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# A Labor Market–Augmented Empirical Stock-Flow Consistent Model Applied to the Greek Economy

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**ABSTRACT**

This paper extends the empirical stock-flow consistent (SFC) literature through the introduction of distributional features and labor market institutions in a Godley-type empirical SFC model. In particular, labor market institutions, such as the minimum wage and the collective bargaining coverage rate, are considered as determinants of the wage share and, in turn, of the distribution of national income. Thereby, the model is able to examine both the medium-term stability conditions of the economy via the evolution of the sectoral financial balances and the implications of functional income distribution on the growth prospects of the economy at hand. The model is then applied to the Greek economy. The empirical results indicate that the Greek economy has a significant structural competitiveness deficit, while the institutional regime is likely debt-led. The policies implemented in the context of the economic adjustment programs were highly inappropriate, triggering private sector insolvency. A minimum wage increase is projected to have a positive impact on output growth and employment. However, policies that would enhance the productive sector's structural competitiveness are required in order to ensure the growth prospects of the Greek economy.

# 1. INTRODUCTION

The policy of internal devaluation has been at the epicenter of the economic adjustment programs (EAPs) implemented in the euro area (EA) and specifically in member countries such as Greece and Portugal (e.g., see European Commission 2012a). Aiming to foster export-led growth, the labor market was deregulated (i.e., the minimum wage was reduced and firm-level bargaining agreements have been prioritized), so as to drive down domestic prices and enhance cost competitiveness. This policy implies a redistribution of national income at the expense of labor, allegedly considered necessary in securing viable output and employment growth.

Doubts have been cast over the implementation of such a policy in Greece, as it totally neglects the domestic economy's regime of accumulation, its particular institutional and behavioral characteristics, and its productive capacity (Argeitis et al. 2018). The aim of this paper is to assess the internal devaluation policy implemented in Greece through the use of an empirical stock-flow consistent (SFC) model. Papadimitriou, Nikiforos, and Zezza (2013) have already provided an early assessment of this policy with the use of the SFC Levy Institute Model for Greece (LIMG). In their analysis, internal devaluation is examined through the introduction of a negative shock in domestic prices. In this respect, the main tool for carrying out the internal devaluation policy (i.e., the labor market institutions) is absent, while the adjustment is set exogenously.

The present paper contributes to this work, as well as to the overall empirical SFC literature, by introducing distributional considerations on aggregate demand and rendering prices endogenous to labor market institutions. Specifically, the private expenditure function of the LIMG is extended so as to account for different propensities to spend according to each source of income, in a quasi-similar fashion to Zezza and Dos Santos (2006). Therefore, in the labor market–augmented SFC model (LMSFC), economic activity is not only affected by public and external demand, as is the case with the LIMG (Papadimitriou, Nikiforos, and Zezza 2018), but also by functional income distribution, albeit in a more provisional manner. In parallel, the minimum wage and the collective bargaining coverage ratio determine the wage share and, in turn, the prices. In this respect it is feasible to examine the impact of internal devaluation on economic activity both in terms of cost competitiveness and domestic demand.

The estimated results and the associated projections indicate that the Greek economy has a significant structural competitiveness deficit, while the institutional regime is likely debt-led. The policies implemented in the context of the EAPs were highly inappropriate, triggering private sector insolvency. A minimum wage increase is projected to have a positive impact on output growth and employment. However, policies that would enhance the productive sector's structural competitiveness are required in order to ensure the growth prospects of the Greek economy.

The rest of the paper is structured in the following manner. Section 2 attempts an overview of the theoretical arguments in favor of the internal devaluation literature, followed by a critique. The structure of the model is presented in section 3. The estimation method, the data, and the estimated results are discussed in section 4. Section 5 is dedicated to the examination of policy scenarios regarding a minimum wage increase and a reduction of part-time and temporary employment, while the last section concludes.

## 2. INTERNAL DEVALUATION AND LABOR MARKET INSTITUTIONS

The major aim of the internal devaluation policy is to enhance the economy's cost competitiveness whenever external devaluation is not an option, as in the case of a fixed exchange rate regime or a monetary union. An improvement in terms of relative prices would allegedly enhance the economy's export performance. At the same time, imports become more expensive and, thus, are substituted for domestically produced goods (Myant, Theodoropoulou, and Piasan 2016, 10). Ultimately, the trade balance becomes positive, while output and employment are assumed to grow in a sustainable manner.

The main emphasis is placed on unit labor cost (ULC) as a measure of competitiveness, which takes into account the labor cost per employee and labor productivity. Higher labor costs as compared to labor productivity indicate a loss in competitiveness and vice versa. Thereby, in the context of an internal devaluation policy, a ULC reduction becomes imperative. This could be achieved either by reducing labor costs per employee or by increasing labor productivity. The choice is not politically

neutral. In mainstream economic thinking, it is usually preferable to reduce labor costs,[1] while on the Keynesian front the focus is laid upon enhancing productivity, mainly through increased public investment (Esping-Andersen and Regini 2000).

In the dominant thinking, the main determinant of prices is labor costs. Markups, which distort the market clearing pricing mechanism, are supposedly removed through product market deregulation. However, this policy has a secondary role in the construction of the EAPs or is harder to impose. Other economic and statutory costs are likely to affect the overall price level,[2] yet they have only a minor role, if any, in the planning of the internal devaluation policy. At least in the short term, the ultimate deflationary tool is the reduction of wages and total labor costs.

The policy in question focuses mainly on enhancing flexibility in the labor market, which in theory contributes to the absorption of labor in the most productive sectors. In this way, the wage share in the tradable goods sector changes in relation to the wage share in nontradables, creating more favorable conditions for a fall in prices (Obstfeld and Rogoff 1996, 212). In particular, in a small, open economy, export prices are determined by international trade, thus the overall price level depends on the prices of nontradable goods. In this respect, a lower wage share in the nontradable sector implies that the aggregate price level would converge toward the level of international prices (Obstfeld and Rogoff 1996).

The internal devaluation policy has been strongly criticized on the grounds of postulating unrealistic assumptions and ignoring the institutional framework of the economies at hand. First of all, this policy has a large social cost due to the necessary increase in unemployment (Blanchard 2007). According to Muller, Schulten, and Zuckerstatter (2015) the emphasis on the ULC presents three main drawbacks. In the first place, it ignores the developments and prospects of borrowing costs and, above all, the impact of reduced wage costs on the profit margin of firms. Secondly, other determinants of competitiveness, such as the structure of domestic production, are being overlooked, rendering the price and exports relationship fragmented. Thirdly, it approaches exports

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[1] As noted by Blanchard (2007), public-investment-led productivity growth pays out only in the medium term, while it endangers the attainment of fiscal targets.
[2] For a full list of these costs, see Obstfeld and Rogoff (1996, 199–202).

as the key factor in GDP growth and national wealth creation, ignoring the effects of internal depreciation on domestic demand.

Felipe and Kumar (2014) note that the ULC ought to be treated as an indicator of the distribution of national income rather of competitiveness. Closely related to this is the fact that in the implementation of the internal devaluation policy, the growth regime is not taken into account. In particular, the institutional characteristics of the economy determine whether the income redistribution, driven by the implementation of the internal devaluation policy, has a positive or negative impact on economic activity.

In line with Bhaduri and Marglin (1990), in a wage-led growth regime, a decline in wages is expected to have a negative impact on GDP, as there will be a significant decline in domestic demand. In this respect, the internal devaluation process fuels recessive dynamics in the economy and vice versa.[3] However, there is also a middle case in which the internal devaluation could drive exports but not investment. The internal institutional characteristics of the economy are not compatible with this policy, but the exporting sector is (Lavoie and Stockhammer 2012).

Finally, another major problem of the internal devaluation strategy is that it focuses on a long-term horizon, neglecting the short-term conditions. In particular, it examines long-term production costs, considering that any measures aimed at removing labor market rigidities in the short term will inevitably lead to an optimal long-term equilibrium. However, this analysis lacks any concerns regarding the existing conditions that determine the growth path of the economy. In other words, there is no coherent and well-defined mechanism linking short-term policies with long-term results (Zezza 2013).

The policy of internal devaluation was implemented in Greece in two waves. In the first EAP, the main focus was laid upon the reduction of the collective bargaining coverage, while in the second EAP, implemented in 2012, the main objective was the immediate adjustment of wages to the macroeconomic conditions. Initially, the labor market was deregulated through: a) the suspension of

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[3] Interestingly, Calmfors and Drifill (1988) reach similar conclusions, though from a mainstream perspective. In their terminology, if output is highly elastic with respect to wages, then a reduction in wages is likely to have a deflationary effect.

the extension of all collective agreements, which no longer concerned noncontracting companies; b) firm-level contracts prevailed over the sector-level contracts; and c) firm-level contracts were allowed to be negotiated by workers' unions other than trade unions (European Commission 2012a). All three measures were aimed at weakening trade unions, indirectly promoting wage adjustments, and making decisive changes to the legal framework that covered industrial relations. As a result, the collective bargaining coverage rate declined from 83.9 percent of employees in 2008 to 15 percent in 2014.

In the second wave, the minimum wage was reduced by 22 percent, while firing of employees was facilitated considerably (European Commission 2012a). The lowering of the minimum wage was supposed to deliver a reduction in the aggregate wage structure, drastically reducing the labor costs of production. Similarly, the facilitation of firing aimed at creating more favorable conditions for the redistribution of labor from the least to the most productive sectors of the economy.

