JOURNAL OF POST KEYNESIAN ECONOMICS
https://doi.org/10.1080/01603477.2020.1713820



# Financialization, dividends, and accumulation of capital

Vincent Duwicquet

**ABSTRACT**

The article proposes a stock-flow consistent macroeconomic modeling of a financialized growth regime. The different effects of financialization are studied in open economies with interest rates, share prices, credit, capital accumulation, and income distribution. The structural characteristics of the financialized growth regime, such as financial accumulation, shareholder power, and international competition, remain heavy brakes on investment and employment. Using the model, we measure the consequences of dividend reduction. In a financialized growth regime, a reduction in dividends would allow a return to full employment throughout the eurozone. However, this policy would have to be accompanied by a reduction in firms' financial accumulation and by a fiscal stimulus policy. In order to achieve a satisfactory social situation, a major institutional change appears essential.

**KEYWORDS**

Income distribution; institutions; macroeconomic models

**JEL CLASSIFICATIONS**

E12; E44; B52

## Introduction

One result of the turn France made in the early 1980s toward economic liberalism has been a higher distribution of profits to shareholders. Between 1980 and 2009, net dividends paid by non-financial corporations (dividends paid minus dividends received) rose from 3 to 8.4% of the value added. At the peak of the crisis (between 2009 and 2010), the portion of dividends declined under the effect of lower profit margins, due to relatively stable employment rather than lower production.

Specifically, profit margins in the industry fell 12.5 percentage points between 2000 and 2012, while the dividend distribution ratio in that time rose 10 points, thereby reducing the margin available for investment. Beyond the question of profit margin levels, it is clear that the real issue is the use of profits. Are they allocated to productive investment, dividend distribution, stock buybacks, financial accumulation or debt reduction? It is the answer to this question that determines a great deal of the economic dynamics generated by business firms.

Another salient stylized fact of the last few years is that the low growth in wages and in the prices of goods and services has been accompanied by

Vincent Duwicquet is at CNRS, UMR 8019, CLERSE - Centre Lillois d'Études et de Recherches sociologiques et Économiques, University of Lille, Lille, France.

high returns on shares and a rise in real estate prices, without a sustainable turnaround in productive investment (which actually has declined in France and in the eurozone since 2011). In this context, private firms could make a choice between productive investment and financial accumulation. In terms of households, the craze for real estate has kept up, at least temporarily, despite the stagnation of wage income as a result of increased debt. The monetary easing carried out by the ECB since 2015 has enabled households to carry debt, through low-interest rates.

In the United Kingdom and especially in the United States, the financialization of the economy has resulted in periods of strong growth (particularly during the 1990s), although characterized by financial instability. Private-sector indebtedness and the rise in the prices of financial and real estate assets have stimulated growth through financial profitability and wealth effects (and capital gains effects), thus reducing unemployment, but at the cost of recurrent crises and greater inequality. Macroeconomic policies leading out of the crisis genuinely helped employment, but they have not withstood the dynamics inherent in the financialized accumulation regime.

In this article, we propose to study these dynamics and assess the positive effects that could result from counteracting some of the channels through which financialized capitalism spreads, particularly in terms of the use of profits. For this, we develop a stock-flow consistent (SFC) model of a two-country monetary union, drawing on the work of Duwicquet, Mazier, and Saadaoui (2018), Duwicquet and Mazier (2010), Clévenot, Guy, and Mazier (2010), Van Treeck (2009), Zezza (2008), Godley and Lavoie (2007), and Lavoie (2003). The monetary union consists of two different-sized blocs, Bloc F and Bloc Z, with Bloc F supposed to represent France, being five times smaller than Bloc Z, which is supposed to represent the rest of the eurozone. This size asymmetry between France and the rest of the eurozone enables us to better assess the effects of economic policy or a crisis limited to one country (asymmetric impact) and the diffusion effects of an economic shock or policy in the rest of the union.

The economic forces in the model tend toward a "stagnationist" trajectory, influencing changes in wages, public debt, and interest rates. Capital accumulation is strongly affected by shareholder requirements imposing a standard of financial profitability. Interest rates and credit play important roles. Since the 1990s, the decline in interest rates has helped to significantly reduce firms' cost of debt. The cost of capital, measured by income from capital (dividends and net interest paid) as a percentage of value-added, has increased only moderately since the close of the 1980s, with an increase in dividends paid being partly offset by a decrease in interest paid.

It is argued in this paper that a change in interest rates and dividends paid must be studied within a macroeconomic framework. In the model

under examination, a decline in interest rates promotes credit without encouraging productive investment. Therefore, a capital cost reduction induced by a lower interest rate would have a small effect on employment. On the other hand, a rise in capital cost due to dividend payments places a financing constraint on firms which may prove to be detrimental to investment at the macroeconomic level, as we shall see.

In the next section, we present the main relationships underlying the macroeconomic dynamics of a financialized economy. In Section "Presentation of the different versions of the model," the results of the model in the baseline scenario (without exogenous shocks) are presented in the charts, showing the evolution of the model's main variables. Six scenarios for the distribution of dividends in the two countries are also simulated. The idea is to examine the possible evolution of an economy seeking to de-financialize itself, whether on its own or in coordination with its neighbors and whether or not it supports this de-financialization with a governmental fiscal stimulus policy. The objective of this kind of simulation is to show the gains in employment that might be expected from a strict de-financialization policy in which dividends are no longer paid, as well as from a decline in firms' financial accumulation.

## SFC modeling and overview of the model

Our article is part of the literature on post-Keynesian stock-flow consistent modeling. Several studies have sought to model the mechanisms underlying financialization in a closed economy. Reyes and Mazier (2014) develop a 5-sector model (households, non-financial corporations, government, banks, central bank) with 2 macroeconomic closures (model 1 with an indebtedness norm where equities issued are determined as a residual and model 2 with an own funds norm where loans to firms are in turn determined as a residual). Model 2 is structurally unstable. The dynamics of model 2 are characterized by financial bubbles with financial accumulation by firms. There is no stabilizing mechanism in this specification. Dallery and Van Treeck (2011) also use 2 specifications of their SFC model: a Fordist regime and a financialized regime. The authors take into account the conflicts between shareholders, managers and workers and their effects on the profit rate and capital accumulation. In the Fordist regime, capital accumulation is higher than in the financialized regime, where the maximization of shareholder value is the primary goal.

Lavoie (2008) and Van Treeck (2009) attempted to simulate the effect of an increase in dividends paid by non-financial corporations. In both models, there are positive short-term effects on rentiers' income and consumption. In Lavoie's (2008) model, employment, real production and real

consumption increase as dividends increase. However, this increase in distributed dividends is accompanied by an increase in the markup, which leads to an acceleration of inflation, which has a negative impact on employment and real output in the long term. In the short term, income increases for rentiers and in the economy as a whole. In the long term, the income of the economy as a whole is lower after the increase in the share of income received by rentiers. The results of Van Treeck (2009) model are similar to those of Lavoie (2008). There is a positive effect on consumption due to an increase in short-term dividends and a negative effect in the long term related to the reduction in capital accumulation. Van Treeck (2009) distinguishes between three cases (contractionary, intermediate and expansionary) according to the value retained for the parameters (in particular the effect of Tobin's q on investment and wealth effects on consumption).

SFC modeling has also been used in open economies. In Chapter 12 of Godley and Lavoie's (2007) book, a two-country model is developed with trade and financial exchanges and an endogenous exchange rate. Lavoie and Zhao (2009), using a three-country model (eurozone, China, USA), study the effect of diversifying China's foreign exchange reserves. In the event of a substitution of part of the dollar reserves by Euros, the depreciation of the dollar and the yuan (supposed to remain fixed against the dollar) worsens the trade balance of the eurozone and favors China and the United States. Valdecantos and Zezza (2015) use a four-country model (eurozone, China, USA, rest of the world) to study the reform of the international monetary system and the establishment of a bancor. Godley and Lavoie (2006) model 2 euro area countries (one with an external deficit, the other with an external surplus) in interaction with the USA. Using this three-country model, they simulate the effect of a loss of competitiveness in a southern euro area country by studying the possible effects on interest rates and public spending. Mazier and Valdecantos (2015) supplement Godley and Lavoie (2006) model by adding the rest of the world and different exchange rates. In the case of multiple Euros (northern and southern Euros), intra-eurozone imbalances are reduced. The case of an exit by Germany is studied by highlighting the positive effects on other countries in the event of an appreciation of the German currency.

Other SFC models have focused on intra-euro area imbalances. Kinsella and Khalil (2011) focus on the deflationary process in the euro area, particularly in Ireland, where fiscal and wage austerity policies were put in place following the 2007–2008 crisis. Lavoie (2003) proposes a two-country model (a North and a South country) to study intra-euro area adjustments. Using the model, 3 scenarios are studied (increase in imports from the South, decrease in public spending in the South and increase in interest rates in the South) in order to show different causes of imbalances and

their persistence depending on the economic policies pursued in the euro area. Duwicquet and Mazier (2010) complete Lavoie's Lavoie (2003) model by including equities and credits as well as an investment function. In order to study the stabilization associated with the financial integration ensuing from monetary union, they propose 3 calibrations (financial autarky, the average degree of financial integration and a high degree of financial integration). Stabilization through intra-euro area capital income appears to be weak. This model is also used in a version with endogenous interest rates to study alternative policies to fiscal austerity. To this end, Duwicquet, Mazier, and Saadaoui (2018) model the effects of the implementation of intra-zone financing and Eurobonds (public debt mutualization version and project bonds version), the effects of which are positive compared to fiscal contraction policies.

The SFC model developed in this article takes up the 5 financial assets (central currency, bonds, bills, shares, loans) of Lavoie's (2008) model and incorporates a second country into a monetary union. Compared to the model in Duwicquet, Mazier, and Saadaoui (2018), the price of shares and goods and services is endogenous, as are markup, employment, unemployment and wages. In addition, we introduce several propensities to consume into the model (propensity to consume capital income, wages, social benefits, capital gains and wealth) as well as a tradeoff between productive investment and financial accumulation. As in Van Treeck's (2009) model, the reference scenario shows a disconnection between the profit share and corporate investment. We supplement Lavoie (2008) and Van Treeck (2009) by proposing to study the effect of a decrease in dividends in a two-country model.

We use the SFC model in order to highlight the mechanisms underlying a financialized growth regime. The model developed is based on post-Keynesian theoretical assumptions. It makes possible to represent the (largely endogenous) transmission channels among the different variables: financial markets, wages, prices, employment, capital accumulation, interest rates, etc.

The model provides a comprehensive description of the assets and liabilities of all agents (firms, households, and government) in both economies, as well as the matrix of real and financial flows that cause them from period to period. Compared with the IS-LM model that combines real flows and monetary stocks, the contributions of the SFC model are multiple. First, real flows create changes in stocks, which feed back into real and financial flows. Second, the model includes a dynamic of capital accumulation to describe short and long-term effects. Capital accumulation implies a change in the real and financial wealth of the various economic agents. According to the model's dynamics, households accumulate

**Table 1.** The different types of markets.

| Type of economy | Type of market | Type of agent |
|---|---|---|
| Real economy | Goods and services | Households, businesses, State, rest of the world |
| Monetary economy | Bank deposits | Households, private banks |
| | Central currency | Households, private banks, central bank |
| | Loans | Businesses, private banks |
| | Refinancing | Private banks, central bank |
| Financial economy | Shares | Businesses, households |
| | Bonds | State, households |
| | Treasury Bills | State, private banks |

financial wealth in the form of deposits, currency, shares and bonds. The State and private firms, on the other hand, accumulate debt. Third, the accumulation of wealth (debt) is not unlimited. Firms are constrained by their debt ratio, as is the State, which may be penalized by the financial markets through higher interest rates on Treasury bills[1]. In addition, the price of shares is introduced by comparing supply and demand from households and firms. Concerning the Labor market, the dynamics of wages, employment and the labor force are taken into account. Prices in the market for goods and services are determined by firms' costs and profit behavior.

Table 1 summarizes the different types of markets that co-exist in the model.

### *Model dynamics and baseline scenario*

In SFC models[2], a baseline, or reference scenario must first be calibrated. To reach this objective, the parameters of the equations are allotted values that will enable the model to generate a realistic change over time in the main economic quantities. Figure 1 shows the model's main relationships.

The calibration is based on indicators in the National Accounts. In our model, growth is relatively low (∼1%) and the low rise in wages and prices is accompanied by high unemployment (∼8.5% for country F and 10% for country Z). This is a situation close to the relative stagnation of the French and European economies. The baseline scenario used[3] is meant to represent a deflationary economy with under-utilized production capacity and characterized by high unemployment, a decline in capital accumulation and an increase in the return on shares (Figures 2 and 3).

The model's baseline is characterized by a downward trend in capital accumulation. In a context of insufficient demand, firms favor savings and financial accumulation behaviors rather than productive investment projects. In such a context, low-interest rates allow firms to go into debt to buy equities and to support the equities price by limiting their share offerings. Demand for corporate and household equities is dependent on the return on shares. This maintains instability and higher return on shares and encourages firms

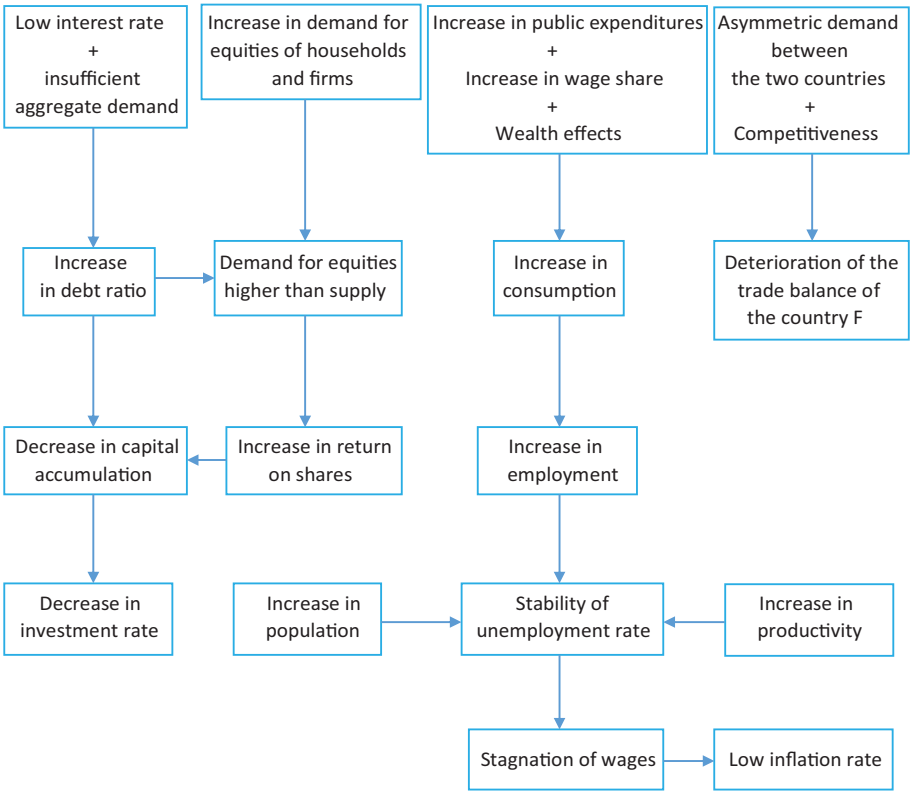


**Figure 1.** Main relationships.

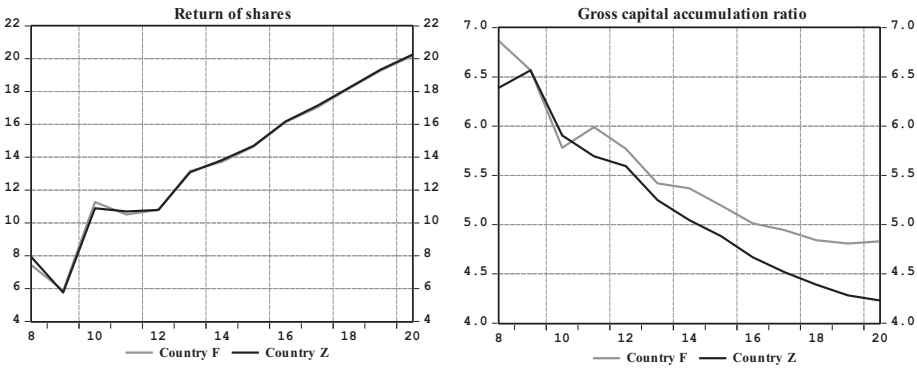


**Figure 2.** Return of shares and capital accumulation in both countries (in percent).

to continue their financial behavior to the detriment of capital accumulation. As shown in Figure 2, the return on shares increases from period 10 (from 8% in period 10 to 20% in period 20) while over the same period the rate of gross accumulation decreases from about 6 to 4.5%.

Despite the decline in the accumulation of productive capital, production tends to increase. Figure 4 shows the evolution of real output and its components (investment, consumption, public expenditure, and trade balance).

