Stock-Flow Consistent Macroeconomic Models:
from Theory to Practice

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Abstract

An increasing number of researchers in macroeconomics has been adopting the Stock-Flow Consistent (SFC) approach to model whole economic system. These models, contrary to modern New Classical and New Keynesian macroeconomic models, integrate the analysis of real markets with flow-of-funds analysis, providing the perfect structure to study modern capitalist systems, with all the links between the "real" and (an usually rather complex) "financial" side. However, when moving from a theoretical to an empirical model, several issues arise.
The aim of this work is to discuss how to get *from Theory to Practice*, providing the basic structure for an emprirical SFC model for Italian data based on the New Cambridge approach. The basic three-sector model, based on the *"Fundamental Identity"*, presented in section 3, will be shaped (and extended), in section 4, to fit Italy's case. I will then present, and discuss, , in section 5 Italy's Trasnaction-Flows and Balance-Sheet Matrices, together with the Financial balances. Finally, I will assess what are the final steps to be made in order to build the final empirical model.

JEL-Classification: B41, E12, E17, E44 , F41, O42
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1 Introduction

Among the various causes that led to the failure of new Classical macroeconometric models (both DSGE and CGE types) in predicting the financial crisis, a prominent role was played by the lack of an appropriate modelling of the financial sector and of its interactions with the real economy. The dissatisfaction towards standard mainstream macroeconomic models came both from orthodox and heterodox authors and practioners: "standard macroeconomics as practiced up to 2008 had failed to understand the interactions between the financial sector and the real economy and so failed to grasp the potential for financial instability" (Duca and Muellbauer, 2014:1); "both the New Classical and New Keynesian complete markets macroeconomic theories [...] did not allow the [key] questions to be asked. *A new paradigm is needed*" (Buiter, 2009:1, emphasis added); "DSGE [models] [...] seem to perform well in fitting past data or in predicting the very near future. However, with the advent of the financial crisis, these models turned out to be completely useless (Lavoie, 2014:90)".

Stock-Flow Consistent (SFC henceforth) macroeconomic models, in turn, do pay a lot of attention to the financial side of the system and on the interdependencies that connect the balance sheets of the various institutional secotrs to their real transactions in a monetary production economy. This, coupled with the fact that there has been a wide recognitnion, from both the press and academics (Chancellor, 2010; Wolf, 2012; Schlefer, 2013; Bezemer, 2010), that Godley and applied models based on the SFC approach have been between the few that correctly predicted both the 2001 and the 2007-08 crisis (Godley, 1999; Godley, Papadimitriou, Hannsgen, and Zezza, 2007), caused a renewed interest in the approach in both its theoretical and emprirical aspects, being it the perfect roof to host various heterodox views and to discuss how modern capitalist financialized systems works[1].

With the advent of the Great Recession and the pubblication of "Monetary Economics" from Godley and Lavoie ((2007)), a book that covered all the basic principles and modelling procedures of the approach, thus, an increasing number of researchers in macroeconomics has started to adopt the SFC approach to model whole economic systems. To move from a theoretical to an empirical model, however, is not always so simple. Still, SFC models *do* allow for a systematic treatement of whole economies, and indeed this has already been done. Pionereed by Wynne Godley and later developed at the Levy Economics Institute, the Levy SFC Macroeconometric model is the most advanced fully-empirical national accounts-based model, with a post Keynesian *closure* and a Minskian approach to Finance. This model has performed quite well in predicting the last major financial crises of the last decade and is currently used to make strategic

[1]The SFC approach has indeed been used to cover a broad variety of issues in post-Keynesian economics, such as financialization, monetary circuits, income and wealth distribution and ecological economics. For a detailed survey, see Dos Santos (2006), Caverzasi and Godin (2015) and Nikiforos and Zezza (2017a).

policy analyses for the US and Greek economy (see Papadimitriou, Nikiforos, and Zezza, 2013, 2016; Nikiforos and Zezza, 2017b).

The aim of this work is to discuss how get *from Theory to Practice*, providing the basic structure for an emprirical model for Italy. After a short introduction on the SFC approach history, the principles for building a sound macroeconomic model and a brief review of the existing applied models, the rest of the work will procede as follows. In section 3, I will present Godley's "Fundamental Identity", its implications and some special cases. I will then discuss the *closures* of the model and its peculiarities. Section 4 will be devoted to adapt the New Cambridge model to fit Italy's case. Following a description the database and its sources (and issues), in section 5 I will show the Transacion-Flow and Balance-sheet matrices, which will provide the accounting structure of the model. I will close the section by presenting and discussing Italy's Financial balances. Finally, in the conclusions, I will try to assess what are the final steps to be made in order to build the actual empirical model [2].

2 The Stock-Flow Consistent Approach

The basic principles of the SFC approach can be dated back to the 70's and 80's with the independent works of Wynne Godley (and the New Cambridge School) on one side, and of James Tobin (and the New Haven School) on the other.

After a long experience ad the UK Treasury, Godley became the director of the Department of Applied Economics at Cambridge University[3], where he established the Cambridge Economic Policy Group (CEPG) together with Francis Cripps. Together, they published "Macroeconomics" (1983), a textbook where one can already find all the early principles and ideas of the SFC approach. It was Kaldor however, among the Cambridgeans, the one who had the graetest influence on Godley during their long lasting friendship. As Godley himself stated in the preface of his *Monetary Economics* "I remember a damascene moment when, in early 1974 (after playing round with concepts devised in conversation with Nicky Kaldor and Robert Neild), I first apprehended the strategic importance of the [Fundamental Identity]" (Godley and Lavoie, 2007:xxxvi). Godley's efforts were always pointed towards a twofold goal, the first being to reconcile economic theory with policy advices, the second to build sound accounting models that integrates the "real" and the "financial" sides of the economy and their interplay. After moving to the Levy Economics Institute, in 1994, Godley started to develop a "simple stock-flow consistent" model for the US economy, a work culminated with the establishment of the Godley-Levy

[2] *e.g.* how to disaggregate the macro sectors, how to treat the CB, how to deal with data related and estimation issues, and so on.

[3] A position previously occupied by Richard Stone, whose work on the National Accounts also had a huge impact on the SFC approach later developed by Godley.

Macroeconometric SFC model.

On the other hand, one can find the works of James Tobin and the New Haven School. Contrary to Godley, Tobin was using a similiar approach, which came to be known as the "pitfalls approach", to analyse portfolio choice from a more orthodox perspetive (Brainard and Tobin, 1968; Tobin, 1969; Backus, Brainard, Smith, and Tobin, 1980). His works were aimed at carefully modellling the interdependencies between the prices and interest rates determined in financial markets and their *real* counterparts, which he tought as being the major deficiency (or, to be more precise, the *pitfall*) of the state-of-art macroeconomic models of the time.

However, both schools somewhat faded in the 80's, because of both lack of funding, the failure to interpret the inflation pressures of the oil crisis (a theme that, anyway, nobody at that time got right) and the rise of the representative agent approach embedded in New Classical and New Keynesian theory.

But now, luckily enough, time has come for a come back.

[...]

2.1 General Principles

Nikiforos and Zezza (2017) identify four basic principles in SFC macroeconomic modelling:

1. *Flow Consistency.* "Everything comes from somewhere and goes somewhere" (Godley and Lavoie, 2007:6), i.e. there cannot be any black hole. As stated by Godley and Cripps, "the fact that money stocks and ows must satisfy accounting identities in individual budgets and in an economy as a whole provides a fundamental law of macroeconomics analogous to the principle of conservation of energy in physics" (Godley and Cripps, 1983:18). This implies that any *source of funds* for a sector is a *use of funds* of another (households receive profits and wages from firms, which in turn receive funds from households when they purchase their products), that any surplus of a sector is the deficit of another or that the imports of a country are the exports of others. This is referred to as "horizontal" consistency in the System of National Accounts terminology (European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations, and World Bank, 2009). "Vertical" consistency, in turn, means that every transaction leads, at least, to a double accounting entries within each agent (usally referred to as credit and debit);

2. *Stock Consistency.* The liabilities of a sector are the asset of another. This means that the overall net wealth of the system sums up to zero;

3. *Stock-Flow Consistency.* Every flow implies a change in one or more stocks. Thus, in order to get the *end-of-period* stocks, one has to take into account the *accumulation* of the relevant flows, plus the possible capital gains. Positive net savings, thus, leads to an increase in net wealth;

4. *Quadruple Entry.* Finally, the three preceedings principles lead to a fourth one: that every transaction implies a quadruple enty in the accounting structure. Introduced by Copeland (1947), quadruple-entry bookkeping is now embedded in the System of National Accounts (EC *et al.*, 2009), assuring the accounting consistency of the whole system.

These principles also shows that the basic accounting structures of SFC models follows that of the SNA. Of course, the degree of detail of the model depends on the research question at hand. For example, Tables 1 and 2 (Appendix 6.1) depicts the basic accounting structure of a theoretical closed-economy SFC model consisting of four sectors (workers, rentiers, firms and the government) and three assets (equities, bonds and capital stock) from Zezza (2016)[4].

[...]

2.2 Empirical SFC models for whole countries

As already said, a big part of the recent resurgence of the SFC approach is due to the recognition, widely shared both in the press and in academia (see Bezemer, 2010), that models based on this framework where between the few that coreectly saw the financial crisis coming.

Godley's works at the CEPR in the 70's already contained all of the general principles of modern SFC empirical models (see Godley and Cripps, 1983; Cripps and Godley, 1976; Cripps, Godley, and Fetherston, 1976). He was attempting at ascertaining the determinants of the "Fundamental Identity" (more on which will be said later on), by building a set of accounting identities linking the monetary transactions between the sectors balance sheets and estimating econometrically the components of aggregate demand, trade and prices. This approach, which come to be known as "New Cambridge", followed the "Cowles Commission" fashion of that time (Fair, 1984).

The same approach as led to the development of models for Denmark (Godley and Zezza, 1992) and, later on at the Levy Institute, for US (Godley, 1999; Nikiforos and Zezza, 2017) and Greece (Papadimitriou et al., 2013, 2016).
Between the principal hallmarks of these models, of the upmost importance is the implied stock-flow norm toward which the economy converges in the long-run[5], which is attained by modelling real private sector demand as a function

[4] For an example af a more *realistic* theorethical model, see Lavoie and Godley (2000-2001), Godley and Lavoie (2007, ch.12) and Dos Santos and Zezza (2008).

[5] Given the absence of external shocks.

of real disposable wealth and of the (lagged) stocks of real financial wealth. The introduction of variables related to capital gains and credit streams creates divergences from the stock-flow norm, which may well have hysteresis patterns. These models thus attempt at modelling the main channels linking the real and the financial side of the economy. In particular, the effect of stocks of assets on future capital income flows (from debtors to creditors), the effects of new credit on expenditure decisions and the effects of end-of-period stock of net wealth on future savings and expenditures decisions. In contrast to many theoretical models, though, the portfolio analysis is kept to a minimum (or absent), so that the effects of shifts in portfolios are neglected. Finally, it is worth noting that, to overcome the Lucas Critique (1976), models parameters are estimated by means of cointegration analysis, so as to assure that they will be stable over a prolonged simulation period. The Levy Institute, however, is not anymore the only place where these empirical SFC are developed.