These measures had a drastic effect on the compensation per employee, which fell by 16 percent between 2009 and 2016. However, the impact on the ULC was mitigated by a reduction of labor productivity. Despite this, the ULC of the Greek economy— as compared to that of Italy, Spain, and Portugal, which also implemented EAPs, either explicitly or implicitly—has improved considerably. In turn, this development led to a reduction of the wage share, which was already low by EA standards, as well as an increase of the profit share, which is currently one of the highest in the EA (INE-GSEE 2019).

None the less, this redistribution at the expense of labor did not have a significant effect on net exports (Passas and Pierros 2017). It remains questionable whether this policy could generate favorable and sustainable growth conditions for the Greek economy (i.e., if its growth regime is profit-led). Onaran and Obst (2016), following a structural approach (i.e., estimating separate econometric equations), indicate that the accumulation regime in Greece is wage-led. Similar conclusions are reached by Pierros (2019), who constructs a structural vector autoregressive (SVAR) model for the Greek economy. The current paper adds to this type of empirical literature by addressing the same research question within the SFC framework.

## 3. THE STRUCTURE OF THE LMSFC

The LMSFC model extends the LIMG model mainly in two areas, namely labor market institutions and international trade. Labor market institutions, such as the minimum wage and the collective bargaining coverage rate, are considered as the main determinants of the wage share,[4] while a larger set of trading partners in the estimations (as compared to the LIMG) provides a better grasp of the export capacity of the Greek firm sector. However, the most important extension is related to the incorporation of the wage and the profit share. In the relevant literature, Burgess et al. (2016) use a Cobb-Douglas function in order to retrieve long-term shares of national income, while Passarella (2018) uses a Leontief production function at the service of the same goal. The approach adopted in this paper is somewhat similar to that of Zezza and Dos Santos (2006). The impact of distribution on private expenditure depends on the different propensities to spend with respect to each source of income. This is achieved primarily by a proper disaggregation of the private sector's disposable income according to each source of income. This is evident in table 1, which presents the LMSFC model's transactions flow matrix (TFM).[5]

The first upper column denotes the sources of aggregate demand, which sum up to nominal GDP. The lower part of the column indicates the functions in which national income is distributed. The novelty of the LMSFC is that it estimates the determinants of the wage share empirically, while treating the shares of the government, the self-employed, and the external sector as exogenous. In this context, the profit share occurs residually, as shown in equation (1), in which $h$ represents a share, while wages, profits, government, self-employed, and the external sector are denoted by the subscripts, $w, f, g, sh,$ and $row$, respectively.

This specification comes with one advantage and one drawback. On the positive side, if wages are reduced, then the wage share plummets and the profit share increases, ceteris paribus. This ex post derivation of profits clearly deviates from the typical target markup pricing procedure adopted in the post-Kaleckian framework (Lavoie 2014). However, as Lee (1999) points out, pricing procedures are not rigid, but instead firms are moving from cost-plus pricing to administrative

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[4] For an empirical work justifying this point of view, see, for example, Guschanski and Onaran (2016).
[5] A numerical TFM is presented in Appendix I, in which the values for the first quarter of 1999 are plugged in.

pricing and back, in line with the economic conditions and developments. Furthermore, a part of the conflict between wages and profits is reflected in statutory laws that dictate industrial relations. In this context, the governing party's related preferences are of great significance. Overall, the present specification is more flexible regarding the determination of shares.

On the negative side, the aggregation of the private sector does not allow for a proper distinction of profits between those of nonfinancial corporations and banks. The profit share corresponds to the profits of the aggregated corporate sector in terms of GDP. In this context, it is implicitly assumed that the effect of profit share on prices, discussed below, accounts also for financial costs (i.e., the interest rate on loans). Thereby, under this setup, the examination of conflicting claims between traditional capitalists and financiers is infeasible.

# Table 1. TFM of the LMSFC

| | Production | Private Sector | Government | Rest of the World | Sum |
|---|---|---|---|---|---|
| Private Expenditure | +PX | -PX | | | 0 |
| Government Consumption | +G | | -G | | 0 |
| Public Investment | +Ig | | -Ig | | 0 |
| Public Inventories | +INVg | | -INVg | | 0 |
| Exports of Goods | +XG | | | -XG | 0 |
| Exports of Services | +XS | | | -XS | 0 |
| Imports of Goods | -MG | | | +MG | 0 |
| Imports of Services | -MS | | | +MS | 0 |
| **[Memo]** | **[GDP]** | **[-Private consumption]** | **[-Public consumption]** | **[-Trade Balance]** | **[0]** |
| Compensation of Employees | -COMP | +COMPps | | +COMProw | 0 |
| Compensation of Employees from Abroad | | +COMProwps | | -COMProwps | 0 |
| Income from Self-Employment | -MIXY | +MIXY | | | 0 |
| Indirect Taxes | -IT | | +ITg | +ITrow | 0 |
| Subsidies | +SUBS | | -SUBSg | -SUBSrow | 0 |
| Government Gross Operating Surplus | -GOSg | | +GOSg | | 0 |
| Interest (private sector debt) | | -Rpsrow | | +Rpsrow | 0 |
| Interest (public debt) | | +Rgps | -Rg | +Rgrow | 0 |
| Interest (rest of the world debt) | | +Rrowps | | -Rrowps | 0 |
| Private Sector Income from Rent | | +RENTps | -RENTps | | 0 |
| Government Income from Rent | | -RENTg | +RENTg | | 0 |
| Earnings from FDI received from abroad | | +FDIps | | -FDIps | 0 |
| Earnings from FDI paid abroad | | -FDIrow | | +FDIrow | 0 |
| Dividends paid | -DIV | +DIVps | +DIVg | +DIVrow | 0 |
| Dividends received from abroad | | +DIVrowps | | -DIVrowps | 0 |
| Profits | -F | +F | | | 0 |
| Direct Taxes | | -DTps | +DT | -DTrow | 0 |
| Social Contributions | | -SOC | +SOC | | 0 |
| Social Benefits | | +BEN | -BEN | | 0 |
| Other Current Transfers (private sector) | | +CURRTRANSps | -CURRTRANSgps | -CURRTRANSrowps | 0 |
| Other Current Transfers (government) | | -CURRTRANSpsg | +CURRTRANSg | -CURRTRANSrowg | 0 |
| Other Current Transfers (rest of the world) | | -CURRTRANSpsrow | -CURRTRANSgrow | +CURRTRANSrow | 0 |
| Capital Taxes | | -KT | +KT | | 0 |
| Capital Transfers (private sector) | | +KTRANSps | -KTRANSgps | -KTRANSrowps | 0 |
| Capital Transfers (government) | | -KTRANSpsg | +KTRANSg | -KTRANSrowg | 0 |
| Capital Transfers (rest of the world) | | | -KTRANSrow | +KTRANSrow | 0 |
| **Total** | | **Private Sector Balance** | **Fiscal Budget** | **-Balance of Payments** | 0 |
| Change in Government Debt | | +ΔGDps | -ΔGD | +ΔGDrow | 0 |
| Change in Net Private Sector Liabilities | | -ΔPSL | | +ΔPSL | 0 |
| **Sum** | **0** | **0** | **0** | **0** | |

$$h_f = 1 - (h_w + h_g + h_{se} + h_{sh} + h_{row}) \tag{1}$$

Be that as it may, profits in levels are given by the product of the profit share and the GDP, as in equation (2). It should be noted that these profits are not netted with respect to the interest payments, since firms and banks are aggregated. In fact, they are closer to the definition of the gross operating surplus of the aggregate corporate sector.

$$F = h_f * GDP \tag{2}$$

As shown in equation (3), the wage share is equal to the compensation paid to domestic employees over GDP. Note that the compensation paid to foreign employees is treated exogenously.

$$h_w = \frac{COMP_{ps}}{GDP} \tag{3}$$

The share of the government sector is the sum of indirect taxes and the operating surplus of publicly owned enterprises, minus the subsidies, over GDP (see equation [4]).

$$h_g = \frac{INT + GOS_g - SUBS_g}{GDP} \tag{4}$$

Accordingly, the share of the self-employed in equation (5) is the mixed income over GDP, while the share of the external sector in equation (6) is equal to the compensation paid to foreign employees, minus the subsidies, over GDP.

$$h_{se} = \frac{MIXY}{GDP} \tag{5}$$

$$h_{row} = \frac{COMP_{row} - SUBS_{row}}{GDP} \tag{6}$$

### 3.1. The Private Sector

The private sector's gross income is given by the vertical reading of the second column of table 1. According to equation (7), it is determined by the sum of the various sources of income, regardless of whether the latter is the outcome of productive or financial activities, and augmented by the net transfer payments toward the private sector.

$$Y = COMP + MIXY + RENTIER + F + NetTrans \qquad (7)$$

In particular, employee compensation comprises wage income both from the productive sector and abroad. Rentier income is the sum of net interest and net rent receipts, dividend payments, and foreign direct investment–related profits, while the net transfers include social contributions, social benefits, and other current transfers. As is typical, the difference between gross income and direct taxes yields gross disposable income. Deducting private expenditure from the latter provides the private sector's gross savings. A further deduction of capital taxes from savings and the inclusion of net capital transfers produces the private sector's financial balance, or the net acquisition of financial assets. The allocation of these funds firmly follows the corresponding LIMG specification.