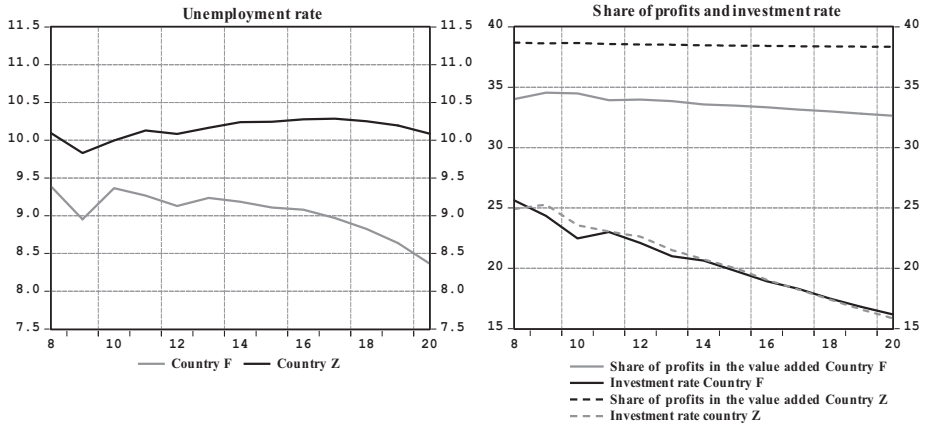


**Figure 3.** Unemployment rate, share of profits and investment rate in both countries (in percent).

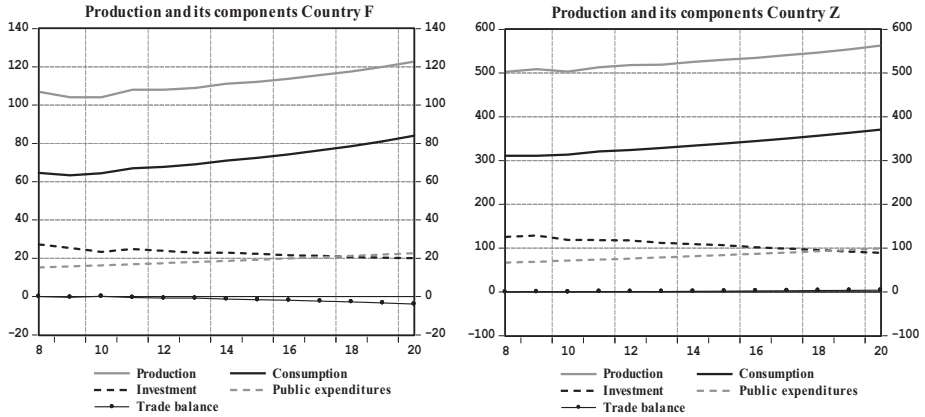


**Figure 4.** Production and its components in both countries.

Consumption turns out to be the main driver of growth. The first cause of this rise in consumption is the multiplier effect of public spending. Public expenditure increases exogenously, which increases national income and consumption. Here we find the Keynesian multiplier effect. Real wages also tend to increase because wages are less restrained than prices which depend on unit Labor costs and imported intermediate goods. As a result of increased production and employment, the unemployment rate falls and nominal wages rise. Firms do not pass on the entire increase in wages in their prices because international competition forces them to reduce their margin as a result of the rise in relative unit Labor costs (compared to the other country). Employment does not instantly adjust to production, which results in increased productivity when production increases. This increase in productivity reduces unit Labor costs and stabilizes prices. In addition, the decline in the investment rate is highlighted in the model by a drop in

the margin rate[4]. Finally, the wealth effects linked to the rise in the price of shares have a positive effect on consumption. Wealth effects have an impact on consumption: household wealth increases faster than wages, social benefits or income from capital. These effects, however, are not sufficient to reduce unemployment since the share of household wealth going into consumption remains much lower than the share of wages and social benefits. Additionally, a decline in investment and a deterioration in the trade balance further reduce growth.

As country Z is five times larger than country F, these size effects translate into a trade deficit in country F in the medium term because growth and prices increase more in country F than in country Z[5].

The evolution of employment and the unemployment rate is very close to that of production. Overall, the unemployment rate is constant and does not decrease despite the increase in employment because of population and productivity increase exogenously.

As Figure 3 shows, the share of profits is relatively stable in the two countries (even if there is a slight decrease in country F), while the rate of investment falls sharply. The model thus accurately reproduces this stylized fact associated with the financialization of the economy, namely the disconnection of profits from investment (Cordonnier and Van de Velde 2015). Once a portion of profits has been distributed in the form of dividends, retained profits do not follow the same trend as the share of profits. Moreover, firms' savings and financial accumulation behavior explain this decorrelation between profit share and investment rate.

In order to make a clear presentation, we only present the main equations[6]. Two of the most important elements of the macroeconomic dynamics are analyzed below, namely firms' investment behavior and household consumption behavior.

### *Capital accumulation*

The rate of accumulation of fixed capital constitutes the core of the model's dynamics. This version of the model adopts the investment equation below, showing the profit ratio, the stock of debt, the profitability of shares and the interest rate. Assuming the econometric study by Clévenot, Guy, and Mazier (2010) on non-financial corporations domiciled in France over the period 1978–2008, we set the value of the coefficients k1, k2, k3, k4, k5, k6 and k7. Superscript F stands for France and Z for the rest of the eurozone.

$$gk^F = k0^F + k1^F \frac{UP^F_{-1}}{Y^F_{-1}} + k2^F TUC^F_{-1} + k3^F \frac{P^F_{P-1}}{P^F_{-1}} - k4^F \frac{L^F_{-1}}{K^F_{-1}} - k5^F rl^F_r - k6^F re^F - k7^F re^Z \quad (1)$$

$gk^F = \frac{I^F}{K^F_{-1}}$ = rate of accumulation, I = investment, K = fixed capital stock, UP = undistributed profit, $\frac{UP}{Y}$ = share of profit retained (after taxes and payment of interest and dividends), TUC = productive capacity utilization rate, Pp = price of production, P = Price of capital, L = loans to firms, $rl_r$ = real rate of interest on credit, re = profitability of shares.

The rate of capital accumulation depends on the rate of profit, which has been decomposed into 3 parts[7]: the profit share, the productive capacity utilization rate and the relative price of production (PP) compared to the price of capital[8] (P). Investment depends negatively on the structure of the debt $\left(\frac{L}{K_{-1}}\right)$. Regarding the financing of their investment, firms use self-financing, net issuance of shares and loans from private banks. Credit financing is one of the closures of the model. Indeed, this financing is carried out without restriction by the banks in the event that the financing per share and per self-financing is not sufficient. Nevertheless, excessive indebtedness (change in the debt stock greater than the change in the capital stock) will reduce the rate of capital accumulation (increasing risk principle).

The investment is negatively dependent on the real cost of credit (rlr), and the profitability of shares[9] in the two countries ($re^F$et $re^Z$). Firms have a tradeoff between productive investment and financial accumulation. When returns on shares increase, firms will tend to prefer financial accumulation at the expense of productive investment.

The rate of utilization turns out to be the main determinant of capital accumulation. Nevertheless, the rate of return on shares and the debt ratio (principle of increasing risk) also play an important role, especially in the medium term. The increase in the debt ratio will reduce the firm's cash and a fortiori its investment expenditure. With regard to the rate of return on shares, businesses arbitrate in favor of financial accumulation if the rate of return it provides is higher than the rate of profit resulting from productive activities. But the rate of return on shares may also exert a negative influence on productive investment due to the profitability standard that shareholders impose on firms, which must select investment projects in descending order of expected profitability. And a rise in the financial standard imposed by shareholders will push firms to undertake only the most cost-effective projects. The real rate of interest is also a major factor that can increase the cost of borrowing for businesses when financial markets are tight.

Potential production in real terms is defined as follows:

$$Y^F_{r\,potential} = \gamma^F K^F_r \tag{3}$$

with $\gamma = 0.35$

$Y_{r\ potential}$ = potential actual production, $K_r$ = capital stock at constant prices

The utilization rate is equal to the product per unit of capital divided by the capital coefficient $\gamma$:

$$TUC^F = \frac{\left(\frac{Y_r^F}{K_r^F}\right)}{\gamma^F} \quad (4)$$

In the model, we take into account the different funding opportunities for firms: internal financing out of retained profits, as well as external financing, through bank credit and/or share offerings. However, we also wish to highlight the possible interactions between these financing methods and the constraints they create for firms. Using profit margins for the distribution of dividends can reduce a portion of productive investment, which can no longer be self-financing. As regards external financing, the need to maintain a high return on shares encourages firms to restrict their offerings of shares and therefore to make more use of credit. Again, this financing method proves to be constrained given that the increase in the debt ratio will require firms to issue more shares. Such an increase will reduce the price of the shares. In order to increase the return on shares by increasing the share price, firms will have to limit their debt ratio by decreasing their investment. A decline in interest rates will raise firms' debt in order to maintain or increase their share price, to the detriment of productive accumulation.

In the model, in addition, firms tend to engage in financial accumulation (the purchase of shares (from other firms) and the repurchase of shares). Consequently, a share of profits is directed to the demand for shares and not toward productive investment.

On the other hand, financialization may, under certain conditions, trigger a virtuous spiral of investment and growth. An increase in the return on shares may have positive effects on the accumulation of fixed capital. Since a portion of the dividends is distributed to households, consumption could be stimulated as a result of the increased household income. Similarly, dividends received, particularly from the rest of the world, may limit the effect of the payment of dividends on firms' retained profits. An increase in share prices has a fairly significant influence on demand in the model. As a result of wealth effects and capital gains, growth can be driven by consumption and firms' rate of profit can recover as a result of increased demand for goods and services. As we will describe in the next section, a decline in unemployment can be accompanied by an increase in share prices and the rate of accumulation.

### *Consumption*

Consumption is the second-largest driver of economic activity. In addition to wages, households receive other income that might be spent: social

benefits and capital incomes (dividends and interests). Moreover, households can also consume as a function of their assets and changes in asset values (the wealth effect). In our model, the consumption equation has 5 propensities to consume:

- the propensity to consume wages, c1,
- the propensity to consume income from capital, c2,
- the propensity to consume capital gains, c3,
- the propensity to consume social benefits, c4, and
- the propensity to consume household wealth, c5.

$$C_r^F = C0^F + c1^F \frac{NLI^F}{P^F} + c2^F \frac{CI^F}{P^F} + c3^F \frac{CG^F}{P^F} + c4^F \frac{PS^F}{P^F} + c5^F \frac{VH_{-1}^F}{P^F} \quad (5)$$

($C_r$ = real consumption, P = price at consumption NLI = net labor income, CI = capital income, CG = capital gains, PS = social benefits, VH = wealth of households)

Different economic dynamics may emerge if households consume a large share of their wage income but put all dividends received into savings. The values of these propensities to consume are thus crucial to determining whether financialization can drive growth. As it is conventionally assumed that the propensity to consume dividends is lower than the propensity to consume wages, the redistribution of national income from wages to dividends necessarily produces a negative effect. If expenditure in the economy is lower, the level of firms' activity is reduced. And yet, in certain circumstances, financialization can also stimulate consumption. Thus if households are very sensitive to wealth effects, they perceive that the value of their assets (real estate and/or financial) is increasing, they will spend more on consumer goods. Similarly, if a high share of households is shareholders in foreign firms, they will receive many dividends, which may help stimulate domestic consumption.

A portion of available income, increased by capital gains, is therefore consumed. Savings of households represent the bank deposits, currency held and domestic and foreign securities purchased (bonds issued by the State and shares issued by firms). The financial wealth of households is therefore composed of four financial assets (deposits, currency, shares, and bonds).

### *Markup, foreign trade, and dynamic of public sector and employment*

Firms' margins are endogenized by taking into account financial and international constraints. At the macroeconomic level, firms will tend to have additional profits to finance not only capital net income paid and taxes but

also a portion of their investment. In the case of an increase in the cost of capital (interest paid and dividends paid net), firms increase their margin rate in order to finance this financial cost. Similarly, an increase in taxes will partly affect the margin rate. In line with the two previous effects, an increase in investment will be partly self-financed by an increase in the margin rate. Since country F has a greater degree of openness, we include the effect of the cost competitiveness on firms' margins. If the unit Labor cost increases faster in country F than in country Z, firms in country F reduce their margin to preserve their price competitiveness.

$$\emptyset^{F} = x0^{F} + x1^{F}\left(\frac{rl^{F}L^{F}_{F-1} + rl^{Z}L^{F}_{Z-1} + DIV^{F} - DIVf^{F}_{F} - DIVf^{Z}_{F} + T^{F}_{f}}{Y^{F}_{potential}}\right) + x2^{F}\left(\frac{I^{F}}{Y^{F}_{potential}}\right) - x3^{F}\left(\frac{ULC^{F}}{ULC^{Z}}\right) \quad (6)$$

$\emptyset$ = Firm's margin, $rl^{F}L^{F}_{F-1}$= Interest paid by firms in country F to banks in country F, $rl^{Z}L^{F}_{Z-1}$= Interest paid by firms in country F to banks in country Z, DIV = Dividends paid by firms in country F, $DIV^{F}_{F}$ = Dividends paid by firms in country F and received by firms in country F, $DIV^{Z}_{F}$ = Dividends paid by firms in country Z and received by firms in country F, Tf = Business taxes, I = Investment, $Y_{potential}$ = nominal potential GDP, ULC = Unit labor cost

Foreign trade is limited to simple equations of imports into the monetary union with income effect and price effects but with no nominal exchange rate effect. However, in real terms, country F's devaluation can play a preponderant role in the model. The elasticities of foreign trade were calibrated according to the literature review by Ducoudre and Heyer (2014).

$$\log\left(M^{F}_{r}\right) = \mu0^{F} + \mu1^{F}\log\left(Y^{F}_{r}\right) + \mu2^{F}\log\left(\frac{P^{F}}{P^{Z}}\right) \quad (7)$$

$$\mu1 = 1 \text{ et } \mu2 = 0.8$$

$$X^{F}_{r} = M^{Z}_{r} \quad (8)$$

$M_r$ = actual imports, $Y_r$ = actual production, $P^F$ = price in Country F, $P^Z$ = price in Country Z, $X_r$ = actual exports.

Public financing is formalized in a simplified form, with government spending, which increases exogenously, and the taxes paid by households, businesses, and banks based on their income. Social benefits depend on taxes and social contributions and are indexed to total wages.

Monetarily, the central bank issues the currency and refinances the private banks without limitation at the prime rate. The interest received in return is equal to the taxes paid by the central bank to the governments of each country[10].

Firms hold and issue equity. The financial accumulation depends on the rate of return on equity (re) with a tradeoff between the demand for both domestic and foreign equity and the positive effect of the economic environment captured in the rate of profit. Household portfolio choices reflect a tradeoff among bank deposits, bonds and equity depending on the relative rates of return on the different assets. The price of equity is determined by comparing supply and demand for equity, which is an increasing function of the cost of credit, the debt ratio and relative prices (i.e., the price of equity versus domestic prices).

The State finances its deficit by issuing bonds held by households and treasury bills purchased by banks. The banks buy treasury bills but not without limitation. Interest rates are therefore endogenized by comparing the supply and demand of treasury bills. The supply is determined by the government's budgetary balance that has to be funded. The demand for bills is determined by the banks of the two countries, as an increasing function of the yield on the bills. We assume that the rate of interest on bonds is identical to the rate of interest on treasury bills. Bond prices vary inversely with interest rates. If nominal interest rates trend upward in both countries, households take capital losses.

Should the government deficit increase, the banks agree to finance that increase but at higher rates of interest. Higher yields on treasury bills are diffused partially in the credit rates offered to firms. The interest rates on loans offered by private banks track the rates on government securities but with a time lag.

Prices in the market for goods and services are determined according to a set markup on unit costs, consisting of the unit cost of Labor and the value of imports of intermediate goods. The wage rate equation shows the effect of prices, productivity, and unemployment. A high level of unemployment tends to reduce the level of wage rates in both countries. The working-age population is assumed to increase at a rate of 0.5% per year. Employment depends positively on economic activity, with an inertia effect captured by the employment level of the previous period. The unemployment rate is defined as the number of unemployed people as a percentage of the working-age population.

## Presentation of the different versions of the model

After calibrating the model and generating the baseline, the second step in SFC modeling is to create "shocks" to look at how the modeled economy

changes when one or more exogenous coefficients are changed. This new dynamic is then compared with the baseline scenario: we examine how far the economy diverges, following the shock, from the path it would have followed. First, we will detail how we calibrated the model to make it match the behavior of the French economy (baseline scenario). We will then present the various shocks that we applied to this virtual economy in order to highlight the consequences of de-financialization, whether it be unilateral or coordinated within the monetary union.

### *The 6 scenarios*

To study in detail the effect of a decline in dividends in comparison with the baseline scenario, we simulate six scenarios in which (at least) one variable will behave differently compared to the baseline scenario. In all the scenarios studied, a dividend reduction policy is simulated by introducing a tax on corporate profits distributed to shareholders from period 10 onward. This is what they have in common. However, six different scenarios were constructed in order to differentiate in two ways between the specific cases attending this reduction of dividends. Is the dividend reduction policy carried out in country F only or in both countries? Also, is the dividend reduction policy accompanied by restrictions on firms' financial accumulation and a governmental fiscal stimulus policy?

In more detail, the different scenarios studied will be identified as follows:

- In the baseline scenario (scenario 0) corporate income tax is assumed to be set at 33%.
- In scenario 1, the effect of a reduction in dividends in both countries is examined. Two separate taxes on profits are included: a tax on undistributed profits and a tax on profits distributed as dividends. The tax on dividends is set at 50%. The tax on retained profits is set so that total profit taxes are equivalent to 33% of total profits. In scenario 1, this tax is set at 24%. It is assumed that the dividends distributed depend negatively on the dividend tax. Following the introduction of the tax, the dividend distribution rate decreases from 58% in the baseline to 33% in scenario 1.
- In scenario 2, dividends are reduced in both countries, but at the same time, it is assumed that financial accumulation (purchase of shares by firms) is also reduced in both countries. Scenario 1 is extended by including a tax on the value of shares held by firms. This tax is set at 1% of the value of the shares. It is assumed that the introduction of this tax encourages firms to reduce their share purchases (in the case of an

increase in the profit rate, the demand for shares falls compared to the baseline) and to favor productive investment[11]. In scenario 2, the tax rate on undistributed profits is set at 18%. As in scenario 1, the tax on dividends is set at 50%.

