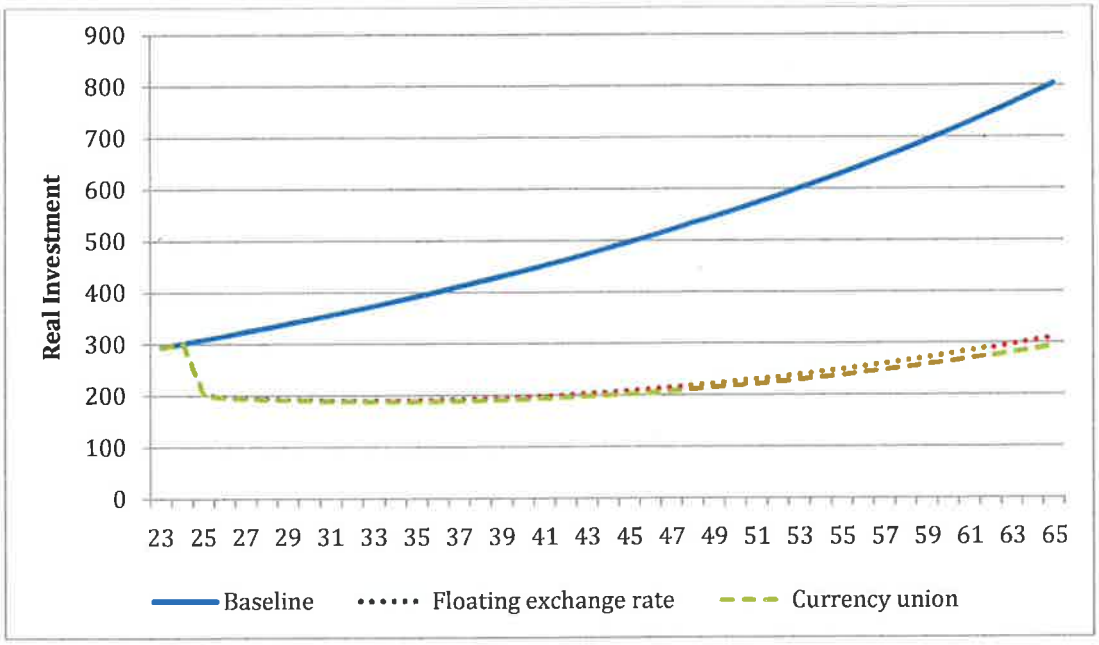


Figure 2: Real investment in country 2 before and after shocks

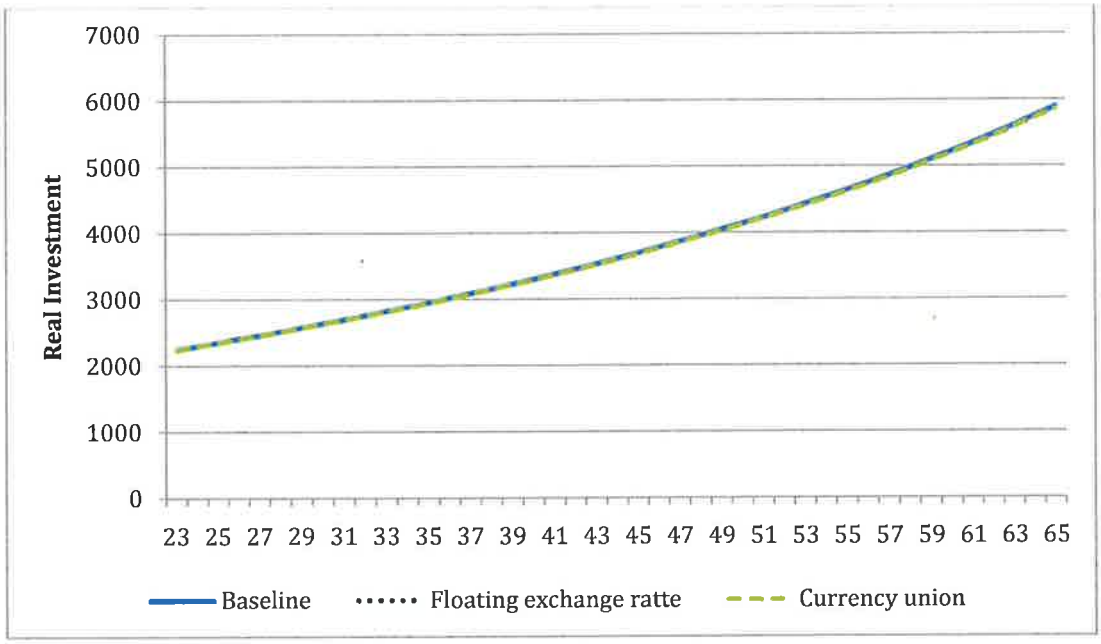


Figure 3: Real GDP in country on country 1 before and after shocks

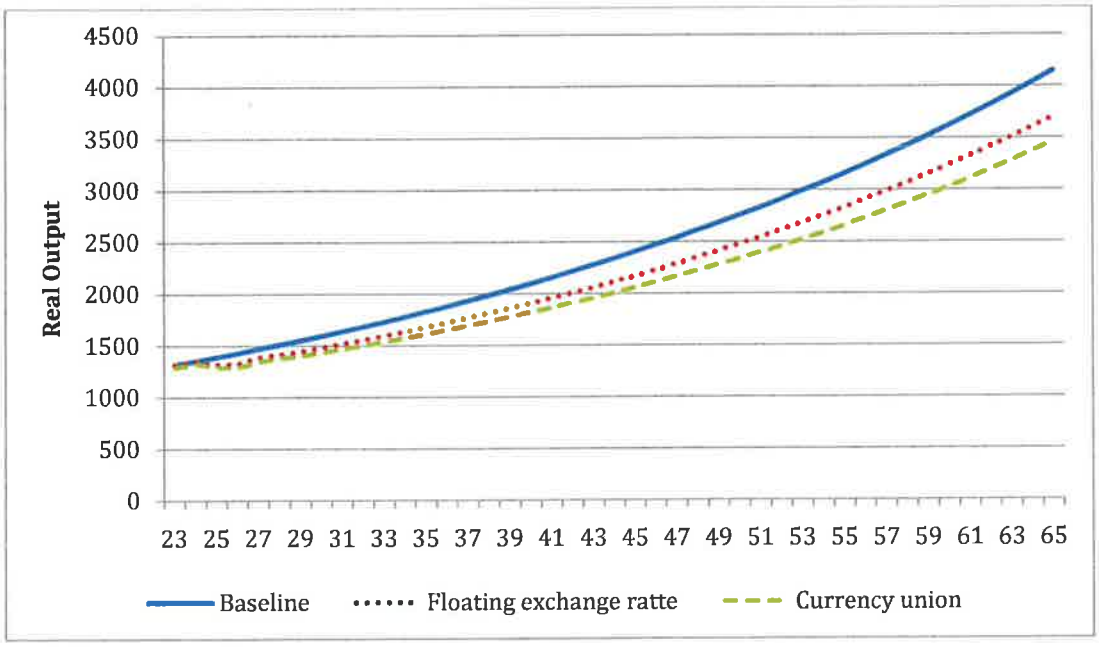


Figure 4: Real GDP in country 2 before and after shocks

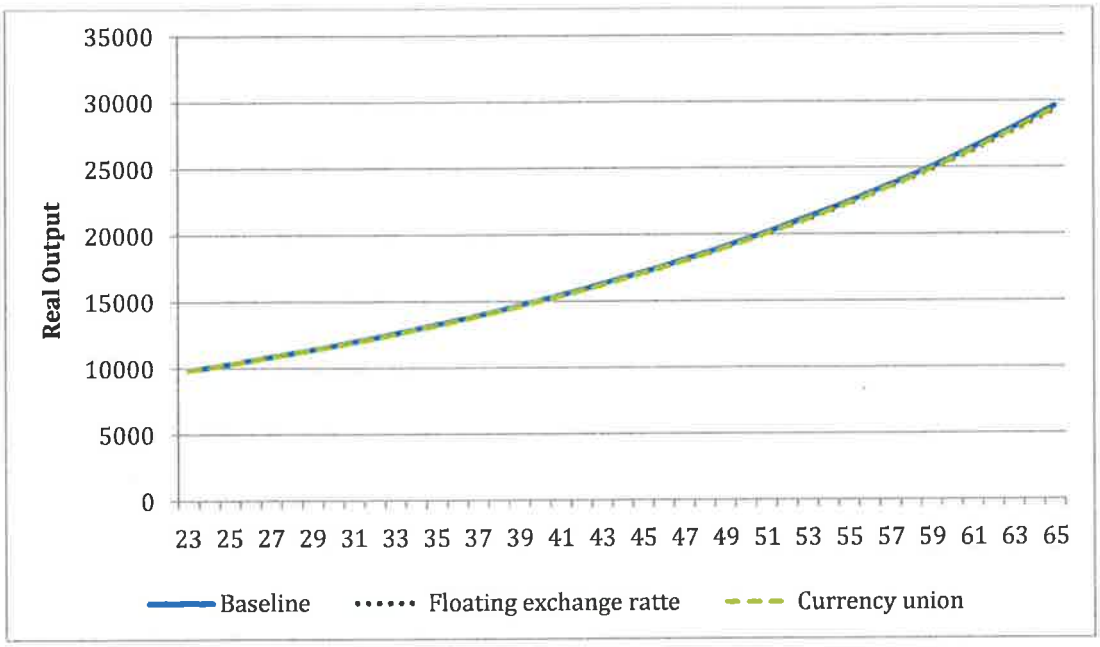


Figure 5: Real consumption in country 1 before and after shocks

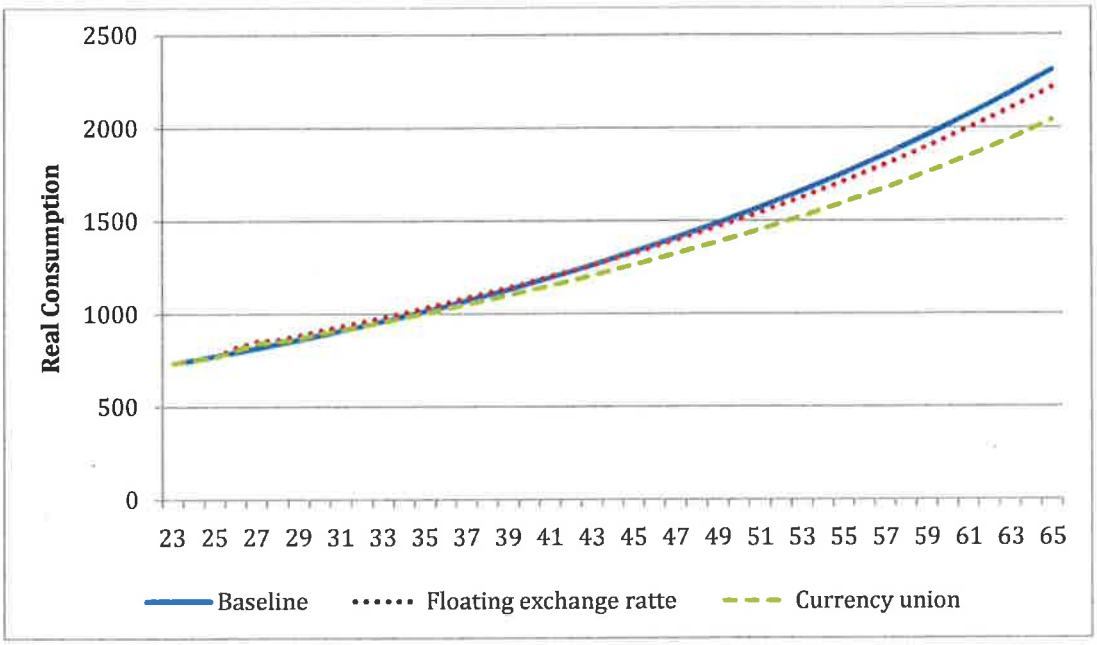


Figure 6: Real consumption in country 2 before and after shocks

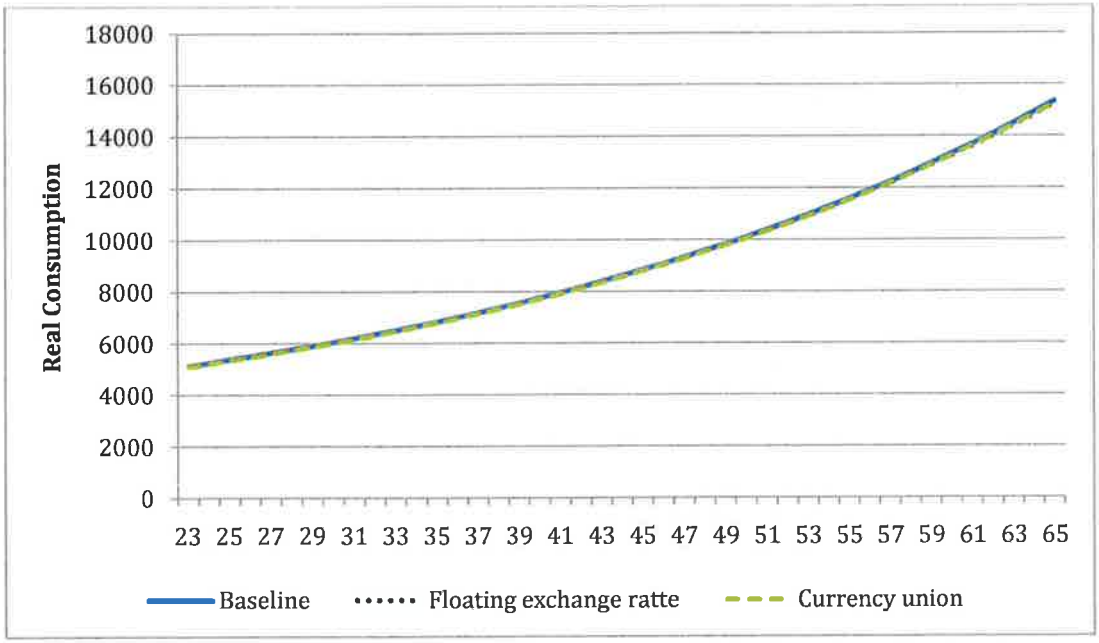


Figure 7: Government debt in country 1 before and after the shocks