Kinsella and Tiou-Tagba Aliti (2012) built a model for Ireland. Their modelling methodology, however, was somewhat different. Given the incompleteness of data for Ireland, they propose a calibration method for parameters values, where the latter may vary. This analysis may still give some important insights on the structure of the system, but would be highly limited for forecasts and projections. A similiar methodology has been applied by Miess and Schmelzer (2016) in their works on Austria. They propose a model with a very detailed financial sector, where parameters are calibrated over the observed time series and then projected afterwards.The model is then used to compare this baseline scenario with different policy proposals. Finally, in a recent work, the Bank of England (Burgess, Burrows, Godin, Kinsella, and Millard, 2016) produced the most advanced and institutionally rich applied SFC model derived from national-accounts data. In contrast from the Levy model, this model for UK is much more disaggregated and has a wide arrays of financial assets. Regarding parameters values calibration, however, these are determined through a mix of econometric estimations, calibration and arbitrary coefficients restrictions.

[...]

3 The "*Fundamental Identity*"

During his time at the CEPG, Godley put forward a three-sector financial balances model, derived from simple a flow-of-funds accounting identity, that formed the basis for all his future research, in particular for the Levy Economics Institue. Albeit simple, this simple model hepls "to provide some rigour in what can or cannot be said. Once we know the financial position of the private sector, there is a constraint on what the external and government deficit can be" (Lavoie, 2014:259).

The three balances are usually portrayed as:

$$(S - I) = (G - T) + CAB \tag{1}$$

where S and I stands for, respectively, private sector (households and firms) savings and non-financial investment in tangible fixed capital and inventories, G and T are government expeditures and taxes while CAB is the current account balance (with all terms expressed in nominal terms). $(S - I)$ is, in Godley's words, the Net Accumulation of Financial Assets of the private sector (NAFA), $(G - T)$ is the government deficit and CAB is the external balance. Godley's interpretation of (1) is that "public deficits and balance of payments surpluses create income and financial assets for the private sector whereas budget surpluses and balance of payments deficits withdraw income and destroy financial assets" (Godley, 1999:8).

One may also rewrite (1) in a more standard, national accounts fashion:

$$(S - I) + (T - G) - CAB = 0 \tag{2}$$

Equation (2) says that the net lending of private $(S - I)$, public $(T - G)$ and foreign sectors (CAB) *must* sum up to zero. Indeed, when something is saved and not used to purchase new tangible capital goods, it *must* have been used to purchase financial assets. $(S - I)$ may be thus viewed, when positive, as the "net financial investment" of the private sector (i.e. the amount lent to the other two sectors) and, when negative, as its "net borrowing". Similarly, $(T-G)$ and (CAB) may be viewed as "domestic public lending/borrowing" (i.e. the government deficit/surplus or, as it used to be called, the "Public Sector Borrowing Requirements") and "current account deficit/surplus". This implies that, whenever the domestic sectors cannot fund their own expenditures, they *must borrow those funds from foreigners.*

Both equations (1) and (2) are useful by themselves, since they clearly depict the contraints any economy faces. Moreover, as wonderfully put by Lavoie, "this is not a matter of opinion. The equation, or rather the fundamental identity, is derived from national accounts identity. *It is a matter of accounting, not economics*" (Lavoie, 2014:260. emphasis added). To see this, consider the following notation:

- PYF = net private income received from abroad;
- T = tax receipts;
- NTR_{GP} = net transfers from the government to the private sector;
- NTR_{GF} = net transfers from the government sector to foreigners;
- NTR_{PF} = net transfers from the private sector to foreigners.

Now note that:

$$GDP = PE + G + XM \tag{3}$$

which implies,

$$GDP - T - PE = G - T + X - M \tag{4}$$

and that:

$$\begin{aligned} &GDP + PYF + NTR_{GP} - NTR_{PF} - T - PE = \\ &G + NTR_{GP} + NTR_{GF} - T + X - M + PYF - NTR_{GF} - NTR_{PF} \end{aligned} \tag{5}$$

Now, using the following notation,

- PDY = Private Disposable Income = $GDP + PYF + NTR_{GP} NTR_{PF} - T$
- PFB = Private Financial Balance = $PDY - PE$
- $PSBR$ = Public Sector Borrowing Requirements = Government Deficit = $G + NTR_{GP} + NTR_{GF} - T$
- BP = Current Account Balance of the Balance of Payments = $XM + PYF - NTR_{GF} NTR_{PF}$

and we are back to the fundamental identity:

$$PFB = PSBR + BP. \tag{6}$$

Again, it is very helpful to understand what these balances imply. Starting with the public sector, a positive $PSBR$ means the government is running a deficit (i.e. spends more than it gets) and needs therefore to issue debt to finance the gap. Thus, the stock of government net debt is given by:

$$GD = GD_{t-1} + PSBR \tag{7}$$

what (7) tells us is that the government debt this quarter is given by last quarter's stock plus the current deficit. Thus, today's deficit feeds tomorrow's stock of debt, which in turn will increase tomorrow's interest payments (i.e. increasing NTr_{GP}). Similarly, the CAB surplus (deficit) may be seen as the net accumulation of foreign-denominated assets by the private sector. Thus, denoting VFN the stock of net private financial assets denominated in foreign currency, I can write:

$$VFN = VFN_{t-1} + BP \tag{8}$$

which implies that the private financial balance can be interpreted as the sum of the private accumulation of government debt and foreigners debt - and, hence, the acronym NAFA, i.e net accumulation of financial assets. Denoting VN as the "stock of private financial assets" I can therefore, write the following stock identity:

$$VN = GD + VFN = VN_{t-1} + PFB = VN - t - 1 + NAFA \tag{9}$$

The dynamics of the three-balances model, thus, work as follows. At the beginning of the period, the inherited stocks of VN, VFN and GD affect the net transfers (given by NTr_{GP}, Ntr_{GF} and NTr_{PF}) via their interest burden and, combined with the usual Keynesian variables in (3) detemine GDP. The latter, together with the other determinants of the transfers' variables will in turn feed the end-of-period stock, thus generating an *intrinsic stock-flow dynamics*.

Finally, worth noting are the links between what has been said above and the Minskyan insight of *Financial Fragility* (1986). When a sector has negative net lending, its debt-to-income ratio will tend to increase. If there is a negative CAB and the government is trying to achieve a balanced budget, it must be that the private sector is running a deficit to fill the gap, thus increasing its debt-to-income ratio (in this case increasing its foreign indebtedness). If this situation persists for a prolonged period of time, it may lead the private sector from a hedge, to a speculative and finally a ponzi position, increasing the total financial fragility of the system and, possibly, to a financial crisis[6].

3.1 Some "special cases" of the *Fundamental Identity*

Some special cases may be drawn from equations (1) and (2):

- *The "Twin Deficits"*. The first one, which is at the core of the Washington Consensus and forms the basis for the IMF "restructuring" programs, is known as the "Twin Deficit Hypothesis". Assuming away private net lending, (1) reduces to

$$(G - T) = -CAB \tag{10}$$

  thus, imposing austerity policies and restraining the budget deficit, the IMF says, will improve the external competitiveness of the country and hence decrease the CAB deficit, "killing two birds with one stone" (Lavoie, 2014:262). However, it is now clear that the underlying assumption that there will be no impact on the growth rate of the economy has been proved, at least, flawed[7]. While, in fact, there has been a decrease in both public and external deficits, it is also true that the adjustment has taken place through a steep reduction in output.

- *The "Balanced Budget Puzzle"*. The second special case focuses on the domestic economy. Assuming $CAB = 0$, (1) reduces to

$$(S - I) = (G - T) \tag{11}$$

[6] As was the case in the run-up to the financial crisis in both U.S and some peripheral countries of the EuroZone.

[7] The assumption being that increases in domestic net lending its inflationary, thus reducing the external comepetitiveness of the country. As in most Neo Classical models, the demand side only plays a role in the short-to-medium run, while the long-run is supply-side determined.

In this second case the public sector deficit is therefore the mirror image of private sector surplus. In this case, thus, advocating for a balanced budget means to *worsen* the public sector net financial position(!).

However, it is also true that there is no need of a budget deficit for the private sector to accumulate financial assets. This may be seen by assuming away also the public deficit, i.e. $(G-T) = CAB = 0$, and by splitting the private sector between firms and households (with the subscripts f and h, repectively). I may then rewrite (1), after rearranging, as:

$$(S_{NFC} - I_{NFC}) + (S_{HH} - I_{HH}) = 0 \tag{12}$$

finally, by assuming away households invetment ($I_{HH} = 0$) so that now S_{HH} represents both households' savings and the their net lending, the above reduces to

$$S_{HH} = I_{NFC} - S_{NFC} \tag{13}$$

It is clear, then, that the private sector can still have a positive financial balance and accumulate new financial assets, even if the government is not running a deficit, given that firms have investment expenditures. The reverse is also true. For a given amount of investment, indeed, any increase in households savings will be matched by a decrease in firms' savings (i.e. their reatained earnings), reminding us of the "Flow consistency" implication that any use of funds from a sector is a source of funds from some other.

3.2 *Closures*

While accounting consistency is important in building a sound macroeconomic model, since it decreases the degrees of freedom of the model and provides some important insights about the constraints faced by any economic system, it is not enough. As shown by Taylor and Lysy (1979), indeed, the conclusions that can be drawn from a model are primarily led by the direction of causality the author imposes over the variables, in other words, its *closures*. From this standpoint, the SFC literature has always found itself within the boundaries of Post-Keynesian economics (see Godley and Lavoie, 2007; Lavoie, 2014). Thus, it is effective demand demand that drives economic growth both in the short *and* in the long-run[8].

The previous discussion of the "Fundamentl Identity" and its special cases, for example, revolves around the direction of causalities imposed on the net lending of the various sectors. As the attentive reader may have imagined when discussing the Twin Deficits case, for mainstream authors the causality runs from the domestic (with the government playing the major role) to the external

[8]With output driving the adjustment and inflation being the result of wage-bargaining struggles of the workers as in Kalecki (1971).

sector while the economy is supply-led. In "Seven Unsustainable Processes" (1999), in turn, Godley assumes a demand-led system where, due to the succesfull expansion of foreign goods in US markets, the trade deficit is treated as exogenous, with the causality going from the external to the domestic sector. This, coupled with the fact that the government was at that time achieving a budget surplus (for the first time in the post-WWII era), made clear to him that the only way for the US economy to sustain those growth rates was trough an increasing indebtedness of the private sector. This led to increased systemic Financial Fragility and, ultimately, to the dot.com financial crisis in 2001. The same kind of analysis is still at the core of the policy research analysis of the Levy Institute, where extension to the first Godley model has led to the development of macroeconometric models for the US and Greece, for which Strategic Analyses are published on a routinely basis.

