

THE GREEK CRISIS: AN INVESTIGATION OF NATIONAL BALANCE SHEET DATA (1997-2014)

Master thesis “Analysis and Policy in Economics” graduate programme (Ecole Polytechnique and Paris School of Economics)

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ABSTRACT

Drawing on a new dataset built for the purpose of this study, I explore the dynamics of national wealth accumulation in Greece between 1997 and 2014, and suggest a thought-provoking narrative of the Greek crisis. After constructing series on domestic and foreign (net) wealth, as well as on private and government (net) wealth, I highlight the role played by real capital gains or losses vs. investment and saving flows in the accumulation of domestic capital and net foreign assets of the public and the private sector. The findings allow to better understand the pre-crisis period where external imbalances emerged, as well as the subsequent adjustment during the crisis following the sudden stop of private foreign capital flows. In particular, I show that the rise in external indebtedness before the crisis was supported, alongside with net borrowings from the government, by real capital losses on both gross external assets and liabilities of the private sector. During the crisis, the external adjustment occurred through real capital losses resulting from the drop in domestic asset prices (tradable debt and equity) but was limited by the surge in external borrowings resulting from the government’s successive official bailouts. Importantly, I relate the emergence of the unsustainable external public debt to the real estate bubble that started in the mid-1990s: the national saving deficit initiated by the property bubble - through a classic wealth effect on households - led the country to borrow from the rest of the world to finance domestic investment in an overheated construction sector. In contrast to Spain or Ireland, the government, instead of the private sector, primarily fulfilled this task. I offer two main possible explanations for this: first, corporations – notoriously small and family-run in Greece - were relatively more credit-constrained and thus had a very limited access to external financing compared to the government; second, given its large initial size in terms of ownership of non-financial assets, the government had relatively more incentives to invest in capital goods. By facilitating cross-border capital flows, the adoption of the single currency acted, not as a cause, but as a catalyst - in the chemical sense of the word – in the detrimental self-fulfilling dynamics that hit Greece and other periphery countries.

Keywords: National wealth, Valuation Effects, Capital Flows, External adjustment, Greece.

JEL classification codes: E01, E21, E22, F32, F33, F36, F45, H12, H63



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ACKNOWLEDGEMENTS

First of all, I want to express my gratitude to Thomas Piketty, my tutor and supervisor, for his continuous guidance throughout my studies at the Ecole Normale Supérieure. On top of supervising the following master thesis and teaching me a fascinating field and approach of Economics, he has always listened and guided me while leaving me a great amount of freedom in my choices.

I also especially thank Gabriel Zucman who has been very responsive and helpful when I was struggling with issues in my work, as well as André François-Poncet, Margot N. Gill and more broadly the committee of the Arthur Sachs Scholarship Fund for providing me with generous financial support, which enabled me to continue this research at Harvard University. In addition, a special thanks goes to those that have made this work possible for whatever reason: Emmanuel Farhi, Marc Gérard, Panagiotis Petrakis and Romain Rancière.

I am grateful to my friends, notably David Amiel, Charles Boissel, Karl Croonenborghs, Thomas Lambert, Alexandre Leandri, Antoine Levy, Thomas Moatti and Nina Roussille, for fruitful discussions on the Greek crisis. Let me also mention Nikolaos Charalampidis who very kindly agreed to send me his own series on national wealth in Greece.

And last, but not least, a final thought goes to my family and Marion for their invaluable support.

Cambridge, December 7, 2015

INTRODUCTION

The Eurozone crisis, that has been ongoing for six years, has already been the subject of numerous articles by academics who seek to understand its causal factors and its dynamics (e.g. Aguiar et al. 2015, Corsetti et al. 2013, Gopinath et al. 2015, Martin and Philippon 2015). Shambaugh (2012) argues that deeply understanding what has been happening in the Euro Area since its implementation, and most notably in the periphery, remains one of the greatest challenges macroeconomists face today. Different interpretations currently compete (lack of fiscal discipline, excessive private leverage, competitiveness divergence due to fixed exchange rates etc.), so that it makes it difficult to get a clear picture of the issues at stake. With this in mind, Baldwin and Giavazzi (2015) asked eighteen famous researchers what caused the Eurozone crisis in order to try to establish a consensus narrative of the crisis. The main causal factor that everyone seems to agree on today appears to be the accumulation of massive public and/or private external debts in the periphery (the so-called GIPS countries: Greece, Ireland, Portugal and Spain) that funded unproductive investments in non-traded and often bubbling sectors such as construction (Giavazzi and Spaventa 2010, Benigno and Fornaro 2014). Evidence shows that these foreign capital flows resulted essentially from intra-Euro Area lending/borrowing from creditor (Northern) to debtor (Southern) countries between 1999 and 2007². Following the burst of the real estate bubbles in the main developed economies between 2006 and 2008 (see [Appendix n°1](#)), the unfolding 2008 global financial crisis that started in the United States and the confidence shock resulting from the disclosure of past hidden fiscal deficits in Greece (October 2009), capital flowed out of the Euro Area periphery countries. Thus, the latter that had heavily relied on foreign capital flows to invest and grow since the adoption of the Euro experienced a sudden stop. Since currency devaluation was no more an option in the monetary union, they had to implement costly internal devaluations to adjust prices, restore competitiveness and ultimately narrow their current account deficits. Now, most researchers agree to say that the crisis was not a sovereign debt crisis *per se*, but rather a balance of payments crisis (hence the “German view” of the crisis through the sole lens of fiscal issues is widely contested). But a key question that remains unanswered so far is why the accumulation of massive - and in the end unsustainable - external debts came mostly from the public sector in Greece and Portugal, as opposed to the private sector in Ireland and Spain. For this very reason, I think that a truly unified view of the causes of the Eurozone crisis has not been achieved yet. In particular, the Greek issue is systematically handled separately in academic and policy debates: Greece is viewed as an outlier, even within the periphery. Most serious economic studies focus on other peripheral countries that went under macroeconomic adjustment programmes, namely Ireland (Lane 2011, 2014, Whelan 2014) and Portugal (Reis 2013). Regarding Greece, a “political view” of the crisis is generally accepted: the accumulation of hidden and unsustainable public external debt is the result of “fiscal indiscipline” of successive unscrupulous governments willing to increase public sector employment and wages³. Many stress that the Greek public debt was already unsustainable before the crisis, so that the adjustment would have had to occur anyway (De Grauwe 2011,

² At the Euro Area level, the current account (i.e. net lending/borrowing from abroad) was in balance throughout the pre-crisis period and even close to balance during the crisis. The current account imbalances were thus primarily among Eurozone members.

³ This is for instance the view of the German Council of Economic Experts (see Feld et al. 2015) and it is not contested among academic circles.

2015)⁴. The disclosure of the hidden fiscal deficits, generally identified as the trigger of the Eurozone crisis, is treated as an exogenous event, thereby ignoring the endogenous economic mechanisms at the total economy level that could have had generated in the first place this external over-indebtedness in the public sector.

I argue that the current inability to achieve a clear, unified and comprehensive view of the Eurozone crisis (and hence on what should be done to avoid the next crisis and improve the EMU institutional architecture) largely lies in our inability to understand the Greek crisis other than through the sole prism of fiscal indiscipline. My intuition is that this is primarily a consequence of a lack of relevant data, namely of detailed national balance sheet data and underlying sector balance sheets that could help to study the macro and sectoral dynamics of wealth accumulation which took place in the country after the adoption of the single currency. The absence of detailed balance sheet data (i.e. on assets and liabilities) for all sectors of the economy is particularly striking when we recall the heated and controversial policy debates we have seen still very recently. The main point of disagreement during the 12-13 July 2015 “crisis summit” that almost precipitated Greece out of the Euro Area was the €50bn privatization agenda suggested by the German Minister of Finance, Wolfgang Schäuble. The only time when a possible evaluation of the total Greek government asset portfolio was ever mentioned was in May 2011 in a statement by the former director of the IMF European Department, Antonio Borges⁵. Today, there is still no publicly available comprehensive data on the issue and the Greek crisis is systematically addressed through the unique lens of public debt, thereby making the debate on privatizations highly political. National balance sheet data are definitely needed to achieve a clear view on the dynamics of wealth accumulation in all sectors of the economy and help answer some key questions. How can we explain from an economic point of view the build-up of a large and unsustainable external debt by the government over such a long period of time before the crisis? Why did the public sector borrow so much? While the Greek public debt has notoriously increased over the last decade, what about the government assets? What was the role of capital gains or losses on domestic capital and net foreign assets in explaining the debt dynamics? What can we say about the dynamics of capital accumulation in the private sector? And finally during the crisis, through what channels did the adjustment occur? It appears essential to try to provide answers to these questions in order to correctly understand the crisis that hit Greece and still shakes the country.

⁴ Even if the domestic banks’ bailout in the end of 2008 played its role in the increase of Greece’s public debt in 2009, this cannot be considered as the main element that deteriorated the public debt sustainability (as opposed to Ireland for instance). As Blanchard (2015) writes: “Even before the 2010 program, debt in Greece was €300bn or 130% of GDP. The deficit was €36bn or 15.5% of GDP. Debt was increasing at 12% a year, and this was clearly unsustainable”. Even abstracting from 2009, the deficit was respectively of 6.1% (€13bn), 6.7% (€16) and 9.9% (€24bn) of GDP in 2006, 2007 and 2008. Between end of 2005 and end of 2008, debt was increasing at more than 10% a year (and between end of 2000 and end of 2008, by more than 8% a year). Besides, out of the €36bn of fiscal deficit in 2009, only approximately €4.4bn can directly be attributed to the rescue of domestic banks (see [Appendix n°2](#) for more details). Thus, even setting aside the cost of bailing out the domestic banks, one can reasonably say that the public debt trajectory was unsustainable, so that a kind of adjustment was in any case inevitable.

⁵ Reported by AFP: “The government has an extraordinarily large portfolio of assets [...] €50bn is less than 20% of all assets that the Greeks could privatize”. Should any comprehensive evaluation by the IMF or any other institution exist, it has remained strictly confidential so far.

To begin, I build a new macro-historical dataset on wealth and income in Greece from 1997 onwards, when detailed enough data (in particular by sectors and asset classes) begin to be exploitable. The database provides information on the evolution of the structure of wealth, saving and investment in the run-up to the Euro Area accession, during the pre-crisis period inside the monetary union (2001-2007) and finally during the crisis between 2008 and 2014. To the best of my knowledge, the resulting series on government and private (net) wealth are the first of their kind. In the spirit of the growing literature on national wealth (Piketty and Zucman 2014) and on external adjustment and international capital flows (Lane and Milesi-Ferretti 2001, 2007 and Gourinchas and Rey 2007a, 2007b, 2013), I intend to draw on this dataset to analyze the accumulation of wealth, before and during the crisis, and to stress notably the role of valuation effects on domestic and foreign wealth in the detrimental dynamics that led to the crisis. This approach of empirical macroeconomics through the investigation of national balance sheets is still in its infancy because the historical data are just beginning to be retrospectively published by national statistical institutes in the most developed economies, but it could have major implications for the prevention, management and analysis of financial crises in the future. I aim to provide a preliminary contribution in this area with the Greek example.

In the first section, I explain how I construct new series and breakdowns of national wealth since 1997 before commenting on the main findings. Then, drawing the dataset, I study in the second section the dynamics of national wealth accumulation and the external adjustment that occurred before and during the crisis. I begin by highlighting notably the role played by real capital gains and losses vs. investment and saving flows in the accumulation of domestic capital and net foreign assets between the government and the private sector. Thereafter, I focus on net foreign assets in order to better specify the evolution of external imbalances through the impact of net lending/borrowing from the rest of the world vs. real capital gains/losses on gross external asset and liability positions by institutional sectors and asset classes. I conclude by suggesting a new narrative of the Greek crisis that departs from the conventional explanation that solely focuses on fiscal indiscipline.

I. CONSTRUCTION OF NATIONAL WEALTH SERIES IN GREECE

In accordance with the publication of new international guidelines (SNA 1993, ESA 1995, SNA 2008 and ESA 2010⁶), the national statistical institutes of some developed economies have begun to publish retrospective national stock accounts which report, whenever possible, the market value of all non-financial and financial assets and liabilities held by each sector (households, government and corporations⁷) in a country. These data notably enable researchers to construct historical series of national wealth with the aim of studying the dynamics of capital accumulation. In that respect, Piketty (2011) analyzes in his pioneer work on France the long-run evolution of private wealth by decomposing wealth accumulation into an “inherited/dynastic” component and a “life-cycle/self-made” component. Piketty and Zucman (2014) extend the database to seven other countries⁸, over longer time periods and also include government wealth in the analysis. Among other things, they notably document the long-run increase in national and private wealth-income ratios as a stylized fact in developed economies⁹. Regarding Greece, there are no such national stock accounts yet, so that we cannot rely at first sight on official series to compute the wealth-income ratios. Charalampidis (2014) makes a first attempt to estimate national wealth in Greece over 1974-2013. Using a two-good wealth accumulation model (thus allowing for relative price effects between capital and consumption goods i.e. real capital gains or losses on capital goods) to simulate the evolution of the national wealth-income ratio, he finds results that are coherent with the regularities observed by Piketty and Zucman (2014) on other developed economies¹⁰. Even if such a kind of simulation is useful to assess the long-run evolution of national wealth, it has a number of drawbacks. Indeed, it relies on, first, the estimation of a starting point for the value of national wealth, which is all the more hazardous when it goes far back in the past given the poor quality of data in Greece; second, the use of an appropriate aggregate asset price index to obtain market-value data for each period; and finally, the estimation method does not provide a breakdown of national wealth between private and government wealth. More broadly, such a simulation method, which by nature requires remaining at a high level of generality, is not perfectly suitable to study the short- to medium-term fluctuations I am interested in. As a consequence, for the purpose of the current study, I suggest another method to estimate national wealth and its decomposition. For the interested reader, I compare in [Appendix n°3](#) my national wealth-income series to the one obtained by Charalampidis (2014). I find strong similarities in terms of level on average, but significant differences in terms of trend.

I.1. Towards a definition of national wealth and its subcomponents

⁶ The United Nations System of National Accounts (SNA) is an international standard system of national accounts whose aim is to provide an integrated, complete system accounts enabling international comparisons of all significant economic activities. The first international standards were published in 1953. New handbooks have been released for the 1968, 1993 and 2008 revisions. The first guidelines for the computation of wealth (stocks) were detailed in the 1993 version. The European System of Accounts (ESA) is the system of national accounts used by members of the European Union. The ESA 95 and ESA 2010 are fully consistent respectively with the 1993 and 2008 SNA in definitions, accounting rules and classifications.

⁷ Note that the central bank is included in corporations. More precisely, it is considered as a financial corporation.

⁸ In addition to France, the seven other developed countries included in their dataset are the United States, the United Kingdom, Germany, Italy, Japan, Australia and Canada.

⁹ Income is defined as “national income”. Thus, it is the sum of net domestic output (GDP minus consumption of fixed capital a.k.a. capital depreciation) and net foreign income (investment income generated by net foreign assets).

¹⁰ In Charalampidis (2014), the national wealth-income ratio indeed increases from about 250% in the 1970s to 500% at the height of the current crisis.

First of all, the most important question that must be raised is how can we measure national wealth? Indeed, before getting into the empirical issues related to Greece in particular, we have to agree on what we want to measure in the first place. Following the most recent international guidelines mentioned before, national wealth of a given country includes all “economic assets” held by residents in the country, meaning all assets over which ownership rights can be enforced and which provide economic benefits to their owners. By definition, this notably excludes human capital as well as future government expenditures and transfers (e.g. pay-as-you-go social security pension, health benefits, education expenses etc.), which are much more difficult to properly evaluate in a comprehensive and uniform manner. However, on condition that they provide economic benefits, it includes non-produced assets such as natural resources (e.g. land and proved natural reserves) and intangible capital (e.g. intellectual property products such as R&D of corporations)¹¹. Besides, residents in the country, who are the ultimate owners of assets and liabilities, can easily be divided into three main sectors, namely the corporations (including the central bank and government-controlled companies¹²), households and non-profit institutions serving households¹³, and the general government (central, state and local governments as well as social security administrations). Each sector has by definition a net wealth equal to the sum of its non-financial and financial assets minus its liabilities. Thus, with this framework in mind, national wealth is naturally defined as the sum of the net wealth of the three main sectors in the economy (throughout the paper, the term “wealth”, when used alone, will always refer to the notion of “net wealth” i.e. assets minus liabilities). But because at the total economy level the sum of domestic financial assets is necessarily equal to the sum of domestic financial liabilities¹⁴, an intuitive definition of national wealth follows as the sum across all sectors in the economy of their respective net foreign asset positions (“NFAP”), i.e. the difference between external (or “foreign”) assets and external (or “foreign”) liabilities, and of their non-financial assets¹⁵:

$$\text{National wealth} = \text{NFAP (corporations, households, government)} + \text{Nonfin. assets (corporations, households, government)} \quad (1)$$

¹¹ This makes one of the key differences between national wealth measures obtained by using official country-wide balance sheets and measures of the capital stock that can be found in the growth accounting literature obtained through cumulating past investment flows and adjusting for changes in relative prices.

¹² According to international guidelines, government units that are engaged in market production such as government-controlled companies and keep as complete set of separate accounts are not in general government but in the corporate sector.

¹³ Non-profit institutions serving households include all individuals and unincorporated enterprises owned by households except those that have sufficiently detailed accounts and behave in the same way as corporations. In the paper, the terms “households” and “households and non-profit institutions serving households” are used indiscriminately. As part of this study on Greece, it is worth noting that the properties of the Church are included in the “Households and NPISHs” sector.

¹⁴ The domestic financial claims are the financial assets held by residents on other residents, whereas the domestic financial liabilities are the financial liabilities of residents due to other residents. Both are necessarily equal at the total economy level.

¹⁵ Although the net foreign asset position of a country only includes financial assets and liabilities, it also incorporates in theory the market value of the non-financial assets such as real estate owned by the rest of the world in the country. Indeed, when a foreigner owns a real property in the country, statisticians record that a domestic quasi-corporation owns the property and that the quasi-corporation is fully owned (equity) by a foreign investor. Because quasi-corporations are unincorporated corporations, these data should be included in the households and NPISHs sector. Note that the fifth edition of the IMF Balance of Payments Manual (BPM5) recommends that quasi-corporations be included in the direct investment data.

This gives immediately a definition of national wealth as the sum of foreign and domestic wealth, where foreign wealth is defined as the sum of net foreign assets across all sectors in the economy, and domestic wealth as the sum of all non-financial assets across all sectors in the economy:

$$\text{Foreign wealth} = \text{NFAP (corporations, households, government)}$$

and:

$$\text{Domestic wealth} = \text{Nonfin. assets (corporations, households, government)}$$

hence:

$$\text{National wealth} = \text{Foreign wealth} + \text{Domestic wealth}$$

Starting from this, one can straightforwardly divide national wealth into a private and public component. Indeed, a simple balance sheet identity at the corporations' aggregate level shows that the sum of the net foreign assets and non-financial assets of corporations is equal to the sum of the domestic net financial claims of households and the general government¹⁶, if and only if the equity of corporations is measured at book value. Indeed, the basic balance sheet identity yields¹⁷:

$$\text{NFAP (corporations)} + \text{Nonfin. assets (corporations)} = \text{Domestic fin. liabilities (corporations)} - \text{Domestic fin. assets (corporations)} \quad (*)$$

And by extension:

$$\text{Domestic fin. assets (households, government)} - \text{Domestic fin. liabilities (households, government)} = \text{Domestic fin. liabilities (corporations)} - \text{Domestic fin. assets (corporations)}$$

Thus, coming back to our initial definition of national wealth (1), we can decompose the latter into a private and public component:

$$\text{National wealth} = [\text{NFAP (households)} + \text{Nonfin. assets (households)} + \text{Domestic fin. assets (households)} - \text{Domestic fin. liabilities (households)}] + [\text{NFAP (government)} + \text{Nonfin. assets (government)} + \text{Domestic fin. assets (government)} - \text{Domestic fin. liabilities (government)}] \quad (2)$$

with:

$$\text{Private wealth} = \text{NFAP (households)} + \text{Nonfin. assets (households)} + \text{Domestic fin. assets (households)} - \text{Domestic fin. liabilities (households)}$$

and:

¹⁶ Domestic net financial claims of households and the general government are the difference between the financial assets held by households and the general government on other sectors of the economy and the liabilities due by households and the general government to other residents.

¹⁷ By definition, the balance sheet identity holds if and only if equity is measured at book value.

$$\text{Government wealth} = \text{NFAP (government)} + \text{Nonfin. assets (government)} + \text{Domestic fin. assets (government)} - \text{Domestic fin. liabilities (government)}$$

hence:

$$\text{National wealth} = \text{Private wealth} + \text{Government wealth}$$

Although it is useful to understand how we can move from one decomposition of national wealth as the sum of foreign and domestic wealth, to the other as the sum of private and government wealth, the second identity (2) follows immediately when one recalls the basic definition of national wealth as the sum of the net wealth of our three main sectors in the economy. Indeed, when equity is measured at book value, the net wealth of corporations is zero by definition, so that national wealth becomes the sum of the net wealth of households (private wealth as defined above) and of the general government (government wealth as defined above). However, when the equity is valued at market prices, the net wealth of domestic corporations can be non-zero, either positive if the book value is higher than the market value, or negative in the opposite case.

To construct national wealth series as well as its subcomponents by using data analogous to official national balance sheet data where equity is valued at market prices, I follow Piketty and Zucman (2014) and define “book-value national wealth” as the sum of net foreign assets and non-financial assets across all sectors in the economy, while “market-value national wealth” is the sum of the net wealth of households and the government. As is suggested by their respective names, the intuition behind this is that the market-value national wealth captures the value of corporations at market prices, while the book-value national wealth estimates corporations’ equity at book value i.e. as the difference between the value of assets and liabilities excluding equity. The difference between the two values is the residual (corporate) wealth. Conceptually, it can be attributed to market fluctuations and/or measurement errors depending on the perspective one adopts. A problem one might immediately see in such a definition of book-value national wealth is that part of the shares issued by domestic corporations - namely the part owned by foreign investors - is still valued at market prices (in the net foreign asset position of corporations). Thus, strictly speaking, the resulting book-value national wealth does not perfectly capture equity at book value. This remark may be all the more relevant when a significant share of domestic corporations’ equity is owned by non-residents (see [Appendix n°4](#) for specific data on Greece). We can attempt to make adjustments to correct this imperfection. I refer to [Appendix n°5](#) for more details on the construction of the “adjusted book-value national wealth”. One must nonetheless keep in mind that the series obtained by incorporating these adjustments is very similar to the standard book-value national wealth obtained by directly using official national balance sheet with equity at market prices. Simply summing the market value of non-financial assets and net foreign assets across all sectors thus yields a good approximation of the actual (here called “adjusted”) book-value national wealth. Now, should we be using the notion of book-value or market-value national wealth for the analysis of national wealth accumulation? It seems that there is no simple answer to this question. First of all, as Piketty and Zucman (2014) pinpoint in the Appendix of their paper, there are several countries (in particular Anglo-Saxon countries) in which the net wealth of corporations is close to zero, meaning that book and market valuations of equity are almost similar. Obviously in such cases, using either book- or market-

value national wealth does not make much difference. For countries where it does make a difference, then it becomes a matter of perspective. One can argue that book valuation can help avoid many measurement errors since estimating the market value of equity in privately held companies is tricky and in essence approximate¹⁸. This argument could be especially relevant in small countries like Greece where private companies account for the largest fraction of equity capital¹⁹. However, for several other reasons, it can be interesting to use measures of market-value national wealth. This can indeed help to avoid a different kind of measurement errors inherent to book valuation related to the difficulty to properly estimate the value of corporations' non-financial assets. Lastly, working with a market valuation of equity is more appropriate to study the role of real capital gains or losses - namely the relative price effects of "capital" with respect to "consumption" goods - in the accumulation of national wealth. Acknowledging the strengths and weaknesses of both approaches, I will consistently report the findings for both types of equity valuation. But as we shall see later on, using either market- or book-value wealth series in Greece over our period of interest makes little difference.

I. 2. Construction of Greek series

As stated previously, there are no official national balance sheet data in Greece, which makes the construction of national wealth series more complicated. Nevertheless, we can use in a comprehensive manner different available data sources to estimate these series with the same methodology - to the extent possible - as the one adopted in the most recent international guidelines (ESA 2010 in our case²⁰). I start by briefly explaining what are the different types of assets usually included in the official national balance sheet data and how they are commonly valued, before presenting my own approach for the computation of Greek series.

All "economic assets" owned by residents and the rest of the world in a country must in theory be included in the national balance sheet data. Thus, it includes all financial assets and liabilities as well as non-financial assets. The latter are divided into produced and non-produced assets. Produced assets consist of produced tangible (fixed assets²¹, inventories and valuables) and intangible (intellectual property products such as mineral exploration and evaluation, computer software and database, R&D, entertainment, literary or artistic originals) assets, as opposed to non-produced assets which incorporate non-produced tangible (natural resources²²) and other

¹⁸ Unquoted shares of private companies are typically valued by statisticians on the basis of observed market prices for comparable, publicly traded companies. This is by nature a delicate exercise. In Greece, at the end of 2014, the market value of unlisted shares of domestic corporations as reported in the country's financial accounts is more than twice as high as the market-value of listed shares.

¹⁹ According to the official Greek financial accounts, the estimated market value of shares issued by private companies accounted for almost 70% of the total market value of all shares at the end of 2014.

²⁰ Most recent international standards for the computation of wealth in Europe.

²¹ Fixed assets mainly include dwellings, non-residential buildings and other structures, machinery, equipment and weapon system and cultivated biological resources. Monuments like the Parthenon are included in the "non-residential buildings and other structures" category.

²² Natural resources mainly include the value of land, mineral and energy reserves and non-cultivated biological resources and water resources. In the official national stock accounts, only assets over which there are ownership rights and which provide economic benefits to their owners are included. As such, "pure" environmental assets like the seas and the air are not included in the natural resources of a country. Lastly, one should note that increases in real estate prices can be attributed to the non-produced assets category if they do not reflect increases in constructed costs but rather increases in the value of lands.

types of intangible assets²³. Then, the general idea of the most recent guidelines such as the ESA 2010 is to construct series with the aid of as many market-value data as possible. Thus, statisticians use, whenever available, census-like sources where economic units report the prevailing market value of their holdings like equity, debt, dwellings etc.²⁴. Otherwise, they can rely on recently observed transactions, notably on the real estate market, to obtain the missing market value of certain assets. Only when prevailing or observed market prices are not available, they estimate, as a second best, the value of assets by cumulating past investment flows and adjusting the series for the depreciation of capital (depreciation adjustment) and the variation of prices (valuation adjustment). Statisticians still have to rely on this second-best approach - called the “perpetual inventory method” - for a large portion of assets, in particular for corporations where, by nature, many non-financial assets such as equipment, structures etc. cannot be valued at market prices. Finally, there are some cases where neither the census-like method nor the perpetual inventory method are suitable, for instance for natural resources such as natural reserves (oil, gas, water etc.) which are never sold because they are the property of the government, and for which we have no data on past investment flows. Then, as a last resort, assets are typically valued by estimating the net present value of future returns over a long-term horizon. With this in mind, table 1 (see below) documents how my series are constructed compared to the corresponding international guidelines. My valuation standards are broadly consistent with the official ones, even if I have no choice, as we shall see later on, but to give to the perpetual inventory method a greater role in the estimation of the value of produced assets.

Table 1 - National balance sheet, valuation of assets and liabilities		
Types of assets/liabilities	Valuation method in ESA 2010	Valuation method in Hyppolite (2015)
Financial assets/liabilities	Mix of prevailing market prices & nominal value	
Currency and deposits	Nominal value	idem
Other accounts receivable/payable	Nominal value	
Loans	Market value (i.e. nominal value minus loss provisions)	
Debt securities	Prevailing market prices	
Equity	Prevailing market prices	
Produced assets	Mix of observed market prices and PIM	PIM only
Fixed assets	Observed market prices whenever available (e.g. for dwellings) or PIM (e.g. for other buildings and corporate tangible assets)	PIM
Inventories	Perpetual inventory method	idem
Valuables	Perpetual inventory method	not included
Non-produced assets	Mix of observed market prices whenever available for land and net present value of future returns otherwise	idem (based on extrapolation of data of a regional peer country)
Natural resources		
Intangible non-produced assets		

Source: ESA 2010

Notes: (1) prevailing or observed market prices are obtained from census-like sources where economic units have to report on the current market-value of their assets and liabilities (e.g. reports on balance sheet - as well as off-balance sheet - positions of financial and non-financial corporations); (2) perpetual inventory method (PIM) consists of cumulating past investment flows with adjustments to account for capital depreciation and changes in asset prices; (3) fixed assets include tangible and intangible fixed assets; tangible fixed assets are the most important category of produced assets: they include dwellings, other buildings and structures (monuments are in theory included in this category), machinery and equipment, cultivated biological resources and weapon systems.

²³ The official distinction between produced and non-produced intangible capital is quite blurred. For instance, according to international guidelines, non-produced intangible capital must include “marketing assets”, although the latter could be logically considered as “produced” assets.

²⁴ Such sources include reports of balance sheet and off-balance sheet positions by non-financial and financial corporations, as well as housing surveys.

Detailed data following the ESA 2010 methodology for financial assets and liabilities are regularly compiled and published on an annual and quarterly basis since 1997 by the national central bank of Greece, namely the Bank of Greece. In this paper, I precisely start by studying the evolution of wealth in 1997 because sufficiently detailed data on financial assets and liabilities before the end of 1997 are not available. Throughout this study, data in drachmas prior to the adoption of the common currency by Greece in January 2001 are systematically converted using the Greek irrevocable Euro conversion rate (340.75 drachmas for one euro)²⁵. In compliance with the ESA 2010 guidelines, all financial assets and liabilities including equity are valued at market prices. When market prices cannot be readily observed, for instance in the case of shares of unlisted companies, statisticians compute market-value approximations. Typically, for unlisted shares, they estimate a market-value proxy on the basis of the prices of listed companies with similar earnings and dividend history and can prospect, if deemed necessary, with a possible downward adjustment to account for inferior liquidity of private companies' shares with respect to public companies. Hence, the data I use for financial assets and liabilities in Greece are by definition fully in accordance with the ones that could have been integrated in the official national balance sheet of the country, should the Greek national statistical institute publish such data.

However, there are no publicly available official historical series of the market value of non-financial assets yet. The newly-created national statistical service²⁶ has just started computing the market-value of non-financial assets held by households, corporations and the general government and officially transmitting the series to Eurostat according to the ESA 2010 framework²⁷. At present, detailed data by institutional sectors are only available for the year 2012 (end of the year) and only relate to produced non-financial assets, which makes the estimation of the value of non-produced assets particularly tricky as we shall see later on²⁸. In view of this, I estimate the historical series for produced assets between 1997 and 2014 in market value by starting from the 2012 available data point and cumulating or subtracting corresponding net investment flows (gross capital formation minus consumption of fixed capital) and using a reference price indicator to adjust for each period the end-of-period market-value of the stock. Formally, suppose K_t is the market-value of the stock of produced assets at the end of period t , I_{t+1} the net-of-depreciation investment flow that occurs during period $t+1$ (i.e. the net capital

²⁵ Greece became the 12th member of the monetary union by adopting the common currency in January 2001. Just like in other countries, a specific irrevocable Euro conversion rate (340.75 drachmas for one euro in the case of Greece) was set at the beginning. In order to avoid a break in the series I follow throughout this study the convention adopted by the main statistical bodies, which is to use this conversion rate to convert data of the pre-Euro Area period in euros. A second option could consist of expressing national currency data for years prior to the Euro adoption in ECU, the precursor currency to the Euro. I favor the first approach for the sake of comparability between different data sources. In practice, one or the other method does not make much difference because we do not go back far prior to the Euro adoption.

²⁶ The national statistical institute of Greece, ELSTAT, is an autonomous legal entity under public law and independent from the government only since July 2010. Prior to July 2010, it was a non-autonomous service of the Greek state known as the National Statistical Service of Greece.

²⁷ The same data are also used by the OECD in their annual national accounts, section "balance sheets for non-financial assets".