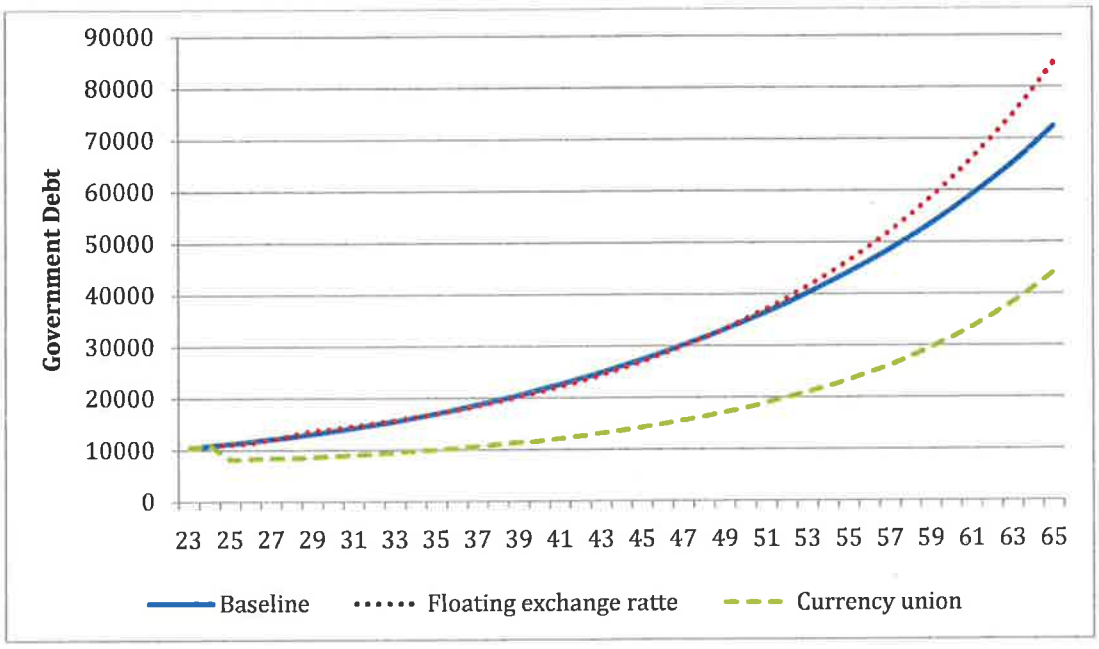


Figure 8: government debt in country 2 before and after the shocks

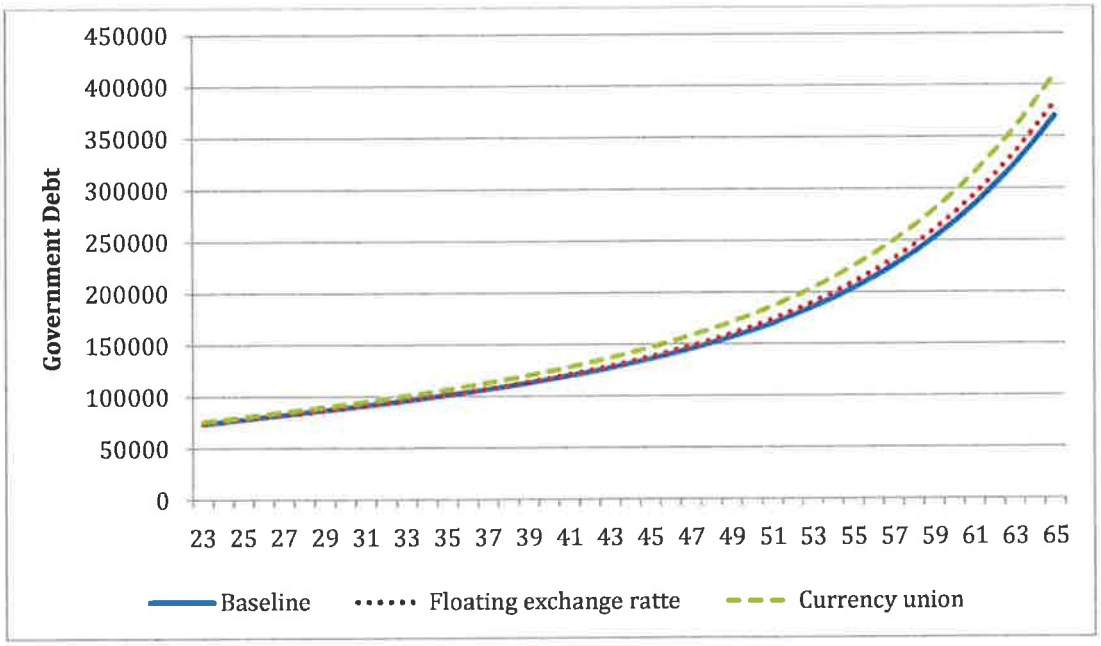


Figure 9: Private (firms) debt in country 1 before and after the shocks

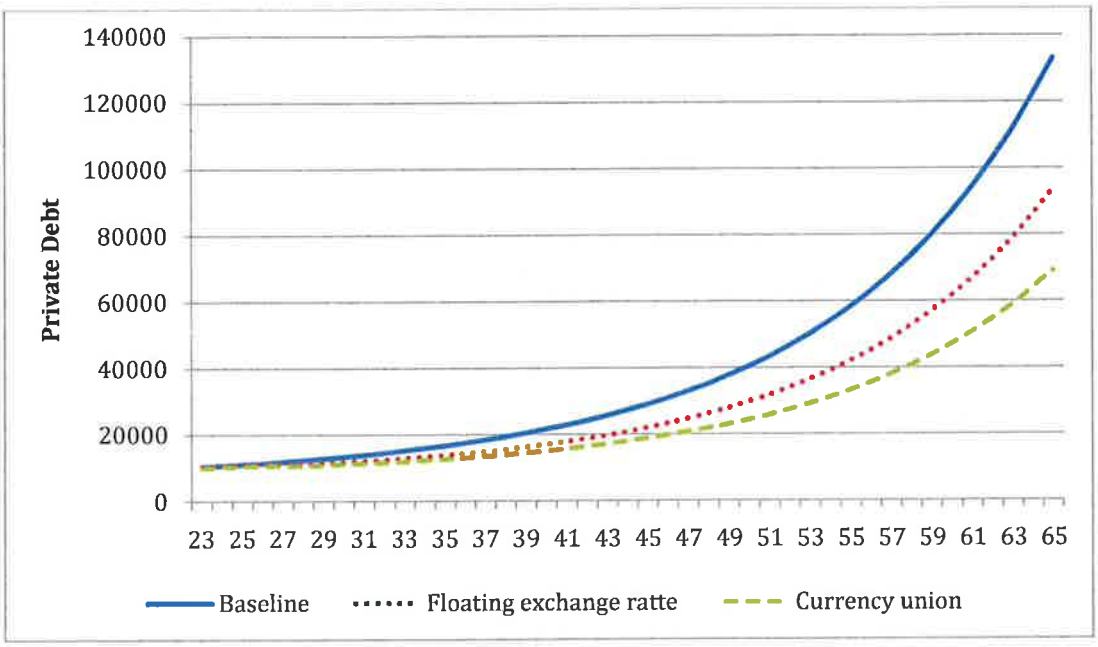


Figure 10: Private (Firms) debt in country 2 before and after the shocks

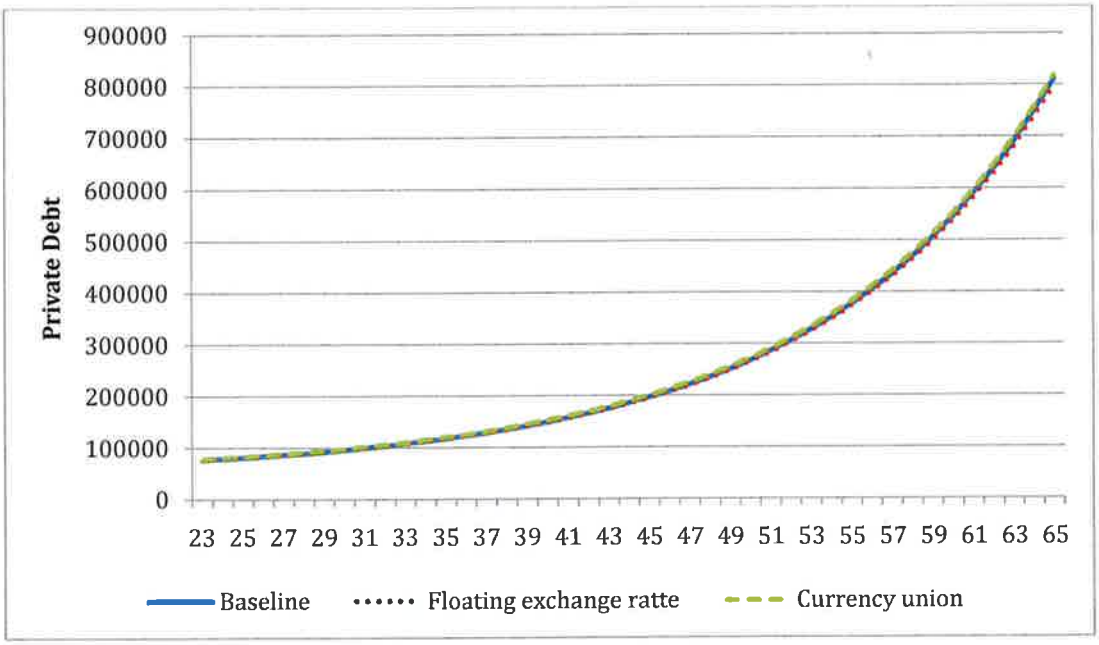


Figure 11: Domestic price inflation in country 1 before and after the shocks

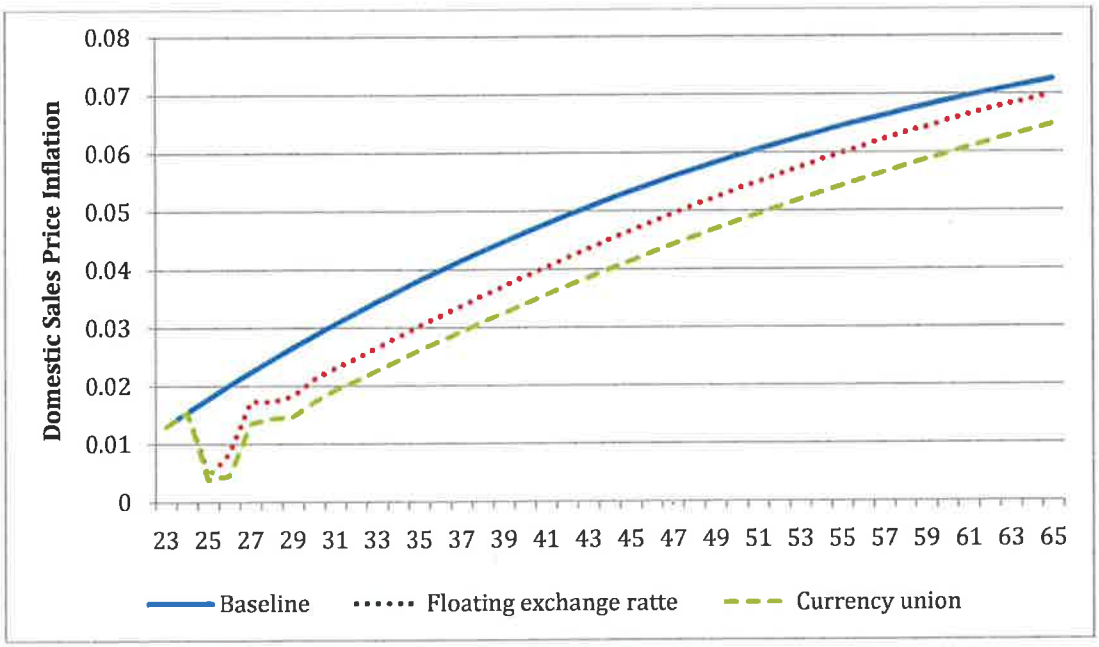


Figure 12: Domestic price inflation in country 2 before and after the shocks