Finally, to close the model, one has to make *behavioral* specifications. Given the k accounting identities that come out of the Transactions and Balance-sheets matrices[9], if I want to determine n endogenous variables I need $n-k$ additional equations. These are given by specifying how the agents and the different sectors behave in the system.

Broadly speaking, I need to specify how:

- *agents make their expenditures* - i.e. consumption, investment, government expenditures in goods and service;
- *agents finance their expenditures* - i.e. how the government finances its deficit (with short term Bills or long-term Bonds), how many more loans households will take on, how firms react to discrepancies between their investments and retained earnings;
- *agents allocate their wealth* - this is done with a "Tobinesque" approach. If there are m assets, one needs to specify $m-1$ demand function (the last one being implied by the rest), thus assuring that any increase in a stock implies a corresponding decrease in some other;
- *productivity growth, wages and inflation are determined* - while there is little work in the related literature on productivity growth, which is thus usually taken as constant or to grow at an exogenous rate, inflation is assumed to be determined by the struggle between workers and employers. The nominal wage reacts to close the gap between workers targeted and actual real wage, with the price level determined as a mark-up on unit production cost (as in Kalecki).
- *the financial sector acts/reacts* - i.e. how the Central Bank reacts to inflation or unemployment pressures and how banks provide credit.

[9]Recall that, for both the Transactions and the Balanc-sheets matrices, the last identity is implied by all others, and thus needs to be dropped to avoid overdetermination. This is the so-called "redundant equality".

It is thus the joint analysis of this accounting skeleton, given the demand-led closure, the behavioral specifications and the presence of multiple assets that allows for an *integrated* analysis of a modern monetary capitalist systems.

A sort of short-run "equilibrium" for the system is guaranteed through price changes in financial markets and output adjusting to make savings equal to investments. However, if expectations driving expenditures or portfolio decisions are not fulfilled or some stock or whatever other variable is not at its target level at the end of the period, this will cause further changes in subsequent periods.

The long-run, in turn, is defined as a state in which stocks and flows grow at the same rate, i.e. *the stock-flow ratios are stable*. This, as in Kalecki, is achieved through a sequence of short-run (dis)equilibria. The adjustment takes place in the single short periods because agents reacts to changes in stocks and stock-flow ratios, thus affecting next periods capital income streams, transactions and asset allocation that in turn will affect next period decisions and so on. From a practical point of view, the long-run defined as above acts as a benchmark for the system, since an ever-increasing (or decreasing) stock-flow ratio would be unsustainable, if holding for prolonged periods.

[...]

4 The Data

It is needless to say that, in theoretical models, the researcher has far more liberty on the decisions to make about the number of sectors and assets to include, on the closures and the behavioral specifications, all choices that may lead to a wide arrange of different models, suited for the question at hand. When building an empirical model, in contrast, the first constraint evoreyone faces is related to the availability and structure of the appropriate data, from which all other decisions will follow.

4.1 Sources and reconciliation problems

In order to build a model which respects the theoretical requirements of the SFC approach, the core of the statistics must be the non-financial accounts of institutional sectors published in Italy by Istat at quarterly frequency from 1999 to present and the financial accounts published by the Bank of Italy at quarterly frequency from 1995 to present[10].

Five main problems arise when using these data sources. The first one is that they are not necessarily consistent: non-financial accounts detail the sources of income for each sector, and the expenditure on current and capital account, ultimately determining saving and net lending. The financial accounts provide

[10]The complete list of data sources are reported in Table 3 in Appendix 6.2

the detail on how net lending can be broken down as changes in financial assets and liabilities. However, since the two sets of statistics come from different data sources, with the former being based on surveys on income and expenditure, and the latter on balance sheet statistics and other sources from the financial sector, the measures of net lending for each sector do not necessarily match.

Figures 1a-1e report net lending/borrowing for all sectors as percent of GDP. The upper part of the figure depicts net lending from the two different sources, while the lower part records the discrepancies between the two series.

Figure 1a. Household: net lending

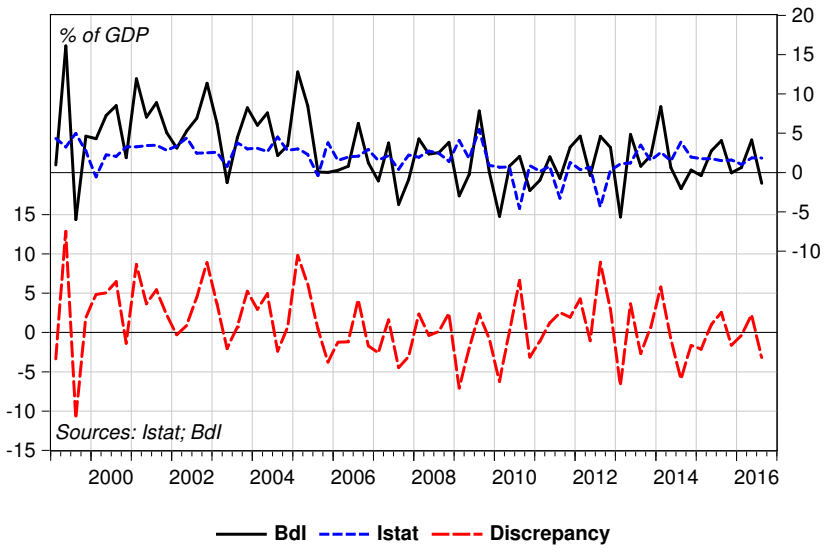


Figure 1b. Non-financial corporations: net lending

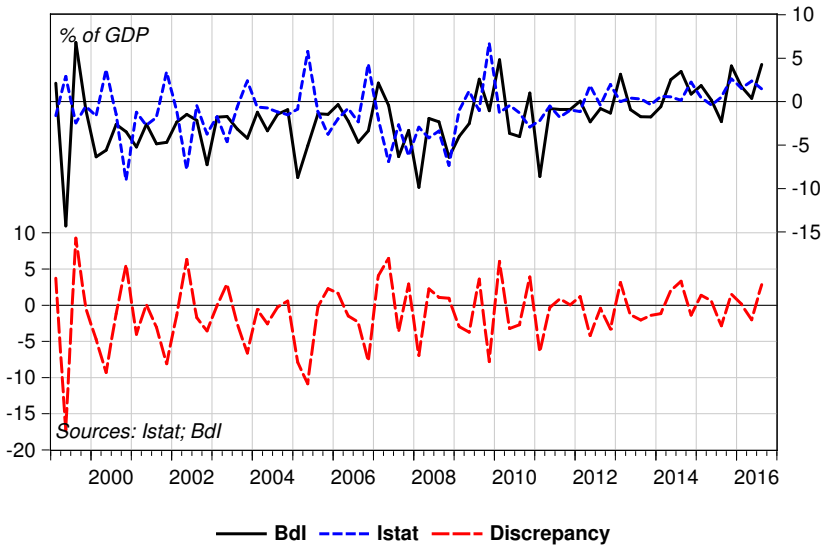


Figure 1c. Financial corporations: net lending

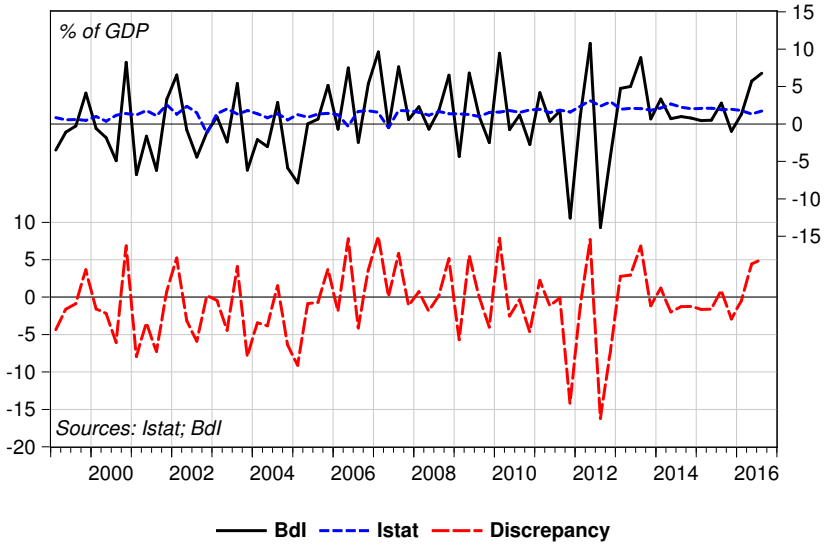


Figure 1d. General government: net lending

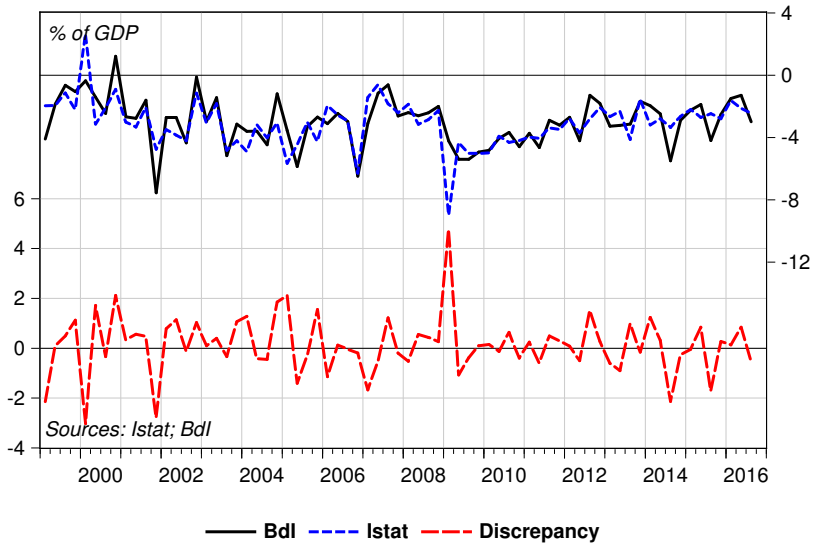
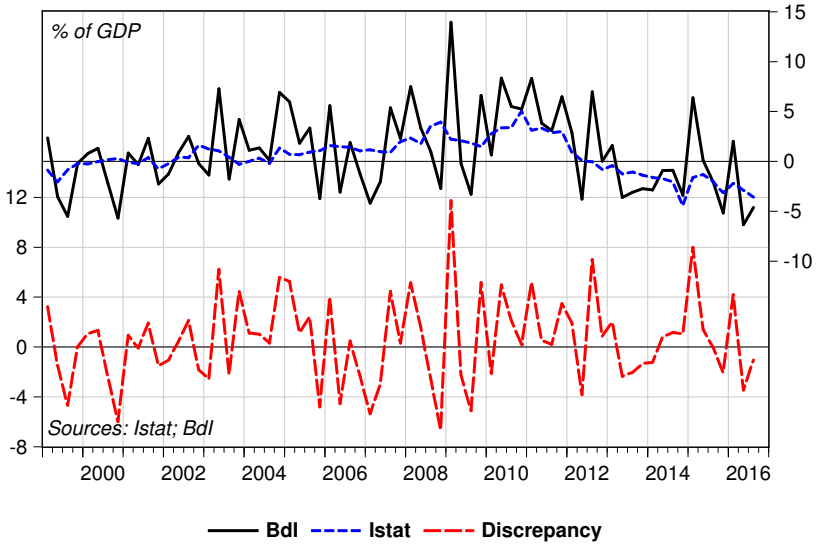


Figure 1e. Rest of the world: net lending



Obviuosly enough, the series from BoI display much higher volatility than the measure taken from ISTAT, due to the presence of capital gains. Neverth-

less, one can still get some interesting informations by looking at the individual sectoral balances.