²⁸ By email, ELSTAT specified that data on produced assets by institutional sectors for the years before 2012 are not available because "the analysis was optional before 2012". Data for the year 2013 will be available after the transmission to Eurostat on 31 December 2015 and data for the year 2014 will be available after the transmission to Eurostat on 31 December 2016, according to the Transmission Program of Regulation 549/2013 ESA 2010. Finally, ELSTAT stressed, with no further detail, that data on non-produced assets are not available because the calculation of such series is not compulsory according to the Transmission Program of Regulation 549/2013 ESA 2010.

formation) and r_{t+1} the variation of the reference price index between t and $t+1$ (year-on-year, end-of-period), we have the following identity:

$$K_{t+1} = (1 + r_{t+1})(K_t + I_{t+1})$$

or equivalently if we go backward:

$$K_t = \frac{K_{t+1}}{1 + r_{t+1}} - I_{t+1}$$

The data on gross capital formation and consumption of fixed capital available in the AMECO (European Commission) database²⁹ (see [Appendix n°6](#)) enable to compute a breakdown by sectors of the net capital formation, so that we are able to estimate the value of produced assets at historical cost held by each sector of the economy over the 1997-2014 period. Then, as reference price indicator to get market-value series, I use the index of prices of dwellings in urban areas created and updated by the national central bank of Greece based on data collected by the credit institutions operating in the Greek real estate market³⁰. By doing so, I implicitly assume that, first, the market price of the total produced assets follows on average the price of dwellings in urban areas and, second, the portfolios of produced assets of our three main sectors (households, corporations and the general government) are relatively homogenous in terms of asset composition, so that they follow the same market-price dynamics³¹. I have no choice but to do so, notably because data on commercial property prices are not available on a sufficiently long period of time. However, when they begin to be available (starting from 2006), they follow the same trend as residential property prices, so that the same market-price dynamics assumption can make sense. In practice, as highlighted in [Appendix n°8](#), there are important differences in the composition of the portfolios of produced assets between the main institutional sectors. For instance, the government owns primarily assets categorized as “other structures” which includes notably roads, railways, bridges, tunnels etc. (61% of its produced assets), while households’ holdings include mostly dwellings (81% of their produced assets). Regarding corporations, the bulk of the portfolio is made of machinery and equipment (40%), non-residential buildings (21%) and inventories (19%). Ideally, this heterogeneity would require working with more price indexes but this is not impossible with the currently available data. In the interest of rigor, I also stress that the valuables are not measured by statisticians in Greece, so that by construction they are excluded from my series on produced assets. It is almost certain however that including them would only marginally change the series since these assets usually account for a very small part of the value of total produced assets when reported in the official national balance sheet of other countries. Besides, it should nonetheless be pointed out that inventories are estimated and

²⁹ AMECO is the annual macro-economic database of the European Commission's Directorate General for Economic and Financial Affairs (DG ECFIN). Using AMECO is perfectly consistent here (relative to the other data sources from the Bank of Greece or ELSTAT that I use) because the main data source of AMECO is Eurostat complemented where necessary by national sources coming from local statistical institutes. All reported series follow the ESA 2010 methodology.

³⁰ Note that this is the most comprehensive real estate price indicator available in Greece. There exist other indicators such as the index of prices of dwellings in Athens, Thessaloniki, in other cities and in urban areas other than Athens. All are reported in [Appendix n°7](#) for the interested reader.

³¹ While recognizing that these assumptions are strong, I stress that we have no choice but to do so because the flow data on gross capital formation and consumption of fixed capital are not sufficiently detailed (no breakdown by asset categories) to enable a finer analysis.

included in the data. Indeed, to take into account the (net) change in inventories, I measure gross investment flows using gross capital formation instead of gross fixed capital formation³². Lastly, I emphasize that produced intangible capital seems to be imperfectly recorded in the official data available for 2012: R&D and computer software and database are evaluated but there are no data in the category “entertainment, literary or artistic originals” and “other intellectual property product”. Thus, because we lack data on valuables and on intangible produced assets, it is likely that I slightly underestimate the market value of the stock of total produced assets over the period³³.

Now, in order to complete the national balance sheet, we need estimates by sectors of the value of non-produced assets. As stated previously, non-produced assets include essentially natural resources, namely land over which ownership rights can be enforced, (proven) mineral and energy reserves as well as water resources. The problem is that data for non-produced assets are completely inexistent in Greece. To deal with this major issue, I choose to extrapolate data – with several adjustments - on the value of corresponding assets in a regional peer country, namely the Czech Republic³⁴. Thereafter, my estimation method relies on two critical assumptions: first, the marginal value of natural resources is the same in both countries (and land follows on average the same market-price dynamics), and second, the relative distribution of produced and non-produced assets across each sector of the economy is comparable in both countries³⁵. The first assumption is essential to derive the market value of non-produced assets in Greece at the country level. It basically amounts to assuming that the marginal value of land and mineral, energy and water reserves (which account for the largest part of the total non-produced assets in all OECD countries where complete official balance sheet data are available³⁶) is the same in Greece and the Czech Republic. Of course, it is a strong assumption but it can be justified by several observations. First of all, as stated previously, the very nature of mineral, energy and water resources often prevents statisticians to evaluate them at market value. Conversely, they are forced to estimate the net present value of their future returns over a long-term horizon. Hence, by construction, the value of the pool of natural resources in a country (excluding land) is not subject to market fluctuations, but only to new discoveries of unknown reserves (or variations in the discount factor). In developed economies such as Greece and the Czech Republic, this is unlikely to happen. Therefore, with the same discount factor, the value of one unit of water, oil, gas or any mineral deposit can be reasonably considered as the same in both countries given that

³² Remember that gross capital formation is the sum of gross fixed capital formation and the net change in the level of inventories.

³³ As a consequence, the national wealth-income ratio might be slightly underestimated.

³⁴ The Czech Republic is indeed the only country in the region that displays appropriate official data i.e. over a sufficiently long period and following the ESA 2010 methodology.

³⁵ To be more explicit, this means that if the general government sector holds for instance 25% of the total produced assets and 50% of the total non-produced assets in the Czech Republic, while the general government holds 30% of the total produced assets in Greece, then a simple rule of three $30\% \cdot 50\% \cdot (1/25\%) = 60\%$ gives the relative size of the general government non-produced asset holdings in Greece with respect to the two other sectors (namely corporations and households). I apply the same rule of three for each of the three main sectors in Greece and then, I normalize the resulting shares to unity in order to obtain for each sector in Greece its implied share in the total of non-produced assets. In the end, it amounts to assuming that the relative distribution of produced and non-produced assets across sectors is the same in both countries.

³⁶ Non-produced assets also include in theory some intangible assets but their value is systematically very small compared to the other non-produced assets (and also to the other intangible assets included in produced assets).

they belong to the same geographic area (namely East-Central Europe)³⁷. As such, after adjusting for the relative size of natural reserves between the two countries, one can straightforwardly derive the value of natural resources excluding land in Greece. However, land is a more complicated issue. We must distinguish two distinct problems: on the one side, the question of the (average) marginal value of land, and on the other side, the fluctuation of its (average) market price. Importantly, the land category includes the ground underlying dwellings and non-residential buildings, which is potentially subject to strong market price fluctuations in case of a real estate bubble or crash, just as the value of dwellings and non-residential buildings³⁸. First, I argue that the assumption of same marginal value is still relevant for land. Indeed, the main structural characteristics that can influence the average marginal value of land are quite similar in Greece and the Czech Republic: both have a relatively comparable land structure³⁹, GDP per capita⁴⁰ and density of population⁴¹. Just as for natural reserves, the advantage of working on land in developed (thus urbanized) countries is that the variable does not vary through time in terms of quantity or structure at a short- or medium-term horizon⁴². Regarding price fluctuations, the problem is that we cannot adjust the price dynamics because the price index of land in the Czech Republic is only available back to 2004. However, as highlighted in [Appendix n°9](#), we observe that, starting from 2004, the index for the average price of land per square meter in the Czech Republic follows the same trend as the general residential property price index I use to construct the Greek series. Because, as evidenced by the Czech example (always in [Appendix n°9](#)), there is generally a very strong correlation between the evolution of prices of existing dwellings and the underlying land, we can assume that the value of residential land followed the same price dynamics throughout 1997-2014 in Greece and the Czech Republic⁴³. Thus, thanks to the first assumption mentioned above, I simply infer the Greek series for non-produced assets at the total economy level by adjusting the Czech series for the relative size of natural resources (land and reserves) between the two countries as detailed in the World Factbook Database (see table 2 below). All in all, the value of non-produced assets is pretty small when compared to the value of produced assets (see [Appendix n°10](#)). One should also note that the margin of error on the measurement of the value of land *vis-à-vis* the total value of national wealth is small because according to my calculations land only accounts on average for less than 50% of the total value

³⁷ There might be different qualities of natural reserves across different geographic areas but this is unlikely to be the case on the European continent.

³⁸ Note that land refers only to the ground over which ownership rights can be enforced. It excludes subsoil assets, non-cultivated biological resources and water resources below the ground for instance (the latter are valued separately).

³⁹ Indeed, according to the World Factbook Database (source: CIA), land use in Greece is 63.4% agricultural, 30.5% forest and 6.1% “other”, while in the Czech Republic land use is 54.8% agricultural, 34.4% forest and 10.8% “other”.

⁴⁰ E.g. \$21,653 for Greece and \$19,563 for Czech Republic in current prices in 2014 according to the IMF World Economic Outlook database.

⁴¹ According to the World Bank database, population density was of 85 people per sq. km in Greece, while the corresponding figure was 136 in the Czech Republic. As a matter of fact, population density is higher in the Czech Republic, which could imply a higher marginal value of land (one can indeed verify in the OECD database that countries where population density is reaching record levels such as Korea or Japan, have a very high value of land compared to other countries). However, when looking at the land structure, the Czech Republic has relatively more forests than Greece - whose marginal value is usually less than agricultural land – so that on average the same-marginal-value assumption could be a good approximation.

⁴² E.g. the respective sizes of land in the Czech Republic and in Greece are the same between 1997 and 2014 (note that the dissolution of Czechoslovakia between the Czech Republic and Slovakia happened on January 1st, 1993). Besides, the composition of land does not vary much in developed countries over such time horizons.

⁴³ I do not address the issue of non-residential land. This is not really important as its value is insignificant.

of non-produced assets and, in turn, the latter represent on average 25% of the total value of non-financial assets (see the piechart diagram in [Appendix n°11](#) for a full decomposition of non-financial assets in 2012 where land accounted for 14% of the total value of non-financial assets). Then, the second assumption allows getting a breakdown of the resulting series for the total economy across our three sectors of interest (households, corporations and the general government). This is perhaps the trickiest part. In order to grasp the intuition of the second assumption, it is useful to look at a number of regularities we can observe for produced and non-produced assets in all countries where the data are available in the most comprehensive reference dataset, namely the OECD annual national accounts⁴⁴. After examination of the cross-country data, I indeed find at the country level that: first, the value of produced assets is systematically higher than the value of non-produced assets except for two countries, Japan and Korea⁴⁵; second, the sectoral breakdown of produced versus non-produced assets is always different within the same country; third, the shares of produced and non-produced assets held by the respective sectors in each country are relatively constant over time; and fourth, in the relatively less advanced economies included in the dataset such as the Czech Republic and Mexico (as opposed to Australia, Canada, France, Japan and Korea), the general government holds a disproportionate fraction of the non-produced assets when compared to its relative ownership of produced assets (see [Appendix n°12](#)). The first regularity is verified in my estimates for Greece as evidenced previously. The second regularity rules out the tempting idea of assuming the same breakdown across sectors for produced and non-produced assets. With respect to the fourth regularity, I argue that Greece, just like the Czech Republic and Mexico, can be contemplated as a relatively less advanced economy in terms of market liberalization when compared to the other economies included in the dataset. So why would the percentage of total non-produced assets owned by the government in such countries be so high compared to the most developed economies? I have two possible explanations in mind. First of all, the most plausible one in my mind is that the advanced privatization process of natural (mineral, energy or water) reserves is a key distinctive feature of the most market-oriented economies. By contrast, in other countries, the market is usually less developed, so that the bulk of natural reserves remains under the ownership of the government. This would explain why the government holds such a disproportionate share of non-produced assets compared to produced assets. In that sense, only a part of non-produced assets, namely land, would roughly mirror the distribution of produced assets across sectors. But on top of that, there might be also a specific issue regarding the sectoral breakdown of land in relatively less advanced countries where the notion of property is not always clear-cut. In Greece for instance, there is no proper cadaster as of today, so that for many pieces of land, the ownership can hardly be attributed to any specific sector⁴⁶. By default,

⁴⁴ To date, the OECD annual national accounts include detailed data on non-produced assets for seven countries, namely Australia, Canada, the Czech Republic, France, Japan, Korea and Mexico. The data comply with the ESA 2010 methodology. Note that the 2012 Greek data on produced assets reported in the OECD database are the same as the ones transmitted by ELSTAT to Eurostat. All this ensures the comparability of the various series.

⁴⁵ Korea and Japan are outliers probably because of the very high population density which put pressure on land values.

⁴⁶ Legal experts highlight that there is no clarity on boundaries or zoning in Greece. Cross-ownerships over the same piece of land are extremely frequent (e.g. we refer to: http://www.nytimes.com/2013/05/27/world/europe/greeces-tangled-land-ownership-is-a-hurdle-in-recovery.html?_r=0). Courts report that they are flooded with “cross-ownership” or “no-ownership” cases. However, as this is primarily true for a large fraction of land in the countryside whose value is far less significant than the value of residential land, it may not affect the sectoral breakdown too much.

statisticians could have no choice but to allocate the pieces of land without identifiable owners to the government. Given the current state of its economy, it seems far more likely that Greece exhibits similar characteristics to the Czech Republic or Mexico than to the most advanced economies with respect to the ownership structure of non-produced assets. Because the data for Mexico only start in 2003, I use again the Czech data to derive the Greek data. As explained before, I infer the sectoral breakdown for non-produced assets in Greece by assuming that for each sector of the economy and for each period, the ratio of produced over non-produced assets is the same in both countries. Finally, I find that the third regularity highlighted above (namely the shares of produced and non-produced assets held by the respective sectors in each country are relatively constant over time) is also verified in my findings (see [Appendix n°13](#)). I provide in [Appendix n°14](#) a complete breakdown of non-financial assets (i.e. including non-produced assets) by institutional sectors for the year 2012. By way of indication, we note that, back in 2012, the government's portfolio (valued at €300bn in market prices) notably included natural resources for 58% (of which most probably energy reserves), other structures (roads, highways, railways, tunnels etc.) for 26%, equipment and weapon systems for 8% (transport equipment, warships, submarines, military aircraft etc.) and non-residential buildings for 6% (offices and monuments), the remaining 2% consisting of dwellings (representational housing for civil servants and social housing) and R&D. To sum up, estimating the value of non-produced assets, and in particular its breakdown across institutional sectors is undoubtedly one of the most delicate parts of this study. At this stage, it is worth reminding that the value of non-produced assets is much lower than the value of produced assets over the 1997-2014 period (see [Appendix n°10](#)), so that possible measurement and allocation errors on non-produced assets across sectors should not affect too heavily my estimation of the national wealth-income ratios, as well as its breakdown between foreign vs. domestic or private vs. government ratios.

	Czech Republic	Greece	Relative size (adjustment factor)
Land (km ²)	77 247	130 647	1.7
Mineral and energy reserves	–	–	0.5
<i>(of which) natural gas (billion cu m) - proved reserves</i>	4.3	1.0	0.2
<i>(of which) crude oil (million bbl) - proved reserves</i>	15.0	10.0	0.7
Water resources (cu km)	13.2	74.3	5.6

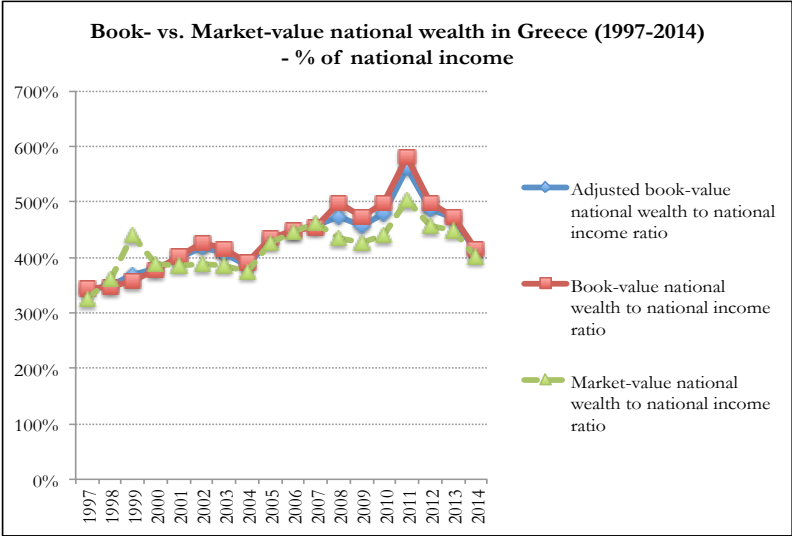
Source: World Factbook Database

Notes: (1) I only include in the category "mineral and energy reserves" the proved reserves of natural gas and crude oil; then the adjustment factor for "mineral and energy reserves" is simply obtained by taking the mean of the respective relative size of proved natural gas and crude oil reserves; (2) according to the World Factbook Database, land use in Greece is 63.4% agricultural, 30.5% forest and 6.1% "other", while the corresponding figures for the Czech Republic are 54.8% agricultural, 34.4% forest and 10.8% "other": land structure is therefore very similar.

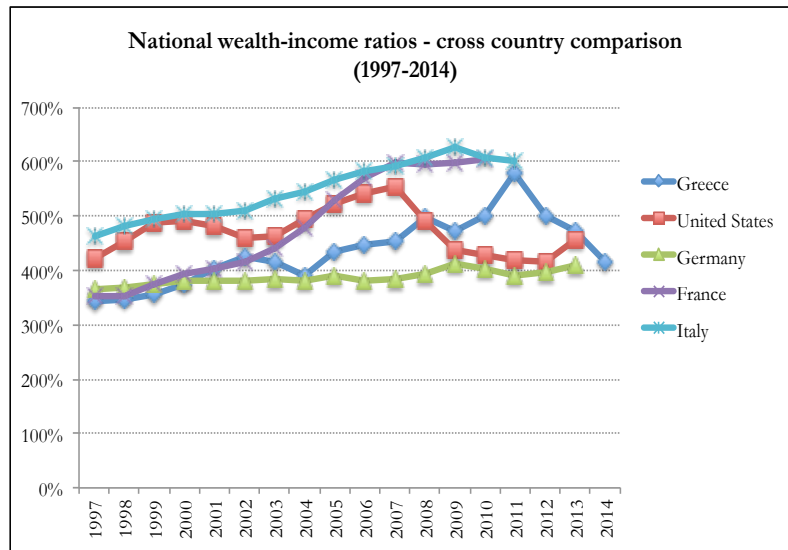
I. 3. Comments on Greek series

Turning now to the empirical results for Greece, I highlight a clear increase in the national wealth-income ratio over the period of interest, regardless of the definition of national wealth (market- or book-value) adopted. Specifically, the book-value national wealth-income ratio increased from 343% in 1997 to 416% in 2014 (21% increase), while the market-value national

wealth-income ratio increased from 326% to 402% (23% increase). For the sake of completeness, I also report the adjusted book-value national wealth-income ratio where equity holdings by the rest of the world are adjusted from market to book value (see [Appendix n°5](#)). Results between adjusted and non-adjusted book-value national wealth are very similar, regardless. Two periods are clearly distinguishable in the series: between 1997 and 2011, the book- and market-value national wealth-income ratio increased almost continuously, respectively from 343% and 326% to 580% and 503% (69% and 54% increase), before decreasing to 416% and 402% at the end of 2014 (28% and 25% decrease). Hence, the crisis has led to a strong decline in the Greek national wealth-income ratio. In spite of the well-known contraction of national income from 2009 onwards (see [Appendix n°15](#)), national wealth has declined even more sharply.

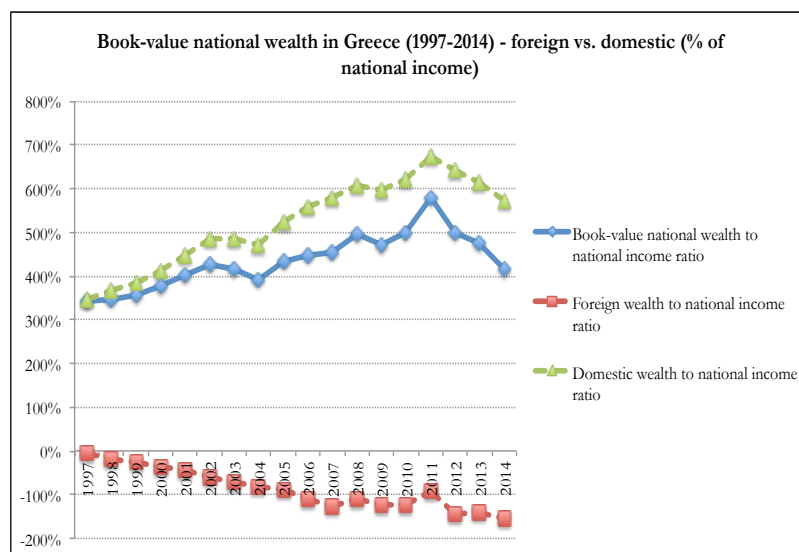


As a little aside, I stress that, in what follows, I focus on commenting and analyzing book-value national wealth series in the main text and refer to the Appendix for results on market-value national wealth. This choice is mainly motivated by the fact that it is easier to switch from a first decomposition of national wealth between domestic and foreign wealth to a second between government and private wealth when adopting the book-value definition. Besides, that does not prevent from fully investigating capital gains/losses effects on net foreign assets, as the equity of domestic corporations owned by the rest of the world is still valued at market prices. Now, in a comparative perspective, the pre-2011 upward trend of the Greek national wealth-income ratio appears to be relatively aligned with the ratios of other developed countries reported in the World Wealth and Income Database (WID), to the exception of Germany where the national wealth-income ratio is strikingly flat. Post-2011, the Eurozone crisis has not led to a strong decline in the national wealth-income ratio of Germany, contrary to what we observe in Greece. But considering the trend of its national wealth-income ratio in the past, Germany might be an outlier. The currently available data for France and Italy stop 2010-2011, so that it is not possible to clarify whether or not the Eurozone crisis triggered a relatively more abrupt decline of national wealth rather than national income in other Euro Area countries. The case of the United States is nonetheless interesting in that respect: the crisis erupted earlier back in 2007-2008 and triggered a five-year decrease in the national wealth-income ratio, similar, in terms of magnitude, to the one experienced by Greece starting from 2011. Hence, profound and prolonged financial crises do seem to destroy relatively more wealth than income.



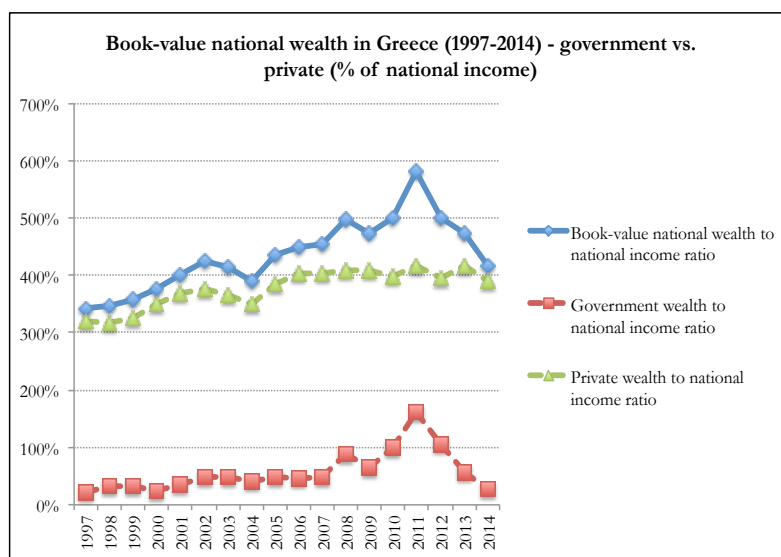
More specifically, the breakdown of the Greek national wealth into its foreign and domestic components shows that the accumulation of domestic capital has been the key driver of national wealth during the whole period (see graph below). Between 1997 and 2011, the rise in the national wealth-income ratio was driven by the rise in the domestic-wealth income ratio, while, starting from 2012, the decline in the national wealth-income ratio has been mostly driven by the decline in the value of the domestic capital stock. However, one of the key developments of the 1997-2014 period is also the accumulation by Greece of a very sizable negative net foreign asset position, from -4% of national income in 1997 to -156% at the end of 2014. Hence, over 1997-2011, the rise in the national wealth-income ratio was limited, compared to the rise in the market value of the domestic capital stock, by the almost continuous build-up of large external imbalances from -4% of national income in 1997 to -92% at the end of 2011. And then, from 2012 onwards, the increase in the negative net foreign wealth as a percentage of national income from -92% to -156% has reinforced the decline in the national wealth-income ratio. As shown by Piketty and Zucman (2014) for the most developed economies included in their dataset, the foreign wealth, whether positive or negative, has generally been a small part of national wealth throughout the last decades even if some countries like Germany or Japan have accumulated large positive net foreign asset positions because of their persistent trade surpluses. But by comparison, the extent of the deepening of the Greek external imbalance is unique among high-income countries (see [Appendix n°16](#)). For instance, while Germany's net foreign asset position amounted to 35% of national income in 2013, the corresponding figure for Greece was of -139%. Also, the well-known and debated external imbalance of the United States was only of -28% of national income back in 2013. It is important to bear in mind these orders of magnitude when thinking about Greece in order to realize how important the developments on net foreign assets over the last two decades are. Thus, although domestic capital still represents the bulk of the national wealth as highlighted in the graph below, the growing role of foreign wealth in

driving down the Greek national wealth over the period has no equivalent in the world of developed economies⁴⁷.



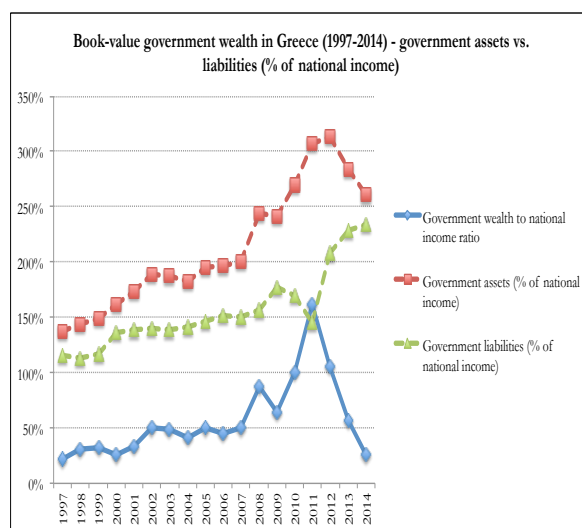
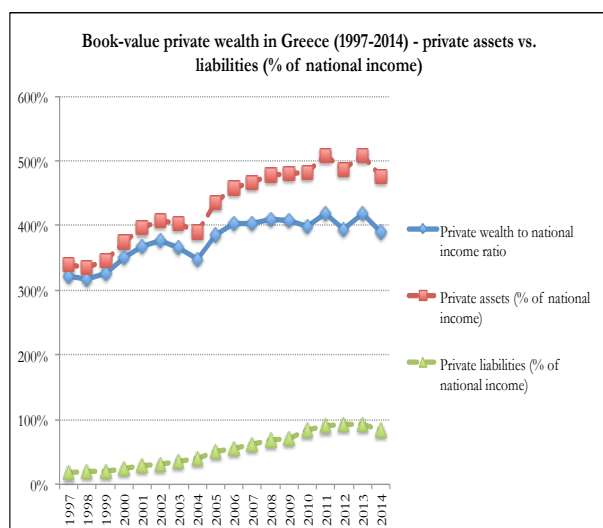
Furthermore, the evolution of private and government wealth also presents interesting patterns. The Greek private wealth-income ratio gradually increased over 1997-2006 from 321% to 403% (26% increase) but has stagnated ever since. Importantly, the government (net) wealth has remained positive during the whole period in spite of the notorious increase in public debt. The government wealth-income ratio rose from around 20% in 1997 to a record level of 162% in 2011, before abruptly declining during the crisis and gradually returning to close to its initial level. Due to this inverted V-shaped pattern followed by the government wealth, the rise in the national wealth-income ratio over 1997-2014 can be fully attributed to the rise in the private wealth-income ratio. However, short- to medium-term fluctuations of the national wealth-income ratio have been increasingly driven by the dynamics of government wealth throughout the period. Indeed, the increase in the national wealth-income ratio between 2006 and 2011 as well as its decline starting from 2012 have been entirely induced by the evolution of government wealth. As such, studying the government wealth accumulation is vital and should enable to better understand both the pre-crisis and crisis dynamics of national wealth accumulation.

⁴⁷ One should note as a caveat that the “official” net foreign asset positions do not include the offshore assets held by residents in tax havens. Including for instance estimates of offshore holdings by households could significantly change the pattern of the Greek foreign wealth.

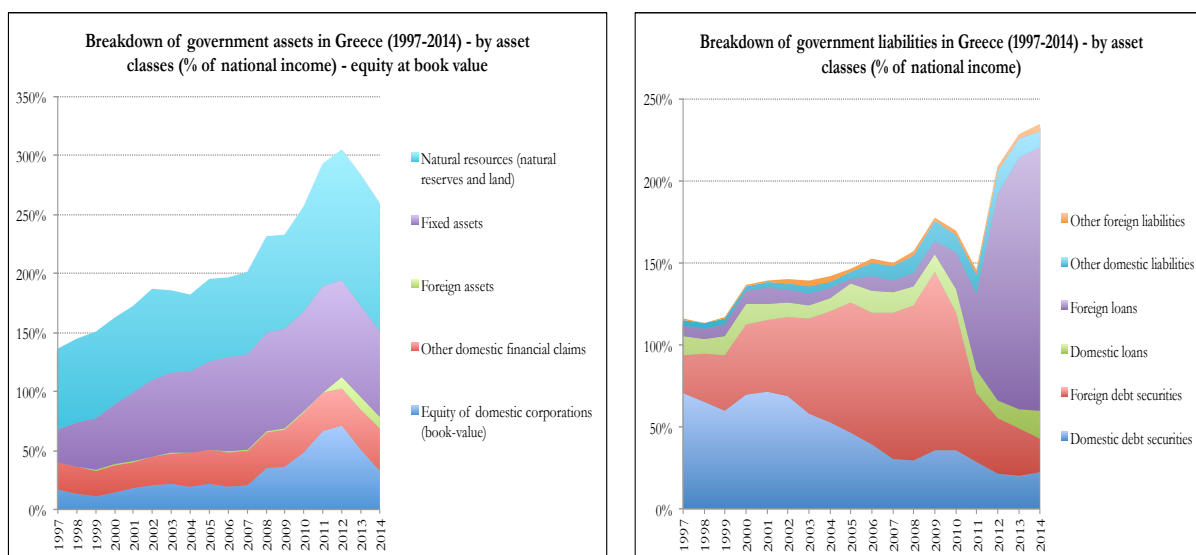


A decomposition of market-value (instead of book-value) national wealth between its private and government subcomponents can be found in [Appendix n°17](#). There is nothing particular to add because the trend is exactly the same. A closer look at the structure of the private and government wealth broken down between assets and liabilities reveals interesting findings. The private wealth-income ratio has increased over 1997-2006 because the value of private assets in percentage of national income rose more rapidly than the value of private liabilities, and has stagnated over 2007-2014 because private assets and liabilities have grown at the same speed ever since. Compared to the value of assets, private liabilities expressed as a percentage of national income are small throughout the whole period. Moreover, in spite of growing liabilities, the Greek government wealth has increased markedly throughout the 1997-2011 period because the value of public assets apparently grew faster than liabilities. Then, as highlighted in the graph below, the sharp increase in the government wealth-income ratio in 2010 and 2011 can be attributed to the steady increase in the value of government assets (reinforced by the bailout of local banks as we shall see later on) but also to the decline in the value of public debt, which is the consequence of the massive tradable public debt sell-off before the early 2012 sovereign debt restructuring⁴⁸. Finally, the crisis eventually led to a strong decline in the government wealth-income ratio up until the end of 2014, when government assets started losing their value and public debt surged with the second official bailout. On the asset side, the graphs show that the crisis has relatively more affected the value of the general government assets, as opposed to private ones. This might be explained by a combination of factors: first, investors' anticipations of imminent government assets' sell-off to honor looming debt repayments that led to a more pronounced decrease in the market value of government than private assets (price effect); second, the speed-up of the privatization process as part of the second economic adjustment programme (volume effect).