With respect to the main constituents of the gross income, the employee compensation paid by the productive sector consists of wages and social contributions. Note that in the calculation of the gross income that social contributions are included both in employee compensation and the net transfers but with an opposite sign and thus they are cancelled out. The wage bill in equation (8) is the product of the average wage ($w_{rate}$) and the level of employment. In turn, the average wage depends on the real wage and the private expenditure deflator. Both the real wage and employment are estimated empirically.

$$WAGE = w_{rate} * N \qquad (8)$$

A series of variables are treated as exogenous, including net rents, profits out of foreign direct investment, dividends, and other current and capital transfers. The interest payments depend on the effective interest rate and the lagged value of private debt.[6] We use the effective interest rate instead

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[6] The formulation is similar to the interest paid by the government in equation (16).

of the standard one for two reasons. First, the aim of the model is not to focus in detail on the model's financial implications and, second, it allows the avoidance of the typical conundrum in estimating interest payments.[7]

Finally, for the estimation of the private sector's real private expenditure, real disposable income (excluding profits) and the corporate sector's net real profits are treated as separate explanatory variables. In doing so, direct taxes are divided between household and corporate taxes. In equation (9), the real disposable income net of profits depends on the gross income net of profits and on the effective direct household income tax rate. The deflator denotes the private expenditure deflator.

$$YD_{h,k} = \frac{(1-dt_{h,rate})*(Y-F)}{ppx} \qquad (9)$$

In a similar vein, the real net corporate profits ($netF_k$) depend on the effective direct corporate tax rate and private expenditure deflator. Under this setup, real private expenditure resembles Zezza and Dos Santos's (2006) consumption function. As is evident in equation (10), real private expenditure depends linearly on real disposable income net of profits, expected real net corporate profits, lagged real net financial wealth,[8] new credit to households and firms, and factors representing capital gains, such as the stock market index and housing prices. The subscript $k$ represents real values.

$$PX_k = f(YD_{hk}, netF_k, FA_{(-4),k}, Loans_k, SMI_k, Phouse_k) \qquad (10)$$

According to this configuration, if real private expenditure is more elastic with respect to real disposable income net of profits, then it is rather likely that the regime of accumulation is not profit-led and vice versa. It is crucially important to note that the private sector's disposable income net of profits takes into account employee compensation, but also the income of the self-employed and the net transfers toward the corporate sector. Thereby, in this present constellation, the model is not able to determine whether the economy is profit-led or wage-led but strictly whether it is profit-led or not.

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[7] For a more detailed analysis on this topic, see Passarella (2018) and Zezza and Zezza (2018).
[8] Four lags are used with regards to financial wealth reflecting a lagged annual impact on private expenditure, given that the data used later on are quarterly.

### 3.2. The Government

Public revenue (*YG*) in equation (11) consists of: a) the gross operating surplus of and the dividends paid by the state enterprises (*GOSg* and *DIVpsg*); b) social contributions (*SOC*); c) other current and capital transfers (*CURRTRANSg* and *KTRANSg*); and iv) direct, indirect, and capital taxes (*DT, ITg,* and *KT*).

$$YG = GOS_g + DIV_{psg} + SOC + CURRTRANS_g + KTRANS_g + DT + IT_g + KT \quad (11)$$

The first two elements in the right-hand side of equation (11) are considered exogenous. The effective social contribution rate (*socrate*) in equation (12) is defined as the actual social contributions paid over the employee compensation of the private sector and the mixed income of the self-employed.

$$soc_{rate} = \frac{SOC}{COMP_{ps}+MIXY} \quad (12)$$

The third source of public revenue (including both types of transfers) is considered as exogenous, while the fourth source (i.e., taxes) serves as the main fiscal policy instrument in terms of public revenues. Commencing from the direct taxes in equations (13) and (14), the effective direct tax rates of households and firms (*dthrate* and *dtfrate*), respectively, are calculated as a ratio of direct taxes paid by the households and firms over their respective income flow. The direct taxes paid from abroad are assumed to be exogenous. The effective direct tax rates are critical policy rates, acknowledging that the actual outcome serves as a mere proxy, since the taxation system's progressiveness and the income distribution of the tax base are neglected under this specific configuration.

$$dt_{h,rate} = \frac{DT_h}{Y-F} \quad (13)$$

$$dt_{f,rate} = \frac{DT_f}{F} \quad (14)$$

The indirect taxes are split between value-added tax (VAT) revenues and revenues from other indirect taxes. The latter are treated exogenously. The VAT revenues are set according to the effective VAT tax rate, since a proper use of the statutory VAT rate would require a slightly more complex modelling approach so as to account for the VAT gap.[9] Therefore, the effective VAT rate (*vat_rate*) is simply defined as the ratio of VAT receipts over GDP.

Finally, capital taxes are treated exogenously since the capital stock is omitted in the LMSFC's formation. Additionally, a part of capital taxes is accounted for in the direct tax payments (Eurostat 2014). Given this data unavailability, even in the event of a separate treatment of the capital stock, a calculation of the effective capital tax rate would have been a poor approximation.

The government expenditure in equation (15) consists of: a) public spending ($G$), investment ($I_g$), and inventories ($INV_g$); b) interest payments on public debt ($R_g$); c) social benefits ($BEN$); and d) other forms of expenditures, like subsidies, current and capital transfers, and the acquisition of nonproduced nonfinancial assets.

$$GE = G + I_g + INV_g + R_g + BEN + Z \tag{15}$$

The first use of funds is considered exogenous, while the same applies for the fourth use of funds, denoted by $Z$. The interest payments in equation (16) depend on the lagged public debt ($GD$) and the effective interest rate ($eir_g$).

$$eir_g = \frac{R_g}{GD_{-1}} \tag{16}$$

Social benefits are divided between unemployment and other benefits. The latter are assumed to be in a constant relation with the GDP. The former depend on the effective unemployment benefit ratio, defined in equation (17) as the unemployment benefit payments ($BEN_{un}$) over the number of unemployed ($UN$).

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[9] See European Commission (2012b).

$$ben_{rate} = \frac{BEN_{un}}{UN} \qquad (17)$$

As is typical, the difference between public revenues and public expenditure yields the fiscal budget, corresponding to the financial balance of the public sector. Finally, the deduction of the interest payments provides the government's primary balance.

## 3.3. The External Sector

The formation of the external sector's identities is rather typical in the LMSFC and follows straightforwardly from the TFM. For instance, the trade balance corresponds to the net exports, which are exports minus imports of goods and services. The addition of income and interest payments and current transfers yields the current account, while the integration of capital transfers provides the balance of payments, or the inverse net lending/net borrowing position of the external sector. However, what deserves particular attention is the behavioral pattern determining the level of net exports.

With regards to the exports of goods and services, we integrate a demand effect, reflected in Greece's main trading partners' national income and one supply-side variable, which is the relative price of goods and services. Equation (18) depicts the linear exports of goods function, in which $i$ represents the trading partners under consideration.[10] The formulation of the real exports of services is identical.

$$XG_k = f(GDP_{k,i}, relpg,) \qquad (18)$$

In equation (19), real imports of goods are a linear function of real private expenditure, deflated public spending (including gross capital formation), and the relative price of goods. In advance, real imports of goods are also affected by the level of the exports of goods. The main reason behind this inclusion is to examine the economy's import content or, simply put, the productive sector's dependence on imported intermediate goods, which in the case of Greece has been found to be

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[10] Trading partners include Germany (DE), Italy (IT), France (FR), Cyprus (CY), the euro area (excluding DE, IT, FR, and CY), the United Kingdom (UK), Bulgaria (BUL), the European Union (excluding the euro area, UK, and BUL), Turkey, and the United States (US). Their choice has been based on the fact that, according to OECD data, they were Greece's top trading partners in 2015.

particularly high (Pierros 2019). It becomes obvious that in the case of a large dependence on imports, the export-led growth envisaged by the proponents of the internal devaluation policy is infeasible.

$$MG_k = f(PX_k, G_k, relpg, XG_k) \tag{19}$$

An alternative specification would include real GDP instead of the constituents of demand, if the statistical properties of the model require so. Needless to mention, the import of services is estimated in a similar fashion. A final remark is related to the balance of payments, which, as in the case of the LIMG, it is determined via two identities. The first is given by the current account after incorporating capital taxes and transfers, while the second stems from the financial balances. Following Papadimitriou, Nikifors, and Zezza (2013), the latter is assumed to be the residual identity, which is not imposed on the system, but consistency demands that it holds at all times.

### 3.4. Labor Market and Labor Productivity

Contrary to the standard approach in SFC models, in which the employment ($N$) depends on real labor productivity (*prod*) and GDP, the employment function is estimated econometrically, taking into account a set of demand factors and a set of structural factors. According to equation (20), employment is a log-linear function of the real labor productivity, sources of demand, (i.e., private expenditure, public spending, and exports), and the educational level of employees, with *edu* denoting the share of skilled workers (i.e., those who have successfully completed their tertiary education) in the total labor force.

$$N = f(prod, PX_k, G_k, X_k, edu) \tag{20}$$

Unemployment is the difference between the labor force—involving persons aged between 15 and 64 years old and growing at an exogenous rate—and employment. Similarly, the unemployment rate (*ur*) is given by the number of unemployed over the total labor force.