Starting with figure 1a, which depicts the households sector, one may note a worsening of its financial position in the run-up to the financial crisis of 2008 and, between 2010-2012 (in concomitance with the european debt crisis), the balance goes into negative territory, meaning households have been deleveraging. Moreover, one may notice that now the balance has stabilized at a lower level. Figure 1b, on the contrary, shows net lending of non-financial corporations. Firms usually display negative net lending, since investments are financed through issues of share, retained earnings and *bank credit*. While households have experienced a worsening of their financial position, the opposite is true with respect to the non-financial sector that, starting from 2008, has experienced a drop in its deficit, with the balance going positive in the last years of the sample, reflecting the drop in investment. Moreover, it seems that the discrepancies are becoming smaller by the end of the sample. Financial corporations, presented in figure 1c, show a relatively stable positive, and increasingly positive, trend around 1-2 percent of GDP for all the period under examination. It appears however that a (small) increasing trend is present also here. The peaks 2011-2013, in turn, are related, again, with the debt crisis and the big changes in asset prices that followed.

Moving to the government sector, this is the only case in which the two measures move together, with the higher discrepancy between the series in 2008-9, again associated with the financial crisis. The effect of austerity policies is clearly depicted in the trajectory of the deficit/GDP, which passes from 4,5-5 percent to a mere 2 percent in recent years. Finally, figure 1e displays the net lending of the external sector. Together with households, the RoW shows the higher discrepancies between the two series (from minus 5 to plus 12 percent of GDP). The increase in the surplus after the financial crisis may well be related to (1) the drop in GDP and (2), the drop in imports caused by austerity.

To achieve consistency between the two data sources for model purposes, two strategies may be adopted. One could (a) assume that financial data are measured more accurately than income and expenditure data, and add the discrepancy to one of the determinants of saving for each sector (income or expenditure), or (b) one could treat the discrepancies as unexplained exogenous variables. The former strategy would make model simulations for consumption, income or saving systematically different from data published in the national accounts, so the latter strategy is to be preferred. This strategy, however, implies that such exogenously given discrepancies be projected into the future for model simulations, increasing the degree of arbitrariness of model projections.

The second problem in statistics for sectoral accounts is that they are not seasonally adjusted, and data exploration shows that when adjusted with the X12 procedure they produce series which have some discrepancy with data

published in the national accounts. This discrepancy is not large (for GDP is between -0.8 and +08 percent of GDP) but will nonetheless imply additional exogenous variables to take the discrepancies into account, as well as introducing further discrepancies in model accounting. As an example, while the sum of interest paid out in the whole economy (including the rest of the world) is equal to the sum of interest income received (in the originally non-seasonally adjusted data), when each flow is seasonally adjusted, the accounting identity will register a discrepancy.

The third problem which needs to be addressed is that non-financial accounts do not provide who-to-whom detail for a number of flows, which include:

- Direct taxes (some of which are paid to foreign institutions)
- Interest and dividends paid/received
- Social benefits other than government individual consumption expenditure
- Other transfers on current accounts
- Transfers on capital account

To address this problem, three solutions are at hand:

- the first is to assume, given the trends in the data, how to allocate these payments. However, this increases the arbitrariness of the model and has to be grounded on data exploration;
- the second is to resort to additional data sources which provide more detail, namely:
  - Balance of payments statistics
  - Other financial statistics on holders of public debt
  - Other financial statistics providing details of the balance sheets of financial institutions
- finally, if both the previous solutions are inapplicable, one may add an additional *Pool* column to the Transactions and Balance sheet matrices. In this case, all sectors receive/pay from/to the Pool, with model coefficents estimated econometrically.

The fourth problem is that if the model wants to address monetary policy, the Central Bank should be explicitly represented. This is the case for financial accounts, which provides details on assets and liabilities of the Bank of Italy, but not for the non-financial accounts. Using data on the balance sheet of the Bank of Italy, I will be able to separate income flows and expenditure flows of the CB from income and payments of other Monetary Financial Institutions (MFI). Since the adoption of the Euro, the BoI has become part of the system of European Central Banks, while the ECB is the (foreign) institution actively

running monetary policy. To model financial transactions between domestic institutions and the ECB, I have to identify how and where such transactions are registered in both financial accounts, balance of payment statistics, and other financial statistics which are available.

The fifth (and final!) problem is that Italian statistics are available only for a relatively short period of time at quarterly frequency, since the strategy adopted by Istat, contrary to other national statistical institutes, is not to revise backwards statistical information when a change in methodology is required, and the additional information to revise the data backwards are not available. Model development would benefit from the ability to compare data related to the period of flexible exchange rates, which started in 1971, to the period of managed exchange rates to the common currency. However, I defer to future research the expansion of the model backwards, which requires appropriate procedures to infer quarterly data from available annual data, and estimation for variables of interest for which no information is available.

[...]

4.2 The level of detail

Available data from non-financial accounts allow to decompose the economy into five institutional sectors:

1. Households and non-profit institutions serving households
2. Non-financial corporations
3. Financial corporations
4. Public sector
5. Rest of the World

While data from financial accounts provide more disaggregated data for Financial corporations, which are split among:

1. Monetary Financial Institution
    - Central bank
    - Banks
2. Other Financial Institution
    - Mutual Funds
    - Other
3. Financial auxiliaries
4. Insurance companies and Pension Funds

- Insurance companies
- Pension Funds

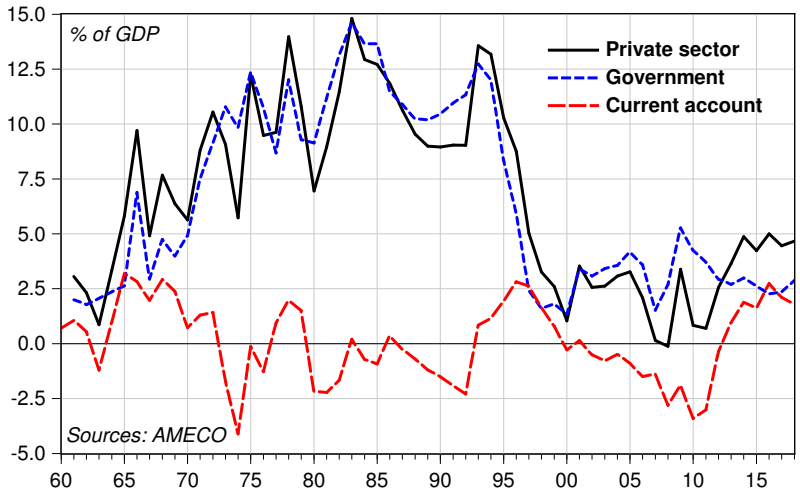
As well as information on the public sector, which is disaggregated into Central government, Local governments and the Italian pension fund (INPS). It is therefore relatively easy to obtain statistical information to separate the Central Bank from the rest of the Financial sector, since sources of revenue and expenditure for the CB are easy to identify. This would allow to build a model with six sectors, where each sector is relatively homogeneous, allowing for an easier identification on the determinants of the rules governing revenues, expenditures, and portfolio management for each sector. On the other hand, this level of detail implies that the number of accounting identities and behavioral equations to be specified increases exponentially.

A possible alternative is to adapt the New Cambridge approach suggested by Godley and the Cambridge Economic Policy Group presented is Section 3, where the whole of the private sector is consolidated, so to focus on the determinants of the net stock of financial assets of a simplified economy composed by a private sector, a public sector, and the rest of the world.

To illustrate these points, Figure 2 reports an estimate of the private sector balance[11], obtained from annual data, along with government deficit, and the current account balance. Further sectoral disaggregation is not available for the 1960-1979 period, which shows how the private sector was accumulating net financial assets which were mainly the liabilities of the public sector, while the current account balance was readjusted by exchange rate movements. As Italy started to fight inflation, and to try to avoid currency realignments in the 1980s, the current account started to deteriorate, up to the large devaluation of 1992, and the decline in government deficit relative to GDP implied a drop in the ability of the private sector to accumulate financial assets. When Italy was preparing for entering the Euro, the current account started to deteriorate again, from a peak in 1996 to a trough in 2010, when it started to recover, mainly because of the austerity measures which made imports collapse. From the beginning of the Great Recession in 2007, the private sector balance seems to have decoupled with the public sector balance.

[11] Government deficit is not available before 1995. For the 1960-1994 period I used the change in government debt to estimate government deficit, since the difference between the two given by net capital gains should be sufficiently small. The private sector balance, i.e. the excess of private saving over investment, is obtained by summing up government deficit to the current account surplus.

Figure 2. Italy. Financial balances

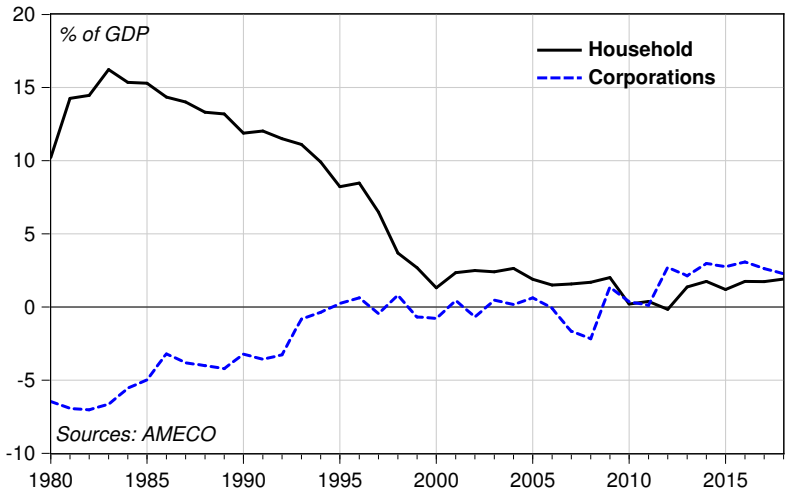


Without going into further details here, one notices that modeling the Italian economy using quarterly data for the 1999-2016 period alone would leave out a long-term feature of the Italian economy, namely the ability to manage the current account balance so to make the size of the public debt a domestic problem, which was easier to match as long as the private sector was willing to accumulate financial assets on top of investment in real assets.