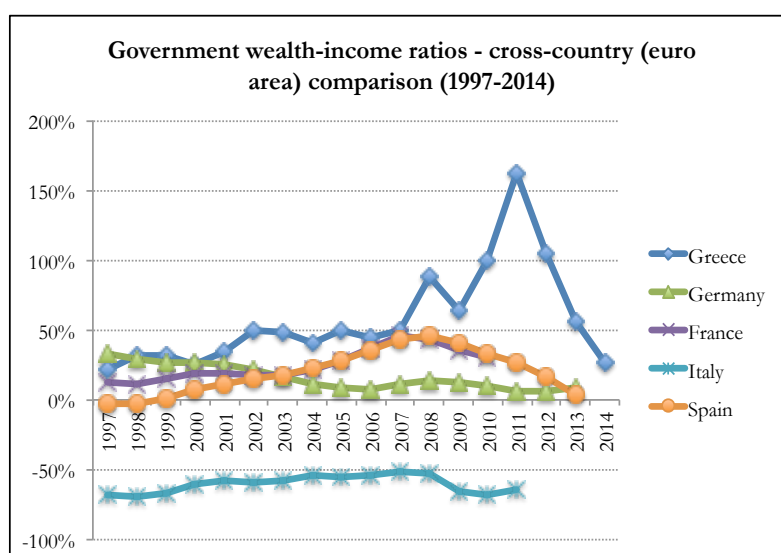
⁴⁸ Recall that debt securities are recorded at market prices in the database.



The breakdown of government assets and liabilities by asset classes shows that, before the crisis, it is essentially the value of fixed assets (mostly other structures, non-residential buildings and weapon systems for the government, see [Appendix n°8](#)) which increased very significantly from 28% of national income in 1997 to 82% (193% increase) in the end of 2007. Conversely, the value of domestic financial claims, including equity claims on domestic corporations, and natural resources remained broadly stable. At the beginning of the crisis between 2008 and 2012, the value of equity holdings in domestic corporations markedly increased, probably as the result of the bailout of local banks in the context of the global financial crisis. It is important to bear in mind that the increase in the value of government assets before the crisis was driven by the increase in the value of fixed assets (capital goods) owned by the government and not by an increase in the value of equity stakes in Greek firms. Regarding the government liabilities, there is a clear pattern of substitution of domestic debt securities by foreign debt securities before the crisis. The market value of debt securities issued by the government and owned by foreign investors increased from 24% of national income in 1997 to 109% in the end of 2009 (354% increase). During the crisis, we note the striking substitution of debt securities owned by the rest of the world by loans from the rest of the world (official loans resulting from the successive bailouts). The interested reader can find in [Appendix n°18](#) the breakdown of government assets when equity is valued at market prices.



Putting government wealth in a cross-country perspective throughout the period reveals that the latter has consistently been higher in Greece than in the main Euro Area countries (see graph below), and this in spite of the larger public debt increase that took place in the country. As reflected in [Appendix n°19](#), the ratio of government assets to national income was significantly higher in Greece than in any major member state of the Euro Area at the beginning of the period and was on an upward trend up until 2012, so that the gap with respect to other countries widened significantly. Importantly, on our period of interest, the size of the public sector in terms of assets has grown much more rapidly in Greece than in other countries. Thus, the high concentration of assets in government hands (or put differently the large size of the public sector in terms of ownership of assets) is a very unique characteristic of Greece and has had no equivalent among the main developed economies of the Euro Area.



Before I conclude this section, I note that, up to now, I strictly followed the international guidelines of the ESA 2010 regarding the computation of wealth, income and saving. As such, the national central bank is considered as a public financial corporation and thus included in the sector of corporations. The question might be asked whether there is any rationale for merging

the national central bank of Greece with the government in an extended public sector. And if so, what would that change to the previous findings regarding government and private wealth? I argue that the answer to the first question depends on the composition of the collateral pool pledged by domestic banks to obtain central bank liquidities. If the government has a direct and massive exposure (for instance through government-guaranteed debts) to the central bank risk, then merging the central bank and the government balance sheets can be justified. This is however unlikely to happen in normal times, when central bank loans to local banks are limited in scope and banks have plenty of assets to pledge as collateral. Hence, merging the central bank and the government balance sheets can only be temporary i.e. correspond to very specific moments when a country is affected by a major crisis *and* the government has a direct exposure to the central bank risk. Merging both balance sheets would obviously increase the size of government assets and liabilities but also potentially change the relative weights between domestic vs. foreign claims and liabilities if for instance the central bank is financing its liquidity injections by borrowing from the rest of the world as it is *de facto* the case in the Euro Area with the TARGET2 system. However, because the net wealth of the central bank is - or close to - zero by definition (depending on the valuation of its equity), it would not change the government (net) wealth. This central bank issue is discussed further in [Appendix n°20](#). In what follows, I continue to include the balance sheet of the national central bank in the private sector, notably for the sake of comparability with the previously described series and also because we do not have sufficiently detailed data on the Bank of Greece's activities compared to other sectors. One must nonetheless bear in mind the issues discussed previously, and above all the fact that the Greek government is very exposed to the central bank risk over the crisis period due to the very existence of government-guaranteed bonds (Pillar II bonds) in the collateral pool.

To sum up this first section, I have constructed new series on the evolution of wealth in Greece since 1997. I have notably highlighted a marked increase in the national-wealth income ratio between 1997 and 2011, followed by a sharp decline thereafter. The trend has been driven by the evolution of the value of the domestic capital stock (non-financial assets), but the very significant increase in external imbalances first limited the rise in national wealth compared to the evolution of the domestic capital stock, and then amplified the drop in the value of national wealth starting from 2012. Besides, the government wealth has remained positive throughout the period (following an inverted V-shaped pattern). Even if the rise in national wealth can be fully attributed to the surge in private wealth over the whole period, the government wealth has been increasingly driving fluctuations in the national wealth-income ratio within the period. In particular, the recent decline of the national wealth-income ratio during the crisis can be fully accounted by the decline in the government wealth-income ratio. Now, studying the dynamics of national, foreign, domestic, private and government wealth accumulation before and during the crisis should help us better understand the key drivers of the evolution of the wealth-income series. Before moving to the second section, I want to reemphasize the assumptions used to construct the series and to overcome the data limitations. Because detailed series on the ownership of produced assets by institutional sectors were only available for the year 2012, I had no choice but to use the perpetual inventory method to obtain market value series over the whole period of interest. This approach has a number of methodological drawbacks. It requires in particular relying on official investment flow series to derive the value of wealth at historical cost, and on an aggregate asset price index to obtain wealth series at market value. Investment flows

might be imperfectly recorded, thus leading to over- or under-estimate the resulting series at historical cost, while the actual asset price dynamics of produced assets might not be adequately reflected by the aggregate price indicator chosen to estimate the series, thus leading, in turn, to over- or under-estimate the resulting series at market value. In order to obtain finer estimates of the value of produced assets, it would be useful to have detailed breakdowns by asset categories of net investment flows. The development of new price indexes for a broader range of non-financial assets is also important. Finally, official estimates of the value of non-produced assets would greatly facilitate the measurement of national wealth. In that respect, it is essential to clarify as soon as possible the notion of property in Greece. The current uncertainty linked to the absence of a modern cadaster is obviously a structural hurdle for the estimation of the breakdown of non-produced assets by institutional sectors. Overall, there is a room for data improvements regarding both flow and stock series. I have tried to build the best wealth-income series possible with the currently available data because I think that better understanding the dynamics of capital accumulation in Greece is too important to wait for the publication of perfect data.

II. DYNAMICS OF NATIONAL WEALTH ACCUMULATION IN GREECE SINCE 1997

As highlighted previously, the series on the evolution of wealth-income ratios in Greece exhibit interesting patterns that need further investigations. Most strikingly, (i) the net wealth of the general government sector rose up until the height of the crisis in spite of the notoriously large increase in public debt and (ii) up to now, Greece has been unable to stabilize its negative net foreign asset position (as a percentage of national income). In this second section, I intend to draw on simple capital accumulation equations and on the most detailed series on saving and investment flows available, in order to explain the dynamics of wealth accumulation in Greece across institutional sectors and asset classes before and during the crisis. More broadly, the goal is twofold: first, try to rationalize the unsustainable macroeconomic dynamics that led to the crisis and then analyze how the adjustment occurred during the crisis.

II. 1. The dynamics of national wealth accumulation

To begin, I consider four time periods: the whole period (1997-2014), as well as three sub-periods, namely the pre-Euro Area period (1997-2000), the Euro Area pre-crisis period (2000-2007), and finally the crisis period (2007-2014)⁴⁹. Whenever possible, I document the dynamics of national wealth accumulation for the four periods⁵⁰. Following Piketty and Zucman (2014), I use a standard wealth accumulation equation to decompose national wealth accumulation into a volume (saving-induced) and a relative price (real capital gains/losses-induced) effect. The idea is to focus on the drivers of the *real* evolution of national wealth, thereby neutralizing the impact of variations in the price of consumption goods. Thus, in order to calculate real growth rates of capital accumulation and derive real domestic currency returns of capital gains or losses, I use series of wealth, income and net national saving expressed in constant domestic currency prices. As reference price index to transform the series expressed up to now in current (domestic currency) prices, I use the national income deflator (equivalent of the GDP deflator)⁵¹. I could alternatively use a consumer price index but GDP deflators are usually of higher quality. Suppose Wn_t is the market value of national wealth at the end of period t , Sn_{t+1} the net (of depreciation) national saving flow that adds to national wealth between end-of-period t and end-of-period $t+1$ and qn_{t+1} the real rate of capital gains or losses on national wealth between end-of-period t and end-of-period $t+1$. Then, the accumulation of national wealth is simply given by the following equation:

$$Wn_{t+1} = (1 + qn_{t+1})(Wn_t + Sn_{t+1}) = (1 + qn_{t+1})\left(1 + \frac{Sn_{t+1}}{Wn_t}\right)Wn_t$$

with qn_{t+1} the capital gains/losses-induced real growth rate of national wealth (or equivalently the real return of capital gains/losses on national wealth)

⁴⁹ Recall that the annual data presented throughout the paper are systematically end-of-period data. As such, the first period 1997-2000 includes for instance the year 2000, while the second period 2000-2007 starts in end 2000.

⁵⁰ I note in advance that detailed data on foreign saving flows by asset classes and institutional sectors are not available before January 2001, so that I will not be able to systematically report the results for the first period (1997-2000).

⁵¹ The national income deflator is calculated using series of national income expressed in current and constant prices available in the AMECO database.

and $\frac{Sn_{t+1}}{Wn_t}$ the saving-induced real growth rate of national wealth (or simply the real growth rate of national wealth that would have prevailed as the result of new net national saving in the absence of real capital gains or losses on assets and liabilities)

As highlighted by the national wealth accumulation equation, I assume in this framework that new (net) national saving are made between end-of-period t and end-of-period $t+1$ and benefit from capital gains or losses realized between the two periods. By definition, for each period, national saving flows equal the sum of saving done by households, retained earnings of corporations and the budget balance of the government. Importantly, the budget balance is net of public investment⁵². Dividing by national income and denoting g_{t+1} the real growth rate of national income between end-of-period t and end-of-period $t+1$, we have:

$$\beta n_{t+1} = \frac{(1+qn_{t+1})(1+\frac{Sn_{t+1}}{Wn_t})}{1+g_{t+1}} \beta n_t$$

$$\text{with } g_{t+1} = \frac{Y_{t+1}-Y_t}{Y_t}$$

and $\beta n_t = \frac{Wn_t}{Y_t}$ the national wealth-income ratio

Cumulating over i years, we obtain a multiplicative decomposition of national wealth accumulation:

$$\beta n_{t+i} = \frac{(1+qn)^i (1+\frac{Sn}{Wn})^i}{(1+g)^i} \beta n_t$$

with $(1 + \frac{Sn}{Wn})^i = \left(1 + \frac{Sn_{t+1}}{Wn_t}\right) * \dots * \left(1 + \frac{Sn_{t+i}}{Wn_{t+i-1}}\right)$ the cumulated saving-induced real growth rate of national wealth

$(1 + qn)^i = (1 + qn_{t+1}) * \dots * (1 + qn_{t+i})$ the cumulated capital gains or losses-induced real growth rate of national wealth

and $(1+g)^i = \frac{Y_{t+i}}{Y_t}$ the cumulated real growth rate of national income⁵³.

As such, the real growth rate of national wealth can be systematically decomposed over any period of time into a saving-induced component (i.e. the real growth rate simply induced by new – net of capital depreciation – national saving flows, or alternatively the share of the real growth rate of national wealth that can be attributed to new national saving), as well as into a capital gains/losses-induced component (i.e. the real growth rate induced by real capital gains or losses, or alternatively the share of the real growth rate of national wealth that can be attributed to real

⁵² By definition, the fiscal deficit is equal to total revenue minus total expenditure of the government. Public investment is in theory included in total expenditure. Gross or net saving of the government is equal to the fiscal deficit plus gross or net investment of the government.

⁵³ All growth rates are *real* growth rates.

capital gains or losses). If we have zero real capital gains or losses on national wealth over a given horizon (i.e. $1 + qn = 1$), then the successive national wealth-income ratios can simply be obtained for each period by cumulating new (net) national saving flows. Using my annual series expressed in constant prices with the national income deflator, I can compute for each period the saving- and capital gains/losses-induced real growth rates of national wealth that explain the observed series of national wealth-income ratios, and then cumulate them to get the average real growth rates over the four periods I am interested in. By doing so, real capital gains or losses are estimated as residuals for each period according to:

$$qn_{t+1} = \left(\frac{\beta n_{t+1}}{\beta n_t} * \frac{1+g_{t+1}}{1+\frac{Sn_{t+1}}{Wn_t}} \right) - 1$$

Hence, by nature, the quality of estimates of real capital gains or losses (as residuals) ultimately depends on the quality of the series on net national saving flows (gross saving minus consumption of fixed capital in the AMECO database). As an important caveat, I stress that if saving flows are imperfectly recorded compared to the values of stocks, the estimates of capital gains or losses will automatically incorporate measurement errors. For instance, if saving flows were underestimated compared to estimates of capital stocks, then I would tend to attribute missing saving to real capital gains and thus overestimate the role of capital gains in driving the dynamics of wealth accumulation⁵⁴. However, the advantage of using the perpetual inventory method for the computation of capital stocks over time is that one directly derives the wealth series from the flow data, thereby minimizing the margin of error compared to market-value series of capital stocks obtained by census-like methods from whom saving flows could be disconnected if badly recorded. From the capital accumulation equation detailed previously, I get the following decomposition of the national wealth accumulation.

	National wealth (% of national income)		Decomposition of the real growth rate of national wealth		
	Beginning of period value	End of period value	Annual real growth rate (A)+(B)	Saving-induced annual real growth rate (A)	Capital gains/losses-induced annual real growth rate (B)
Greece whole period (1997-2014)	343%	416%	1,0%	-0,5% <i>-54%</i>	1,6% <i>154%</i>
Greece pre-euro area (1997-2000)	343%	376%	6,2%	2,0% <i>33%</i>	4,1% <i>67%</i>
Greece euro-area pre-crisis (2000-2007)	376%	453%	6,1%	0,2% <i>3%</i>	5,9% <i>97%</i>
Greece euro-area crisis (2007-2014)	453%	416%	-6,0%	-2,4% <i>40%</i>	-3,6% <i>60%</i>

Source: author's computations

Note: the table reads as follows: the real growth rate of national wealth in Greece over a given period has been X% a year on average over the period and can be decomposed into a Y% saving-induced wealth growth rate and a Z% capital gains-induced wealth growth rate. Thus, by construction: X%=Y%+Z%. Besides, I also report in italics the share of total wealth growth coming from saving vs. capital gains.

Indicative comments: real capital gains and losses have played a critical role in the dynamics of national wealth accumulation over the periods we are interested in. In brief: (1) over 1997-2000 i.e. before the adoption of the common currency, real capital gains on national wealth are of 4.1% a year on average and explain 67% of the increase in national wealth (in constant prices), (2) during the euro area pre-crisis period between 2001 and 2007, real capital gains of 5.9% a year on average virtually explain all (97%) the "real" increase in national wealth, (3) during the crisis period, real capital losses of 3.6% a year on average explain 60% of the decrease of national wealth in real terms and finally (4) over the whole period (1997-2014), the real growth of national wealth has been entirely driven by real capital gains (actually without these capital gains, national wealth would have decreased in constant prices).

⁵⁴ Note that one of the main reasons why saving flows might be underestimated is because they do not include research and development (R&D is indeed considered as intermediate consumption). But, R&D flows being almost insignificant in Greece throughout the period (between -0.1% and 0.5% of national income cf. Appendix n°21), including R&D flows in the official saving flows' series is unlikely to change the magnitude of real capital gains found in this paper.

Before the crisis, large average real capital gains of respectively 4.1% and 5.9% a year over 1997-2000 and 2000-2007 explained the bulk of the real increase in national wealth. Indeed, positive net national saving flows only accounted for respectively 33% and 3% of the real increase of national wealth over 1997-2000 and 2000-2007. During the crisis, significant real capital losses on national wealth (-3.6% a year on average over 2007-2014), alongside with negative net national saving flows, caused a real decline in national wealth of -6% a year on average. Precisely, over the crisis period (2007-2014), the negative net national saving flows explain 40% of the decrease in national wealth expressed in constant domestic currency prices, while real capital losses account for the remaining part (60%). All in all, over the whole period (1997-2014) cumulated real capital losses on national wealth during the crisis remained smaller than cumulated real capital gains before the crisis, so that, in the absence of national saving flows, national wealth expressed in constant prices would have increased on average by 1.6% a year. Conversely, negative net national saving during the crisis offset positive net national saving before the crisis, so that over the whole period, the saving-induced real growth rate of national wealth is negative (-0.5% a year on average). As a result of these two combined dynamics, national wealth has grown on average by 1% a year in real terms over 1997-2014. Given the prevailing low levels of national saving before the crisis, it is worth noting the role played by real capital gains, which appear retrospectively of paramount importance to explain the general dynamics of national wealth accumulation in Greece over 1997-2014 (and thus the upward trend of the national wealth-income ratio highlighted in the first section of this paper).

II. 2. The decomposition of national wealth accumulation between domestic capital and net foreign assets

With these preliminary findings in mind, we can now begin examining the national wealth accumulation at a more detailed level, so as to better understand the underlying dynamics of real capital gains/losses vs. saving/investment flows. To do so, I suggest decomposing the accumulation of national wealth into a domestic and foreign component. Thus, I refine the dynamics of national wealth accumulation by noting that:

$$Wn_t = W_t + NFA_t \text{ where } W_t \text{ and } NFA_t \text{ denote respectively the domestic capital stock and the net foreign asset position at the end of period } t$$

$$\beta n_t = \beta_t + nfa_t \text{ where } \beta_t \text{ and } nfa_t \text{ denote respectively the domestic and foreign wealth-income ratios}$$

$$Sn_t = I_t + S_t \text{ where } I_t \text{ and } S_t \text{ denote respectively the net capital formation and foreign saving flows (i.e. net lending/borrowing to/from the rest of the world) at the total economy level between end-of-period } t-1 \text{ and end-of-period } t$$

Then, the decomposition of the national wealth accumulation into a domestic and foreign component (q_{t+1} and r_{t+1} are respectively the real returns of capital gains or losses on domestic capital and net foreign assets between end-of-period t and end-of-period $t+1$) follows:

$$\beta n_{t+1} = \frac{(1+q_{t+1})(1+\frac{I_{t+1}}{W_t})}{(1+g_{t+1})} \beta_t + \frac{(1+r_{t+1})(1+\frac{S_{t+1}}{NFA_t})}{(1+g_{t+1})} nfa_t$$

As highlighted in the first section, the domestic capital stock includes all non-financial assets (e.g. dwellings, non-residential buildings, all sorts of structures, equipment, natural capital etc. see [Appendix n°11](#) for a detailed decomposition of domestic capital at the total economy level at the end of 2012), while net foreign assets are the difference between gross external assets (i.e. all financial claims of domestic residents on the rest of the world) and gross external liabilities (i.e. all financial liabilities of domestic residents *vis-à-vis* the rest of the world)⁵⁵. The balance of payments data enable to calculate the foreign saving flows (net lending/borrowing to/from the rest of the world) for each period as the sum of the current account balance plus the net foreign capital transfers plus the net errors and omissions.

In order to derive the relative contribution of the accumulation of domestic capital and net foreign assets to the broad dynamics of national wealth accumulation, the investment/saving- and capital gains/losses-induced growth rates on domestic and foreign wealth can be adjusted, as follows:

With respect to the investment/saving-induced wealth growth rates:

$$\begin{aligned} Sn_{t+1} &= I_{t+1} + S_{t+1} \\ \frac{Sn_{t+1}}{Wn_t} &= \frac{I_{t+1}}{Wn_t} + \frac{S_{t+1}}{Wn_t} \\ \frac{Sn_{t+1}}{Wn_t} &= \frac{W_t}{Wn_t} * \frac{I_{t+1}}{W_t} + \frac{NFA_t}{Wn_t} * \frac{S_{t+1}}{NFA_t} \end{aligned}$$

and with respect to the capital gains/losses-induced wealth growth rates:

$$\begin{aligned} q_{t+1} &= \frac{W_{t+1}}{W_t + I_{t+1}} - 1 \\ r_{t+1} &= \frac{NFA_{t+1}}{NFA_t + S_{t+1}} - 1 \\ qn_{t+1} &= \frac{Wn_{t+1}}{Wn_t + Sn_{t+1}} - 1 \\ \text{so that } qn_{t+1} &= \frac{W_t + I_{t+1}}{Wn_t + Sn_{t+1}} q_{t+1} + \frac{NFA_t + S_{t+1}}{Wn_t + Sn_{t+1}} r_{t+1} \end{aligned}$$

⁵⁵ Thus, the net foreign assets only include, strictly speaking, financial assets and liabilities. But in theory, the market value of the non-financial assets such as real estate assets owned in the rest of the world by domestic residents or owned by the rest of the world in the country are incorporated. For instance, when a foreigner owns a real property in the country, statisticians record that a domestic quasi-corporation owns the property and that the quasi-corporation is fully owned (through equity) by a foreign investor. Because quasi-corporations are unincorporated corporations, these data should be included in the households and NPISHs sector.

We obtain the following decomposition of the dynamics of national wealth, which directly highlights the impacts on national wealth accumulation of new net investment/saving and capital gains/losses on domestic capital and net foreign assets.

Table 4 - Decomposition of national wealth accumulation in Greece (1997-2014): the role of net foreign assets and domestic capital

	National wealth (% of national income)				Decomposition of the real growth rate of national wealth					
	Beginning of period value		End of period value		Annual real growth rate (A)+(B)		Saving/investment-induced annual real growth rate (A)		Capital gains/losses-induced annual real growth rate (B)	
	<i>Net foreign assets</i>	<i>Domestic capital</i>	<i>Net foreign assets</i>	<i>Domestic capital</i>	<i>Net foreign assets</i>	<i>Domestic capital</i>	<i>Net foreign assets</i>	<i>Domestic capital</i>	<i>Net foreign assets</i>	<i>Domestic capital</i>
Greece whole period (1997-2014)	-4%	346%	-156%	572%	-2,0%	3,0%	-1,6%	1,1%	-0,4%	1,9%
	343%		416%		1,0%		-0,5%		1,6%	
Greece pre-euro area (1997-2000)	-4%	346%	-37%	413%	-3,3%	9,5%	-1,4%	3,4%	-2,0%	6,1%
	343%		376%		6,2%		2,0%		4,1%	
Greece euro-area pre-crisis (2000-2007)	-37%	413%	-127%	580%	-3,7%	9,8%	-2,0%	2,2%	-1,7%	7,6%
	376%		453%		6,1%		0,2%		5,9%	
Greece euro-area crisis (2007-2014)	-127%	580%	-156%	572%	0,3%	-6,2%	-1,3%	-1,0%	1,7%	-5,2%
	453%		416%		-6,0%		-2,4%		-3,6%	

Source: author's computations

Note: the table reads as follows: the real growth rate of national wealth in Greece over a given period has been X% a year on average and can be decomposed into a Y% saving-induced and Z% capital gains/losses-induced growth rates (by construction: X%=Y%+Z%). Besides, the table highlights the relative contribution of foreign and domestic wealth (depending respectively on net lending/borrowing to/from the rest of the world and on gross capital formation) to national wealth accumulation. The reported real growth rates on net foreign assets and domestic capital are *adjusted* growth rates (i.e. they take into account the relative size of the respective capital stocks) and thus directly reflect the respective impacts of net lending/borrowing to/from the rest of the world and domestic investment flows on national wealth accumulation.

Indicative comments: the detailed decomposition of national wealth accumulation between net foreign assets and domestic capital provides several new findings: (1) real capital gains on national wealth during the pre-crisis period came from very significant real capital gains on domestic capital (due to the real estate bubble) and have been mitigated by real capital losses on net foreign assets, (2) conversely, real capital losses on national wealth during the crisis period have been driven by real capital losses on domestic capital and mitigated by real capital gains on net foreign assets, (3) over the whole period 1997-2014, (net) real capital gains can be explained by real capital gains on domestic capital, only partially offset by real capital losses on net foreign assets.

During the decade preceding the crisis (1997-2007), the rise in external indebtedness was sustained (in approximately the same proportion) by net borrowings from the rest of the world and real capital losses on the net foreign asset portfolio. This negatively affected the real growth rate of national wealth but was not sufficient to push it towards negative levels because, in the meantime, the stock of domestic capital grew sharply as the result of positive investment flows (net of capital depreciation) but most importantly of massive real capital gains due to the real estate bubble (see [Appendix n°7](#)). As reflected in table 4, net investment flows on the domestic capital stock over 2000-2007 were slightly higher than net borrowings from the rest of the world, while real capital gains on domestic capital were far greater in absolute terms than real capital losses on net foreign assets. Because of these domestic capital gains, national wealth measured in constant prices increased by more than 6% a year on average over the pre-crisis decade. During the crisis, in spite of persistent net borrowings from the rest of the world, the country managed to stabilize its external indebtedness in real terms, thanks to the real capital gains on net foreign assets. Hence, real capital gains on net foreign assets played a crucial role in the external adjustment dynamics and also in mitigating the decline in national wealth. But the contraction in the price of domestic capital goods led to major real capital losses on the domestic capital stock. In addition, net domestic investment flows became negative given the surge in capital depreciation. All this resulted in a largely negative real growth rate of national wealth (-6% a year on average over 2007-2014). Nonetheless, over the whole period 1997-2014, positive net investment flows and real capital gains on the domestic capital stock more than offset the negative impact of the rise in external indebtedness and of real capital losses on net foreign assets, thereby allowing national wealth to grow in constant prices (at 1% a year on average). All in all, the finer decomposition of national wealth accumulation shows that the real capital gains on national wealth over the 1997-2014 period identified at the beginning of this second section came only from real capital gains on the stock of domestic non-financial assets. Interestingly, real capital gains and losses on domestic capital and net foreign assets followed opposite movements

before and during the crisis. Therefore, price fluctuations on external assets and liabilities systematically enabled to mitigate the price fluctuations of the domestic real estate market, even if this occurred at the expense of the country's external sustainability before the crisis. But as a matter of fact, the pre-crisis pattern of real capital gains and losses respectively on domestic capital and net foreign assets prevailed over the whole period. Indeed, real capital losses on foreign wealth during the pre-crisis period have only been partially offset by real capital gains during the crisis period, while conversely real capital gains on domestic capital during the pre-crisis period have only been partially offset by real capital losses during the crisis. This is the reason why we observe, in spite of the crisis, persistent real capital gains on national wealth over 1997-2014. Thus, up to now, the crisis has not completely reversed the large real capital gains experienced on the stock of domestic capital before the crisis due to the real estate bubble⁵⁶.

At this stage, it is still too early to develop a theory aiming at rationalizing the pre-crisis dynamics. In order to do so, it is necessary to study the accumulation of domestic capital and net foreign assets at the sectoral level (government vs. private sector). But, at the moment, I would like to suggest a working hypothesis at the macroeconomic level. Given the magnitude of real capital gains on the domestic capital stock experienced over the pre-crisis period, the perceived wealth of Greek residents increased very substantially at the time. That could have encouraged them to consume more, thus save less (wealth effect), therefore creating a deficit of national saving and the need to borrow from the rest of the world to finance the local investment gap. In spite of real capital losses endured on external debt, there might have been no incentives on the side of Greece to stop foreign borrowings because real capital gains on the domestic capital stock were far higher than the real capital losses on net foreign assets. International lenders had no incentives to stop lending on their side either, because they were precisely enjoying real capital gains on their credits. Foreign capital flows were flowing in to finance domestic investments in overvalued assets in non-traded sectors such as construction, thereby further fueling the real estate bubble, the deficit of national saving and the need to borrow even more from the rest of the world and so on. All in all, we begin to see the kind of self-fulfilling dynamics that plunged the country into the crisis by jeopardizing its external sustainability. There is no wonder that the adoption of the common currency facilitated capital flows across members of the Economic and Monetary Union, and thus these foreign borrowings in the case of Greece. After a period of euphoria underpinned by the underreporting of the budget deficit by the government, the well-known sudden stop followed after the fraud disclosure at the end of 2009. During the crisis, the external adjustment came from the drop in domestic asset prices (and the related real capital gains on net foreign assets), even if the continuous increase in external borrowings because of the government's successive official bailouts prevented from significantly downsizing in constant domestic currency prices the net foreign asset position. The common currency was certainly not the cause of the crisis *per se*⁵⁷. But it arguably acted as a catalyst – in the chemical sense of the word – in the detrimental self-fulfilling dynamics that hit Greece.

⁵⁶ It is however possible that once the crisis will be over, there will be zero real capital gains throughout the period. This would confirm the broad empirical finding of Piketty and Zucman (2014), namely that over the long run, saving and income growth rates are sufficient to explain the dynamics of the national wealth-income ratio, so that real capital gains (or losses) play no role.

⁵⁷ Note for instance that the real estate bubble began well before the adoption of the Euro (see graph in [Appendix n°7](#)).

II. 3. The role of the government vs. the private sector in the dynamics of net foreign assets' and domestic capital accumulation

Up to now, I have studied the accumulation of national wealth between domestic capital and net foreign assets at the total economy (or macroeconomic) level. Many questions remain unanswered. How were net saving and investment flows, capital gains and losses distributed across sectors within the economy? What about the distribution of net saving/investment flows and capital gains/losses between asset classes? How can we explain persistent real losses on net foreign assets and persistent real capital gains on domestic capital over a ten-year horizon before the crisis (1997-2007)? If economic agents are rational and optimize their consumption/saving decisions over an inter-temporal horizon, how could foreign borrowings possibly be sustained by real capital gains on domestic capital as argued before?

In order to improve the previous analysis, I draw on a non-public dataset of the balance of payments, which displays a breakdown of the country's financial account at a very disaggregated level by asset classes and institutional holders⁵⁸. Precisely, in the continuity of the previous analysis, the dataset enables to study: first, the dynamics of national wealth accumulation at a more granular level, namely between institutional sectors, and then, the external adjustment dynamics by asset classes and institutional sectors at a very disaggregated level, namely at the level of the gross external asset and liability positions. In this sub-section, I focus on the dynamics of national wealth accumulation between institutional sectors. Because the detailed balance of payments data only start in January 2001, I drop from now on the 1997-2000 period and thus I restrict myself to the analysis of wealth accumulation starting from the adoption of the common currency (January 2001, or equivalently end of 2000). I divide the economy into two main sectors: the general government sector on the one side, the households and corporations (private sector) on the other side⁵⁹. The idea is to break down the accumulation of domestic capital and net foreign assets between these two sectors. Note that I leave aside the question of the allocation of national saving and the redistributive effects of real capital gains/losses among sectors within the domestic economy. The main interest of the detailed balance of payments data is that they enable to decompose foreign saving flows (net lending/borrowing to/from the rest of the world) between our two main sectors. Indeed:

$$S_t = S_t^{gov} + S_t^{priv} \text{ where } S_t \text{ denote the net lending/borrowing from the rest of the world (or foreign saving) between end-of-period } t-1 \text{ and end-of-period } t, \text{ and similarly } S_t^{gov} \text{ the foreign saving of the government and } S_t^{priv} \text{ the foreign saving of households and corporations}$$

⁵⁸ The dataset is made available upon request by the Bank of Greece. I wish to thank the Bank of Greece Balance of Payments Statistics Division for their valuable help.

⁵⁹ First, I stress that I have no choice but to merge households and corporations together because the detailed balance of payments data I rely on to calculate foreign saving flows do not separate households from non-financial corporations. Then, strictly speaking, the two main sectors I mention (government vs. households and corporations) are not equivalent to the traditional separation between public and private sector. Indeed, saying that would amount to considering that all corporations are privately owned. Yet, the government owns shares in domestic corporations for instance. Public corporations (including the national central bank) are included in the general "corporations" category. With this caveat in mind, I will nonetheless roughly say that I compare wealth accumulation in the public and private sector.

At this stage, it is useful to comment on the series of saving and investment flows. As evidenced in [Appendix n°6](#), the government invested a lot in domestic capital goods up until 2009 (to the exception of 2005 where we record a negative net investment flow). After capital depreciation, the net capital formation coming from the government accounted for 3% of national income per year between 1997 and 2009, while the corresponding figures were of 3% for corporations and 6% for households. With respect to net national saving flows (see [Appendix n°22](#)), only corporations had a continuous track record of positive saving over the whole period. Net saving of households became negative in 2000, and has remained so up to now, while the same has occurred for the government starting from 2003. Overall, net national saving flows decreased almost continuously. Given the level of capital formation at the total economy level (see [Appendix n°23](#)), it is clear that the country (and most probably first and foremost the government) relied on foreign borrowings to invest in domestic capital goods.

