

A study of a two-sector model of China in a SFC framework

By TianXi Cao

5966118

Major Paper presented to the

Department of Economics of the University of Ottawa

In partial fulfillment of the requirements of the M.A. Degree

Supervisor: Professor Marc Lavoie

May 2012

ECO 7997

1. Introduction

1.1 Issue Raised

At the 2011 G-20 Cannes Summit, the Chinese government was asked again to have a more flexible exchange rate for the Chinese currency – the Renminbi (RMB). Due to the large trade surplus of China, this means an appreciation of the RMB. The Chinese government claimed that China was at the stage of a structural adjustment, so it would be too early for China to increase the flexibility of its exchange rate. 'If the RMB continues to appreciate by 20%, it would cause a severe lay-off problem in China,' said Chinese Premier Wen Jiabao in 2010 when he visited New York (P. Eckert and S. Holland 2010). However, more and more governments are pressuring the Chinese government to appreciate the RMB, because they think that the undervaluation of the RMB makes the price of Chinese goods too low in the world market. Since the appreciation seems inevitable, the main object now is to rebalance the Chinese economic structure in order to face the upcoming new challenges.

The unbalanced structure of the Chinese economy has never disappeared during the whole development of China since 1978. The Premier Wen Jiabao interpreted the unbalanced structure as being due to several main concerns such as large income disparities and irrational industrial structures during the 4th Plenary Session of the 11th National People's Congress. For example the income disparity between the urban and rural area was 3.23:1 on average in 2010, which was the largest in the world. In the Midwest provinces of China, the figure increased to more than 4:1 in 2010 (J. Pan and H. Wei 2011). The Gini coefficient which is commonly used to measure income inequality workers also shows a wide income disparity in China. The Gini coefficient of Canada in 2005 was 32.1 and the coefficient of China was 41.5 in 2007¹. The larger Gini coefficient implies a larger income disparity in the country. A large income disparity would restrict the purchasing power from the low-income sector, and hence block the development of domestic effective demand.

¹ The numbers are from The World Fact Book on the CIA website:<https://www.cia.gov/library/publications/the-world-factbook/fields/2172.html>

An irrational industrial structure implies that many so-called manufacturing industries have some features like open-access agriculture. For example, most of the manufacturing industries produce basic goods, such as socks, shoes, shirts and so on. Since the price elasticity of demand for such goods is low, the output of the goods is constrained by this feature. Thus, simply reducing the price of these goods will not raise domestic demand, so the manufacturing industries have to rely on exports. Also barriers to entry for these basic goods are very low. Many manufacturing industries produce the same sorts of goods, and as a result the prices of these goods get reduced to an almost perfect competition level. Since the profit margin is very small and the labour supply is abundant, the owners do not have any motivation to increase labour productivity by using more advanced machines. As a consequence, the firms producing basic goods turn out to be labour-intensive and focus on low value-added goods, leaving the design and the brand behind or handing them over to companies located in foreign countries. Thus, the wage rates in these manufacturing industries are very low and hard to increase, because labour productivity is very low and increasing only very slowly. The irrational industrial structure makes the large income disparity more severe in China and should be taken into account when solving the problem of a lack of domestic effective demand.

The rest of this paper will focus on establishing a stock-flow coherent model that considers the problems of large income disparity and the irrational industrial structure. Some simulation experiments will be done to see the effects of fiscal policies, monetary policies and of modifications to the propensity to consume basic goods on the domestic effective demand in a closed economy.

1.2 Model to Be Modified

The most popular model of structural imbalance is the two-sector model which was first established by Lewis (1954). Post-Keynesian economists have studied the structure of economies for a long time. "In essence Kaldor anticipated the neo-Kaleckian dual economy macroeconomic framework that has come to be known as 'structuralist' macroeconomics." (Sarkar, 2009, p. 394) However, the canonical post-Keynesian two-sector model does not appear to be suitable for these experiments. Since a differentiated behaviour on the part of workers is not incorporated in the

canonical Post-Keynesian model, it would be difficult to model the shift of workers from one sector to the other.

The model that was modified is based on chapter 4, and is combined with chapter 6 and chapter 7 of Godey and Lavoie (2007). This model has the advantage of modeling the effects of fiscal policies and monetary policies from a demand side, but it does not have a two-sector version yet.

The modification of the Chapter 4 model of Godley and Lavoie (2007) is based on section 4 of the paper by S. Chakrabarti (2011). In this section, Dr. Chakrabarti shows a decent way of establishing a basic two-sector model within a Kaleckian framework.

1.3 Literature review of post-Keynesian two-sector models

Lewis' (1954) classical two-sector model is remarkable. He fully realized that low-productivity workers in the 'subsistence' sector can be absorbed by what he called the 'capitalist' sector. The wages of the 'capitalist' sector would remain the same until the low-productivity workers have all been taken out of the subsistence sector (this is what Lewis calls the turning point). Also, he fully recognized the capital constraint limiting the growth of the 'capitalist' sector. However, he did not recognize the importance of the demand linkages between the 'subsistence' sector and the 'capitalist' sector, for example a greater internal trade deficit of the 'capitalist' sector may generate faster growth in the 'capitalist' sector, since the income of the participants to the 'subsistence' sector is higher. "There is no recognition of the fact that a worsening term of trade for industry may be associated with faster industrial growth because of higher rural incomes which accompany a faster growth of agriculture." (Thirlwall 1986, p. 200)

The importance of a demand linkage between the agricultural and industrial sectors in the two-sector model was pointed out by post-Keynesian economists. If the workers of the agricultural sector are incapable of producing an amount of food above their needs, there is no sufficient market for manufacturing goods. Likewise, if the workers of the industrial sector cannot trade for the food that they need, the economy will go backward or become underdeveloped (Nurkse 1962).

Thirlwall (1986) has built a two-sector model emphasizing balanced growth. He points to two shortcomings of the classic two-sector model, and emphasizes the lack of demand linkages between the sectors in past models. According to him “there is no recognition that the level of output in agriculture may itself determine the demand for the output of the industrial sector and vice versa” (Thirlwall 1986, p.200). The World Development Report (1979) was cited in his paper as evidence to show that a stagnant rural economy with low purchasing power blocks the development of the industrial sector in many developing countries. Thirlwall (1986) recognized disguised unemployment as an omnipresent feature of the agricultural sector in most of the developing countries. He also mentioned that when the wage of the industrial sector is exogenous, then the employment of the industrial sector will be endogenous. However, in this paper, he did not model how workers would be shifting from one sector to another.

Chakrabarti (2011) has provided a model based on the Kaleckian tradition, which focuses on the change of the employment rate in the urban sector and rural sector. He divided the labour force into the labour in the urban sector, the labour in the rural sector that produces food and the labour in the rural sector that produces non-agricultural goods. The labour in the rural sector can move between the agricultural goods production and non-agricultural goods production. The main improvement in his model is the possibility to move surplus labour from the agricultural goods production to the non-agricultural goods production, but labour does not move from the rural sector to the urban sector directly. Since the non-agricultural goods could have the same characteristics as the goods produced in the urban sector, the unemployment rate in the urban sector will increase if the output of the non-agricultural goods increases in the rural sector. A decrease of surplus workers in the agriculture sector would cause an increase of the unemployment rate in the urban sector. Thus, this sort of labour shifting within the rural sector does not improve the unbalanced situation which is at the core of the less-developed countries in general, and in China in particular.

1.4 New Ideas of My Paper

As is well known, more and more finance instruments are available nowadays. Income inequality may be getting more severe, since the workers in the sector offering higher wage rates may have the incentive and the capacity to buy these financial products. Thus the role of the government should be increased, in an attempt to solve the problem of large disparity income. In this paper, more emphasis will be put on policies that the government may be able to put into place, with the help of a modified Godley and Lavoie (2007) stock-flow consistent model.

Secondly, in this model the main obstacle that blocks the development of the economy is the lack of effective demand. For example, Chinese foreign exchange reserves are the highest in the world. Excess savings cover physical investment is the big problem in China. The capital constraint is no longer the main obstacle to many export-driven developing countries. In this paper the capital accumulation constraint will be put aside, and we will focus instead on the effective demand constraint.

In most standard two-sector models, the two sectors are divided according to the kind of output they produce, because the growth rates are easier to be calculated. However, this kind of division has some limitations in interpreting the large disparities of income in one sector, if the workers are considered to have the same purchasing power in each sector. For example, the worker who is a designer has a higher wage rate than the worker who is an assembler in the same sector. We propose a more general division based on purchasing power, according to the different kind of goods that the worker produces.

2. The model

2.1 Two-sector Division

There is a number of ways to envisage the division of an economy into two sectors, such as Capitalist and Subsistence (W. A. Lewis 1954), Industrial-Agriculture (A. P. Thirlwall 1986), North-South (P. Sarkar 1994), and Rural-Urban (S. Chakrabarti 2011). However, although the names change, the division of these models is, effectively more or less the same. One sector

produces the agricultural goods, and provides its surplus goods as an investment to the other sector, and also provides the effective demand to the other sector. The other sector produces the non-agricultural goods, and spends its surplus goods in exchange for the agricultural goods as well as investing in its own sector.

In our model, the economy is divided into basic-goods and the luxury-goods sectors. The first sector produces the basic goods which are highly related to the basic needs of consumers, such as most of the agricultural goods, some general merchandise and some basic services like hair cutting and restaurant services. The demand for this kind of goods is inelastic. The luxury-goods sector produces the rest of the goods consumed by the worker, which are not highly related to the worker's basic needs. In our model, we assume that both sectors suffer from a lack of effective demand. In the luxury-goods sector, it is due to the lack of purchasing power of consumers, while in the basic-goods sector it is due to the inelasticity of demand for basic goods. The output of the basic-goods sector is constrained in our model. The reason is not a capacity constraint which refers to the land productivity constraint², but due to the inelastic demand for basic goods.

In addition, the workers in the luxury-goods sector have enough purchasing power to afford basic goods, so the supply of the basic goods to consumers who also happened to be workers in the luxury-goods sector is sufficient. S. Chakrabarti (2011) points out that non-agricultural goods lack the effective demand from both sectors, while the supply of agricultural goods from the rural sector is sufficient for the urban sector. This real phenomenon also can be applied in our model. The real wage in the luxury-goods sector, according to the amount of basic goods that can be exchanged from the basic-goods sector, is higher than what is needed to pay for basic needs, so workers in that sector can spend the rest of their wages on the consumption of luxury goods or they can save their excess income. Since the supply from the basic-goods sector to the luxury-goods sector is sufficient, the more income that the worker has, the more will be spent on luxury goods, but expenditures on basic goods will remain almost the same. Thus the output of the basic-goods sector will still be constrained by demand.