According to Nikiforos and Zezza (2017), labor productivity in SFC models is usually considered to be given or growing at a constant rate. The present study departs from this practice and estimates productivity empirically. In line with the work of Valdecantos (2012) and Passarella (2018), we

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introduce a Verdoorn effect on productivity, augmented by other structural factors. Apart from the demand effect, critical for the examination of the driving forces of labor productivity is the share of large corporations in total corporations (*largecorp*). Specifically, large corporations employ a larger share of productive capital, they implement a crucial mass of physical investment, and job positions are more specialized. Mayhew and Neely (2006) also refer to the importance of education and training of both employees and managers. The share of highly educated employees over the population size (*edu*) is taken under consideration. However, the lack of qualitative and quantitative data obstructs the integration of a similar variable with respect to managers. The research and development (R&D) spending as share of GDP (*r&d*) is also considered as a driving force for technological progress. In addition, we employ the share of female employees in the total employment (*fem*) as a proxy for the labor supply variation. In particular, the share of female employees reflects labor force utilization, given that the employment of male employees is usually closer to full capacity and moves procyclically. The proposed specification is provided in equation (21), which is assumed to be log-linear.

$$prod = f(h_f, \ I_{g,k}, PX_k, X_{g,k}, largecorp, fem, edu, r\&d) \qquad (21)$$

Of equal importance to labor productivity is the determination of the real wage. In particular, the focus is laid upon the average real wage's determinants, defined as the wage bill over the number of employees, adjusted for changes in the private expenditure deflator. In the SFC literature, real wages—and consequently, prices—are the outcome of conflicting claims. According to Kalecki (1971), wages depend on the relative strength of labor unions and the associated institutions in demanding and actually receiving higher wages.

Following firmly and in a more sophisticated manner, Godley and Lavoie (2007, 386) consider the determination of the real wage as a nonlinear function of the employment rate and labor productivity. The real wage increases in line with the employment rate, considering that near full employment conditions provide ample strength to the labor unions to attain higher wages. Accordingly, the nominal wage is assumed to be a function of the real wage adjusting to the real wage desired by the labor unions.

In the present case, the average real wage is assumed to be a log-linear function of the unemployment rate, labor productivity, and employee tenure, as reported in equation (22). The distance between the minimum and median wage (*minw*) and the collective bargaining coverage ratio (*collbarg*) is included as an indicator of the dispersion of wages across all sectors of the economy. This dispersion, in particular with respect to the minimum wage, could have multiple readings. For instance, the significance of the minimum wage could reflect an economy that creates low-quality jobs or that there is low-to-moderate income inequality.

$$(wage_{ratek}) = f(ur, prod, tenure, edu, minw, collbarg) \tag{22}$$

It should be mentioned that labor market institutions also include the flexibility of the labor market and in particular the prevalence of part-time and temporary employment. Active labor market policies affect labor market conditions in advance. For instance, the introduction of a large job-creation program is likely to have a considerable impact on the determination of wages and the relative strength of the labor unions. The integration of these features is a topic for further research.

## 3.5. Price Deflators

In the (post) Kaleckian literature, the price setting process practically determines the income distribution between employers, employees, and financiers. As shown in equation (23), domestic prices, mirrored by the price deflator of private expenditure, depend linearly on the profit share, the effective VAT rate, labor productivity, the price of energy, and the price of imported goods. The interest rate on loans is excluded, as it would create endogeneity issues with the profit share. Instead, it is used as a substitute for the latter, if the profit share is found to be statistically insignificant.[11]

$$ppx = f(h_f, vat_{rate}, prod, penergy, \ pmg) \tag{23}$$

The first explanatory variable reflects the weight of profits in the formation of prices. The usage of the effective indirect tax rate is straightforward. The price of energy is treated as exogenous, though

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[11] Furthermore, the wage share or the average wage could be used as regressors with the appropriate length of lags, which would ensure the absence of collinearity with the profit share.

it could be modelled with respect to oil prices and the domestic economy's demand for energy. Finally, the price of imported goods is included in the calculations in order to capture the impact of the import content on domestic prices. Note that the public sector deflator is assumed to follow the lagged growth rate of the private expenditure deflator. The price of exported goods in equation (24) is identical to that of the private expenditure deflator, save the VAT rate. However, the VAT rate is included in the price of exported services given the large share of tourism in the output of the overall sector.

$$pxg = f(h_f, prod, pmg, penergy) \tag{24}$$

## 4. DATA, ECONOMETRIC METHODS, AND EMPIRICAL RESULTS

The data employed in the construction of the LMSFC are quarterly, covering the period from the 1999Q1 to 2016Q4, and they have been retrieved from the sectoral accounts of Eurostat and the financial accounts of the Bank of Greece (BoG). Additional data have been drawn from the OECD, and the European Commission's Annual Macroeconomic database, as well as Federal Reserve databases.

With regards to the TFM's construction, the integration of households, firms, and banks in the private sector allows for a close approximation of the inflows and outflows between the private, public, and external sectors. Problems regarding the construction of the "who pays whom" matrix arise only in the case of interest payments and capital transfers. The public sector's interest payments toward the other two sectors have been divided according to the lagged value of the public debt held by the private and external sectors. Additionally, capital transactions and the acquisition of nonproduced, nonfinancial assets have been divided after observing the data.[12] Finally, whenever the time dimension of specific variables was smaller than the time dimension of the overall sample, the flow variables were assumed to be equal to their latest available value or to grow at a constant rate (i.e., the trend of the past twelve quarters).

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[12] Some minor disturbances occur, which do not however affect the estimations. See Appendix I for a more detailed discussion.

Due to space limitations, it is infeasible to engage in a proper discussion of the econometric techniques applied in the estimations and the associated results. The techniques applied in the estimations are discussed in Appendix II, while the values of the estimated coefficients are presented in Appendix III. However, it is important to discuss some specific empirical findings that are connected to the internal devaluation policy's implementation.

Firstly, the coefficient of the private sector's disposable income net of profits in the private expenditure function exceeds unity (i.e., it is equal to 1.39), implying that the private sector's spending pattern, and especially households, is debt-led. Specifically, households' spending was financed by increased borrowing before the crisis, while after the crisis it has been financed by accumulated financial resources. In fact, since 2012, household consumption exceeds their disposable income, indicating that savings are negative, while their cash holdings and deposits are dropping (Koratzanis and Pierros 2017). Furthermore, the coefficient of net real corporate profits is particularly low (it is equal to 0.41), denoting the corporate sector's reluctance to invest. In particular, their savings exceed their investment activity, thus their financial balance is positive (Argeitis, Koratzanis, and Pierros 2017). In this respect, the Greek economy's growth pattern is clearly unsustainable, with the implementation of the internal devaluation policy aggravating the private sector's unsustainability conditions.

Secondly, the main driver of the import of goods is the export of goods (the coefficient is equal to 0.98), while private expenditure has only a limited effect on imports (the corresponding value is equal to 0.37). This finding indicates that there is a significant structural deficit in the domestic productive sector, which renders the attainment of export-led growth infeasible. Thereby, the primary problem of the Greek economy does not lie in its cost competitiveness but on its poor productive capacity and, specifically, the high import content of the exporting sector. In this respect, the implementation of the internal devaluation policy is clearly inappropriate, as it totally neglects any structural considerations.

Thirdly, and following firmly from the second finding, both the private expenditure deflator and the exports of goods deflator are heavily influenced by the price of imported goods. Therefore, the poor structure of the domestic sector does not only generate a limitation in terms of exporting capacity but it also poses constraints in terms of cost competitiveness. It is important to mention that the

profit share has a larger impact the average wage than it does on domestic prices. This likely follows from the size of Greece's nontradable sector, which has higher profit margins as compared to the tradable sector. This is another fact indicating that the internal devaluation policy is inappropriate for the Greek economy, as it not only failed to boost exports, but it also increased the profit margins in particular sectors (Pierros 2019).

Finally, the average wage has been found to be critically, as well as negatively, dependent on the unemployment rate, as expected, but also positively related to the distance between the minimum and median wage. It is likely that the corporate sector produces low-skill jobs (Argeitis et al. 2018), thus the minimum wage has a strong impact on the average wage. Furthermore, the collective bargaining coverage rate has been found to be statistically insignificant. Instead, a variable reflecting the share of part-time and temporary employment in total employment has been used, which exerts negative pressure on the average wage.

## 5. SIMULATIONS

The LMSFC consists of 94 equations, among which 11 are behavioral. The system was solved simultaneously. However, many variables in the behavioral equations were found to be statistically insignificant. A trial and error approach was applied, which entailed the manual removal of insignificant variables, but also variables that generated collinearity or trivialized cointegration, followed by another round of simultaneous estimation. This process was repeated until the point in which all variables were significant, collinearity was at a minimum level, and cointegration was not rejected by the relevant tests, while the coefficients were relatively stable.

Having attained a solution to the model, in-sample projections were applied in order to ensure that the model replicates actual data efficiently. Figure 1 presents the net acquisition of financial assets (NAFA) by the private sector as estimated by the LMSFC model and compares them to the actual data. The model replicates the data fairly well, save the period from 1999–2002, where a minor discrepancy is observed. This is likely related to the serial correlation with regards to the import and export of services, which is presented in the start of the sample, as discussed in Appendix II. The LMSFC replicates the evolution of the fiscal budget in figure 2 efficiently.