Now, the decomposition of the national wealth accumulation can be further refined as follows:

$$\beta_{t+1} = \frac{(1+q_{t+1}^{gov})(1+\frac{I_{t+1}^{gov}}{W_t^{gov}})}{(1+g_{t+1})} \beta_t^{gov} + \frac{(1+q_{t+1}^{priv})(1+\frac{I_{t+1}^{priv}}{W_t^{priv}})}{(1+g_{t+1})} \beta_t^{priv} + \frac{(1+r_{t+1}^{gov})(1+\frac{S_{t+1}^{gov}}{NFA_t^{gov}})}{(1+g_{t+1})} nfa_t^{gov} + \frac{(1+r_{t+1}^{priv})(1+\frac{S_{t+1}^{priv}}{NFA_t^{priv}})}{(1+g_{t+1})} nfa_t^{priv}$$

$$\text{with } I_t^{gov} + S_t^{gov} = Sn_t^{gov}, I_t^{priv} + S_t^{priv} = Sn_t^{priv} \text{ and } Sn_t^{gov} + Sn_t^{priv} = Sn_t$$

$$\text{and } \beta_t = \beta_t^{gov} + \beta_t^{priv} = \frac{W_t^{gov}}{Y_t} + \frac{W_t^{priv}}{Y_t} \text{ and } nfa_t = nfa_t^{gov} + nfa_t^{priv} = \frac{NFA_t^{gov}}{Y_t} + \frac{NFA_t^{priv}}{Y_t}$$

$$\text{and } \frac{I_{t+1}}{W_t} = \frac{W_t^{gov}}{W_{n_t}} \frac{I_{t+1}^{gov}}{W_t^{gov}} + \frac{W_t^{priv}}{W_{n_t}} \frac{I_{t+1}^{priv}}{W_t^{priv}}$$

$$\frac{S_{t+1}}{NFA_t} = \frac{NFA_t^{gov}}{W_{n_t}} \frac{S_{t+1}^{gov}}{NFA_t^{gov}} + \frac{NFA_t^{priv}}{W_{n_t}} \frac{S_{t+1}^{priv}}{NFA_t^{priv}}$$

$$\text{and } q_{t+1} = \frac{I_{t+1}^{gov} + W_t^{gov}}{Sn_{t+1} + W_{n_t}} q_{t+1}^{gov} + \frac{I_{t+1}^{priv} + W_t^{priv}}{Sn_{t+1} + W_{n_t}} q_{t+1}^{priv}$$

$$r_{t+1} = \frac{S_{t+1}^{gov} + NFA_t^{gov}}{Sn_{t+1} + W_{n_t}} r_{t+1}^{gov} + \frac{S_{t+1}^{priv} + NFA_t^{priv}}{Sn_{t+1} + W_{n_t}} r_{t+1}^{priv}$$

The decomposition of national wealth accumulation by institutional sectors presented in table 5 shows that the rise in external indebtedness before the crisis (2000-2007) was mostly driven by net borrowings from the government and real capital losses of the private sector. Interestingly, external net lending/borrowing flows of the private sector were positive on average during the period, so that, without real capital losses, the net foreign asset position of the private sector (positive at the beginning of the period) would have increased because of foreign saving flows.

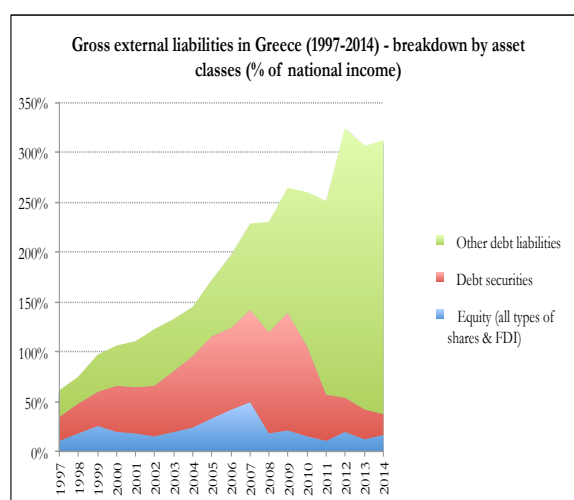
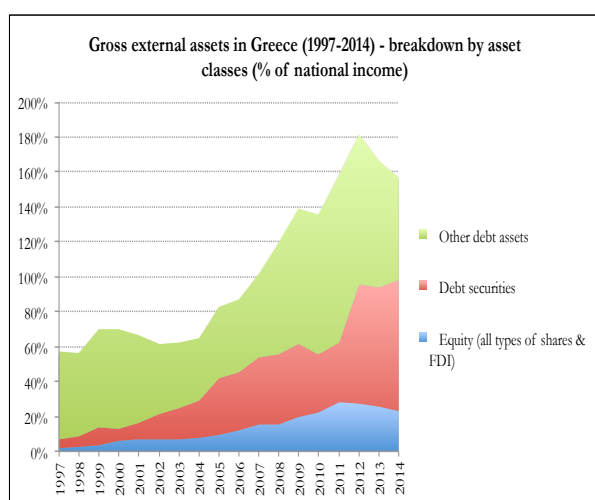
Besides, the government made zero real capital losses on its net foreign asset portfolio over the pre-crisis period. Between 2000 and 2007, it notably made large investments (reflected by positive net investment flows) in the domestic capital stock. It seems pretty straightforward given the low or negative level of domestic saving by the government throughout the period (see [Appendix n°22](#)) that the massive public external borrowings helped finance domestic investments, which explained, in turn, the major part of the real growth rate of domestic capital at the total economy level during the pre-crisis period. Finally, even if the government realized real capital gains on its stock of domestic capital goods, the real estate bubble mostly benefitted the private sector. During the crisis, the increase in external indebtedness as a result of new borrowings from the rest of the world can be fully attributed to the general government (the private sector actually corrected its negative net foreign asset position). Capital gains on net foreign assets came from both the government and the private sector but relatively more from the government's portfolio. Conversely, the public and private sector both suffered from real capital losses on domestic capital but the latter were higher in absolute value on the private sector's portfolio. Over the whole period, the government was nonetheless relatively more affected if we compare the real capital losses endured during the crisis to the real capital gains made before the crisis. Net investment flows on private domestic capital became largely negative during the crisis, thereby contributing to the real decrease in national wealth. The government, for its part, continued to slightly invest in domestic capital goods. Over the whole period (2000-2014), real capital gains or losses on net foreign assets played zero role in the dynamics of national wealth accumulation because positive real capital gains on the government's net foreign asset position realized during the crisis period were offset by real capital losses on the net foreign asset portfolio of the private sector accumulated during the pre-crisis period.

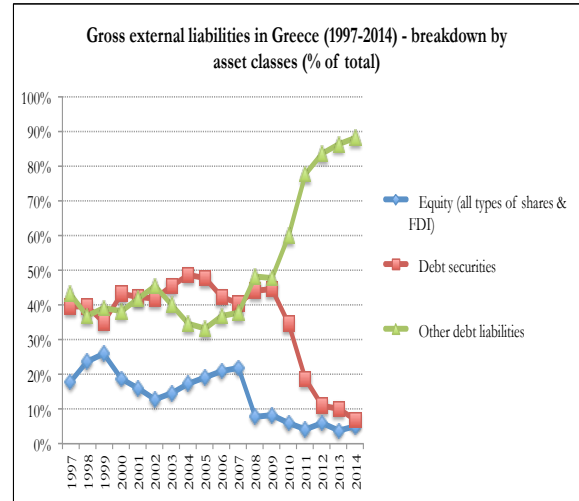
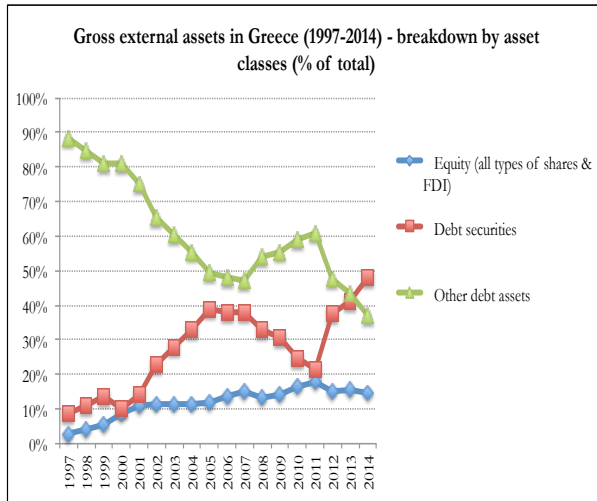
	Decomposition of the real growth rate of national wealth											
	Annual real growth rate (A)+(B)				Saving/investment-induced annual real growth rate (A)				Capital gains/losses-induced annual real growth rate (B)			
	Net foreign assets		Domestic capital		Net foreign assets		Domestic capital		Net foreign assets		Domestic capital	
	Government	Private sector	Government	Private sector	Government	Private sector	Government	Private sector	Government	Private sector	Government	Private sector
Greece euro area period (2000-2014)	-1,6%	-0,1%	0,6%	1,0%	-2,2%	0,5%	0,8%	-0,2%	0,6%	-0,6%	-0,2%	1,3%
	-1,7%		1,6%		-1,7%		0,6%		0,0%		1,0%	
	-0,1%				-1,1%				1,0%			
Greece euro-area pre-crisis (2000-2007)	-2,2%	-1,6%	2,1%	7,8%	-2,2%	0,2%	1,5%	0,7%	0,0%	-1,8%	0,6%	7,1%
	-3,7%		9,8%		-2,0%		2,2%		-1,7%		7,6%	
	6,1%				0,2%				5,9%			
Greece euro-area crisis (2007-2014)	-1,0%	1,3%	-0,9%	-5,4%	-2,1%	0,7%	0,1%	-1,2%	1,1%	0,6%	-1,0%	-4,2%
	0,3%		-6,2%		-1,3%		-1,0%		1,7%		-5,2%	
	-6,0%				-2,4%				-3,6%			

I report in [Appendix n°27](#) and [28](#) a detailed evolution of real capital gains and losses on domestic capital and net foreign assets by periods (annual flows) at the total economy level, as well as for the general government and the private sector. This helps to understand the magnitude and the time distribution of flows.

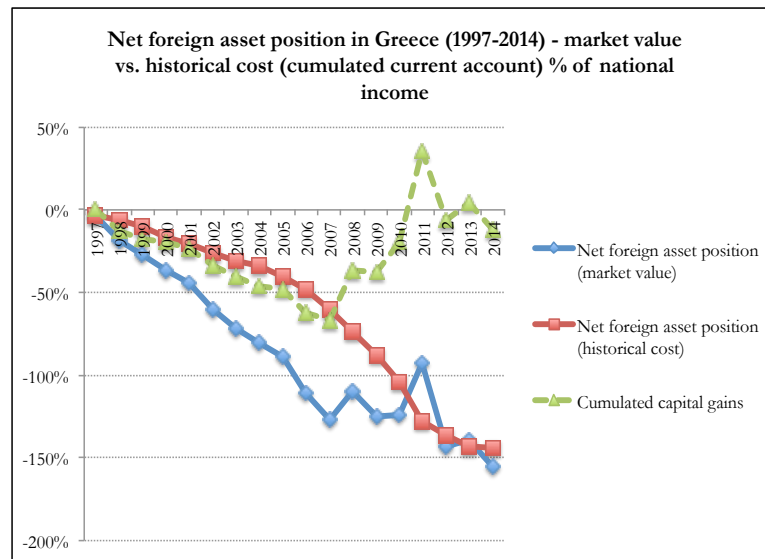
II. 4. The external adjustment dynamics since the adoption of the common currency

Before concluding, I focus more specifically on the gross external asset and liability positions in order to analyze the external adjustment dynamics that occurred before and during the crisis. I classify the gross positions into three main categories of assets, namely equity (including all types of shares and foreign direct investments), debt securities and finally other assets/debts (including essentially currency and deposits, loans and trade credits). A rapid detour by the evolution of the composition of the net foreign asset position is useful to motivate the current perspective. As shown in the graphs below, the breakdown by asset classes of the Greek net foreign asset portfolio has indeed evolved a lot over time. On the asset side, the share of equity and debt securities has increased significantly, while the initially overwhelming share of “other debt assets” (loans, deposits, trade credits) has decreased gradually except between 2007 and 2011. Conversely, the composition of the gross external liability position remained broadly stable until 2009 but, starting from 2010, the share of other debt liabilities has sharply increased - while the share of debt securities decreased in the same proportions - to account for almost 90% of external liabilities at the end of 2014. This pattern on the gross liability position is obviously the result of the official bailouts that *de facto* replaced the Greek tradable public debt by official loans. Overall, throughout the whole period, the respective shares of the different assets have never been the same in the gross external asset and liability positions. I report in [Appendix n°26](#), the same graphs for all institutional sectors (government, households, corporations).





Moreover, as pinpointed previously and highlighted by the graph below, cumulated capital gains/losses, defined as the difference between the stock of net foreign assets in market value and the stock of net foreign assets at historical cost (calculated by cumulating external net lending/borrowing flows available in the balance of payments), are of paramount importance to explain the dynamics of foreign wealth.



By complementing the gross external asset and liability positions in market value available in the country's official financial accounts, the detailed balance of payments data enable to study the accumulation of foreign wealth at a very disaggregated level. Formally, the accumulation of net foreign assets depends on the accumulation of gross external assets and liabilities, which can be decomposed, just like before, into a volume (saving) and relative price (real capital gains/losses) effect as follows:

$$NFA_{t+1} = (1 + r_{t+1})(NFA_t + S_{t+1}) = (1 + r_{t+1}) \left(1 + \frac{S_{t+1}}{NFA_t}\right) NFA_t = A_{t+1} - L_{t+1}$$

$$A_{t+1} = (1 + r_{t+1}^A) \left(1 + \frac{S_{t+1}^A}{A_t}\right) A_t$$

$$L_{t+1} = (1 + r_{t+1}^L) \left(1 + \frac{S_{t+1}^L}{L_t}\right) L_t$$

$$nfa_{t+1} = a_{t+1} - l_{t+1} = \frac{(1+r_{t+1}) \left(1 + \frac{S_{t+1}^A}{NFA_t}\right)}{(1+g_{t+1})} nfa_t = \frac{(1+r_{t+1}^A) \left(1 + \frac{S_{t+1}^A}{A_t}\right)}{(1+g_{t+1})} a_t - \frac{(1+r_{t+1}^L) \left(1 + \frac{S_{t+1}^L}{L_t}\right)}{(1+g_{t+1})} l_t$$

By construction, the real returns of capital gains/losses on external assets and liabilities are the weighted sum of the real returns of capital gains/losses on each asset class. I report in the tables below the weighted returns on each asset class of the gross external asset and liability positions⁶⁰.

	Decomposition of the real growth rate of gross external assets																	
	Annual real growth rate (A)+(B)						Saving-induced annual real growth rate (A)					Capital gains/losses-induced annual real growth rate (B)						
	Government			Private sector			Government			Private sector		Government			Private sector			
	Equity (all shares & FDI)	Debt securities	Other debt assets	Equity (all shares & FDI)	Debt securities	Other debt assets	Equity (all shares & FDI)	Debt securities	Other debt assets	Equity (all shares & FDI)	Debt securities	Other debt assets	Equity (all shares & FDI)	Debt securities	Other debt assets			
Greece euro-area period (2000-2014)	0,0%	0,4%	0,0%	1,1%	4,2%	-0,3%	0,0%	0,3%	0,1%	1,2%	4,5%	2,3%	0,0%	0,0%	-0,1%	-0,1%	-0,3%	-2,6%
	0,4%			5,0%			0,4%			8,0%		-3,0%						
Greece euro-area pre-crisis (2000-2007)	0,0%	0,0%	0,0%	2,1%	7,4%	-0,1%	0,0%	0,0%	0,0%	2,1%	6,9%	3,9%	0,0%	0,0%	0,0%	0,0%	0,6%	-4,1%
	0,1%			9,4%			0,0%			12,9%		-3,4%						
Greece euro-area crisis (2007-2014)	0,0%	0,7%	-0,1%	0,1%	1,0%	-0,3%	0,0%	0,7%	0,1%	0,3%	2,2%	0,7%	0,0%	0,1%	-0,2%	-0,2%	-1,2%	-1,0%
	0,7%			0,8%			0,8%			3,2%		-2,6%						

Sources: author's computations

Note: the table reads as follows: the real growth rate of gross external assets in Greece over a given period has been X% a year on average and can be decomposed into a Y% saving-induced growth rate and a Z% capital gains/losses-induced growth rate. Thus, by construction: X%=Y%+Z%. Besides, the table highlights the relative contribution of the government and the private sector (households and corporations) to the gross external asset accumulation. For both sectors, I also provide a breakdown of the impact of asset accumulation on the gross external asset position by asset classes (equity, debt securities and other debt assets).

Indicative comments: (1) over the three periods of interest, gross external assets have suffered from real capital losses of approximately 3% a year on average (mostly coming from the private sector), while the gross external asset position kept growing because of sustained lending flows to the rest of the world on all categories of assets (also mostly coming from the private sector); (2) during the pre-crisis period (2000-2007), real capital losses were concentrated on "other debt assets" held by households and corporations, while during the crisis (2007-2014), all categories of foreign assets suffered from real capital losses, primarily concentrated on debt securities and other debt assets held by the private sector.

As highlighted in table 6, over the three periods of interest, the gross external asset position of Greece has suffered from real capital losses of approximately 3% a year on average, while it kept growing – especially during the pre-crisis period at an average real rate of 12.9% per year – as the result of sustained positive net saving flows on all categories of assets. During the pre-crisis period (2000-2007), real capital losses on gross external assets of 3.4% a year on average were essentially concentrated on “other debt assets” held by households and corporations, while the latter made real capital gains on their foreign investments in debt securities. At this stage, it is worth reminding that real capital gains or losses may result either from changes in foreign or domestic asset prices or from exchange rate changes at the end of year depending on the currency denomination of foreign assets and liabilities⁶¹. Because the “other debt assets” category includes mostly assets whose market value expressed in a given currency is not expected to vary much (deposits, loans, trade credits), observed real capital losses should logically be explained by exchange rate movements. However, one should note that it is nonetheless possible to observe real capital gains or losses on loans, independently of exchange rate movements. Indeed, official financial accounts record in theory loans at “market value” by subtracting to the nominal value of loans the loan loss provisions. In case of defaults of loans, the loan loss provisions should increase, and ultimately the market value of loans decrease. Nonetheless, using the Greek data on the currency breakdown of gross external assets estimated by Lane and Shambaugh (2010), we

⁶⁰ Returns are weighted according the relative size of each asset class in the gross positions.

⁶¹ Remember that the estimates of real capital gains or losses are domestic currency returns, so that the appreciation or depreciation of the domestic currency against a given foreign currency immediately generates capital gains or losses.

see that a significant share of gross external assets was denominated in foreign currencies that depreciated *vis-à-vis* the Euro over the period (see [Appendix n°32](#)). Overall, an appropriate weighted exchange rate for gross external assets shows that on average external assets depreciated over the period because of exchange rate movements, which explains why we observe persistent real capital losses in domestic currency terms. During the crisis (2007-2014), all categories of assets, especially debt securities and again other debt assets held by the private sector, suffered from real capital losses of 2.6% a year on average. While real capital losses on other debt assets were lower compared to the pre-crisis period, households and corporations made major capital losses on their foreign portfolios of debt securities and equity. I may reasonably attribute these losses to asset price movements in other countries affected by the 2008 global crisis (or by the Eurozone crisis starting from 2010). But given the persistence of these losses over 2007-2014, it appears that Greek assets abroad were located in countries that have durably suffered from the crisis. Overall, the pattern of persistent real capital losses on gross external assets observed in Greece throughout the whole period (2000-2014) is particularly striking and probably almost unique among European countries over such a long period of time. For the pre-crisis period in particular, it points to the fact that foreign investments - notably by the private sector - may be badly monitored with respect to the exchange rate exposure and also worthlessly concentrated on very low-yield investments such as deposits. Importantly, the fact that foreign investments are concentrated on low-yield assets cannot explain the real capital losses *per se*⁶². However, it can explain why significant capital losses on this very asset class (e.g. because of exchange rate movements in this case) have such an importance at the aggregate level⁶³. Lastly, it should be borne in mind that all this dynamics on gross external assets involves almost exclusively the private sector (households and corporations). The government put some money in the rest of the world during the crisis – notably by buying foreign debt securities – but this remains marginal⁶⁴.

Regarding external liabilities, we notice that net borrowings from the rest of the world increased the gross external liability position at an average real rate of 11.8% a year over 2000-2007. Most of foreign borrowings were in the form of debt securities issued by the government (60%) or of equity issued by domestic corporations (20%). Besides, before the crisis, significant real capital losses on the stock of external liabilities (3% a year on average) also contributed to increase the external imbalance of the country. These real capital losses on gross external liabilities during the pre-crisis period essentially came from “other debt liabilities” issued by the government (30%) and the private sector (70%) and equity issued by corporations. On the contrary, the country realized real capital gains on the debt securities issued by the government and purchased by the rest of the world. The real capital losses on other debt liabilities are rather puzzling because the country also endured real capital losses on the same category of assets on its gross external asset position. This would tend to show that there is an asymmetry in the currency denomination of these assets on the asset vs. liability side of the external balance. Indeed, the only way to explain these real capital losses would be to say that while foreign deposits or loans to the rest of the world were denominated in currencies that depreciated against the Euro, the deposits or loans

⁶² Indeed the risk profile has only an influence on yields, not on capital gains or losses.

⁶³ Other things being equal, the higher the share of a given asset class in the total, the higher the importance of a given pattern of capital gains or losses on this very asset class on the total.

⁶⁴ Gross external assets increased by 0.8% a year on average during the crisis as the result of new investments abroad by the general government.

from the rest of the world were denominated in currencies that appreciated against the Euro over 2000-2007⁶⁵. This is nonetheless contradicted by the data (see [Appendix n°31](#)). It might be therefore due to measurement errors if the values of the stocks of other debt liabilities are partially disconnected from the corresponding saving flows. During the crisis (2007-2014), the country's net foreign asset portfolio benefitted from large real capital gains on average (5% a year), notably on equity issued by corporations (27% a year on average) and debt securities issued by the general government (5.5% per year on average) as a result of falling domestic asset prices. Precisely, because of real capital gains on domestic equity, the gross external liability position decreased by 2.8% a year on average over 2007-2014, while the latter decreased by 2.7% a year on average due to the capital gains on public debt securities. The real capital gains on external liabilities enabled the gross external liability position to decrease in real terms by 0.5% a year on average over 2007-2014, in spite of the uninterrupted flows of net borrowings from abroad (4.5% a year on average) on the part of the government (e.g. new borrowings in the form of loans due to the successive bailout programmes increased gross external liabilities by 6.5% a year on average over the crisis period). The real capital gains on gross external liabilities experienced during the crisis largely offset the real capital losses endured before the crisis: over the whole period (2000-2014), real capital gains decreased the value of gross external liabilities by an average of 1% a year. In that sense, the crisis undeniably played a role in stabilizing the external position of the country. But over 2000-2014, new borrowings from the rest of the world increased the stock of external liabilities by 8% a year on average (net effect: increase by 6.9% a year on average). About two thirds of these borrowings came from the government in the form of debt securities (47%) and other debt liabilities i.e. loans (53%)⁶⁶. The remaining third is due to the issuance of new shares by domestic corporations (this explains 17% of the increase in the gross external liability due to new borrowings) and a mix of new loans made by - or deposits transferred to the Greek private agents (households and corporations).

Table 7 - Accumulation of gross external liabilities in Greece (2000-2014) - breakdown by institutional sectors and asset classes

	Decomposition of the real growth rate of gross external liabilities																	
	Annual real growth rate (A)+(B)						Saving-induced annual real growth rate (A)						Capital gains/losses-induced annual real growth rate (B)					
	Government			Private sector			Government			Private sector			Government			Private sector		
	Equity (all shares & FDI)	Debt securities	Other debt liabilities	Equity (all shares & FDI)	Debt securities	Other debt liabilities	Equity (all shares & FDI)	Debt securities	Other debt liabilities	Equity (all shares & FDI)	Debt securities	Other debt liabilities	Equity (all shares & FDI)	Debt securities	Other debt liabilities	Equity (all shares & FDI)	Debt securities	Other debt liabilities
Greece euro-area period (2000-2014)	-	0,6%	3,5%	0,4%	-0,1%	2,5%	5,3%	2,8%	1,4%	0,0%	1,2%	-	-1,9%	0,7%	-1,0%	-0,1%	1,3%	
	4,1%			6,9%			8,0%			2,7%			-1,2%			0,1%		
Greece euro-area pre-crisis (2000-2007)	-	6,3%	0,2%	3,0%	0,0%	5,1%	-	7,4%	-0,9%	2,3%	0,1%	2,9%	-	-1,0%	1,0%	0,7%	0,0%	2,2%
	6,5%			14,8%			6,3%			5,3%			0,0%			2,9%		
Greece euro-area crisis (2007-2014)	-	-4,9%	7,0%	-2,2%	-0,2%	-0,2%	-	-2,2%	6,5%	0,5%	0,0%	-0,4%	-	-2,7%	0,4%	-2,8%	-0,2%	0,3%
	2,1%			-0,5%			4,4%			0,1%			-2,3%			-2,7%		
							4,5%						-5,0%					

Sources: author's computations

Note: the table reads as follows: the real growth rate of gross external liabilities in Greece over a given period has been X% a year on average and can be decomposed into a Y% saving-induced growth rate and a Z% capital gains/losses-induced growth rate. Thus, by construction: X%=Y%+Z%. Besides, the table highlights the relative contribution of the government and the private sector (households and corporations) to the gross external liability accumulation. For both sectors, I also provide a breakdown of the impact of liability accumulation on the gross external liability position by asset classes (equity, debt securities and other debt assets).

Indicative comments: (1) during the pre-crisis period (2000-2007), the gross external liability position has suffered from real capital losses of 3% a year on average (the corresponding figure is positive in the table but of course because we are talking about liabilities, this is a capital loss from the Greek point of view), coming essentially from other debt liabilities of the government and private sector and equity issued by domestic corporations; (2) during the crisis, the country experienced very large real capital gains on equity issued by domestic corporations and debt securities issued by the government as a result of falling domestic asset prices: this allowed the gross external liability position to decrease in real terms in spite of the surge in net borrowings from abroad by the government (particularly marked on the "other debt liabilities" category where official loans of the bailout programme are recorded); (3) over the whole period, the gross external liability position recorded positive real capital gains because capital gains during the crisis largely offset the capital losses endured before the crisis (nonetheless, given the large real capital losses on gross external assets endured throughout the period (3% a year on average see previous table), this was not sufficient to generate real positive capital gains on net foreign assets).

I am now in a position to sum up what we have learnt so far. Before the crisis, the general government heavily borrowed from the rest of the world by issuing debt securities, while

⁶⁵ Indeed, the real rates of capital gains/losses are always calculated with respect to the domestic currency. Greece would thus have had an unhedged exchange rate exposure in the country's net foreign asset position.

⁶⁶ Official loans as part of the country's bailouts.

simultaneously investing a lot of money in domestic capital goods. The evidence suggests that the issuance of external debt securities largely served to finance these so-called investments. Up until the crisis, the government enjoyed significant real capital gains on its domestic capital stock, while avoiding enduring real capital losses on its net foreign asset position (and even enjoying real capital gains on its issuances of external debt securities!). Hence, it was all the more prompted to further borrow from the rest of the world through the issuance of new bonds that it realized real capital gains on these very instruments, as well as on the domestic assets they helped finance. Theoretically, capital gains should be purely transitory, and thus have no effect on the arbitrage between consumption and saving of infinitely long-lived rational agents. But from a political economy perspective where the government is a short-sighted agent because of the very existence of electoral cycles, there is no reason that capital gains do not have a direct impact on the saving decisions (more specifically, dissaving decisions in this case) through a classic “wealth effect”⁶⁷. During the crisis, the pace of external debt accumulation resulting from new borrowings barely slowed down for the government. The structure of external debt nonetheless profoundly changed because loans provided by the rest of world replaced external debt securities. Over 2007-2014, the gross liability position increased on average by 6.5% a year because of new loans, while it decreased by 2.2% a year following the reduction in the stock of debt securities held by the rest of the world⁶⁸. Alongside the continuous accumulation of foreign debt, the government enjoyed large real capital gains on its stock of external debt securities. But its stock of capital goods suffered from real capital losses. All in all, the government wealth decreased substantially over 2007-2014 in spite of the real capital gains on external debt securities. As for the private sector, significant real capital losses on both external assets and liabilities caused a deterioration of the private net foreign asset position in spite of positive foreign saving flows (i.e. relatively more investments abroad than borrowings from the rest of the world) before the crisis. Given the nature of assets affected by these very losses, the most likely scenario is that the Greek private sector failed to hedge its exchange rate exposure on average (precisely, deposits of private agents abroad were denominated in foreign currencies that depreciated against the Euro, while deposits and loans received from the rest of the world were denominated in foreign currencies that appreciated against the Euro). Regarding the domestic capital stock, the private sector was the first beneficiary of the real estate bubble. While positive net investment flows of the private sector increased the real value of national wealth by 0.7% a year between 2000 and 2007, real capital gains on the domestic capital increased national wealth by 7.1% a year on average. The comparison between capital formation resulting from private sector investment flows and real capital gains on capital goods highlights that the increase in the value of private wealth (measured in constant prices) in Greece was mostly generated by a bubble before the crisis. It is particularly striking to take note that the bulk of capital formation at the domestic level derived from public investments. Before the crisis, the Greek economy was therefore mostly driven by the public sector. In fact, the private sector essentially invested abroad: for instance, ignoring capital gains and losses, the gross external asset position of the private sector increased by 12.9% a year on

⁶⁷ The wealth effect is the change in spending that accompanies a change in *perceived wealth*. If the perceived wealth increases as the result of real capital gains and if the government is short sighted (because of electoral cycles), then it should spend (i.e. borrow) more immediately.

⁶⁸ Note that, here, the reduction is not the result of a drop in the market value of bonds (which is reflected in the real capital gains on external debt securities) but rather a consequence of (i) the early 2012 restructuring that reduced the nominal value of the Greek tradable public debt, (ii) the “re-domestication” of the government debt securities holdings when Greek banks purchased bonds from foreign banks at the height of the crisis.

average over 2000-2007 because of new investments in equity (16%), in debt securities (54%) and new loans or deposits abroad (30%). During the crisis, domestic net investment flows of the private sector became negative (as the result of a surge in capital depreciation), and private capital goods suffered from heavy real capital losses. Hopefully, this was counterbalanced by a sharp adjustment of the net foreign asset position. Between the end of 2007 and the end of 2014, the external balance of the private sector quickly moved from a negative level (-30% of national income) to a positive one (20% of national income) as the result of positive net lending/borrowing to the rest of the world and real capital gains on net foreign assets. In detail, the private sector kept investing in foreign assets (although less heavily than before the crisis), downsized its net borrowings from the rest of the world to almost zero and corporations realized massive real capital gains on their shares held by the rest of the world.

To conclude, I will try to suggest an interpretation of the dynamics that precipitated the country in the crisis. The low level of national saving, originating in the households sector because of the real estate bubble, forced the local economic actors to borrow from the rest of the world to finance domestic investments in capital goods⁶⁹. The government primarily fulfilled this task, thus initiating a significant and detrimental rise in external public indebtedness. On the contrary, corporations partially turned away from domestic investments. The private sector seems to have split into two: on the one hand, the banks and the big non-financial corporations that heavily invested abroad, and on the other hand, the smaller local firms (the “micro firms”) that had no choice but to survive locally with little or no prospect of investment. The government probably overinvested in the domestic economy, which ultimately resulted in a huge external public debt. Conversely, the private sector massively invested abroad and made persistent real capital losses on its net foreign assets, thereby further worsening the country’s external sustainability. There was clearly a misallocation of capital at the total economy level. The key issue is now to understand in what sense these public and private unsustainable dynamics were related. I see two possible explanations: either most of corporations remained credit constrained and thus did not benefit, as opposed to the government and a limited number of big firms and banks, from increasing financial integration; or the public sector was too big in terms of ownership of assets and therefore “monopolized” domestic investment by “crowding out” local corporations, leaving the biggest no choice but to invest abroad. In the first case, the government would have had no choice but to borrow from the rest of the world to invest locally and support the economy. In the second case, the size of the public sector would be to blame. Both explanations could easily be reconciled to contribute to explain the problem. One could argue that an environment with structural factors such as the small size of firms and the large size of the public sector, combined with cyclical factors such as low national saving amid a real estate bubble and a complete liberalization of capital flows had everything it takes to degenerate into an unsustainable public debt accumulation.