² P. Sarkar (2001) uses a neo-Kaleckian framework characterized by excess capacity and an insufficient effective demand problem in the North, while the South is facing a capacity constraint.

2.2 Major Assumptions

To establish a two-sector model with income disparities, several basic assumptions should be made at the beginning.

2.2.1 Surplus Workers in the Basic-Goods Sector

In developing countries, social insurance is not well developed. The workers are choosing between working and suffering from starvation and illness, since they need money to buy food and health care. They all need to work, whatever the wage rate. Therefore, full employment is assumed in both sectors since the model is designed for developing countries. Since the output of the basic-goods sector is constrained by demand, disguised unemployment inevitably appears, as the same output will be produced by more workers if more workers are left to work in the basic-goods sector. Disguised unemployment is another way to describe the surplus of workers in the agricultural sector (J. Robinson 1936). The surplus of workers lowers the average productivity of the basic-goods sector, so it is reasonable to assume that the real wage in the basic-goods sector is always lower than in the luxury-goods sector.

2.2.2 Income Disparity

The basic assumption of the model is different wage rates in the two sectors, different purchasing powers. The target real wage in the luxury-goods sector is β . β represents the amount of real basic goods a worker in the luxury-goods sector expects to have from his wage. In the basic goods sector, workers do not have the same bargaining power to ask for the target real wage. The real wage in the basic-goods sector is the average product of the labour. Since the model is built to study the situation before the Lewis turning point, the real wage in the basic-goods sector is lower than in the luxury-goods sector. If the real wages in the two sectors were to be the same, then the surplus workers would be fully absorbed by the luxury-goods sector and the two-sector problem would be solved. The model then would be exactly as described by the Godley and Lavoie (2007) chapter 4 model, which is the model of government money with portfolio choice.

2.2.3 Relative Price

Relative price is a key feature of the two-sector model, and can be shown to play a role in the real world. “A response of the manufacturing sector to the increase in oil prices has led to a process of inflation in order to restore the previous relative price”.(F. Targetti 1985, p. 96) Due to the relative price between luxury goods and basic goods, the two-sector bottleneck cannot be solved by itself. The relative price can be generated as follows:

The target real wage of the luxury-goods sector is assumed to be a constant in the standard two-sector models³. Here, the capital letter means nominal value and the small letter represents the real value.

$$\boxed{1} \quad \frac{W_l}{P_b} = \beta$$

W_l is the target nominal wage of the workers in the luxury-goods sector. P_b is the price of basic goods.

In the luxury-goods sector, the price of luxury goods is decided by the owners of firms. They take the profit margin and the unit cost of the production in consideration. The unit cost contains many components. In a dual-sector model, since an excess capacity in the luxury-goods sector is assumed, then the price of luxury goods, following the Kaleckian tradition, would be⁴:

$$\boxed{2} \quad P_l = (1 + \varphi) * U_c$$

Where P_l represents the price of luxury goods and U_c is the unit cost of producing one luxury good. φ is a positive mark-up reflecting the degree of monopoly or the market power of the firms in the luxury-goods sector (P. Sarkar 1993). Also φ indicates a profit margin of luxury goods, since the only cost is assumed to be the workers' wage. The unit cost is the total wage payment divided by the real production, and then P_l could be rewritten as:

$$\boxed{3} \quad P_l = (1 + \varphi) * W_l * \frac{N_l}{Y_l}$$

³ See A. K. Dutt 1996, A. Bhaduri and R. Skarstein 2003, S. Chakrabarti 2011

⁴ See W. Godley and M. Lavoie 2007, chapter 7, p. 244, and S. Chakrabarti 2011

$$= (1 + \varphi) * \frac{W_l}{Pr_l}$$

Pr_l is the productivity of the luxury-goods sector, y_l is the real output of the luxury-goods sector. In the model, Pr_l is exogenous, and is changed when there is a technology shock. Replace W_l by the equation of the target real wage, to obtain:

4

$$\frac{P_l}{P_b} = \beta * \frac{(1 + \varphi)}{Pr_l}$$

Since β is a positive constant, Pr_l is exogenous and φ is a mark-up, the relationship of the relative prices does not change within the model. In order to simplify the model, P_b is assumed to be a constant. Then the nominal values in the model can be used to replace the real values, since the prices are related to each other and the relation is exogenous.

So,

5

$$P_l = \beta * \frac{(1 + \varphi)}{Pr_l} * P_b$$

And P_l is also exogenous in the model.

Profit distribution is a severe problem in developing countries. In Godley and Lavoie (2007), a private bank and the stock market can be introduced in the model to deal with profit distribution. Since the model here is a simple version, private banks and the stock market are not defined yet. As a further simplification, φ is assumed to be zero, which means all the profits of luxury goods are distributed to their workers. The previous equation can be simplified as:

6

$$P_l = \beta * \frac{P_b}{Pr_l}$$

2.3 Balance Sheet and Transactions flow Matrix

The balance sheet (Table 1) and the transaction matrix (Table 2) of the two-sector model are crucial elements to establish a stock-flow consistent model.

Table1. Balance sheet of the two-sector economy

Developing Country	Luxury-goods sector Workers	Basic-goods Sector Workers	Govt.	Central Bank	Sum
Cash Money	$+Hh^l$	$+Hh^b$		$-H$	0
Bills	$+Bh^l$	$+Bh^b$	$-B$	$+B_{cb}$	0
Wealth	$-Vh^l$	$-Vh^b$	$-Vg$	0	0
Sum	0	0	0	0	0

Hh denotes the cash money held by the workers in the basic-goods sector and the luxury-goods sector (b and l), and the H denotes the cash money issued by the central bank. B is the total amount of treasury bills supplied by the government. Bh denotes the treasury bills bought by the workers in both sectors and B_{cb} represents the treasury bills bought by the central bank, who acts as a residual buyer to clear the surplus supply of treasury bills. Vh and Vg are the total wealth of workers in both sector and the government respectively.

Table2. Transactions flow matrix of two-sector economy

Developing Country	Luxury-goods Sector Workers	Luxury-goods Sector Production	Basic-goods Sector Workers	Basic-goods Sector Production	Gov.t	Central Bank	Sum
Basic goods Consumption	$-C_b^l$		$-C_b^b$	$+C_b$			0
Luxury Goods Consumption	$-C_l^l$	$+C_l$	$-C_l^b$				0

Government Expenditure		$+G_l$		$+G_b$	$-G$		0
Total Wages	$+W^l * N^l$	$-W^l * N^l$	$+W^b * N^b$	$-W^b * N^b$			0
Interest Payments	$+r_{-1} * (B_{h-1}^l - B_{h-1} + \frac{\Delta N^b}{N})$		$+r_{-1} * (B_{h-1}^b + B_{h-1} + \frac{\Delta N^b}{N})$		$-r_{-1} * B_{-1}$	$+r_{-1} * B_{cb-1}$	0
Profits of Central Bank					$+r_{-1} * B_{cb-1}$	$-r_{-1} * B_{cb-1}$	0
Taxes	$-T^l$		$-T^b$		$+T$		0
Change in Cash	$-\Delta H_h^l$		$-\Delta H_h^b$			$+\Delta H$	0
Change in Bills	$-\Delta B_h^l$		$-\Delta B_h^b$		$+\Delta B$	$-\Delta B_{bc}$	0
Sum	0	0	0	0	0	0	0

Brief explanations of the entire notation in the balance sheet, the transaction matrix and the equations will be presented in the appendix.

2.4 Equations

C denotes the nominal consumption. The superscripts b and l represent the sectors of basic goods and luxury goods respectively. The subscripts b and l represent the goods purchased. The definitions of the superscript and the subscript are the same as the other variables in our model. For example, C_l^b represents the consumption of luxury goods in the basic goods sector.

The income of the luxury-goods sector can be determined from the demand side by the consumption of luxury goods in both sectors and the government consumption of luxury goods. The equation of the income in the luxury-goods sector can be presented as:

7

$$Y_l = C_l + G_l$$
$$Y_l = C_l^b + C_l^l + G_l$$

Where Y is the nominal income and G is the nominal government expenditure.

The income of the workers in the basic-goods sector is also determined by the consumption of basic goods from both sectors and government.

8

$$Y_b = C_b + G_b$$
$$Y_b = C_b^l + C_b^b + G_b$$

The GDP in the model is only determined by consumption and government expenditure. The overall nominal GDP of the developing country is

9

$$Y = Y_b + Y_l$$

The consumption of the basic goods from the workers in the luxury-goods sector is equal to a certain proportion of their wages.

10

$$C_b^l = \mu_0^l * Y_l$$
$$C_b^l = \mu_0^l * W^l * N^l$$

By Equation (1)

$$C_b^l = \mu_0^l * P_b * \beta * N^l$$

μ_0 is defined as the coefficient that represents the propensity to consume basic goods. Since basic goods are highly related to the workers' basic needs, the consumption of basic goods happens before they decide to consume luxury goods. The expression of the consumption function depends on the population and nominal wages of each sector. Since the relative price is assumed to be given, the consumption of basic goods in the luxury-goods sector is only related to the population of the luxury-goods sector.

The consumption function of basic goods in the basic-goods sector is given by:

11

$$C_b^b = \mu_0^b * Y^b$$

$$C_b^b = \mu_0^b * W^b * N^b$$

The consumption of basic goods in the basic-goods sector also depends on the propensity to consume basic goods, μ_0 , the nominal wage rate, and the number of workers. The coefficient μ_0 in both sectors is assumed to be the same, so that if the wage were to be the same in the two sectors, then the consumption of the basic goods by the workers of both sectors would be the same per worker. Since the wage rate in the basic-goods sector is lower than in the luxury-goods sector, the consumption of basic goods per worker in the basic-goods sector is also lower. For example, the high-income worker may buy organic food while the low-income worker may buy the genetically-modified crop. The consumption of basic goods only depends on regular income, that is, the wealth of workers is not spent on the consumption of basic goods.

