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MASTERS DISSERTATION
Master Analysis and Policy in Economics

Decomposing the Wealth in Greece, 1974 - 2012

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Résumé

This Master Thesis studies the *Evolution of National Wealth as a multiple of National Income* and the *Nature of External Wealth* in Greece, during the last four decades.

In the first part, novel estimates for the long-run evolution of the Wealth-to-Income ratio are generated based on an accumulation equation, and the evidences found suggest three distinct periods. During the period 1974-1985, the national wealth-income ratio was at a low level, around 230%, because of the real capital losses of that epoch. During the following two decades, 1986-2007, both the national and the private wealth soared whereas government's wealth shifted to negative positions; in 1986 the national and the private wealth corresponded to two years and two months of national income (220%), whereas in 2007 the national wealth reached the four years and eleven months (490%) and the private wealth the five years and five months (540%). That sharp increase was substantially influenced by positive asset price effects: 4.4% was the growth rate of wealth induced by real capital gains while the total growth of the real value of wealth was 6.7% per year. During the third period, 2008-2012, the economic recession, the fall of asset prices and the collapse of saving led to successive declines of the wealth of all the institutional sectors; in 2012 the national ratio was 400%. In general, the findings indicate that the savings determine the long-run trend of wealth (annual growth of 4%) and the capital gains approximate zero, whereas in the short run mainly the asset price effects influence the value of wealth. The general evolution is compatible with the patterns observed in other European countries, although the rise started later (in mid-80s, not in 1970) and from a relatively lower level.

In the second part of the analysis, the deterioration of the External Wealth (i.e. the Net Foreign Asset Position (NFAP)) of the country is documented; the NFAP was 2% in 1995, and -130% in the eve of the financial crisis. The dissertation shows that the continuous current account deficits cannot fully explain the declining NFAP in the period 1995-2007. The significant Valuation Losses, computed at -3% per year, worsened the NFAP further, leading to a total return of the external wealth at the level of -6% – half the trade deficits of that period. A further decomposition shows that the valuation losses emanate from both the foreign Equity and Debt liabilities. The findings about the asymmetric structure of the external wealth – the differences in the currency denomination of foreign assets and liabilities – could account for a part of the valuation losses.

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À ma famille,

pour leur soutien constant,

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Introduction

This Master Thesis studies the *evolution* and the *nature* of Aggregate Wealth in Greece during the last forty years. The motivating questions are the following. Did the value and the importance of national wealth rise during Greece's modern history? Did that rise emanate from high savings or from soaring asset prices? What characteristics are observed in the significant deterioration of the External Wealth of the country? The attempt is to empirically investigate these questions by bringing new data, producing novel estimates for the national and external wealth, and documenting their long-run evolution[1].

The dissertation is divided in two parts. Part I estimates the evolution of the National Wealth-to-Income ratio by going through a labyrinth of estimation techniques because of the inexistence of any complete estimate for the domestic wealth of any institutional sector in the Greek economy. Part II emphasises the part of the national wealth that is held to and by the rest of the world, namely the External Wealth – or "Net Foreign Asset Position" of Greece vis-à-vis the rest of the world.

Part I attempts to provide the first estimates for the aggregate wealth-income ratio in Greece, during the period 1974-2012. Why is important to know the evolution of this ratio and what does it imply? The wealth-income ratio could be seen as a broad indicator showing the magnitude of the annual value of the capital stock (physical and financial) with respect to the value of annual income generated by the economy. In other words, it indicates how many years of national income correspond to the current value of wealth. Loosely speaking, how many years an economy would be able to sustain its income level by simply liquidating all of its assets without producing anything, *ceteris paribus*. In a sense, it highlights the long-run interplay between capital and labour, and embodies both a domestic part and an external part. The domestic part incorporates numerous characteristics of the economy, such as the growth and inflation rates, the asset price movements and the realised savings. The external part is influenced by the competitiveness of the economy, as it is reflected in the current account balance, and by the asset prices and exchange rate fluctuations. This first attempt to map the evolution of the country's wealth should be interesting given the current course of economic and social events. The evidences are placed in a historical perspective, and a cross-country comparison is also pursued.

The main focus is on the "National Wealth" – the wealth held by permanent residents of the country both within Greece (domestically) but also abroad (foreign). Therefore, the term "National" refers to the property owner, i.e. the country's permanent residents. The term "Wealth" in an

[1]«La description elle seule est capable de rendre compte des aspects nouveaux de l'action... Elle détermine avec le plus de précision possible, si elle est bien conduite, les caractères et les propriétés des phénomènes observés… Elle appelle l'analyse qui décompose ou classe les phénomènes selon des articulations ou propriétés intelligibles… grâce à elle la réflexion théorique est guidée et le champ de la déduction abstraite réduit ou cerné.» Bartoli (1977) pp.363-364

aggregate level refers to the value of tangible capital, and the value of financial capital. A decomposition of National Wealth in Private (Households') and Government's is also pursued.

The Wealth-Income ratio is a state variable in macroeconomic models since the very early ones. For instance in Modiglianis' (1986) paper, and it appears as capital-income ratio, but with capital broadly defined, in Harrod (1939), Domar (1947) and Solow (1956). The evolution of the above ratio has been, recently, documented in Piketty and Zucman (2013) for four euro-area countries. One should note that for the countries included in that paper the wealth is not estimated but it is directly observed from the National Accounts of each country. Nonetheless, the paper also presents a wealth accumulation equation which, when implemented on the data, produces estimates for the above ratio close to the observed. We use a similar version of that equation in this Master Thesis. The authors show that the wealth-income ratios rose from the level of 200%-300% in the 1970s to the current level of 400%-600% for the countries of their sample. The questions we examine are the following: Is that rise observed in Greece too? If that is the case, then what forces can account for it?

Methodologically, different variables are estimated for slightly different time periods depending on the data availability and the question we pose. We, firstly, document the evolution of the variable in question and then decompose it in various dimensions in order to provide evidences for its explanation. A methodological advantage of the analysis is that it heavily relies on accounting identities that hold no matter the underlying theoretical edifice and capture the notion of path dependency. The innovative features of Part I are the research orientation, placed on the *aggregate* wealth, the application of the novel question of its *evolution* in the case of Greece, and the investigation of its forces. In general, there are data limitations in exploring directly the characteristics, the evolution and macro-distribution of wealth. The inexistence of Balance Sheets, clear ownership rights of many real estate properties and agricultural land, as well as the total housing value render very difficult the direct calculation of the national domestic wealth[2]. Nevertheless, based on accounting identities, a thorough analysis and use of existing datasets not yet employed to address such questions this thesis proceeds to provide first estimates for the national wealth that is not directly observed.

In Part II, we observe the huge deterioration of the External Wealth: 2% in 1995, -130% in 2007 and -160% in 2012. By applying various decompositions on the External Position we attempt to understand its trajectory. We investigate whether the current account deficits are the sole reason for the above decline or whether there are also significant Valuation Effects. Moreover, the analysis goes further and investigates one possible explanation of the Valuation Effects, namely the currency denomination of external assets and liabilities. The innovative features of the investigation of the

[2] Nevertheless, the calculation of the External Wealth can be achieved, i.e. the wealth of the permanent residents of the country to the rest of the world (net of liabilities), and it is the topic of the second part of this thesis.

Valuation Channel in Greece as well as the structure of its external wealth complement the study of the long-run evolution of the Aggregate Wealth of the country.

One of the main findings of the analysis is that the National Wealth indeed rose sharply in the period under investigation and reached levels comparable with the other European countries in the recent years (close to 500%). Moreover, three distinct periods in the evolution of wealth were identified. In the period 1974-1985, the national wealth-income ratio started at a relatively low level and declined because of the real capital losses of that epoch. During the period 1986-2007, both the national and the private wealth experienced a tremendous increase whereas the governmental wealth shifted to negative positions; in 1986 the value of national wealth corresponded to almost two years and two months of national income whereas in 2006 it reached the four years and eleven months. In the third period, 2008-2012, the fall of asset prices and the negative savings led to successive declines in the wealth of all the institutional sectors.

The particularities that distinguish the evolution from the one that took place in other European countries is the timing of the rise – Aggregate Wealth rose sharply only after 1986 and not from the early 1970s – and the fact that it started to rise from lower levels. Therefore, although the rise started later, it managed to "catch-up" very fast, and this is explained by the average rate of growth of wealth at 6.7% during 1986-2007. That rate of growth is well above the long-run average of 4% that is observed both in Greece and in the other European countries mentioned above. The dissertation decomposes that rate of growth and shows that 4.4% was the growth of wealth induced solely by positive asset price movements whereas the rest was induced by savings. Despite these strong asset price effects the Thesis shows that the savings determine the long-run trend of wealth while the price effects phase out – although they have a strong influence in the short-run variations. Another finding is the increase in the importance of Private Wealth and the decline of the Public Wealth to negative values – something consistent with the increase in the public borrowing since the 1980s. In the sub-period 1996-2007, the significant magnitude of the above rise could be better understood if the deterioration of external wealth is taken into account. Moreover, along the course of the analysis, we identified a striking observation that may call for future investigation: the "collapse" of the private savings during the period of the euro currency.