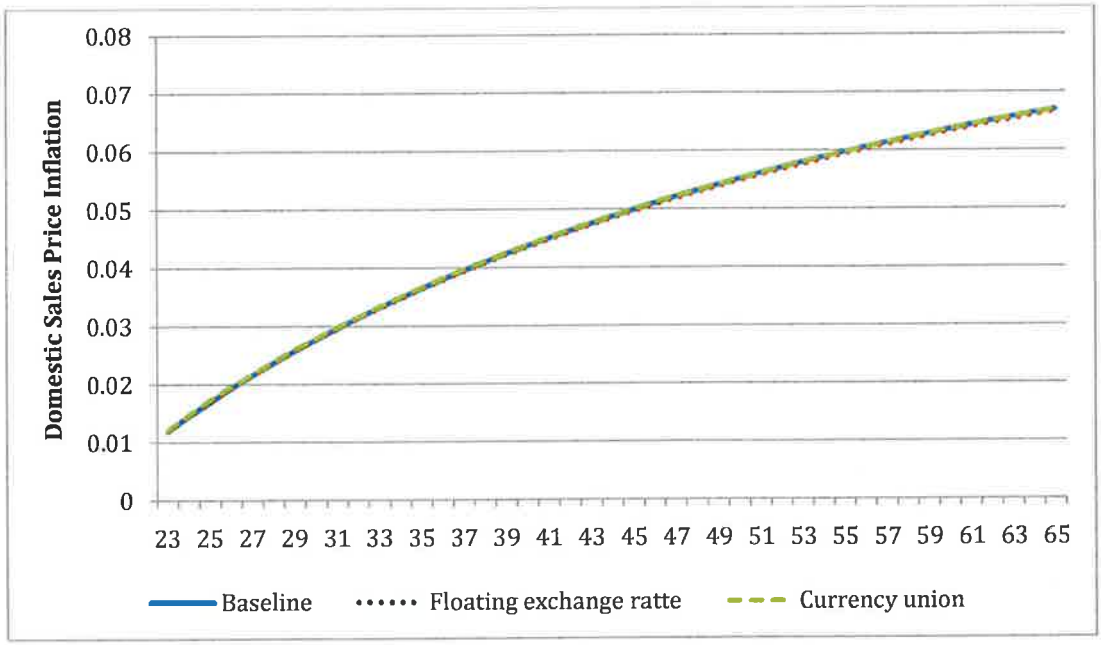


Figure 11-A: General Price inflation in country 1 before and after the shocks

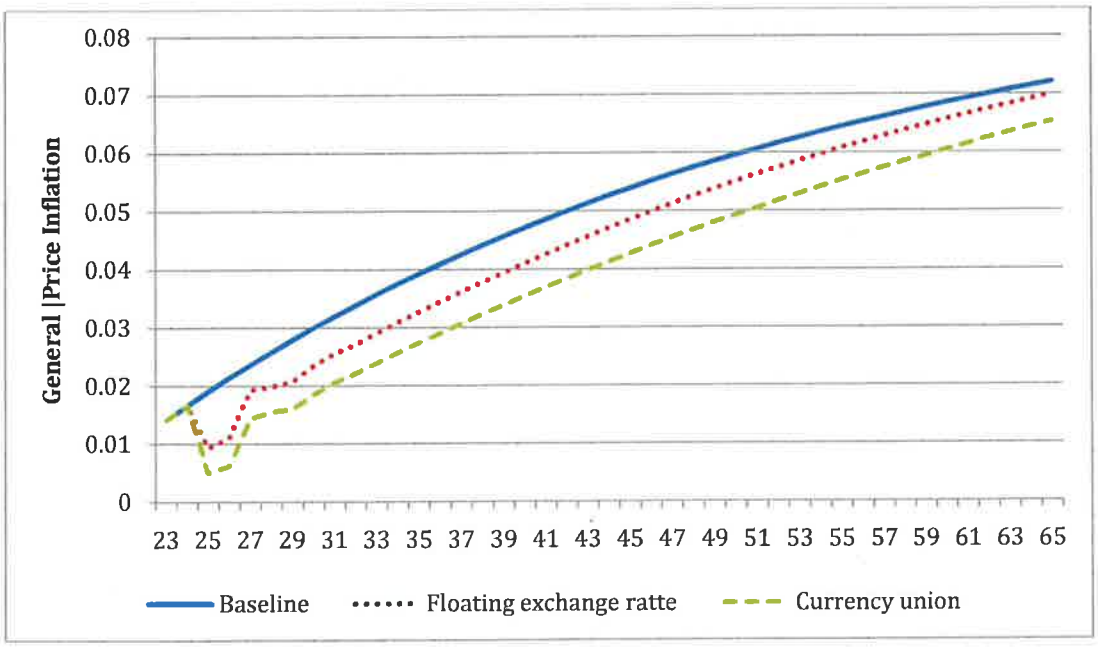


Figure 12-A: General Price inflation in country 2 before and after the shocks

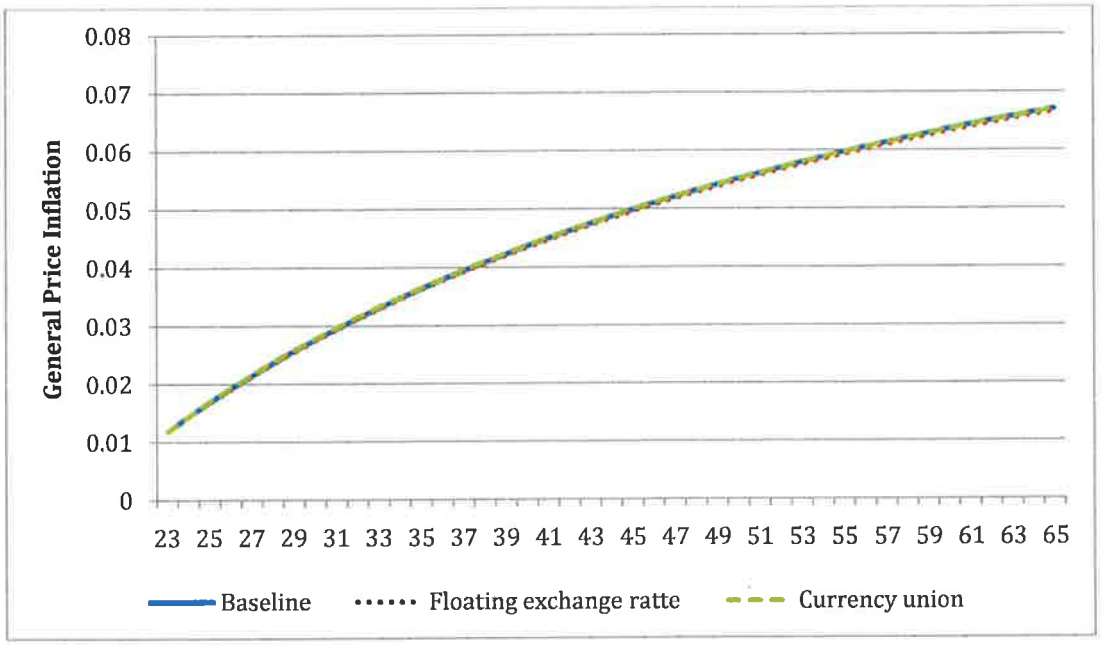


Figure 13: Money supply in country 1 before and after the shocks

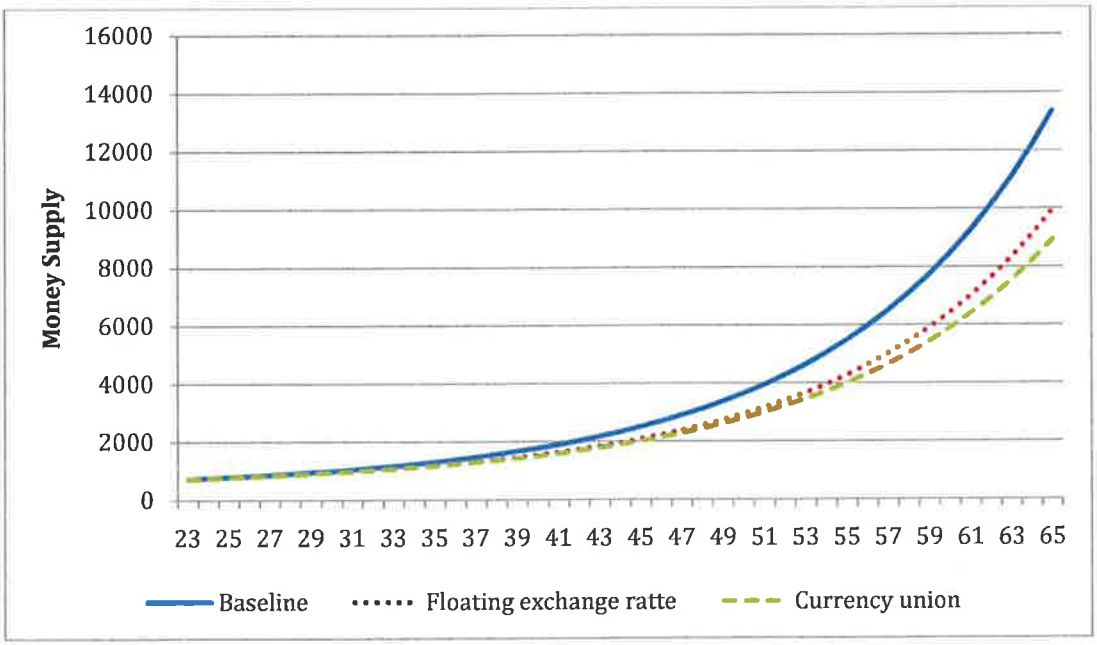


Figure 14: Money supply in country 2 before and after the shocks

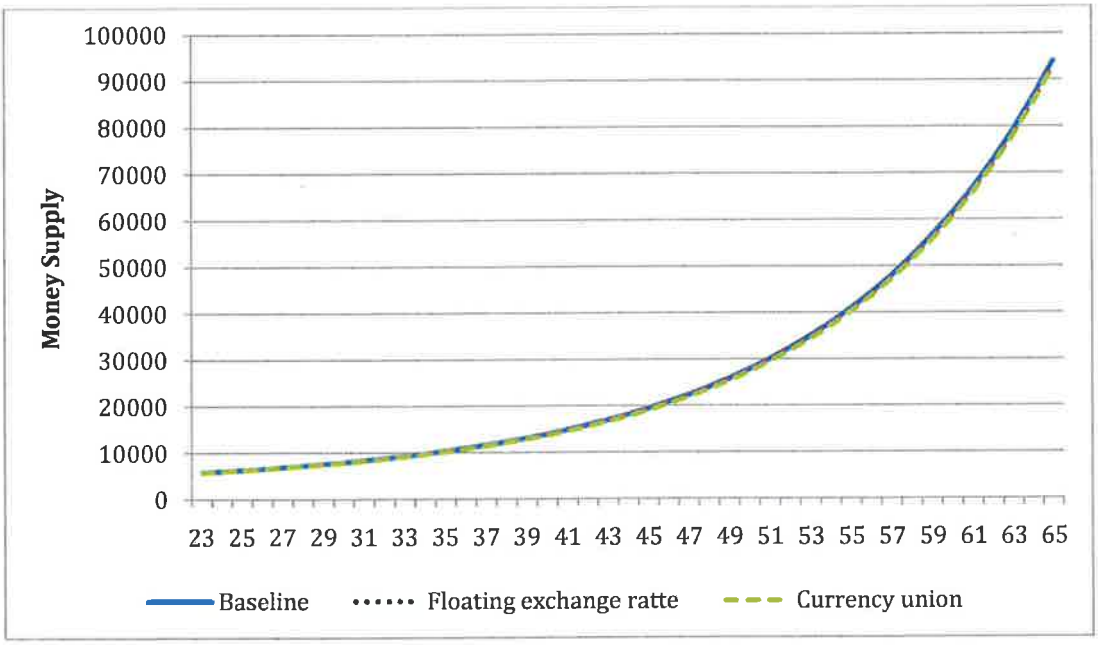


Figure 15: Current account balance in both countries before and after the shocks

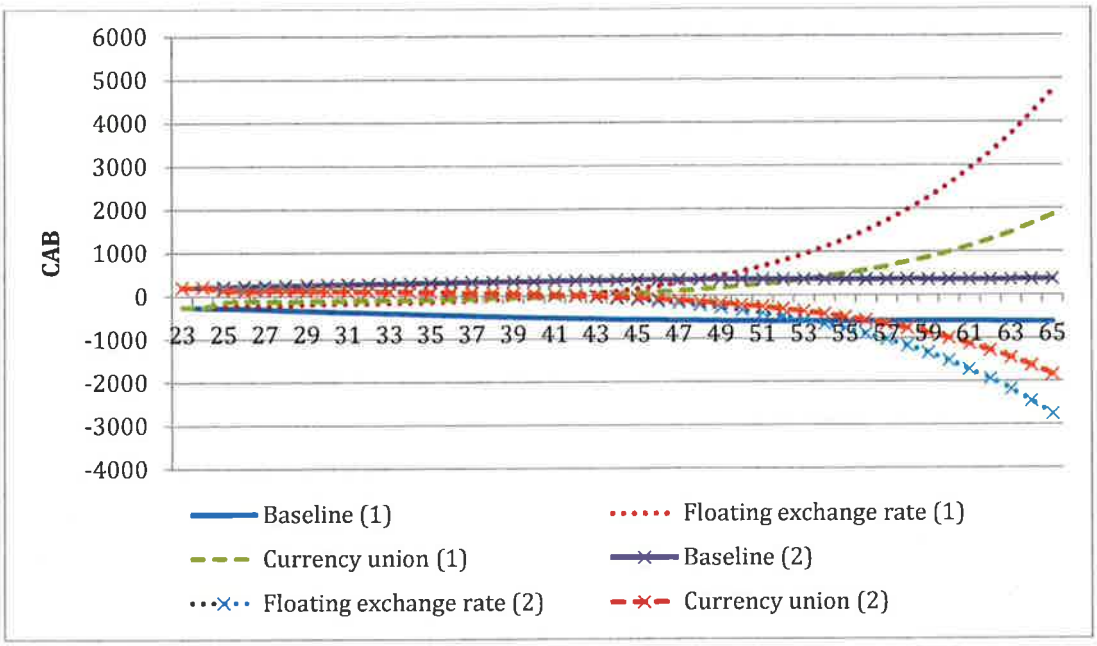