⁶⁹ Experiencing an increase in their perceived wealth because of real capital gains, Greek households consumed/borrowed more and thus saved less. This resulted in negative net saving for households throughout the whole period (see [Appendix n°22](#)). The low level of saving by households throughout the period might also be due to offshore tax evasion, which is considered as a rampant phenomenon in Greece.

CONCLUSION

After constructing and documenting new series on national wealth and its main components in Greece since 1997, I have studied the dynamics of national wealth accumulation and external adjustment in the country before and during the crisis. I have tried to construct the best series possible using the currently available data in a comprehensive manner. It is clear that there is still a large room for data improvements. In particular, there are at least three areas where better data would be particularly helpful to refine the series: first, detailed series on net investment flows (i.e. gross capital formation *and* capital depreciation a.k.a. consumption of fixed capital) at the asset class level (e.g. for dwellings, non-residential buildings, other structures etc.); second, additional price indexes for non-financial assets (e.g. for commercial properties, land categories etc.⁷⁰); and third, official estimates of the market value of the natural capital stock i.e. land and energy reserves. Regarding the value of land and notably its breakdown by institutional sectors, the implementation of a modern land registry (cadaster) appears as a prerequisite in Greece. The improvement of current data is therefore critical to better estimate in particular the value of the domestic capital stock. As I have tried to highlight in the paper, monitoring the evolution of domestic capital and notably of real capital gains on domestic assets really matters as soon as we want to understand the underlying drivers of international capital flows. At the time of financial globalization, there is no doubt that constructing homogenous and detailed series on domestic capital in every country is important for our understanding of international economics and finance. The development and publication of data on (market-value) national wealth is still in its infancy – just as the data on saving/investment flows and national income were in the early 1950s. Statistical institutes should take the issue seriously to further work on the publication of retrospective historical data and on the harmonization of methods and existing data across countries. Besides, economists from the academic world should also deal with the problem and, if necessary, get ahead of official statisticians, as Kuznets did in the 1930-1940s for the measurement of economic growth.

Drawing on the detailed analysis of national wealth accumulation, I have suggested a new narrative of the Greek crisis that can complement the traditional “political view” focusing exclusively on hidden fiscal imbalances. I argue that the real capital gains on the domestic capital stock resulting from the real estate bubble that begun in the mid-1990s played a critical role in driving the external imbalances accumulated in the run-up to the crisis following the adoption of the single currency. Indeed, substantial capital gains of households arising from the property bubble increased their perceived wealth and thus their consumption at the expense of saving through a classic “wealth effect”. Unobservable dynamics in official data such as offshore tax evasion might also partly explain the low level of domestic saving observed throughout the period⁷¹. This would be a more unorthodox approach of the “national saving deficit” that could prove to be particularly relevant in a country like Greece where tax fraud is thought to be a rampant phenomenon. However, if tax fraud could help to explain the tendentially low level of

⁷⁰ Currently, the available indexes focus exclusively on residential properties.

⁷¹ According to this hypothesis, a part of the savings of Greek households would not be reported in official data because it would simply be placed in offshore tax havens. In any case, it is clear that tax evasion is potentially a shortfall for domestic investment. Zucman (2013) shows that the orders of magnitude of offshore tax evasion can be very high.

recorded national saving in the country, we can hardly imagine that it could account for the continuous decline in national saving (as a share of national income) during the decade prior to the crisis. Indeed, there was *a priori* no “shock” likely to further encourage offshore tax evasion in the late 1990s. This is the reason why I believe that the real estate bubble remains the main causal factor of the national saving deficit and the related need to borrow from the rest of the world to finance domestic investment. In the spirit of Bernanke (2005), one could also reasonably argue that other factors than domestic ones (i.e. say global factors) contributed to explaining the surge in financial capital flows from the rest of the world. Nonetheless, because pre-crisis capital flows were mostly between member countries of the Euro Area, the story would not exactly be the same as the one highlighted by Bernanke in his global saving glut theory⁷². Precisely, the external factors that might have sustained high levels of capital flows to Greece could be (i) the high saving because of aging population⁷³ and the low prospective returns to domestic investment in northern countries like Germany (amid slightly decreasing real estate prices in real terms - see [Appendix n°1](#), declining workforces and high capital-labor ratios) and (ii) the structural decrease in real interest rates triggered by the creation of the EMU and the adoption of the single currency. Because foreign capital flows were primarily flowing in non-traded bubbling sectors such as construction (see [Appendix n°6](#)), the aforementioned combination of domestic and external forces created a detrimental self-fulfilling dynamics that inevitably ended up in a sudden stop. In this sense, the Euro acted not as a cause but as a catalyst - in the chemical sense of the word – in the run up to the crisis⁷⁴. Up to now, it just might be that this narrative of the Greek crisis actually applies to the other periphery countries that underwent adjustment programmes during the crisis (i.e. Ireland, Portugal and Spain), and thus provides a global narrative for the Eurozone crisis. Namely, as evidenced by the BIS data (see [Appendix n°1](#)), Spain and Ireland experienced very severe real estate bubbles starting from the mid-1990s⁷⁵. However, the data for Portugal are not available on a sufficiently long period to allow for a meaningful comparison⁷⁶. The net foreign asset position of these countries also deteriorated sharply before the crisis – although less in Ireland as a percentage of national income compared to the rest of the periphery⁷⁷.

Then, most importantly, I have shown that the key feature of the pre-crisis developments in Greece is that the government in the first place - instead of the private sector such as in Ireland or Spain – heavily borrowed from the Euro Area creditor countries to finance domestic investment. Understanding why remains a real challenge for macroeconomists today. I suggest several explanations for this, while stressing that all can explain part of the mechanism at work: (i) financial frictions due to insufficiently deep European and domestic financial markets and the

⁷² Remember that, when framing the “global saving glut” theory, Bernanke (2005) insists on the transformation of major developing economies following the financial crises of the 1990s from net borrowers on international capital markets to net lenders through the accumulation of foreign-exchange reserves.

⁷³ The increasing number of retirees relative to the number of workers leads workers to save more in order to pay pensions.

⁷⁴ The adoption of the single currency by encouraging capital flows did not immediately generate the right incentives to correct the housing bubble that started in the 1990s.

⁷⁵ In real terms, the Spanish and Greek property bubbles appear to be of comparable magnitude. By contrast, the Irish bubble was even more severe.

⁷⁶ Nonetheless, official data, starting from 2008 onwards, suggest that nominal and real prices have declined less than in the other periphery countries, so that the real estate bubble – if it ever existed – could be of lower magnitude.

⁷⁷ Indeed, the level of domestic saving was substantially higher in Ireland throughout the period.

predominance of micro firms, (ii) the large size of the public sector in terms of ownership of assets and (iii) particular historical circumstances, namely the 2004 Summer Olympics, that favored large-scale public investments over the pre-crisis period. According to the first explanation, a significant part of Greek firms – notoriously small and family-run – remained credit constrained and thus did not benefit from increasing financial integration and the related decrease in the cost of capital following the adoption of the single currency in 2001, as opposed to the government and a small number of big corporations⁷⁸. This would be coherent with the main idea of Gopinath et al. (2015) for instance. With a very limited access to the international debt and capital markets as well as few opportunities to secure loans from foreign banks, many Greek firms were unable to borrow from the rest of the world the necessary funds to cope with the national saving deficit and cover the local investment gap. Moreover, it is likely that the domestic banking sector partly failed to channel foreign savings to local businesses in an efficient manner, probably because the latter were too small and thus also credit-constrained at the domestic level⁷⁹. Therefore, the government might have had no choice but to substitute to private agents to boost domestic investment and avoid a recession. According to this view, the origin of the public external over-indebtedness would come from the private sector, and precisely from financial frictions related to the micro size of firms and insufficiently deep financial markets. Conversely, the second explanation focuses on the size of the public sector as opposed to the size of firms. By size of the public sector, I do not refer to the usual underlying concept of government final consumption expenditure (i.e. mostly spending related to the workforce) or even government total expenditure⁸⁰, but rather to the market value of government assets (combining financial such as equity in domestic firms and non-financial assets such as highways, hospitals, schools etc.). I focus on a problem that has not been raised so far, namely the size of the Greek public sector in terms of ownership of assets. Many observers have already noted that the general government total expenditure as a percentage of national income remained broadly stable in Greece before the crisis and was in line with or below the EU average, thereby pointing to the “myth of the bloated Greek state” to quote the title of an article published in *Foreign Affairs*⁸¹ (see [Appendix n°33](#)). But as evidenced in the paper, the ratio of government assets to national income was substantially higher in Greece than in the main Euro Area countries at the end of the 1990s, and the government invested heavily in the economy thereafter up until the crisis. Thus, from a “stock” perspective, the size of the public sector seems to be significantly higher than elsewhere in the Euro Area, whereas from a “flow” perspective, the stability of the

⁷⁸ Privately held companies predominate by a wide margin in Greece. Indeed, excluding investment fund shares, the (estimated) market value of unlisted shares accounted for almost 70% of the market value of total shares according to the official financial accounts. Besides, according to the financial platform Bloomberg, that provides data on the ownership of firms (equity), even listed companies are often largely owned by rich families. Always according to Bloomberg, only twenty Greek non-financial firms had tapped the international debt capital market as at end of June 2015. Non-bank financing has remained extremely limited throughout the period. As evidenced in [Appendix n°26](#), the percentage of external debt securities of corporations in the total gross external liabilities has remained very tiny and has only slightly increased over time.

⁷⁹ Potential distortions within the domestic banking sector related to opaque and poor governance also might have disrupted the efficient allocation of foreign savings (see the capital misallocation literature).

⁸⁰ In addition to government consumption expenditure (payments of public sector employees, goods and services expenditures like fuel for military, jets and rent for government buildings and other structures), government total (gross) expenditure includes specific payments (such as social transfers, interest on debt, subsidies), gross investment (on structures, equipment, software etc.) and other capital-type expenditures (e.g. increase in the value of government-owned land). Total net expenditure is net of capital depreciation (i.e. taking into account net investment instead of gross investment).

⁸¹ D. Boucoyannis, “The Myth of the Bloated Greek State”, *Foreign Affairs* (August 6, 2015).

government expenditure ratio necessarily masks variations between components, including for instance increasing investment spending and decreasing debt service costs. What are the conclusions to be drawn at this stage? Amid a real estate bubble, the government had even more incentives to invest in existing and new capital goods such as roads, airports, hospitals etc. that it already owned a large stock of assets on which it was realizing real capital gains⁸². Besides, from a political economy point of view, the government can be considered as a short-sighted investor: the electoral cycle encourages by nature political incumbents to implement public investments through additional borrowings in order to affect growth prospects and hope for reelection⁸³. Hence, the larger the initial size of the public sector in terms of ownership of assets and the real capital gains on these very assets (anticipated as “perpetual” given the government’s short-term horizon), the bigger the incentives to increase the current stock of public assets through investment (either in new or existing assets). In Greece, we clearly experienced a more rapid increase in the value of government assets than liabilities: aside from roll-over of existing debt, public debt borrowed from the rest of the world was used to finance domestic investment and subsequently the value of assets was increasing faster because they enjoyed real capital gains which was not the case for liabilities. The initial “over-size” of the public sector combined with the real estate bubble might be the trigger of this detrimental dynamics. In this sense, it might be that public investments crowded out private investment opportunities at the domestic level by investing in projects that could have been undertaken by the private sector otherwise. Moreover, it is also sure that beyond the aforementioned endogenous saving-investment dynamics between the public and private sector, a historic event like the 2004 Summer Olympic Games created incentives (or simply required) to upgrade the country’s infrastructure through major public investments. We need only mention for instance the expansion of the Athens Metro system and the construction of the Eleftherios Venizelos International Airport, the “Tram” (metropolitan light rail system), the “Proastiakos” (suburban railway system linking the airport and the suburban towns of Athens), the “Attiki Odos” (motorway encircling Athens) as well as obviously many stadiums and sport complexes – all these are large-scale public investments related to the hosting of the Olympics. So the debate on the causes of the Greek crisis boils down to the following question: is the government too big or the firms too small? I argue that there is no simple explanation and both approaches can be reconciled to explain the mechanism at play. On the one hand, in the context of a major real estate bubble and lower real interest rates with the entry into the Euro, it is certain that the large size of the public sector in terms of ownership of assets provided incentives for public investments financed by foreign borrowings given the low level of domestic saving available. On the other hand, strictly speaking, the crowding out assumption of the private sector should be taken with caution, as we are primarily interested in the use of foreign (and not domestic) saving. But the idea that firms were constrained by their micro size in their external borrowing capacity, leading the government to partially replace private actors for local investment, is very plausible. Both aspects – big government and micro firms – may have worked in the same direction to reinforce the detrimental dynamics of foreign borrowings to finance overvalued assets in the construction sector. Ultimately, the accumulation of public debt proved to be unsustainable because (i) investments of the government were made

⁸² Other things being equal, the larger the stock of assets, the more a given average (capital gains) return generates significant capital gains as a percentage of national income.

⁸³ Conversely, an investor with an infinitely long-term horizon would ignore capital gains in its investment decision (zero wealth effect).

in assets whose value was artificially inflated by the real estate bubble until its burst in 2008, (ii) markets were unable to assess the true market value of the Greek government assets given the lack of official estimates and lastly (iii) the fiscal capacity of the state (capacity to generate new tax revenues) was limited given the poor quality of the fiscal administration. The adjustment was inevitable at one point. By delaying the subsequent sudden stop in external financing, the fraudulent underreporting of the actual fiscal deficits only worsened its impact. Furthermore, I have also shown that the country's external sustainability was further jeopardized by the private sector dynamics: in the run-up to the crisis, corporations (and among them first and foremost banks) largely increased their overseas activities but suffered from significant real capital losses on their external assets and liabilities⁸⁴. As a result, the net foreign asset position of corporations also deteriorated, thus further increasing the country's external imbalance fueled by massive government borrowings. During the crisis, the main difference between the public and the private sector proved to be the capacity to adjust their respective net foreign asset positions. When domestic asset prices began to fall sharply, it generated real capital gains on gross external liabilities for both the government – primarily through the fall in debt securities' prices - and corporations – primarily through the fall in equity prices. But, in effect, the adjustment in the current account and thus ultimately in the net foreign asset position came essentially from the private sector because the real capital gains on government debt securities were offset by the surge in external debt following the successive official bailouts, which *de facto* replaced tradable public debt by loans. Nowadays, the net foreign asset position taken as a percentage of national income keeps deteriorating at the country level. Reaching a credible deal involving debt-relief measures to achieve public debt sustainability remains urgent⁸⁵. If such a deal is beyond the limits where Europeans are ready to go, it might be the time to consider new “direct” external adjustment strategies, such as a devaluation of the common currency or a unilateral exit from the Euro Area (i.e. devaluation of a new national currency), which could help stabilize through the trade and valuation channels the external imbalance of the country. Precisely studying the impact on net foreign assets of such scenarios is an area for further research.

To conclude, this attempt to rationalize the notorious “fiscal indiscipline of Greece” has several theoretical and policy implications. First of all, it can set a new and potentially comprehensive framework to understand the dynamics that led to the Eurozone crisis and help understand why Greece is not fundamentally an outlier, but just a different manifestation of the same underlying phenomenon. As mentioned previously, the other periphery countries (with the exception of Portugal for which the currently available data do not allow to push the reasoning as far) all experienced real estate bubbles and a substantial increase in external imbalances over the same period. The main feature that distinguishes these countries lies in the nature of sectors that have accumulated external imbalances to finance local investment: the public sector in Greece, as opposed to the private sector in Spain and Ireland. Thus, I argue that the causes of the Eurozone crisis were the real estate bubbles in the periphery countries that, combined with high saving and

⁸⁴ Indeed, aside from real capital gains/losses, the gross external assets of corporations increased more rapidly than the gross external liabilities over the pre-crisis period. But corporations endured severe real capital losses on their sizeable gross external assets, most probably because of exchange rate movements (unhedged currency risk).

⁸⁵ According to the latest public debt sustainability analysis published by the IMF (July 2015), “Greece's debt can now only be made sustainable through debt relief measures that go far beyond what Europe has been willing to consider so far”.

low expected returns of domestic investment in Northern countries (especially Germany)⁸⁶, resulted in unsustainable foreign capital flows within the Euro Area. Instead of flowing into productive activities, capital flows inflated the real estate bubbles. Then, the inevitable burst of the bubbles in the Euro Area following the global financial crisis and the subsequent sudden stops put immediately at risk the sectors that were relying on these inflows to operate, thereby depressing aggregate demand in the affected countries. Private losses were transferred to the book of the public sector in Ireland and Spain when banks had to be bailed out. Most importantly, whether external borrowings came from the public or private sector before the crisis depended on the relative incentives or comparative advantages of the respective governments to borrow from the rest of the world to finance domestic investment as well as on the relative size of firms (and related external credit constraints) or capacity of domestic banks to efficiently channel foreign saving to local firms. To take a concrete example with Greece and Spain where the magnitude of the real estate bubble and the variation of the net foreign asset position as a percentage of national income were very similar before the crisis, I stress that the reasons for which the external debt was mainly public in Greece and private in Spain are the greater influence of the public sector in the Greek economy (relatively more state-oriented given the distribution of asset ownership), the larger opening of Spanish firms to the international financial market and the better ability of Spanish banks to borrow from the rest of the world to finance the local economy⁸⁷. More empirical and theoretical research is definitely needed in this direction. Undeniably, the Eurozone crisis displays a number of similarities with the financial crises endured by emerging market economies during the 1990s and beginning of the 2000s: loss of lender confidence, capital outflows, overvalued fixed exchange rates, debt overhang issues, sharp decline in domestic asset prices and ultimately weakened banking systems and recessions. In this sense, it is time to put an end to the misconception of “European exceptionalism” (i.e. “the Euro Area is different”), which prevailed in 2010 at the time of the Greek bailout decision and remains the way many European policymakers view the crisis today. This should help us move forward in the appropriate direction by learning from the post-crisis experience of emerging countries. As analyzed by Bernanke (2005), the latter responded to the crises by becoming net creditors *vis-à-vis* the rest of the world and more precisely by building buffers against potential capital outflows that involved the accumulation of foreign exchange reserves and the issuance of domestic debt to pay down external debt. Obviously, this is not a way out for countries in a monetary union. One must think about the conditions for sustainable capital flows between member countries. Improving the current architecture of the EMU in order to achieve an efficient allocation of saving towards productive investment is the real challenge for policy makers. In that respect, the narrative of the Greek crisis and more broadly of the Eurozone crisis I have suggested in this paper has a number of policy implications to improve the resilience of the EMU. Suppose that Europeans solve the immediate issue, namely public debt sustainability in Greece. Now, what should be done to prevent future crises? First, better monitoring the evolution of domestic asset prices, and in particular real estate prices, should help prevent the emergence of asset bubbles that can perniciously attract foreign capital in an unsustainable way like in Greece, Ireland and Spain. The Macroeconomic Imbalance Procedure introduced in 2011 should in theory help monitor asset prices but many complain about the lack of legibility and enforceability of the procedure. To

⁸⁶ In Germany for instance, real estate prices stagnated and even slightly decreased in real terms over the period.

⁸⁷ Obviously, this reasoning is relative and does not mean that Spanish firms were not credit constrained. In particular, on the misallocation of capital in Spain, see Gopinath et al. (2015).

remedy this, the national central banks could be given the means or power to counteract regional bubbles after a defined threshold is crossed. Second, eliminating financial frictions that impede the funding of firms in the periphery is urgent. Improving the deepness of domestic and European financial markets to allow a much higher number of firms to tap the debt capital markets as well as implementing fiscal incentives to increase the size of firms should help remove financial frictions. By willing to promote non-bank financing, the Capital Markets Union agenda goes in the right direction but it has yet to demonstrate its ability to actually deepen the European and domestic financial markets in the periphery. Fiscal incentives to increase the size of firms in the periphery should be implemented at the country level. Reforms of the local banking system might also be necessary to better channel saving to credit constrained firms for investment. Third, reducing the size of the public sector through effective privatizations in countries where the government still hold many assets could enhance the value of underexploited assets and limit the incentives of the government to borrow excessive amounts of debt and “overinvest” in the economy at the expense of the private sector. We should nevertheless be very careful in the implementation of an ambitious privatization agenda in a country like Greece where the risk of fire sales is very high in the current environment. Also, the privatization of state assets must be understood in the broad set of policy reforms previously mentioned⁸⁸. Lastly, the Greek or Portuguese experiences have shown that (i) external imbalances can arise in the public sector because the government can have strong incentives to invest heavily in the economy, (ii) the fiscal targets of the Stability and Growth Pact (SGP) failed and are still likely to fail in the future in preventing lasting fiscal imbalances to materialize in the absence of coercion mechanisms, (iii) macroeconomic adjustment programmes involving internal devaluations are by essence long and costly and can generate sharp tensions between creditor and debtor countries whose interests are not aligned. As such, in addition to the aforementioned measures, a sovereign restructuring mechanism to deal with specific public debt sustainability issues in the Euro Area could be necessary. With the Banking Union agenda, European policymakers have primarily focused on implementing restructuring/resolution frameworks for European banks that could prove less costly for taxpayers and avoid the “socialization” of private losses⁸⁹. An equivalent restructuring mechanism for the sovereigns is still lacking, most probably because policymakers fear moral hazard issues and refuse to recognize the lack of credibility of the SGP’s fiscal targets. The ESM and the OMT are undoubtedly new powerful tools to deal with sovereign difficulties but they are based on the logic of mandatory internal devaluations. A standardized restructuring mechanism would not necessarily increase moral hazard within the Euro Area, as markets would have incentives to better price the riskiness of sovereign debt (because of anticipated losses) when countries start moving away from mandatory fiscal targets. It would also substantially improve the resilience of the Euro Area by allowing policymakers to act quickly in case of emergency⁹⁰. Such a mechanism may also be accompanied by the introduction of mandatory exposure limits to domestic sovereign debt for local banks in order to cope with the other side of the sovereign-bank negative feedback loop that has not been addressed by the Banking Union. A diversification of sovereign debt portfolios would thus ensure that domestic banks are relatively more sheltered from the consequences of a sovereign default.

⁸⁸ Importantly, the privatization agenda must be understood as an economic issue and not a political one.

⁸⁹ The new bail-in rules and the Single Resolution Mechanism/Board must help manage banking crises without having to bail out failed banks with public funds.

⁹⁰ For instance, with such a tool available back in 2010, the Greek crisis could have been handled more quickly.

All in all, beyond these policy issues, the Euro Area still has to find the right track to recover from the current deadlock and ensure it has a future. In that respect, there is much to learn from its near past when foreign capital flows weakened instead of strengthening the monetary union. Investments in unproductive or bubbling sectors as in the past are no way out: they would only lead a temporary resumption of growth before the next crisis. Durable growth will only come from productive investments and thus productivity gains in the periphery. To build a resilient and prosperous monetary union, the member states must be able to mobilize their resources to promote innovative ventures and not let the United States be at the forefront of technology alone. This would require not only financial capital invested in the right projects but also educational changes to “drive” human capital and the workforce towards innovative sectors.

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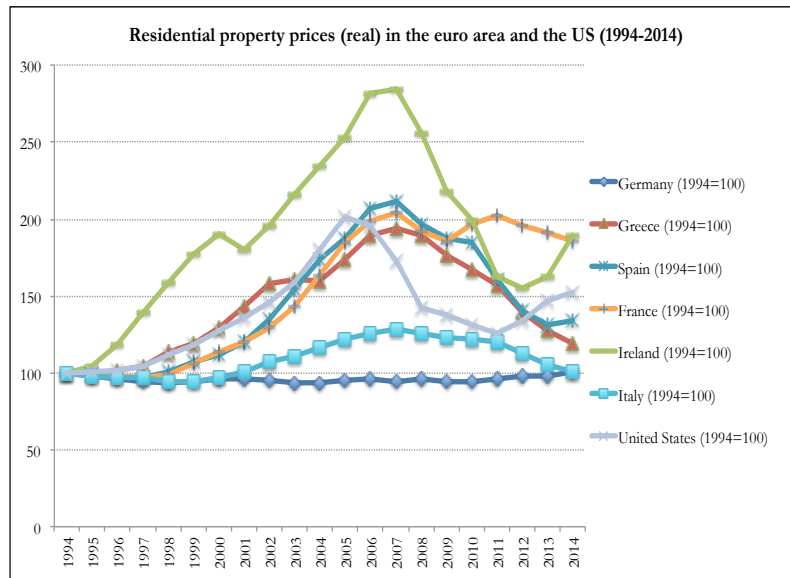
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APPENDIX

Appendix n°1: Residential property prices in the Euro Area and the US (nominal prices deflated by GDP deflator)

Sources: own calculations based on BIS property prices for all countries except Greece; for Greece, Bank of Greece main real estate price indicator (price of dwellings in urban areas); GDP price deflators obtained via the AMECO database



Appendix n°2: November 2008 Hellenic Republic bank support plan

Sources: Law 3723/2008, Greek banks' annual financial statements

The Hellenic Republic bank support plan (Law 3723/2008) was implemented at the end of 2008 to strengthen domestic banks' capital and liquidity positions in the midst of the global financial crisis. The (initially) €28bn rescue package consisted of three pillars:

- Pillar I: non-dilutive capital increase for domestic banks with redeemable preference shares (with a 10% fixed rate of return) to be issued by banks, bought by the Hellenic Republic with Greek government bonds (equivalent of cash) and redeemed at the issue price at most five years after their issuance. Greek government bonds (with a coupon rate of 6-month Euribor plus 130 basis points premium) were transferred to the banks' securities portfolio. In 2009, Greek top four banks issued €2.6bn of redeemable preference shares and received an equal amount of GGBs.
- Pillar II: government-guaranteed borrowings facility (initially limited at €15bn but quickly expanded well beyond this threshold cf. table below) to allow domestic banks to issue to "themselves" government-guaranteed notes (recorded off-balance sheet) used as collateral for refinancing purposes (regular refinancing with the ECB up until February 2015 and then for specific refinancing with the national central bank through the Emergency Liquidity Assistance (ELA) procedure). The nominal value of government guaranteed notes issued under Pillar II has become colossal starting from 2010 (e.g. €42bn Pillar II bonds outstanding at the end of 2010). However, because they are

guarantees, these debts are neither recorded in the annual fiscal deficit of the government nor in the stock of public debt.

- Pillar III: new facility aiming at transferring to domestic banks special Greek government bonds collateralized with consumer loans. The law specifies that these special GGBs had to be kept in the banks' portfolios and use only for refinancing purposes. In 2009, Greek top four banks received approximately €1.8bn of these bonds.

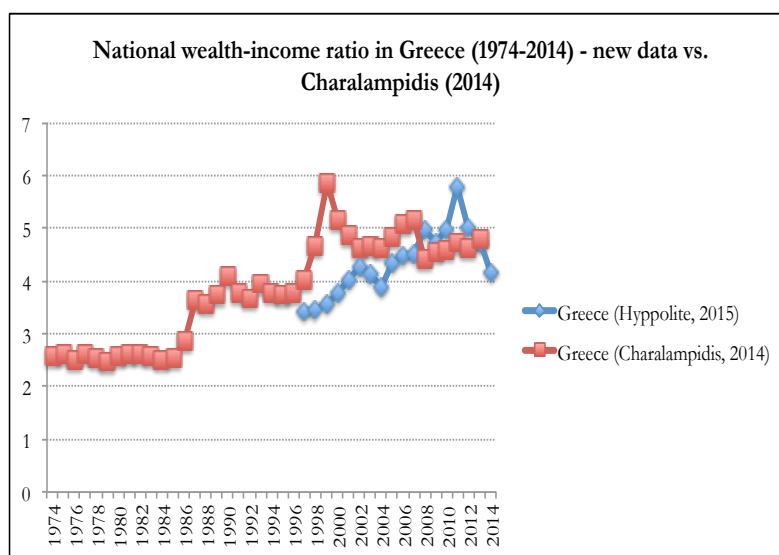
Hellenic Republic 2008 Bank Support Plan - Key Data for Top 4 Greek Banks							
		2009	2010	2011	2012	2013	2014
Alpha Bank	Pillar I preference shares	940	940	940	940	940	-
	Pillar II government-guaranteed notes	1000	9500	14000	9800	9800	9800
	Pillar III special government bonds	-	1600	500	500	500	1600
Piraeus Bank	Pillar I preference shares	370	370	750	750	750	-
	Pillar II government-guaranteed notes	n.a.	8200	13100	11200	7600	6300
	Pillar III special government bonds	865	1300	424	n.a.	1426	2998
Eurobank Ergasias	Pillar I preference shares	950	950	950	950	950	950
	Pillar II government-guaranteed notes	-	12050	17776	16276	13932	13667
	Pillar III special government bonds	900	1737	-	-	-	1918
National Bank of Greece	Pillar I preference shares	350	350	1350	1350	1350	1350
	Pillar II government-guaranteed notes	500	11966	14798	14798	14798	8766
	Pillar III special government bonds	n.a.	787	787	787	847	2109
Total "core banks"	Pillar I preference shares	2610	2610	3990	3990	3990	2300
	Pillar II government-guaranteed notes	1500	41716	59674	52074	46130	38533
	Pillar III special government bonds	1765	5424	1711	1287	2773	8625

Source: relevant banks' end-of-year financial statements (available online on banks' websites)

Notes: amounts are in €mn and at nominal value; "-" means the amount outstanding is zero; "n.a." means the corresponding figure is not available

Appendix n°3: Long-run national wealth-income series

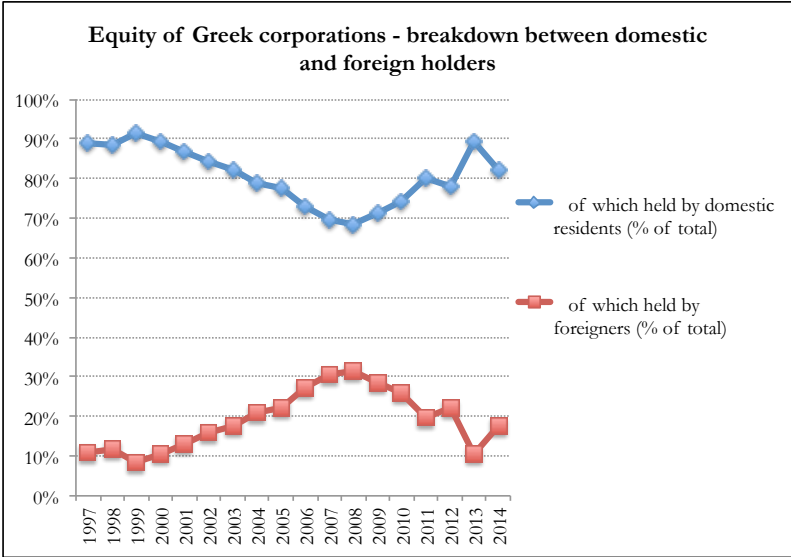
Sources: Charalampidis (2014), own calculations



As highlighted in the graph, even if the average level of the national-wealth income ratio is relatively comparable in both series, the respective trends differ significantly: while Charalampidis (2014) series is relatively chaotic over 1997-2014, I observe an upward trend which is only reversed by the crisis starting from 2012. Besides, the striking increase by 50% of the national

wealth-income ratio within three years (1997-1999) in the run-up to the Euro adoption observed in Charalampidis (2014) is not apparent in my data. By contrast, the burst of the dot-com bubble can be seen in my series.

Appendix n°4: Equity holdings of domestic corporations by residents vs. non-residents
Sources: own calculations based on Bank of Greece financial accounts



These series are calculated using the annual financial accounts of corporations published by the Bank of Greece (the Greek national central bank). At the beginning of the period (in 1997), Greek residents owned 90% of the shares issued by Greek corporations. This gradually decreased over time up until 2008 where residents held only 70%. Since 2008, we experience a “renationalization” of domestic equity holdings: nowadays, residents own 80% of domestic shares. Aside from this trend, this nonetheless shows that domestic equity holdings by the rest of the world are not negligible over the whole period.