The consumption function of luxury goods is assumed to be:

12

$$C_l^l = \alpha_1^l * (Yd^l - C_b^l) + \alpha_2^l * (V_{-1}^l - V_{-1} * \frac{\Delta N^b}{N})$$

$$C_l^b = \alpha_1^b * (Yd^b - C_b^b) + \alpha_2^b * (V_{(-1)}^b + V_{-1} * \frac{\Delta N^b}{N})$$

Yd is the disposable income of the workers and V is the wealth of the workers in each sector. α_1 is the propensity to consume out of regular income after basic goods have been consumed. α_2 is the propensity to consume out of accumulated wealth. It is reasonable to assume that a part of income and wealth are saved to buy luxury goods in the future, such as cars or new versions of iPhones. ΔN^b is the number of workers transfers from the basic-goods sector to the luxury-goods sector in the last period.

13

$$\Delta N^b = N^b - N^b_{-1}$$

When a worker moves from one sector to the other sector, he takes his wealth to the other sector as well. Since the wealth in the model is only made up of treasury bills, it is reasonable to assume that the wealth would be attached to individual workers. To simplify the question, the wealth of each worker that moves from one sector to the other is assumed to be the average of the total wealth of both sectors. Since the worker in the luxury-goods sector has more treasury bills than the worker in the basic-goods sector, when the worker moves from the luxury-goods sector to the basic-goods sector, the wealth that he carries is smaller than the average of the total wealth in the luxury goods sector. When the worker moves from basic-goods sector to the luxury-goods sector, the wealth that he carries is larger than the average of the total wealth in the basic goods sector. This assumption is reasonable, because when the worker shifts from the basic-goods sector to the luxury-goods sector, it is the high-wealth worker who is more likely to shift, and vice versa.

The disposable income YD is determined as:

14

$$Yd^l = Y_l - T^l + r_{-1} * B_{h-1}^l - r_{-1} * B_{h-1} * \frac{\Delta N^b}{N}$$

$$Yd^b = Y_b - T^b + r_{-1} * B_{h-1}^b + r_{-1} * B_{h-1} * \frac{\Delta N^b}{N}$$

T is the taxation of each sector, and r represents the interest rate on treasury bills. (-1) in the subscript represents the last period.

In the basic-goods sector, from Equation 13 and 14, the disposable income to consume luxury goods in the basic-goods sector shows that there exists a purchasing power constraint on the workers of the basic-goods sector, since the wage income that the workers of the basic-goods sector can use to buy luxury goods mainly depends on $C_b^l + G_b$.

15

$$Yd^b - C_b^b = C_b^l + G_b - T^b + r_{-1} * B_{h-1}^b + r_{-1} * B_{h-1} * \frac{\Delta N^b}{N}$$

The regular income, which the workers in the basic-goods sector can obtain to purchase luxury goods according to Equation 13, mainly depends on the government expenditure on basic goods G_b and the consumption of basic goods from the luxury-goods sector C_b^l . This equation indicates that a decrease in the value of $C_b^l + G_b$ would reduce the purchasing power of the workers in the basic-goods sector with regards to luxury goods, and hence the total income of the workers in the luxury-goods sector would be reduced. Since the wage rate in the luxury-goods sector is exogenous, the population of workers in the luxury-goods sector would get reduced. The workers would have to move from the luxury-goods sector to the basic-goods sector.

More importantly, Equation 15 shows that to increase the purchasing power with regards to luxury goods in the basic-goods sector is too hard. The purchasing power of the workers of the basic-goods sector regarding luxury goods is mainly determined by the luxury-goods sector's consumption of basic goods. Since the supply of the basic goods to the luxury sector is sufficient according to the target real wage β , the consumption of basic goods in the luxury-goods sector increases only when the population in the luxury-goods sector increases. Therefore, the purchasing power in the basic goods sector regarding luxury goods is constrained by the limited demand of basic goods and is hard to increase, because the limited demand of basic goods is hard to change. For example, suppose there is a singer and one of his fans on Robinson Crusoe's island. The fan produces socks. The singer trades socks by singing a song to his fan. The next time the singer will sing to his fan does not depend on the fan, but it depends on when the socks of the singer wear out and whether he wants to buy a new one. In this case, it clearly shows that the purchasing power of the fans is lower and difficult to increase, especially when the socks are of a high quality.

In the luxury-goods sector, total consumption demand per worker, C_d , including the demand for basic goods and luxury goods per worker can be presented as:

16

$$C_d = C_b^l + \alpha_1^l * (Y_d^l - C_b^l) + \alpha_2^l * V_{(-1)}^l$$

$$Cd = (1 - \alpha^l) * C_b^l + \alpha^l * Yd^l + \alpha^l * V_{(-1)}^l$$

Since C_b^l per worker in the luxury-goods sector is exogenous, and $(1 - \alpha^l)$ is a constant, then the previous equation can be rewritten as:

17

$$Cd = \alpha^0 + \alpha^l * Yd^l + \alpha^l * V_{(-1)}^l$$

$$\alpha^0 = (1 - \alpha^l) * C_b^l$$

α^0 is a positive constant. This expression is the same as equation 7.16 in Godley and Lavoie (2007). Therefore when there is no surplus labour in the economy, the model would be no different from the Chapter 6 models in Godley and Lavoie (2007). The expression of consumption demand per worker in the basic-goods sector is different, since the consumption of basic goods in the basic-goods sector is not a constant. α^0 is endogenous.

The taxation in the model is defined as

18

$$T^l = \theta^l * \left(Y_l + r_{-1} * B_{h-1}^l - r_{-1} * B_{h-1} * \frac{\Delta N^b}{N} \right)$$

$$T^b = \theta^f * \left(Y_b + r_{-1} * B_{h-1}^b + r_{-1} * B_{h-1} * \frac{\Delta N^b}{N} \right)$$

θ is the tax rate of each sector . Taxes are taken out of regular income and the interest income arising from treasury bills. To separate the tax rate of each sector is useful in testing the effect of tax reduction on each type of goods.

The wealth accumulation functions are:

19

$$V^l = V_{-1}^l - V_{-1} * \frac{\Delta N^b}{N} + (Yd^l - C_i^l - C_b^l)$$

$$V^b = V^b_{-1} + V_{-1} * \frac{\Delta N^b}{N} + (Yd^b - C_1^b - C_b^b)$$

The wealth of each sector is equal to the previous wealth in each sector, taking into account the amount of wealth being shifted due to the fact that some workers, ΔN^b , will be moving from one sector to the other, plus the savings left after current- period consumption.

The total wealth is:

20

$$V = V^l + V^b$$

The wealth shifting between the two sectors does not affect the total wealth in the whole economy.

The number of workers in the luxury-goods sector is decided by the firms, according to the productivity of workers and the price of luxury goods:

21

$$N^l = \frac{Y_l}{Pr_l * P_l}$$

The rest of the labour force needs to work in the basic-goods sector, because all workers need to work to maintain a basic living standard. The number of workers working in the basic-goods sector is:

22

$$N^b = N - N^l$$

The productivity of the basic-goods sector is:

23

$$Pr_b = \frac{Y_b}{P_b * N^b}$$

Since the demand for the basic goods is constrained, then the productivity in the basic-goods sector is considered lower than the productivity in the luxury-goods sector. The nominal wages in the basic-goods sector is

24

$$W^b = \frac{Y_b}{N^b}$$

In the standard two-sector model, all the manufacturing industries are considered as the high-productivity sectors, and the price of their goods contains a profit margin φ . In our model, φ is assumed to be zero, so that the profit is delivered to workers in the luxury-goods sector through a higher wage β . However, some may argue that the workers in some industries, such as the sock industry, which in our model is defined as the basic-goods sector, should have some bargaining power to acquire a higher salary, β , which includes the profit, as is the case in the standard two-sector models. However, since capital is not the restrictive factor, everyone in the basic-goods sector can establish a sock industry. The demand for basic socks is limited, since the price elasticity of demand for basic socks is low. The total number of socks can be sold annually in domestic markets is certain. Therefore, the competition in this industry is very intensive, so that the price drops to the perfect-competition level and the profit margin is totally crowded out. Thus, workers in sock industries would only receive an average production of basic goods as their wages.

The rest of the equations are the same as in Godley and Lavoie (2007, Chapter 4). The explanations are also the same. They are presented below with brief explanations.

Cash money held in the luxury-goods sector

25

$$Hh^l = V^l - Bh^l$$

Cash money held in the basic-goods sector

26

$$Hh^b = V^b - Bh^b$$

Demand for government bills in the luxury-goods sector

27

$$Bh^l = V^l * \left(\lambda 0^l + \lambda 1^l * r - \lambda 2^l * \left(\frac{Yd^l}{V^l} \right) \right)$$

Demand for government bills in the basic-goods sector

$$28 \quad Bh^b = V^b * \left(\lambda 0^b + \lambda 1^b * r - \lambda 2^b * \left(\frac{Yd^b}{V^b} \right) \right)$$

Overall tax payments

$$29 \quad T = T^l + T^b$$

Overall government expenditure

$$30 \quad G = G_l + G_b$$

Total treasury bills

$$31 \quad Bh = B_h^l + B_h^b$$

Total cash

$$32 \quad Hh = Hh^l + Hh^b$$

Supply of government bills

$$33 \quad Bs = Bs_{(-1)} + (G + r_{(-1)} * Bs_{(-1)}) - (T + r_{(-1)} * B_{cb(-1)})$$

Supply of cash

$$34 \quad Hs = Hs_{(-1)} + B_{cb} - B_{cb(-1)}$$

Government bills held by the central bank

$$35 \quad B_{cb} = Bs - Bh$$

Interest rate of treasury bills

36

$$r = r_{\text{bar}}$$

Government deficit

37

$$\text{DEF} = T - (G + r * Bh_{(-1)})$$

The model is now complete, and several experiments will be done on the basis of the above equations. There are two ways to reduce the number of surplus workers in the basic-goods sector. One is to move the surplus workers from the basic-goods sector to the luxury-goods sector, just as in Lewis (1954). The other way is to sell the surplus goods abroad or absorb them through government expenditures, which is essentially what China is doing.

Selling the surplus goods abroad does not necessarily solve the problem of the surplus workers in the basic-goods sector. The external markets increase the demand for the basic goods. Labour productivity in the basic-goods sector increases and so does the wage. However, if the exchange rate works properly, increased exports of basic goods would be compensated by increased imports of luxury goods in value terms according to the chapter 6 models in Godley and Lavoie (2007). So there would be no effect on the value of GDP. Only when the exchange rate is fixed would GDP increase as exports increase. But huge government foreign reserves are generated during the process. If the government can keep accumulating the foreign reserves, there is no problem. But if the government is required to limit or reduce the amount of reserves, then the imports of luxury goods would increase. Consider an extreme case which may happen due to the comparative advantage of trade in each country, while one country produces basic goods only and the other country produces luxury goods only. The difference of bargaining power on the wage of the workers in the two countries generates a large disparity in income distribution between the two countries. Hence, the middle income trap appears. The middle income trap was first discovered by the IMF, to describe the bottleneck that stops wages from increasing in developing countries.