Figure 3 reports the available evidence from the AMECO database on the net lending of household and corporations[12], which shows that the entire decline in the private sector financial balance is due to the household sector. Again, modeling only the 1999-2016 period would take out the large decline in household saving relative to investment.

[12]Net lending for the household sector is not available, and it has been estimated as the difference between disposable income and current and capital expenditure, i.e. without taking into account net capital transfers.

Figure 3. Italy. Financial balances



[...]

5 An Empirical SFC Macroeconomic model for Italy

As pointed out in the previous sections, many complications arise when one tries to make the final step from a theoretical to an empirical model. In fact, when looking at the National Accounts, it is clear that in reality (almost) every sector holds (almost) every asset. Thus, if one doesn't want to incur in Robinson's (1962) criticism of building a useless 1:1 map of the economy, aggregations of sectors and a description and modelling of only the relevant assets and transcations is needed.

This section will be devoted to the construction of an applied SFC macroeconomic model fo Italy, based on the data sources introduced in the previous section.

5.1 The Transaction-Flow Matrix

To illustrate the point above, Table 4 (Excel Appendix - sheet 1) displays the "actual" Transaction Matrix for the Italian economy as of 1999q1.

Starting from the top, the first block records the Rest of the World (RoW) Production account, which registers exports, imports, and the net indirect taxes paid domestically. We then pass to the "Generation of Primary incomes":

adding the contributions to production to the GVA of the various sectors and subtacting the costs of production (equal to wages and taxes on goods&services) yields Gross Profits (consisting of net profits and mixed income).

The "Attribution of Primary incomes" records the wages and indirect taxes received (by households and RoW the former and Government and RoW the latter), the subsidies paid and the capital incomes paid and received by the various institutional secotrs (which are divided into interests, dividends, reinvested earnings from FDI, other incomes from investments and rent from land) that, summed to gross profits, yields Primary income. Next, we have the "Distribution of Secondary incomes": to primary income, we add and subtract direct taxes, benefits (which consists of net social contributions, other social transfers and social transfers in kind) and other current transfers, to get to Disposable income. In the "Uses of Disposable incomes", from the post-tax income we add the variations in pensions entitlements and subtract consumption (collective and individual), and we get to Savings.

The "Variations in net wealth due to savings and transfers and capital account" records the transfers in capital account paid and received (consisting of taxes on capital account and other current transfers) that yields the variations in net wealth while, finally, in the "Acquisition of non financial assets", we find investments (in fixed capital and in inventories) and other acquisitions of non-financial non-produced assets. What is left represents the Net Lending of the various sectors or, as Godley called it, the NAFA.

As one may notice, however, we already encounter a series of problems. First and foremost, I will need to write an identity for each and every entry of both the Transactions and Balance sheet matrices. Thus, to keep the model simple enough is a priority. Secondly, as it is clear from the table, almost every sector is involved in almost all transactions. To reconstruct the who-to-whom payments is the second issue to solve.

Table 5 (Excel Appendix - sheet 2) shows indeed the Model Transaction-Flow Matrix[13].

The matrix here is a simplified version of Table 3, still recording all transactions as they appear in the NFA. The first difference between the two tables is that the upper part of the matrix, which records the incomes from production, has now been filled (Only Exports and Imports have still to be added). The second difference, as one may note, is the *Pool* column. Its purpose is to serve as payer/recipient everytime it is not clear from the data, neither from

[13]It is worth mentioning that, in what follows, I will be working with series adjusted via the X-12 procedure in Eviews. As noted in a previous section, most series display a strong seasonality. However, when seasonally adjusting the data, the identities (usually) record a discrepancy. There are various ways to treat these discrepancies, and I will explify all operations made on the series.

its structure nor from additional sources, how to reconstruct the who-to-whom payments. The coefficients for the behavioral specifications will then be estimated econometrically.

Starting from the first column and reading vertically, GDP (note that the series for GDP is taken from NIPA tables. In this way I can make the seasonally adjusted series from the NFA consistent with published data) from the production side is the sum of the wage bill, mixed income, operating surplus (net profits)[14], indirect taxes paid and subsidies received:

$$GDP = WB + MIXY + OPS + INDTAX - SUBS \tag{14}$$

Of course, we know that, from the demand side[15], GDP is also the sum of consumption, investments in fixed capital, changes in inventories, government expenditure and net exports of goods&services:

$$GDP = CONS + GFCF + DINV + G + XGS - MGS \tag{15}$$

Figure 4. GDP from NIPA and NFA

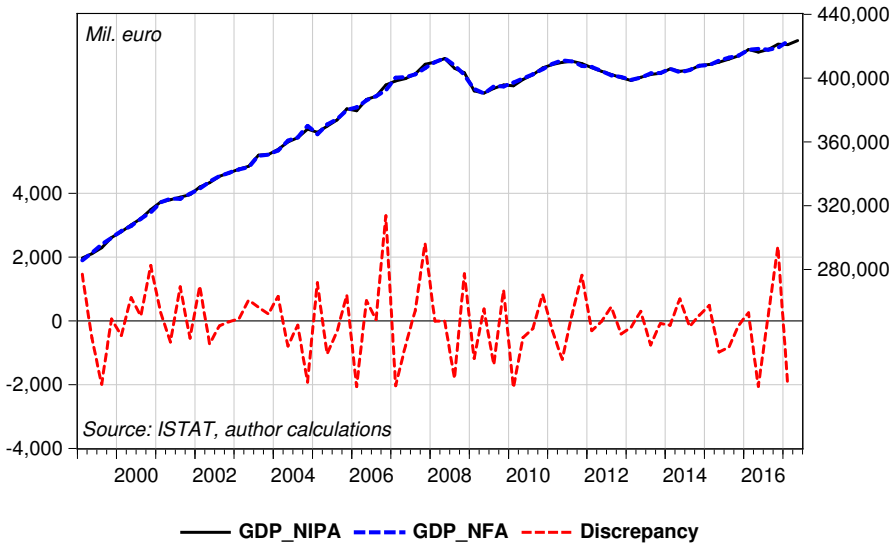


Figure 4 displays the two series for GDP (from NIPA tables and seasonally adjusted NFA). It is clear that the discrepancy is small enough, in the order of +3/-2 Bn euro.

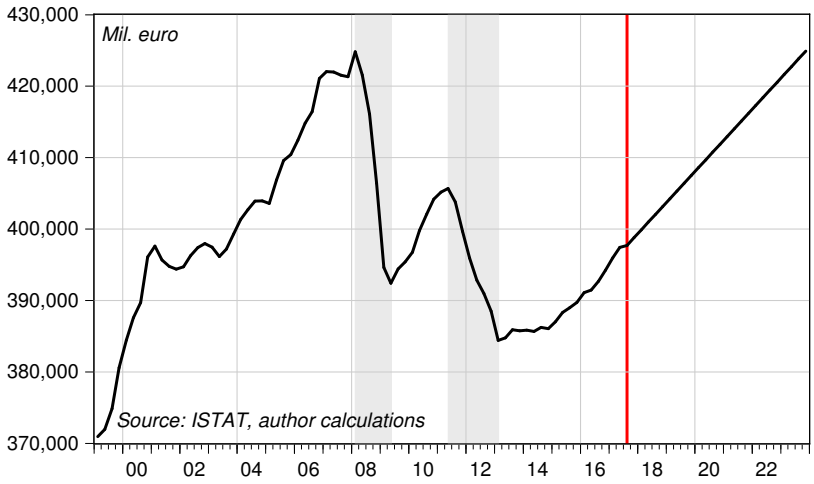
[14]Strangely enough, in the published data OPS *is not* equal to Gross Profits minus Mixed income. The series here is thus calculated as a residual from GDP.

[15]All the series here are taken from NIPA tables.

It is useful, however, to look at the dynamics of Real GDP in order to have a clearer view of what happened to the economy in the last two decades.

Figure 4.2. displays Real GDP, with the shaded areas corresponding to the Great Recession and the Sovereign Debt crisis. It is quite disturbing to see that the Italian economy has gone back 16 years, reaching only in 2016 the levels of 2001 (!). Moreover, given the recent trend (2014-2017), I projected real GDP forward to see how long would it take for the system to get back to its pre crisis levels, with the red line corresponding to the end of the sample. This will only happen, given the current institutional and policy regime, in 2023 (!). Moreover, I still haven't touched the issue of the *costs* of this adjustment in terms of unemployment, public deficits and debt, which will be discussed later on together with the Financial Balances.

Figure 4.2. Italy - Real GDP



Turning to households, income from production (INCP) is the sum of wages (i.e. the wage bill, wb, plus the wages received from abroad, wagesfrow), mixed income and operating surplus:

$$HH\_INCP = WAGES + MIXY + HH\_OPS \tag{16}$$

While for the Government it is the sum operating surplus and indirect taxes received minus the subsidies paid:

$$GVT\_INCP = GVT\_OPS + GVT\_INDT\_r - GVT\_SUBS\_p \tag{17}$$

Finally, for the RoW is the sum of net exports, wages and taxes received and wages and subsidies paid:

$$ROW\_INCP = (ROW\_M - ROW\_X) + (WAGES2ROW + ROW\_INDT\_r) - (WAGESFROW + ROW\_SUBS\_p) \tag{18}$$

Figures 5.1-7.4 shows Incomes from production for the various institutional sectors, splitted into their components, as a share of GDP.

Starting with the private sector, displayed in Figures 5.1-5.4, in the pre-crisis period, up to 2006, households incomes where on a more or less stable rising path, which accelerated in the following two years, pumped by the steady rise in wages and profits (reaching their peak in 2009), while the mixed income component was declining throughout. From 2008 onwards, with the crush in financial markets and the austerity measures imposed on the private sector, which prevented wages to rise anymore, the trend inverted, and stabilized at a stagnant path.