With respect to the deterioration of External Wealth, the thesis shows that price movements matter a lot. We found that External Wealth exhibited significant Valuation Losses (-3%) on top of the current account deficits, during 1995-2007, stemming from the foreign liabilities of the country. Moreover, by adding the valuation losses to the annual capital income paid abroad (net of receipts) we calculated an approximate return on the external position at the level of -6%. Implicitly, we treated the NFAP as a single asset and we calculated a return based on the sum of the yield (annual flow of capital income) and of the change in the value of the position with respect to its value in the previous

period. The evidences found suggest very unstable dynamics as well as a very difficult external adjustment. Finally, the thesis documented evidences in support of the idea that part of the losses may emanate from the asymmetric international balance sheet of the country (structure of the external wealth). The asymmetry implies that the external liabilities of the country are denominated in Euros whereas the external assets have a part that is denominated in other currencies. Nevertheless, it should be stated again that the data deficiencies are significant and empirical assumptions were made for that part.

In sum, this dissertation places a novel question about the evolution of aggregate wealth in Greece and attempts to investigate it based on a thorough analysis, various decompositions and the use of the most recent approaches of the literature.

Section 1, of Part I, elaborates on the way the equation for the wealth accumulation is formulated, summarises the data, and presents the main estimates of national wealth as multiple of national income. Section 2 investigates the forces of the evolution (price versus volume effects), Section 3 estimates the evolution of the private wealth, Section 4 conducts a sensitivity analysis and Section 5 concludes on the findings of Part I. In Part II, Section 6 presents the main observations for the external wealth of Greece and decomposes it in institutional sectors, whereas Section 7 quantifies the valuation effects and the total returns. Section 8 provides a first approximation to an explanation of the valuation effects and Section 9 concludes for Part II. Epilogue synthesises the findings of the Master Thesis.

Part I. National Wealth Estimates

The estimation of the evolution of the wealth-income ratio is performed via macroeconomic accounting identities and, therefore, the obtained results should hold in all the theoretical frameworks. The obtained results focus on the time-series dimension and the attempt to place them both in a historical perspective as well as in a cross-country dimension is undertaken. These estimates are based on aggregate data from the National Accounts and not from survey data.

1. Wealth Accumulation Equation

Wealth is broadly defined as any asset; either a financial asset, such as bonds, equities, derivatives, loans etc, or a non-financial (tangible) asset such as real estate property, machines, land etc. It can be seen as the Capital Stock of the economy, when capital is defined with a broad sense. The capital (from now own capital and wealth terms are used equivalently) is a stock variable that can increase either through volume increases coming from new savings, or from price changes reflecting the asset price fluctuations.

In order to generate estimates for the aggregate wealth we use an accumulation equation of past savings with the appropriate price adjustments. To that end we consider as benchmark Piketty (2010) who implements such an equation for the *private* wealth-income ratio. Given our data limitations we extend the above in certain ways which we explain along the course of the thesis. The accumulation of wealth each year is the sum of the existing wealth and the new savings, after accounting for the change in their price. Two implicit assumptions are made here, namely the price of wealth follows a composite index defined over various assets, and the savings and wealth are priced in the same way.

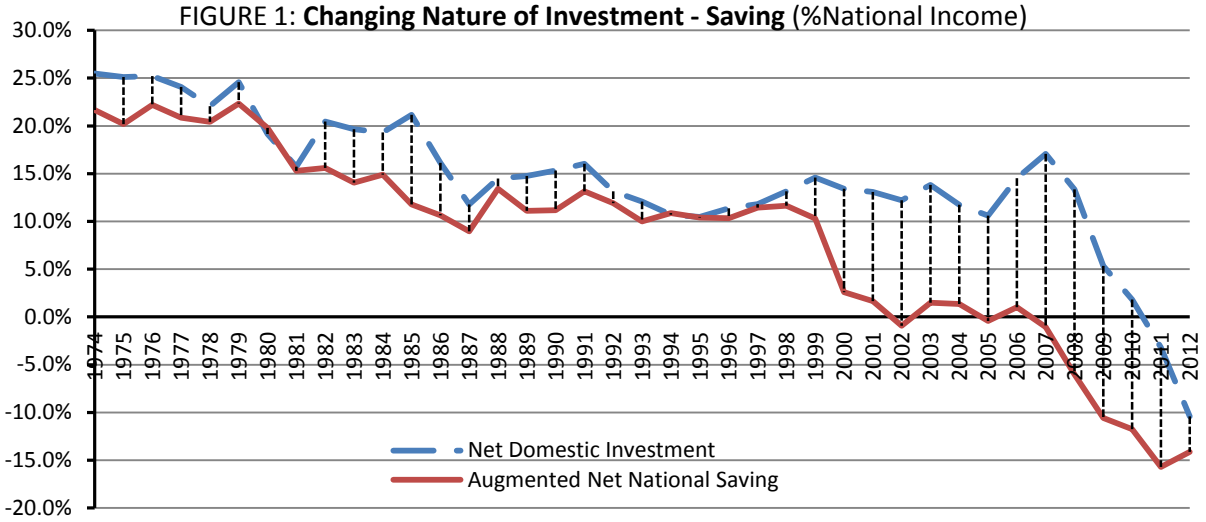
$$W_{t+1}^{n} = \frac{Q_{t+1}}{Q_t}(W_t^n + S_t^n)$$

$$S_t^n = S_t^p + S_t^g + NK_t$$

Where, National Wealth in period t+1, W_{t+1}^{n}, is equal to the sum of the national wealth and the national saving of the previous period, $W_t^n + S_t^n$, after having measured the latter in the period's t+1 units by multiplying them with the change in the asset price index $\frac{Q_{t+1}}{Q_t}$. This asset price index hypothetically reflects and weights properly all the asset prices that exist in the economy. We call S_t^n the "Augmented" National Saving, meaning the national saving, net from capital depreciation, and augmented by the Net Capital Transfers. Hence, S_t^p is the Private Saving, S_t^g is the Government Saving, and NK_t are the Net Capital Transfers, namely the Capital Receipts from the rest of the world minus the Capital Transfers to the rest of the world.

The rationale for the above is the following. Firstly, it is more appropriate to use the "Net Saving"[3] term of the National Accounts given the interest in the estimation of the *national* wealth[4]. Secondly, because we are interested in the total wealth we propose to "augment" the Net Saving with the "Net Capital Transfers". These transfers show changes in the property owner and, usually, consist of debt forgiveness and migrants' transfers. In the case of Greece, they are roughly around 1%-2% of NNI in the last thirty years, which means that they have a significant contribution in nation's wealth. The nature and the evolution of the National Saving are highly important and we refer many times to them during the analysis. To clarify it further, Net National Saving indicates the resources that the national economy has available to finance its investments by its own means after the savings going to repay the existing capital (capital depreciation) have been deducted. Therefore, if the economy has negative saving it would mean that this economy has to borrow from abroad to cover part of its capital depreciation, its investments and its consumption in excess of its income. The following graph presents the evolution of the net saving ratio and the share of Net Investments in NNI when inventories are included. The difference of the two curves is the Net Borrowing of the country, namely the part of investments that takes place in the country and is financed by foreign means (Net Investments= Net Savings plus Net Capital Transfers plus Net Borrowing). Net Investments were around 20% from 1974-1985, they fell to 15% in the period 1986-2007, and they declined further since then. Since 1999, the Net Borrowing increases systematically with respect to its past evolution.

FIGURE 1: **Changing Nature of Investment - Saving** (%National Income)



Notes: The two curves shall read in levels – their difference is the Net Borrowing from abroad.
Both Total Investment and Saving are net of Capital Depreciation; this is why in later years they are negative.
Appendix C presents the depreciation series (around 20% at that time).
Source: National Accounts and Author's computations

[3] B.8n in ESA1995; it is the sum of the saving of all sectors (Household, NPISH, Corporate, and Government)
[4] National Wealth = Private (Households and Non-Profit Institutions servicing Households) Wealth + Government's Wealth.