**Figure 1. Net Acquisition of Financial Assets (in million euro, 1999Q1–2016Q4)**
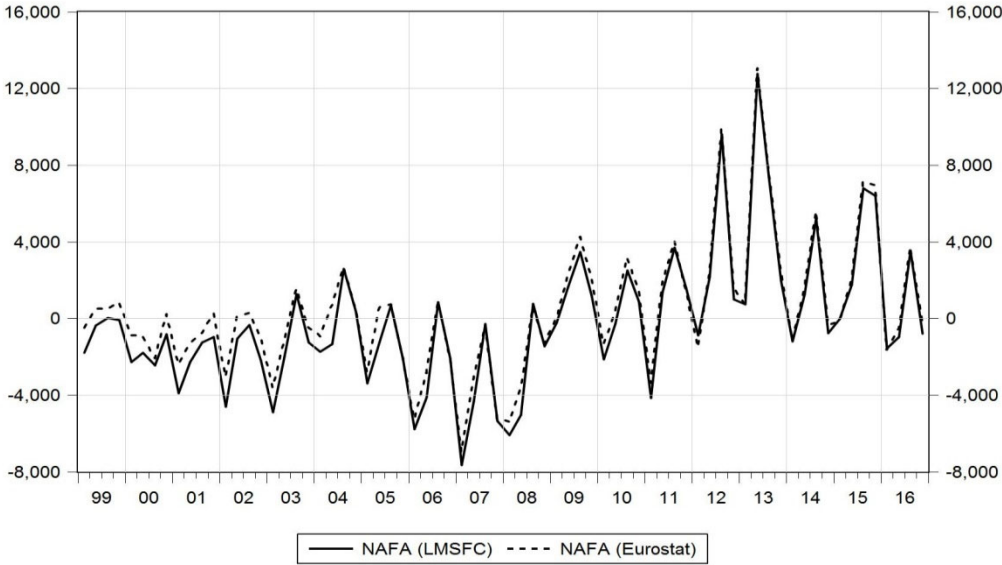


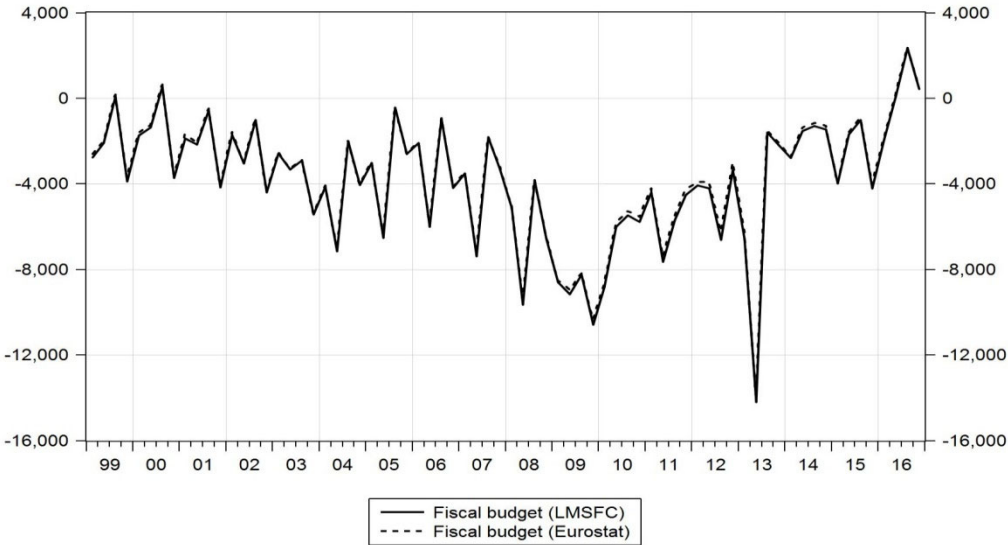**Figure 2. Fiscal Budget (in million euro, 1999Q1–2016Q4)**

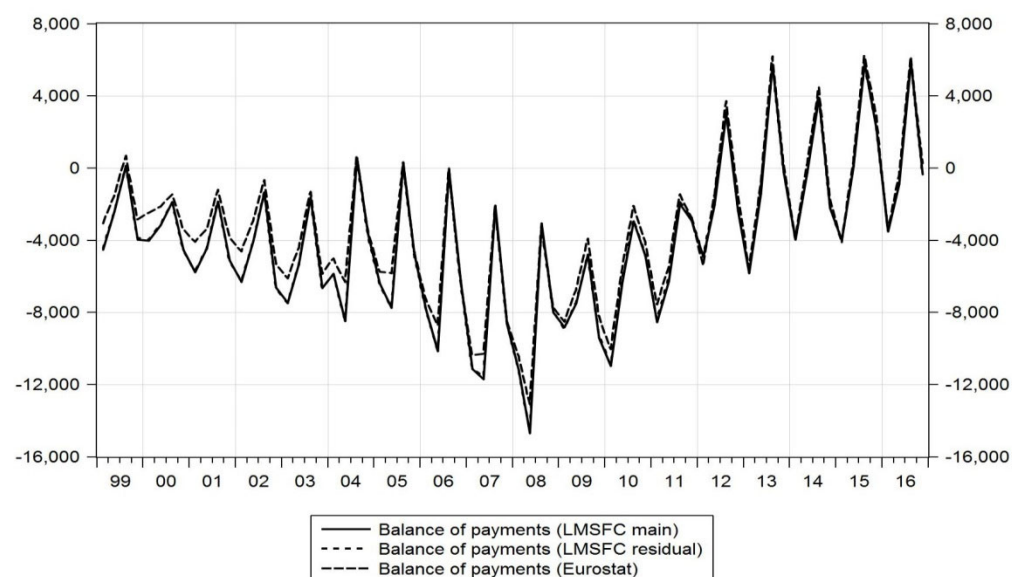**Figure 3. Balance of Payments (in million euro, 1999Q1–2016Q4)**



Figure 3 serves a dual purpose. Firstly, the LMSFC replicates actual data well, except for an initial period between 1999 and 2002. This is again attributed to the presence of serial correlation that vanishes afterwards. In conjunction with the serial correlation observed in figure 1, the discrepancy cancels out. Secondly, the model is consistent, as the balance of payments calculated via the residual function is perfectly equal to the one retrieved by the main equation.

Having examined the LMSFC's consistency and efficiency, a set of policy scenarios is taken under consideration. In particular, policy changes are introduced in the model in its out-of-sample projections, which are then compared to the baseline scenario.[13] Specifically, we examine: a) two scenarios regarding an increase of the minimum wage in 2019Q1; and b) a decrease in the share of partial and temporary employment in total employment, again in 2019Q1. It is worthy of mentioning that in the out-of-sample projections, the exogenous variables (ex., public consumption) were held constant. More importantly, data regarding external trade were taken from the

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[13] Given that the data used in the LMSFC end in 2016Q4, short-term projections regarding the evolution of real GDP are of no use. However, it is important to notice that for 2017, real GDP growth was estimated to be equal to 1.3 percent, being slightly off its actual value by 0.2 percent, while for 2018 the growth was projected to be equal to 2.1 percent, exceeding the actual growth rate by 0.2 percent. The model tends to overestimate net exports and underestimate private expenditure. As discussed in Appendix I, the projections ought not to be considered as a forecast but rather as an examination of the properties of the Greek economy.

International Monetary Fund's *World Economic Outlook* (IMF 2018). Given that, the IMF's current projections regarding the world economy are more pessimistic (IMF 2019), the following scenarios ought to be viewed strictly as indicative.

Commencing from the first scenario, a one-off increase in the minimum wage by 10 percent in 2019Q1 (scenario 1) is compared to a gradual increase in the minimum wage by 2.5 percent each quarter of the same year (scenario 2). The results in terms of real GDP and employment are presented in figures 4 and 5. In both scenarios, the impact on real GDP is positive. The 10 percent increase in the minimum wage, which the SYRIZA government introduced in February of 2019, is projected to yield an additional 0.7 percent of growth in real GDP. The overall outcome of a gradual minimum wage increase of 2.5 percent would have added 0.9 percent to real GDP growth.

In terms of employment, the overall outcome is somewhat similar. In scenario 1, the unemployment rate is projected to fall by almost 0.7 percent, while in scenario 2 the reduction as compared to the baseline scenario is equal to 0.85 percent. It would not do great injustice to argue that the Greek economy is not profit-led, since a redistribution of the national income in favor of labor has a positive impact on aggregate demand. However, the overall effect both in terms of output and employment is moderate. One would expect that this is owed to an increase in the balance of payments following an increase of domestic demand. However, the actual mechanism is somewhat different. Fiscal consolidation and in particular the high tax rates mitigate the impact of an increased wage share on domestic demand.