Figure 16: Capital account balance in both countries

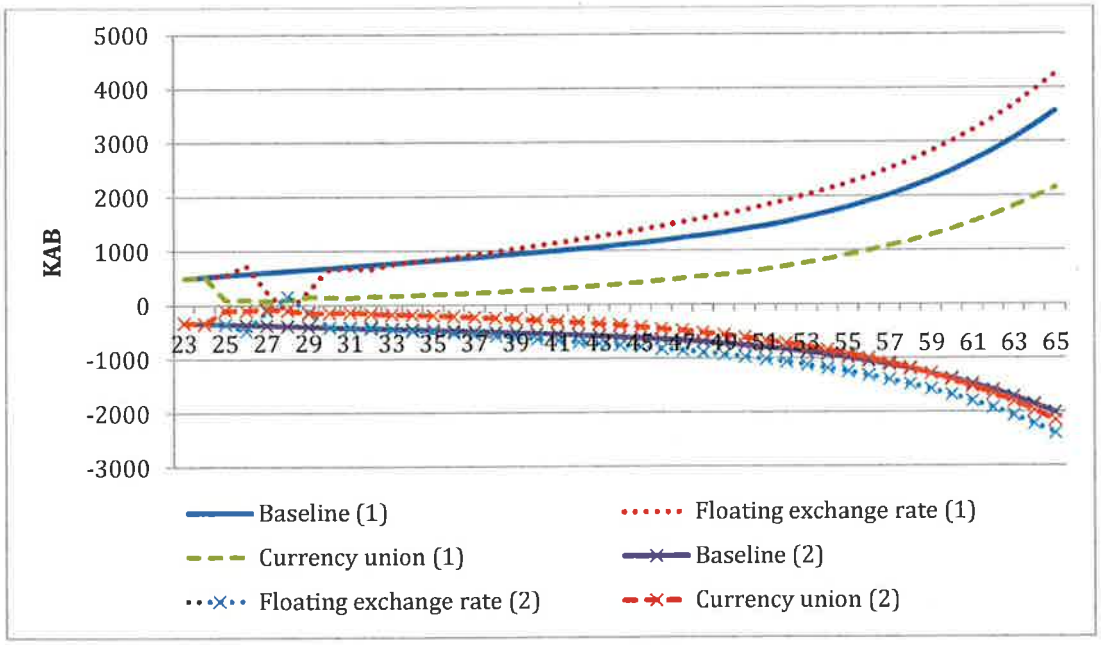


Figure 17: Exchange rate

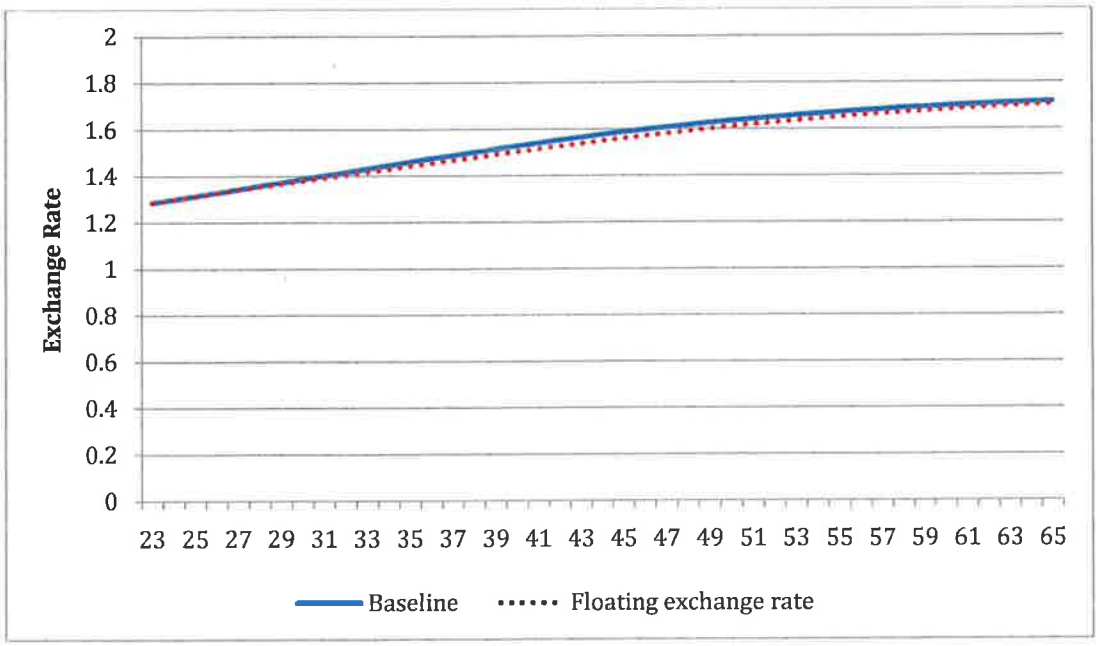


Figure 18: Capital adequacy ratio in country 1 banks

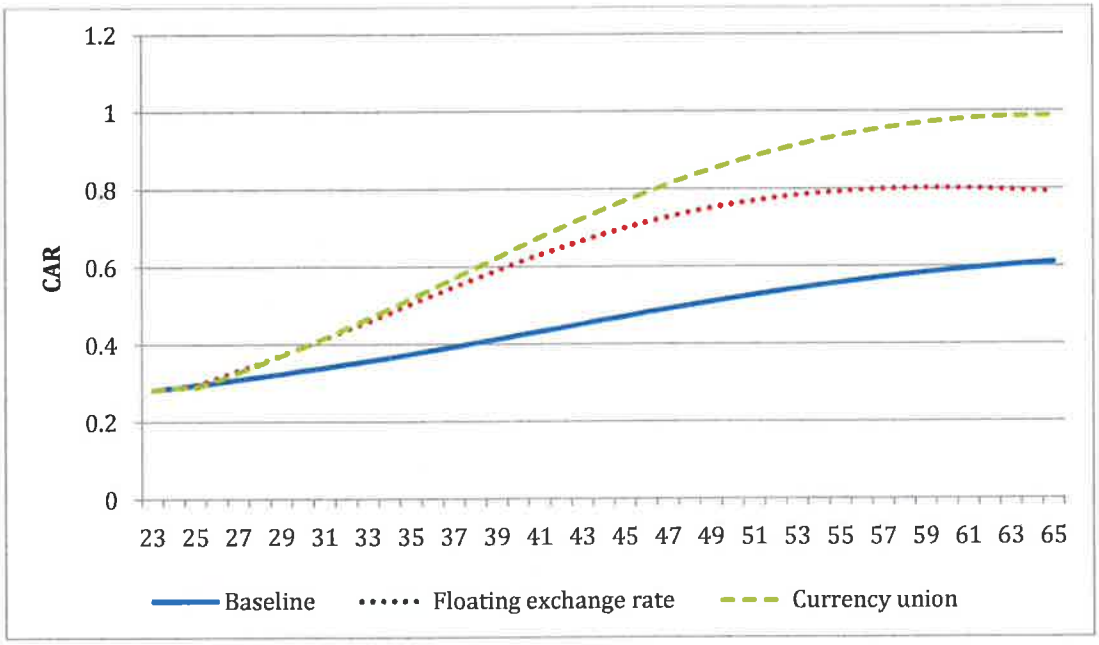


Figure 19: Capital adequacy ratio in country 2 banks

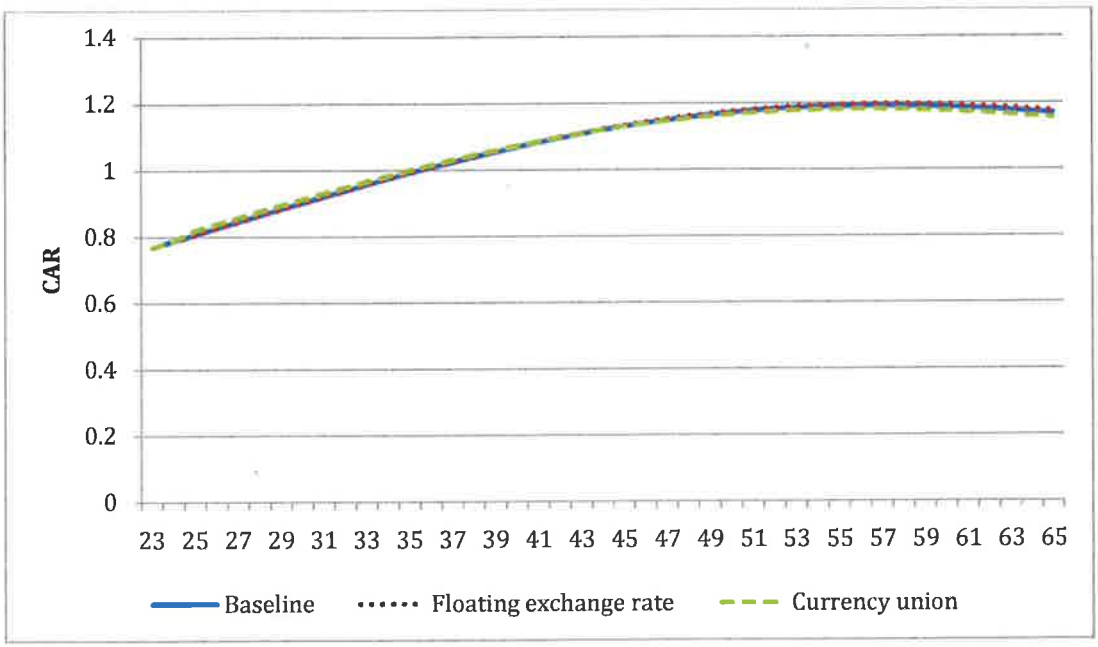


Figure 20: Tobin's q ratio for country 1

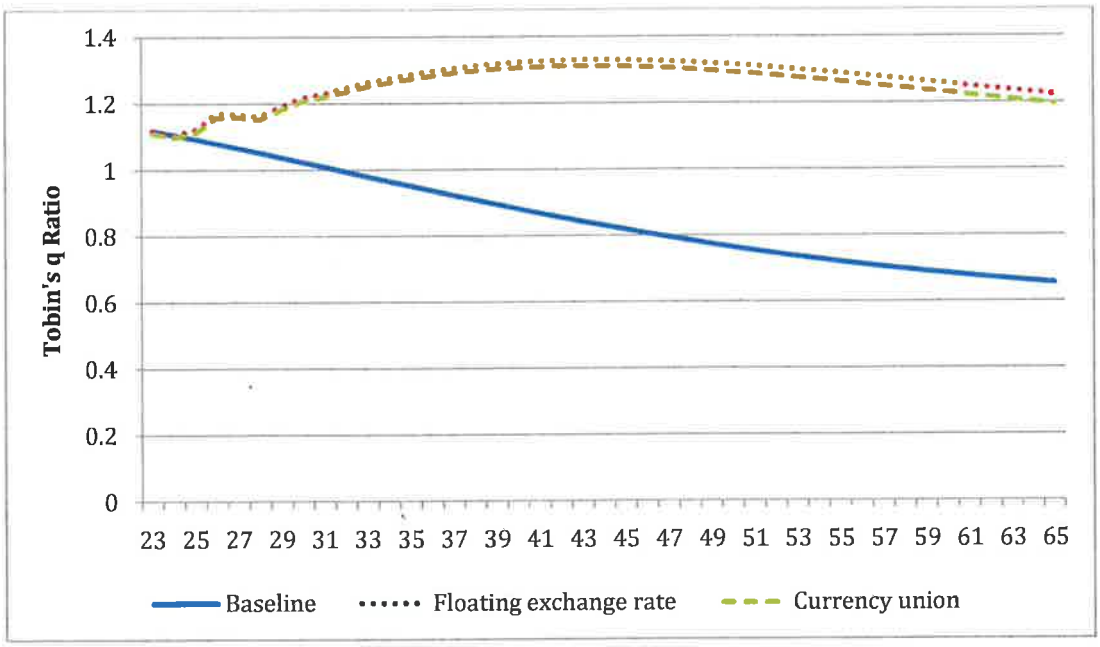


Figure 21: Tobin's q ratio for country 2

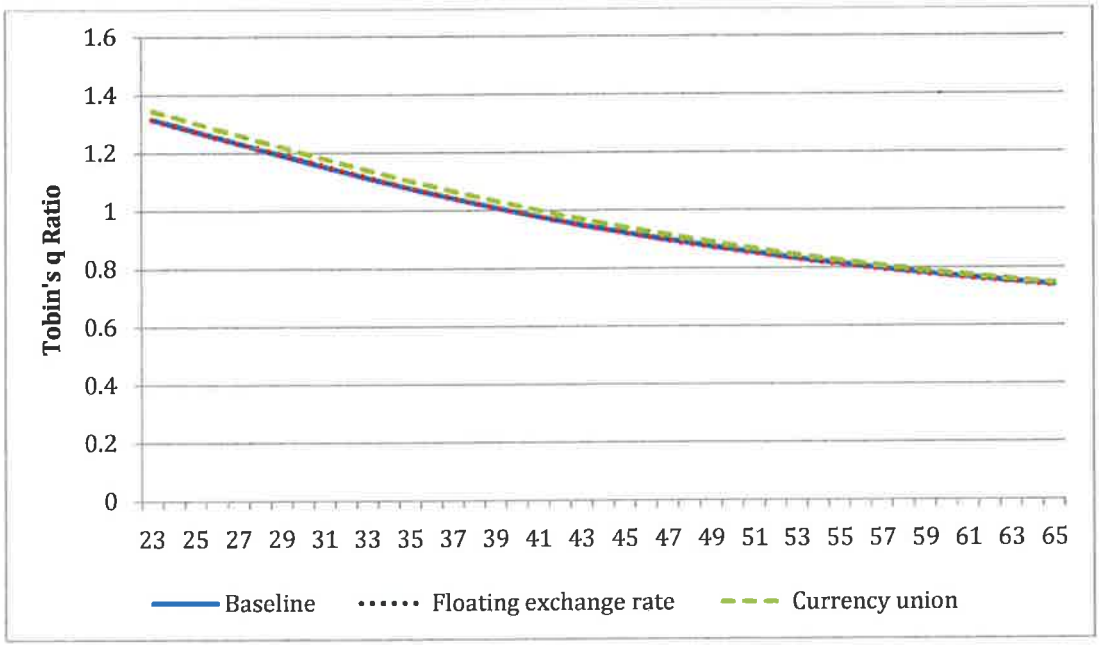


Figure 22: Public sector borrowing requirements for country's 1 government

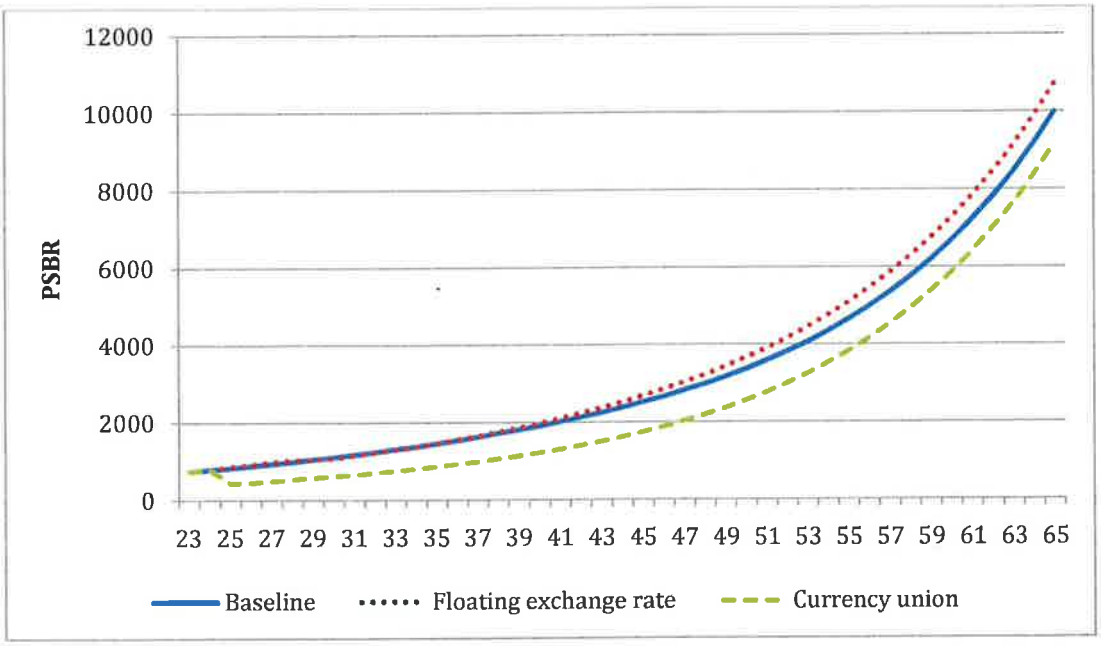