Fig. 5.1.-5.4. Households Incompe from Production

Figure 5.1. Wages

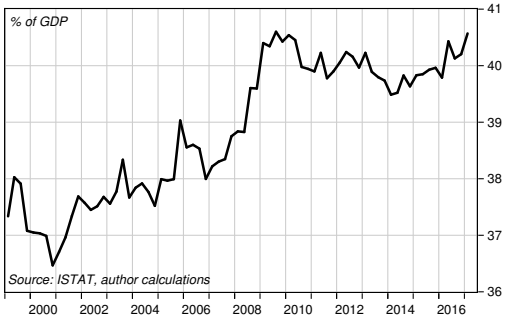


Figure 5.2. Profits

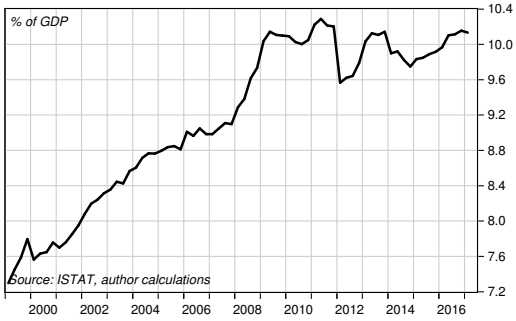


Figure 5.3. Mixed Income

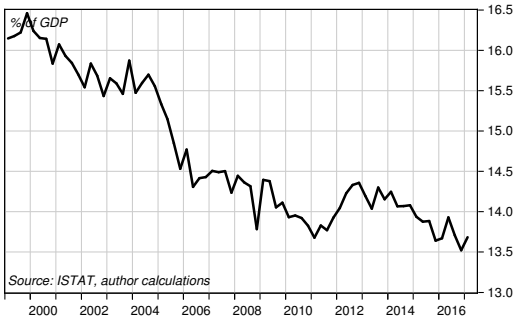
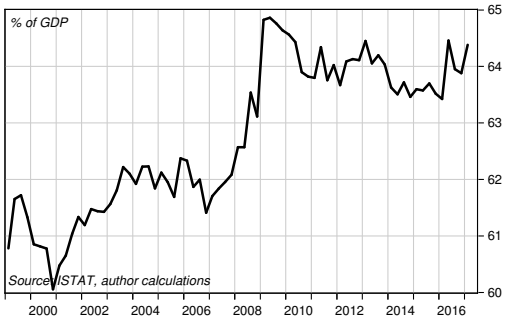
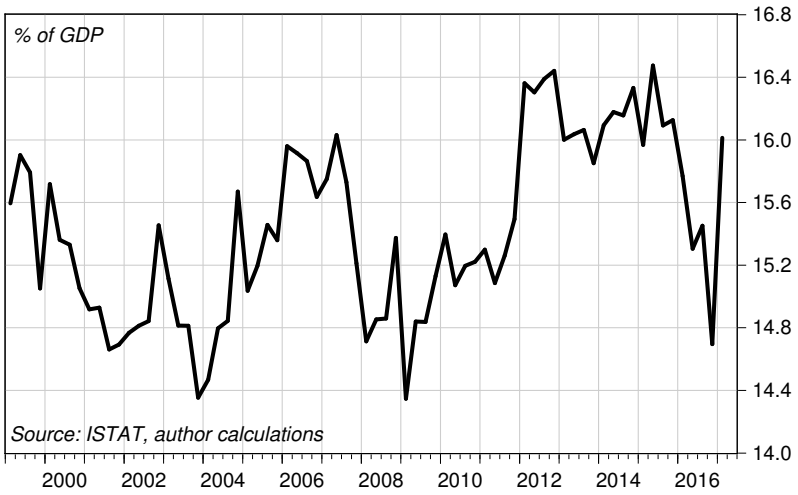


Figure 5.4. Income from Production



Regarding the Government, its Income from Production is completely dominated by the dynamics of indirect taxes received, displayed in Figure 6.4.

Figure 6.4. Income from Production



Finally, the Foreign sector. Figures 7.1-7.4 shows income from production and its main components. During the first years of the euro, Italy's net external position worsened, going negative from 2005 up to 2011 when, due to the collapse of imports, the CAB went back to positive territory. It is also interesting to note that, even if the numbers are small, while the share of domestic wages paid to foreigners has been stable all over the period under examination, wages received from abroad have doubled. This may be due to emigration (?). Finally, it is clear that it is the net external postion that dominates the dynamics of production income for the external sector.

Figures 7.1-7.4 - RoW Income from Production

Figure 7.1. Exports/Imports

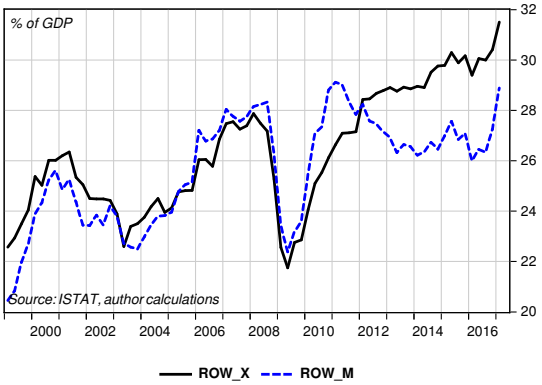


Figure 7.2. Wages paid/received

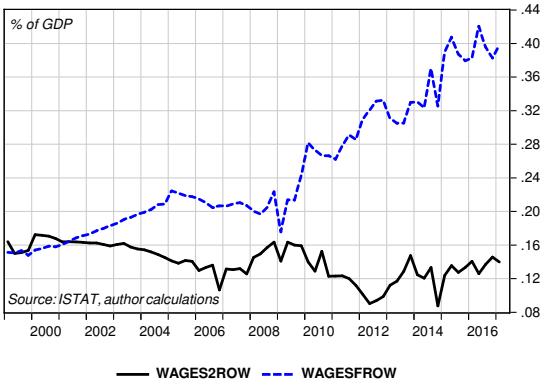
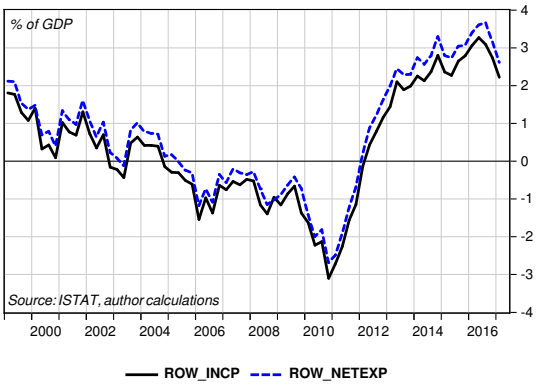


Figure 7.4. Income from Production



The next block records the Capital incomes paid and received. These are divided into Interests[16], which are paid and received by all sectors, Dividends[17], which are received by all but paid only by Corporations home and abroad, Reinvested earnings from FDI, paid and received only by domestic and foreign Corporations, Other capital incomes, payd only by domestic and foreign Financial Corporations and received by all but the Government and, finally, the Rent from Land, paid and received by households, firms and the government.

Thus, for example[18], Interests received by FC are calculated (residually) as the difference between total outlays and total receipts:

$$\begin{aligned} &FC\_INT\_r = \\ &+ (HH\_INT\_p + NFC\_INT\_p + FC\_INT\_p + GVT\_INT\_p + ROW\_INT\_p) \\ &- (HH\_INT\_r + NFC\_INT\_r + GVT\_INT\_r + ROW\_INT\_r) \end{aligned} \tag{19}$$

A few things are worth noting regarding these capital incomes, on which some further considerations may be said and more in depth research is needed.

Starting from Interests, Figure 5 displays the amounts paid and received by NFC as percent of GDP. While the two series were moving together in the first part of the sample, from 2006 one may notice a divergence that lasts up to the financial crisis of 2008 and, from then on, the outlays are converging to receipts.

[16] When adjusting the series, I decided to add the discrepancies of the X-12 procedure to the interest received by Financial Corporations FC_INT_r. This is so because financial institutions get almost half of the total interests paid and one should always try to get these discrepancies away from series that will enter behavioral specifications estimates, in particular those regarding the households and external sector.

[17] Here the discrepancy is added to NFC's payments.

[18] Due to space constraints, I will only specify the identity for FC, to illustrate the method. A complete list of the identities can be found in Appendix 6.5.

Figure 5. Interest paid/received by NFC

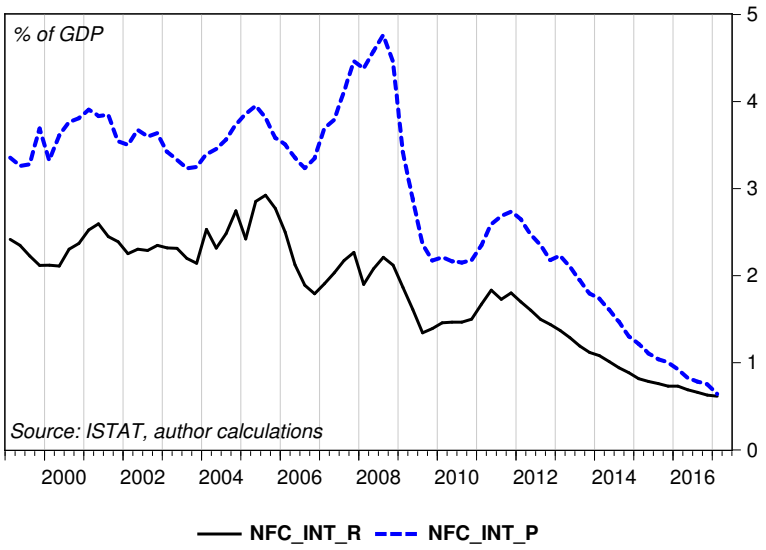
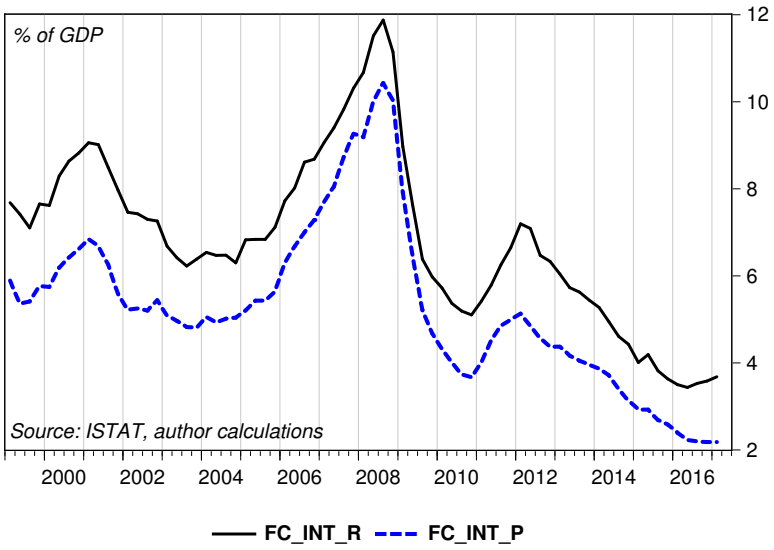


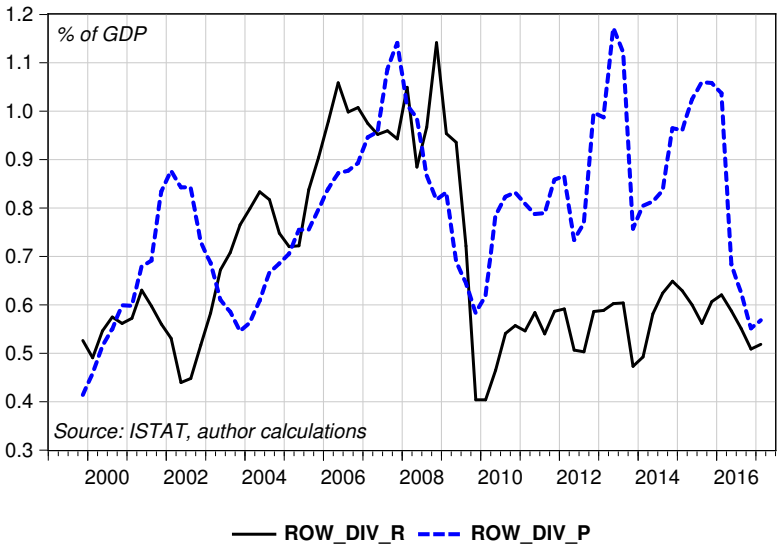
Figure 6, in turn, displays the crash in interests paid and received by Financial Corporations, that clearly show the effect of the double dip recession of 2008 and 2012, from which they never recovered.