**Figure 4. Impact of a Rise in the Minimum Wage on Real GDP (2017Q1–2023Q4)**
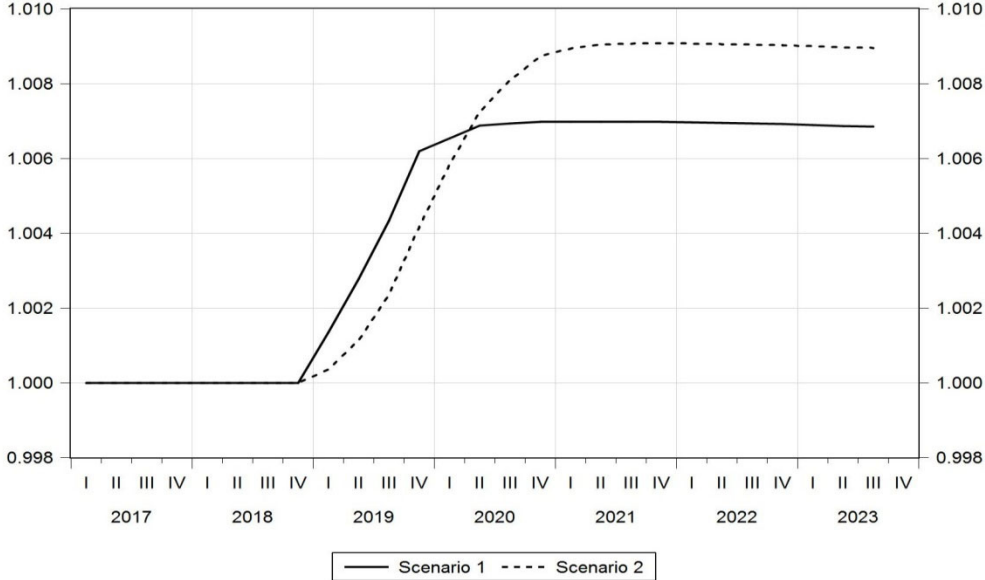


**Note:** Comparison with baseline scenario. Four period moving averages.

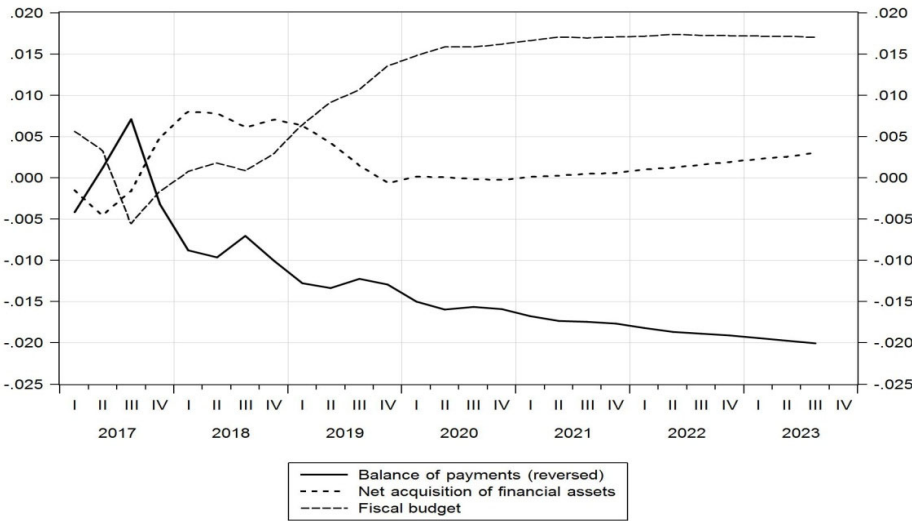**Figure 5. Impact of a Rise in the Minimum Wage on the Unemployment Rate (2017Q1–2023Q4)**
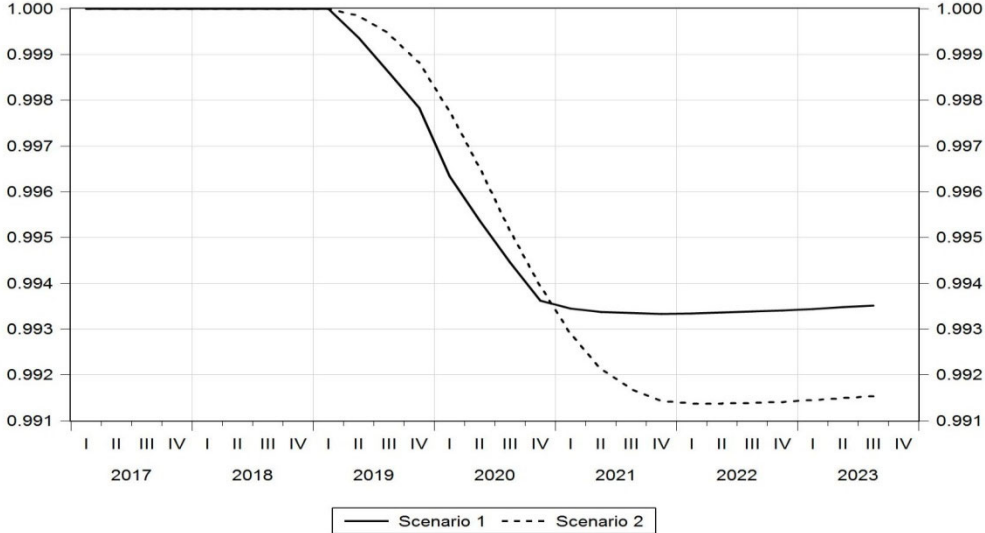


**Note:** Comparison with baseline scenario. Four period moving averages.

As is evidenced in figures 6 and 7, which present the evolution of the sectoral financial balances in terms of GDP, the fiscal budget increases considerably and the external sector is in deficit, while the private sector's financial balance is reduced when the minimum wage increase is imposed. It is worth mentioning that the balance of payments is positive due to the financial inflows from the European Structural Funds, which account for 2 percent of GDP, on average. Once the shock is absorbed, the private sector's financial balance recovers. Due to the private sector's excessive spending, the financial balance in scenario 2 becomes negative for a short period, generating temporary destabilizing tendencies. Thereby, scenario 1 is likely a more preferable choice. Needless to mention that in the case of a full restoration of the minimum wage to the precrisis level (i.e., an increase of 25 percent), growth in output and employment would have been more robust, but the private sector's financial balance would have turned even more negative.

However, the results should be viewed with skepticism, since it is unclear whether the additional income created by the minimum wage increase would be spent or if the households would prefer to repay their debt payment commitments and their arrears toward the government, which are both exceptionally high (Koratzanis and Pierros 2017). Alternatively stated, it is infeasible to determine whether a structural break has occurred or will do so with regards to the behavior underlying the private expenditure of the private sector.

**Figure 6. Sectoral Financial Balances in Scenario 1 (percent of GDP, 2017Q1–2023Q4)**



**Note:** Comparison with baseline scenario. Four period moving averages.

Scenario 3 is dedicated to the restoration of the nationwide collective bargaining agreements, reflected in the present case as a reduction in the share of part-time workers in total employment, from 20.1 percent in the 2016Q4 to 14 percent in the 2019Q1. The overall effect is stronger for both output and employment growth. Specifically, real GDP is projected to be 1.5 percent higher than in the baseline scenario, while the unemployment rate is projected to fall by an additional 1.4 percent (see figure 8).

**Figure 7. Sectoral Financial Balances in Scenario 2 (percent of GDP, 2017Q1–2023Q4)**
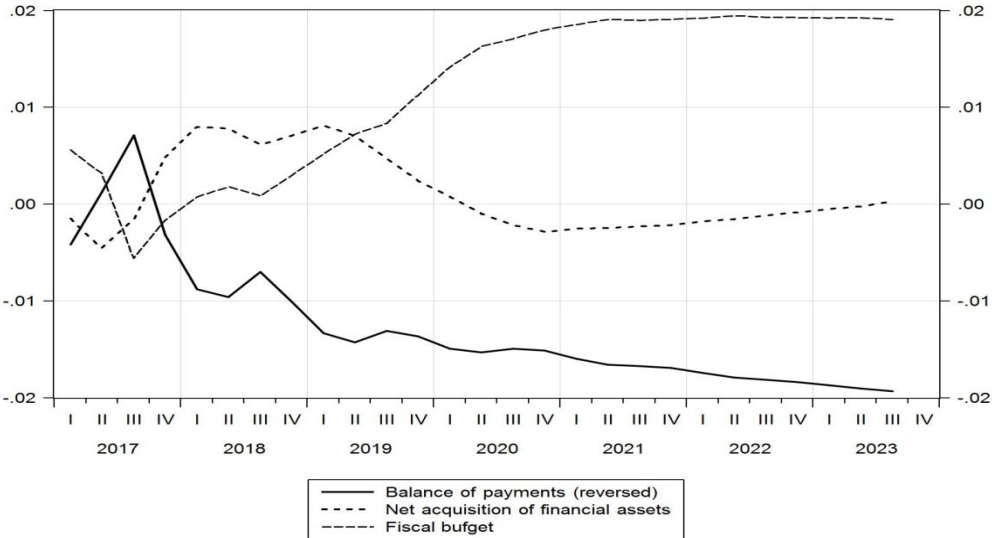


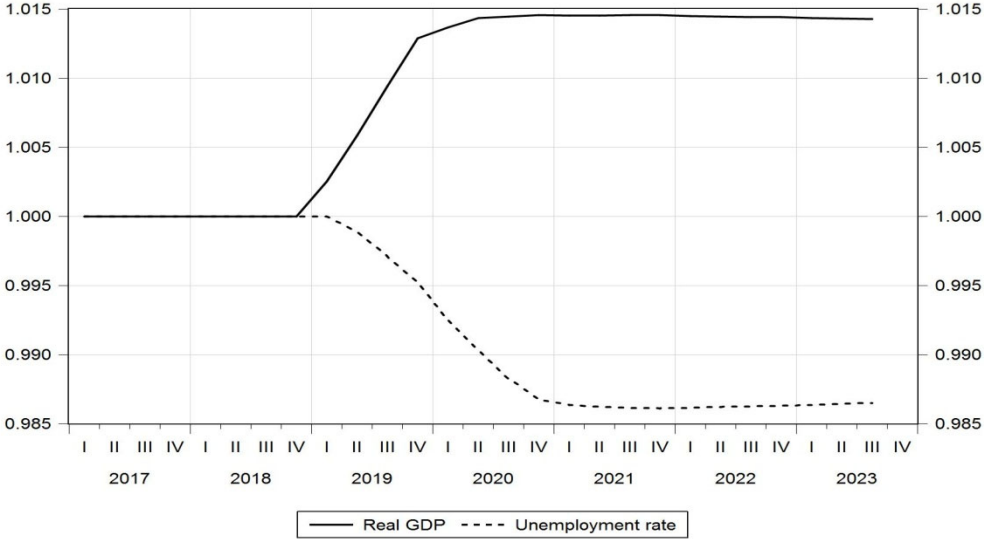**Note:** Comparison with baseline scenario. Four period moving averages.