By dividing the equation for W_{t+1}^n with the nominal **(Net) National Income (NNI)** at time t+1, Y_{t+1}, the national wealth-income ratio, expressed as β_t^n, follows the accumulation equation:

$$\boldsymbol{\beta_{t+1}^n = \frac{(1+q_{t+1})}{(1+g_{t+1})}(\beta_t^n + s_t^n) = \frac{(1+q_{t+1})}{(1+g_{t+1})}\left(1 + {s_t^n}/{\beta_t^n}\right)\beta_t^n} \quad \textbf{(1)}$$

Where,

t=1974...2012

$\beta_t^n = W_t^n/Y_t$, the ratio of National Wealth to (Net) National Income Y_t

g_{t+1} the real growth rate of the economy above the inflation of the Consumer Price Index (CPI)

$s_t^n = S_t^n/Y_t$, the "Augmented" ratio of Net National Saving to NNI

$q_{t+1} = \frac{Q_{t+1}/Q_t}{P_{t+1}/P_t}$, the asset price inflation above the CPI inflation (P_{t+1}/P_t)

Equation **(1)** describes the evolution of the *national wealth-income ratio* β_t^n. This ratio each period depends positively on the asset price increases above the increase in the inflation (price effect) and on the national saving that occurred in the previous period (volume effect). It is decreasing with higher real growth of national income which indicates that the incomes grow fast relatively to the capital and therefore the balance between the importance of labor and capital income in the economy changes. It is an accounting equation independent of model assumptions. This equation will be used throughout Part I. To initiate it we need an initial value for 1974 (also estimated based on accounting identities) which is then plugged in the equation **(1)** along with data from the National Accounts for the other variables and, hence, estimates for the whole evolution of β_t^n are generated.

1a. Summary of Data

This Thesis uses data from the National Accounts of Greece from 1974 to today. The sources, the way in which data have been collected, any possible weakness and the missing items are described in complete details in the Appendix A. In a nutshell, we compile a complete dataset for 1974-2012 with data emanating from National Sources – the Hellenic Statistical Authority, the Bank of Greece and the Ministry of Finance – and not from the database of an international agency. These national sources have unique elements because the investigation of the long-run evolution is possible only via them, and because they enable the detailed decomposition of many variables, such as saving components and factor shares, through a long time period that otherwise could not take place. The latest official published data for each year are chosen, in order to take into account revisions that took place. All data are expressed in "current euro", i.e. in current market prices for each year, converted into euro through the fixed exchange rate that prevailed in the official date of its implementation. All in all, the data seem to exhibit continuity although a break appears in 1988, which reflected a revision that took place in 1997 in order to comply with the ESA1995 and which considered the data only

since 1988. Any possible discrepancy is reduced due to our medium to long-run perspective and use of ratios of variables.

The following table summarises the main variables for Part I. It presents the simple arithmetic averages – for real growth, inflation, housing returns and stock exchange returns it is the annual percentage geometric average. **All the figures presented in the dissertation are always net of capital depreciation.**

TABLE 1: **Summary Tables for the Main Economic Variables** (all figures are %)

Period	Real Growth of NNI	Net Investment (%NNI)	National Saving (%NNI)	Private Saving (%NNI)	Public Saving (%NNI)	Net Borrowing (%NNI)
1974-1980	1.9	23.7	21	19.9	1.1	-2.6
1981-1990	-0.2*	16.9	11.9	20.6	-8.8	-4.2
1991-2000	3.5	12.7	8.8	13.5	-4.7	-2.4
2001-2012	-1.2**	8.3	-6.6	1.7	-8.3	-12.9
Total	0.8	14.4	7.1	12.9	-5.8	-6.1

*for the break in 1988, the average rate of change between the rates of 1987 and 1989 is included
** In [2001-2008] it is +2.7%; in [2009-2012] it is -8.5%.

Period	Net Primary Incomes (%NNI)	Net Capital Transfers (%NNI)	Inflation	Return of Housing Price Index (starts in 1994)	Athens Stock Exchange Returns
1974-1980	3.6	0	17.3	–	-3.7
1981-1990	0.4	0.8	19.0	–	25.0
1991-2000	1.8	1.5	9.3	10.4	13.8
2001-2012	-1.8	2	3.2	3.1	-10.4
Total	0.7	1.2	11.1	5.5	5.1

Source: National Accounts, Bank of Greece, Athens Stock Exchange Data

1b. Starting Point: β^n_{1974}

In order to initiate the wealth accumulation equation **(1)** it is necessary to have an initial value for the wealth-income ratio in the year 1974. Such an observation does not exist and, thus, we estimated it based on accounting identities. We implemented the type "$\alpha_\kappa = r * \beta^n$", where β^n=K/Y is the capital-income ratio we want to estimate; α_κ is the national capital share to national income; r the real interest rate; K the national capital (national wealth W) [5] of the economy; and Y the National Income. That type can be proved from the following equations in which Y_k is the part of national income that comes from capital – namely interests, rents, dividends plus the net capital income from abroad. It is a pure accounting type without any model assumption.

[5] By definition the national capital equals the sum of the "Domestic" capital (operating in the territory of the Greek economy) plus the "Net Foreign Asset Position", i.e. how much of this capital belongs to Greece and how much of the capital of the rest of the world is an ownership of the country's citizens.

Proof:

National Capital Share: $\alpha_{\kappa} = \frac{Y_k}{Y}$ (2)

National Capital Income: $Y_k = r * K$ (3)

National Wealth-Income Ratio: $\beta^n = \frac{W}{Y} = \frac{K}{Y}$ (4)

By multiplying by parts (2) and (3), and substituting (4), we get the type: $\boldsymbol{\alpha_{\kappa} = r * \beta^n}$ **(5)**

In the following two subsections we estimate the capital share (α_{κ}) and calibrate the interest rate (r) based on national data, and then by substituting them in the above equation we obtain an initial estimate for the wealth-income ratio (β^n) for the year 1974.

The above type means that the value of a country's capital with respect to its income, β^n, depends upon the importance of the capital in the production of yearly income, α_{κ}, and the return, r, on this capital. A high capital share in the annual national income flow implies a high value of total wealth, whereas a high return to capital is associated with a lower wealth – probably implying a low capital level. The power of this type is that it is an accounting identity that holds in any economy. On the other hand, it does not establish the direction of causable relationships among the three variables. For instance, is the wealth level that determines the return (i.e. high wealth with low returns; or scale effects: high wealth with even higher returns) or is it the opposite? Certainly the chain of causalities is longer, involving country-heterogeneous characteristics, the level of development of financial markets and the distribution of wealth but such an investigation is beyond the scope of this dissertation.

Estimating the "national" capital-income share α_{κ} in 1974

The labor and capital income shares indicate the importance of each one of these factors in the generation of the national income each year. They depict the distribution of income in a macro level between these factors of production[6]. In Appendix B, we elaborate on the various methods to estimate the factor shares[7] and we compute their long-run evolution for the period 1958-2007. Here the emphasis is on obtaining an initial value for the capital share. An initial note is that we calculate them as percentages of the national income, in other words after having deducted the capital depreciation and the payments from and to the rest of the world. By construction the income going to capital and the income going to labor must equal to National Income (less indirect taxes) and they should add up to 100%. We focus on the labor share because the main implemented estimation procedure is viable only via labor data. From the National Income Account of the National Accounts we obtain the following table. Phrases in parentheses are the exact terminology used.

[6] It remains an open debate whether factor shares remain constant in time. One of the Kaldor's *Stylized Facts* is that the shares remain indeed constant. Kaldor (1961)

[7] Gollin (2002) presents them analytically and discuss the advantages and disadvantages of each one of them.

TABLE 2: **National Income Account, 1974**

1974	In million euro
Wage Bill ("Wages and Salaries of other Sectors")	540.21
Agricultural Income	284.3
Mixed Income of Households ("Income from Property and Entrepreneurship Accruing to Household")	538.83
Operating Surplus of Corporations ("Saving of Corporations")	18.76
Government Income from Property and Entrepreneurship	40.50
Interest Payments on Public Debt	20.95
Direct Taxes on Corporations (old definition for NNI)	24.35
Sum: Net National Income (NNI)	1,419.20*

*There is a term called "statistical discrepancy" in this NA edition, actual NNI=1,426.01

In order to calculate the correct labor share we have to decompose both the mixed income and the agricultural income into a labor and a capital component because both of them come from a combination of these factors. We consider agricultural income the same way we consider the mixed income, and we group both of them *as income from self employment*, i.e. income of unincorporated firms. The estimation proceeds in the following way given the data limitations.