The purpose of this model is to study how to efficiently transfer the surplus workers from the basic-goods sector to the luxury-goods sector, therefore the main indicator of our experiments is

the population of workers in the luxury-goods sector. Since the basic-goods sector contains disguised unemployment, the labour productivity in the basic-goods sector is lower than the labour productivity in the luxury-goods sector. The labour productivity in the basic-goods sector can be increased by reducing the size of the surplus labour force. Thus, shifting the surplus workers from the basic-goods sector to the luxury-goods sector implies that the real output in the luxury-goods sector increases while the real output in the basic-goods sector does not decrease.

3. Simulation Experiments

In this section, several experiments will be done, using fiscal and monetary policies to reduce the surplus workers in the basic-goods sector. Also some experiments will be done by assuming exogenous technological shocks on both sectors. It will be shown that these shocks produce results that are not dissimilar from those obtained in the case of the standard two-sector model. The starting values of the exogenous variables and parameters of the model are shown in the appendix at the end of this paper. In order to avoid results that would be due solely to differences in parameter values, similar parameters regarding the behaviour of workers in different sectors are assumed to be the same. In reality, the propensity to consume basic goods in the low-income sector is likely to be higher than the propensity to consume basic goods in the high-income sector, but such a discrepancy will only be looked at the end of this section. The software used to run the simulations is Eviews 6. Many starting values for parameters are taken from Godley and Lavoie (2007, Chapter 6), as they can be found on the website:
<http://gennaro.zezza.it/software/eviews/gl2006.php>

3.1 Government Policy

Three possible experiments can be done in the fiscal and monetary policy area: increasing government expenditures, reducing tax rates and increasing the interest rate on treasury bills. We will conclude by comparing the three government policies.

3.1.1 Government Expenditure

Government funds can be spent on both sectors. The same amount of government expenditure increases on each sector has a different effect on the number of workers changed in both sectors.

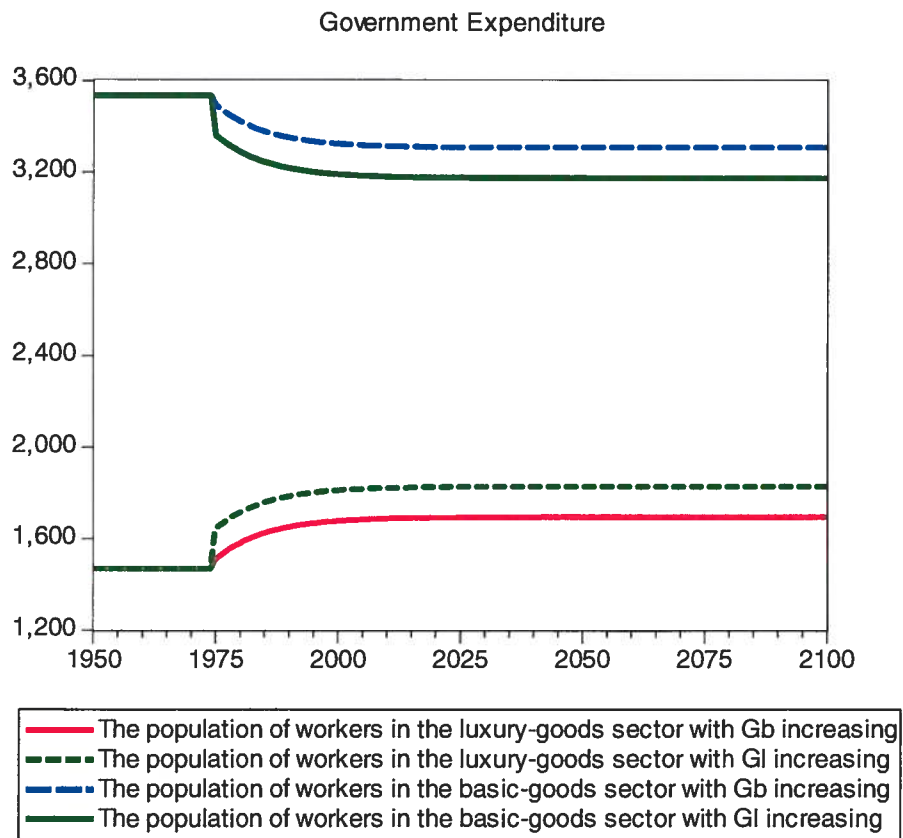


Figure1. Impact on the number of workers (left axis) in each sector, after a permanent increase in government expenditure from 20 to 28 in 1975 in different sectors respectively.

A permanent increase in government expenditure on basic goods, while government expenditure on luxury goods remains the same, will increase the number of workers in the luxury-goods sector and reduce the surplus workers in the basic-goods sector. The total income of workers in the basic-goods sector arises from the consumption of basic goods in both sectors plus the government expenditure on basic goods. Therefore, an increase of government expenditure on basic goods will increase the income in the basic-goods sector, and will reduce the income disparity of the economy.

Increasing government expenditure on luxury goods does not increase the wage rate in the luxury-goods sector, since the wage is decided by the target real wage. However, the increase of government expenditure on luxury goods increases the total demand for luxury goods, which stimulates firms to hire more workers, who will then be able to leave the basic-goods sector. This effect increases real output in the luxury-goods sector and reduces the amount of surplus workers in the basic-goods sector. The reduction of surplus workers increases labour productivity and hence wages in the basic-goods sector. As a result, the purchasing power of the workers in the basic-goods sector in terms of luxury goods increases as well.

An increase of the same size in government expenditures on luxury goods has a stronger effect than in the previous case removing more surplus labour from the basic-goods sector, as workers flow to the luxury-goods sector. Nevertheless, whether the government spends more in one sector or in the other sector makes no difference to the size of the government deficit, as shown in Figure 2. We can also see that when the economy recovers a stationary state, the fiscal deficit is brought back to zero.

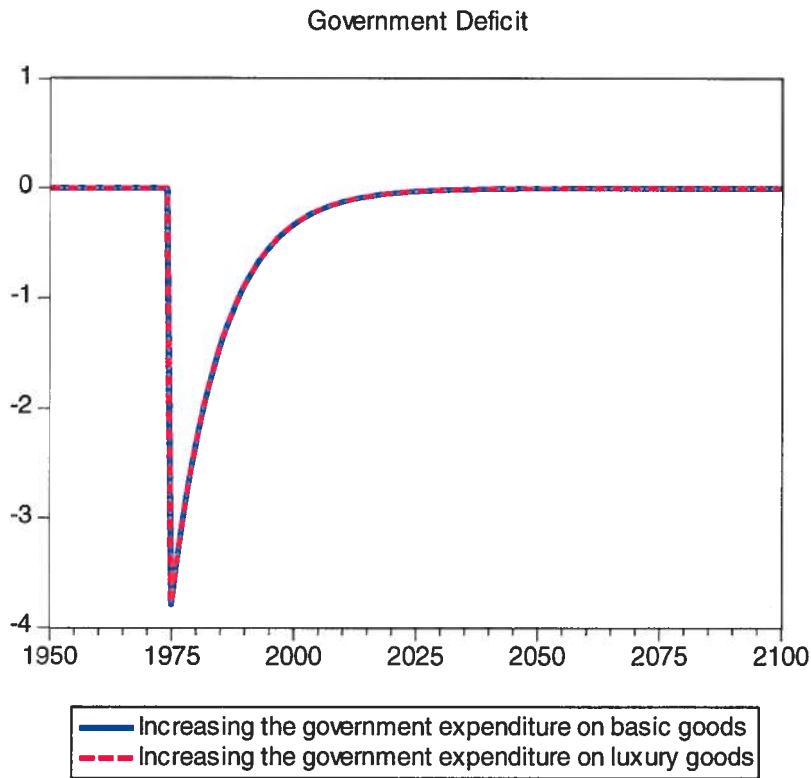


Figure 2. Evolution of government deficit, after an increase of government expenditure on two goods respectively in 1975.

The reason that the effect of government expenditure on luxury goods is higher than on basic goods is that directly increasing the regular income of workers in the basic-goods sector enhances the consumption of basic goods in the basic-goods sector, but it does little to enhance consumption in the luxury-goods sector. A larger share of income is spent on the consumption of basic goods by workers operating in the basic goods sector. This consumption does not help reduce the size of surplus labour in the basic-goods sector. As a result, the effect on the movement of workers is not as impressive as the effect on the movement of workers when government expenditures go towards luxury goods.

3.1.2 Taxation

The reduction of tax rates can also help to reduce the number of surplus workers in the basic-goods sector. Decreasing the tax rate in the basic-goods sector, θ_b , will directly increase the purchasing power in terms of luxury goods of the workers in the basic-goods sector, which will increase the consumption of luxury goods of the workers in the basic-goods sector and shift the surplus workers from the basic-goods sector to the luxury-goods sector. Decreasing the tax rate in the luxury-goods sector, θ_l , will increase the consumption of luxury goods by workers in the luxury-goods sector, helping workers to shift from the basic-goods sector to the luxury-goods sector.