**Figure 8. Real GDP and Unemployment Rate in Scenario 3 (2017Q1–2023Q4)**



**Note:** Comparison with baseline scenario. Four period moving averages.

It appears that the enhanced labor market flexibility and the promotion of firm-level agreements and part-time employment had a stronger negative effect on the average wage as compared to the reduction of the minimum wage. This is also observed in figure 9, which presents the evolution of the wage shares in scenarios 1 and 3. The increase in the latter case is exceptionally high as compared to the former.

**Figure 9. Wage Share in Scenarios 1 and 3 (2017Q1–2023Q4)**



**Note:** Comparison with baseline scenario. Four period moving averages.

**Figure 10. Sectoral Financial Balances in Scenario 3 (percent of GDP, 2017Q1–2023Q4)**



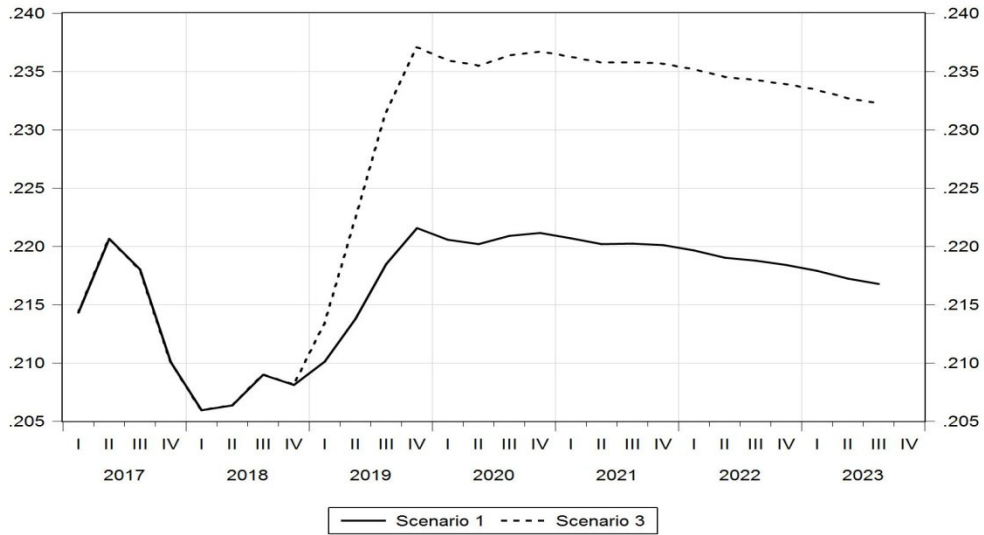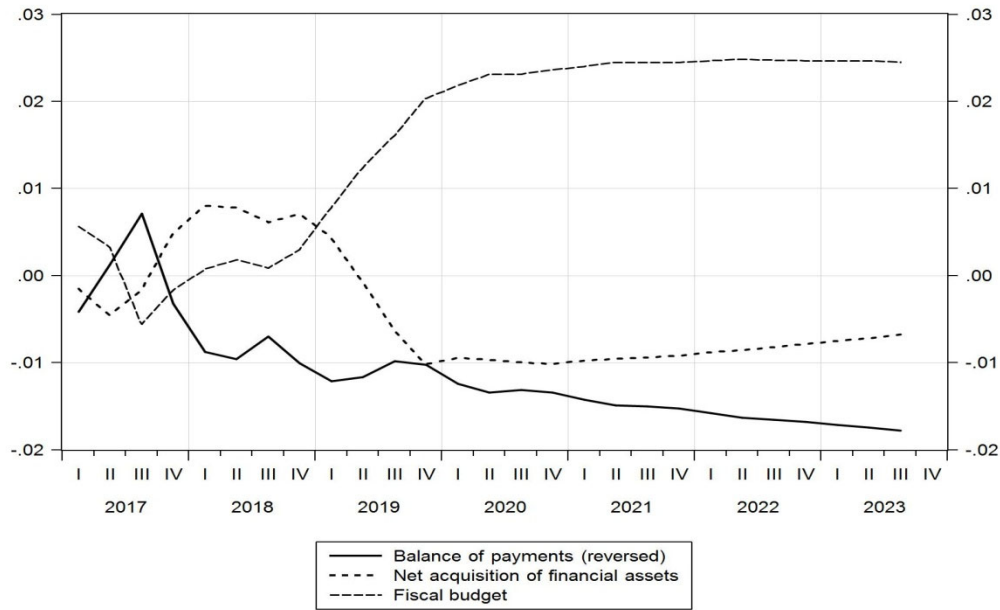**Note:** Comparison with baseline scenario. Four period moving averages.

None the less, the impact on the private sector's financial balance is even stronger. As depicted in figure 10, not only is the private sector's financial balance consistently negative, but the surplus in the balance of payments is mitigated. Considering that the inflows from the European Structural Funds fluctuate between 1.5 percent and 2 percent of GDP, net exports are negative. More importantly, the increase of the fiscal surplus is robust, highlighting the asphyxiating impact of fiscal policy on the private sector's solvency and domestic demand. This finding provides a solid foundation for arguing that the private sector's financial fragility has been triggered by fiscal as well as income austerity, increasing nonperforming loans to unprecedented levels.


## 6. CONCLUSIONS


In this paper, a Godley-type SFC empirical model was constructed, aiming to assess the implementation of an internal devaluation policy in an actual economy. In particular, the impact of functional income distribution on private expenditure is taken into account by estimating wage and profit shares. In turn, the wage share is considered as an outcome of labor market institutions (i.e., collective bargaining agreements and the minimum wage). In this respect, the labor market augmented–SFC is able to examine the impact of labor market deregulation on export performance and domestic demand.

The LMSFC was then applied to the Greek economy. Three policy scenarios were implemented, including a one-off 10 percent increase of the minimum wage, a gradual increase of the minimum wage by 2.5 percent in the course of one year, and the restoration of national bargaining agreements, reflected in a decline of the share of part-time and temporary employment in total employment. The results of the aforementioned scenarios in terms of output, employment, and sectoral financial balances are somewhat similar, though of a varying intensity. In all cases a reregulation of the labor market is expected to have positive output and employment growth effects. In the case of scenario 3 (i.e., a reduction of the share of part-time workers), the effect is significantly stronger, implying that the substitution of full-time jobs with part-time employees had a more severe impact on the average wage as compared to the minimum wage.

In parallel, in all three scenarios the wage share increases, providing evidence that the Greek economy is not profit-led. In fact, the Greek economy appears to be debt-led, since the propensity to consume out of the private sector's disposable income net of profits exceeds unity. This finding, in conjunction with the poor export capacity of the domestic productive sector and the harsh fiscal austerity, specifies the limits to private-expenditure-based growth. First of all, the debt-led growth regime generates a destabilizing tendency in terms of the private sector's financial conditions. Secondly, fiscal austerity hinders the increased domestic demand's growth effect and additionally undermines the private sector's solvency. Thirdly, the domestic corporate sector's export capacity is such that it does not allow the attainment of a trade surplus that would result in a sufficient inflow of funds to counterbalance the negative effects of fiscal austerity.

Given these particular institutional and behavioral characteristics and their corresponding limitations, another policy mix is required in the case of Greece to ensure the viable growth prospects of the economy. Specifically, in the short-term, the reregulation of the labor market is considered as imperative, as it would restore the level of domestic demand. In addition, fiscal policy ought to be redesigned so as not to hinder output growth and trigger financial instability. This of course implies the restructuring of Greek public debt. However, Greece's medium- and long-term prospects would be ensured by a public-investment-led strategy, (i.e., infrastructure, green economy, etc.). Such a policy would enhance the productive sector's structure and improve its ability to generate a sustainable trade surplus.