The way in which we compute the factor shares for the 1974 is based on the assumption that the average wage is the same in the self employment sector and the rest sectors of the economy. It is a fruitful way because it uses a lot of information. It assumes that every member that works earns the same average wage, independently of what she/he may earn from her/his capital ownership. This assumption *prima facie* seems extreme in a multi-sector developed economy, but considering Greece, an economy with 80% of its industrial production being consumption goods and between 11%-15% being low-technology capital goods during the 1950s and until the 1980s[8], it does not sound far-fetched. By observing the magnitudes in the above table one can notice that the mixed income is roughly the same with the total wages paid in the economy. The agricultural income amounts to half of them.

The method proceeds as follows: firstly the average wage in the economy is calculated by dividing the Wage Bill with the total number of employed workers. Then this average wage is multiplied with the total labor force (employers plus self-employed plus employees) to obtain the Total Labor Income in the economy. Finally, the Total Labor Income is divided by the Net-of-taxes National Income (NNP-Taxes) to obtain the labor share in the national economy. In all cases we include the interest payments of the government (as negative capital income) as well as its capital income from property and entrepreneurship. The formula is the following, in which e_L is the share of employees to the total labor force:

$$\alpha_l = \frac{\text{Wage Bill}^*(1/e_L)}{\text{NNP-Direct Taxes}}$$

[8] See Germidis and Negreponti-Delivanis (1975).

The data for the labor force are taken from the 1971 and 1981 Population Censuses. In order to have the share of employees in the year 1974 we *interpolate* in the interval 1971-1981 by assuming a linear function. The method of the postulated same average wage is notorious because it usually produces very low capital shares or even negative. The former is indeed the case for the year1974, whereas the latter occurs when the long-run evolution is studied. Here we propose two modifications that are related to the nature of Census data. The goal of these modifications is to avoid overestimating the total labor income and, thus, underestimating the capital share.

- The first, and most innocuous, is to exclude from the labor force the number of unpaid workers (employed at home or in family business) listed in the censuses. The rationale is not that we attempt to reduce at all the importance of that work but we suggest it because what this exercise tries to accomplish is to attribute the average wage to the specific number of individuals for whom it has been recorded. The new share of employees becomes 49% (it was 42% without any modification), and the labor and capital shares are estimated at 79% and 21% respectively.

- The second modification is more novel. We propose to exclude from the employees' share also the number of people under nineteen years old. The rationale is similar to the above one, and more particularly it is about very young workers that they hardly have a stable job (censuses' questionnaires are based on voluntary responses and on a loose concept of employment over the last week before the census) and they would very rarely earn the average wage of the economy. It would be fruitful to have intermediate ages within the scale ten to nineteen years old of the census data but it is not the case. Using the two modifications, the employees' share becomes 47%, whereas the labor and the capital shares are estimated at 83% and 17% respectively.

Bernanke and Gurkayank (2002) calculate the average labor share for Greece at 86% during the period 1980-1995 by assuming the same average wage. Therefore, their capital share is induced at 14%. They used an employee-labor force ratio of 52%. Therefore, we choose to keep the capital share of 17% which is relatively closer to their result[9]. In sum, in 1974 the share of the total income going to labor was roughly 83% whereas the capital appropriated the rest 17%. This implies that capital was relatively scarce and therefore we should not expect a high value of wealth-income ratio. An association with high returns given the low quantity of capital in the economy is possible. The significant self employment and agricultural sector, and the low corporate profits mainly account for this result.

[9] An alternative, more "crude", approach would be to assume the same labor share in the self employment sector and in the total economy. That share, α_l, emanates from the following equation: $\alpha_l = \frac{\text{Wage Bill} + \alpha_l(\text{Self Employment Income})}{\text{NNP-Direct Taxes}}$. This type estimates the labor share at 93.4% which seems extremely low.

Estimating the real interest rate

Estimating an interest rate for the whole economy is neither a simple task nor it can be seen as a completely precise exercise. In any case, we try to deduct the best available information from the existing data.

This dissertation estimates an interest rate based on a model[10]. Although the general orientation is to work and estimate accounting identities, in this point we have to make assumptions. Namely, we assume the economy behaves as in the standard dynastic model with infinite-horizon representative agents that maximise their lifetime utility under perfect foresight and perfect capital, labor and goods markets, with well-behaved homogeneous preferences and so on so forth. More importantly we assume Constant Elasticity of Substitution utility function (CES), and under the above assumptions the usual Euler equation is obtained. In this way we obtain a logical estimate for the interest rate, but the drawback is that its level heavily depends on the values of the parameters and the underlying assumptions of the model. We assume the standard parameters' values that are usually used in the literature.

Euler: $U'(C_t) = \frac{(1+r)}{(1+\theta)} U'(C_{t+1})$ where $U_t = \frac{{C_t}^{1-\sigma}}{1-\sigma}$, σ>1

By assuming a balanced growth path for consumption, i.e. that consumption grows in the same rate with the total growth of the economy a type for the interest rate r is determined:

$$r = (1+\theta) * (1+g)^{\sigma} - 1$$

Therefore, the interest rate is a positive function of θ, which is the rate of time preference – a high θ means that agents do not value the future as much as they value present consumption in utility terms. Typical values for θ vary in the range of 0.1%-4%. The interest rate is also a positive function of the growth rate of the economy, and the parameter σ of the utility function. This parameter shows the curvature of the utility function, i.e. how fast the marginal utility goes to 0, meaning how fast satiation is reached as the consumption levels rise. Moreover, the reciprocal 1/σ is the Inter-temporal Elasticity of Substitution which shows the responsiveness of agents to changes in the price of the future consumption relative to the present (meaning the interest rate). In other words, how much they value consumption smoothing and, thus, how much they shift consumption inter-temporally as a response to changes in the interest rate. With σ>1 it means that people prefer to annuitize their consumption and they do not respond too much in changes of the interest rate.

[10] An alternative estimate for the interest rate was attempted via a simple transformation of the Fisher rule, meaning that the interest rate equals the difference between a nominal interest rate – say the time-deposit rate – and inflation. This attempt did not go far because although the time-deposit rates for twelve months at 1974 were at 11%, the inflation that year was 26.9%. Therefore, a negative interest rate would be generated. Although such an interest rate is perfectly valuable it is not relevant to our purpose because it would generate a negative β^n which does not make much sense. Attempting to average the deposit rates over, say, a three-year period still did not work because inflation was always higher those years.

Because the above type for the interest rate is a formula for the steady state, we average the real growth rate over all the years for which we have the CPI index, namely for the years 1959-2012. In such a way, the average growth rate will capture the notion of the long run, and it is estimated at 2.8%. There is not the content that the economies reach the balanced growth path or any other assessment of the relevance of the above formula with respect to the real world. The goal is to obtain a short of structural, underlying interest rate – probably there are more elegant ways to approach an underlying interest rate but these propel well beyond the abilities of this dissertation. In sensitivity analysis it is shown that the initial wealth-income ratio resulting from the estimate of the interest rate will not matter in the long run evolution.

Using standard values for the parameters, θ=1% and σ=2, and based on the growth rate of 2.8% the obtained interest rate is 6.7%. That figure is compatible with Piketty (2010) who finds that the real interest rate for France during 1979-2009 was 6.9%, and 7.7% during 1913-2009. Here, the obtained interest rate implies a low quantity of capital. By using the preferred capital share $\alpha_\kappa = 17\%$***, the national wealth-income ratio is estimated at 2.5.***

If we had used the same σ, but a lower θ at 0.1% then the interest rate would be 5.8% and the wealth-income ratio 2.9. In case of θ=4%, the interest rate would be 9.9% and the ratio 1.7. The following table attempts to elaborate on all the cases and provide a complete picture to the reader. It also includes the estimates for the capital share $\alpha_\kappa = 21\%$. The benchmark estimate is highlighted. It appears that the parameters have a role as well. The proof of the values chosen for the parameters is well beyond the orientation of this thesis. We finally choose what is commonly used in the literature.

TABLE 3: **Estimates for the Interest Rate and the Wealth-Income Ratio in 1974**

Estimates for the initial r			Resulting wealth-income ratio: β^n=W/Y=α_κ/r	
Real Growth, **g=2.8%** (1959-2012)		**r=(1+θ)(1+g)^σ -1**	For $\boldsymbol{\alpha_\kappa = 17\%}$	For $\alpha_\kappa = 21\%$
σ=2	θ=0.1%	5.8%	2.9	3.6
	θ=1%	**6.7%**	**2.5**	3.1
	θ=4%	9.9%	1.7	2.1

Although the preferred estimate of 2.5 is clearly debatable, the whole picture seems to exhibit a stable pattern in the range of 2.0 – 3.1 (the values 1.7 and 3.6 are highly implausible given the evidence for these ratios in other European countries). In sensitivity analysis it appears that assuming any value in that range does not alter the results.