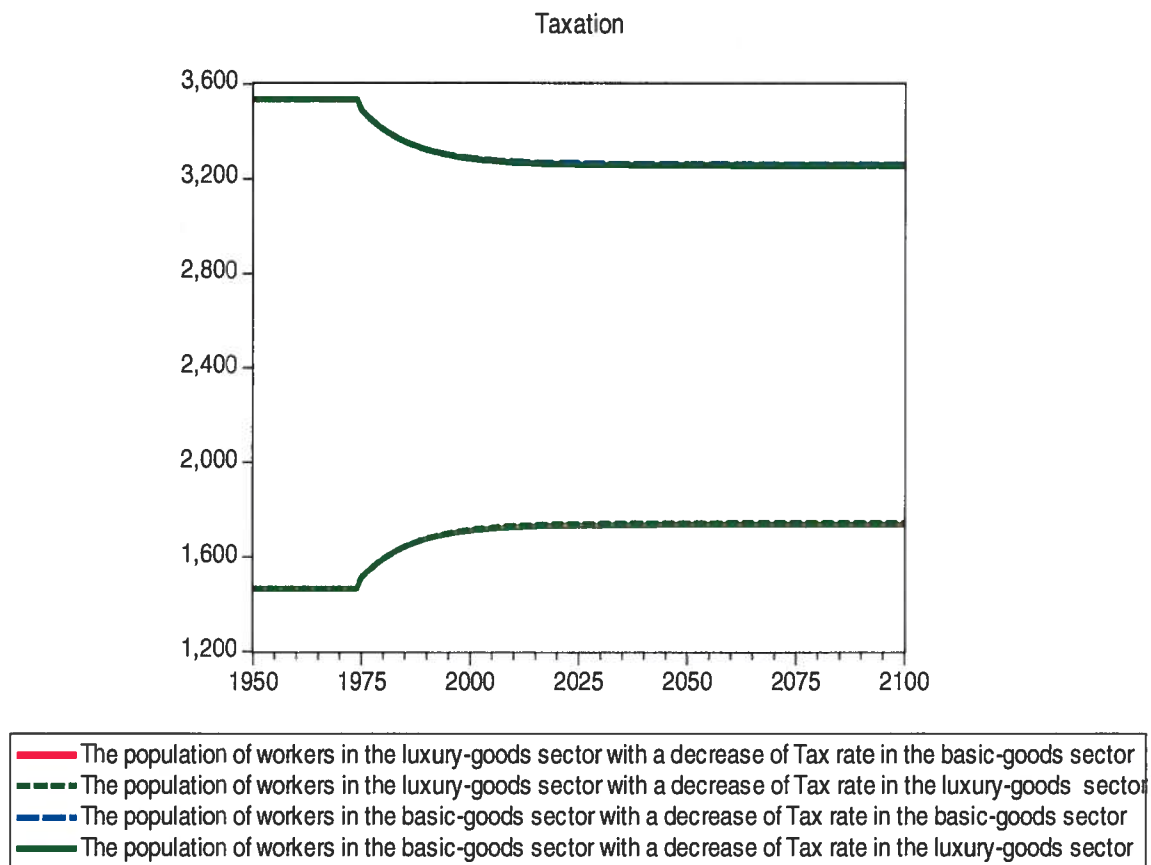


Figure 3. Impact on the number of workers (left axis) in each sector, after a permanent decrease in tax rate from 0.2 to 0.161 in 1975 in the basic-goods sector and from 0.2 to 0.145 in 1975 in the luxury-goods sector.

Note that a different tax reduction across sectors was applied because the total income Y and the wealth V are different in each sector. The rate of tax reduction was chosen so as to generate the same amount of government deficit in as shown on Figure 4.

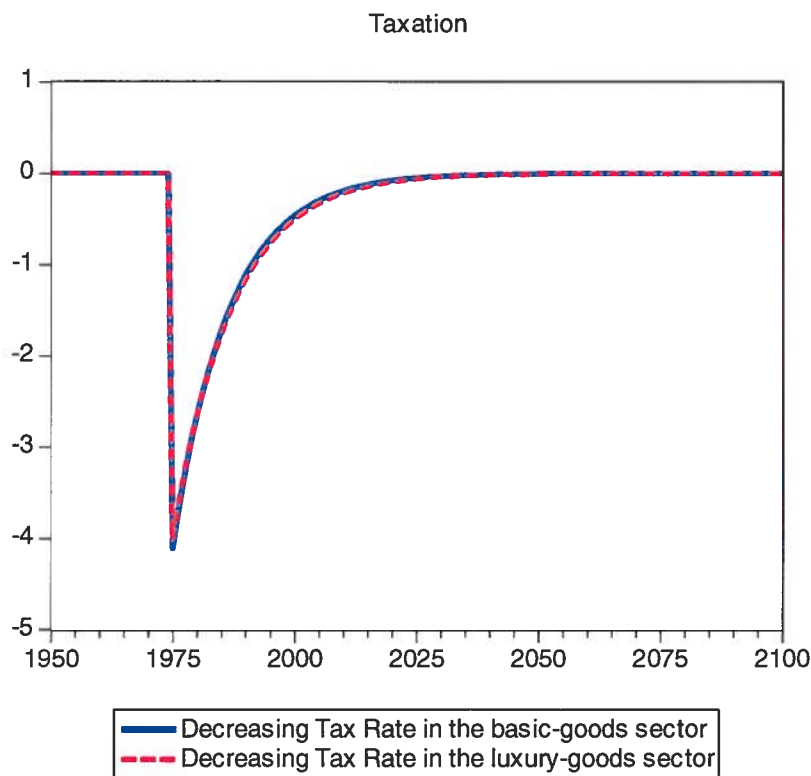


Figure 4. Evolution of government deficit, after a decrease of tax rate in two sectors respectively in 1975.

The number of workers shifting from the labour-surplus sector to the luxury-goods sector is almost the same in these two cases (Figure 3). However, the effect is not as impressive as the effect of increasing the government expenditure on luxury goods, even though the government deficit will be higher in the regime of reducing the tax rate than in the regime of increasing the government expenditure. The reason is that a part of tax-saving money is spent on purchasing treasury bills and cash money. Since the increase of treasury bills and cash money held by the workers does not help in transfer of the surplus workers from the basic-goods sector to the luxury-goods sector very well, the effects of the tax reduction on reducing the surplus workers in the basic-goods sector are weakened.

3.1.3 Interest Rate

An increase of the interest rate on treasury bills is a monetary policy. It will increase the purchasing power of both sectors in terms of luxury goods as holders of government securities will benefit from higher interest revenue on their savings. Also, an increase of the interest rate on treasury bills will increase the demand for treasury bills in terms of the total wealth V .

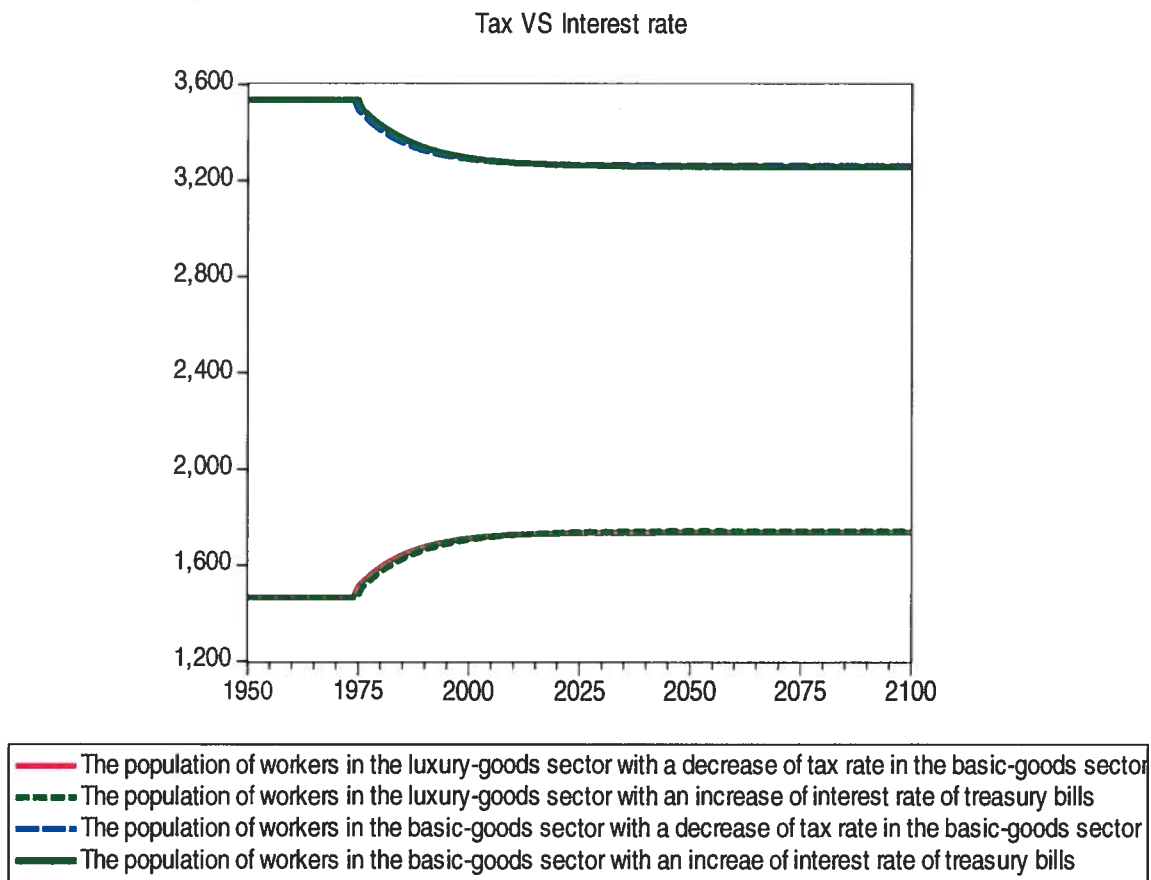


Figure 5. Impact on the number of workers (left axis) in each sector, after a permanent decrease in tax rate from 0.2 to 0.161 in 1975 in the basic-goods sector and an increase in the interest rate on treasury bills from 0.025 to 0.0525 in 1975.

In order to have a clear view of the different effects between an increasing interest rate on treasury bills and a decreasing tax rate in the basic-goods sector, the change in the number of workers in each sector is controlled at almost the same amount. The amount of government deficits generated in each process is given in Figure 6.

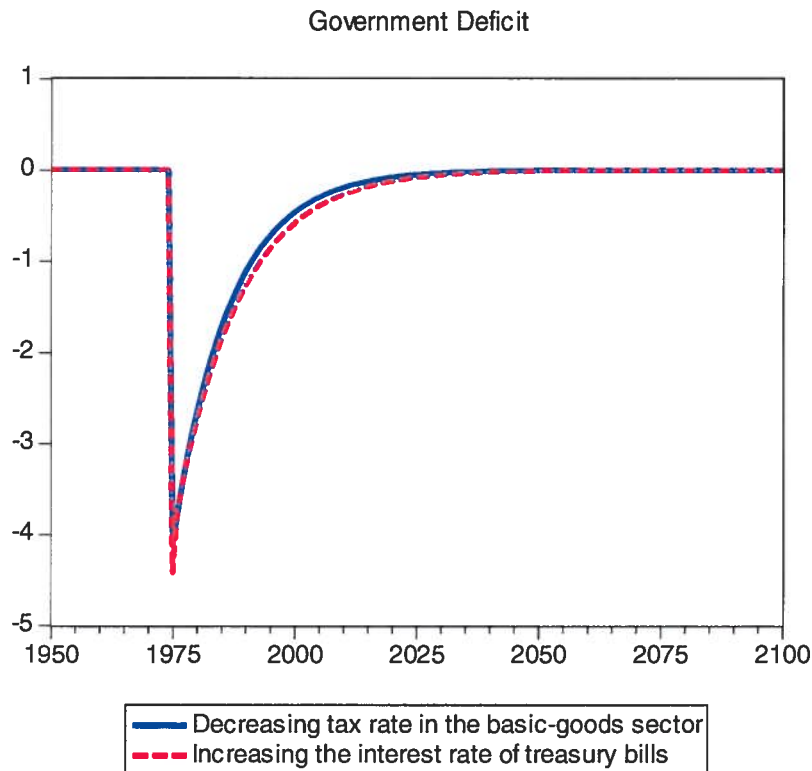


Figure 6. Evolution of the government deficit, after a decrease in tax rates in the basic-goods sector and an increase in the interest rate on treasury bills in 1975.