Appendix n°5: The issue of book-value national wealth

In practice, I see no empirical hurdles to adjust the book-value national wealth series (obtained by directly using official national balance sheet data) in order to measure the shares of domestic corporations owned by the rest of the world in book- rather than market value. Indeed, one can start by deriving the aggregate book-value of domestic corporations’ equity as follows:

$$\begin{aligned} &\text{Book_value of equity} \\ &= \text{Fin. assets (corporations)} + \text{Nonfin. assets (corporations)} \\ &- \text{Fin. liabilities (corporations)} + \text{Market_value of equity} \end{aligned}$$

Then, calculate the implied Tobin’s Q:

$$\text{Tobin's Q} = \frac{\text{Market_value of equity}}{\text{Book_value of equity}}$$

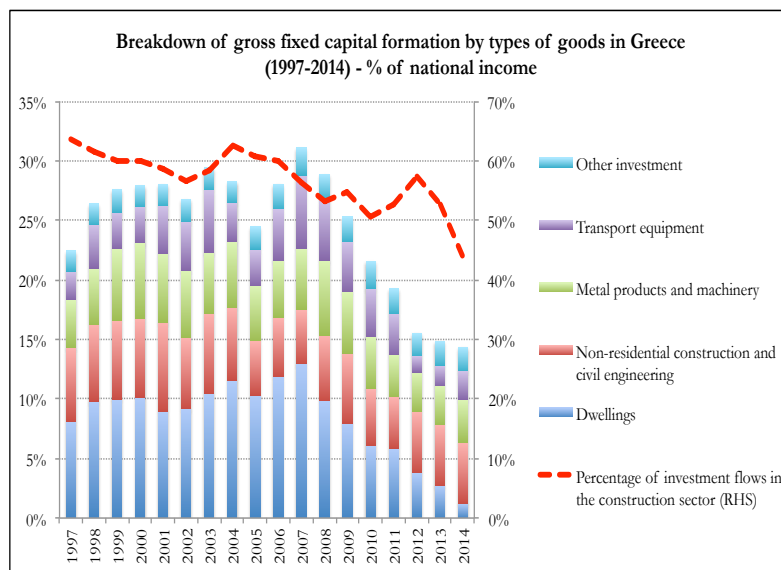
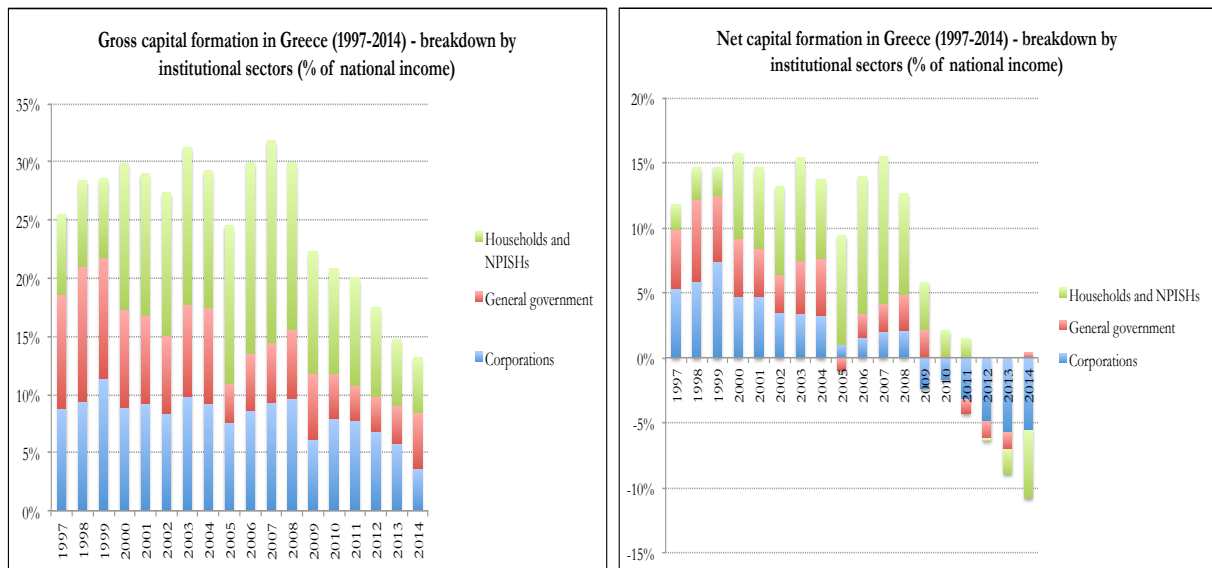
And finally use the Tobin's Q to adjust the market-value series of domestic shares owned by the rest of the world in the net foreign asset position:

$$\text{Book_value of equity owned by RoW} = \frac{\text{Market_value of equity owned by RoW}}{\text{Tobin's Q}}$$

Ultimately, this approach enables to derive detailed breakdowns of foreign vs. domestic and government vs. private wealth with equity at book value. The sum of the private (households) and government net wealth with market-value series of equity adjusted using the implied Tobin's Q calculated above should be exactly equal to the adjusted book-value national wealth obtained previously.

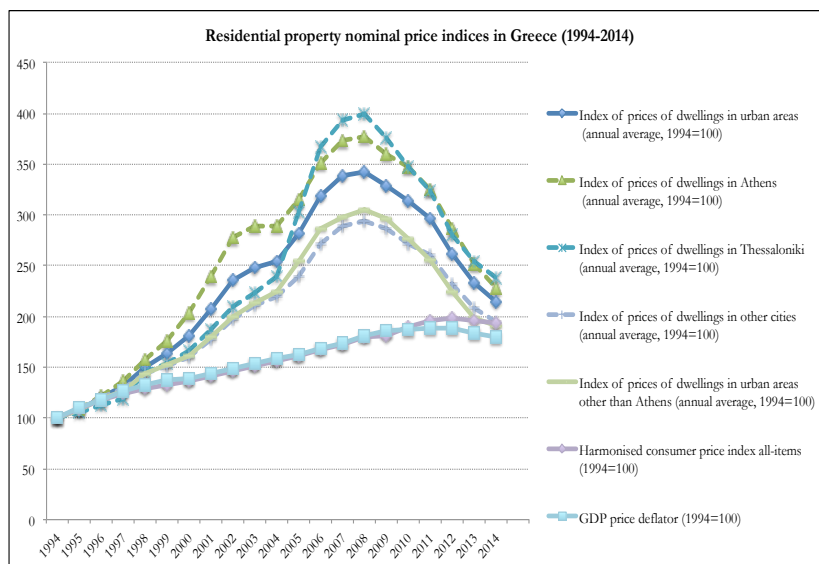
Appendix n°6: Gross and net capital formation (gross and net of capital depreciation investment flows) by institutional sectors and breakdown of gross fixed capital formation by types of goods

Source: own calculations based on AMECO (European Commission)



Appendix n°7: Residential property prices in Greece (nominal prices) vs. consumer price index and GDP deflator

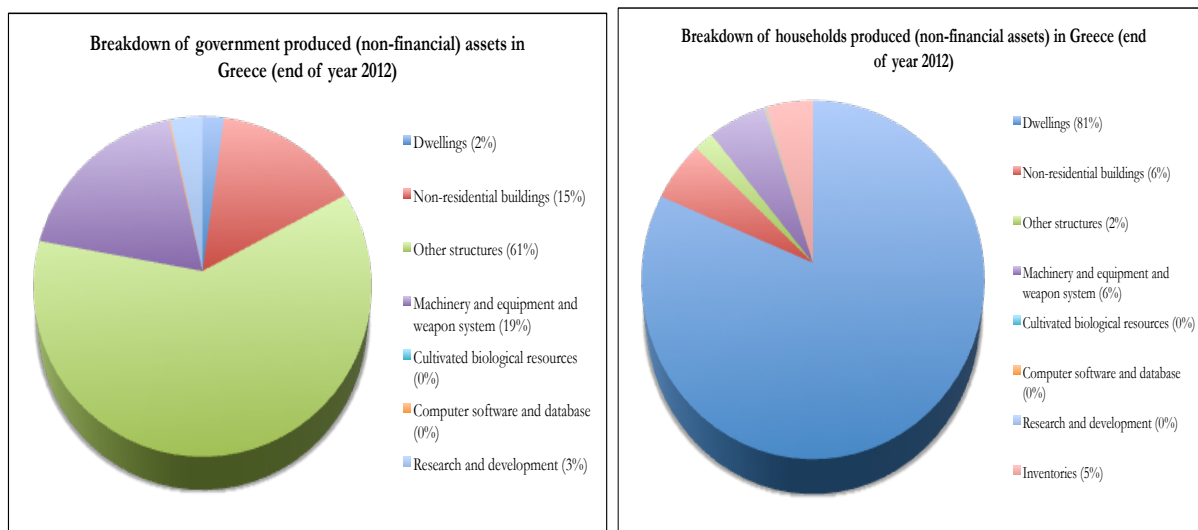
Sources: own calculations based on Bank of Greece data for real estate price indices and European Commission AMECO for GDP price deflator and harmonized consumer price index

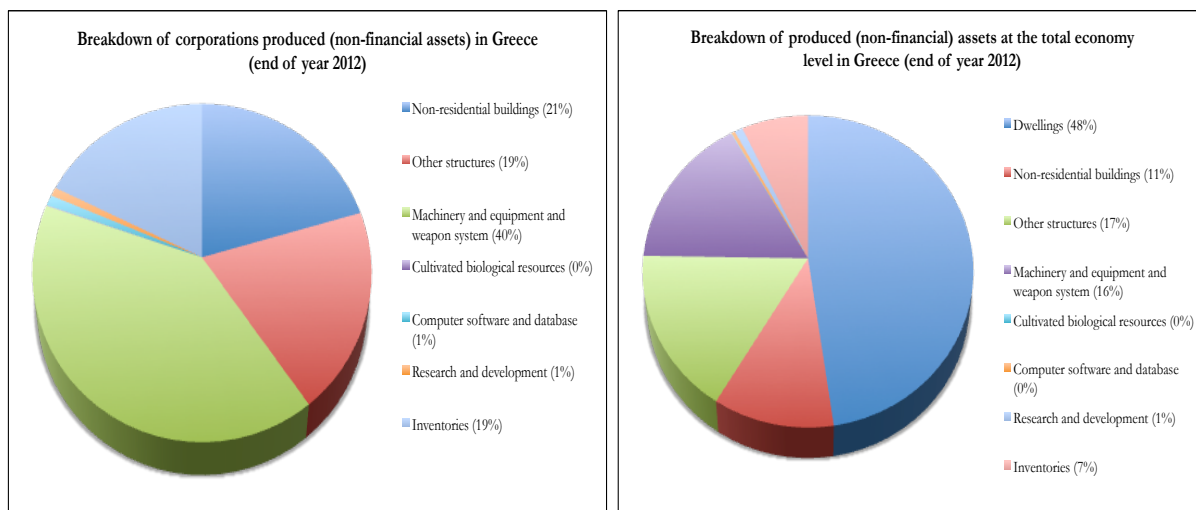


Appendix n°8: Portfolio of produced assets by institutional sectors in 2012

Source: own calculations based on ELSTAT data (produced in accordance with Eurostat and OECD methodologies)

The piechart diagrams below provide a detailed decomposition of produced assets by institutional sectors in Greece as at end 2012. The detailed breakdown of produced assets per asset category is only available for 2012.





For the sake of clarity, I point out that:

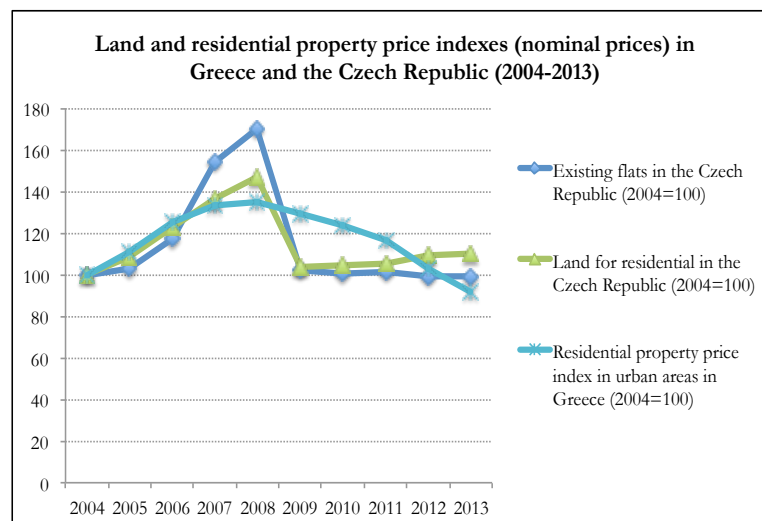
- **Dwellings** typically include buildings or equipment such as houseboats, mobile homes or caravan that are used entirely or primarily as residences (including the associated structures such as garages). Importantly, the value of dwellings is net of the value of land underlying dwellings which is a non-produced asset included in “natural resources” (as “land”).
- **Non-residential buildings** include buildings other than dwellings such as warehouse and industrial buildings, commercial buildings, buildings for public entertainment, hotels, restaurant, schools (educational buildings), hospitals (health buildings) and also public monuments identified as non-residential buildings because of particular historical, national, regional, local, religious or symbolic significance.
- **Other structures** include typically highways, streets, roads, railways, airfield runways, bridges, tunnels, subways, dams, harbors, pipelines, communication and power lines, construction for sport and recreation etc. Structures intended to improve land adjacent but not integral to them such as sea-walls, dykes or flood barriers are classified as other structures and not land. Other structures also include public monuments not classified as dwellings or non-residential buildings.
- **Machinery and equipment and weapon systems** include transport equipment, information and communication technologies equipment other than acquired by households for final consumption (e.g. vehicles, furniture, kitchen equipment, computers i.e. all durable goods of households are excluded because considered as final consumption). Machinery and equipment integral to buildings are excluded and included in dwellings or non-residential buildings. On top of that weapons systems are vehicles and other equipment such as warships, submarines, military aircraft, tanks, missile carriers and launchers. Note that most single-use weapons (ammunition, rockets) are nonetheless recorded as inventories.
- **Cultivated biological resources** include livestock for breeding, dairy, draught etc. and vineyards, orchards and other plantations of trees yielding repeat products that are under the direct control, responsibility and management of institutional units.
- **Computer software and database** consist of computer programs and files of data.

- **Research and development** corresponds to the value of expenditure on creative work undertaken on a systematic basis in order to increase the stock of knowledge. The value of R&D is determined in terms of economic benefits expected in the future. In practice, it is often valued as the sum of the costs.
- **Inventories** consist of goods and services that came into existence in the current period or in an earlier period held for sale, use in production or other use at a later date. They include materials and supplies, work-in-progress, finished goods and goods for resale.

For more details about the classification of assets and composition of each category, I refer to the ESA 2010 manual, available online: http://www.lb.lt/n22873/esa_2010-en_book.pdf (Annex 7.1, p182).

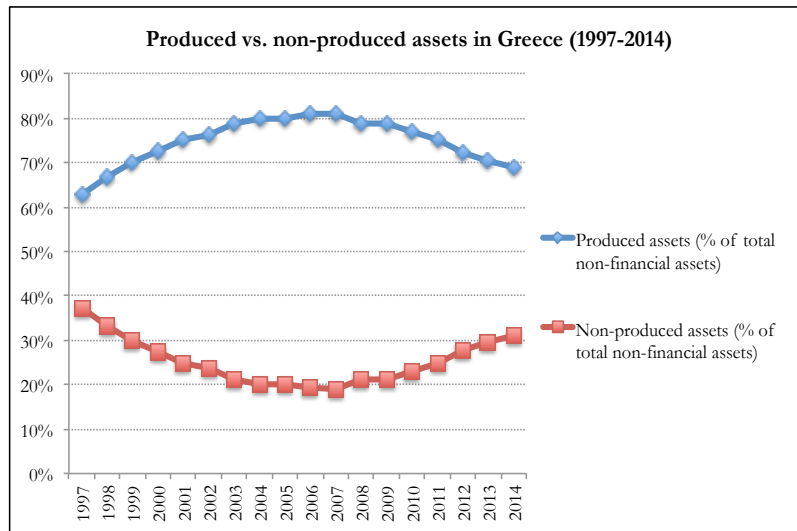
Appendix n°9: Land and residential property prices in Greece and the Czech Republic

Sources: own calculations based on BIS property prices for the Czech Republic and Bank of Greece real estate statistics for Greece

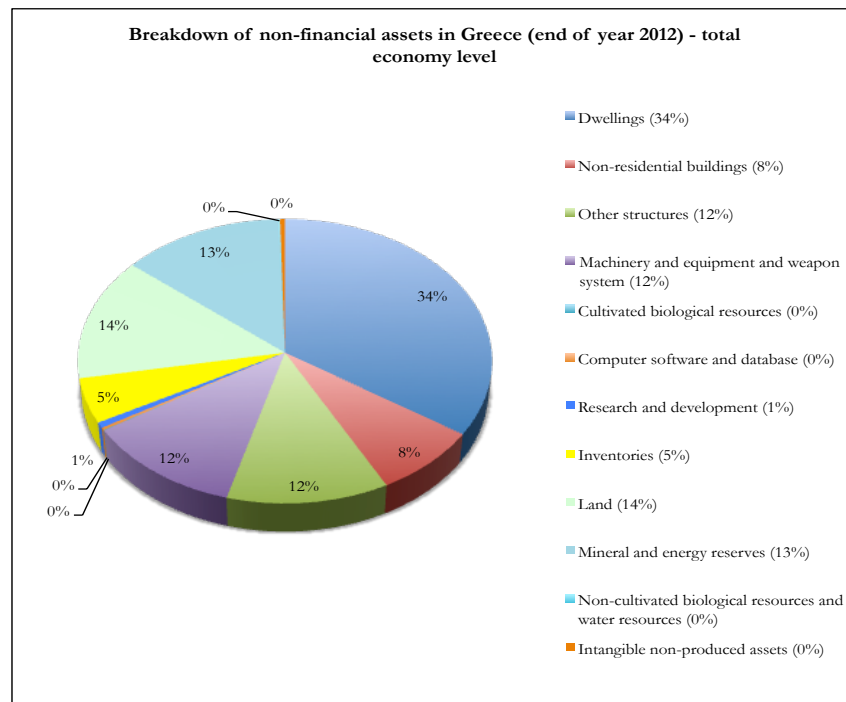


Appendix n°10: Percentage of produced vs. non-produced assets in total non-financial assets in Greece

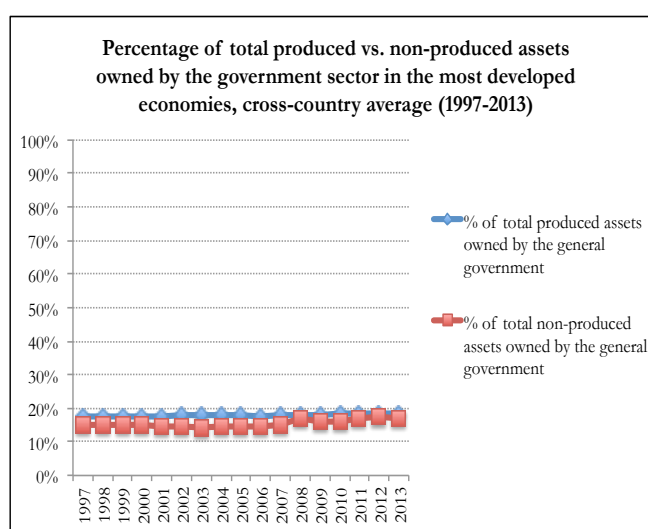
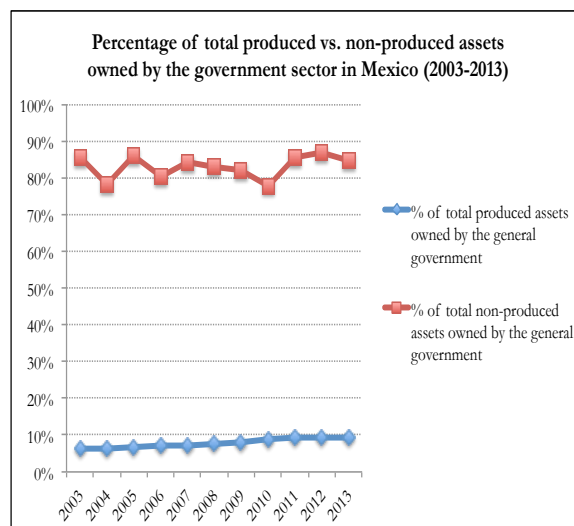
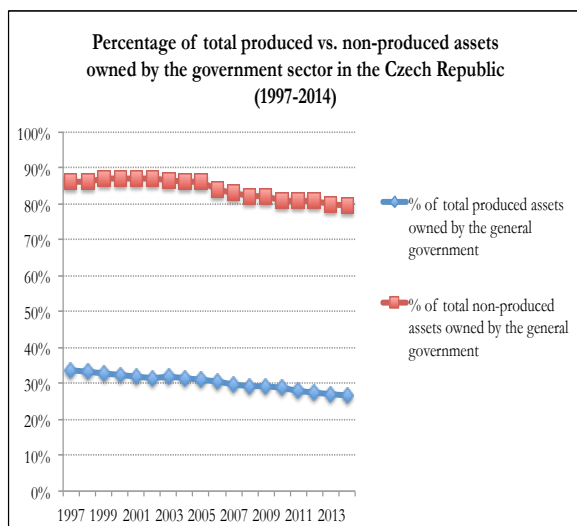
Source: own calculations



Appendix n°11: Full decomposition of non-financial assets at the total economy level (2012)
Source: own calculations



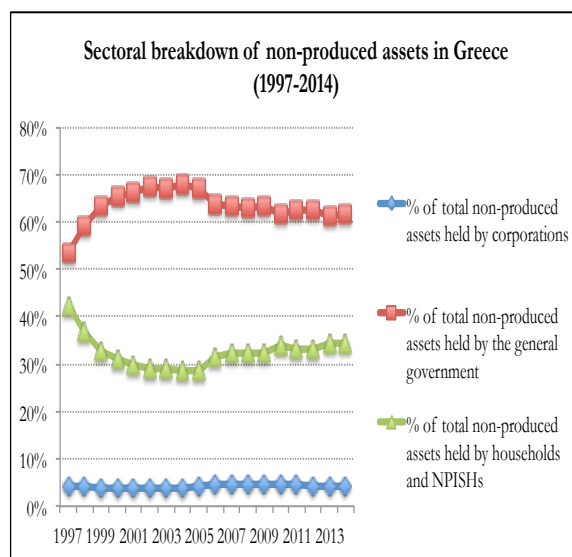
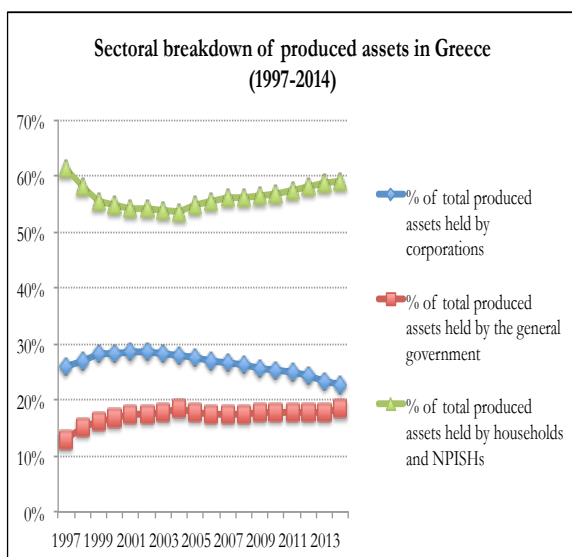
Appendix n°12: Share of total produced vs. non-produced assets owned by the government sector in other economies.
Source: own calculations based on OECD (annual national accounts)



The reference dataset for the construction of these series in all countries is the OECD annual national accounts (non-financial balance sheets). The sample of the “most developed economies” includes five countries, namely Australia, Canada, France, Japan and Korea. The variance of the percentage of total produced and non-produced non-financial assets owned by the government between these countries is very low. I construct the cross-country average series by simply calculating for each period between 1997 and 2013 the arithmetic mean of all series included in the sample. The graphs clearly show that in the relatively less developed economies (namely the Czech Republic and Mexico) the government holds throughout the period a disproportionately large share of the total non-produced assets compared to (i) its ownership of produced assets and (ii) the percentage of total non-produced assets owned by the governments of the most developed economies. Note that the data before 2003 are not available for Mexico.

Appendix n°13: Breakdown by institutional sectors of produced and non-produced assets in Greece

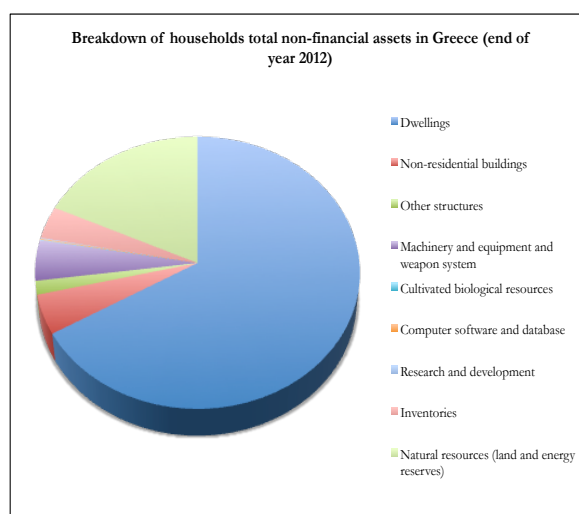
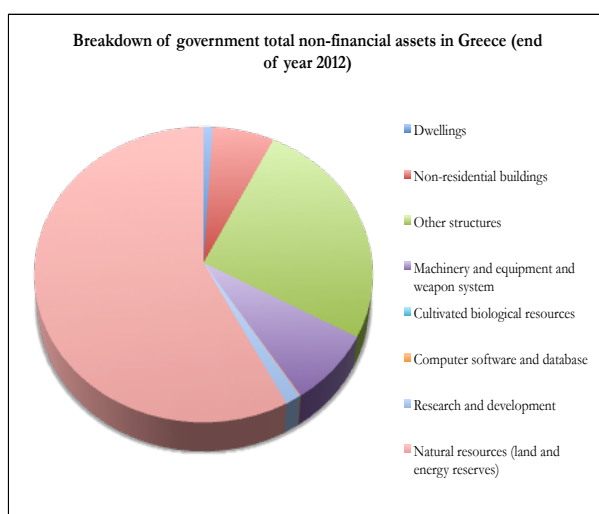
Source: own calculations

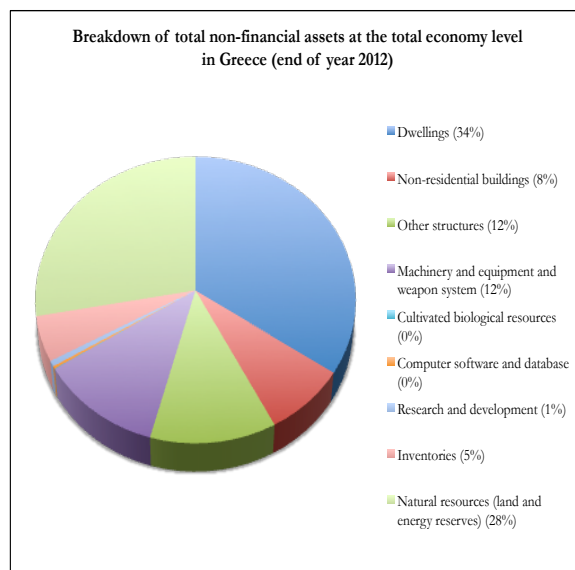
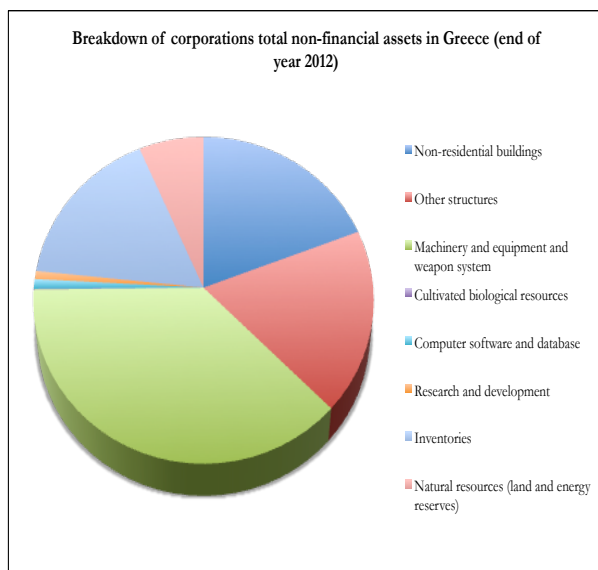


Note that the distribution of produced and non-produced assets across institutional sectors in Greece is broadly constant over time. This is consistent with the observations in countries for which official balance sheet data are available.

Appendix n°14: Portfolio of non-financial (produced and non-produced) assets by institutional sectors in 2012

Sources: ELSTAT, own calculations





Appendix n°15: Evolution of national income in Greece (€mn, current prices)

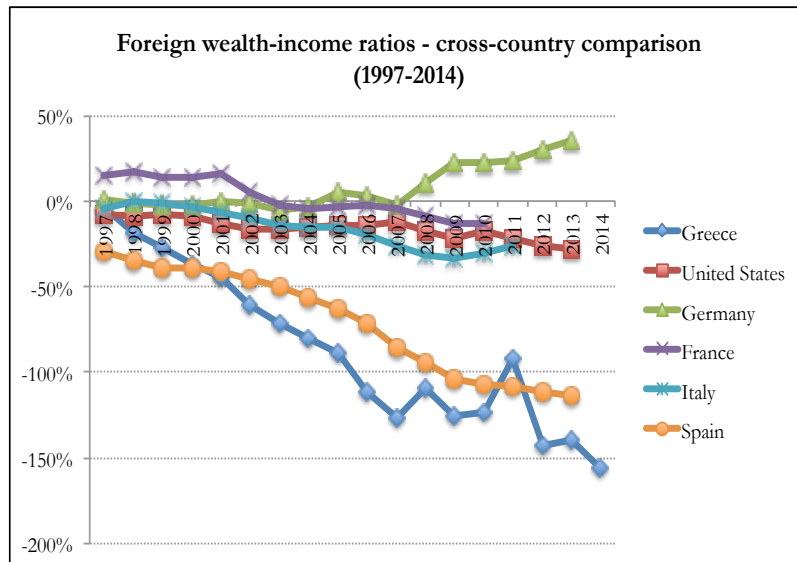
Source: European Commission (AMECO)



As highlighted in the graph, national income began to contract in 2009 after a sharp increase in the run-up to the Euro adoption and between 2001 and 2008 within the monetary union. National income is defined as the sum of net domestic output (GDP net of consumption of fixed capital) and of the net foreign income (i.e. essentially income received from investments of Greek residents abroad minus income paid to foreign investors in Greece). The series comes from the AMECO database (European Commission).

Appendix n°16: Cross-country comparison of net foreign asset positions (as a percentage of national income)

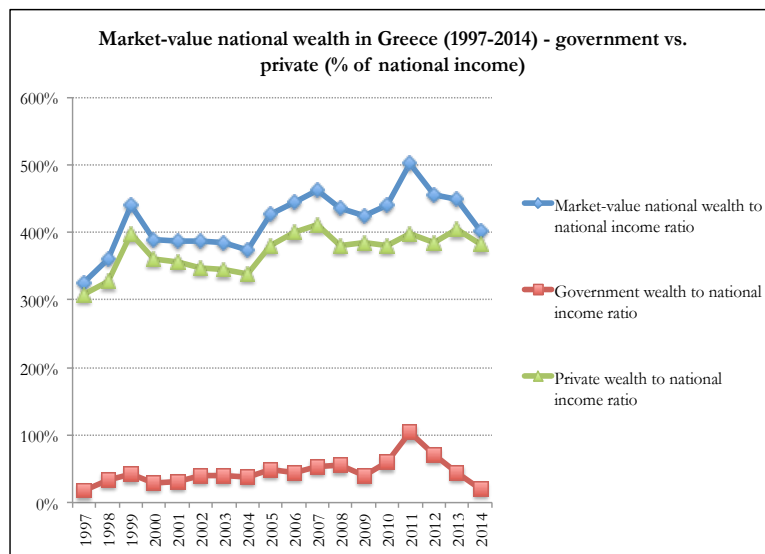
Sources: own calculations for Greece based on Bank of Greece data (financial accounts) and The World Wealth and Income Database (WID) for other countries



The deterioration of the Greek net external position was extremely significant before the crisis. After two positive adjustment spikes in 2008 and 2011, it has continued to deteriorate significantly from 2012 onwards. From a cross-country perspective, the downward trend of the Greek foreign wealth has no equivalent (only Spain has a similar trajectory, though less marked).