The range and the level of estimates are supportive to the preferred value. In addition, the preferred value is very close to the initial estimate obtained from the Perpetual Inventory Method (2.6) in the sensitivity analysis. Different stories can fit the choice of the high interest rate. For example, in 1974 the capital level was low and therefore the potential returns high. Moreover, given

the transition to a democracy people may have anticipated a better future, the subsequent rise of the welfare state and the state intervention in the market that could be translated into a higher interest rate. On the contrary, given the political instability the real r could be lower. The level of the interest rate cannot be deduced from this story telling but the general framework seems the following: *At 1974 the capital stock was significantly low, there was a real growth of 1.9% per annum in the following decade, and all these imply that the r might be high.*

A wealth-income ratio around 2.5 would mean that the asset value of the national economy corresponds roughly to two years and six months of national income. Just to put this number in perspective, from Piketty and Zucman (2013), the national wealth-income ratio of France was around 3.5, of Germany at 3, of Italy at 2.8 and of USA at 3.8. The obtained estimate is lower indicating a low initial capital stock, and probably reflecting the post war visions that the country should integrate the world markets with labor-intense exports, based on the theory of comparative advantage, instead of following the alternative of heavy industrialization.

1c. Composite Asset Price Index

In order to run the Wealth Accumulation Equation we need a "price" for the wealth and the savings of each year. This "price" should reflect the heterogeneity of the forms of wealth (buildings, land, equity, loans, bonds etc). Therefore, a composite asset price index that presumably reflects the portfolio of the country by attributing the proper weights to each class of assets is constructed.

There are available data for the price indexes of the following classes of assets: Stocks (Athens Stock Exchange Index - ASE), Housing (Housing Prices Index), and assets that are anchored to inflation (Consumer Price Index - CPI). It is also assumed that a class of assets (such as government debt) are held in nominal terms and therefore their price level is constant and equal to the previous-period level. In this thesis it is assumed that these asset price indexes are connected multiplicatively via the following type[11]: $Q_t = \prod_i (P_t^i)^{fi}$

Where "*i*" indicates the type of asset price index, P_t^i is the level of the *i* price index at period *t*, and fi is the weight attributed to the price index *i*. This type states that the percentage change in Q_t equals the sum of the weighted percentage change of each price index. Assuming that the weights are: 30% on the stock exchange index, 30% on the housing price index, 25% on the CPI index, and 15% on the previous-year level of the composite index, then the total yearly change in the asset price index is the following.

$$Q_{t+1}/Q_t = 30\%\left(P_{t+1}^{ASE}/P_t^{ASE}\right) + 30\%\left(P_{t+1}^{Housing}/P_t^{Housing}\right) + 25\%\left(P_{t+1}/P_t\right) + 15\%$$

[11] See also Arthur (2005).

By rearranging this generates the annual (nominal) returns "q_t" of the composite index,

$$q_t = 30\%\, \pi_{t+1}^{ASE} + 30\%\, \pi_{t+1}^{Housing} + 25\%\, \pi_{t+1}$$

Where,

$q_t = {}^{Q_{t+1}}/_{Q_t} - 1$, the percentage change of the composite asset price index

P_t^{ASE} : the Athens Stock Exchange (ASE) index, and π_{t+1}^{ASE} its yearly percentage change

$P_t^{Housing}$: the price index for the Housing prices, and $\pi_{t+1}^{Housing}$ its yearly percentage change

P_t : the Price Index of the Consumer Price Index, and π_{t+1} the inflation rate

In other words, the yearly changes in the composite asset price index are the linear weighted sum of the changes in each class of assets.

Data for the Athens Stock Exchange index and the CPI span over the whole period but the Housing prices index of the Bank of Greece starts only in 1994. Attributing the proper weights to each asset class is not easy because these weights would define the portfolio allocation of national wealth. For the period 1995-2012, we attribute 30% on Stocks, 30% on Housing, 25% on assets that are anchored to inflation and 15% on the assets of which their price is held constant. The 30% weight on Stocks is split by 25% on the ASE and by 5% on a global stock exchange index, in particular on the Morgan Stanley Capital Index MSCI World, in order to also capture the price of assets held abroad. For the period 1974-1994, in which the housing prices index is not available, its 30% is attributed entirely on the CPI. We do not use a global stock exchange index in that period because the full openness of the Capital Account took place in 1994. Therefore, for the period 1974-1994 the portfolio allocation that we assume is 30% on stocks, 55% on assets that are anchored to inflation and 15% on nominal assets of which their price is held constant.

TABLE 4: **Composite Asset Price Index for the National Wealth**

1974 - 1994	Equity	30%	On Athens Stock Exchange Index (ASE)*
	Housing	-	Unavailable. We attribute its weight (same as in 1995-2012) on CPI
	CPI-assets	55%	
	Constant Prices	15%	
1995 - 2012	Equity	30%	25% on ASE, 5% on Morgan Stanley Capital Index (MSCI World)
	Housing	30%	
	CPI-assets	25%	
	Constant Prices	15%	

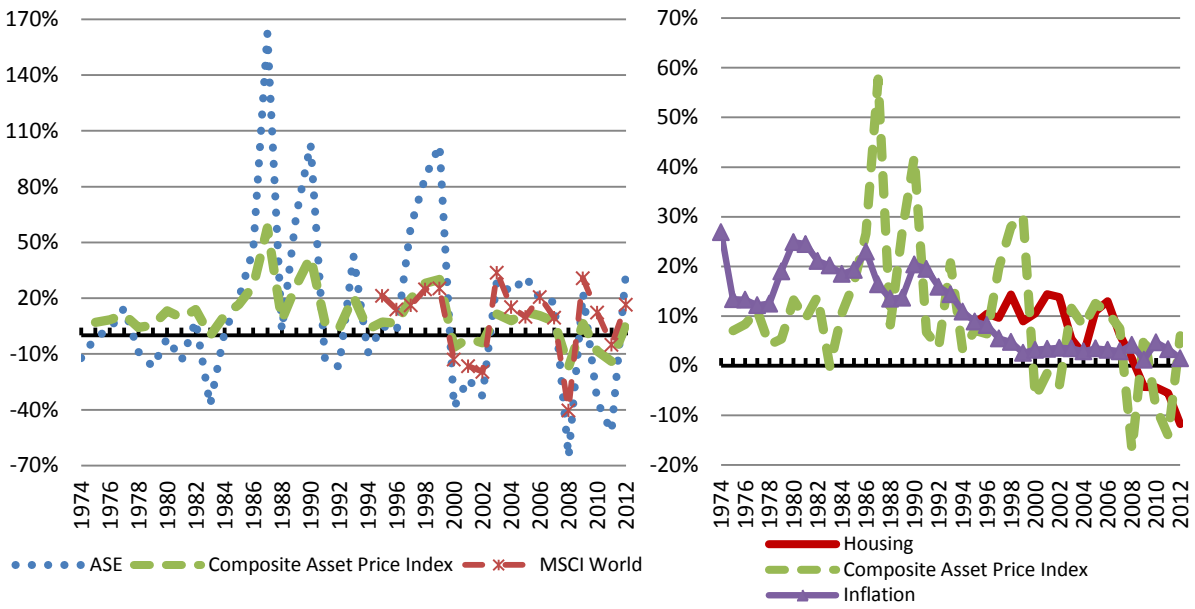
*The full openness of the Capital Account took place in 1994. Therefore, we do not use a global index for the stock exchange in that period.

Based on Piketty (2010), the suitable weights for an index for the *Private* Wealth are: 30% on stocks, 30% on housing, 20% on CPI and 20% on nominal assets. These are the weights we assume when we construct a composite asset price index for the Private Wealth, but in this section we

investigate the *National* Wealth. Therefore, we choose to attribute more weight on the CPI-assets (25%) and less on nominal assets (15%). This transformation appears appropriate because nominal assets, mainly public debt, are assets in *Private Portfolios* but because they are liabilities of the government their significance is reduced in *National Portfolios*.

Moreover, not having a housing-price index for the early period might not be a problem. In purely narrative terms, it is probable that the rise in the housing prices did not start early. Since the 1960s, there was a common practise according to which the owners of land and/or small houses could exchange their properties to a number of apartments in the building that would be constructed in that location. The building company would take the rest apartments as a compensation for the cost of construction. The demand for houses under that environment was high but more probably the supply could run at a commensurate pace given the large availability of land and, thus, prices may have not risen early. In addition, in Greece housing is considered as one of the safest assets, characterised by one of the higher European owner occupation ratio (74% in household dwellings; European Housing Finance Review 2004). The following graph depicts the annual (nominal) returns of each asset price index as well as the returns of the composite asset price index.