Figure 6. Interest paid/received by FC



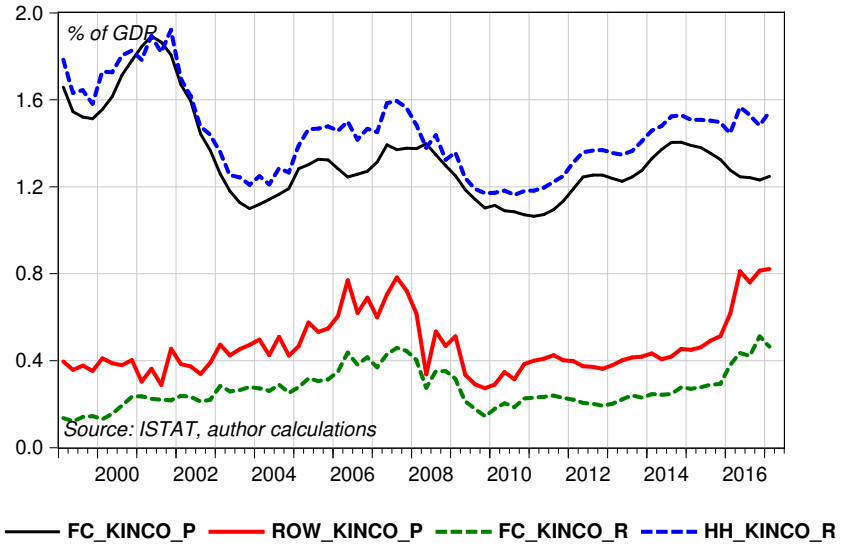
Moving to Dividends, Figure 7 shows the Dividend paid and received by the RoW. Two thing are worth noting here: first, how the domestic private sector was part of the "dance" in the build up of the crisis, as reflected by their outlays abroad and, secondly, how the two series diverge after the initial drop, a situation that lasts until 2016, where they converge again (downwards, up to 0.5% of GDP).

Figure 7. Dividends paid/received by RoW



Regarding Other incomes from capital, Figure 8 shows the relation between housholds and domestic NFC on one hand and the foreign setor and domestic banks on the other.

Figure 8. Other Current Transfers in Capital Account



Figures 9 and 10 dispaly Reinvested earnings from FDI for domestic Corporations. Even if the numbers are small enough, it is striking, regarding FC, first, the drop in receipts, that fall down to 0.005 of GDP and, secondly, that banks are the targets of FDI from abroad starting from 2007. With respect to NFC, while the outlays have been on a downward path throughout, the receipts jump up to 0.7 % of GDP and then crashes down, arriving to negative territory.

Figure 9. FC Reinvested Earnings from FDI

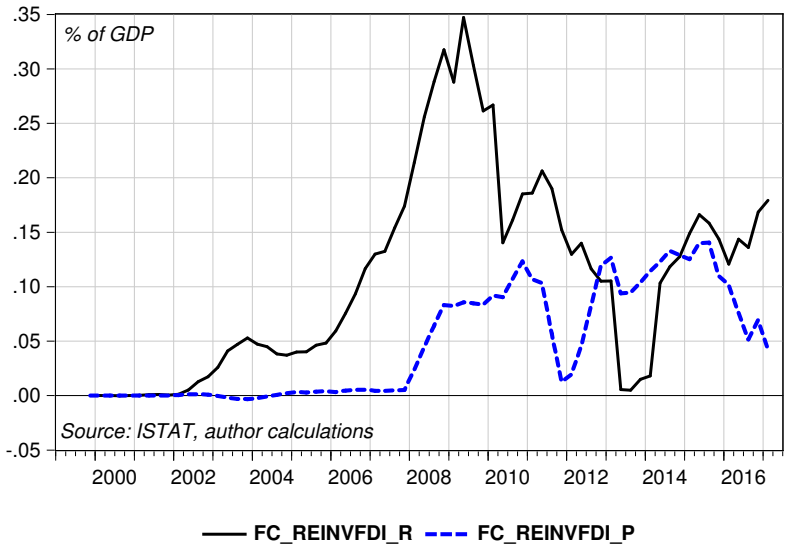
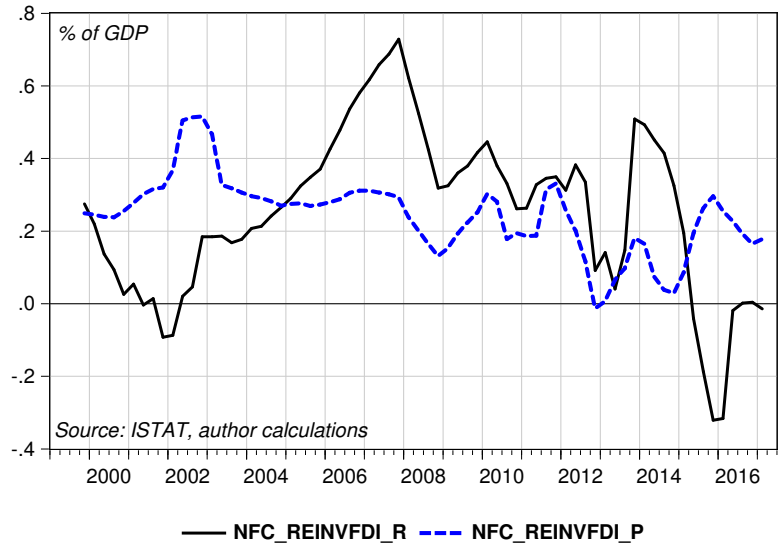


Figure 10. NFC Reinvested Earnings from FDI



It is clear here that, while adding a small discrepancy from a statistical procedure is, yes, arbitrary, but it makes little harm (hopefully), to impose how

and why only certain sectors convey in some markets and not others may be trickier to justify. Thus, I will for now resort to the Pool.

Returning to the Matrix, Primary income, thus, is the sum of Incomes from production and capital incomes. For Househlds, it is the sum of Incomes from production, interests, dividends and other capital incomes received minus interests and rent from land paid:

$$\begin{aligned} &HH\_YP = HH\_INCP \\ &+ (HH\_INT\_r + HH\_DIV\_r + HH\_KINCO\_r) \\ &- (HH\_INT\_p + HH\_RENTL\_p) \end{aligned} \tag{20}$$

For Non Financial Corporations, is the sum of profits, interest, dividends, reinvested earnings from FDI and other capital incomes received, minus interests, dividends, reinvested earnings from FDI and rent from land paid:

$$\begin{aligned} &NFC\_YP = NFC\_OPS \\ &+ (NFC\_INT\_r + NFC\_DIV\_r + NFC\_REINVFDI\_r + NFC\_KINCO\_r) \\ &- (NFC\_INT\_p + NFC\_DIV\_p + NFC\_REINVFDI\_p + NFC\_RENTL\_p) \end{aligned} \tag{21}$$

Financial Corporations, in turn, do not pay out rent from land:

$$\begin{aligned} &FC\_YP = FC\_OPS \\ &+ (FC\_INT\_r + FC\_DIV\_r + FC\_REINVFDI\_r + FC\_KINCO\_r) \\ &- (FC\_INT\_p + FC\_DIV\_p + FC\_REINVFDI\_p) \end{aligned} \tag{22}$$

Now comes the Government. To income from production, one adds interests, dividends and rent from land received by the domestic NFA and households, minus the interests paid:

$$\begin{aligned} &GVT\_YP = GVT\_INCP \\ &+ (GVT\_INT\_r + GVT\_DIV\_r + GVT\_RENTL\_r) - (GVT\_INT\_p) \end{aligned} \tag{23}$$

Finally, the Rest of the World. To net Exports, I first add the trasfers from the domestic sector to foreigners (in the form of wages and indirect taxes) and subtact the transfers from the foreign sector to the domestic economy (wages and subsidies), and then add and deduce capital incomes:

$$\begin{aligned} &ROW\_YP = (ROW\_M - ROW\_X) \\ &+ (WAGES2ROW + ROW\_INDT\_r) - (WAGESFROW + ROW\_SUBS\_p) \\ &+ (ROW\_INT\_r + ROW\_DIV\_r + ROW\_REINVFDI\_r + ROW\_KINCO\_r) \\ &- (ROW\_INT\_p + ROW\_DIV\_p + ROW\_REINVFDI\_p + ROW\_KINCO\_p) \end{aligned} \tag{24}$$

Figures 12 to 15 displays Primary incomes for the domestic economy, using both the constructed series and the "actual" (seasonally adjusted) ones, together with their discrepancy, as percent of GDP.