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## APPENDIX I. A NUMERICAL TFM OF THE LMSFC MODEL

## Table A1. TFM (1999Q1)

|  | Prod | PrivS | Gov | RoW | Sum |
|---|---|---|---|---|---|
| Private expenditure | 28582 | -28582 |  |  | 0 |
| Public spending | 5441 |  | -5441 |  | 0 |
| Public investment | 1839 |  | -1839 |  | 0 |
| Public inventories | 230 |  | -230 |  | 0 |
| Exports | 4857 |  |  | -4857 | 0 |
| Imports | -9064 |  |  | 9064 | 0 |
| GDP | 31885 | -28582 | -7510 | 4207 | 0 |
| Comp | -5636 | 5570 |  | 66 | 0 |
| Compg |  | 3110 | -3110 |  | 0 |
| Comprow |  | 180 |  | -180 | 0 |
| Soc |  | -3748 | 3748 |  | 0 |
| ProdTax | -1945 |  | 1945 |  | 0 |
| VAT | -2116 |  | 2116 |  | 0 |
| ImTax | -52 |  |  | 52 | 0 |
| OthINT | -262 |  | 262 |  | 0 |
| Subsprod | 662 |  | -3 | -659 | 0 |
| Subsoth | 75 |  | -3 | -72 | 0 |
| Mixed income | -13484 | 13484 |  |  | 0 |
| Ggos | -4063 |  | 4063 |  | 0 |
| Interestw |  | -146 | -562 | 708 | 0 |
| Interestp |  | 3337 | -3023 | -314 | 0 |
| Divpspay |  | -193 | 189 | 4 | 0 |
| Divpsrec |  | 18 |  | -18 | 0 |
| FDIpay |  | -102 |  | 102 | 0 |
| FDIrec |  | 19 |  | -19 | 0 |
| Rent |  | -31 | 31 |  | 0 |
| Profits | -5064 | 5064 |  |  | 0 |
| DT |  | -2051 | 2063 | -12 | 0 |
| Ben |  | 3218 | -3218 |  | 0 |
| IntCooppay |  |  | -50 | 50 | 0 |
| IntCooprec |  |  | 158 | -158 | 0 |
| Euown |  |  | -312 | 312 | 0 |
| Miscg |  | -344 | 344 |  | 0 |
| Miscw |  | -101 |  | 101 | 0 |
| Miscp |  | 914 | -270 | -644 | 0 |
| Ktax |  | -82 | 82 |  | 0 |
| Grantsg |  |  | 496 | -496 | 0 |
| Grantsp |  | 16 | -16 |  | 0 |
| Grantsw |  |  | -23 | 23 | 0 |
| Acq |  | -62 | 155 | -93 |  |
| SUM | 0 | -512 | -2448 | 2960 | 0 |
| NLNB (Eurostat) |  | -470 | -2584 | 3054 | 0 |
| Res |  | -42 | 136 | -94 | 0 |
| NLNB (BoG) |  | 12915 | -1908 | -9870 | 1137 |
| NLNBres |  | -13385 | -676 | 12924 | -1137 |

The reading of the TFM follows from the structure of the model presented within text. The row "SUM" yields the net lending/net borrowing position of the three institutional sectors, while the following row, "NLNB (Eurostat)," presents the actual financial balances as provided by Eurostat. The discrepancy between the estimated and the actual data, given in the row "Res," is rather small and is mainly attributed to the assumptions made in order to construct the "who pays whom" matrix regarding the capital transfers. In this respect, the LMSFC's TFM replicates actual data quite satisfactorily.

However, major concerns arise when comparing the financial balances as stemming from the nonfinancial transactions provided by Eurostat with those from the Bank of Greece's financial transactions. Firstly, the financial balances from the financial transactions do not add up to zero (see the penultimate row), thereby, the data are not consistent. Secondly, the discrepancy between the two types of financial balances is enormous (see last row). For instance, the difference for the private sector in 1999Q1 was equal to 13.9 billion euro, which is equal to the one-third of the GDP in the same quarter.

Given these data limitations, the model could hardly be considered as a forecasting tool. For instance, in the lower part of the TFM, there are seven types of discrepancies, with some of them being highly significant. These discrepancies are treated as exogenous. Therefore, the model is prone to forecasting errors. For this reason, the LMSFC is used as a mechanism for the examination of the properties of the Greek economy, given the data limitations and their inconsistency.

# APPENDIX II. SOME NOTES ON THE ECONOMETRIC ESTIMATION OF THE BEHAVIORAL EQUATIONS

Due to the size of the sample, which contains a structural break in most of the series (i.e., the outburst of the crisis), an à la Perron (1997) breakpoint augmented Dickey Fuller (ADF) unit root test, accompanied by standard Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests, was applied.[14] The model that provided the minimum Schwarz information criterion (SIC) value was preferred. Almost all variables have been found to be nonstationary of the first order. Exports and imports of services, real net profits, R&D spending, and the share of large corporations were found to be stationary, while the real GDPs of Bulgaria, the rest of the EA member states, and of the rest of the EU member states had two unit roots.

Due to the small sample size that contained at least one structural break, an error correction model would have provided suboptimal results (Stock and Watson 1993). Thereby, a dynamic ordinary least square (DOLS) model has been applied to all variables[15] except stationary exports and imports of services, in which an autoregressive distributed lag (ARDL) model has been used. In advance, a series of dummy variables was included in the econometric estimations. The *global1* and *global2* dummies aim to capture a break in the trend or the intercept, respectively, caused by the global financial crisis. The *specific1* and *specific2* dummy variables aim to capture a break in the trend or the intercept due to the Greek economic crisis. It is worthy of mentioning that the *specific1* dummy variable is equal to one only between 2010Q1–2013Q4, since after 2013 the output is not falling but is stagnant (INE-GSEE 2019). The *lmd* dummy variable, which is equal to one after 2011, aims to capture the impact of labor market deregulation implemented in the context of the EAPs after 2011. The dummy variable *CC* is equal to one in 2015Q3, denoting the implementation of capital controls. Other dummies have been included, depending on the properties of each particular estimated equation.

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[14] Taking into account different models (i.e., with trend, break in trend, break in constant and trend, etc.), overall twelve unit root tests have been applied to each variable.

[15] A Granger causality test is first applied before the DOLS estimation in order to ensure that the leads cause the dependent variable (Hayakawa and Kurozumi 2008).

Regarding the robustness of the results, the DOLS estimations are followed by a coefficient variance decomposition test, so as to test for collinearity, and by four cointegration tests including Hansen's instability (Hansen 1992), Park's added variable (Park 1990), the Engle-Granger (1987), and the Phillips-Ouliaris (1990) tests. It is also important to note that the leads and lags have been chosen according to the minimum SIC test.

In the case of the ARDL models, a series of serial correlation and heteroskedasticity tests is applied, such as the standard autocorrelation function and the Jarque-Berra normality tests (Jarque and Berra 1980), the normality regression equation specification error test (RESET) (Ramsey 1969), the Breusch-Godfrey maximum likelihood (LM) test (Breusch and Pagan 1979), and the autoregressive conditional heteroskedasticity (ARCH) test (Engle 1982). Overall, most of the estimated equations behave properly and are cointegrated, save a serial correlation that is present in the case of the exports and imports of services. Specifically, serial correlation is observed in the start of the sample, which vanishes after 2002 when the euro currency is officially introduced in Greece. Most likely serial correlation is related to measurement errors and the quality of the data. However, it does not affect in any significant manner the estimated output.

# APPENDIX III. VALUES OF THE ESTIMATED COEFFICIENTS

The following table presents the values of the coefficients estimated as described above and which have been used in the simulations. Note that all estimated values denote the long-run coefficients.

| Private expenditure | | Exports of goods | | Imports of goods | |
|---|---|---|---|---|---|
| Disposable income | 1.39 | USA | 1.06 | Private expenditure | 0.37 |
| Net profits | 0.41 | Germany | 0.02 | Exports of goods | 0.98 |
| Financial wealth | 0.03 | PM of goods | 1725.11 | Relative prices | -21787 |
| Loans to firms | 0.53 | Constant | -19326 | Constant | 13041 |
| Loans to households | -0.33 | Trend | -95.15 | Capital controls | -1968.79 |
| Capital controls | -4739.92 | Trend^2 | 0.53 | Global2 | 1239.34 |
| Deflator outlier | -4947.07 | Capital controls | 924.75 | Specific | -724.29 |
| | | | | EMU crisis | -889.61 |
| **Exports of services** | | **Imports of services** | | **Labor productivity** | |
| USA | 9.66 | Relative prices | 0.31 | Private expenditure | 0.01 |
| Italy | 2.27 | Real GDP | 6.66 | Exports of goods | 0.02 |
| UK | 0.04 | Capital controls | 0.04 | Constant | 57.11 |
| Capital controls | -2550.93 | EMU crisis | -703.73 | Trend | 0.49 |
| Global | 2204.62 | Deflator outlier | -501.44 | Trend^2 | -0.01 |
| **Employment** | | **Average wage** | | **Private expenditure deflator** | |
| Private expenditure | 0.05 | Unemployment rate | -3.93 | PM of goods | 0.35 |
| Exports of goods | 0.04 | Minimum wage | 1.7 | Profit share | 0.49 |
| Productivity | 0.23 | Part-timers | -4.77 | Average wage | 0.11 |
| Exports of services | 0.03 | Constant | -3.69 | Constant | 0.05 |
| Constant | 6.31 | LMD2 | -0.54 | Trend | 0.01 |
| Specific | 0.02 | EMU crisis | -0.35 | | |
| **Exports of goods deflator** | | **Exports of services deflator** | | | |
| PM of goods | 1.03 | Average wage | 0.06 | | |
| Constant | 0.04 | VAT rate | 0.87 | | |
| Trend | -0.01 | PM of goods | 0.28 | | |
| Trend^2 | 0.01 | Constant | 0.25 | | |
| Specific 2 | -0.05 | Trend | 0.01 | | |
| EMU crisis | -0.05 | | | | |
| Deflator outlier | 0.04 | | | | |