FIGURE 2: **Nominal Returns of Composite, ASE, MSCI, Housing, and CPI Indexes, 1974-2012**



Source: Bank of Greece, Hellenic Statistical Office

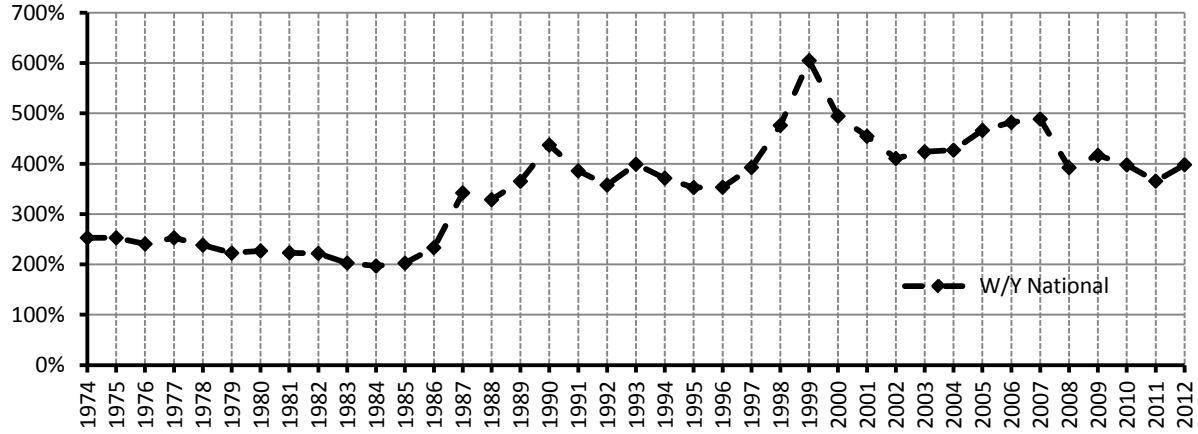
During 1974-1985, it appears that inflation was constantly higher than the returns of the composite asset price index. Therefore, the wealth of that period is expected to be influenced by a negative price effect, namely an erosion of the asset returns. For the rest of the period, the (nominal) returns of the composite index fluctuate around the inflation. This could be an indication of low real average price effects in the wealth-income evolution during the whole period. Moreover, the peaks

and the drops in the returns of the composite index follow the ones of the Athens Stock Exchange Index. The returns of the Housing Prices Index seem relatively stable at the annual level of 5.8%. In sensitivity analysis there is a thorough experimentation with various combinations for the weights of the composite index. The results are very much the same. The only difference is in case which more weight is attributed on the stock exchange index, then the peaks are higher and the drops lower, but the general picture is unchangeable.

1d. National Wealth Estimates

This part presents the main results for the evolution of National Wealth. Equation **(1)** has been initiated with the value $\beta_{1974}^{n} = 2.5$ and the above composite asset price index has been used. Therefore, the estimated evolution of the National Wealth-Income Ratio in Greece during the last four decades is the following.

FIGURE 3**: National Wealth-Income Ratio W/Y, Greece 1974-2012**



Source: Calculations based on data from National Accounts and Bank of Greece

National Wealth started at 250% times the National Income in 1974. It exhibited a decreasing trend until the mid-80s. Since then the ratio started to increase rapidly for the next twenty years, and from the level of 230% in 1986 reached the level of 490% in 2007. In the stock market boom of 1999 it even reached the level of 600%. Focusing on the euro-era, the national wealth-income ratio initially remained relatively stable around a plateau of 450% until 2007. Since the current economic recession, the ratio declined further, reaching the low level of 370% in 2011.

It appears that the national wealth-to-income ratio exhibits a horizontal S-shaped curve with three distinct periods.

- Between 1974 and 1985 the relative low initial capital in the economy, the real growth of 1.2% and the high average inflation (18.7% per year) pushed towards a decline in the ratio. The high ratio of (net) national saving (18%) was not enough to counterbalance that decline.

- In the second phase that starts in 1986 and goes up to 2007, there is a strong upward slope that drives up the wealth-income ratio. During 1986 and up to 1999 the slope is mainly influenced by two stock market booms in the late 1980s and late 1990s, the significant tame of the inflation (11.8%), the financialization of the economy especially after the full openness of the capital account in 1994, the stable national saving at 10%-11%, and the slow real growth at 1%. As we show in the next section the wealth was rising with a rate of 8.5% in that sub-period. During the first period of the euro, the national savings phased out but they were counterbalanced by the significant capital gains leading to a stabilisation of the ratio around 450% (the real wealth growth rate was 3%).

- Finally, in the third phase of the seemingly horizontal S-curve, the ratio follows a declining path. It is driven by the drop of (net) national savings (from 0.2% in 2001 to -17.2% in 2012 – more data about the national and private saving in the following section) and by the fall of the asset prices due to the economic crisis.

In sum, the ratio remained at a low level until 1986, when it soared from roughly 230% to almost 500% in 2007, and then declined again. That rise is compatible with the evidences presented in Piketty and Zucman (2013), namely the rise of wealth-income ratios from the level of 2-3 to 4-6. For example, according to their evidences the ratio in Italy, Germany and France rose from (2.9, 3.1, and 3.5) in 1974 to (5.9, 3.9, and 6.0) in 2007, respectively. Nevertheless, there are two particularities in the case of Greece. Firstly, the rise did not start in 1970 as it did in the other countries, but only in mid-80s. Secondly, the rise started approximately from the lower bound of the range of initial values of the other countries. Moreover, the substantial deterioration of external wealth, that we document in Part II, was not observed in such magnitudes in other countries and it was another factor that did not allow any higher increase in the national ratio after 1995. Generally, the emphasis should be placed on the big picture, the general evolution, and not on the specific annual levels given the uncertainty of the estimation procedure. In the sensitivity analysis conducted, there is experimentation with various different specifications and the general evolution seems robust. We discuss more analytically the intuition for the low capital level in the early years when we decompose the National Wealth to Private and Government in Section 3. That decomposition enables to shed more light and, hence, we postpone the discussion until then, whereas here we emphasised the documentation and the description of the evolution. The following section thoroughly decomposes the forces – price versus saving effects – which shaped the long-run evolution of wealth.

2. Decomposition to Price and Volume Effects

In this section we elaborate on the evolution of the aggregate wealth in Greece by providing more evidence. To that end, we decompose the total evolution of wealth to its two main components: the savings and the real capital gains. These components reflect the changes in wealth: either from the addition of new wealth via new savings (volume effect) or from changes in the price of the existing

wealth, namely the fluctuation of asset prices above inflation (price effect). They can be found from the fundamental equation (1) by rewriting it in the following way:

$$\frac{\beta_{t+1}^n}{\beta_t^n} = \frac{(1+q_{t+1}) * (1+s_t^n/\beta_t^n)}{(1+g_{t+1})}$$

By reminding that β_{t+1}^n is the ratio of aggregate wealth $W_{t+1}^n$to *nominal* incomeY_{t+1} it follows:

$$\frac{W_{t+1}/P_{t+1}}{W_t/P_t} \equiv (1+g_{wt}) = (1+q_{t+1}) * (1+s_t^n/\beta_t^n)$$

The last type shows that the growth of aggregate wealth above the inflation, g_{wt}, equals the product of a price effect and a volume effect in the RHS. The price effect is the real capital gain, q_{t+1}, stemming from the changes in the asset prices above the inflation. The volume effect comes from the new savings in the economy as a percentage of the existing wealth, s_t^n/β_t^n. In the following table we present these two effects.

TABLE 5: **Decomposition of Total Growth of Wealth**

Period	Wealth-Income Ratio β_t^n	Real Growth of Wealth g_{wt}	Real Capital Gains q_t	Savings' Effect s_t^n/β_t^n	Real Income Growth g_t
1974-1985	**2.3**	**-0.1%**	**-7.6%**	**8.0%**	**1.2%**
1986-2007 (1986-2000 ; 2001-2007)	**4.1** (3.9 ; 4.5)	**6.7%** (8.5% ; 3.0%)	**4.4%** (5.1% ; 2.8%)	**2.0%** (2.8% ; 0.1%)	**2.5%** (2.1% ; 3.2%)
2008-2012	**3.9**	**-10.8%**	**-8.6%**	**-3.0%**	**-7.0%**
Pre-Crisis Average	3.5	4.4%	0.2%	4.1%	2.0%
Total-Period Average	3.5	2.3%	-1.0%	3.2%	0.8%

Notes:
Real Capital Gains represent the Price Effect, stemming from the fluctuation of asset prices above inflation.
Savings' Effect is the Volume Effect from the addition of new wealth via the new savings.
Both of them reflect the rate of growth of wealth induced by their changes – not their percentage contribution.
Hence, their sum must be approximately equal to the real growth of wealth in the third column.
Real Growth of Wealth indicates the growth of the value of wealth – not of the wealth-income ratio.
Real Income Growth (last column) has been added for comparison purposes.
Source: National Account; Author's Calculations.