Figure 23: Public sector borrowing requirements for country's 2 government

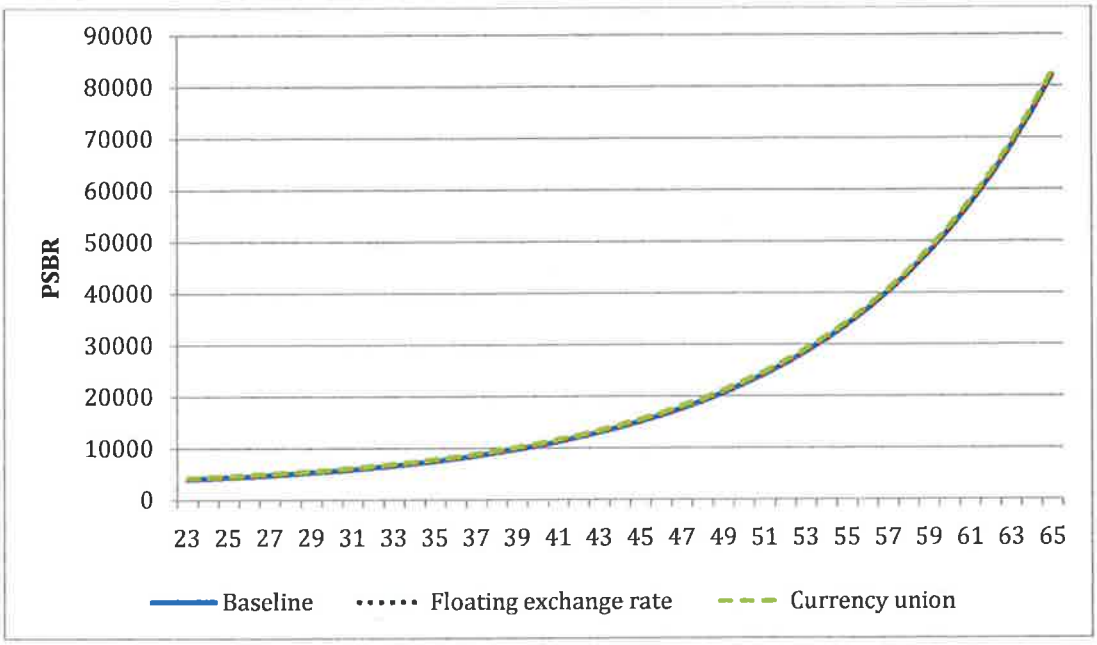


Figure 24: Real households' wealth in country 1

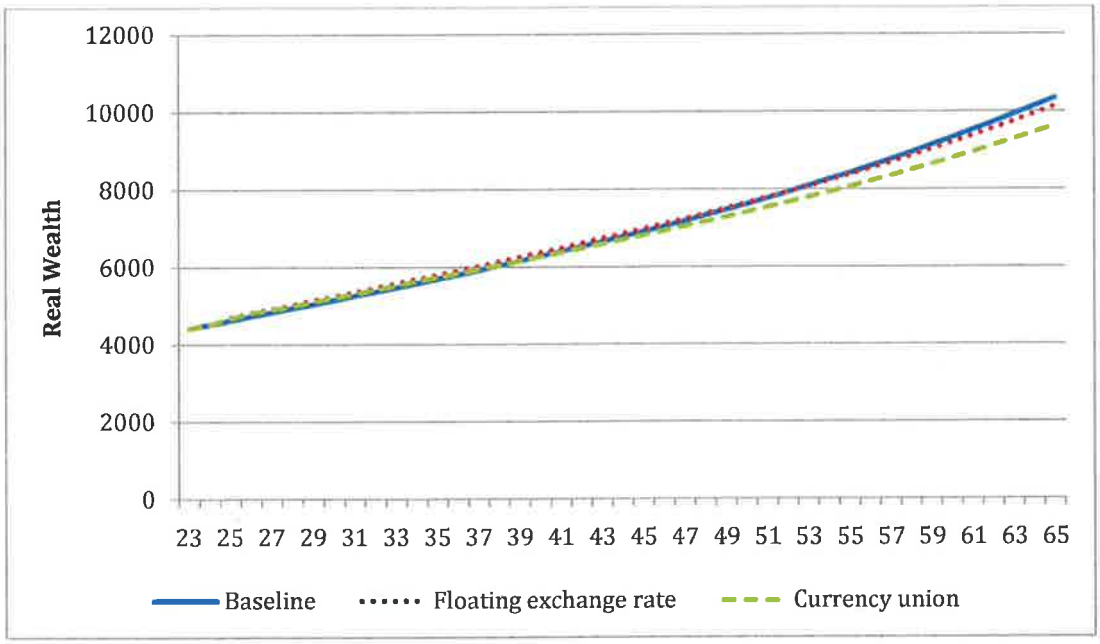


Figure 25: Real households' wealth in country 2

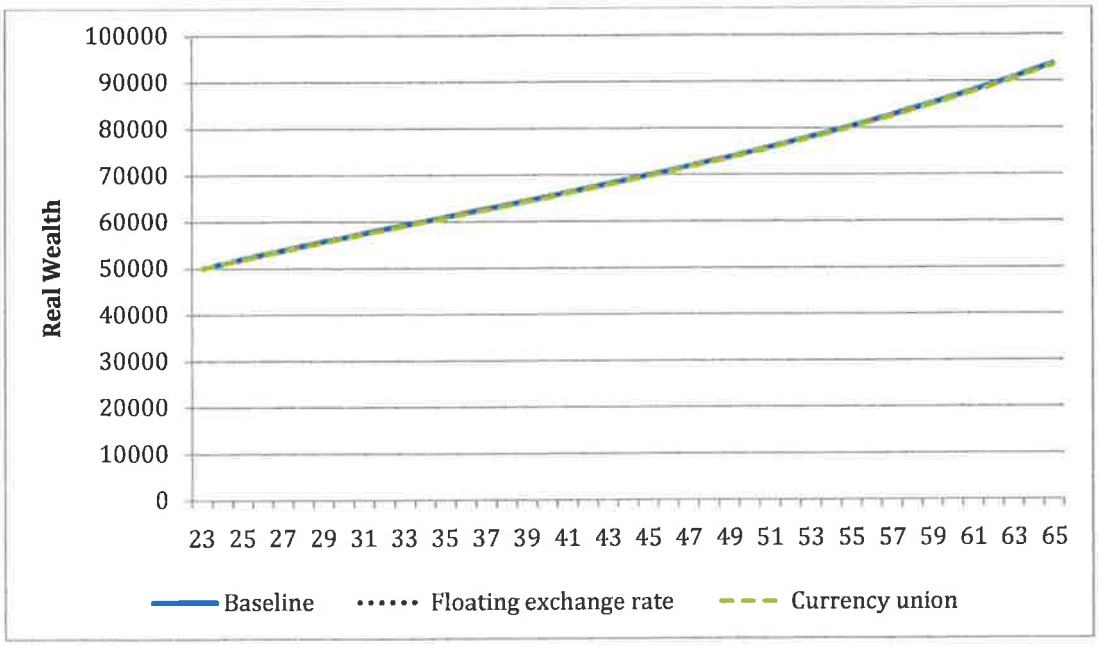


Figure 26: Real disposable income in country 1

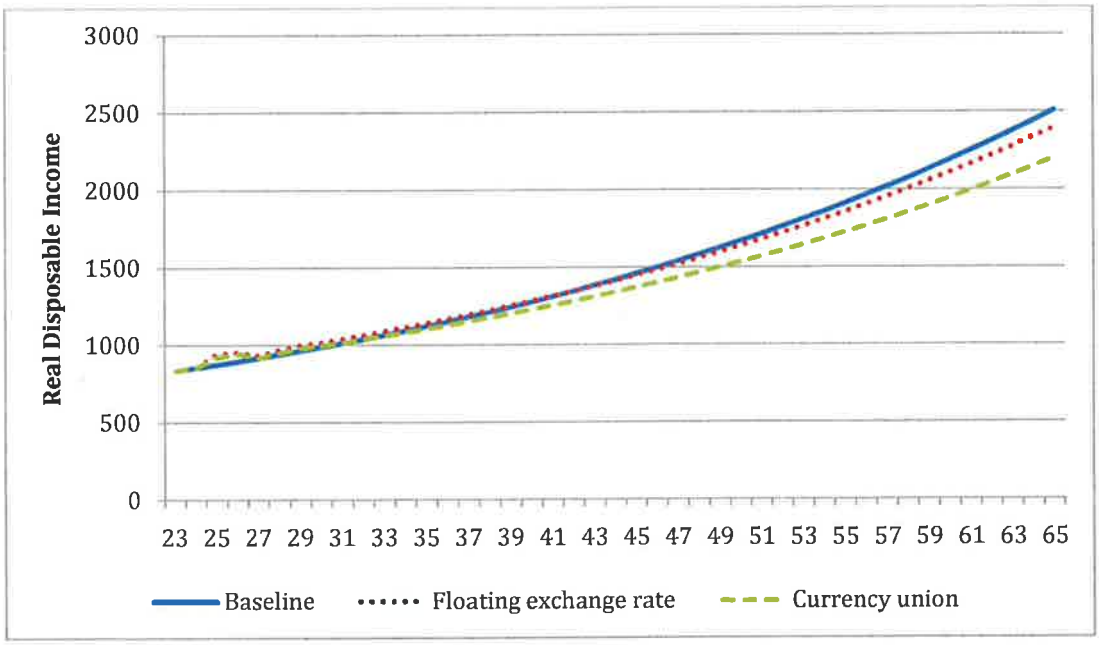


Figure 27: Real disposable income in country 2

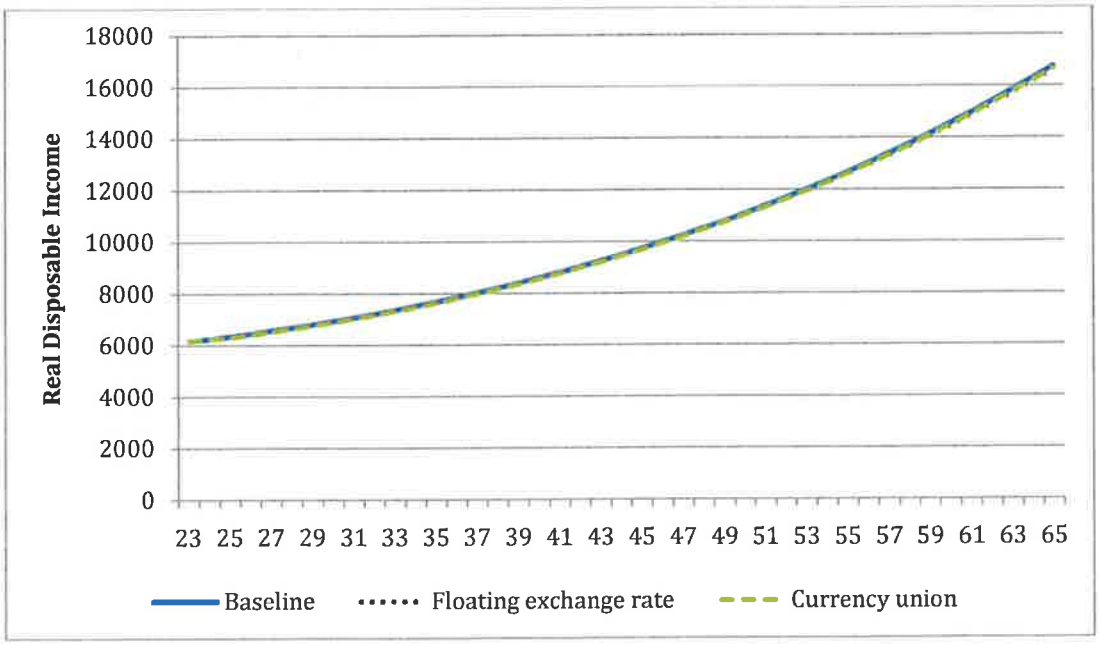


Figure 28: Real exports of the 1st country.

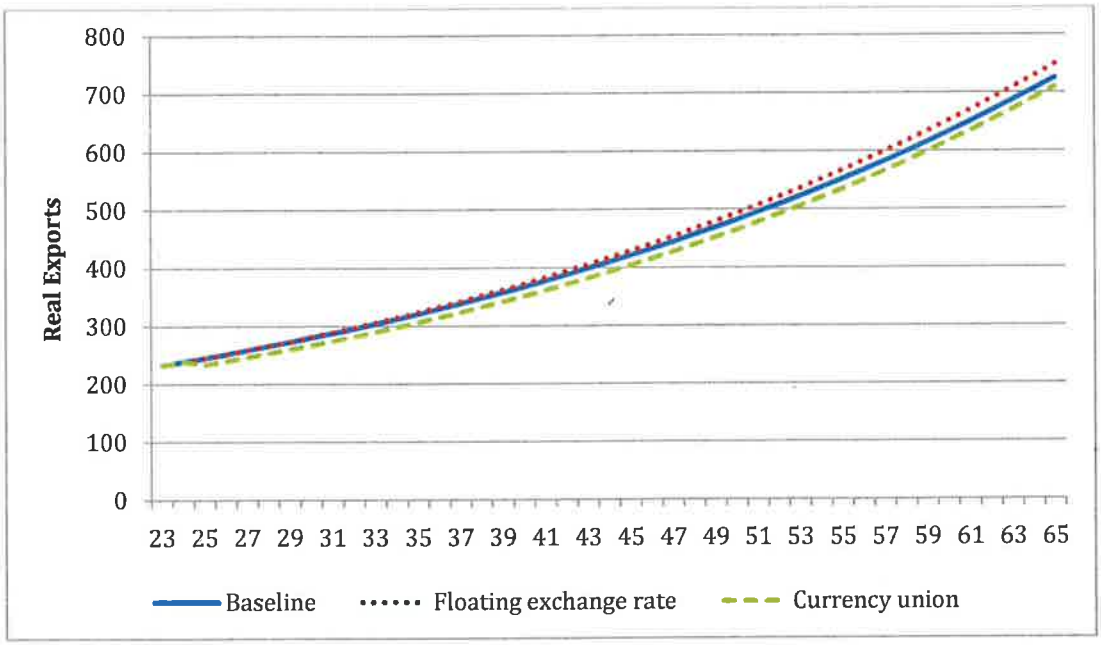


Figure 29: Real imports of the 1st country.