When the numbers of workers shifting from the basic-goods sector to the luxury-goods sector are almost the same, an increase in interest rates generates more government deficit than a tax reduction policy during the process (shown in Figure 6). Workers attempt to hold more treasury bills, compared to a situation where workers benefit from a tax reduction. However, this

behaviour of workers does not help to transfer the surplus workers from the basic-goods sector to the luxury-goods sector.

3.1.4 Conclusions about Fiscal and Monetary Policies

The three government policies all work well in moving the surplus workers from the basic-goods sector to the luxury-goods sector. If there is no limitation on the government deficit, then it does not matter which policy or policies the government applies to improve the two-sector problem in a closed economy. If the government deficit is limited, increasing government expenditure on luxury-goods is more effective in absorbing surplus workers than the other policies. The next two parts will discuss the different areas to which government expenditures can be devoted.

3.2 Exogenous Technical Progress

How the government spends its funds may also affect the effectiveness of policies in solving the problem of surplus workers in the basic-goods sector. We first discuss the effect of improving labour productivity in each sector. Then the results of these experiments are compared with the results in the standard two-sector model.

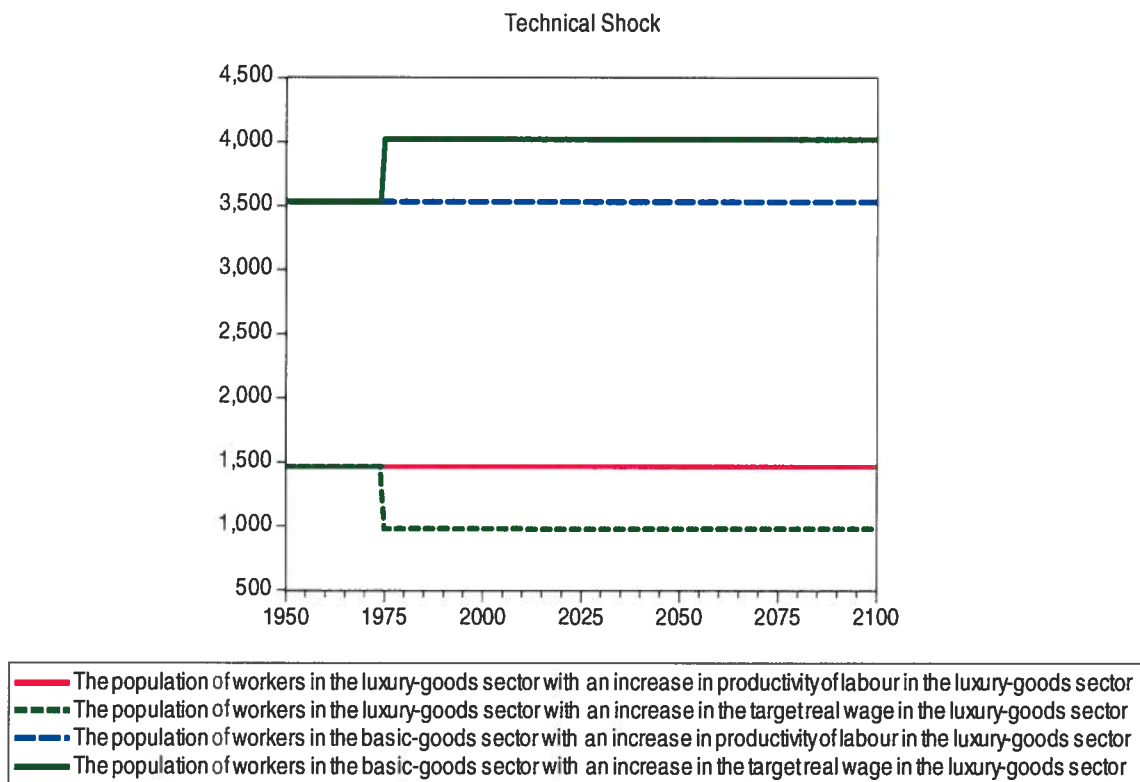


Figure 7. Impact on the number of workers (left axis) in each sector, after a permanent increase in the labour productivity in the luxury-goods sector from 6 to 7 in 1975, and increasing the target real wage β from 2 to 3 in 1975.

A technical shock on the luxury-goods sector does not have any impact on absorbing the surplus workers, since the relative price is constrained. On the one hand, the increase of labour productivity in the luxury-goods sector reduces the price of luxury goods. The purchasing power in terms of luxury goods for the workers in the basic-goods sector is increased. Workers in both sectors intend to purchase more luxury goods, and this induces workers to move from the basic-goods sector to the luxury-goods sector. On the other hand, the increase of labour productivity has a negative effect on the absorption of workers, since the same amount of luxury goods can now be produced by fewer workers. Figure 7 shows that the number of workers does not change in the two sectors.

Also, from the relative price, Equation 6, we have:

38

$$P_m * P_{rm} = \beta * P_f$$

If the target real wage, the profit margin and the price of basic goods do not change, the increase of labour productivity in the luxury-goods sector is always compensated by an equivalent reduction in the price of luxury goods. Therefore, a technical shock on the production of luxury-goods does not help to solve the problem of surplus workers in the basic-goods sector.

An increase of labour productivity in the basic-goods sector has a negative effect on absorbing the surplus workers from the basic-goods sector to the luxury-goods sector, if the target real wage of the workers in the luxury-goods sector is increased in line with the increase in productivity. Recall that the labour productivity of the basic-goods sector is limited by the extent of effective demand, since there always is surplus labour. For example, the degree of mechanisation in developing countries is very low in agriculture and in most labour-intensive industries, even though machines for these industries do exist. The owners of these industries do not have the motivation to improve labour productivity by increasing the degree of mechanisation. Therefore, an increase of labour productivity in the basic-goods sector, due to technical progress, does not have any effect on the production of basic goods. However, if the increase in the labour productivity of the basic-goods sector increases the target real wage in the luxury-goods sector, then the problem of surplus workers in the basic-goods sector will become more severe. The workers in the luxury goods sector will require more basic goods for their real wage than before, since they may consider the same amount of basic goods are less valuable now than in the past.

Compared with the standard two-sector model, the results of our model with respect to technical progress are close to those of the standard model. P. Sarkar (1994) concluded that technical progress in the basic-goods sector reduced trade between the two sectors, while technical progress in the luxury-goods sector did not have the same effect. P. Sarkar (2001) later argued that in the neo-Kaleckian dual-economy framework, the technical progress turned against the trade in the basic-goods sector, even though the luxury-goods sector has a higher rate of technical progress. The reason he pointed out is that there are different fruits of technical

progress enjoyed by the two sectors. In the basic-goods sector the fruit is the price reduction while in the luxury sector the fruit is the income increase. An increasing disparity of income reduces trade between the two sectors. From the equations, the trade between each sector depends on the population of the luxury sector and the real target wage in the luxury sector. Thus, since the trade between each sector decreases and the target real wage in the luxury sector increases, the population in the luxury sector decreases.

3.3 Government Expenditure on Education

The previous experiments are based on the assumption of perfect mobility of workers. However, in the real world, the worker may not be able to shift freely and costlessly between the two sectors. For example, in China there is a worker-registration policy that blocks workers from moving from the rural area to the urban area. But more often the barriers are caused by the lack of skills of workers. Thus, the effect of the fiscal policies and monetary policies in absorbing the surplus workers and increasing real output depends on the extent of mobility between the two sectors.

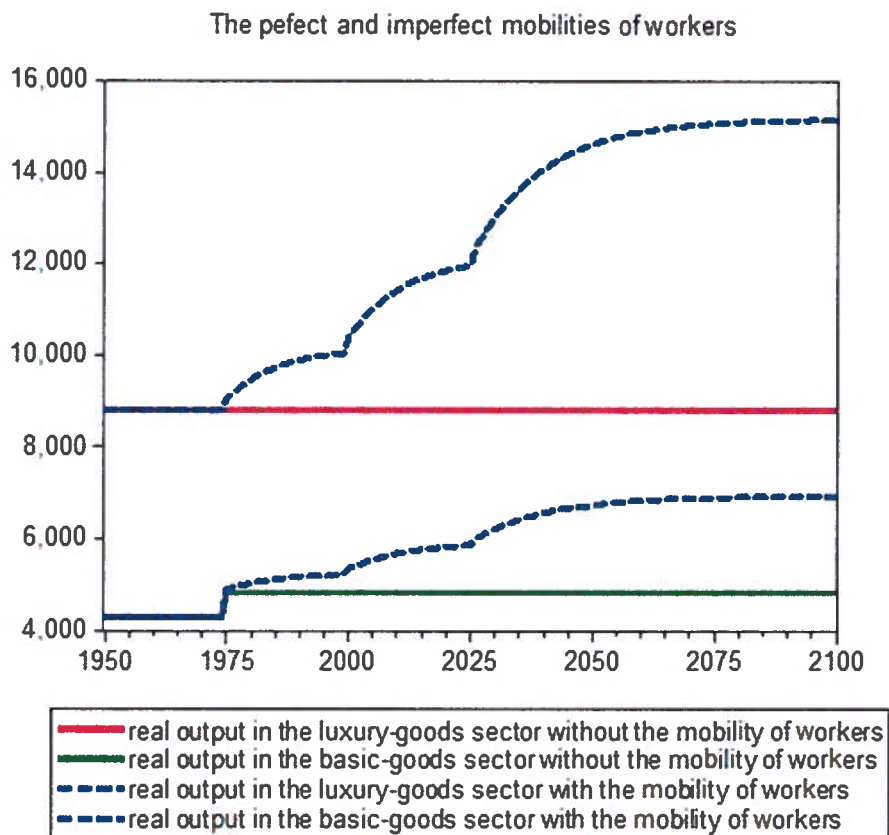


Figure 8. Evolution of the real output of the two sectors, after a permanent increase in government expenditure G_b from 20 to 28 in 1975, a permanent decrease in tax θ_b from 0.2 to 0.161 in 2000 and a permanent increase in interest rate from 0.025 to 0.0525 in 2025.