Given the current recession it makes a difference to distinguish the average effects for the periods *with* and *without* the crisis. We find that the real capital gain from asset holdings is virtually zero for the period 1974-2007 (actually it is 0.2% but given the level of uncertainty of these estimates it may not differ from zero) whereas it is reduced significantly to roughly -1.0% when the years of recession are included. It is crucial to note that both of these averages are negatively influenced by the

large capital losses of the early period 1974-1985. Therefore, it appears that the average capital gains on the long term do not differ significantly from zero, although the year-to-year variations may be extremely large – for instance the real capital gains in the years of the stock market booms can be as high as 30% while in more normal times they can be significantly positive or negative. The corollary is that mainly the savings account for the long-run evolution of wealth. The volume effect accounted for almost all the growth of the wealth (4% per year). Moreover, it is clear that the extremely low national saving in the euro era (close to zero from 2001 and negative in the recent years) has negatively affected the wealth-income ratio. In addition, the wealth growth takes always more extreme values than the income growth, i.e. higher in good times and lower in bad times, but in the long run it is positive and higher than the income growth.

The findings that in the long run the savings matter and the capital gains approximate zero, as well as that the long-run growth of wealth is around 4%, and higher than income growth, are very similar to the findings of Piketty and Zucman (2013) for other European countries. They also find a zero effect of capital gains in the long run, and the 4% growth of wealth (usually above the income growth).

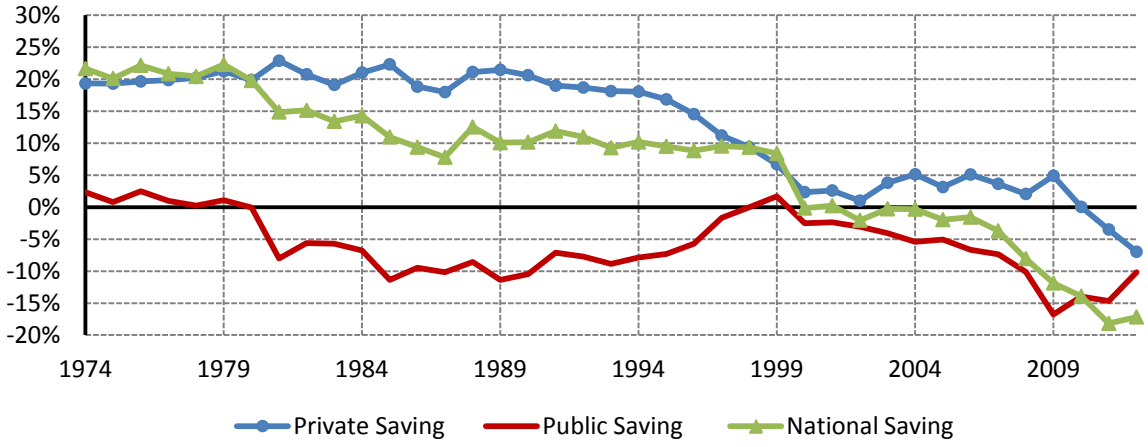
During the large increase of 1986-2007, wealth was growing with the spectacular rate of 6.7%, of which 4.4% was induced by capital gains from two stock market booms, declining inflation, and high housing prices inflation. That increase was stronger during the years of convergence to the European standards but was also sustained to a high level even in the euro era (see figures in parenthesis). If we had presented decennial averages, the average contribution of price effects would appear smaller in general but larger in the years that included the stock market booms. The contribution of savings was substantial during the convergence but zero in the euro era. During the first period of 1974-1985 the savings were pushing towards a high growth of wealth by 8.0% but they could not counterbalance the capital loss of the asset prices underperforming the inflation. During the recent years, 2008-2012, the collapse of both savings and asset prices led to a rapid decline of wealth by 10.8% per year.

In sum, ***the three distinct phases of the evolution of wealth are documented analytically*** and their explanation provided here and in the previous section seems to hold based on that decomposition. In the first phase, 1974-mid1980s, the high savings did not counterbalance the erosion of asset prices from the impact of high inflation – the negative price effect dominated. In the second phase, since the mid-80s and up to 2007, the rise of asset prices along with savings (initially, but to a less extent in the euro era) generated high growth rates of wealth – both effects were in the same direction. The subsequent recession, decline in asset prices, and zero savings led to successive falls of the ratio. ***These evidences in combination with the above paragraphs indicate that the long-run***

evolution of the value of wealth is influenced by the savings whereas the short-run fluctuations by the asset prices.

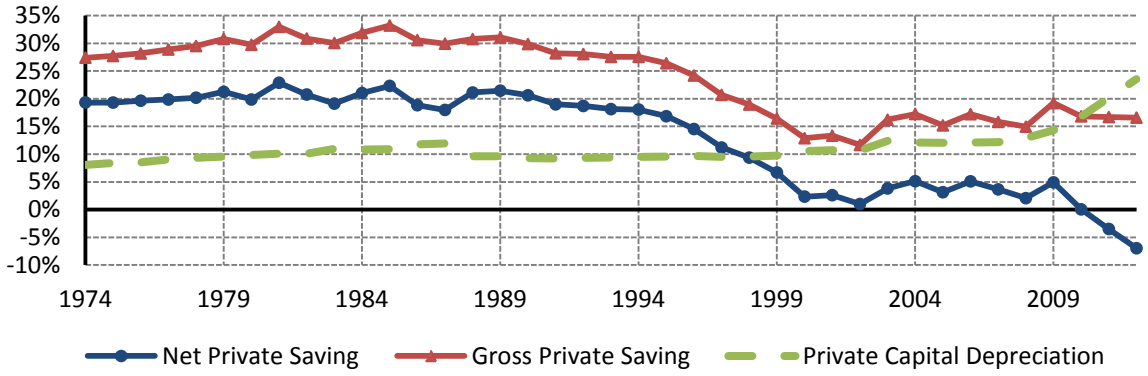
Until so far, we have treated national saving homogeneously without looking its private and public component. From the following graph it appears that the private savings were always significant at the level 18% until the euro-period. Since then, there is a striking decline to very low values until the onset of the economic recession after of which private saving turned negative. The origins of that baffling decline are left for further research. The second graph presents the gross and the net private saving to clarify the evolution further.

FIGURE 4: **National, Private, and Public Saving** (%NNP)



Source: National Accounts

FIGURE 5: **Net and Gross Private Saving, and Private Capital Depreciation** (%NNI)



Source: National Accounts

3. Private Wealth Estimates

This part documents the evolution of Private Wealth. The main motivation is that the National Wealth-Income ratio, β^n, although fruitful to draw various conclusions it does not provide the full picture. National Wealth is the sum of Private and Government Wealth. Moreover, during the studied period the government shifted to highly indebted structures with negative saving. The goal is to disentangle the Private from the National Wealth and study it separately. For the private wealth the same accumulation equation was used, but the national saving was replaced by the private (sum of personal and corporate), and a different composite asset price index was implemented. This index attributes 30% on the stock exchange indexes, 30% on the housing prices index, 20% on the CPI and 20% on the level of the index in the previous year (table below). With respect to the composite index for the national wealth (paragraph 1c.) this index attributes more weight on the assets that are held in nominal terms rather than on the CPI-assets. These assets, such as public debt, constitute a wealth component to a larger extent in the private portfolios than in the national portfolio. The starting value is estimated for the year 1997 (available data for the financial wealth by institutional sector start only in 1994), and from that year the accumulation equation has been run forwards and backwards. The following paragraphs describe the estimation procedure.