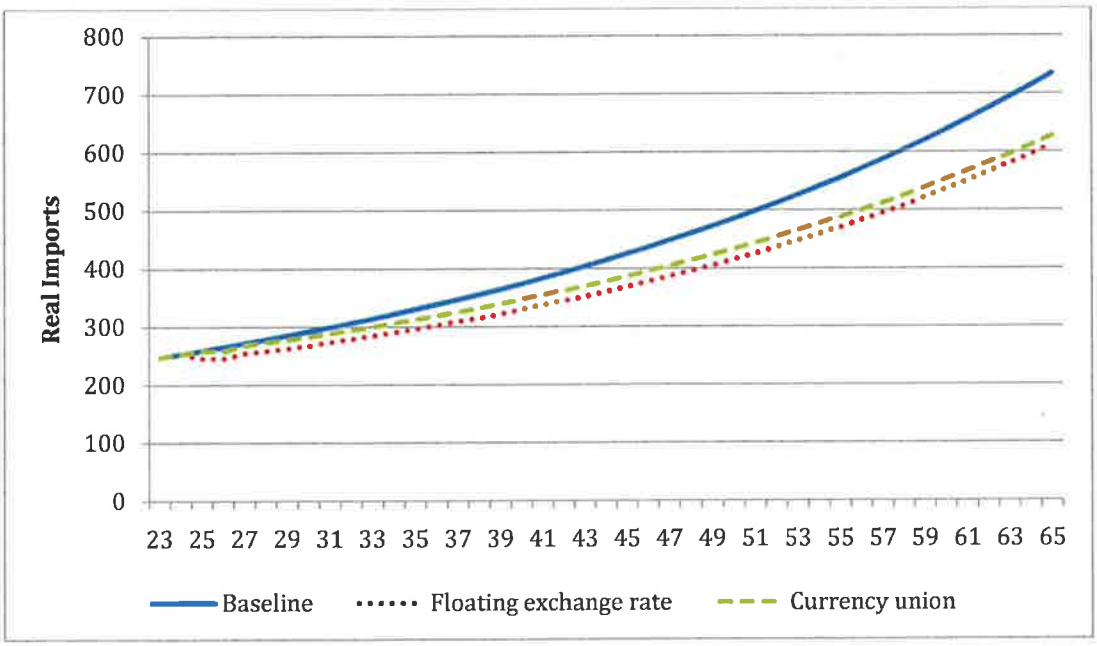


Figure 30: Real exports of the 2nd country.

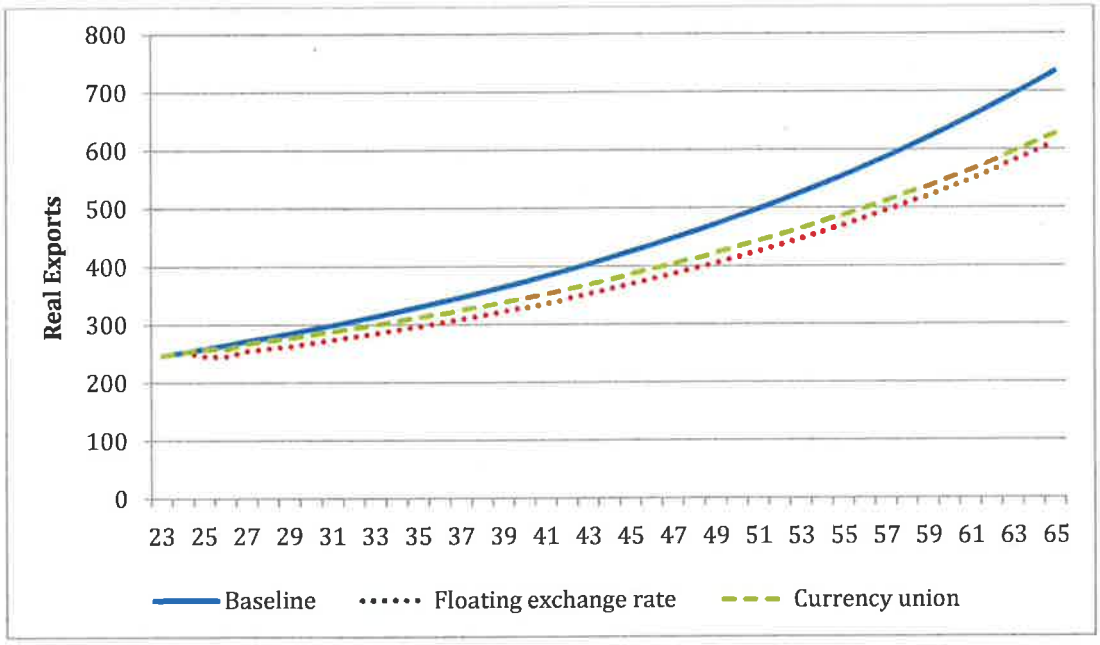


Figure 31: Real imports of the 2nd country.

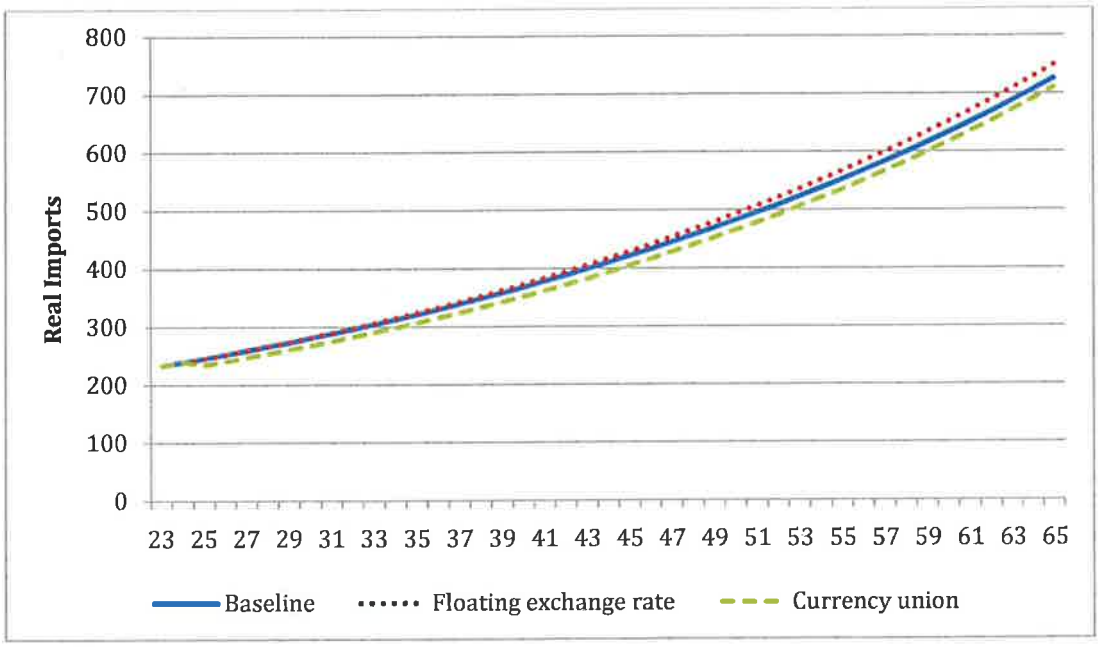


Figure 32: Employment rate in the 1st country.

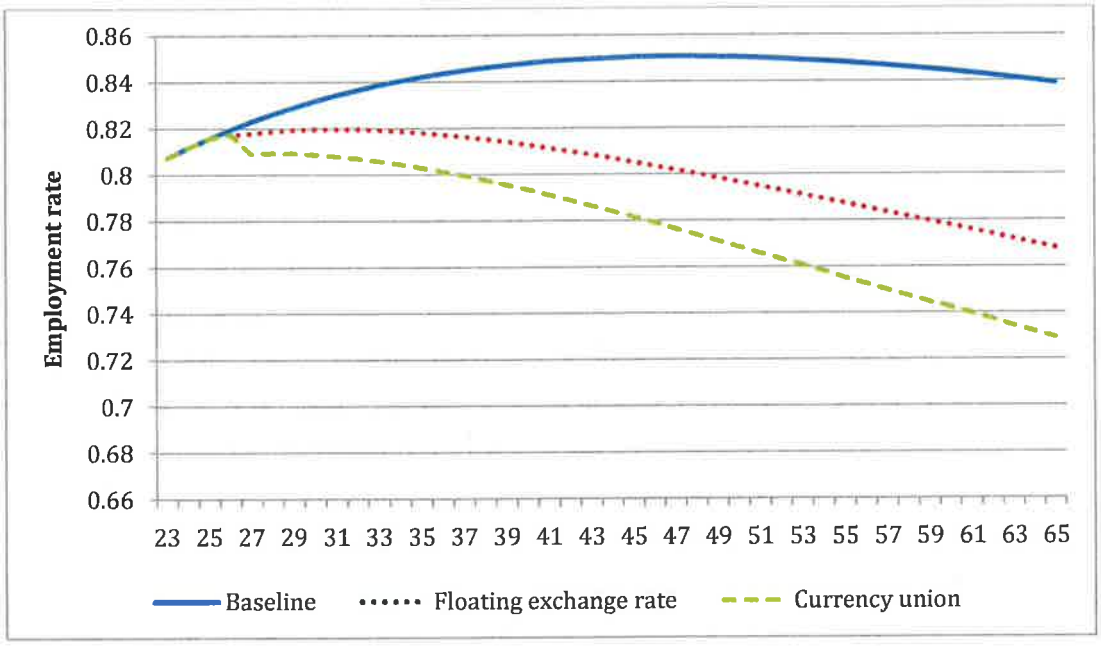
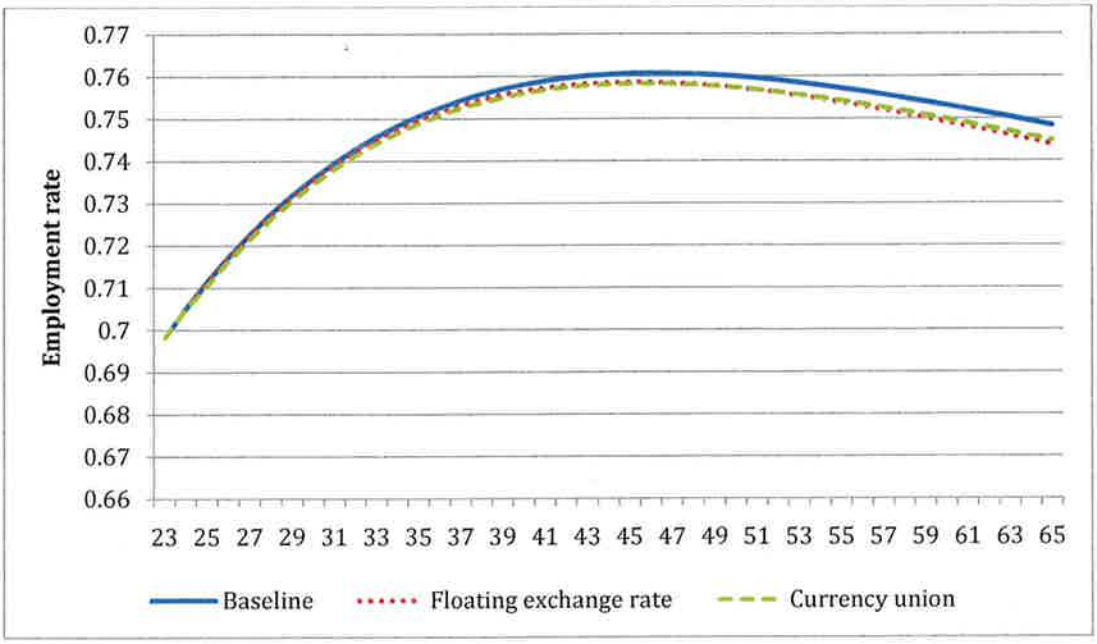
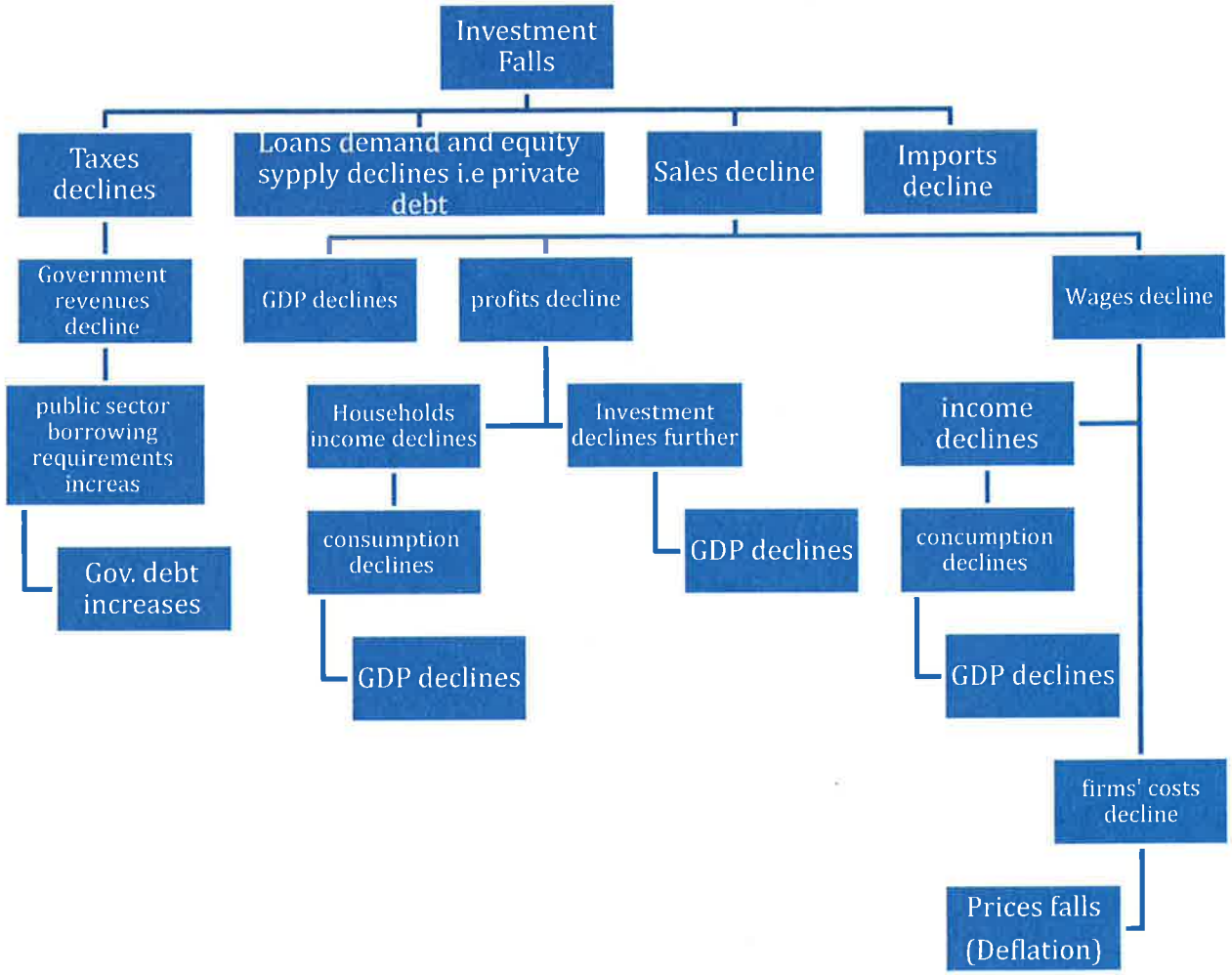


Figure 33: Employment rate in the 2nd country.