- Scenario 3 incorporates the assumptions of scenario 2 and adds a government fiscal policy intended to stimulate future-oriented investments (in education, health, infrastructure and environmental transition). The ex-ante magnitude of this increase in public expenditure is equivalent to 1 point of GDP in the baseline scenario for both countries. As for the reduction of dividends, this policy is carried out from period 10 onwards. The idea is to examine a form of de-financialization that goes beyond dividends alone and requires a more ambitious shift in economic dynamics (a decline in financial accumulation and a fiscal stimulus policy).
- Scenario 4 investigates the effect of a reduction in dividends solely in country F.
- Scenario 5 looks at the effects of the policy carried out in scenario 2 but in country F only.
- Lastly, scenario 6 contains a reduction in dividends policy combined with a reduction in financial accumulation and a fiscal stimulus policy, but only for country F. (The slowdown in financial accumulation and the increase in government spending are therefore asymmetrical here.)

Theoretically, the macroeconomic effects of the dividend reduction policy are represented in the Figure 5.

A reduction in dividends[12] in the model has four immediate effects: a rise in the share of profits retained, a decline in household income, a decrease in the margin rate and reduction of the rate of return on shares. The net effects will depend on the calibration of the model and in particular the sensitivity of investment to the share of profits retained, wealth effects and the propensity to consume dividends. For this reason, we propose three different calibrations in order to test the robustness of the model's results[13]. These calibrations can be understood as variants of the French economy in which households and firms are financialized to varying degrees, with consumption and investment behaviors that are more or less sensitive to financial variables (as may be the case in the United States).

In all cases, a decline in dividends has a positive effect on investment through the increase in the share of profits retained[14]. The reduction in profits distributed to shareholders will also have an effect on the return on shares. This reduction will encourage productive investment at the expense of financial investment. Firms no longer constrained to generate a profit

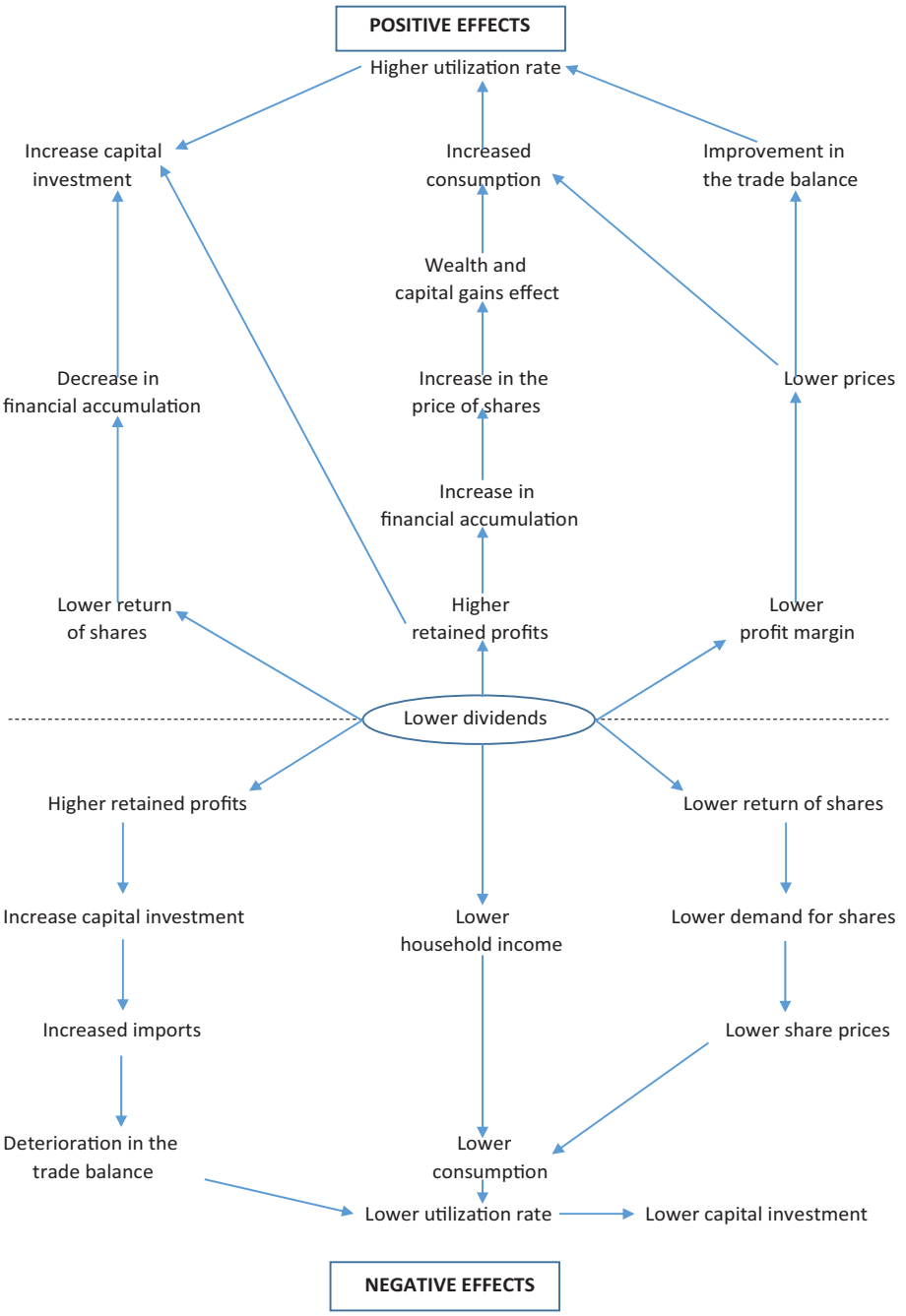


**Figure 5.** Positive and negative effects of a reduction in dividends.

margin to pay dividends will be more able to self-finance their investments and reduce their profit margin. In the model, this decrease will be favorable not only to firms, who will benefit from a gain in price competitiveness

but also to households, which will consume more thanks to the increase in real wages and the share of wages in the value added.

The wealth and capital gains effects may also stimulate household consumption, given that a portion of the profits will be intended for financial accumulation, which will tend to increase the price of shares (particularly in the medium term).

On the other hand, a reduction in dividends is equivalent to a decrease in shareholders' income, which will result in a decline in consumption. The extent of this decline depends on the value of the propensity to consume dividends that was used in the calibration (25% in calibration 1, 60% in calibration 2 and 10% in calibration 3). If financial accumulation is reduced sufficiently, the price of shares will tend to decrease (or increase less than in the baseline scenario), which also may reduce consumption as a result of a decline in household wealth and capital losses.

Regarding the effects on the trade balance, we observe two opposite effects. If the increase in investment outweighs the decrease in consumption (due to the decline in dividends), then national income will increase. The rise in imports deteriorates the trade balance. This deterioration will be higher if the decrease in dividends occurs only in country F (as will be the case in scenario 3). If, on the contrary, the decline in dividends occurs in both countries, the income effect will work in favor of country F (which is smaller and therefore more open than country Z) and its trade balance will improve through the imports of country Z.

The effects on the utilization rate will also be complex and will depend on the value of the multiplier and the accelerator for each period: an increase in investment may equally well reflect an increase as a decline in the utilization rate with a retroactive effect on investment.

Given that the macroeconomic mechanisms and a fortiori their effects on the distribution of income, employment, and capital accumulation may vary depending on the parameters selected in the behavioral equations, 3 calibrations of the model are proposed (Table 2).

In calibration 1, it is assumed that investment depends on the share of the profits retained and the productive capacity utilization rate, with an equivalent coefficient set at 3.5%. The propensity to consume wages and social benefits is assumed to be significantly greater (82%) than the propensity to consume dividends (25%) and capital gains (1%). Since the coefficients of the investment equation, as well as the marginal propensities to consume, are extremely difficult to measure empirically, we propose two alternative calibrations to calibration 1, for the purpose of testing the robustness of the model.

Calibration 2 focuses on a greater effect of profits on investment. In this calibration, investment is more sensitive to the share of the profits retained

**Table 2.** Value of selected coefficients in the three calibrations of the model.

| | Calibration 1 (%) | Calibration 2 (%) | Calibration 3 (%) |
|---|---|---|---|
| Sensitivity of the accumulation rate to the share of profits retained: k1 | 3.5 | 6 | 0 |
| Sensitivity of the accumulation rate to the utilization rate: k2 | 3.5 | 2 | 3.5 |
| Propensity to consume wages: c1 | 82 | 85 | 75 |
| Propensity to consume dividends: c2 | 25 | 10 | 60 |
| Propensity to consume capital gains: c3 | 1 | 8 | 0 |
| Propensity to consume social benefits: c4 | 82 | 90 | 82 |

than to the utilization rate. The propensity to consume dividends is set at 10% versus 85% for the propensity to consume wages and 90% for social benefits. The propensity to consume capital gains is relatively high (8%). Because of the great sensitivity of investment to profits, firms are assumed here to base their decisions more on profitability and operating cash flow than on-demand.

In calibration 3, unlike calibration 2, investment is more sensitive to the utilization rate: firms pay more attention to the state of demand than to profitability or self-financing when deciding whether to invest. The propensity to consume wages is lower than in the other calibrations (75% versus 85% in calibration 2 and 82% in calibration 1), while the propensity to consume dividends is relatively high (60% versus 10% in calibration 2 and 25% in calibration 1). The propensity to consume capital gains is assumed to be nil.

Depending on each calibration, the baseline scenarios will, therefore, be different. This will enable us to compare the effect of the four scenarios with the baseline scenario for each calibration. First, we present the results obtained from calibration 1 for scenarios 1, 2, and 3.

### *Scenarios 1, 2, and 3 in calibration 1*

Figure 6 shows the change in the unemployment rate in both countries[15]. Compared to the baseline scenario, the unemployment rate appears lower in the medium term in the three scenarios studied. In scenario 1, in the very short term, the reduction in dividends leads to a slight increase in unemployment as a result of the relative decline in consumption. In the medium term, unemployment is down by about 5% compared to the baseline. While a reduction in dividends has a positive effect on employment, this policy alone is not sufficient to return to full employment.

In scenario 2, the decline in unemployment is greater than in scenario 1, given that a part of the increase in profits retained is directed more to productive investment than to financial investment. Reducing financial accumulation decreases the unemployment rate by about 35% in country F and 25% in country Z as compared to baseline.

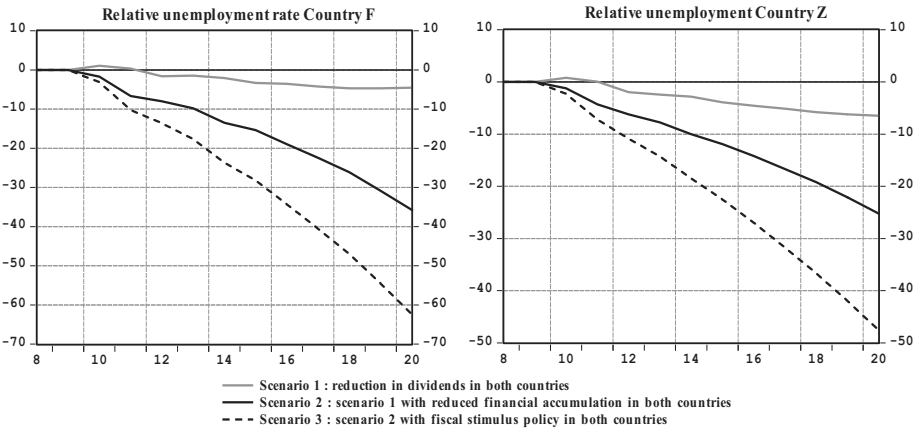


**Figure 6.** Relative unemployment rate in both countries (in percent).

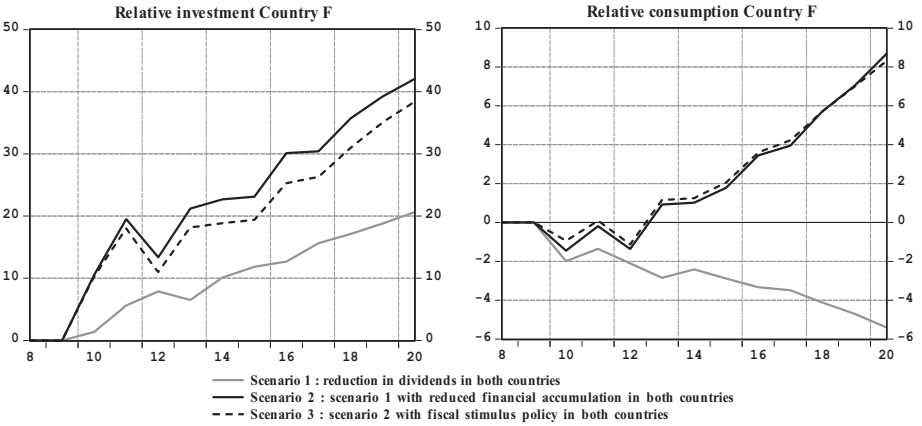


**Figure 7.** Relative investment and relative consumption in country F (in percent).

In scenario 3, unemployment is reduced to an even greater extent, especially in the medium term; by period 20, the unemployment rate is only 3.3% in country F and 5.4% in country Z. Since the model draws on post-Keynesian thought, stimulating demand through higher government spending triggers a positive multiplier effect on consumption and an accelerator effect through an increase in the accumulation rate, which acts positively on investment. Moreover, in scenario 3 (as in scenario 2), firms arbitrate more in favor of productive investment over financial accumulation. Thus the profit added by a reduction in dividends does not fuel financial speculation, but rather an accumulation of productive capital.

As shown in Figure 7, investment increases in all three scenarios compared to the baseline, due to the effects mentioned above. The difference between scenario 1 and scenarios 2 and 3 can be seen in the way consumption changes. In scenario 1, consumption declines compared to the baseline. A reduction in dividends acts negatively on consumption, but

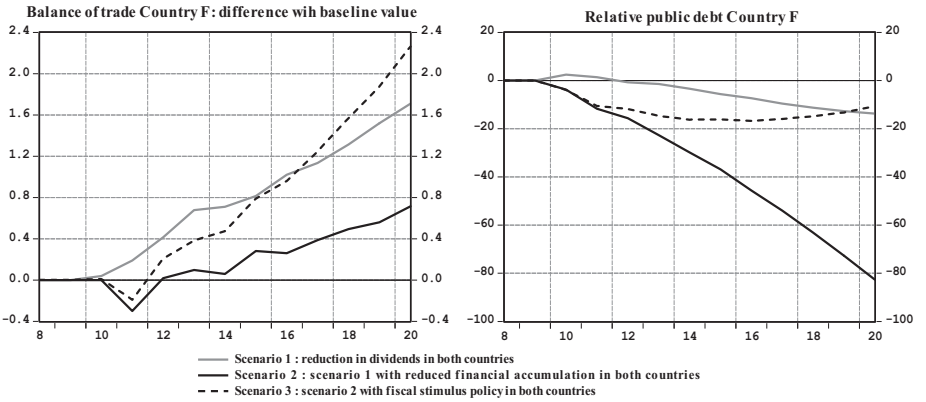


**Figure 8.** Relative balance of trade (in percent point) and relative public debt (in percent) in country F.

this effect is offset by a decline in the profit margin, which, through an increase in the share of wages, has a positive effect on consumption. In scenarios 2 and 3, on the other hand, consumption is greater than in the other two scenarios (baseline and scenario 1) due to the investment multiplier. In the medium term, consumption is stimulated more in scenario 3 than in scenario 2 through the multiplier effect of government spending.

The effect on the trade balance[16] and the public debt in country F can be seen in Figure 8. In the baseline scenario, the balance of trade is constantly deteriorating. In all scenarios, the trade balance deteriorates less than in the baseline in the medium term. This is explained by the symmetricality of the policies carried out in both countries. The decline in dividends stimulates demand in the large country (country Z), thus boosting the exports of the small country. A reduction in dividends may also prove to be effective in reducing the ratio of public debt. In the medium term, public debt falls, particularly in scenario 2. This lower level of public debt results from greater growth and inflation rates in scenarios 1, 2 and 3 (∼4% in scenario 3, 3.5% in scenario 2 and 1% in scenario 1 and in the baseline scenario). In scenario 2, the public debt ratio is lower because growth is driven more by private investment.