Figure 12. Primary Income of HH and discrepancy

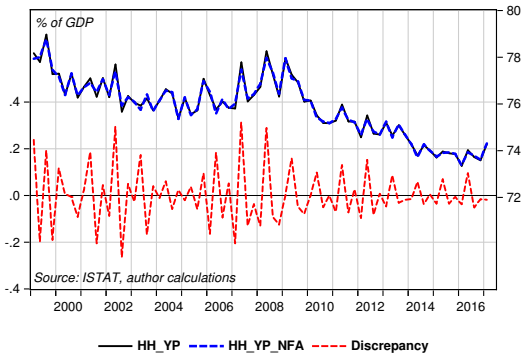


Figure 13. Primary Income of NFC and discrepancy

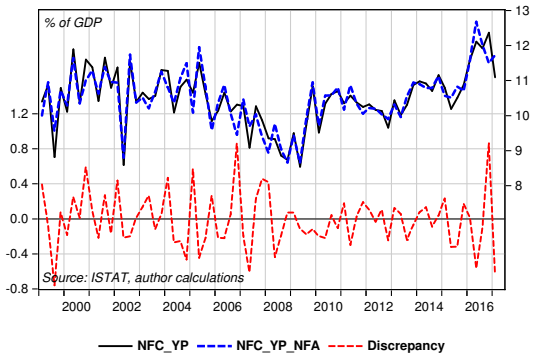


Figure 14. Primary Income of FC and discrepancy

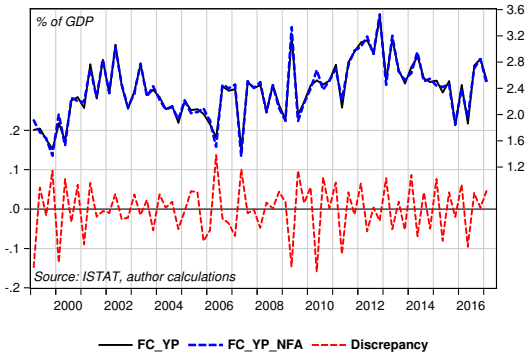
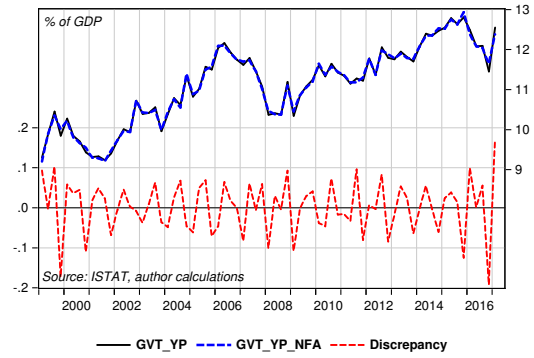


Figure 15. Primary Income of Government and discrepancy



Even if these only represents pre-tax income, and thus the Government could still intervene to redistribute, it is quite striking how households never recovered from the recession, with their share going down of 4% of GDP.

Next, I need to get to disposable income (YD). To (YP) I need to add the direct taxes received (by the Government and RoW, i.e. some EU Institution)

and paid by the sectors[19], social benefits and contributions[20] (recalling that I needed to ad line 23, "Social Transfers in Kind", GINDC, for Households and Governments Disposable Income to add up) and the other current transfers paid and received[21].

[insert graphs on major components of diposable income
Households Disposble Income, thus, is given by:

$$HH\_YD = HH\_YP - HH\_TAX\_p + ((HH\_BEN\_r - GINDC) - HH\_BEN\_p) + (HH\_OTC\_r - HH\_OTC\_p) \tag{25}$$

where TAX are direct taxes, BEN are social benefits, $GINDC$ is Government (collective) consumption, and OTC are other current transfers.

Moving to NFC, recall that they pay taxes also to EU institutions, thus:

$$NFC\_YD = NFC\_YP - (NFC\_TAX\_pW + NFC\_TAX\_pD) + (NFC\_BEN\_r + NFC\_OTC\_r) - (NFC\_BEN\_p + NFC\_OTC\_p) \tag{26}$$

Continuing with FC:

$$FC\_YD = FC\_YP - FC\_TAX\_p + (FC\_BEN\_r + FC\_OTC\_r) - (FC\_BEN\_p + FC\_OTC\_p) \tag{27}$$

Turning to the Government, it receives and pays taxes, pays out social tansfers in kind (to households) on top of the total benefits, and receives and pays other current transfers:

$$GVT\_YD = GVT\_YP + (GVT\_TAX\_r - GVT\_TAX\_p) + (GVT\_BEN\_R - (GVT\_BEN\_p - GINDC)) + (GVT\_OTC\_r - GVT\_OTC\_p) \tag{28}$$

Finally, recall that the foreign sector pays taxes domestically but also receives them from NFC:

[19] Here I assumed that only NFC pay taxes to foreign institutions, thus, $TAX\_r_{ROW} = TAX\_pW_{NFC}$. Tha amount of taxes paid domestically, in turn, is computed as the difference between the total outlays and the amounts paid abroad, $TAX\_pD_{NFC} = TAX\_p_{NFC} - TAX\_pW_{NFC}$. This is so for two order of reason: first, EU Institutions get almost nothing compared to the Government (100-500 Mil. against 40-60 Bln) and, secondly, this leaves me the opportunity not to use the Pool, since now the Government is (residually) the only recipient of taxes. For the same reason, the discrepancies stemming from the seasonal adjustments have been added to net Government receipts.

[20] As before, the discrepancies from seasonal adjustments have here been added to Government expenditures.

[21] Again, Government outlays gets the discrepancies from seasonal adjustments.

$$ROW\_YD = ROW\_YP + (NFC\_TAX\_p - ROW\_TAX\_p) + (ROW\_BEN\_r - ROW\_BEN\_p) + (ROW\_OTC\_r - ROW\_OTC\_p) \quad (29)$$

[insert graphs on discrepancies between constructed series for disposable income and actual ones]

The lower part of the matrix, then, records how Disposable income is spent between consumption, investments and additions to financial assets. Adding to Disposable Income the variations in pensions entitlements[22] (for households only) and subtracting them (only for the domestic private sector) and taking out consumption (of households and Government) leaves us with Savings (SAV). Thus:

$$HH\_SAV = HH\_YD + (HH\_PENSR\_r) - (HH\_PENSR\_p + HH\_CONSF) \quad (30)$$

$$NFC\_SAV = NFC\_YD - (NFC\_PENSR\_p) \quad (31)$$

$$FC\_SAV = FC\_YD - (FC\_PENSR\_p) \quad (32)$$

$$GVT\_SAV = GVT\_YD - (GVT\_CONS\_COLL + GVT\_CONS\_IND) \quad (33)$$

[insert graphs on discrepancies between constructed series for savings and actual ones]

The next block registers the variations in net wealth due to transfers in Capital account. Beginning from Taxes, also here I assumed that only NFC pays to EU institutions[23], then we find the other transfers in capital account[24] while lines 38 and 39 records the total trasfers paid and received from. Thus, subtracting the transfers from Savings yields the Variations in Net Wealth.

As for GDP, I decided here to make the series for $GFCF$ and $DINV$ consistent with the NIPA tables. Both components of Investments have thus been calculated as a residual[25]:

$$NFC\_GFCF = GFCF\_NIPA - (HH\_GFCF + FC\_GFCF + GVT\_GFCF) \quad (34)$$

[22] As before, I assigned the discrepancy from seasonal adjustment to NFC outlays.

[23] Thus $NFC\_TRK\_TAX\_pW = ROW\_TRK\_TAX\_r$ while the amount paid domestically is calculated as a residual, $NFC\_TRK\_TAX\_pD = GVT\_TRK\_TAX\_r - (HH\_TRK\_TAX\_p + FC\_TRK\_TAX\_p)$, getting the discrepancy from seasonal adjustment.

[24] Here the discrepancy is addedd to Government payments.

[25] With the residuals from seasonal adjustment going to NFC in both cases.

and

$$NFC\_DINV = DINV\_NIPA - (HH\_DINV + FC\_DINV + GVT\_DINV) \tag{35}$$

Finally, subtracting Investments and the other acquisitions of non-produced non-financial assets from Savings yields the Net Lending of the various sectors.

[...]

5.2 The Balance Sheet Matrix

Now I can turn to the Financial side of the system. Tables 6 and 7 display the "actual" Financial Accounts (Stock and Flows, Excel Appendix - sheets 3 and 4 respectively) for Italy as of 2015. To keep things simple, I decided to record only the stocks above 25 Bn and all the corresponding flows. As previously noted, the Financial Accounts from BoI offer much more disaggregation than the NFA published by ISTAT. Financial corporations are here divided into 7 subsectors. Most Important, the Central Bank is separeted here from domestic banks, which will allow to model monetary policy in a more systematic way.

Starting from the top, we find "gold and monetary reserves", "banknotes and monetary deposits" and "other deposits" (which are held by Monetary Financial Institutions, MFI, other residents and RoW), "short-term asset" (issued by Government, other residents and RoW), "long-term assets" (issued by MFI, the Government, other residents and RoW), "Derivatives", "short" and "long-term loans" (issued by MFI, the Government, other residents and RoW), "shares" and "shares of mutual funds" (issued by domestic and foreign firms), "Insurance technical reserves" (split into life and pension fund insurances and others) and, finally, "other accounts" (made of commercial credit and others). What is left represents the Net Wealth of the various sectors.

As for the Transaction Matrix, also for the financial side I have to keep the model matrix as simple as possible, and combine the informations on financial assets and liabilities with other data sources regarding investments in real assets. Moreover, it is not clear how to attribute the monetary base between the BoI and the ECB, for which further work is needed.

Table 8 (Excel Appendix - sheet 5) shows the Model Balance sheet.

Banks hold deposits of households, firms and of the foreign sector[26] (these are the sums of "banknotes and monetary deposits" and "other deposits"). More-

[26]The rest of the deposits are held by the CB, for the "othe deposits" part (200 mld) and the banking sector (380mld in "banknotes and monetary deposits" and 340mld in "other deposits"). These are omitted from the model, 1) for the sake of simplicity, 2) because only a small part of the "banknotes and monetary deposits" of banks is held abroad, and most of these deposits are inside the banking sector itself.

over, banks issue loans[27] to households as consumer credit ("short-term loans" from MFI and OFI), and for mortgages ("long-term loans" from MFI and OFI), and to firms as investments finance ("short term loans" and "long term loans" from MFI and OFI).

In turn, the Government issues debt, which is held by all sectors but firms ("short term asset" from government and "long term asset" from MFI, central government ("cct" and "other") and other residents). Firms issue equities while Financial Corporations issue debt, which are bought by households and the foreign sector ("shares" of domestic NFC the former, stock of long term assets held by banks the latter). Firms get FDI from the foreign sector (stock of domestic shares held by foreign sector) while banks and the CB hold foreign liabilities ("short" and "long-term asset" from row).

The residuals between total assets/liabilities from Table 7 and the stocks displayed in the matrix is recorded as "Other Net". These turn out to be small for most sectors, meaning that the simplifications made have not impacted too heavily, but not for the CB. This is certainly related with its relation to the ECB. Finally, summing vertically, we get to the Net Financial Assets of the various sectors.

[...]

6 (Preliminary) Conclusions

This works attempts to show how to build a SFC macroeconomic model and how to get *From Theory to Practice*. After discussing the SFC method and presenting the New Cambridge model in sections 2 and 3, section 4 introduces the database for the empirical model, which consists mainly of Financial Accounts (from BoI) and Non-Financial Accounts (from ISTAT), and sheds some light and questions on how to make the best out of these sources. Finally, in section 5 I start with the actual model. I present the Transaction-Flows and Balance sheet matrices of the model, alongside a discussion of some relevant aspects stemming out of a first data exploration.

What needs to be done: complete the analysis of the "real" economy; discuss and complete the model's balance sheet; reconcile the two database, i.e. link the dynamics of stocks to flows of interest and income;endogenize everything but the policy variables; model employment; estimate behavioral equations; make policy simulations.

[27] A problem that arises here is that I do not have the informations on how to disaggregate the loans towards the other sectors.

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