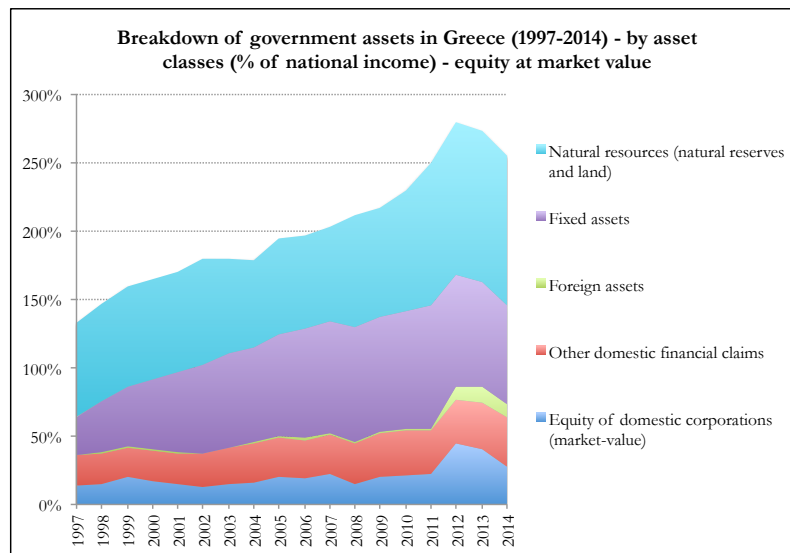
Appendix n°17: Market-value national wealth series and subcomponents

Source: own calculations



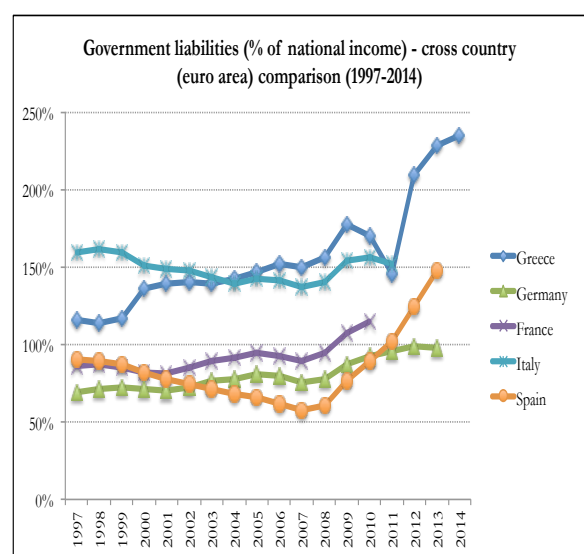
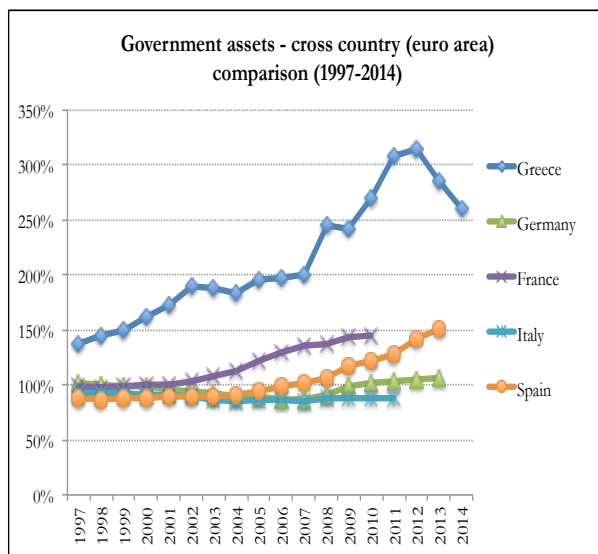
Appendix n°18: Breakdown of government assets by asset classes with equity valued at market prices (% of national income)

Sources: own calculations



Appendix n°19: Cross-country comparison of government assets vs. liabilities (as a percentage of national income)

Sources: own calculations for Greece and The World Wealth and Income Database (WID) for other countries



Appendix n°20: The central bank and the government

Sources: own calculations, Bank of Greece (financial accounts)

First of all, one must recall the general role of central banks and their relationship with the government. The ESA 2010 gives the following definition: “The central bank subsector consists of all financial corporations and quasi-corporations whose principal function is to issue currency, to maintain the internal and external value of the currency and to hold all or part of the international reserves of the country”. According to Hall and Reis (2015), “a central bank is an independent arm of government whose relation to the government is contractual”. Even if a “modern” central bank enjoys a large degree of autonomy and independence to conduct its main

activities, i.e. manage the nation's reserve assets, issue the national currency⁹¹ and define the monetary policy stance, it remains closely related to the government. Indeed, based on the proceeds generated by its activities, it makes regular payments to the government. These payments are made in the form of dividends as long as they do not exceed the net operating income of the central bank. When they do, they are recorded as a decrease in equity, so that a central bank can in theory end up and operate in negative equity⁹². In such a situation, the government, as ultimate guarantor of the national general interest, can decide to recapitalize the central bank, either immediately if the dividend rule specifies it or if it considers that the regular operations of the central bank would be impeded should it operate in negative equity⁹³, or gradually by allocating its future dividend payments to the rebuilding of the central bank's equity capital⁹⁴. But that does not make the central bank "dependent" on the government *per se*. Indeed, the two main (and intrinsically related) reasons why negative equity at a given point in time is not, strictly speaking, an issue are that any central bank (i) structurally makes profits because it pays less interest on its liabilities than what it receives on its assets and (ii) has in theory the power to issue unlimited liabilities⁹⁵. Therefore, I argue that including the central bank in the corporations rather than in the general government sector makes sense because it does not necessarily need any sort of assistance by the government – even when in negative equity – to manage its own activities and balance sheet. However, the government may find itself indirectly involved in the activities of the central bank when it is exposed to the default risk on liquidity provided by the central bank to local banks. Let me take one example that will prove to be particularly relevant in the Greek case. If domestic banks pledge government-guaranteed assets as collateral to tap central bank liquidity, then, in an event of default on central bank loans, the government would end up with a debt *vis-à-vis* the central bank. Hence, the links between the central bank activities (or put it differently, the central bank risk) and the government ultimately depend on the composition of the collateral pool retained by the central bank. Precisely, Greece is an interesting case where we find during the crisis a particularly high exposure of the government to the activities of the national central bank. Before detailing why, a short detour is required to visualize the extent of liquidities injected by the Bank of Greece in local banks during the crisis. Looking at

⁹¹ Within the Eurosystem, every national central bank issues notes. The "currency" issued by the Eurosystem in general includes euro notes and coins. However, coins are issued by central governments in the Euro Area (with the approval of the European Central Bank which controls the quantity of coins in circulation). By convention, coins are nonetheless treated as liabilities of the national central banks (which in return hold a notional claim on governments).

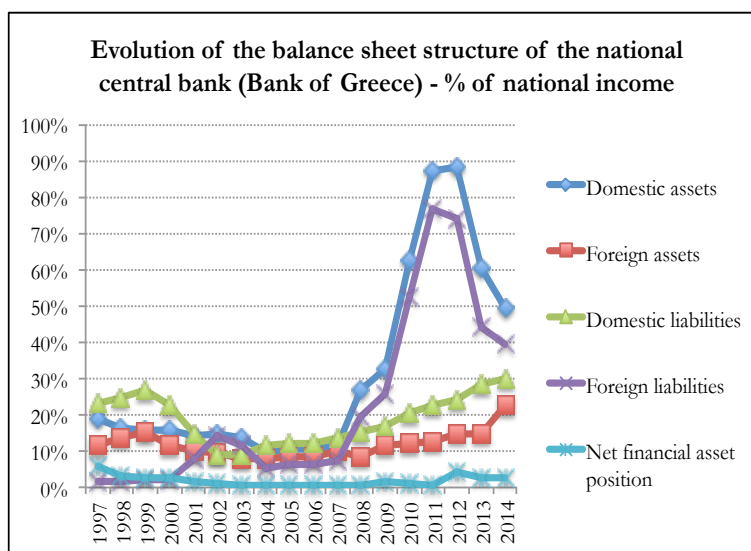
⁹² Exceptional payments of central banks differing from the usual dividend payments made to the government are also systematically recorded as a withdrawal of equity.

⁹³ For instance if the government considers that operating in negative equity would have an impact on the central bank's capacity to anchor inflation expectations.

⁹⁴ Note that because the equity capital of some central banks is made of listed shares (this is the case for the Bank of Greece for instance), they can also in theory be recapitalized by non-government actors through the issuance of new shares. It is also worth noting that every central bank makes provisions (never disbursed to the government) based on the profits made at the end of the year. This makes an additional buffer to cover potential balance sheet losses.

⁹⁵ Central bank's liabilities are made of two types of liabilities: first, monetary liabilities such as banknotes (which do not pay any interest but are demanded as means of payments and sometimes safe collateral) and second, monetary liabilities such as fixed-term deposits by domestic banks (which are remunerated at a very low – and sometimes negative as today in the Euro Area – interest rate). Note that in the Euro Area, the current interest rate on the deposit facility is of -0.3%. It reached negative levels at -0.1% on June 11, 2014, then was further lowered at -0.2% on September 10, 2014, and finally lowered to the current level on December 9, 2015. Obviously, the central bank's power to issue unlimited liabilities in the form of banknotes can be quickly impeded by a loss of confidence in the value of the national currency (risk of hyperinflation). Besides, the power to issue unlimited reserves through new deposits of domestic banks is also limited by the resources of banks and the contractionary effects it would eventually have on the real economy through the credit channel (credit crunch).

the balance sheet, we realize how massive the support to the domestic banking sector in the form of collateralized loans – reflected by the sharp increase in the size of domestic assets as a percentage of national income – has been during the crisis⁹⁶. Importantly, I stress that loans to domestic banks were mostly financed through borrowings from the rest of the world (“foreign liabilities in the graph below”).

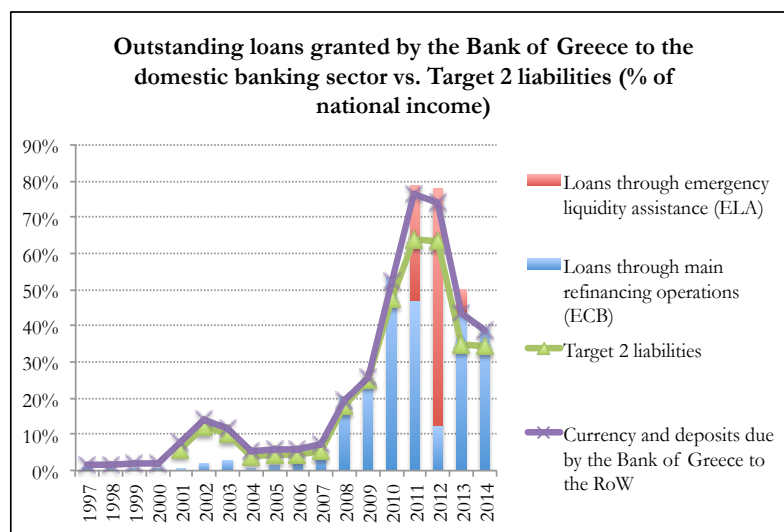


Collecting data at a finer level, we observe in the graph below that these “foreign borrowings” - that finance liquidity injections in the domestic banking sector - are essentially made of liabilities due to the rest of the Eurosystem, the so-called TARGET2 liabilities⁹⁷. The mechanism is the following: fearing a break-up from the monetary union and a devaluation of their deposits following a return to a new national currency, depositors move their deposits from Greece to a safe haven, say Germany. German banks receive new deposits and, afraid of taking long positions with money likely to be withdrawn unexpectedly, transfer the cash to their accounts at the Deutsche Bundesbank. Then, the German central bank incurs a claim (a “TARGET2 claim”) of the equivalent amount *vis-à-vis* the European Central Bank. Facing a cash shortage, Greek banks borrow from the Bank of Greece against eligible collateral the exact same amount. The central

⁹⁶ These loans to the Greek banking sector were made either of regular ECB loans (always implemented in the Eurosystem at the national central bank level) or of liquidity tapped under the Emergency Liquidity Assistance (ELA) procedure. This procedure can be activated (and was activated in Greece between 2011 and 2013 and again starting from February 2015) under exceptional circumstances to allow solvent banks in a given Euro Area country to continue receiving liquidity from their national central bank when they have no more eligible assets in their book to pledge as collateral for ECB regular refinancing operations. Importantly, the ELA procedure specifies that the responsibility for the provision of new loans lies with the national central bank which ultimately carry the risk associated with the liquidity injections. The Governing Council of the ECB may also decide to set a threshold for ELA operations once they exceed a €2bn limit.

⁹⁷ On September 21st, 2015, the ECB started publishing retrospective TARGET2 data at the national central bank level on a monthly basis. The official data extend back to 2008. For previous years (2001-2007), I use the dataset of Steinkamp and Westermann (2014). The balance sheet of the Bank of Greece is extracted from the country’s financial accounts used to calculate wealth series in the first section. TARGET2 liabilities are included on the liability side in the “currency and deposits” category as “liabilities due to the rest of the world”. We see in the graph that the total currency and deposits due by the Bank of Greece to the rest of the world are a relatively good proxy for TARGET2 liabilities. Note also that loans related to the ELA procedure are recorded in the “short-term loans” category in the official financial accounts (asset side), while the regular ECB loans are recorded in the “currency and deposits” category (asset side).

bank of Greece incurs a liability *vis-à-vis* the European Central Bank, a “TARGET2 liability”. The system is perfectly balanced and finally, the Bank of Greece has been able to finance its loans to local banks through new deposits issued by another central bank, namely a “creditor” central bank (the Deutsche Bundesbank in my example). As we can see, this is only possible because of the architecture of the Euro Area, in particular because of the TARGET2 system. Outside the monetary union, the central bank of Greece would have been forced to issue its own liabilities (i.e. “domestic liabilities”) to finance its liquidity injections, and thus most probably to print paper money with the risk of creating inflation, as increasing the deposits of local banks would have been impossible given their poor financial health. But it is also likely that outside the monetary union, depositors (Greek or foreign ones) would have had more difficulty transferring cash from Greece to another country, so that Greek banks would have had less liquidity needs in the end.



That being said, coming back to the question of the link between the central bank and the government, the very reason why the government exposure to the central bank risk is high in Greece is the composition of the collateral pool. Indeed, in order to tap central bank liquidity, Greek banks are pledging notably government-guaranteed bonds (a.k.a. “Pillar II bonds”) issued since 2009 under Law 3723/2008. These bonds are “fake” debt securities issued by banks for the sole purpose of tapping central bank liquidity: the notes are never sold to any counterparty, the banks issue them to “themselves” and the central bank considers them as eligible collateral because of the government guarantee. The notes are literally “made out of thin air” and introduce a kind of circular financing whose sole aim is to draw liquidity out of the Eurosystem to face the cash shortage in the Greek banking system (see [Appendix n°2](#) for more details). It implies that a default by Greek banks on central bank loans collateralized with Pillar II bonds would immediately activate the guarantee and create a new government debt *vis-à-vis* the central bank. So what share of the total collateral pool do these government-guaranteed notes account for? What are they worth in nominal terms?

Breakdown of the Eurosystem collateral pool for the top 4 Greek banks (end of 2014)					
	Alpha Bank	Piraeus Bank	Eurobank Ergasias	National Bank of Greece	Total core banks
Eurosystem	15 400	16 600	12 300	15 700	60 000
EFSF bonds	4 200	5 700	1 200	5 000	16 100
Greek sovereign	10 700	9 800	10 500	9 800	40 800
<i>Pillar II bonds</i>	7 500	6 300	8 500	8 000	30 300
<i>GGBs & T-bills (including Pillar III bonds)</i>	3 200	3 500	2 000	1 800	10 500
Other (non-marketable assets)	500	1 100	600	900	3 100
% of total					
EFSF bonds	27%	34%	10%	32%	27%
Greek sovereign	69%	59%	85%	62%	68%
<i>Pillar II bonds</i>	49%	38%	69%	51%	51%
<i>GGBs & T-bills (including Pillar III bonds)</i>	21%	21%	16%	11%	18%
Other (non-marketable assets)	3%	7%	5%	6%	5%

Source: author's computations, banks' presentations to investors (available on banks' websites in the section "investor relations")

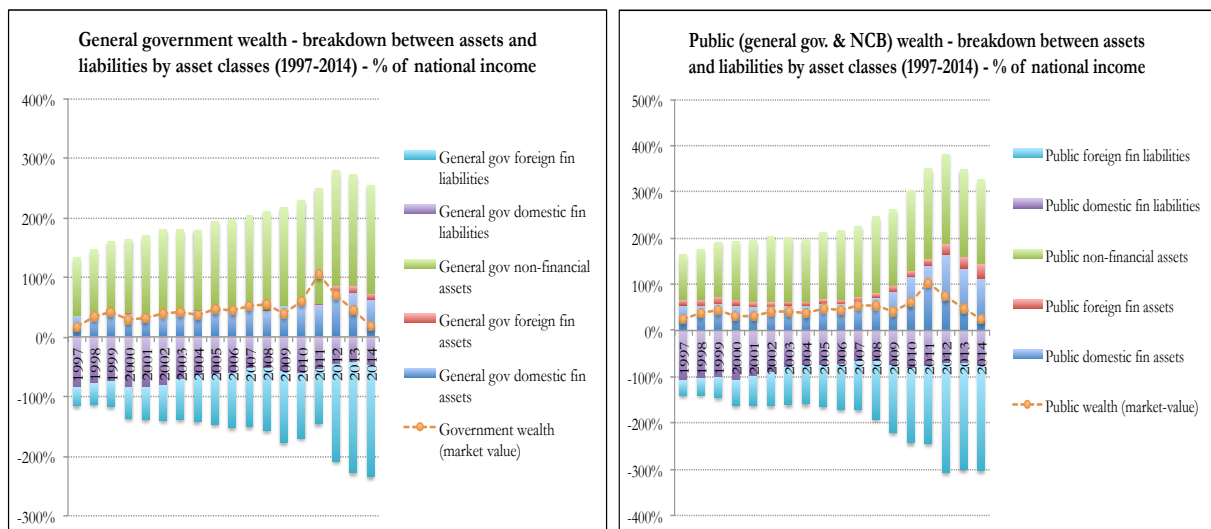
Notes: (1) figures are extracted from different sources and should be considered as indicative rather than exact numbers; (2) amounts presented in the table are nominal values of collateral (as opposed to cash values). They represent the nominal value of pledged assets. Because of haircuts (relatively small though as at end 2014 where liquidity was fully obtained via ECB regular refinancing and not ELA), the amounts of liquidity actually obtained by banks are lower than the above figures.

As highlighted in the above table, a large share of the collateral pool (51%) is made of Pillar II bonds, for a corresponding nominal value of €30bn⁹⁸. The exposure of the government to the central bank risk is thus very high. A large portion of the collateral pool (27%) is also made of EFSF notes that have been received by local banks in 2012-2013 in exchange for new shares as part of their recapitalization by the Hellenic Financial Stability Fund following the early 2012 public debt restructuring (PSI). The seizure of these notes by the central bank in an event of default would arguably force the government to a new recapitalization of the main domestic banks to avoid massive negative spill-over effects to the real economy. If we agree on this, the total exposure of the government to the central bank risk at end of 2014 was of €46bn (32% of national income). In both cases, a private default on central bank liquidity would generate new debts for the government because of the very nature of assets pledged as collateral⁹⁹. All in all, when the government is directly exposed to the risk of default of the domestic banking sector on central bank liquidity, merging the government and the central bank into a broad “public sector”

⁹⁸ I report in the table above the end of 2014 data for the collateral pool because data prior to 2014 are not available (not disclosed by banks). But given the amounts of outstanding Pillar II bonds between 2009 and 2014 (see [Appendix n°1](#)), it is very unlikely that the share of Pillar II bonds in the collateral pool would be significantly lower.

⁹⁹ Note that at the end of 2014, the ELA procedure was no more active in Greece, so that the Eurosystem loans to the Greek banks were only made of ECB regular loans. On 4 February 2015, the Governing Council of the ECB decided to lift the waiver that ensured the eligibility of Greek sovereign bonds as well as government-guaranteed bonds (Pillar II bonds) as collateral for the main refinancing operations of the ECB, thereby immediately redirecting the Greek banking sector in the ELA procedure given the liquidity needs of the local banks and the composition of their collateral pools. This decision was heavily commented in the press at the time. Several analysts saw it as the proof of an aggressive political step by the Governing Council to put pressure on the Greek government and force him to give up its strong stance in the (re-)negotiation of the bailout programme. However, this view must be relativized because the ECB had long planned – well before February 2015 – to stop accepting the government-guaranteed bonds as collateral in its main refinancing operations (indeed, the ECB press release of March 22nd, 2013, stated: “The Governing Council of the European Central Bank has adopted Decision ECB/2013/6, which prevents, as of 1 March 2015, the use as collateral in Eurosystem monetary policy operations of uncovered government-guaranteed bank bonds that have been issued by the counterparty itself or an entity closely linked to that counterparty”). Hence, strictly speaking, the 4 February 2015 decision only concerned Greek sovereign bonds (Greek government bonds and T-bills) and the latter accounted for a relatively small part of the collateral pool eligible for the ECB refinancing operations. The decision simply precipitated an inevitable return into the ELA procedure, thereby allowing local banks to get access to more liquidity (in spite of the increase in haircuts) given the lower requirements, inherent to the ELA procedure, regarding the quality of eligible collateral. Pillar II bonds remained - and remains until further notice - eligible as collateral for refinancing under the ELA procedure (although with much higher haircuts than previously under the ECB regular refinancing framework).

can be justified. But what would it actually change to the previous results regarding the evolution of government wealth? While the value of public wealth (defined now as the sum of government and central bank net wealth) would remain close to the government wealth (as defined previously) because the net asset position (or net wealth) of the Bank of Greece is virtually zero over time (see graph above)¹⁰⁰, the structure of the public wealth would differ from the one of government wealth given the discrepancy between domestic (asset side) and foreign (liability side) financing in the central bank balance sheet. The public claims on domestic corporations (in particular banks) would be significantly higher than the domestic claims directly related to the government, and the TARGET2 liabilities would add to the government external debt. Obviously, this should be transitory because the increase in the central bank balance sheet and the growing asymmetry between domestic assets and foreign borrowings is directly related to the crisis¹⁰¹. Indeed, as highlighted in the graphs below, the difference between government and public wealth is mainly visible during the crisis. Adding the central bank balance sheet to the government wealth obviously increases the size of government assets and liabilities but more importantly the asymmetry between domestic claims and foreign liabilities.



In normal times, central bank loans to domestic banks are limited in scope, so that banks have many assets to pledge as collateral and the government will not have a direct exposure to the central bank risk. In this case, there is no reason to merge the government and central bank balance sheets into an extended public sector balance sheet. But in prolonged periods of stress where governments are guaranteeing local banks' assets to ensure that they have enough eligible collateral to tap central bank liquidity, we can observe large and long-term government exposures to the central bank risk. It is definitely the case in Greece since 2009. As such, there is a rationale to include in the government wealth the part of the central bank balance sheet to which the government is exposed through guarantees. But in the end, even this could be disputed. One could indeed argue that, in an event of default, the government could always implement an arrangement with its central bank to avoid honoring its guarantee. The central bank could

¹⁰⁰ Note that if assets and liabilities were expressed in nominal terms in the financial account of the Bank of Greece and the equity at book-value, the central bank's net asset position should be exactly zero.

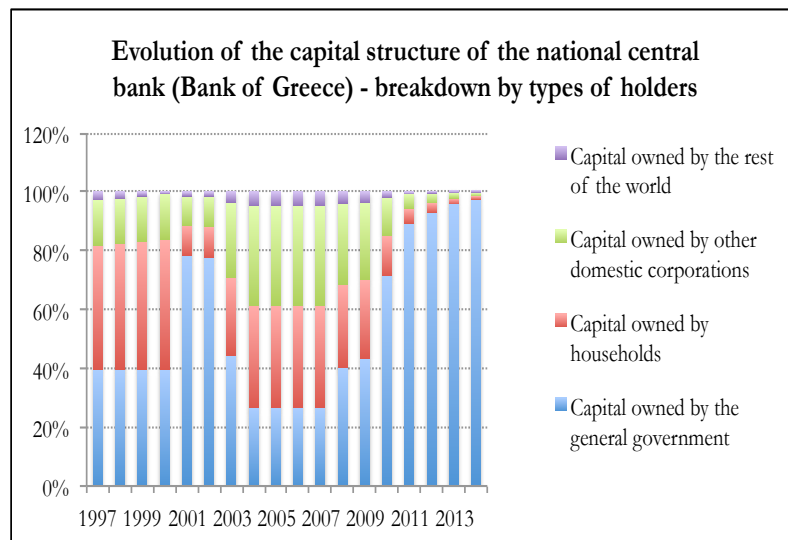
¹⁰¹ Indeed, once the crisis is over, the size of the Bank of Greece balance sheet (and in the process the size of the loans to the local banking sector and the TARGET2 liability) should be rapidly narrowing.

partially absorb the losses thanks to its provisions and the issuance of new liabilities, then operate if necessary in negative equity for a while, and wait for the government to gradually recapitalize it by giving up its annual dividend payments. All things being equal, this should generate a loss for the government in the end, but the latter could be amortized over a long period of time, and most importantly largely reduced if the central bank shoulders a share of the burden. Finally, I note that this last scenario is nonetheless unlikely within the monetary union because the European Central Bank would not let the Bank of Greece operate in negative equity and thus would force the Greek government to recapitalize it immediately.

Note related to the Bank of Greece Statute and specific rules:

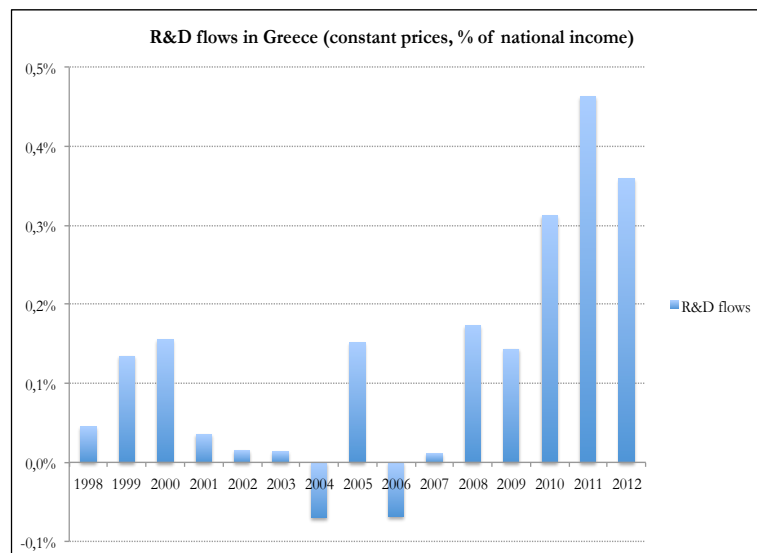
In the monetary union, the activities of the national central banks (in relation with the European Central Bank) are governed by the “Protocol on the Statute of the European System of Central Banks and of the European Central Bank” (https://www.ecb.europa.eu/ecb/legal/pdf/en_statute_2.pdf) annexed to the Treaty establishing the European Community, as well as by their respective earlier “Statute” which were amended at the time of the common currency’s adoption (see the Ninth edition of the “Statute” of the Bank of Greece: <http://www.bankofgreece.gr/BogDocumentEn/Statute.pdf>). Thus, as a legacy of the pre-Euro Area period, each national central bank within the Euro Area maintains a set of separate rules, notably in terms of capital structure, specific to its own “Statute”. More specifically, in Greece, the national central bank is a Corporation (“Société Anonyme”) with public (the government) and private shareholders. The shares of the Bank of Greece are registered and have been listed on the Athens Exchange since 12 June 1930. Its equity is only made of tradable shares¹⁰². As shown in the graph below, the Greek government is by far the largest holder of central bank’s equity (it owned 97% of the capital at the end of 2014).

¹⁰² Note that the fact that the shares of the central bank are listed is rather unusual (even if in the United States for instance, listed shares for each Federal Reserve Bank also exist and can be traded). Such shares nonetheless do not carry with them any control right or claim on profits *per se*. Most often, the equity of central banks is made of an “other equity” component owned by the general government. The valuation of this “other equity” component depends on the convention to be adopted. In theory, it should be set equal to the bank’s net assets (difference between its total assets and its liabilities excluding any equity component), so that the equity of central banks is valued at book value and attributed to the general government. As we see with Greece, this is not always the case. The Bank of Greece website (<http://www.bankofgreece.gr/Pages/en/Bank/shareholders.aspx>) specifies: “After a number of increases over the years, the capital of the Bank of Greece currently amounts to €111,243,361.60, divided into 19,864,886 shares with a par value of €5.60 each. The number of Bank of Greece shareholders is roughly 19,000”. Finally, we stress that the contribution of the Bank of Greece to the capital of the European Central Bank is recorded on the asset side of the Bank of Greece in the “other equity” category.



Appendix n°21: R&D flows in Greece (% of national income)

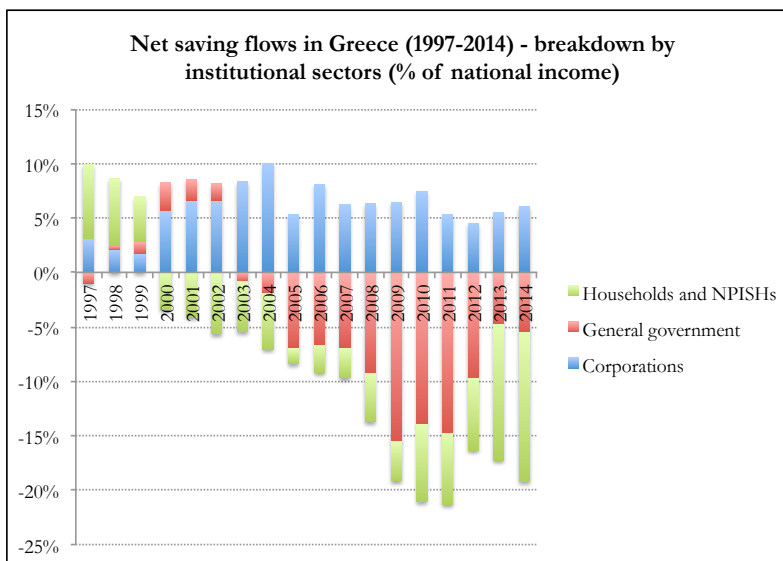
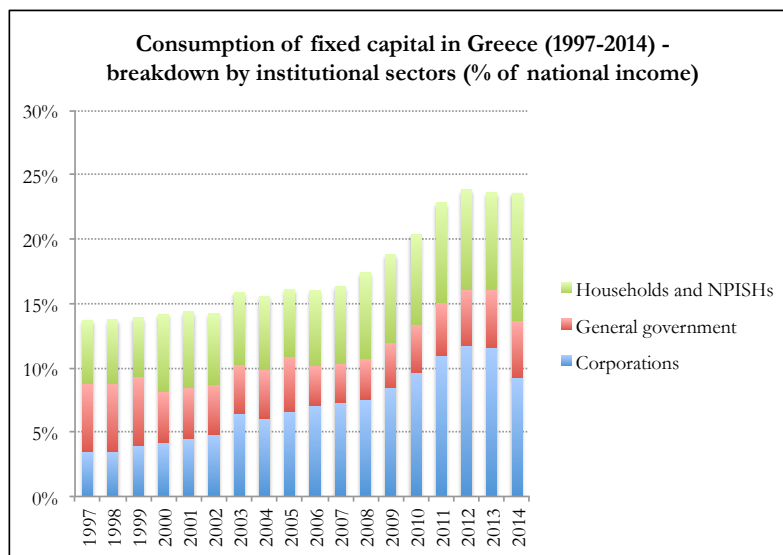
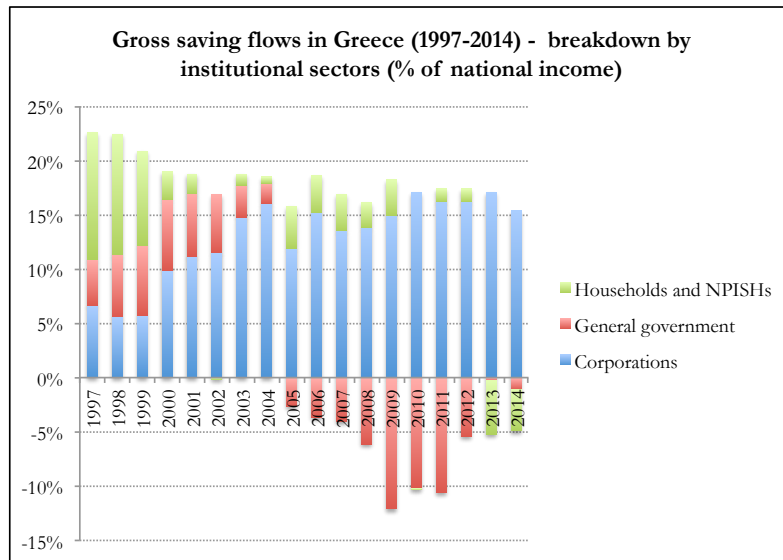
Sources: own calculations, OECD (annual national accounts)



I extrapolate data on the value of the stock of R&D (current prices) available in the OECD annual national accounts (section: balance sheet, non-financial assets) for Greece. First, the series is expressed in constant prices thanks to the national income deflator (calculated using the AMECO data). Then, I simply calculate flows as difference between stocks. As highlighted in the graph, the value of R&D flows is generally very small compared to the extent of national saving flows. Including R&D flows in the official saving flow series would not change the magnitude of real capital gains and losses.