The real output in the luxury-goods sector does not change if workers are not able to move from the basic-goods sector to the luxury-goods sector, even though the monetary policies and the fiscal policies are applied. Suppose the price of basic goods P_b , which works as a standard, does not change, and the assumption of the relative price still holds in the regime with the mobility of workers and the regime without the mobility of workers. In the regime without the mobility of workers, the real output of the luxury goods is constrained from the supply side, since the worker supply is constrained. The real output of the basic-goods sector is still constrained from the demand side, since the demand for basic goods is constrained while there is excess capacity.

The real output in the basic-goods sector shows a small increase only when the government expenditure G_b increases from 20 to 28, but the magnitude of the increase of the real output is much smaller than if the same policy was to be applied in the regime with perfect worker mobility. Thus, the government should get rid of all the barriers which block the mobility of workers, such as the workers-registration system, before they decide to apply the fiscal policies and monetary policies to absorb surplus workers from the basic-goods sector. The government expenditures on education and skills training make a positive contribution to solve the problem of surplus workers in the basic-goods sector.

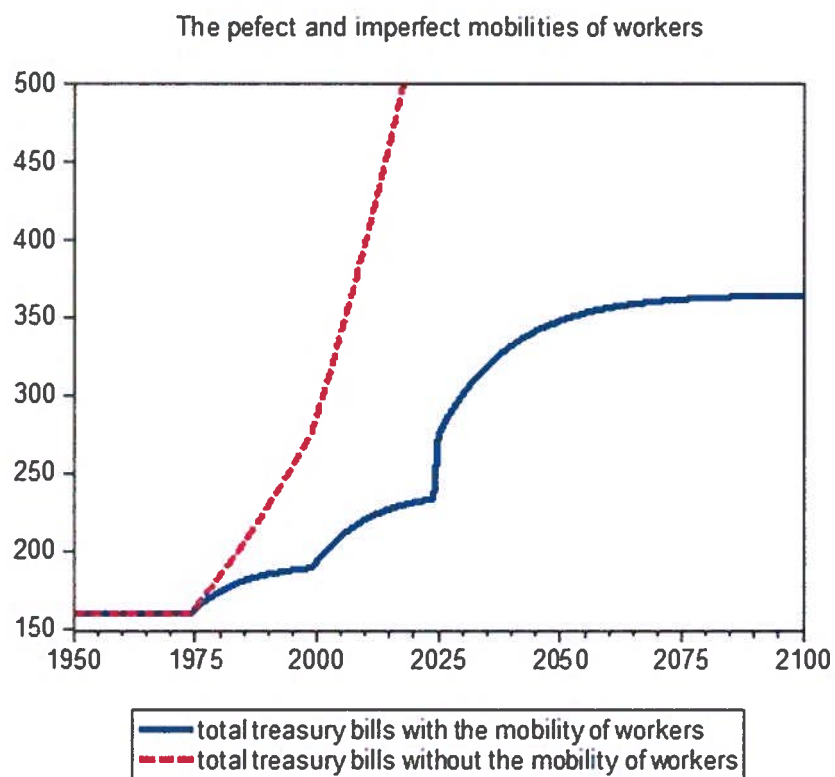


Figure 9. Evolution of the amount of treasury bills held by workers in the two sectors, after a permanent increase in government expenditure G_b from 20 to 28 in 1975, a permanent decrease in tax θ_b from 0.2 to 0.161 in 2000 and a permanent increase in interest rate from 0.025 to 0.0525 in 2025.

If the government does not eliminate these barriers, then an increase of government deficit will only be compensated by an increase in the amount of treasury bills held by workers in the regime. From 1975 to 2000 in Figure 9, even though the interest rate does not increase, the total amount of treasury bills held by workers in both sectors increases dramatically, after the fiscal and monetary policies are applied.

Also, the dramatic increase of the amount of treasury bills held by workers can indicate restrictions in the flows of workers, when the fiscal and monetary policies are applied. A high saving rate in developing countries not only reflects the shortage of social insurance, but it also reflects large impediments to the mobility of workers. For example, the high-income workers have nowhere to spend their money except on saving, since the real output of luxury-goods is constrained from the supply side in a regime without the mobility of workers. Government expenditures on education and skills training become crucial under these circumstances.

3.4 The Propensity to Consume Basic Goods

In reality, the propensity to consume basic goods may be different in both sectors. For example, the worker in the basic-goods sector has a higher propensity to consume basic goods than the worker in the luxury-goods sector. Engel's law implies that when income increases, the proportion of income spent on food decreases. Since the propensity to consume basic goods has the same meaning as the proportion of income spent on basic goods, it is reasonable to assume that the propensity to consume basic goods in each sector is different, in line with Engel's law. If the assumption of symmetry in both sectors of the economy is relaxed, then the change in the propensity to consume basic goods in the basic-goods sector can be experimented.

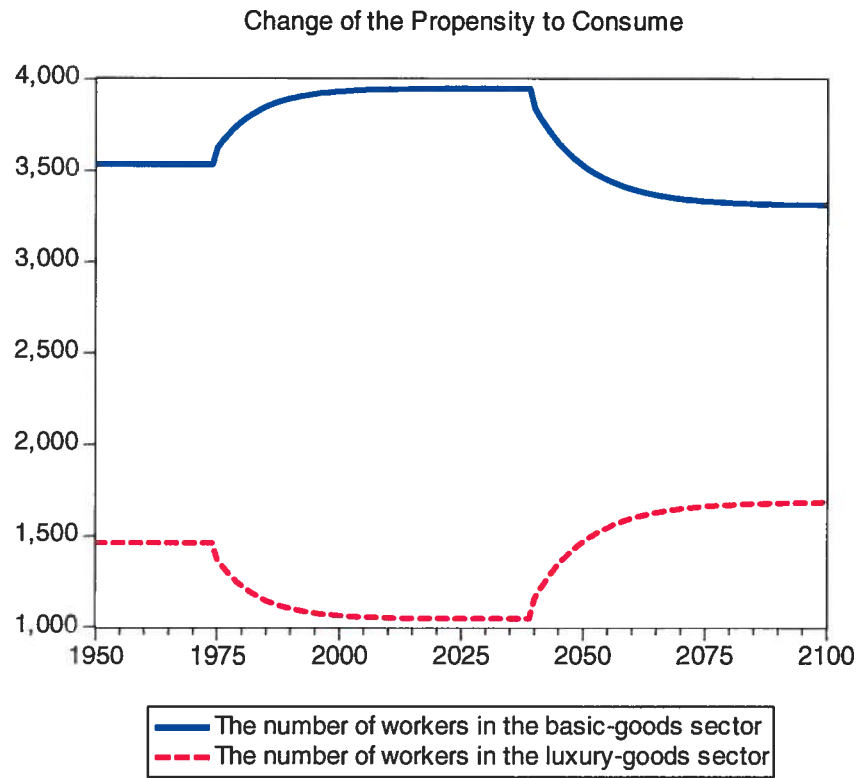


Figure 10. Impact on the number of workers (left axis) in each sector, after a permanent increase in μ_0^b from 0.5 to 0.65 in 1975, and a permanent decrease in μ_0^b from 0.65 to 0.4 in 2040

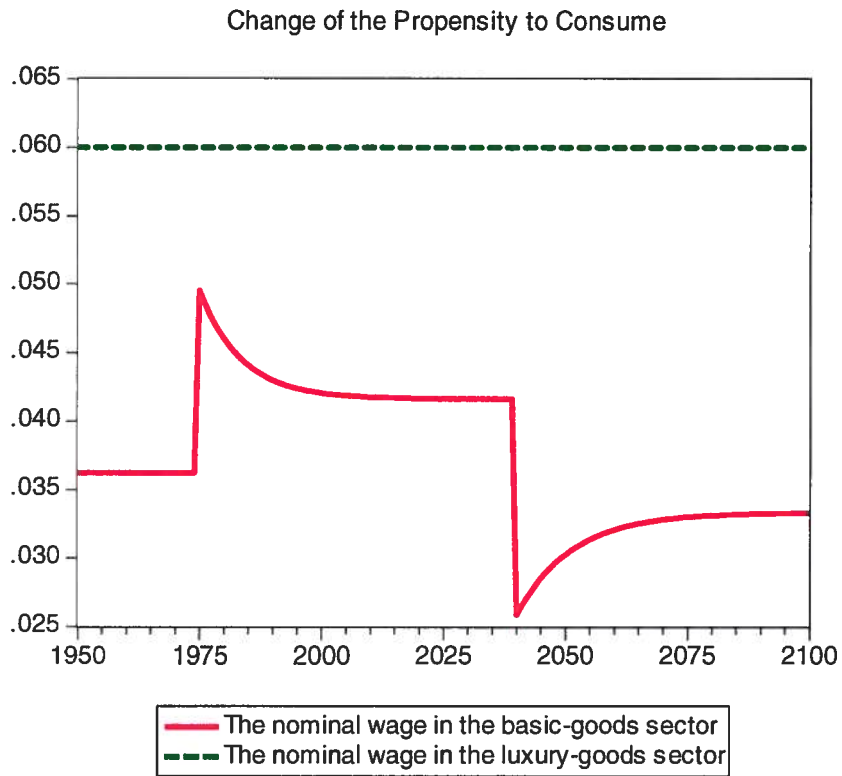


Figure 11. Impact on the nominal wages of workers (left axis) in each sector, after a permanent increase in μ_0^b from 0.5 to 0.65 in 1975, and a permanent decrease in μ_0^b from 0.65 to 0.4 in 2040

If the propensity to consume basic goods in the basic-goods sector increases, workers will move from the luxury- goods sector to the basic-goods sector. The situation of the surplus workers in the basic-goods sector is more severe. The real wage in the basic-goods sector increases (as shown on Figure 11), but the purchasing power in terms of luxury goods for the workers in the basic-goods sector reduces. The reason can be shown mathematically as follow.