In terms of income distribution, a reduction in dividends increases the share of wages, particularly in scenario 3 (Figure 9), where the fiscal stimulus policy reduces unemployment and increases wages. Since employment increases less than proportionally as a result of the increase in output, productivity increases more in scenarios 2 and 3, allowing real wages to rise. Prices increase less than nominal wages (which increase with Labor productivity and lower unemployment) because higher productivity allows firms to avoid an inflationary slippage associated with higher nominal wages. By contrast, the fiscal stimulus policy also favors shareholders, to

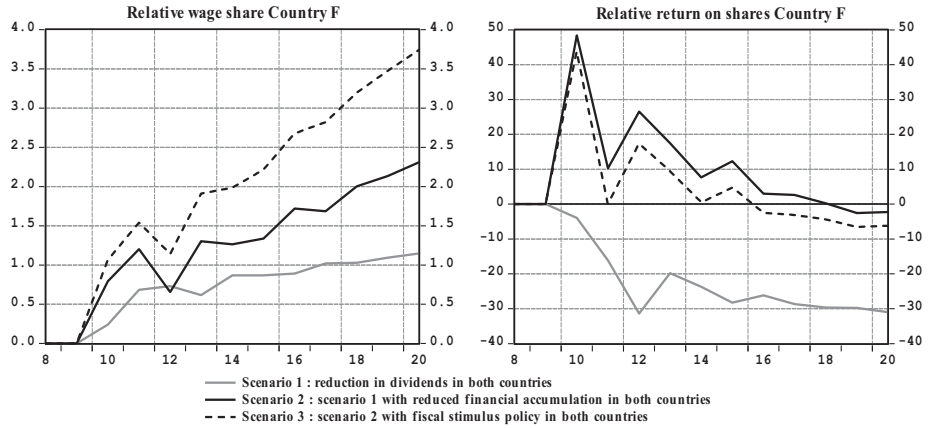


**Figure 9.** Relative wage share and relative return on shares in country F (in percent).

the extent that a share of the increase in household and business income is directed toward the financial markets, causing an increase in the price of shares and a return on shares of 19% in scenario 3 and 20% in scenario 2 from period 20 onwards (despite a reduction in dividends). The highest rate of growth benefits households and pulls up the return on capital. This result stresses the importance of structural effects related to financialization, which cannot be totally countered by a stimulus policy, by demand and/or the reduction of dividends. In scenario 1, the return on shares is lower (15% in period 20) than in scenarios 2 and 3, as is the share of wages.

### *The 6 scenarios in the 3 calibrations*

In order to complete our study on the effects of a reduction in dividends, we include asymmetric scenarios (reduction of dividends, the slowdown of financial accumulation and fiscal stimulus policy in country F). In addition, we present the results of each scenario according to three different calibrations. Table 3 summarizes the results obtained in terms of unemployment rates. Logically, the magnitude of the reduction will vary depending on the calibration applied. In most cases, a reduction in dividends decreases the unemployment rate in both the short and medium-term. However, in calibration 3, a reduction in dividends leads to an increase in the unemployment rate in scenario 1 in the medium term and in scenario 4 in the short term.

In $t = 12$, unemployment increases in calibration 3 (in which the utilization rate has a great effect on investment and there is a high propensity to consume dividends) while it decreases in calibrations 1 and 2 (in which the share of profits has a great effect on investment and there is a weak propensity to consume dividends). In calibration 3, there is a greater decrease in consumption than in the other two calibrations. This is explained by the

**Table 3.** Variation in the unemployment rate in country F (in points) in the different scenarios compared to the baseline scenario in periods 12 and 20.

| | Calibration 1 | | Calibration 2 | | Calibration 3 | |
|---|---|---|---|---|---|---|
| | $t=12$ | $t=20$ | $t=12$ | $t=20$ | $t=12$ | $t=20$ |
| Scenario 1: reduction in dividends in both countries | −0.1 | −0.4 | −0.3 | −0.1 | +0.4 | −0.3 |
| Scenario 2: scenario 1 + reduced financial accumulation in both countries | −0.7 | −3.0 | −0.9 | −2.7 | −0.2 | −2.7 |
| Scenario 3: scenario 2 + fiscal stimulus policy in both countries | −1.2 | −5.2 | −1.4 | −4.8 | −0.7 | −5.0 |
| Scenario 4: reduction in dividends in country F | −0.2 | −0.3 | −0.3 | −0.3 | +0.1 | −0.3 |
| Scenario 5: scenario 4 + reduced financial accumulation in country F | −0.6 | −1.8 | −0.7 | −1.7 | −0.3 | −1.5 |
| Scenario 6: scenario 5 + fiscal stimulus policy in country F | −1.0 | −3.2 | −1.1 | −3.1 | −0.6 | −3 |

In the first column, the results of scenarios 1, 2 and 3 in calibration 1 are presented.

higher propensity to consume dividends in calibration 3 (60% compared to 25% in calibration 1 and 10% in calibration 2). This decrease in consumption reduces demand and utilization rates, which has a negative impact on investment. The accumulation of capital decreases in calibration 3 because the investment is totally insensitive to the increase in profits ($k1 = 0\%$). The decrease in dividends increases retained profits but not investment, which tends to decrease as a result of lower consumption. In addition, the decline in dividends in the larger country further reduces income in calibration 3, which reduces country F's exports and income. In the end, the unemployment rate increases in the short term in calibration 3 as a result of the decline in investment, consumption and net exports.

The differences in results between calibrations 1 and 2 are also explained by parameters k1 and c2. In $t = 12$, the unemployment rate decreases more in calibration 2 than in calibration 1; in calibration 2, investment is stimulated by the increase in profits (following the decrease in dividends distributed). Consumption is reduced less because the propensity to consume dividends is very low (10%).

In the medium term, the unemployment rate decreases in calibration 3 while it increases in the short term, mainly due to a high propensity to consume dividends. Thus the complexity of the model brings out several contradictory effects. The more dividends are consumed, the more demand is stimulated by income from the capital but the less significant the wealth effects will be. In the medium term, the wealth effects tend to compensate for the decline in consumption caused by the reduction in dividends.

A reduction in dividends will boost the demand for equity and the wealth effects (and capital gains) that drive consumption and employment in the medium term.

In scenario 2, in $t = 12$, the unemployment rate decreases less in calibration 3 for the same reasons as in scenario 1 ($k1 = 0$ and $c2 = 0.6$ in calibration 3).

In the medium term, for the other scenarios 2 and 3, the results for the three calibrations are very similar. In $t = 20$, in all three calibrations, the

combination of a reduction in dividends and a slowdown in financial accumulation accompanied by a fiscal stimulus policy is reflected in a sharp decline in the unemployment rate.

Scenarios 4, 5 and 6, which are the asymmetric variants of scenarios 1, 2, and 3, are also simulated in the three calibrations. The decline in the unemployment rate is not observed in scenario 4 for calibration 3 in the short term but the results are very close in the three calibrations in the medium term, with a decrease in the unemployment rate. The results of comparing scenarios 4, 5, and 6 are also very close to those observed in comparing scenarios 1, 2, and 3. A reduction in dividends is much more effective when it is accompanied by a decrease in financial accumulation and an increase in public expenditure. The results in terms of employment and reductions in unemployment are weaker for the asymmetric policies, especially scenario 6, than for the symmetrical policies. This result appears logical in a model with two countries of asymmetric size, where some of the demand-side stimulus boosts the economy of the other country through trade and financial transactions. When the stimulus is symmetrical, the small country (here country F) benefits from the stimulus from the large country, which in a ripple effect reduces unemployment simultaneously in both countries. According to the three calibrations, the average decline in unemployment is 5 points in scenario 3 and approximately 3 points in scenario 6. The asymmetry of the stimulus policy would, therefore, shave 2 points off the unemployment rate. Thus co-operative policies, in particular within the eurozone, turn out to be more effective than isolated policies, which may nonetheless prove to be good instruments for combating unemployment (limited though they may be).

### *Degree of realism of the scenarios*

In this simulation exercise, 3 policies are considered: lower dividends, lower financial accumulation, and higher public spending. The SFC model we developed allowed us to compare the effects of these different policies by highlighting the greater effectiveness of a decrease in dividends if combined with a reduction in financial accumulation (and a recovery in productive investment) and fiscal stimulus. The results obtained using the model can be put into perspective in terms of the political economy.

In the current institutional and political context, these 3 policies face considerable difficulties related to the fiscal rules of the euro area and the importance of financialization. In the case of France, which has a relatively high dividend distribution rate, a policy to reduce dividends seems unlikely in the very short term, especially with the current government, which has

reduced taxes on capital. Nevertheless, rather than studying the effect of a dividend increase, we decided to simulate the effect of a dividend decrease for three reasons:

- Many studies (including those by Lavoie (2008), Van Treeck (2009), Reyes and Mazier (2014) and Cordonnier and Van de Velde (2015)) have focused on the negative effects of financialization on productive investment and aggregate demand. With a view to supplementing these studies, our article proposes to examine the effects of a reduction in financialization, in particular on capital accumulation and the unemployment rate.
- We also believe that the combination of several economic policies is interesting to study using an SFC model by highlighting the macroeconomic conditions necessary for a return to full employment. Significant state intervention (in terms of taxation, regulation and public expenditure) therefore seems essential to us if shareholder power is to be challenged and financial accumulation restricted.
- In the medium term, several factors could influence government policy. High levels of public debt and rising inequalities could encourage governments to increase taxes on capital. The investments necessary for the environmental transition could be more easily implemented if financial accumulation was limited. Similarly, a fiscal stimulus would promote demand and productive investment without affecting corporate profits at the macroeconomic level. This scenario, based on the definancialization of economies, could be politically accepted by a large number of actors if this transition is associated with an increase in employment and corporate profitability.

The results of the model suggest that a substantial investment policy, accompanied by an increase in public spending in the euro area as a whole, would have significant positive effects on employment. However, as with dividend reduction, this policy now appears unlikely in the short term. Indeed, the implementation of such a policy is hampered by political blockages between the countries of the North and East of the eurozone and the countries of the South. The creation of the new Hanseatic League (2018) illustrates the divergence of views on fiscal policy. Nevertheless, in the case of monetary policy (where very different and opposing views also coexist), these differences of opinion did not prevent a change of course with the introduction of quantitative easing and negative interest rates on banks' excess reserves. As Emmanuel Macron points out in an interview with the Economist magazine in November 2019, a policy change is essential to meet the challenges of the future.

"In this context, we must rethink our macroeconomic framework. We need more expansionist policies, to invest more. Europe cannot be the only area not to do it. That's why I think the debate about the 3% for national budgets, and the 1% for the European budget, belongs to another century," (Macron, November 2019, The Economist).

A budgetary policy might be introduced if unemployment remains too high in Spain, Italy, and France. The political crises arising in many European countries and the rise of

Eurosceptic parties in quite a few European countries could paradoxically strengthen European cooperation and create the conditions for a coordinated fiscal stimulus in order to avoid stagnation or even a breakdown of the eurozone. Unfortunately, we believe that only a significant increase in unemployment or a new financial crisis could upset the European economic doctrine on government spending and financialization, as was the case for monetary policy.

## Conclusions

In the previous section, the effects of financialization on capital accumulation and employment were studied with a macroeconomic model with two countries of asymmetric size (country Z being five times larger than country F). Depending on the scenario and the time frame, differences in the unemployment rate can be observed. When the dividend distribution ratio is 58% (as is the case in the baseline scenario), the unemployment rate may be about 0.6 points higher in the medium term than when the distribution rate is 33%.

Despite the positive effect of a reduction in dividends on employment, public debt and the investment ratio, the unemployment rate does not decrease significantly and may even increase (in calibration 3), as it does in scenario 1 (reduction in dividends in both countries) and in scenario 4 (reduction in dividends only in country F). This result shows the great structural effects of financialization, which are not limited to the distribution of profits in the form of dividends. In the model, a decline in dividends results in higher profitability for firms, which promotes financial accumulation (share buybacks, mergers and acquisitions, purchase of shares) and may give rise to the stock market "bubbles." If retained profits are greatly increased as a result of a reduction in dividends, there is no guarantee that they will be directed into productive investment, in particular in the context of an overall lack of demand and financial accumulation. Furthermore, depending on the level of the propensity to consume dividends, a recessive effect may appear through a decrease in household consumption.

The change in the dividend distribution rate alone is of limited use in significantly reducing unemployment.

In this article, we have also shown that, in a financialized growth regime, a reduction in dividends would allow a return to full employment throughout the eurozone, but only if this policy is accompanied by a reduction in firms' financial accumulation and a fiscal stimulus policy. A coordinated policy at the euro area level is much more effective than an isolated policy, although even the latter can have positive effects (Table 3).

Reducing dividends is not sufficient: it must be accompanied by interventions to reform the mechanisms of financial capitalism. Such interventions may take the form of a change in corporate governance, forcing firms to reinvest earnings as a result of the reduction of dividends. At the macroeconomic level, two simultaneous changes, of course, are required: there must be an end to financial accumulation and a policy of fiscal stimulus must be introduced.

Although a return to full employment can be reached in a financialized growth regime, this regime is characterized by financial instability, which is fostered by the formation of bubbles and increasing inequality. The structural characteristics of the financialized growth regime such as financial accumulation, shareholder power and international competition remain major obstacles to investment and employment. To implement policies against financial accumulation remains a strong challenge, in a context where not all financial assets held by firms are acquired on a purely speculative basis.[17] In such circumstances, a policy to reduce dividends combined with a fiscal stimulus policy may prove to be very effective for employment but cannot alone resolve the problems of the allocation of firms and household income.

## Notes

1. This constraint depends on the institutional rules and the role assigned to the central bank.
2. We refer here to numerical theoretical SFC models. Empirical SFC models are calibrated by estimating coefficient values using standard econometric techniques.
3. The model runs over the period 3-20. We present here the baseline scenario corresponding to calibration 1. In order to test the robustness of the model, we calibrated the model in three different ways. Details of the three calibrations are given in Table 2.
4. The equation of firm margin is presented in the section on the behavioural relationship.
5. It should be noted that without asymmetric size effects, the differences in income and prices between the two countries would also have created trade imbalances. Size effects accentuate the imbalances and the effects on the smaller country's exports of a change in income in the larger country.

6. The complete model can be found in the Appendix. Simulations in Eviews are available upon request.
7. The rate of profit can be broken down as follows:

$$\frac{UP}{K} = \frac{UP}{Y_r.Pp}\frac{Y_r}{K_r}\frac{Pp}{P}$$

With $K = K_rP$ and $Y = Y_rPp$

8. The price of capital is assumed to be identical to the prices of consumption, government expenditures and exports. In the model, there are 2 prices: the price of GDP (Pp) and the price of consumption (P). For simplicity's sake, we assume that the price of capital is the same as the price of consumption. The relative price of capital (GDP price compared to the price of capital) is a component of the profit rate and therefore one of the determinants of capital accumulation.
9. The profitability of the shares is given by the following formula:

$$re^F = \frac{\Delta pe^F}{pe^F_{-1}} + \frac{DIV^F}{pe^F_{-1}E^F_{-1}} \quad (2)$$

Pe = price of shares, DIV = dividends, E = quantity of shares issued

10. These revenues correspond to seignoriage incomes.
11. In the investment function, parameter k6 falls from 8% in the baseline to 2% in scenario 2 and parameter k7 falls from 0.8% in the baseline to 0.2% in scenario 2.
12. Dividends are reduced in period 10.
13. The three calibrations are shown in Table 2.
14. Figure 7 shows the effects of a dividend reduction on investment.
15. The relative unemployment formula is as follows:

$$\frac{\text{unemployment scenario} - \text{unemployment baseline}}{\text{unemployment baseline}} \times 100$$

16. Unlike the other variables studied, the trade balance can be negative. We therefore use the following formula:

$$\textit{trade balance (in percent of gdp) scenario} - \textit{trade balance (in percent of gdp) baseline}$$

17. Some financial investments are actually of an industrial and/or strategic nature.

## ORCID

Vincent Duwicquet http://orcid.org/0000-0003-0376-0518

## References

Clévenot, M., Y. Guy, and J. Mazier. 2010. "Investment and Rate of Profit in a Financial Context: The French Case." *International Review of Applied Economics* 24 (6):693–714. doi:10.1080/02692170903426112.

Cordonnier, L., and F. Van de Velde. 2015. "The Demands of Finance and the Glass Ceiling of Profits without Accumulation." *Cambridge Journal of Economics* 39 (3): 871–885. doi:10.1093/cje/beu064.

Dallery, T., and T. Van Treeck. 2011. "Conflicting Claims and Equilibrium Adjustment Processes in a Stock-Flow Consistent Macroeconomic Model." *Review of Political Economy* 23 (2):189–211. doi:10.1080/09538259.2011.561557.

Ducoudre, B., and E. Heyer. 2014. "Baisse de l'euro et désinflation compétitive, quel pays en profitera le plus?" *Revue de L'ofce* 5 (136):221–253. doi:10.3917/reof.136.0221.

Duwicquet, V., and J. Mazier. 2010. "Financial Integration and Macroeconomic Adjustments in a Monetary Union." *Journal of Post Keynesian Economics* 33 (2):333–370. doi:10.2753/PKE0160-3477330207.

Duwicquet, V., J. Mazier, and J. Saadaoui. 2018. "Dealing with the Consequences of the Exchange Rate Misalignments for Macroeconomic Adjustment in the EMU." *Metroeconomica* 69 (4):737–767. doi:10.1111/meca.12211.

Godley, W., and M. Lavoie. 2006. "A Simple Model of Three Economies with Two Currencies: The Eurozone and the USA." *Cambridge Journal of Economics* 31 (1):1–23. doi:10.1093/cje/bel010.

Godley, W., and M. Lavoie. 2007. *Monetary economics*. Basingstoke: Palgrave MacMillan.

Kinsella, S., and S. Khalil. 2011. "Debt-Deflation in a Stock Flow Consistent Macromodel." In *Contributions in Stock-Flow Consistent Modeling: Essays in Honor of Wynne Godley*, edited by D. B. Papadimitriou and G. Zezza. Basingstoke, UK: Palgrave MacMillan.

Lavoie, M. 2003. "A Fully Coherent Post-Keynesian Model of the Euro Zone." In *Globalisation, Regionalism and Economic Activity*, edited by P. Arestis, M. Baddeley and J. McCombie. Cheltenham: Edward Elgar.