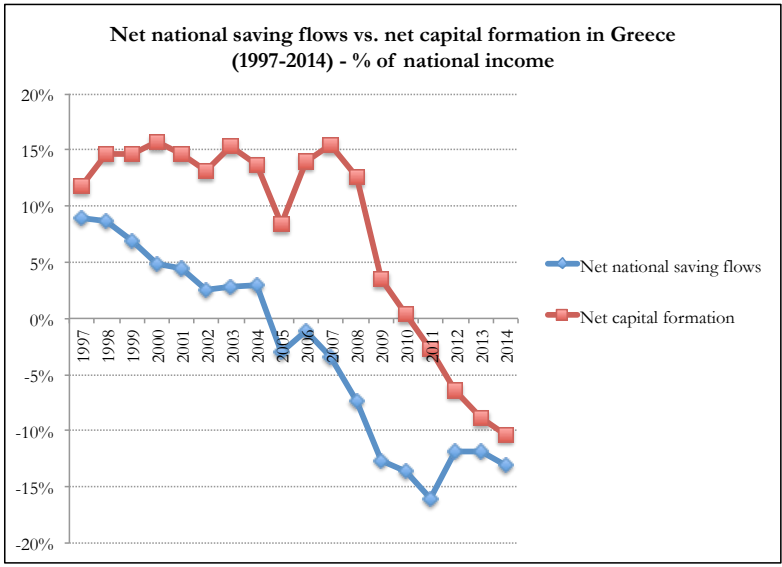
Appendix n°22: Gross and net saving flows in Greece, breakdown by institutional sectors

Source: own calculations based on AMECO (European Commission) database

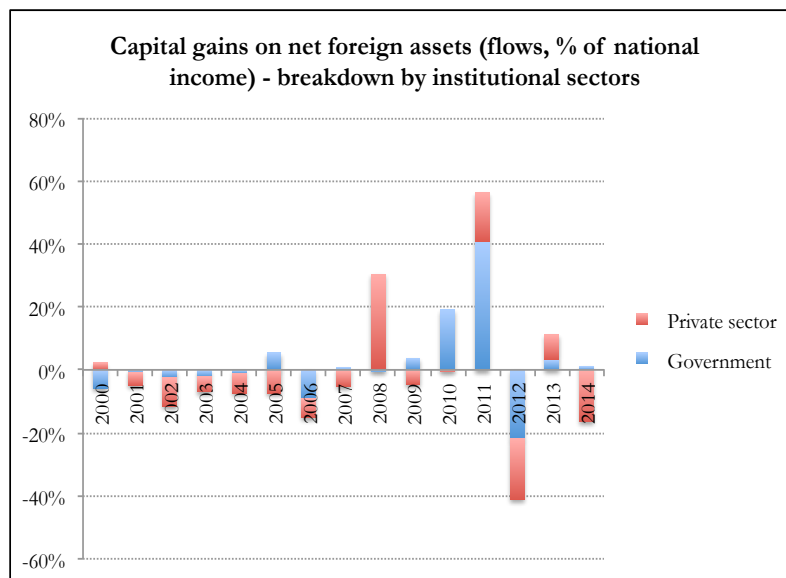
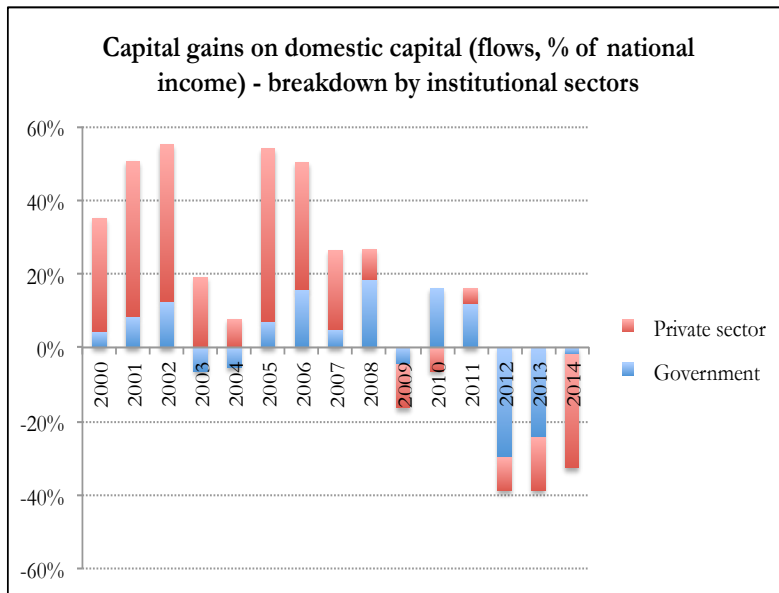


The saving flows series broken down by institutional sectors are constructed using the AMECO database (European Commission). Gross saving flows are positive except for the general government starting from 2005 and for households starting from 2013. Capital depreciation accounts for approximately 15% of national income between 1997 and 2007 but gradually increases with the crisis to reach 24% in 2012. The increase is particularly marked for corporations. Thus, given the relative distribution of fixed assets across institutional sectors (see [Appendix n°7](#)), the increase is most probably attributable to the depreciation of used machinery and equipment. The key feature of corporations' fixed capital structure compared to the government and households is indeed the large share of machinery and equipment. Taking into account capital depreciation, net saving flows are negative throughout the whole period for households, and negative for the government starting from 2003. They remain nonetheless positive for corporations over the whole period.

Appendix n°23: Net national saving vs. net capital formation in Greece (% of national income)
Source: own calculations based on AMECO (European Commission) database

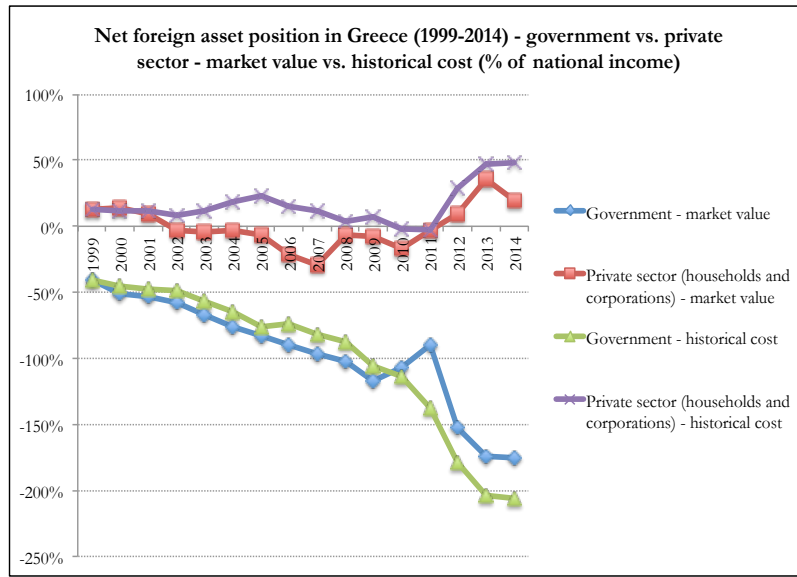


Appendix n°24: Real capital gains/losses on domestic and foreign wealth by institutional sectors (flows for each period, % of national income)
Source: own calculations



Appendix n°25: Evolution of net foreign assets in market value vs. historical cost by institutional sectors (% of national income)

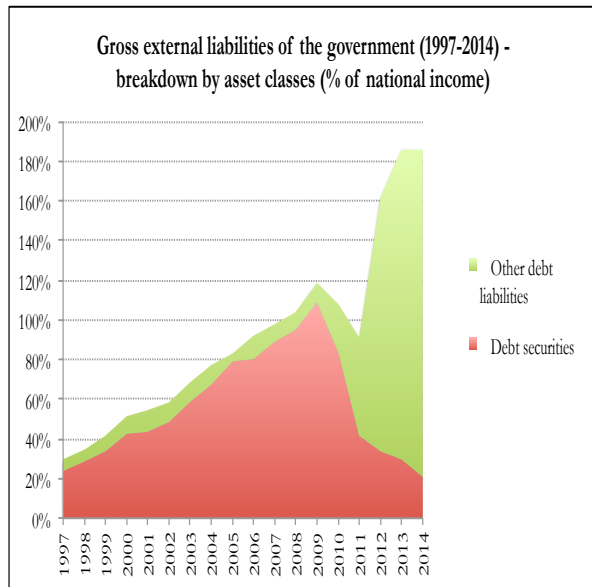
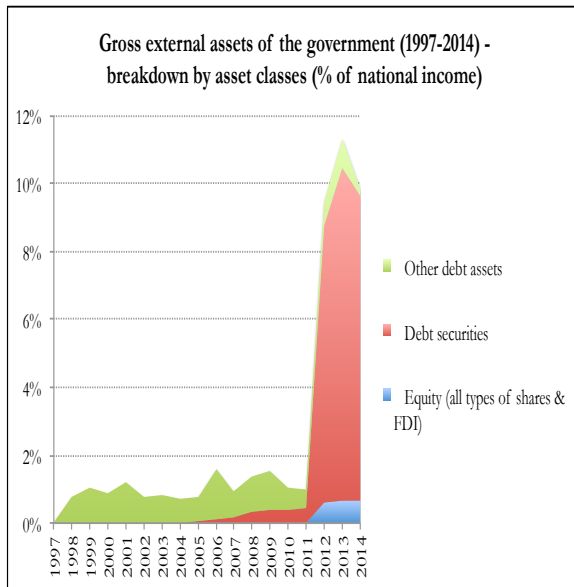
Sources: own calculations, Bank of Greece



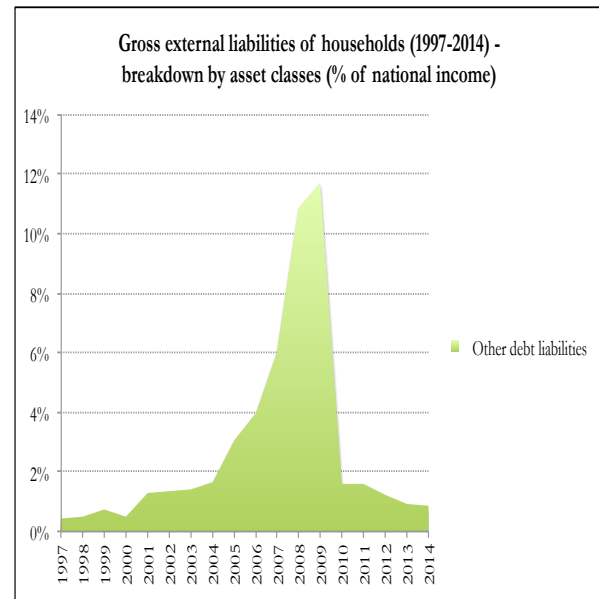
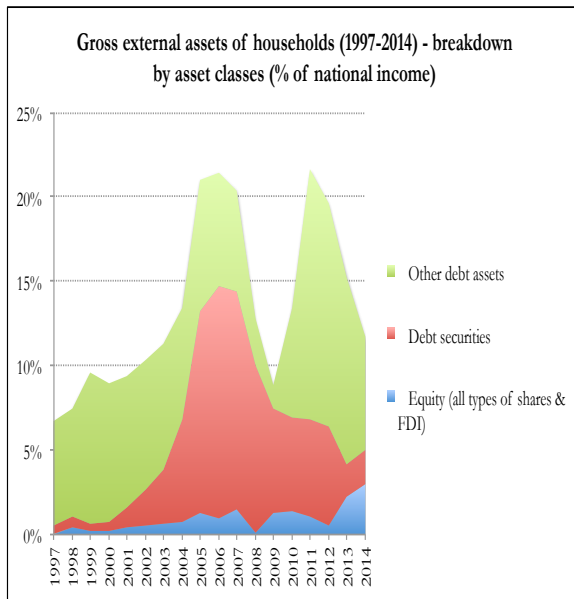
Appendix n°26: Breakdown of gross external assets and liabilities by institutional sectors and asset classes (% of national income)

Source: own calculations, Bank of Greece

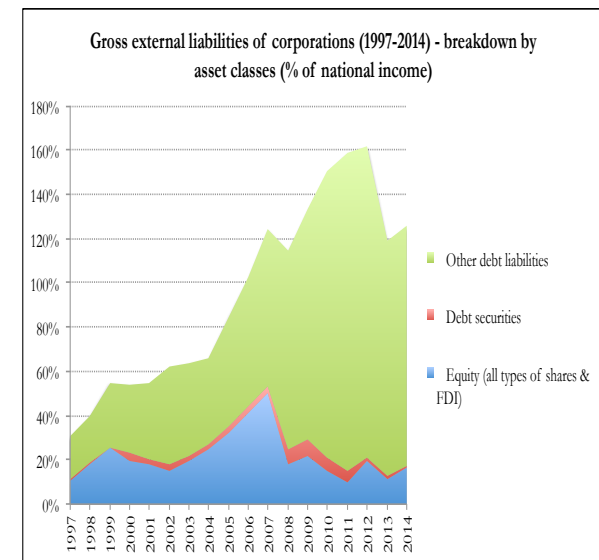
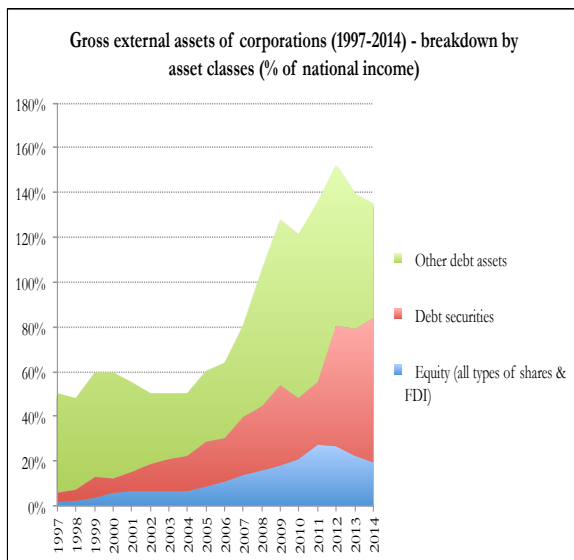
- **Government**



- **Households**

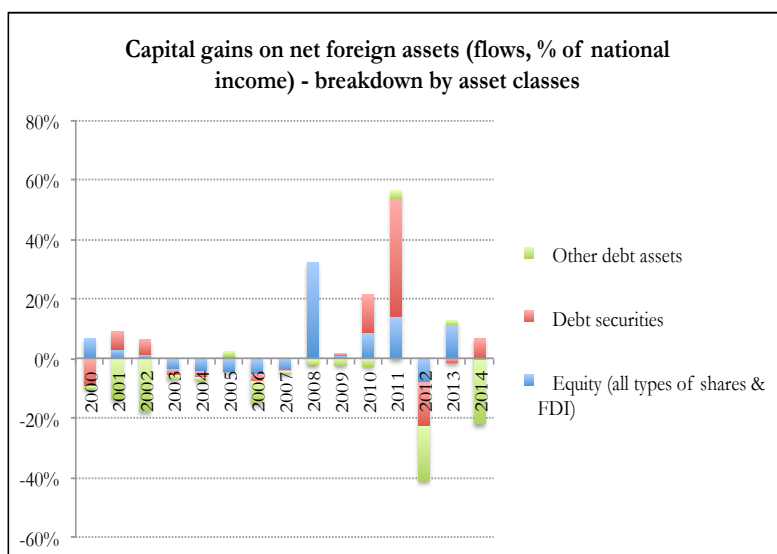
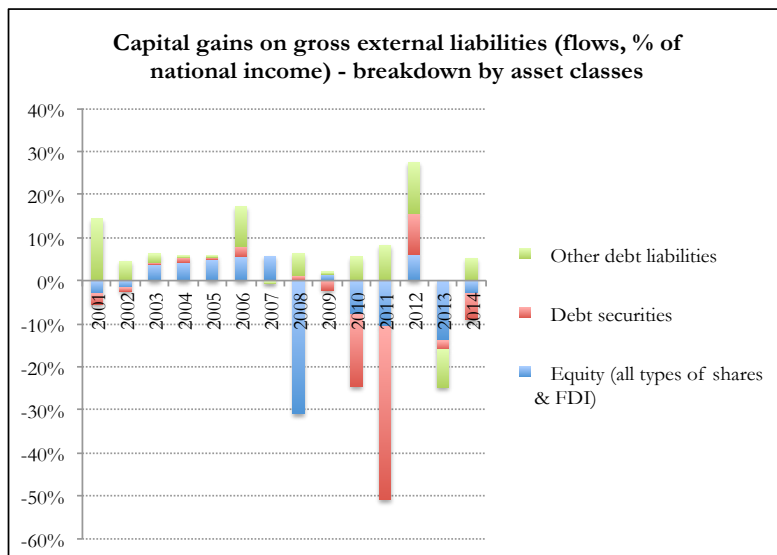
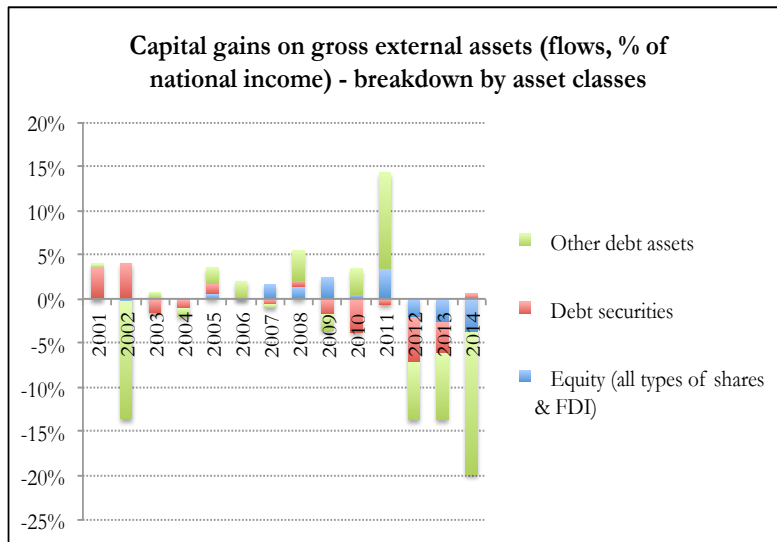


- **Corporations**



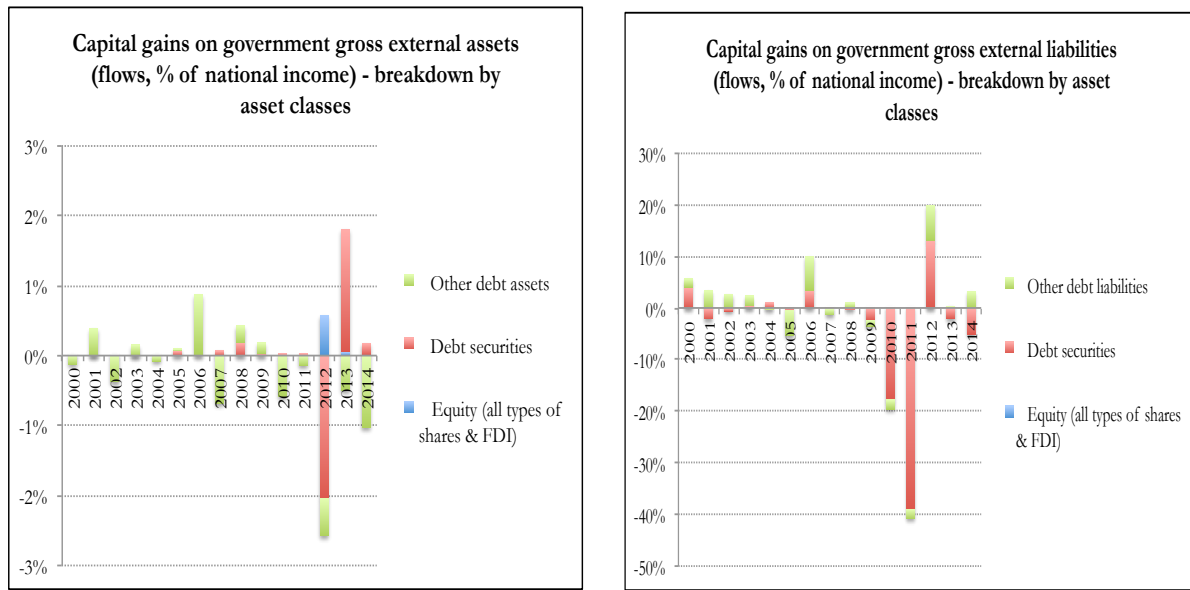
Appendix n°27: Real capital gains/losses on gross external assets/liabilities and net foreign assets at the total economy level by asset classes (flows for each period, % of national income)

Source: own calculations



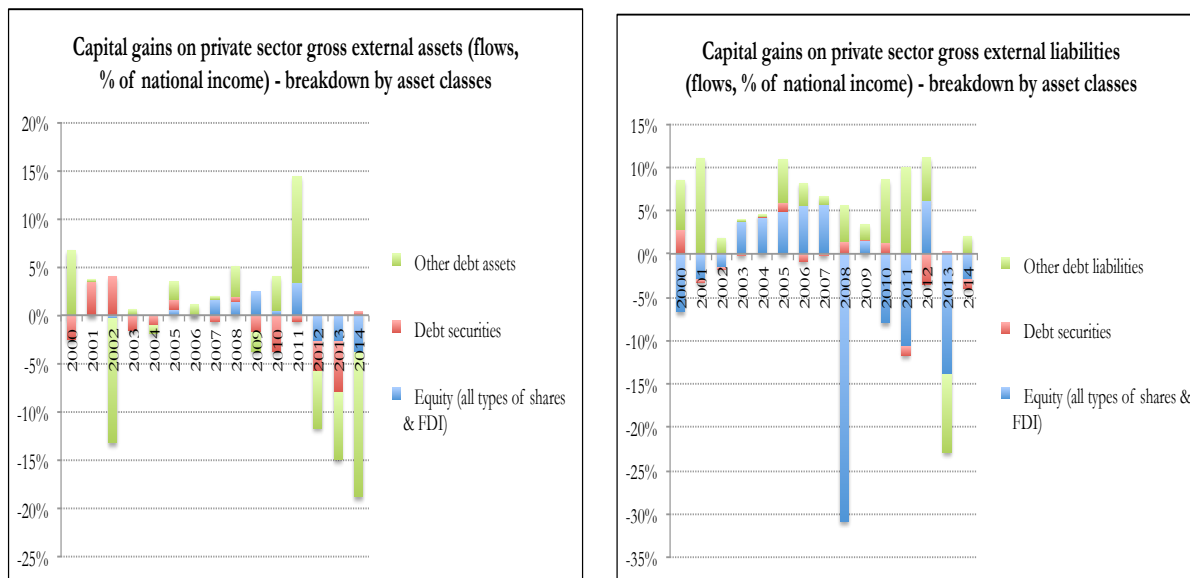
Appendix n°28: Real capital gains/losses on gross external assets and liabilities of the government by asset classes (flows for each period, % of national income)

Source: own calculations



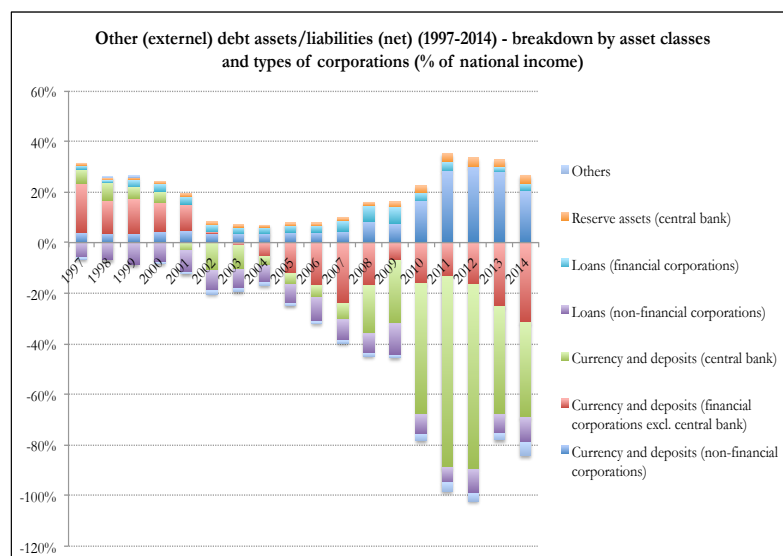
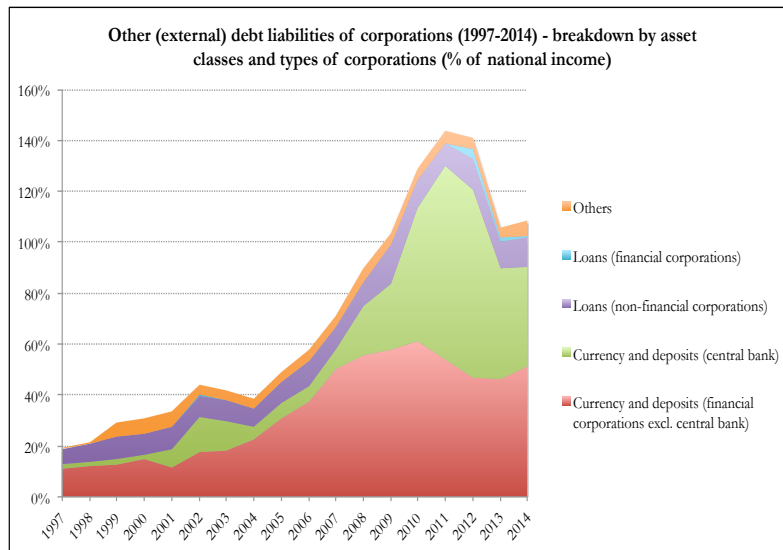
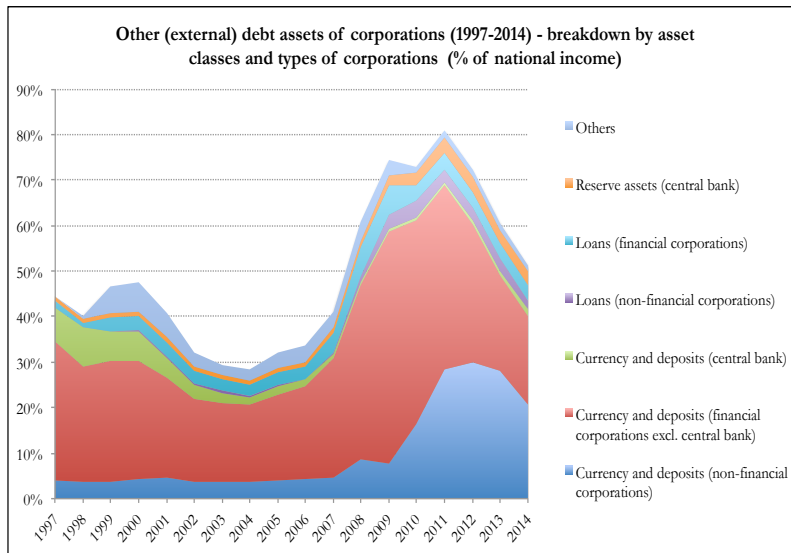
Appendix n°29: Real capital gains/losses on gross external assets and liabilities of the private sector by asset classes (flows for each period, % of national income)

Source: own calculations



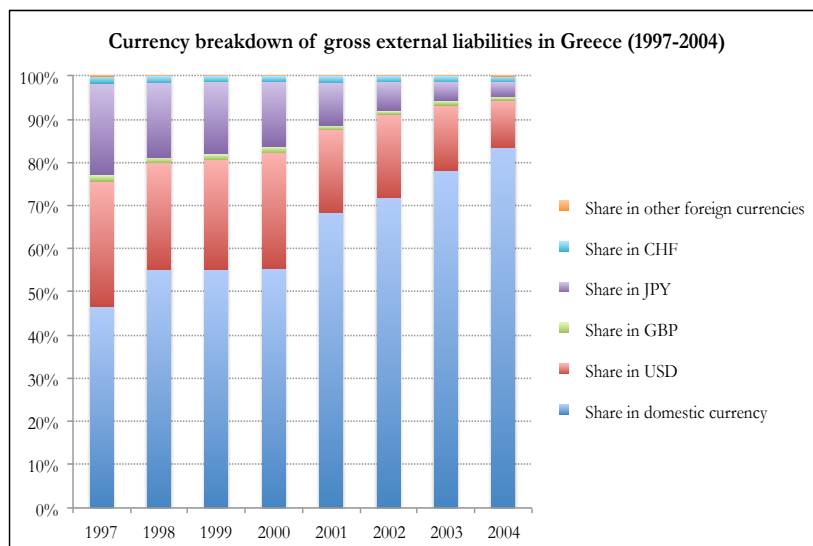
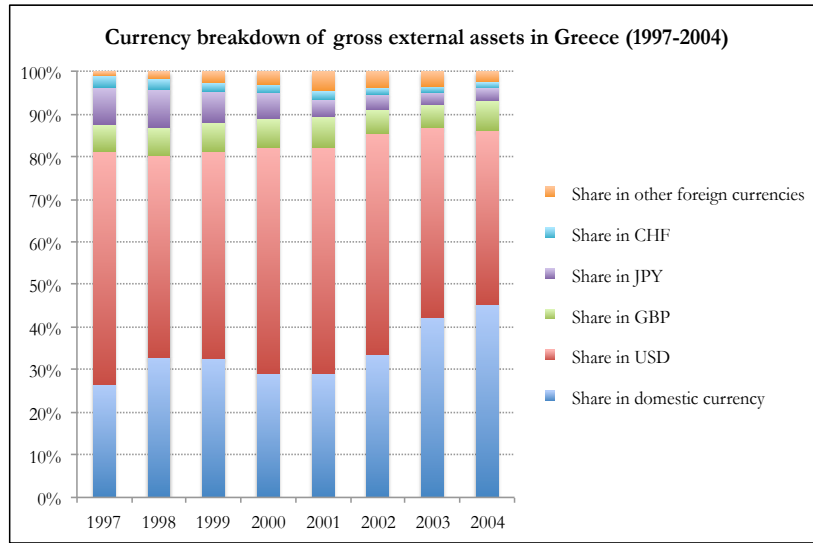
Appendix n°30: Breakdown of other debt assets and liabilities of corporations by asset classes

Source: own calculations, Bank of Greece



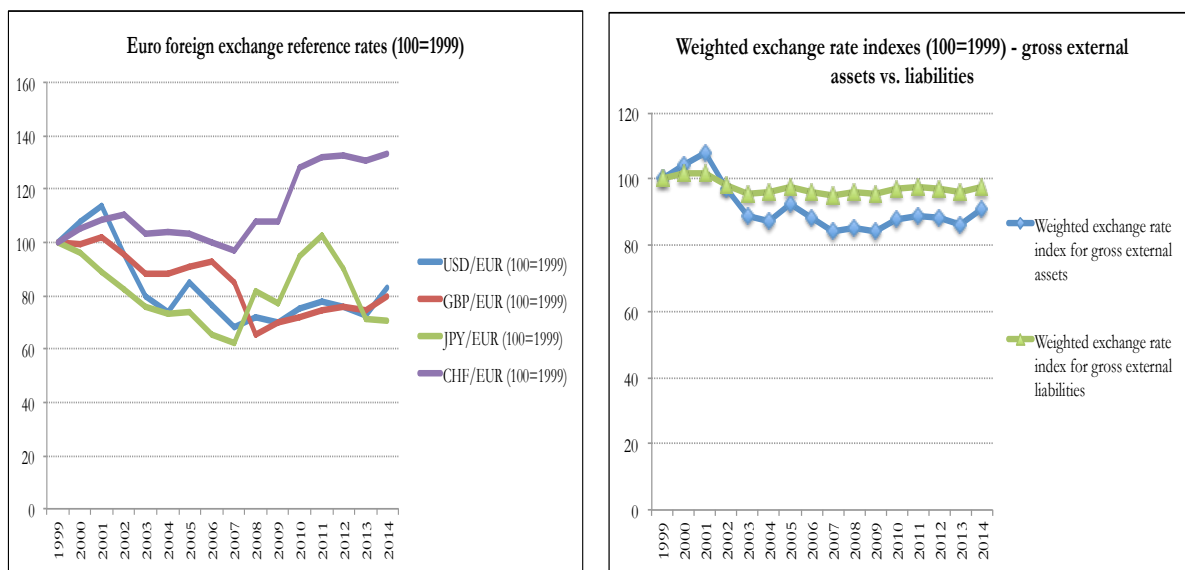
Appendix n°31: Currency breakdown of gross external assets and liabilities

Source: Lane and Shambaugh (2010)



Appendix n°32: Weighted exchange rate index for gross external assets and liabilities

Source: own calculations based on Lane and Shambaugh (2010)



Appendix n°33: Final consumption expenditure of the government (% of national income): Greece vs. EA vs. GIPS excluding Greece

Source: own calculations based AMECO (European Commission database)