Interpretations



The above mechanism considers no decline in government expenditures. If government decreases its expenditures we will have more declines in prices (deflation) and debt liquidations.

Table 1: Balance Sheets Matrix

	Country 1					Ex. Rate	Country 2					Sum
	Households	**Firms**	**Gov.**	**C. Bank**	**Banks**		**Households**	**Firms**	**Gov.**	**C. Bank**	**Banks**	
Inventories		$+IN^1$				E		$+IN^1$				ΣIN
Fixed Capital		$+K^1$				E		$+K^2$				ΣK
HPM	$+H^1_{h\,d}$			$-H^1_s$	$+H^1_{b\,d}$		$+H^2_{h\,d}$			$-H^2_s$	$+H^2_{b\,d}$	0
Advances				$+A^1_s$	$-A^1_s$					$+A^2_s$	$-A^2_s$	0
Household Loans	$-L^1_{h\,d}$				$+L^1_{h\,s}$		$-L^2_{h\,d}$				$+L^2_{h\,s}$	0
Firm Loans		$-L^1_{f\,d}$			$+L^1_{f\,s}$			$-L^1_{f\,d}$			$+L^2_{f\,s}$	0
Deposits	$+M^1_d$				$-M^1_s$		$+M^2_d$				$-M^2_s$	0
Bills[1]	$+B^1_{h\,1\,d}$		$-B^1_s$	$+B^1_{cb\,1\,d}$	$+B^{11}_{b\,1\,d}$	E	$+B^1_{h\,2\,d}$					0
Bills[2]	$+B^2_{h\,1\,d}$			$+B^2_{cb\,1\,d}$		E	$+B^2_{h\,2\,d}$		$-B^2_s$	$+B^2_{cb\,2\,d}$	$+B^{21}_{b\,2\,d}$	0
Bonds[1]	$+BL^1_{1\,d}.P^1_{bl}$		$-BL^1_{1\,s}.P^1_{bl}$			E	$+BL^1_{2\,d}.P^1_{bl}$					0
Bonds[2]	$+BL^2_{1\,d}.P^2_{bl}$					E	$+BL^2_{2\,d}.P^2_{bl}$		$-BL^2_{2\,s}.P^2_{bl}$			0
Firm Equities	$+e^1_d.P^1_e$	$-e^1_s.P^1_e$					$+e^2_d.P^2_e$	$-e^2_s.P^2_e$				0
Bank Capital	$+OF^1$				$-OF^1$		$+OF^2$				$-OF^2$	0
Reserves				$+R^1$		E				$+R^2$		ΣR
Balance	$-V^1_h$	$-NW^1_f$	$-NW^1_g$			E	$-V^2_h$	$-NW^2_f$	$-NW^2_g$			$\Sigma K+\Sigma R$
Sum	**0**	**0**	**0**	**0**	**0**		**0**	**0**	**0**	**0**	**0**	**0**

Country 1	Households	Firms		Government	C. Bank		Banks		Ex. Rate
		Current	Capital		Current	Capital	Current	Capital	
Consumption	$-C^1$	$+C^1$							
G. Expenditure		$+G^1$		$-G^1$					
Investment		$+-I^1$	$-I^1$						
Exports		$+X^1$							E
Imports		$-IM^1$							E
Δ Inventories		$+\Delta IN^1$	$-\Delta IN^1$						
Taxes	$-T^1_I$	$-T^1_s$		$+T^1$					
Wages	$+WB^1$	$-WB^1$							
Firm profits	$+FD^1_f$	$-F^1_f$	$+FU^1_f$				$-r^1_{l\text{-}1}.NPL^1$		
Bank profits	$+FD^1_b$						$-F^1_b$	$+FU^1_b$	
C. Bank profits				$+F^1_{cb}$	$-F^1_{cb}$				
Interest on									
Advances					$+r^1_{a\text{-}1}.A^1_{s\text{-}1}$		$-r^1_{a\text{-}1}.A^1_{d\text{-}1}$		
Household loans	$-r^1_{l\text{-}1}.L^1_{h\,d\text{-}1}$						$+r^1_{l\text{-}1}.L^1_{h\,s\text{-}1}$		
Firm loans		$-r^1_{l\text{-}1}.L^1_{f\,d\text{-}1}$					$+r^1_{l\text{-}1}.L^1_{f\,s\text{-}1}$		
Deposits	$+-r^1_{m\text{-}1}.M^1_{d\text{-}1}$						$+-r^1_{m\text{-}1}.M^1_{s\text{-}1}$		
Bills[1]	$+r^1_{b\text{-}1}.B^1_{h\,1\,d\text{-}1}$			$-r^1_{b\text{-}1}.B^1_{s\text{-}1}$	$+r^1_{b\text{-}1}.B^1_{cb\,1\,d\text{-}1}$		$+r^1_{b\text{-}1}.B^1_{b\,1\,d\text{-}1}$		E
Bills[2]	$+r^2_{b\text{-}1}.B^2_{h\,1\,d\text{-}1}$				$+r^2_{b\text{-}1}.B^2_{cb\,1\,d\text{-}1}$				E
Bonds[1]	$+BL^1_{1\,d\text{-}1}$			$-BL^1_{s\text{-}1}$					E
Bonds[2]	$+BL^2_{1\,d\text{-}1}$								E
Δ Stocks of									
Advances						$-\Delta A^1_s$		$+\Delta A^1_d$	
Household loans	$+\Delta L^1_{h\,d}$							$-\Delta L^1_{h\,s}$	
Firm loans			$+\Delta L^1_{f\,d}$					$-\Delta L^1_{f\,d}$	
HPM	$-\Delta H^1_{h\,d}$					$+\Delta H^1_s$		$-\Delta H^1_{b\,d}$	
Deposits	$-\Delta M^1_d$							$+\Delta M^1_s$	
Bills[1]	$-\Delta B^1_{h\,1\,d}$			$+\Delta B^1_s$		$-\Delta B^1_{cb\,1\,d}$		$-\Delta B^1_{b\,1\,d}$	E

Bills[2]	$-\Delta B^2_{h\,l\,d}$					$-\Delta B^2_{cb\,l\,d}$			E
Bonds[1]	$-\Delta BL^1_{l\,d}\cdot p^1_{bl}$			$+\Delta BL^1_{s}\cdot p^1_{bl}$					E
Bonds[2]	$-\Delta BL^2_{l\,d}\cdot p^2_{bl}$								E
Equities	$-\Delta e^1_{d}\cdot p^1_{e}$		$+\Delta e^1_{s}\cdot p^1_{e}$						
Reserves						$-\Delta R^1$			E
Default loans			$+NPL^1$					$-NPL^1$	
Sum	0	0	0	0	0	0	0	0	

Table 2: Transactions Matrix.

Country 2	Households	Firms		Government	C. Bank		Banks		Sum
		Current	Capital		Current	Capital	Current	Capital	
Consumption	$-C^2$	$+C^2$							0
G. Expenditure		$+G^2$		$-G^2$					0
Investment		$+-I^2$	$-I^2$						0
Exports		$+X^2$							0
Imports		$-IM^2$							0
Δ Inventories		$+\Delta IN^2$	$-\Delta IN^2$						0
Taxes	$-T^2_I$	$-T^2_s$		$+T^2$					0
Wages	$+WB^2$	$-WB^2$							0
Firm profits	$+FD^2_f$	$-F^2_f$	$+FU^2_f$				$-r^2_{l-1}.NPL^2$		0
Bank profits	$+FD^2_b$						$-F^2_b$	$+FU^2_b$	0
C. Bank profits				$+F^2_{cb}$	$-F^2_{cb}$				0
Interest on									
Advances					$+r^2_{a-1}.A^2_{s-1}$		$-r^2_{a-1}.A^2_{d-1}$		0
Household loans	$-r^2_{l-1}.L^2_{h\,d-1}$						$+-r^2_{l-1}.L^2_{h\,s-1}$		0
Firm loans		$-r^2_{l-1}.L^2_{f\,d-1}$					$+-r^2_{l-1}.L^2_{f\,s-1}$		0
Deposits	$+-r^2_{m-1}.M^2_{d-1}$						$+-r^2_{m-1}.M^2_{s-1}$		0
Bills[1]	$+r^1_{b-1}.B^1_{h\,2\,d-1}$								0
Bills[2]	$+r^2_{b-1}.B^2_{h\,1\,d-1}$			$-r^2_{b-1}.B^2_{s-1}$	$+r^2_{b-1}.B^2_{cb\,2\,d-1}$		$+r^2_{b-1}.B^2_{b\,2\,d-1}$		0
Bonds[1]	$+BL^1_{2\,d-1}$								0
Bonds[2]	$+BL^2_{2\,d-1}$			$-BL^2_{s-1}$					0
Δ Stocks of									
Advances						$-\Delta A^2_s$		$+\Delta A^2_d$	0
Household loans	$+\Delta L^1_{h\,d}$							$-\Delta L^2_{h\,s}$	0
Firm loans			$+\Delta L^1_{f\,d}$					$-\Delta L^2_{f\,d}$	0
HPM	$-\Delta H^1_{h\,d}$					$+\Delta H^1_s$		$-\Delta H^2_{b\,d}$	0

Deposits	$-\Delta M^1_d$							$+\Delta M^2_s$	**0**
Bills[1]	$-\Delta B^1_{h\,2\,d}$								**0**
Bills[2]	$-\Delta B^2_{h\,2\,d}$			$+\Delta B^2_s$		$-\Delta B^2_{cb\,2\,d}$		$-\Delta B^2_{b\,2\,d}$	**0**
Bonds[1]	$-\Delta BL^1_{2\,d}\cdot p^1_{bl}$								**0**
Bonds[2]	$-\Delta BL^2_{2\,d}\cdot p^2_{bl}$			$+\Delta BL^2_s\cdot p^2_{bl}$					**0**
Equities	$-\Delta e^2_d\cdot p^2_e$		$+\Delta e^2_s\cdot p^2_e$						**0**
Reserves						$-\Delta R^2$			**0**
Default loans			$+NPL^2_f$					$-NPL^2$	**0**
Sum	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Production firms equations	
$y^i = s^{ei} + \Delta in^{ei} - im^{ei}$	
$s^{ei} = \beta^i . s^i + (1 - \beta^i) . s^i_{-1} . (1 + gr^i_{pr})$	
$in^{ei} = in_{-1} + \gamma^i . (in^{Ti} - in^i_{-1})$	
$in^{Ti} = \sigma^{Ti} . s^{ei}$	
$im^{ei} = \beta^i . im^i + (1 - \beta^i) . im^{ei}_{-1}$	
$in^i = in^i_{-1} + (y^i - s^i + im^i)$	
$k^i = k^i_{-1} . (1 + gr^i_k)$	
$gr^i_k = gr^i_0 + \gamma^i_u . u^i - \gamma^i_r . rr^i_l$	
$u^i = \frac{y^i}{k^i_{-1}}$	
$rr^i_l = \left\{\frac{(1 + r^i_l)}{(1 + \pi^i)}\right\} - 1$	
$\pi^i = \frac{p^i_s}{p^i_{s-1}} - 1$	
$i^i = (gr^i_k + \delta^i) . k^i_{-1}$	
$s^i = c^i + g^i + i^i + x^i$	
$S^i = s^i . p^i_s$	
$IN^i = in^i . UC^i$	

$I^i = i^i . p_s^i$	
$K^i = k^i . p_s^i$	
$Y^i = s^i . p_s^i + \Delta in^i . UC^i - im^i . p_m^i$	
$P_y^i = \frac{Y^i}{y^i}$	
$\omega^{Ti} = \left(\frac{W^i}{P_s^i}\right)^T = \Omega_0^i + \Omega_1^i . Pr^i + \Omega_2^i \{ER^i + z_3^i . (1 - ER^i) - z_4^i . bandT^i + z_5^i . bandB^i\}$	
$ER^i = \frac{N_{-1}^i}{N_{fe-1}^i}$	
$z_3^i = 1 \quad if \quad 1 - bandB^i \leq ER^i \leq 1 + bandT^i$	
$z_4^i = 1 \quad if \quad ER^i > 1 + bandT^i$	
$z_5^i = 1 \quad if \quad ER^i < 1 - bandB^i$	
$W^i = W_{-1}^i + \Omega_3^i . (\omega^{Ti} . p_{s-1}^i - W_{-1}^i)$	
$Pr^i = pr_{-1}^i . (1 + gr_{pr}^i)$	
$N^i = N_{-1}^i + \eta^i . (N^{Ti} - N_{-1}^i)$	
$N^{Ti} = \frac{y^i}{pr^i}$	
$WB^i = W^i . N^i$	
$UC^i = \frac{WB^i}{y^i}$	

$NUC^i = \frac{W^i}{pr^i}$	
$NHUC^i = (1 - \sigma^{Ni}).NUC^i + \sigma^{Ni}.(1 + r_{lN}^i).NUC_{-1}^i$	
$P_s^i = (1 + \varphi^i).NHUC^i$	
$F_f^i = S^i - IM^i + \Delta IN^i - T_s^i - WB^i - r_{l-1}^i.L_{f\,d-1}^i$	
$FD_f^i = \psi_D^i.F_{f-1}^i$	
$FU_f^i = F_f^i - FD_f^i - r_{l-1}^i.(L_{f\,d-1}^i - IN_{-1}^i) + r_{l-1}^i.NPL_f^i$	
$L_{f\,d}^i = L_{f\,d-1}^i + I^i + \Delta IN^i - FU_f^i - \Delta e_s^i.p_e^i - NPL_f^i$	
$NPL_f^i = npl_f^i.L_{f\,d-1}^i$	
$e_s^i = e_{s-1}^i + (1 - \psi_U^i).\frac{I_{-1}^i}{p_e^i}$	
$r_k^i = \frac{FD_f^i}{(e_{s-1}^i.p_{e-1}^i)}$	
$PE^i = \frac{p_e^i}{\left(\frac{F_f^i}{e_{s-1}^i}\right)}$	
$q^i = \frac{(e_s^i.p_e^i + L_{f\,d}^i)}{(K^i + IN^i)}$	
Trade Equations	
$\boldsymbol{P_x^1} = v_0^1 + v_1^1.\boldsymbol{E} + v_2^1.\boldsymbol{P_y^1} + v_3^1.\boldsymbol{P_y^2}$	
$\boldsymbol{P_m^1} = v_0^1 + v_1^1.\boldsymbol{E} + v_2^1.\boldsymbol{P_y^1} + v_3^1.\boldsymbol{P_y^2}$	
$P_x^2 = P_m^1.E$	