Lavoie, M. 2008. "Financialisation Issues in a post-Keynesian Stock-Flow Consistent Model." *Intervention: European Journal of Economics and Economic Policies* 5 (2): 331–356.

Lavoie, M., and J. Zhao. 2009. "A Study of the Diversification of China's Foreign Reserves in a Three-Country Stock-Flow Consistent Model." *Metroeconomica* 61 (3):558–592. doi: 10.1111/j.1467-999X.2009.04082.x.

Macron, E. 2019. "On the Edge of a Precipice", *The Economist*, interview with Emmanuel Macron, November 7, 2019.

Mazier, J., and S. Valdecantos. 2015. "A Multi-Speed Europe: Is It Viable? A Stock-Flow Consistent Approach." *European Journal of Economics and Economic Policies: Intervention* 12 (1):93–112. doi:10.4337/ejeep.2015.01.08.

Reyes, L., and J. Mazier. 2014. "Financialized growth regime: Lessons from Stock Flow Consistent Models". *Revue de la regulation* [online], 16 (2). doi:10.4000/regulation.11021.

Valdecantos, S., and G. Zezza. 2015. "Reforming the International Monetary System: A Stock-Flow-Consistent Approach." *Journal of Post Keynesian Economics* 38 (2):167–191. doi:10.1080/01603477.2015.1065679.

Van Treeck, T. 2009. "A Synthetic, Stock-Flow Consistent Macroeconomic Model of Financialisation." *Cambridge Journal of Economics* 33 (3):467–493. doi:10.1093/cje/ben039.

Zezza, G. 2008. "U.S. growth, the Housing Market and the Distribution of Income." *Journal of Post Keynesian Economics* 30 (3):375–405. doi:10.2753/PKE0160-3477300304.

## Appendix A. Main parameters

**Table A1.** Value of the parameters for the model (calibration 1 in the baseline).

| Main parameters | | | | |
|---|---|---|---|---|
| | | **Investment made by firms** | | |
| $k0^F$ | $k0^Z$ | Autonomous component | 0.055 | 0.057 |
| $k1^F$ | $k1^Z$ | Marginal impact of profit share | 0.035 | 0.035 |
| $k2^F$ | $k2^Z$ | Marginal impact of utilization rate effect | 0.035 | 0.035 |
| $k3^F$ | $k3^Z$ | Marginal impact of relative price of capital | 0.0001 | 0.0001 |
| $k4^F$ | $k4^Z$ | Marginal impact of firms' indebtedness | 0.06 | 0.06 |
| $k5^F$ | $k5^Z$ | Marginal impact of real interest rate | 0.025 | 0.025 |
| $k6^F$ | $k6^Z$ | Marginal impact of return on share (domestic) | 0.08 | 0.08 |
| $k7^F$ | $k7^Z$ | Marginal impact of return on share (foreign) | 0.008 | 0.008 |
| $\delta^F$ | $\delta^Z$ | Rate of depreciation | 0.05 | 0.05 |
| | | **External trade** | | |
| $\mu0^F$ | $\mu0^Z$ | Autonomous component | −1.39 | −3 |
| $\mu1^F$ | $\mu1^Z$ | Income elasticity | 1 | 1 |
| $\mu2^F$ | $\mu2^Z$ | Price elasticity | 0.8 | 1 |
| | | Consumption | | |
| $c0^F$ | $c0^Z$ | Autonomous component | −1.98 | 2.29 |
| $c1^F$ | $c1^Z$ | Marginal propensity to consume out of net labor income | 0.82 | 0.82 |
| $c2^F$ | $c2^Z$ | Marginal propensity to consume out of capital income | 0.25 | 0.25 |
| $c3^F$ | $c3^Z$ | Marginal propensity to consume out of capital gains | 0.01 | 0.01 |
| $c4^F$ | $c4^Z$ | Marginal propensity to consume out of social benefits | 0.82 | 0.82 |
| $c5^F$ | $c5^Z$ | Marginal propensity to consume out of wealth | 0.04 | 0.04 |
| | | **Cash money held by households** | | |
| $h0^F$ | $h0^Z$ | Cash to consumption ratio | 0.15 | 0.15 |
| | | **Rate of interest on T-bills issued** | | |
| $-a1_Z^Z$ | | Autonomous component | – | 0.012 |
| $a1_F^F$ | | Marginal impact of growth of country F on rate of country F | 18.5 | – |
| $a1_Z^F$ | | Marginal impact of growth of country Z on rate of country F | 2.28 | – |
| $a2_F^F$ | $a2_Z^F$ | Marginal impact of rates of country Z on rate of country F | 7.5 | 9.15 |
| | $b2_Z^Z$ | Marginal impact of supply of T-bills | | 0.02 |
| | | Rate of interest on bank loans | | |
| $a$ | $a$ | Marginal impact of rate on T-bills | 0.1 | 0.1 |
| | | Bank's reserve and rate of interest on bank deposits | | |
| $\phi^F$ | $\phi^Z$ | Bank's reserves | 0.05 | 0.05 |
| $m2b^F$ | $m2b^Z$ | Banks margin | 0.005 | 0.005 |
| | | **Tax rates and undistributed profits** | | |
| $\theta_b^F$ | $\theta_b^Z$ | Banks | 0.176 | 0.176 |
| $\theta_h^F$ | $\theta_h^Z$ | Personal income tax rate | 0.13 | 0.13 |
| $\theta_u^F$ | $\theta_u^Z$ | Tax rate on profits (without dividends paid) | 0.33 | 0.33 |
| $\theta_d^F$ | $\theta_d^Z$ | Tax rate on dividends | 0.33 | 0.33 |
| $\theta_V^F$ | $\theta_V^Z$ | Tax rate on equities held by firms | 0 | 0 |
| $\omega^F$ | $\omega^Z$ | Social contributions rate | 0.34 | 0.35 |
| $sf0^F$ | $sf0^Z$ | Rate of undistributed firms' profit | 0.419 | 0.419 |
| $\tau_d^F$ | $\tau_d^Z$ | Marginal impact of tax rate on dividends | 0 | 0 |
| | | Supply of equities | | |
| $g0^F$ | $g0^Z$ | Autonomous component | 0.287 | 2.127 |
| $g1^F$ | $g1^Z$ | Marginal impact of domestic real interest rate | 0.5 | 0.5 |
| $g2^F$ | $g2^Z$ | Marginal impact of foreign real interest rate | 0.1 | 0.1 |
| $g3^F$ | $g3^Z$ | Marginal impact of firms' indebtedness | 0.45 | 0.45 |
| $g4^F$ | $g4^Z$ | Marginal impact of real price of equities | 0.0001 | 0.0001 |
| | | Potential GDP and markup | | |
| $\gamma^F$ | $\gamma^Z$ | Coefficient of capital | 0.35 | 0.35 |
| $x0^F$ | $x0^Z$ | Autonomous component | 0.23 | 0.52 |
| $x1^F$ | $x1^Z$ | Marginal impact of capital cost and tax | 0.17 | 0.16 |
| $x2^F$ | $x2^Z$ | Marginal impact of investment | 0.03 | 0.03 |
| $x3^F$ | – | Marginal impact of relative unit labor cost | 0.01 | – |

(*continued*)

**Table A1.** Continued.

| Main parameters | | | | |
|---|---|---|---|---|
| | | **Price of good and services** | | |
| $m^F$ | $m^Z$ | Imports of intermediate goods | 15 | 15 |
| $\alpha^F$ | $\alpha^Z$ | Inflation pressures | 0.0001 | 0.0001 |
| | | **Wages** | | |
| $w0^F$ | $w0^Z$ | Autonomous component | 1.296 | 1.296 |
| $w1^F$ | $w1^Z$ | Marginal impact of current price | 0.6 | 0.6 |
| $w2^F$ | $w2^Z$ | Marginal impact of previous period price | 0.4 | 0.4 |
| $w3^F$ | $w3^Z$ | Marginal impact of labor productivity | 0.6 | 0.6 |
| $w4^F$ | $w4^Z$ | Marginal impact of unemployment rate | 0.2 | 0.2 |
| | | **Employment** | | |
| $n0^F$ | $n0^Z$ | Autonomous component | 1.6 | 8 |
| $n1^F$ | $n1^Z$ | Marginal impact of current real production | 0.118 | 0.117 |
| $n2^F$ | $n2^Z$ | Marginal impact of previous period real production | 0.1 | 0.1 |
| $n3^F$ | $n3^Z$ | Marginal impact of previous period employment | 0.2 | 0.2 |
| | | **Population** | | |
| $a^F$ | $a^Z$ | Share of employment in the labor force | 0.79 | 0.79 |
| $\beta^F$ | $\beta^Z$ | Growth of the working age population | 1.005 | 1.005 |
| | | **Public expenditures** | | |
| $g0_r^F$ | $g0_r^Z$ | Autonomous component | 0 | 0 |
| $g1_r^F$ | $g1_r^Z$ | Growth of the public expenditures | 1.033 | 1.033 |

| | | |
|---|---|---|
| | **Demand of country F bonds by households of country F** | |
| $v0_F^F$ | Autonomous demand | 0.24 |
| $v1_F^F$ | Marginal impact of rate on country F bonds | 1 |
| $v2_F^F$ | Marginal impact of rate on country Z bonds | 0.5 |
| $v3_F^F$ | Marginal impact of rate on bank deposits | 0.2 |
| $v4_F^F$ | Marginal impact of rate on return of country Z equities | 0.4 |
| $v5_F^F$ | Marginal impact of rate on return of country F equities | 0.8 |
| | **Demand of country Z bonds by households of country F** | |
| $v0_F^Z$ | Autonomous demand | 0.25 |
| $v1_F^Z$ | Marginal impact of rate on country Z bonds | 1 |
| $v2_F^Z$ | Marginal impact of rate on country F bonds | 0.5 |
| $v3_F^Z$ | Marginal impact of rate on bank deposits | 0.2 |
| $v4_F^Z$ | Marginal impact of rate on return of country Z equities | 0.4 |
| $v5_F^Z$ | Marginal impact of rate on return of country F equities | 0.8 |
| | **Demand of country Z bonds by households of country Z** | |
| $v0_Z^Z$ | Autonomous demand | 2.11 |
| $v1_Z^Z$ | Marginal impact of rate on country Z bonds | 1 |
| $v2_Z^Z$ | Marginal impact of rate on country F bonds | 0.5 |
| $v3_Z^Z$ | Marginal impact of rate on bank deposits | 0.2 |
| $v4_Z^Z$ | Marginal impact of rate on return of country Z equities | 0.4 |
| $v5_Z^Z$ | Marginal impact of rate on return of country F equities | 0.8 |
| | **Demand of country F bonds by households of country Z** | |
| $v0_Z^F$ | Autonomous demand | 0.24 |
| $v1_Z^F$ | Marginal impact of rate on country F bonds | 2 |
| $v2_Z^F$ | Marginal impact of rate on country Z bonds | 2 |
| $v3_Z^F$ | Marginal impact of rate on bank deposits | 0.2 |
| $v4_Z^F$ | Marginal impact of rate on country Z bonds | 0.1 |
| $v5_Z^F$ | Marginal impact of rate on country F bonds | 0.1 |
| | **Demand of country F equities by households of country F** | |
| $j0_F^F$ | Autonomous demand | 0.182 |
| $j1_F^F$ | Marginal impact of rate on country F bonds | 0.8 |
| $j2_F^F$ | Marginal impact of rate on country Z bonds | 0.4 |
| $j3_F^F$ | Marginal impact of rate on bank deposits | 0.2 |
| $j4_F^F$ | Marginal impact of rate on return of country F equities | 1 |
| $j5_F^F$ | Marginal impact of rate on return of country Z equities | 0.5 |

(*continued*)

**Table A1.** Continued.

| | | |
|---|---|---|
| | **Demand of country Z equities by households of country F** | |
| $j0_F^Z$ | Autonomous demand | 0.082 |
| $j1_F^Z$ | Marginal impact of rate on country F bonds | 0.4 |
| $j2_F^Z$ | Marginal impact of rate on country Z bonds | 0.8 |
| $j3_F^Z$ | Marginal impact of rate on bank deposits | 0.2 |
| $j4_F^Z$ | Marginal impact of rate on return of country F equities | 0.5 |
| $j5_F^Z$ | Marginal impact of rate on return of country Z equities | 1 |
| | **Demand of country Z equities by households of country Z** | |
| $j0_Z^Z$ | Autonomous demand | 1.072 |
| $j1_Z^Z$ | Marginal impact of rate on country F bonds | 0.4 |
| $j2_Z^Z$ | Marginal impact of rate on country Z bonds | 0.8 |
| $j3_Z^Z$ | Marginal impact of rate on bank deposits | 0.2 |
| $j4_Z^Z$ | Marginal impact of rate on return of country F equities | 0.5 |
| $j5_Z^Z$ | Marginal impact of rate on return of country Z equities | 1 |
| | **Demand of country F equities by households of country Z** | |
| $j0_Z^F$ | Autonomous demand | 0.052 |
| $j1_Z^F$ | Marginal impact of rate on country F bonds | 0.8 |
| $j2_Z^F$ | Marginal impact of rate on country Z bonds | 0.4 |
| $j3_Z^F$ | Marginal impact of rate on bank deposits | 0.2 |
| $j4_Z^F$ | Marginal impact of rate on return of country F equities | 1 |
| $j5_Z^F$ | Marginal impact of rate on return of country Z equities | 0.5 |
| | **Demand of country F equities by firms of country F** | |
| $f0_F^F$ | Autonomous demand | 0.052 |
| $f1_F^F$ | Marginal impact of return of country F equities | 1 |
| $f2_F^F$ | Marginal impact of return of country Z equities | 0.5 |
| $f3_F^F$ | Marginal impact of profit rate | 0.8 |
| $\tau_v^F$ | Marginal impact of tax rate on equities held by firms | 0 |
| | **Demand of country Z equities by firms of country F** | |
| $f0_F^Z$ | Autonomous demand | 0.132 |
| $f1_F^Z$ | Marginal impact of return of country Z equities | 0.5 |
| $f2_F^Z$ | Marginal impact of return of country F equities | 1 |
| $f3_F^Z$ | Marginal impact of profit rate | 0.8 |
| $\tau_v^F$ | Marginal impact of tax rate on equities held by firms | 0 |
| | **Demand of country Z equities by firms of country Z** | |
| $f0_Z^Z$ | Autonomous demand | 0.945 |
| $f1_Z^Z$ | Marginal impact of return of country Z equities | 1 |
| $f2_Z^Z$ | Marginal impact of return of country F equities | 0.5 |
| $f3_Z^Z$ | Marginal impact of profit rate | 0.8 |
| $\tau_v^Z$ | Marginal impact of tax rate on equities held by firms | 0 |
| | **Demand of country F equities by firms of country Z** | |
| $f0_Z^F$ | Autonomous demand | 0.105 |
| $f1_Z^F$ | Marginal impact of return of country F equities | 0.5 |
| $f2_Z^F$ | Marginal impact of return of country Z equities | 1 |
| $f3_Z^F$ | Marginal impact of profit rate | 0.8 |
| $\tau_v^Z$ | Marginal impact of tax rate on equities held by firms | 0 |

## Appendix B. Entire model

**Table B1.** Variables involved in the model.

| Variables | | Name |
|---|---|---|
| $Y^F$ | $Y^Z$ | Domestic production, in nominal terms |
| $Y_r^F$ | $Y_r^Z$ | Domestic production, in real terms |
| $Y^F_{potential}$ | $Y^Z_{potential}$ | Potential production, in nominal terms |
| $Y^F_{r\ potential}$ | $Y^Z_{r\ potential}$ | Potential production, in real terms |
| $P_p^F$ | $P_p^Z$ | Price of domestic production |
| $P^F$ | $P^Z$ | Price of consumption, capital, public expenditure and exports |
| $TUC^F$ | $TUC^Z$ | Capacity utilization rate |
| $NLI^F$ | $NLI^Z$ | Net labor income |
| $CI^F$ | $CI^Z$ | Capital income |
| $\wp^F$ | $\wp^Z$ | Markup |
| $ULC^F$ | $ULC^Z$ | Unit labor costs |
| $Wu^F$ | $Wu^Z$ | Unit wage |
| $W^F$ | $W^Z$ | Employee compensation |
| $PA^F$ | $PA^Z$ | Labor force |
| $PAT^F$ | $PAT^Z$ | Working age population |
| $N^F$ | $N^Z$ | Employment |
| $U^F$ | $U^Z$ | Unemployment rate |
| $CL^F$ | $CL^Z$ | Firm's social contributions |
| $PS^F$ | $PS^Z$ | Social benefits |
| $T_h^F$ | $T_h^Z$ | Taxes on personal income |
| $T_f^F$ | $T_f^Z$ | Taxes on firms |
| $T_b^F$ | $T_b^Z$ | Taxes on banks |
| $T_{eb}$ | $T_{eb}^F$ $T_{eb}^Z$ | Taxes on central bank |
| $YD^F$ | $YD^Z$ | Households disposable income |
| $C^F$ | $C^Z$ | Households consumption, in nominal terms |
| $C_r^F$ | $C_r^Z$ | Households consumption, in real terms |
| $BD^F$ | $BD^Z$ | Bank deposit held by households |
| $CG^F$ | $CG^Z$ | Households' capital gains |
| $VH^F$ | $VH^Z$ | Households' wealth |
| $B_F^F$ | | Demand of country F bonds by households of country F |
| $B_F^Z$ | | Demand of country Z bonds by households of country F |
| $B_Z^Z$ | | Demand of country Z bonds by households of country Z |
| $B_Z^F$ | | Demand of country F bonds by households of country Z |
| $Eh_F^F$ | | Demand of country F equities by households of country F |
| $Eh_F^Z$ | | Demand of country Z equities by households of country F |
| $Eh_Z^Z$ | | Demand of country Z equities by households of country Z |
| $Eh_Z^F$ | | Demand of country F equities by households of country Z |
| $H_h^F$ | $H_h^Z$ | Cash money held by households |
| $UP^F$ | $UP^Z$ | Firms' retained earnings |
| $gk^F$ | $gk^Z$ | Accumulation rate |
| $I^F$ | $I^Z$ | Investment made by firms, in nominal terms |
| $I_r^F$ | $I_r^Z$ | Investment made by firms, in real terms |
| $K^F$ | $K^Z$ | Firms' fixed capital stock, in nominal terms |
| $K_r^F$ | $K_r^Z$ | Firms' fixed capital stock, in real terms |
| $L^F$ | $L^Z$ | Loans supplied by private banks to firms |
| $Ef_F^F$ | | Demand of country F equities by firms of country F |
| $Ef_F^Z$ | | Demand of country Z equities by firms of country F |