The consumption of basic goods in the basic goods sector is

$$C_b^b = \mu_0^b * Y^b$$

The consumption of luxury goods in the basic-goods sector is

$$C_1^b = \alpha 1^b * (Yd^b - C_b^b) + \alpha 2^b * (V_{(-1)}^b + V_{-1} * \frac{\Delta N^b}{N})$$

Replace Yd^b by Equation 14 and rearrange the equation, then:

39

$$C_1^b = \alpha 1^b * [(1 - \theta) * (Y^b + r_{-1} * B_{h-1}^b + r_{-1} * B_{h-1} * \frac{\Delta N^b}{N}) - C_b^b] + \alpha 2^b * (V_{(-1)}^b + V_{-1} * \frac{\Delta N^b}{N})$$

$$C_1^b = \alpha 1^b * [(1 - \theta) * (G^b + C_b^l + r_{-1} * B_{h-1}^b + r_{-1} * B_{h-1} * \frac{\Delta N^b}{N}) - \theta * C_b^b] + \alpha 2^b * (V_{(-1)}^b + V_{-1} * \frac{\Delta N^b}{N})$$

Taking the derivative of the consumption of luxury goods by the workers in the basic-goods sector by the consumption of basic goods by the workers of the same sector, we then obtain:

40

$$\frac{\partial C_1^b}{\partial C_b^b} = -\theta < 0$$

In the short run, when the propensity to consume basic goods by the workers in the basic-goods sector increases, the consumption of basic goods in the same sector, C_b^b , increases. Therefore, the real wage in the basic goods sector increases as well, but the consumption of luxury goods by the workers in the basic goods sector is reduced. The workers move from the luxury-goods sector to the basic-goods sector.

In the long run, since workers can move without restraints from one sector to another, the wage rate in the basic-goods sector first increases, only to decline later, and finally reaches a new equilibrium which is higher than that of the initial state. Also more workers work in the basic-goods sector in the new equilibrium.

4. Conclusion

In this paper, a model based on the standard Kaleckian two-sector model and on a stock-flow coherent model is introduced in order to simulate the income disparity and irrational economic structure that exist in China. This model is general so that it can be applied to many developing countries with similar problems. In these countries, the capital constraint is not the main problem; instead these countries suffer from a severe problem due to the lack of domestic effective demand for the goods being produced inside the country. The present model is for illustrative purposes, as it is overly simple; and it applies only to a closed economy.

Government policies and workers' behaviours are crucial in studying this issue. Since this issue cannot be solved by itself, government policies are the most important elements to address this problem. The surplus of workers in the basic-goods sector is the main problem in countries such as China. Therefore the number of workers moving from the basic-goods sector to the luxury-goods sector will be the best indicator to test the effectiveness of government policies in our model. Three types of government policies -- increasing government expenditure, reducing tax rates and increasing interest rates -- are experimented in this paper. These policies have an effect on absorbing the surplus workers from the basic-goods sector, and moving these workers towards the luxury-goods sector. When controlling the size of government deficits generated by these three types of policies, increasing government expenditure on luxury goods is proven to be the most successful policy in absorbing surplus workers from the basic-goods sector to the luxury-goods sector. Reducing tax in each sector has almost the same effect on shifting the surplus workers. Increasing the interest rate on treasury bills is the least successful policy.

Two more experiments are introduced in the paper to show the different effects on the economy with an increase of government expenditure on technical progress and on education.

Having technical progress in this model does not help to solve the surplus problem. In fact, the problem may get worse when the technical progress occurs in the basic-goods sector, since the fruits enjoyed by each sector are different. This result is similar to the result that was achieved in the standard Kaleckian two-sector model with technical progress.

Increasing government expenditure on education improves the mobility of workers between the basic-goods sector and the luxury-goods sector. The level of mobility of workers between the two sectors has a huge effect on the effectiveness of fiscal and monetary policies. The change of real outputs is determined by the level of mobility of workers. If workers are immobile between sectors, there is no change in the real output of the luxury-goods sector when the fiscal and monetary policies are applied. The deficits of the government are only compensated by a dramatic increase in the acquisition of treasury bills by workers. Thus, ruling out the barriers of movement between the two sectors is the first policy to be implemented before fiscal and monetary policies are applied.

The two-sector problem is not difficult to solve in a closed economy. However, an open economy model is more complicated. For example, when the interest rate of treasury bills increases, foreign investment may increase, and vice versa. How the increase of foreign investment would affect the numbers of workers in the two sectors is not clear yet. Moreover, once foreign investment is taken into consideration, we need to remove the no-profit assumption of the model, and consider how income distribution between profits and wages would modify the results of the model. In particular, the mark-up ϕ would not be zero anymore. One would need to consider how the profits would be distributed between the entrepreneurs of the luxury-goods sector, those of the basic-goods sector and even the entrepreneurs of the foreign sector as a return on their foreign investments. Although it would be more complicated, an open economy model would also be more interesting to study.

5. Appendix

5.1 Values of the Parameters

$\alpha_{1_l} = 0.4$	$\alpha_{1_b} = 0.4$	$\alpha_{2_l} = 0.2$	$\alpha_{2_b} = 0.2$	$\lambda_{0_l} = 0.67$
$\lambda_{0_b} = 0.67$	$\lambda_{1_l} = 5$	$\lambda_{1_b} = 5$	$\lambda_{2_l} = 0.01$	$\lambda_{2_b} = 0.01$
$\mu_{0_l} = 0.5$	$\mu_{0_b} = 0.5$	$\theta_l = 0.2$	$\theta_b = 0.2$	$\varphi = 0$

5.2 Starting values of the Variables

$n_l = 1467.064$	$n_b = 3532.936$	$\Delta N_b = 0$	$\beta = 2$	$pr_b = 2$
$n = 5000$	$pr_l = 6$	$p_l = 0.01$	$p_b = 0.03$	$g = 40$
$g_l = 20$	$g_b = 20$	$r = 0.025$	$r_{bar} = 0.025$	$v_l = 83.14438$
$v = 204.07148$	$b_{cb} = 43.59512$	$b_{h_l} = 65.38252$	$b_{h_b} = 95.09380$	$v_b = 120.9271$
$h_s = 43.59512$	$h_h = 43.59512$			

5.3 Notations Used in the Paper

θ^l	tax rate of the luxury-goods sector
θ^f	tax rate of the basic-goods sector
φ	profit margin of luxury goods
β	target real wage in the luxury-goods sector

μ_0^l	propensity to consume luxury goods
μ_0^b	propensity to consume basic goods
B_h^l	demand for government T-bills in the luxury-goods sector
B_h^b	demand for government T-bills in the basic-goods sector
B_{bc}	government T-bills held by the central bank
B_s	supply of government T-bills
C_b^l	nominal consumption of basic goods in the luxury-goods sector
C_l^l	nominal consumption of luxury goods in the luxury-goods sector
C_l	total nominal consumption of luxury goods
C_b^b	nominal consumption of basic goods in the basic-goods sector
C_l^b	nominal consumption of luxury goods in the basic-goods sector
C_b	total nominal consumption of basic goods
G_l	nominal government expenditure on the luxury goods
G_b	nominal government expenditure on the basic goods
G	total nominal government expenditure
H_h^l	cash money held by the workers in the luxury-goods sector
H_h^b	cash money held by the workers in the basic-goods sector
H_s	supply of cash
N^l	number of workers in the luxury-goods sector
N^b	number of workers in the basic-goods sector
P_b	price of basic goods
P_l	price of luxury goods
Pr_l	productivity of the luxury-goods sector
r	nominal interest rate of treasury bills
T^l	taxation of the luxury-goods sector
T^b	taxation of the basic-goods sector
T	total taxation
Uc	unit cost of producing one luxury good
V^l	total wealth of workers in the luxury-goods sector
V^b	total wealth of workers in the basic-goods sector

V_g	total wealth of government
W_l	nominal wage of the workers in the luxury-goods sector
W_b	nominal wage of the workers in the basic-goods sector
Y_l	nominal income in the luxury-goods sector
Y_b	nominal income in the basic-goods sector
Y_d^l	disposable income of the workers in the luxury-goods sector
Y_d^b	disposable income of the workers in the basic-goods sector

References

- Bhaduri, A. and Skarstein, R. (2003): 'Effective Demand and the Terms of Trade in a Dual economy: a Kaldorian perspective', *Cambridge Journal of Economics*, 27(4), pp. 583-595.
- Chakrabarti, S. (2011): 'A Macroeconomic Structure of Employment: Rural-Urban Conflict in a Kaleckian Framework', *Review of Radical Political Economics*, 43(2), pp. 172-197.
- Dutt, A. K. (1996): 'Intersectoral Capital Mobility in a Kaldorian Model of Growth and Development', *Manchester School*, 64(2), pp. 153-169.
- Eckert, P. and Holland, S. (2010, September 23): Obama asks Wen for more action on yuan. *Reuters*
Retrieved from <http://www.reuters.com/article/2010/09/23/us-usa-china-yuan-idUSTRE68L5K120100923>.

- Godley, W. and Lavoie, M. (2007): *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, Palgrave MacMillan, Basingstoke.
- Lewis, W. A. (1954): 'Economic Development with Unlimited Supplies of Labour', *The Manchester School*, 22(2), pp. 139-191.
- Nurkse, R. (1962): *Equilibrium and Growth in the World Economy*, Harvard University Press.
- Pan, J. and Wei H. (2011): *Annual Report on Urban Development of China No. 4*, Social Sciences Academic Press (China).
- Robinson, J. (1936): 'Disguised Unemployment', *The Economic Journal*, 46(182), pp. 225-237.
- Sarkar, P. (1993): 'Effective Demand and Income Distribution in the Context of Agriculture-industry Demand Linkage: A Two-sector Macroeconomic Framework', *Journal of Macroeconomics*, 15(4), pp. 787-803.
- Sarkar, P. (1994): 'North-South Terms of Trade and Growth: A Macroeconomic Framework on Kaldorian Lines', *World Development*, 22(11), pp. 1711-1715.
- Sarkar, P. (2009): 'A Centre-Periphery Framework on Kaldorian Lines', *Review of Political Economy*, 21(3), pp. 393-401.
- Sarkar, P. (2001): 'Technical Progress and the North-South Terms of Trade', *Review of Development Economics*, 5(3), pp. 433-443.
- Targetti, F. (1985): 'Growth and the Terms of Trade: A Kaldorian Two-Sector Model', *Metroeconomica*, 37(1), pp. 79-98.
- Thirlwall, A.P. (1986): 'A General Model of Growth and Development on Kaldorian Lines', *Oxford Economic Papers*, 38(2), pp. 199-219.