$P_m^2 = P_x^1 . E$	
$E = \frac{B_{h\,1\,s}^2}{B_{h\,1\,d}^2}$	
$\boldsymbol{x^1 = \varepsilon_0 - \varepsilon_1 . (P_{m-1}^2 - P_{y-1}^2) + \varepsilon_2 . y^2}$	
$\boldsymbol{im^1 = \mu_0 - \mu_1 . (P_{m-1}^1 - P_{y-1}^1) + \mu_2 . y^1}$	
$im^2 = x^1$	
$x^2 = im^1$	
$CAB^1 = X^1 - IM^1 + r_{b-1}^2 . B_{h\,1\,d-1}^2 + r_{b-1}^2 . B_{cb\,1\,d-1}^2 - r_{b-1}^1 . B_{h\,2\,s-1}^1$	
$CAB^2 = X^2 - IM^2 + r_{b-1}^1 . B_{h\,2\,d-1}^1 - r_{b-1}^2 . B_{h\,1\,s-1}^2 - r_{b-1}^2 . B_{cb\,1\,s-1}^2$	
$KAB^1 = \Delta B_{h\,2\,s}^1 - \Delta B_{h\,1\,d}^2 - \Delta B_{cb\,1\,d}^2$	
$KAB^2 = \Delta B_{h\,1\,s}^2 + \Delta B_{cb\,1\,s}^2 - \Delta B_{h\,2\,d}^1$	
Households equations	
$YP^i = WB^i + FD_f^i + FD_b^i + r_{m-1}^i . M_{d-1}^i + r_{b-1}^i . B_{h\,i\,d-1}^i + r_{b-1}^z . B_{h\,i\,d-1}^z + BL_{i\,d-1}^i + BL_{i\,d-1}^z$	
$YD^i = YP^i - T_I^i - r_{l-1}^i . L_{h\,d-1}^i$	
$yd^i = \frac{YD^i}{P_s^i} - \pi^i \frac{V_{-1}^i}{P_s^i}$	
$c^i = \alpha_0^i + \alpha_1^i . (yd^{ei} + nl^i) + \alpha_2^i . v_{-1}^i$	
$yd^{ei} = \varepsilon_2^i . yd_{-1}^i + (1 - \varepsilon_2^i) . yd_{-1}^{ei}$	
$\Delta V^i = YD^i - C^i$	

$GL^i = \eta_l^i . YP^i$	
$\eta_l^i = \eta_0^i + \eta_r^i . rr_l^i$	
$NL^i = GL^i - REP^i$	
$REP^i = \delta_{rep}^i . L_{h\,d-1}^i$	
$L_{h\,d}^i = L_{h\,d-1}^i + NL^i$	
$nl^i = \frac{NL^i}{p_{ds}^i}$	
$BUR^i = \frac{(REP^i + r_{l-1}^i . L_{h\,d-1}^i)}{YP^i}$	
$C^i = c^i . P_s^i$	
$v^i = \frac{V^i}{P_s^i}$	
$H_{h\,d}^i = \lambda_c^i . C^i$	
$V_{fma}^i = V^i - H_{h\,d}^i - L_{h\,d}^i - OF^i$	
$\frac{M_d^i}{V_{fma}^i} = \lambda_{10}^i + \lambda_{11}^i . r_m^i + \lambda_{12}^i . r_b^i + \lambda_{13}^i . \left(r_b^z + d(xr)\right) + \lambda_{14}^i . r_{bl}^i + \lambda_{15}^i . \left(r_{bl}^z + d(xr)\right) + \lambda_{16}^i . r_k^i$	
$\frac{B_{h\,i\,d}^i}{V_{fma}^i} = \lambda_{20}^i + \lambda_{21}^i . r_m^i + \lambda_{22}^i . r_b^i + \lambda_{23}^i . \left(r_b^z + d(xr)\right) + \lambda_{24}^i . r_{bl}^i + \lambda_{25}^i . \left(r_{bl}^z + d(xr)\right) + \lambda_{16}^i . r_k^i$	
$\frac{B_{h\,i\,d}^z}{V_{fma}^i} = \lambda_{30}^i + \lambda_{31}^i . r_m^i + \lambda_{32}^i . r_b^i + \lambda_{33}^i . \left(r_b^z + d(xr)\right) + \lambda_{34}^i . r_{bl}^i + \lambda_{35}^i . \left(r_{bl}^z + d(xr)\right) + \lambda_{16}^i . r_k^i$	
$\frac{p_{bl}^i . BL_{i\,d}^i}{V_{fma}^i} = \lambda_{40}^i + \lambda_{41}^i . r_m^i + \lambda_{42}^i . r_b^i + \lambda_{43}^i . \left(r_b^z + d(xr)\right) + \lambda_{44}^i . r_{bl}^i + \lambda_{45}^i . \left(r_{bl}^z + d(xr)\right) + \lambda_{16}^i . r_k^i$	

$\frac{xr.p_{bl}^{z}.BL_{i\,d}^{z}}{V_{fma}^{i}} = \lambda_{50}^{i} + \lambda_{51}^{i}.r_{m}^{i} + \lambda_{52}^{i}.r_{b}^{i} + \lambda_{53}^{i}.\left(r_{b}^{z} + d(xr)\right) + \lambda_{54}^{i}.r_{bl}^{i} + \lambda_{55}^{i}.\left(r_{bl}^{z} + d(xr)\right) + \lambda_{16}^{i}.r_{k}^{i}$	
$\frac{p_{e}^{i}.e_{d}^{i}}{V_{fma}^{i}} = \lambda_{60}^{i} + \lambda_{61}^{i}.r_{m}^{i} + \lambda_{62}^{i}.r_{b}^{i} + \lambda_{63}^{i}.\left(r_{b}^{z} + d(xr)\right) + \lambda_{64}^{i}.r_{bl}^{i} + \lambda_{65}^{i}.\left(r_{bl}^{z} + d(xr)\right) + \lambda_{66}^{i}.r_{k}^{i}$	
$M_{d}^{i} = V_{fma}^{i} - B_{h\,i\,d}^{i} - B_{h\,i\,d}^{z} - p_{bl}^{i}.BL_{i\,d}^{i} - xr.p_{bl}^{z}.BL_{i\,d}^{z} - p_{e}^{i}.e_{d}^{i}$	
$e_{d}^{i} = e_{s}^{i}$	
Government equations	
$G^{i} = g^{i}.P_{s}^{i}$	
$g^{i} = g_{-1}^{i}.(1 + gr_{g}^{i})$	
$T_{s}^{i} = \tau_{s}^{i}.S^{i}$	
$T_{I}^{i} = \theta^{i}.YP^{i}$	
$T^{i} = T_{s}^{i} + T_{I}^{i}$	
$B_{h\,i\,s}^{i} = B_{h\,i\,d}^{i}$	
$B_{h\,z\,s}^{i} = B_{h\,z\,d}^{i}.xr$	
$BL_{s}^{i} = BL_{i\,s}^{i} + BL_{z\,s}^{i}$	
$BL_{i\,s}^{i} = BL_{i\,d}^{i}$	
$BL_{z\,s}^{i} = BL_{z\,d}^{i}.xr$	
$B_{b\,s}^{i} = B_{b\,d}^{i}$	

$B^1_{cb\,1\,s} = B^1_{cb\,1\,d}$	
$B^2_{cb\,2\,s} = B^2_{cb\,2\,d}$	
$B^2_{cb\,1\,d} = constant$	
$B^2_{cb\,1\,s} = B^2_{cb\,1\,d}.xr$	
$PSBR^i = G^i + r^i_{b-1}.B^i_{s-1} + BL^i_{s-1} - (T^1 + F^1_{cb})$	
$\Delta(B^1_s) = PSBR^1 - \Delta BL^i_s.p^i_{bl}$	
$GD^i = B^i_{h\,i\,s} + B^i_{h\,z\,s} + BL^i_s + H^i_s$	
Central bank equations	
$\Delta H^1_s = \Delta A^1_s + \Delta B^1_{cb\,1\,d} + \Delta B^2_{cb\,1\,d} + \Delta R^1$	
$\Delta B^2_{cb\,2\,d} = \Delta H^2_s - \Delta A^1_s - \Delta R^2$	
$H^2_s = H^2_{h\,s} + H^2_{b\,s}$	
$F^1_{cb} = r^1_{a-1}.A^1_{s-1} + r^1_{b-1}.B^1_{cb\,1\,d-1} + r^2_{b-1}.B^2_{cb\,1\,d-1}$	
$F^2_{cb} = r^2_{a-1}.A^2_{s-1} + r^2_{b-1}.B^2_{cb\,2\,d-1}$	
$H^1_{b\,s} = H^1_s - H^1_{h\,s}$	
$H^2_{b\,s} = H^2_{b\,d}$	
$H^i_{h\,s} = H^i_{h\,d}$	
$B^1_{cb\,1\,d} = B^1_s - B^1_{h\,1\,s} - B^1_{b\,s} - B^1_{h\,2\,s}$	

$B^2_{h\,1\,s} = B^2_s - B^2_{h\,2\,s} - B^2_{b\,s} - B^2_{cb\,2\,d} - B^2_{cb\,1\,s}$	
$r^i_b = constant$	
$r^i_a = \varsigma^i . r^i_b$	
$r^i_{bl} = r^i_b + add^i_{BL}$	
$p^i_{bl} = \frac{1}{r^i_{bl}}$	
Private banks equations	
$H^i_{b\,d} = \rho^i . M^i_s$	
$M^i_s = M^i_d$	
$L^i_{h\,s-1} = L^i_{h\,d-1}$	
$L^i_{f\,s-1} = L^i_{f\,d-1}$	
$F^i_b = r^i_{l-1} . \left(L^i_{h\,s-1} + L^i_{f\,s-1} - NPL^i_{-1}\right) - r^i_{a-1} . A^i_{d-1} + r^i_{b-1} . B^i_{b\,d-1} - r^i_{m-1} . M^i_{s-1}$	
$FD^i_b = \lambda^i_b . F^i_{b-1}$	
$FU^i_b = F^i_b - FD^i_b$	
$\Delta OF^i_b = FU^i_b - NPL^i$	
$r^i_l = r^i_m + add^i_1$	
$CAR^i = \frac{OF^i_b}{L^i_{h\,s} + L^i_{f\,s}}$	

$A_d^i = \{bot^i . M_s^i - B_{b\,d\,N}^i\} . z_1^i$	
$z_1^i = 1 \quad iff \;\; BLR_N^i < bot^i$	
$B_{b\,d\,N}^i = M_s^i - H_{b\,d}^i - L_{h\,d}^i - L_{f\,d}^i + OF_b^i$	
$BLR_N^i = \frac{B_{b\,d\,N}^i}{M_s^i}$	
$BLR^i = \frac{B_{b\,d}^i}{M_s^i}$	
$r_m^i = r_{m-1}^i + \Delta r_m^i + \xi_b^i . \Delta r_a^i$	
$\Delta r_m^i = \xi_m^i (z_1^i - z_2^i)$	
$z_1^i = 1 \quad iff \;\; BLR_N^i < bot^i$	
$z_2^i = 1 \quad iff \;\; BLR_N^i > top^i$	
$B_{b\,d}^i = A_d^i + M_s^i - H_{b\,d}^i - L_{h\,d}^i - L_{f\,d}^i + OF_b^i$	

1- The subscript *b* refers to a bank.

2- The subscript *cb* refers to a central bank.

3- The subscript *d* refers to demand.

4- The superscript *e* refers to the expected value or volume.

5- The subscript *f* = firms.

6- The subscript *h* = households.

7- The superscript or subscript *i* = 1 for country one and 2 for country two.

8- The subscript *l* refers loans.

9- The subscript *m* refers deposits.

10- The superscript *T* refers target value or volume.

11- The superscript *z* = 1 for country one and 2 for country 2, such that $z \neq j$.

12- $xr = e$ when $z = 1$ and $1/e$ when $z = 2$.

A	Advances
B	Government treasury bills
BL	Government bonds (number)
BLR	Bank liquidity ratio
BLR_N	Notional bank liquidity ratio
BUR	Households debt burden
C	Nominal consumption
C	Real consumption
CAB	Current account balance
CAR	Capital adequacy ratio
E	Exchange rate, how much units of the first country currency per one unit of the first country currency.
e	Firms equities (number)

ER	Employment rate
F	Profits
FD	Dividends
FU	Returned earnings
G	Nominal government expenditure
g	Real government expenditure
GD	Government debt
GL	Households gross loans
gr_g	Government expenditure growth rate
gr_k	Capital growth rate
gr_pr	Productivity growth rate
H	High powered money
HC	Hestoric cost
I	Nominal investment
I	Real investment
IM	Value of imports
im	Volume of imports
IN	Value of inventories
in	Volume of inventories
K	Nominal fixed capital

k	Real fixed capital
KAB	Capital account balance
L	Loans
M	Bank deposits
N	Number of employees
N_{fe}	Number of employees in a full employment level
$NHUC$	Normal historic unit cost
NL	Value of new loans
nl	Real value of new loans
NPL	Value of non-performing loans
npl	Ratio of NPL as a share of total loans demand
NUC	Normal unit cost
OF	Own funds of banks
ω^T	Real wages
P_{bl}	Government bond price
P_e	Equity price
P_m	Import prices
P_s	Sales prices
P_x	Export prices
P_y	GDP deflator

PE	Price earning ratio
φ	Price mark-up
π	Price inflation
pr	Workers' productivity
$PSBR$	Public sector borrowing requirement
q	Tobin's q ratio
R	Reserves
r_b	Treasury bills interest rate
r_{bl}	Bonds interest rate
r_k	Dividend yield of firms
r_l	Loans interest rate
r_m	Deposits interest rate
REP	Households loans repayments
rr_l	Real interest rate on loans
S	Nominal sales
s	Real sales
T	Taxes
T_s	Firms taxes (sales tax)
T_l	Households taxes (income tax)
U	Capecity utilization

UC	Unit cost
V	Nominal wealth
V_{fma}	Financial market asset wealth
v	Real wealth
W	Wage rate
WB	Wage bill
X	Value of exports
x	Volume of exports
Y	Nominal output or GDP
y	Real GDP
YD	Nominal disposable income
yd	Real disposable income
YP	Value of personal income