(*continued*)

**Table B1.** Continued.

| Variables | | Name |
|---|---|---|
| $Ef_Z^Z$ | | Demand of country Z equities by firms of country Z |
| $Ef_Z^F$ | | Demand of country F equities by firms of country Z |
| $re^F$ | $re^Z$ | Rate on return of equities |
| $E^F$ | $E^Z$ | Number of equities |
| $DIV^F$ | $DIV^Z$ | Dividends distributed by firms |
| $DIVf_F^F$ | | Dividends distributed by country F firms to country F firms |
| $DIVh_F^F$ | | Dividends distributed by country F firms to country F households |
| $DIVf_F^Z$ | | Dividends distributed by country Z firms to country F firms |
| $DIVh_F^Z$ | | Dividends distributed by country Z firms to country F households |
| $DIVf_Z^Z$ | | Dividends distributed by country Z firms to country Z firms |
| $DIVh_Z^Z$ | | Dividends distributed by country Z firms to country Z households |
| $DIVf_Z^F$ | | Dividends distributed by country F firms to country Z firms |
| $DIVh_Z^F$ | | Dividends distributed by country F firms to country Z households |
| $BT^F$ | $BT^Z$ | Treasury bills held by banks |
| $B^F$ | $B^Z$ | Bonds held by households |
| $pb^F$ | $pb^Z$ | Price of bonds held by households |
| $L_F^F$ | | Loans supplied by country F banks to country F firms |
| $L_Z^F$ | | Loans supplied by country Z banks to country F firms |
| $L_Z^Z$ | | Loans supplied by country Z banks to country Z firms |
| $L_F^Z$ | | Loans supplied by country F banks to country Z firms |
| $BT_F^F$ | | T-bills issued by country F government held by country F banks |
| $BT_F^Z$ | | T-bills issued by country Z government held by country F banks |
| $BT_Z^Z$ | | T-bills issued by country Z government held by country Z banks |
| $BT_Z^F$ | | T-bills issued by country F government held by country Z banks |
| $BP^F$ | $BP^Z$ | Banks' profit |
| $RF^F$ | $RF^Z$ | Central bank refinancing made to private banks |
| $H_b^F$ | $H_b^Z$ | Reserves held by private banks |
| $M^F$ | $M^Z$ | Imports, in nominal terms |
| $M_r^F$ | $M_r^Z$ | Imports, in real terms |
| $X^F$ | $X^Z$ | Exports, in nominal terms |
| $X_r^F$ | $X_r^Z$ | Exports, in real terms |
| $H$ | | Central money |
| $rl^F$ | $rl^Z$ | Nominal interest rate on loans |
| $rl_r^F$ | $rl_r^Z$ | Real interest rate on loans |
| $id^F$ | $id^Z$ | Nominal interest rate on bank deposit |
| $r^F$ | $r^Z$ | Nominal interest rate on Treasury bills |
| $G^F$ | $G^Z$ | Public expenditures, in nominal terms |
| $G_r^F$ | $G_r^Z$ | Public expenditures, in real terms |
| $pe^F$ | $pe^Z$ | Price of equities |
| $ib$ | | Rate of interest on central bank refinancing |

## Full list of model equations

$$gk^F = k0^F + k1^F\frac{UP^F_{-1}}{Y^F_{-1}} + k2^F TUC^F_{-1} + k3^F\frac{P^F_{P-1}}{P^F_{-1}} - k4^F\frac{L^F_{-1}}{K^F_{-1}} - k5^F rl^F_r - k6^F re^F - k7^F re^Z \quad (1)$$

$$re^F = \frac{\Delta pe^F}{pe^F_{-1}} + \frac{DIV^F}{pe^F_{-1}E^F_{-1}} \quad (2)$$

$$Y^F_{r\,potential} = \gamma^F K^F_r \quad (3)$$

$$TUC^F = \frac{\left(\frac{Y^F_r}{K^F_r}\right)}{\gamma^F} \quad (4)$$

$$C^F_r = C0^F + c1^F\frac{NLI^F}{P^F} + c2^F\frac{CI^F}{P^F} + c3^F\frac{CG^F}{P^F} + c4^F\frac{PS^F}{P^F} + c5^F\frac{VH^F_{-1}}{P^F} \quad (5)$$

$$\emptyset^F = x0^F + x1^F\left(\frac{rl^F L^F_{F-1} + rl^Z L^F_{Z-1} + DIV^F - DIVf^F_F - DIVf^Z_F + T^F_f}{Y^F_{potential}}\right) + x2^F\left(\frac{I^F}{Y^F_{potential}}\right) - x3^F\left(\frac{ULC^F}{ULC^Z}\right) \quad (6)$$

$$\log\left(M^F_r\right) = \mu0^F + \mu1^F\log\left(Y^F_r\right) + \mu2^F\log\left(\frac{P^F}{P^Z}\right) \quad (7)$$

$$X^F_r = M^Z_r \quad (8)$$

$$re^Z = \frac{\Delta pe^Z}{pe^Z_{-1}} + \frac{DIV^Z}{pe^Z_{-1}E^Z_{-1}} \quad (9)$$

$$C^Z_r = C0^Z + c1^Z\frac{NLI^Z}{P^Z} + c2^Z\frac{CI^Z}{P^Z} + c3^Z\frac{CG^Z}{P^Z} + c4^Z\frac{PS^Z}{P^Z} + c5^Z\frac{VH^Z_{-1}}{P^Z} \quad (10)$$

$$NLI^F = Wu^F N^F - CL^F - T^F_h \quad (11)$$

$$NLI^Z = Wu^Z N^Z - CL^Z - T^Z_h \quad (12)$$

$$CI^F = id^F BD^F_{-1} + B^F_{F-1} + B^Z_{F-1} + DIVh^F_F + DIVh^Z_F \quad (13)$$

$$CI^Z = id^Z BD^Z_{-1} + B^Z_{Z-1} + B^F_{Z-1} + DIVh^Z_Z + DIVh^F_Z \quad (14)$$

$$CG^F = \Delta pb^F B^F_{F-1} + \Delta pb^Z B^Z_{F-1} + \Delta pe^F Eh^F_{F-1} + \Delta pe^Z Eh^Z_{F-1} \quad (15)$$

$$CG^Z = \Delta pb^Z B^Z_{Z-1} + \Delta pb^F B^F_{Z-1} + \Delta pe^Z Eh^Z_{Z-1} + \Delta pe^F Eh^F_{Z-1} \quad (16)$$

$$\Delta PS^F = \Delta T^F_h + \Delta T^F_f \quad (17)$$

$$\Delta PS^Z = \Delta T^Z_h + \Delta T^Z_f \quad (18)$$

$$VH^F = BD^F + pb^F B^F_F + pb^Z B^Z_F + pe^F Eh^F_F + pe^Z Eh^Z_F + H^F_h \quad (19)$$

$$VH^Z = BD^Z + pb^Z B^Z_Z + pb^F B^F_Z + pe^Z Eh^Z_Z + pe^F Eh^F_Z + H^Z_h \quad (20)$$

$$pb^F = \frac{1}{rb^F} \quad (21)$$

$$pb^Z = \frac{1}{rb^Z} \quad (22)$$

$$Y^Z_{r\,potential} = \gamma^Z K^Z_r \quad (23)$$

$$\emptyset^{Z} = x0^{Z} + x1^{Z}\left(\frac{rl^{Z}L^{Z}_{Z-1} + rl^{F}L^{Z}_{F-1} + DIV^{Z} - DIVf^{Z}_{Z} - DIVf^{F}_{Z} + T^{Z}_{f}}{Y^{Z}_{potential}}\right) + x2^{Z}\left(\frac{I^{Z}}{Y^{Z}_{potential}}\right) \tag{24}$$

$$ULC^{F} = \frac{Wu^{F}N^{F}}{Y^{F}_{r}} \tag{25}$$

$$ULC^{Z} = \frac{Wu^{Z}N^{Z}}{Y^{Z}_{r}} \tag{26}$$

$$TUC^{Z} = \frac{\left(\frac{Y^{Z}_{r}}{K^{Z}_{r}}\right)}{\gamma^{Z}} \tag{27}$$

$$\log\left(M^{Z}_{r}\right) = \mu 0^{Z} + \mu 1^{Z}\log\left(Y^{Z}_{r}\right) + \mu 2^{Z}\log\left(\frac{P^{Z}}{P^{F}}\right) \tag{28}$$

$$gk^{Z} = k0^{Z} + k1^{Z}\frac{UP^{Z}_{-1}}{Y^{Z}_{-1}} + k2^{Z}TUC^{Z}{}_{-1} + k3^{Z}\frac{P^{Z}_{-1}}{P^{Z}_{-1}} - k4^{Z}\frac{L^{Z}_{-1}}{K^{Z}_{-1}} - k5^{Z}rl^{Z}_{r} - k6^{Z}re^{Z} - k7^{Z}re^{F} \tag{29}$$

$$X^{Z}_{r} = M^{F}_{r} \tag{30}$$

$$Y^{F} = C^{F} + I^{F} + G^{F} + X^{F} - M^{F} \tag{31}$$

$$Y^{Z} = C^{Z} + I^{Z} + G^{Z} + X^{Z} - M^{Z} \tag{32}$$

$$Y^{F}_{r} = C^{F}_{r} + I^{F}_{r} + G^{F}_{r} + X^{F}_{r} - M^{F}_{r} \tag{33}$$

$$Y^{Z}_{r} = C^{Z}_{r} + I^{Z}_{r} + G^{Z}_{r} + X^{Z}_{r} - M^{Z}_{r} \tag{34}$$

$$C^{F} = C^{F}_{r}P^{F} \tag{35}$$

$$C^{Z} = C^{Z}_{r}P^{Z} \tag{36}$$

$$I^{F} = I^{F}_{r}P^{F} \tag{37}$$

$$I^{Z} = I^{Z}_{r}P^{Z} \tag{38}$$

$$G^{F} = G^{F}_{r}P^{F} \tag{39}$$

$$G^{Z} = G^{Z}_{r}P^{Z} \tag{40}$$

$$X^{F} = X^{F}_{r}P^{F} \tag{41}$$

$$X^{Z} = X^{Z}_{r}P^{Z} \tag{42}$$

$$M^{F} = M^{F}_{r}P^{Z} \tag{43}$$

$$M^{Z} = M^{Z}_{r}P^{F} \tag{44}$$

$$YD^{F} = Wu^{F}N^{F} + id^{F}BD^{F}_{-1} + B^{F}_{F-1} + B^{Z}_{F-1} + DIVh^{F}_{F} + DIVh^{Z}_{F} + PS^{F} - CL^{F} - T^{F}_{h} \tag{45}$$

$$YD^{Z} = Wu^{Z}N^{Z} + id^{Z}BD^{Z}_{-1} + B^{Z}_{Z-1} + B^{F}_{Z-1} + DIVh^{Z}_{Z} + DIVh^{F}_{Z} + PS^{Z} - CL^{Z} - T^{Z}_{h} \tag{46}$$

$$CL^{F} = \omega^{F}W^{F} \tag{47}$$

$$CL^{Z} = \omega^{Z}W^{Z} \tag{48}$$

$$W^{F} = Wu^{F}N^{F} \tag{49}$$

$$W^Z = Wu^Z N^Z \tag{50}$$

$$T_h^F = \theta_h^F\left(W^F + id^F BD_{-1}^F + B_{F-1}^F + B_{F-1}^Z + DIVh_F^F + DIVh_F^Z\right) \tag{51}$$

$$T_h^Z = \theta_h^Z\left(W^Z + id^Z BD_{-1}^Z + B_{Z-1}^Z + B_{Z-1}^F + DIVh_Z^Z + DIVh_Z^F\right) \tag{52}$$

$$T_f^F = \theta_u^F\left(Y_{-1}^F - W_{-1}^F - rl^F L_{F-2}^F - rl^Z L_{Z-2}^F - DIV^F\right) + \theta_d^F DIV^F + \theta_v^F\left(pe^F Ef_F^F + pe^Z Ef_F^Z\right) \tag{53}$$

$$T_f^Z = \theta_u^Z\left(Y_{-1}^Z - W_{-1}^Z - rl^Z L_{Z-2}^Z - rl^F L_{F-2}^Z - DIV^Z\right) + \theta_d^Z DIV^Z + \theta_v^Z\left(pe^Z Ef_Z^Z + pe^F Ef_Z^F\right) \tag{54}$$

$$P^F = \left(1 + \emptyset^F\right)\left(\frac{Wu^F N^F + m^F P^Z}{Y_r^F}\right) \text{ if } TUC^F < 1.1 \tag{55}$$

$$P^F = \left(1 + \emptyset^F\right)\left(\frac{Wu^F N^F + m^F P^Z}{Y_r^F}\right) + \alpha^F TUC^F \text{ if } TUC^F > 1.1 \tag{56}$$

$$P^Z = \left(1 + \emptyset^Z\right)\left(\frac{Wu^Z N^Z + m^Z P^F}{Y_r^Z}\right) \text{ if } TUC^Z < 1.1 \tag{57}$$

$$P^Z = \left(1 + \emptyset^Z\right)\left(\frac{Wu^Z N^Z + m^Z P^F}{Y_r^Z}\right) + \alpha^Z TUC^Z \text{ if } TUC^Z > 1.1 \tag{58}$$

$$Wu^F = w0^F + w1^F P^F + w2^F P_{-1}^F + w3^F \frac{Y_r^F}{N^F} - w4^F U^F \tag{59}$$

$$Wu^Z = w0^Z + w1^Z P^Z + w2^Z P_{-1}^Z + w3^Z \frac{Y_r^Z}{N^Z} - w4^Z U^Z \tag{60}$$

$$N^F = n0^F + n1^F Y_r^F + n2^F Y_{r-1}^F + n3^F N_{-1}^F - trend^F \tag{61}$$

$$N^Z = n0^Z + n1^Z Y_r^Z + n2^Z Y_{r-1}^Z + n3^Z N_{-1}^Z - trend^Z \tag{62}$$

$$PA^F = a^F N^F + (1 - a^F) PAT^F \tag{63}$$

$$PA^Z = a^Z N^Z + (1 - a^Z) PAT^Z \tag{64}$$

$$PAT^F = \beta^F PAT_{-1}^F \tag{65}$$

$$PAT^Z = \beta^Z PAT_{-1}^Z \tag{66}$$

$$U^F = \frac{PA^F - N^F}{PA^F} \times 100 \tag{67}$$

$$U^Z = \frac{PA^Z - N^Z}{PA^Z} \times 100 \tag{68}$$

$$DIV^F = (1 - sf^F)\left(Y_{-1}^F - W_{-1}^F - rl^F L_{F-2}^F - rl^Z L_{Z-2}^F\right) \tag{69}$$

$$DIV^Z = (1 - sf^Z)\left(Y_{-1}^Z - W_{-1}^Z - rl^Z L_{Z-2}^Z - rl^F L_{F-2}^Z\right) \tag{70}$$

$$sf^F = sf0^F + \theta_d^F \tau_d^F \tag{71}$$

$$sf^Z = sf0^Z + \theta_d^Z \tau_d^Z \tag{72}$$

$$\mathrm{DIVf}_{\mathrm{F}}^{\mathrm{F}} = \mathrm{DIV}^{\mathrm{F}}\left(\frac{\mathrm{Ef}_{\mathrm{F}-1}^{\mathrm{F}}}{\mathrm{E}_{-1}^{\mathrm{F}}}\right) \tag{73}$$

$$\mathrm{DIVh}_{\mathrm{F}}^{\mathrm{F}} = \mathrm{DIV}^{\mathrm{F}}\left(\frac{\mathrm{Eh}_{\mathrm{F}-1}^{\mathrm{F}}}{\mathrm{E}_{-1}^{\mathrm{F}}}\right) \tag{74}$$

$$\mathrm{DIVf}_{\mathrm{Z}}^{\mathrm{F}} = \mathrm{DIV}^{\mathrm{F}}\left(\frac{\mathrm{Ef}_{\mathrm{z}-1}^{\mathrm{F}}}{\mathrm{E}_{-1}^{\mathrm{F}}}\right) \tag{75}$$

$$\mathrm{DIVh}_{\mathrm{Z}}^{\mathrm{F}} = \mathrm{DIV}^{\mathrm{F}}\left(\frac{\mathrm{Eh}_{\mathrm{z}-1}^{\mathrm{F}}}{\mathrm{E}_{-1}^{\mathrm{F}}}\right) \tag{76}$$

$$\mathrm{DIVf}_{\mathrm{Z}}^{\mathrm{Z}} = \mathrm{DIV}^{\mathrm{Z}}\left(\frac{\mathrm{Ef}_{\mathrm{F}-1}^{\mathrm{Z}}}{\mathrm{E}_{-1}^{\mathrm{Z}}}\right) \tag{77}$$

$$\mathrm{DIVh}_{\mathrm{Z}}^{\mathrm{Z}} = \mathrm{DIV}^{\mathrm{Z}}\left(\frac{\mathrm{Eh}_{\mathrm{F}-1}^{\mathrm{Z}}}{\mathrm{E}_{-1}^{\mathrm{Z}}}\right) \tag{78}$$

$$\mathrm{DIVf}_{\mathrm{F}}^{\mathrm{Z}} = \mathrm{DIV}^{\mathrm{Z}}\left(\frac{\mathrm{Ef}_{\mathrm{F}-1}^{\mathrm{Z}}}{\mathrm{E}_{-1}^{\mathrm{Z}}}\right) \tag{79}$$

$$\mathrm{DIVh}_{\mathrm{F}}^{\mathrm{Z}} = \mathrm{DIV}^{\mathrm{Z}}\left(\frac{\mathrm{Eh}_{\mathrm{F}-1}^{\mathrm{Z}}}{\mathrm{E}_{-1}^{\mathrm{Z}}}\right) \tag{80}$$

$$\Delta\mathrm{BT}^{\mathrm{F}} = \mathrm{G}^{\mathrm{F}} + \mathrm{r}^{\mathrm{F}}\mathrm{BT}_{-1}^{\mathrm{F}} + \mathrm{B}_{-1}^{\mathrm{F}} + \mathrm{PS}^{\mathrm{F}} - \mathrm{CL}^{\mathrm{F}} - \mathrm{T}_{\mathrm{h}}^{\mathrm{F}} - \mathrm{T}_{\mathrm{f}}^{\mathrm{F}} - \mathrm{T}_{\mathrm{b}}^{\mathrm{F}} - \mathrm{T}_{\mathrm{eb}}^{\mathrm{F}} - \mathrm{pb}^{\mathrm{F}}\Delta\mathrm{B}^{\mathrm{F}} \tag{81}$$

$$\Delta\mathrm{BT}^{\mathrm{Z}} = \mathrm{G}^{\mathrm{Z}} + \mathrm{r}^{\mathrm{Z}}\mathrm{BT}_{-1}^{\mathrm{Z}} + \mathrm{B}_{-1}^{\mathrm{Z}} + \mathrm{PS}^{\mathrm{Z}} - \mathrm{CL}^{\mathrm{Z}} - \mathrm{T}_{\mathrm{h}}^{\mathrm{Z}} - \mathrm{T}_{\mathrm{f}}^{\mathrm{Z}} - \mathrm{T}_{\mathrm{b}}^{\mathrm{Z}} - \mathrm{T}_{\mathrm{eb}}^{\mathrm{Z}} - \mathrm{pb}^{\mathrm{Z}}\Delta\mathrm{B}^{\mathrm{Z}} \tag{82}$$

$$\Delta\mathrm{B}^{\mathrm{F}} = \Delta\mathrm{B}_{\mathrm{F}}^{\mathrm{F}} + \Delta\mathrm{B}_{\mathrm{Z}}^{\mathrm{F}} \tag{83}$$

$$\Delta\mathrm{B}^{\mathrm{Z}} = \Delta\mathrm{B}_{\mathrm{Z}}^{\mathrm{Z}} + \Delta\mathrm{B}_{\mathrm{F}}^{\mathrm{Z}} \tag{84}$$

$$\Delta\mathrm{L}_{\mathrm{F}}^{\mathrm{F}} = \Delta\mathrm{L}^{\mathrm{F}} - \Delta\mathrm{L}_{\mathrm{Z}}^{\mathrm{F}} \tag{85}$$

$$\Delta\mathrm{L}_{\mathrm{Z}}^{\mathrm{Z}} = \Delta\mathrm{L}^{\mathrm{Z}} - \Delta\mathrm{L}_{\mathrm{F}}^{\mathrm{Z}} \tag{86}$$

$$\Delta\mathrm{BT}_{\mathrm{F}}^{\mathrm{F}} = \Delta\mathrm{BT}^{\mathrm{F}} - \Delta\mathrm{BT}_{\mathrm{Z}}^{\mathrm{F}} \tag{87}$$

$$\Delta\mathrm{BT}_{\mathrm{Z}}^{\mathrm{Z}} = \Delta\mathrm{BT}^{\mathrm{Z}} - \Delta\mathrm{BT}_{\mathrm{F}}^{\mathrm{Z}} \tag{88}$$

$$\mathrm{BP}^{\mathrm{F}} = \left(1-\theta_{\mathrm{b}}^{\mathrm{F}}\right)\left(\mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{F}} + \mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{Z}} + \mathrm{r}^{\mathrm{F}}\mathrm{BT}_{\mathrm{F}-1}^{\mathrm{F}} + \mathrm{r}^{\mathrm{F}}\mathrm{BT}_{\mathrm{F}-1}^{\mathrm{Z}} - \mathrm{id}^{\mathrm{F}}\mathrm{BD}_{-1}^{\mathrm{F}} - \mathrm{ibRF}_{-1}^{\mathrm{F}}\right) \tag{89}$$

$$\mathrm{BP}^{\mathrm{Z}} = \left(1-\theta_{\mathrm{b}}^{\mathrm{Z}}\right)\left(\mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{Z}} + \mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{F}} + \mathrm{r}^{\mathrm{Z}}\mathrm{BT}_{\mathrm{Z}-1}^{\mathrm{Z}} + \mathrm{r}^{\mathrm{Z}}\mathrm{BT}_{\mathrm{Z}-1}^{\mathrm{F}} - \mathrm{id}^{\mathrm{Z}}\mathrm{BD}_{-1}^{\mathrm{Z}} - \mathrm{ibRF}_{-1}^{\mathrm{Z}}\right) \tag{90}$$

$$\mathrm{T}_{\mathrm{b}}^{\mathrm{F}} = \theta_{\mathrm{b}}^{\mathrm{F}}\left(\mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{F}} + \mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{Z}} + \mathrm{r}^{\mathrm{F}}\mathrm{BT}_{\mathrm{F}-1}^{\mathrm{F}} + \mathrm{r}^{\mathrm{F}}\mathrm{BT}_{\mathrm{F}-1}^{\mathrm{Z}} - \mathrm{id}^{\mathrm{F}}\mathrm{BD}_{-1}^{\mathrm{F}} - \mathrm{ibRF}_{-1}^{\mathrm{F}}\right) \tag{91}$$

$$\mathrm{T}_{\mathrm{b}}^{\mathrm{Z}} = \theta_{\mathrm{b}}^{\mathrm{Z}}\left(\mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{Z}} + \mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{F}} + \mathrm{r}^{\mathrm{Z}}\mathrm{BT}_{\mathrm{Z}-1}^{\mathrm{Z}} + \mathrm{r}^{\mathrm{Z}}\mathrm{BT}_{\mathrm{Z}-1}^{\mathrm{F}} - \mathrm{id}^{\mathrm{Z}}\mathrm{BD}_{-1}^{\mathrm{Z}} - \mathrm{ibRF}_{-1}^{\mathrm{Z}}\right) \tag{92}$$

$$\Delta\mathrm{RF}^{\mathrm{F}} = \Delta\mathrm{H}_{\mathrm{b}}^{\mathrm{F}} + \Delta\mathrm{L}_{\mathrm{F}}^{\mathrm{F}} + \Delta\mathrm{L}_{\mathrm{F}}^{\mathrm{Z}} + + \Delta\mathrm{BT}_{\mathrm{F}}^{\mathrm{F}} + \Delta\mathrm{BT}_{\mathrm{F}}^{\mathrm{Z}} - \Delta\mathrm{BD}^{\mathrm{F}} - \mathrm{BP}^{\mathrm{F}} \tag{93}$$

$$\Delta\mathrm{RF}^{\mathrm{Z}} = \Delta\mathrm{H}_{\mathrm{b}}^{\mathrm{Z}} + \Delta\mathrm{L}_{\mathrm{Z}}^{\mathrm{Z}} + \Delta\mathrm{L}_{\mathrm{Z}}^{\mathrm{F}} + + \Delta\mathrm{BT}_{\mathrm{Z}}^{\mathrm{Z}} + \Delta\mathrm{BT}_{\mathrm{Z}}^{\mathrm{F}} - \Delta\mathrm{BD}^{\mathrm{Z}} - \mathrm{BP}^{\mathrm{Z}} \tag{94}$$

$$\mathrm{H}_{\mathrm{b}}^{\mathrm{F}} = \varphi^{\mathrm{F}}\mathrm{BD}^{\mathrm{F}} \tag{95}$$

$$H_b^Z = \varphi^Z BD^Z \tag{96}$$

$$T_{eb} = ib\left(RF_{-1}^F + RF_{-1}^Z\right) \tag{97}$$

$$T_{eb}^F = T_{eb}\left(\frac{Y^F}{Y^F + Y^Z}\right) \tag{98}$$

$$T_{eb}^Z = T_{eb}\left(\frac{Y^Z}{Y^F + Y^Z}\right) \tag{99}$$

$$L_Z^F = L^F\left(\frac{X^F}{Y^F}\right) \tag{100}$$

$$L_F^Z = L^Z\left(\frac{X^Z}{Y^Z}\right) \tag{101}$$

$$BT_Z^F = \left(a1_Z^F r^F - a2_Z^F r^Z\right)Y^Z \tag{102}$$

$$BT_F^Z = 0 \tag{103}$$

$$H = H_h^F + H_h^Z + H_b^F + H_b^Z \tag{104}$$

$$rl^F = rl_{-1}^F(1-a) + ar_{-1}^F \tag{105}$$

$$rl^Z = rl_{-1}^Z(1-a) + ar_{-1}^Z \tag{106}$$

$$id^F = ib - m2b^F \tag{107}$$

$$id^Z = ib - m2b^Z \tag{108}$$

$$r^F = \frac{BT^F + a2_F^F r^Z Y^F + a2_Z^F r^Z Y^Z}{a1_F^F Y^F + a1_Z^F Y^Z} \tag{109}$$

$$r^Z = a1_Z^Z + \frac{b2_Z^Z BT^Z}{Y^Z} \tag{110}$$

$$rb^F = r^F \tag{111}$$

$$rb^Z = r^Z \tag{112}$$

$$G_r^F = g0_r^F + g1_r^F G_{r-1}^F \tag{113}$$

$$G_r^Z = g0_r^Z + g1_r^Z G_{r-1}^Z \tag{114}$$

$$\Delta BD^F = YD^F - C^F - pb^F\Delta B_F^F - pb^Z\Delta B_F^Z - pe^F\Delta Eh_F^F - pe^Z\Delta Eh_F^Z - \Delta H_h^F \tag{115}$$

$$\Delta BD^Z = YD^Z - C^Z - pb^Z\Delta B_Z^Z - pb^F\Delta B_Z^F - pe^Z\Delta Eh_Z^Z - pe^F\Delta Eh_Z^F - \Delta H_h^Z \tag{116}$$

$$B_F^F = v0_F^F + v1_F^F rb^F - v2_F^F rb^Z - v3_F^F id^F - v4_F^F re^Z - v5_F^F re^F \tag{117}$$

$$B_F^Z = v0_F^Z + v1_F^Z rb^Z - v2_F^Z rb^F - v3_F^Z id^F - v4_F^Z re^Z - v5_F^Z re^F \tag{118}$$

$$B_Z^Z = v0_Z^Z + v1_Z^Z rb^Z - v2_Z^Z rb^F - v3_Z^Z id^Z - v4_Z^Z re^Z - v5_Z^Z re^F \tag{119}$$

$$B_Z^F = v0_Z^F + v1_Z^F rb^F - v2_Z^F rb^Z - v3_Z^F id^Z - v4_Z^F re^Z - v5_Z^F re^F \tag{120}$$

$$Eh_F^F = j0_F^F - j1_F^F rb^F - j2_F^F rb^Z - j3_F^F id^F + j4_F^F re^F - j5_F^F re^Z \tag{121}$$

$$Eh_F^Z = j0_F^Z - j1_F^Z rb^F - j2_F^Z rb^Z - j3_F^Z id^F - j4_F^Z re^F + j5_F^Z re^Z \tag{122}$$

$$Eh_Z^Z = j0_Z^Z - j1_Z^Z rb^F - j2_Z^Z rb^Z - j3_Z^Z id^Z - j4_Z^Z re^F + j5_Z^Z re^Z \tag{123}$$

$$\mathrm{Eh}_{\mathrm{Z}}^{\mathrm{F}} = \mathrm{j0}_{\mathrm{Z}}^{\mathrm{F}} - \mathrm{j1}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{rb}^{\mathrm{F}} - \mathrm{j2}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{rb}^{\mathrm{Z}} - \mathrm{j3}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{id}^{\mathrm{Z}} + \mathrm{j4}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{re}^{\mathrm{F}} - \mathrm{j5}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{re}^{\mathrm{Z}} \tag{124}$$

$$\mathrm{Ef}_{\mathrm{F}}^{\mathrm{F}} = \mathrm{f0}_{\mathrm{F}}^{\mathrm{F}} + \mathrm{f1}_{\mathrm{F}}^{\mathrm{F}}\mathrm{re}^{\mathrm{F}} - \mathrm{f2}_{\mathrm{F}}^{\mathrm{F}}\mathrm{re}^{\mathrm{Z}} + \mathrm{f3}_{\mathrm{F}}^{\mathrm{F}}\frac{\mathrm{UP}^{\mathrm{F}}}{\mathrm{K}_{-1}^{\mathrm{F}}} - \theta_{\mathrm{v}}^{\mathrm{F}}\tau_{\mathrm{v}}^{\mathrm{F}}\frac{\mathrm{UP}^{\mathrm{F}}}{\mathrm{K}_{-1}^{\mathrm{F}}} \tag{125}$$

$$\mathrm{Ef}_{\mathrm{F}}^{\mathrm{Z}} = \mathrm{f0}_{\mathrm{F}}^{\mathrm{Z}} \;+\; \mathrm{f1}_{\mathrm{F}}^{\mathrm{Z}}\mathrm{re}^{\mathrm{Z}} - \mathrm{f2}_{\mathrm{F}}^{\mathrm{Z}}\mathrm{re}^{\mathrm{F}} + \mathrm{f3}_{\mathrm{F}}^{\mathrm{Z}}\frac{\mathrm{UP}^{\mathrm{F}}}{\mathrm{K}_{-1}^{\mathrm{F}}} - \theta_{\mathrm{v}}^{\mathrm{F}}\tau_{\mathrm{v}}^{\mathrm{F}}\frac{\mathrm{UP}^{\mathrm{F}}}{\mathrm{K}_{-1}^{\mathrm{F}}} \tag{126}$$

$$\mathrm{Ef}_{\mathrm{Z}}^{\mathrm{Z}} = \mathrm{f0}_{\mathrm{Z}}^{\mathrm{Z}} + \mathrm{f1}_{\mathrm{Z}}^{\mathrm{Z}}\mathrm{re}^{\mathrm{Z}} - \mathrm{f2}_{\mathrm{Z}}^{\mathrm{Z}}\mathrm{re}^{\mathrm{F}} + \mathrm{f3}_{\mathrm{Z}}^{\mathrm{Z}}\frac{\mathrm{UP}^{\mathrm{Z}}}{\mathrm{K}_{-1}^{\mathrm{Z}}} - \theta_{\mathrm{v}}^{\mathrm{Z}}\tau_{\mathrm{v}}^{\mathrm{Z}}\frac{\mathrm{UP}^{\mathrm{Z}}}{\mathrm{K}_{-1}^{\mathrm{Z}}} \tag{127}$$

$$\mathrm{Ef}_{\mathrm{Z}}^{\mathrm{F}} = \mathrm{f0}_{\mathrm{Z}}^{\mathrm{F}} + \mathrm{f1}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{re}^{\mathrm{F}} - \mathrm{f2}_{\mathrm{Z}}^{\mathrm{F}}\mathrm{re}^{\mathrm{Z}} + \mathrm{f3}_{\mathrm{Z}}^{\mathrm{F}}\frac{\mathrm{UP}^{\mathrm{Z}}}{\mathrm{K}_{-1}^{\mathrm{Z}}} - \theta_{\mathrm{v}}^{\mathrm{Z}}\tau_{\mathrm{v}}^{\mathrm{Z}}\frac{\mathrm{UP}^{\mathrm{Z}}}{\mathrm{K}_{-1}^{\mathrm{Z}}} \tag{128}$$

$$\mathrm{E}^{\mathrm{F}} = \mathrm{Eh}_{\mathrm{F}}^{\mathrm{F}} + \mathrm{Eh}_{\mathrm{Z}}^{\mathrm{F}} + \mathrm{Ef}_{\mathrm{F}}^{\mathrm{F}} + \mathrm{Ef}_{\mathrm{Z}}^{\mathrm{F}} \tag{129}$$

$$\mathrm{E}^{\mathrm{Z}} = \mathrm{Eh}_{\mathrm{Z}}^{\mathrm{Z}} + \mathrm{Eh}_{\mathrm{F}}^{\mathrm{Z}} + \mathrm{Ef}_{\mathrm{Z}}^{\mathrm{Z}} + \mathrm{Ef}_{\mathrm{F}}^{\mathrm{Z}} \tag{130}$$

$$\mathrm{pe}^{\mathrm{F}} = \frac{\left(\mathrm{E}^{\mathrm{F}} - \;\mathrm{g0}^{\mathrm{F}} - \mathrm{g1}^{\mathrm{F}}\mathrm{rl}_{\mathrm{r}}^{\mathrm{F}} - \mathrm{g2}^{\mathrm{F}}\mathrm{rl}_{\mathrm{r}}^{\mathrm{Z}} - \mathrm{g3}^{\mathrm{F}}\frac{\mathrm{L}_{-1}^{\mathrm{F}}}{\mathrm{K}_{-1}^{\mathrm{F}}}\right)\mathrm{P}^{\mathrm{F}}}{\mathrm{g4}^{\mathrm{F}}} \tag{131}$$

$$\mathrm{pe}^{\mathrm{Z}} = \frac{\left(\mathrm{E}^{\mathrm{Z}} - \;\mathrm{g0}^{\mathrm{Z}} - \mathrm{g1}^{\mathrm{Z}}\mathrm{rl}_{\mathrm{r}}^{\mathrm{Z}} - \mathrm{g2}^{\mathrm{Z}}\mathrm{rl}_{\mathrm{r}}^{\mathrm{F}} - \mathrm{g3}^{\mathrm{Z}}\frac{\mathrm{L}_{-1}^{\mathrm{Z}}}{\mathrm{K}_{-1}^{\mathrm{Z}}}\right)\mathrm{P}^{\mathrm{Z}}}{\mathrm{g4}^{\mathrm{Z}}} \tag{132}$$

$$\mathrm{H}_{\mathrm{h}}^{\mathrm{F}} = \mathrm{h0}^{\mathrm{F}}\mathrm{C}^{\mathrm{F}} \tag{133}$$

$$\mathrm{H}_{\mathrm{h}}^{\mathrm{Z}} = \mathrm{h0}^{\mathrm{Z}}\mathrm{C}^{\mathrm{Z}} \tag{134}$$

$$\mathrm{UP}^{\mathrm{F}} = \left(\mathrm{Y}^{\mathrm{F}} - \mathrm{W}^{\mathrm{F}} - \mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{F}} - \mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{F}} - \mathrm{DIV}^{\mathrm{F}} + \mathrm{DIVf}_{\mathrm{F}}^{\mathrm{F}} + \mathrm{DIVf}_{\mathrm{F}}^{\mathrm{Z}} - \mathrm{T}_{\mathrm{f}}^{\mathrm{F}}\right) \tag{135}$$

$$\mathrm{UP}^{\mathrm{Z}} = \left(\mathrm{Y}^{\mathrm{Z}} - \mathrm{W}^{\mathrm{Z}} - \mathrm{rl}^{\mathrm{Z}}\mathrm{L}_{\mathrm{Z}-1}^{\mathrm{Z}} - \mathrm{rl}^{\mathrm{F}}\mathrm{L}_{\mathrm{F}-1}^{\mathrm{Z}} - \mathrm{DIV}^{\mathrm{z}} + \mathrm{DIVf}_{\mathrm{Z}}^{\mathrm{Z}} + \mathrm{DIVf}_{\mathrm{Z}}^{\mathrm{F}} - \mathrm{T}_{\mathrm{f}}^{\mathrm{Z}}\right) \tag{136}$$

$$\mathrm{rl}_{\mathrm{r}}^{\mathrm{F}} = \mathrm{rl}^{\mathrm{F}} - \frac{\Delta\mathrm{P}^{\mathrm{F}}}{\mathrm{P}_{-1}^{\mathrm{F}}} \tag{137}$$

$$\mathrm{rl}_{\mathrm{r}}^{\mathrm{Z}} = \mathrm{rl}^{\mathrm{Z}} - \frac{\Delta\mathrm{P}^{\mathrm{Z}}}{\mathrm{P}_{-1}^{\mathrm{Z}}} \tag{138}$$

$$\mathrm{I}_{\mathrm{r}}^{\mathrm{F}} = \mathrm{gk}^{\mathrm{F}}\frac{\mathrm{K}_{-1}^{\mathrm{F}}}{\mathrm{P}^{\mathrm{F}}} \tag{139}$$

$$\mathrm{I}_{\mathrm{r}}^{\mathrm{Z}} = \mathrm{gk}^{\mathrm{Z}}\frac{\mathrm{K}_{-1}^{\mathrm{Z}}}{\mathrm{P}^{\mathrm{Z}}} \tag{140}$$

$$\Delta\mathrm{K}^{\mathrm{F}} = \mathrm{I}^{\mathrm{F}} - \delta^{\mathrm{F}}\mathrm{K}_{-1}^{\mathrm{F}} \tag{141}$$

$$\Delta\mathrm{K}^{\mathrm{Z}} = \mathrm{I}^{\mathrm{Z}} - \delta^{\mathrm{Z}}\mathrm{K}_{-1}^{\mathrm{Z}} \tag{142}$$

$$\Delta\mathrm{L}^{\mathrm{F}} = \mathrm{I}^{\mathrm{F}} - \mathrm{UP}^{\mathrm{F}} - \mathrm{pe}^{\mathrm{F}}\Delta\mathrm{E}^{\mathrm{F}} + \mathrm{pe}^{\mathrm{F}}\Delta\mathrm{Ef}_{\mathrm{F}}^{\mathrm{F}} + \mathrm{pe}^{\mathrm{Z}}\Delta\mathrm{Ef}_{\mathrm{F}}^{\mathrm{Z}} \tag{143}$$

$$\Delta\mathrm{L}^{\mathrm{Z}} = \mathrm{I}^{\mathrm{Z}} - \mathrm{UP}^{\mathrm{Z}} - \mathrm{pe}^{\mathrm{Z}}\Delta\mathrm{E}^{\mathrm{Z}} + \mathrm{pe}^{\mathrm{Z}}\Delta\mathrm{Ef}_{\mathrm{Z}}^{\mathrm{Z}} + \mathrm{pe}^{\mathrm{F}}\Delta\mathrm{Ef}_{\mathrm{Z}}^{\mathrm{F}} \tag{144}$$

$$\mathrm{P}_{\mathrm{p}}^{\mathrm{F}} = \frac{\mathrm{Y}^{\mathrm{F}}}{\mathrm{Y}_{\mathrm{r}}^{\mathrm{F}}} \tag{145}$$

$$\mathrm{P}_{\mathrm{p}}^{\mathrm{Z}} = \frac{\mathrm{Y}^{\mathrm{Z}}}{\mathrm{Y}_{\mathrm{r}}^{\mathrm{Z}}} \tag{146}$$

$$H = RF^F + RF^Z \tag{147}$$

This last equation is removed from the model to check the stock-flow consistency.

## Appendix C. Determination of the interest rate on T bills and determination of the price of equities

The interest rate and the price of the equities are determined by the supply and demand.

### *Determination of the price of the equities*

The supply of equities is represented by the following equations:

$$E^{SF} = g0^F + g1^F rl_r^F + g2^F rl_r^Z + g3^F \frac{L_{-1}^F}{K_{-1}^F} + g4^F \frac{pe^F}{P^F}$$

$$E^{SZ} = g0^Z + g1^Z rl_r^Z + g2^Z rl_r^F + g3^Z \frac{L_{-1}^Z}{K_{-1}^Z} + g4^Z \frac{pe^Z}{P^Z}$$

The demand of equities is represented by Equations (129) and (130) as follows:

$$E^F = Eh_F^F + Eh_Z^F + Ef_F^F + Ef_Z^F \tag{129}$$

$$E^Z = Eh_Z^Z + Eh_F^Z + Ef_Z^Z + Ef_F^Z \tag{130}$$

At equilibrium, the supply of equities is equal to the demand and is given by the following relations:

$$E^{SF} = E^F \text{ and } E^{SZ} = E^Z$$

By replacing with the equations, we obtain the following equations:

$$g0^F + g1^F rl_r^F + g2^F rl_r^Z + g3^F \frac{L_{-1}^F}{K_{-1}^F} + g4^F \frac{pe^F}{P^F} = E^F$$

$$g0^Z + g1^Z rl_r^Z + g2^Z rl_r^F + g3^Z \frac{L_{-1}^Z}{K_{-1}^Z} + g4^Z \frac{pe^Z}{P^Z} = E^Z$$

From the following equations, we obtain the price of equity:

$$pe^F = \frac{\left(E^F - g0^F - g1^F rl_r^F - g2^F rl_r^Z - g3^F \frac{L_{-1}^F}{K_{-1}^F}\right) P^F}{g4^F} \tag{131}$$

$$pe^Z = \frac{\left(E^Z - g0^Z - g1^Z rl_r^Z - g2^Z rl_r^F - g3^Z \frac{L_{-1}^Z}{K_{-1}^Z}\right) P^Z}{g4^Z} \tag{132}$$

### *Determination of the interest rate on T bills*

T Bills issued by the country F and domestically held in the private banks ($BT_F^F$) as well as bills held in the rest of the union ($BT_Z^F$) depends on the interest rates differential between the two countries:

$$\frac{BT_F^F}{Y^F} = a1_F^F r^F - a2_F^F r^Z$$

$$\frac{BT_Z^F}{Y^Z} = a1_Z^F r^F - a2_Z^F r^Z$$

By summing demands of these two countries, we obtain the global demand for Treasury bills issued by the country F as follows:

$$BT^F = \left(a1_F^F r^F - a2_F^F r^Z\right)Y^F + \left(a1_Z^F r^F - a2_Z^F r^Z\right)Y^Z$$

The interest rate on Treasury bills issued by the country F becomes endogenous and we can write the following equation:

$$r^F = \frac{BT^F + a2_F^F r^Z Y^F + a2_Z^F r^Z Y^Z}{a1_F^F Y^F + a1_Z^F Y^Z} \tag{109}$$

Regarding the rest of the union (the country Z), we assume that the country F does not hold bills issued by the northern country that finances its public deficit only domestically:

$$BT_F^Z = 0 \tag{103}$$

$$BT^Z = BT_Z^Z$$

The global demand for Treasury bills issued by the country Z depends on the level of interest rate ($r^Z$) and the national income ($Y^Z$):

$$BT_Z^Z = \frac{\left(r^Z - a1_Z^Z\right)Y^Z}{b2_Z^Z}$$

Consequently, we have the following interest rate determination for the northern country:

$$r^Z = a1_Z^Z + \frac{b2_Z^Z BT^Z}{Y^Z} \tag{110}$$

## Appendix D. Initial values of stock variables (in percent of GDP) and evolution in the baseline

**Table D1.** Initial values of stock variables.

| | Country F | Country Z |
|---|---|---|
| Stock of capital | 410.3 | 410.3 |
| Stock of net equities | 176 | 207.7 |
| Stock of loans | 49.9 | 49.9 |
| Stock of deposits | 72.7 | 72.7 |
| Stock of refinancing | 12.9 | 12.9 |
| Stock of central money | 12.9 | 12.9 |
| Stock of treasury Bills | 34 | 25.3 |
| Stock of bonds | 23.3 | 23.3 |

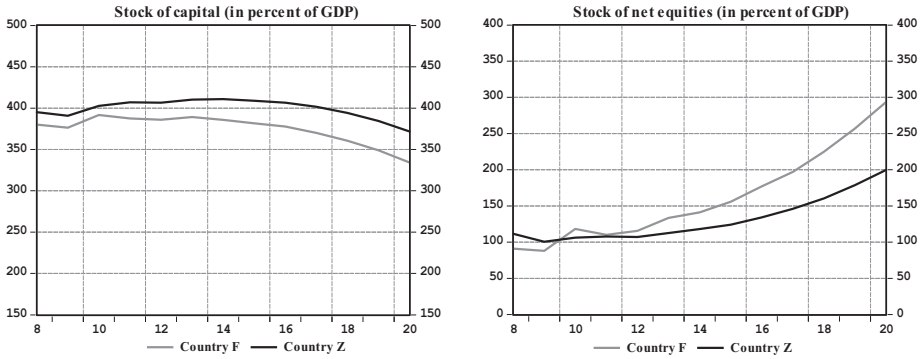


**Figure D1.** Stock of capital and stock of net equities.

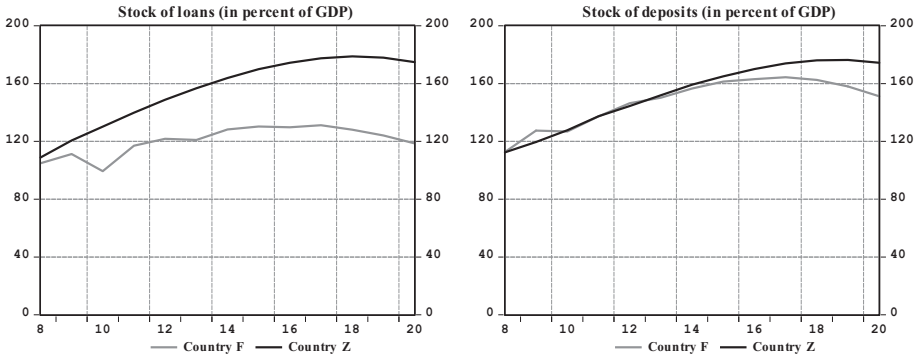


**Figure D2.** Stock of loans and stock of deposits.

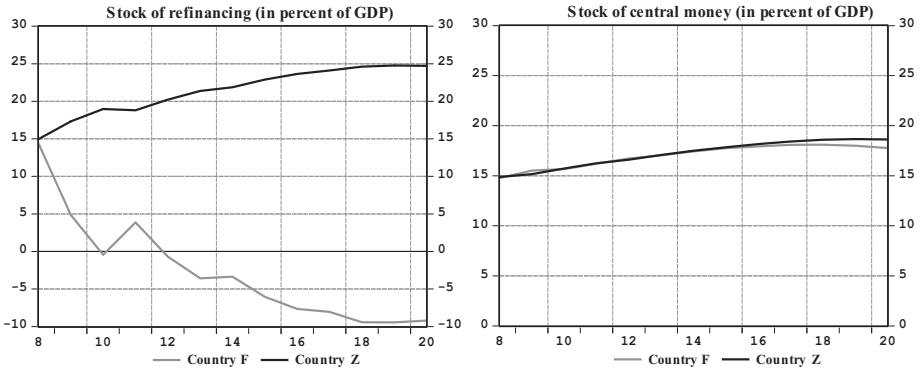


**Figure D3.** Stock of refinancing and stock of central money.

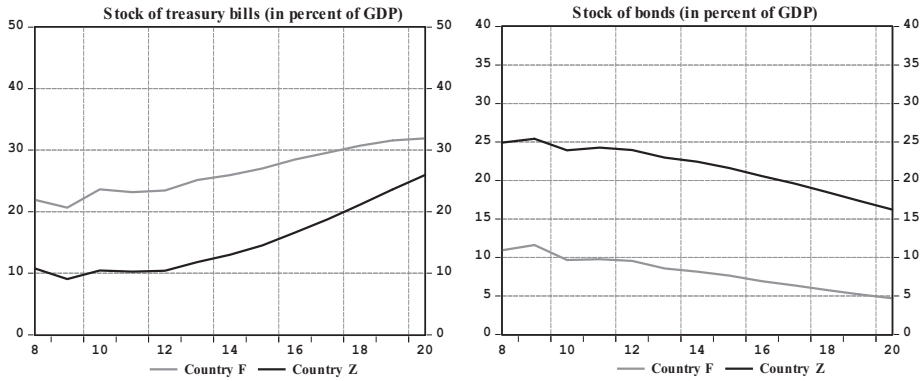


**Figure D4.** Stock of treasury bills and stock of bonds.

## Appendix E. Parameters in scenarios

**Table E1.** Parameters in different scenarios.

| Period: 10–20 | Baseline | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 | Scenario 5 | Scenario 6 |
|---|---|---|---|---|---|---|---|
| $\theta_d^F$ | 0.33 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| $\theta_u^F$ | 0.33 | 0.24 | 0.18 | 0.18 | 0.24 | 0.18 | 0.18 |
| $\tau_d^F$ | 0 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| $\theta_d^Z$ | 0.33 | 0.5 | 0.5 | 0.5 | 0.33 | 0.33 | 0.33 |
| $\theta_u^Z$ | 0.33 | 0.24 | 0.18 | 0.18 | 0.33 | 0.33 | 0.33 |
| $\tau_d^Z$ | 0 | 0.5 | 0.5 | 0.5 | 0 | 0 | 0 |
| $\theta_v^F$ | 0 | 0 | 0.01 | 0.01 | 0 | 0.01 | 0.01 |
| $\tau_v^F$ | 0 | 0 | 80 | 80 | 0 | 80 | 80 |
| $k6^F$ | 0.08 | 0.08 | 0.02 | 0.02 | 0.08 | 0.02 | 0.02 |
| $k7^F$ | 0.008 | 0.008 | 0.002 | 0.002 | 0.008 | 0.002 | 0.002 |
| $\theta_v^Z$ | 0 | 0 | 0.01 | 0.01 | 0 | 0 | 0 |
| $\tau_v^Z$ | 0 | 0 | 80 | 80 | 0 | 0 | 0 |
| $k6^Z$ | 0.08 | 0.08 | 0.02 | 0.02 | 0.08 | 0.08 | 0.08 |
| $k7^Z$ | 0.008 | 0.008 | 0.002 | 0.002 | 0.008 | 0.008 | 0.008 |
| $g0_r^F$ | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| $g0_r^Z$ | 0 | 0 | 0 | 5 | 0 | 0 | 0 |