TABLE 6: **Composite Indexes for National and Private Wealth**

		National		Private
1974 - 1994	Equity	30%*		30%*
	Housing**	-		-
	CPI-assets	55%	→	50%
	Constant Prices	15%	→	20%
1995 - 2012	Equity	30%***		30%***
	Housing	30%		30%
	CPI-assets	25%	→	20%
	Constant Prices	15%	→	20%

*On Athens Stock Exchange Index (ASE)
** Unavailable in that period. We attribute its weight (same as during 1995-2012) on CPI-assets
***25% on ASE, 5% on MSCI World Index

We know that the national wealth equals the sum of the domestic fixed capital and the net financial wealth. The financial wealth is the sum of the domestic financial wealth and the external wealth which by definition is recorded as financial wealth only. We consider as institutional sectors only the Households (with the NPISH) and the Government, and for all the figures we look at their sum. We exclude the Corporations assuming that their wealth, either their domestic or external wealth, is reflected "1-1" in the balance sheet of households because data for the value of the tangible corporate assets does not exist. The following is a schematic representation:

National Wealth = Domestic Capital + Net Financial Wealth

Domestic Capital= (Households' + Government's) Domestic Capital

Net Financial Wealth= (Households' + Government's) Net financial Wealth

We have an estimate for the national wealth, 490%, in 1997 and we take the net financial wealth of households and government from the "Financial Accounts" of the Bank of Greece and, therefore, we pin down the total domestic fixed capital. From Kamps (2004)[12], we obtain the value of the Net Capital Stock of the Government at 55% times the NNI (51% times the GDP) for 1994. Kamps (2004) estimates the Capital Stock of various governments based on a capital accumulation equation (the Perpetual Inventory Method) but his estimate does not include the value of land of the Government neither the wealth of the church. A brief remark is that the absence of a cadastre for the state property renders impossible to know the exact value of the tangible assets of the government and, thus, the above figures should be considered as rough lower estimates. By subtracting the capital of the government from the domestic capital we find the households' capital at 291% times the NNI. Finally, we add that number to the net financial wealth of the households, 139%, and obtain the **private wealth-income ratio at the level of <u>430%</u>**. Schematically,

Private Wealth= Households' Capital + Households' Net Financial Position

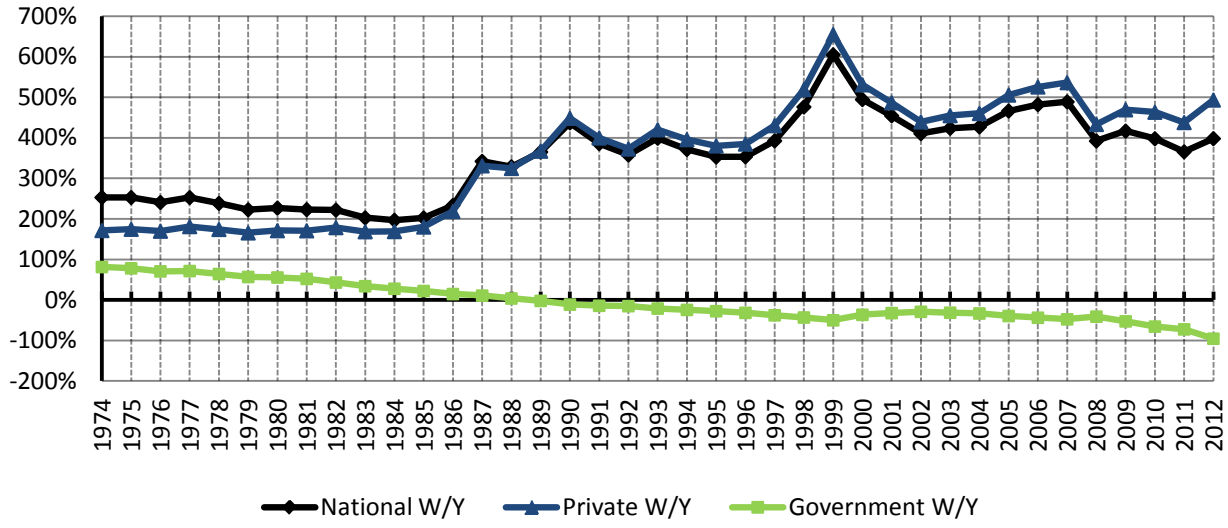
We also pin down the government wealth as the difference between the national and the private wealth. The term "Domestic Capital" that we used above should be viewed as the sum of all *tangible* assets whereas the "Net Financial Wealth" as the sum of all financial assets net of the sum of all the liabilities. The value of the Domestic Capital, 2.91 times the NNI, should reflect mainly the private housing. However, there is a rough estimate from the National Bank of Greece in the "Economic and Market Analysis" of June 2009 p.2, according to which the residential real estate value in Greece in 2009 is *"...currently valued to be in the range of 5.2 times the GDP...though this may also reflect the relatively larger size of the underground economy in Greece..."*. Had we done the same procedure for 2009 and used the estimates for the government's capital from the August 2009, IMF Country Report No. 09/245 (which is also based on Kamps (2004)), then we would obtain an estimate at the level of 3.3. Between their 5.2 and the 3.3 obtained here there is a significant unexplained discrepancy. Given that their estimate is not followed by any proof but it is simply noted, we cannot say much more about the validity of our results. In case we had used their estimate, the private ratio would exceed 700% leading to a net financial position of the government of less than 300%.

An important remark in this section is that we brought together various estimates and different datasets and tried to infer further measures from them. Therefore, the estimated figures may not reflect precisely the actual magnitudes. Nevertheless, we performed various simple tasks and procedures in order to make the data consistent logically, with each other, and to "match" other actual

[12] Data are presented for 1990 and 2000. For the year 1997, we assume a linear function between the two points.

measures. ***In any case, the results obtained here could be viewed as a lower bound above which the wealth-income ratio evolves. Put different, the simpler assumptions have been made, and the middle solutions have been chosen and, hence, the wealth-income evolution certainly is not overestimated.*** The following graph presents the findings.

FIGURE 6: **National, Private, and Government Wealth-Income Ratios, Greece 1974-2012**



Source: National Accounts, Bank of Greece, Kamps (2004) and Author's Calculations

The general evolution of the private wealth has the same characteristics with the national wealth. However, since the early 1990s the private wealth series lie above the national wealth due to the drop of public saving. In the early years between 1974 and 1985 the private wealth was stable due to the high (net) private savings around 20% counterbalancing the high inflation, whereas the national ratio was declining. In these years the public wealth was positive. During 1986-2007 the private wealth rose in parallel with the national wealth but it reached higher levels, ex. 540% in 2007. More particularly, between 1986 and 1992 the two ratios coincide and exhibit a sharp rise from 220% to 370%, influenced by the first market boom of late 1980s, the significant saving and the decline of inflation. The two ratios remained around that level until 1997. Since then and up to the beginning of the current economic downturn, the second stock market boom, the financial integration in European markets and the capital account liberalisation along with the further reduction of inflation counterbalanced the real growth and the declining private savings leading to further increases of the private ratio. After the beginning of the economic crisis the private wealth declined from the level of 540% to 440% in 2011. In 2012, the slight increase in the ratio reflects the mere fact that the denominator of the ratio has experienced a huge decline. The wealth of the government was around 80% in 1974 and then was continuously declining towards negative values. In sum, the private ratio experienced a significant rise during the last four decades reaching a level higher than 500% – a level

comparable to other European economies. For example, in 2007 the private wealth was 550% in France, 630% in Italy and 380% in Germany. Nevertheless, ***as in national ratio, the timing of the rise of private wealth was later, in mid-80s and not in 1970, and from a lower initial level***. The rise is strong given that ***the levels of other European countries were reached in a smaller time interval.***

The idea of a low initial ratio of private wealth should be expected for numerous reasons that we list below. It shall not be seen as the result of an overestimation of the government' wealth, but *it is very likely that the official data lead to some underestimation of the private wealth.*

- Two straightforward reasons are the tax evasion and the underestimation of the private external wealth. The early accounts of Greece could not capture the significant private wealth held abroad in deposits, assets from the shipping sector, and other investments in residential property etc. The tax evasion was huge and the capital controls in the flows of assets most probably had pushed further the private external wealth to belong in the black economy and, hence, our estimates do not capture them in the term "private savings". These deficiencies are endogenous in the data and they cannot be corrected. We expect the private wealth of that period to be higher than what is estimated here.

Here, we draw from the studies of Germidis and Negreponti-Delivanis (1975), Giannitsis (1985) and Christidou (1987) to present more evidence about the 1950s and the 1960s that could interpret and indicate the validity of a low initial wealth in the 1970s.

- During the 1950s and the 1960s, there was a significant difference between the investments in construction relative to the investments in the heavy industrial production – 70% of the total fixed capital investments were allocated to the construction sector. The production was highly concentrated in consumption goods which do not require technologically advanced capital of a high market value. Therefore, these two observations could be indications of a low value of tangible wealth. Moreover, the financial development of the economy was low at that time and, hence, we should not expect a high value of financial wealth either (see returns of ASE index in section 1c.).

- With regards to the private and government components of the national wealth; during the 1960s there were some large industries (chemical products, transportation material, oil) but their finance was based on foreign direct investments which were covering approximately the 80% of the total investments in these sectors – that fact could illustrate a low level of private wealth owned by the permanent residents of the country. The timing of the observed sharp decline of the wealth of the government in the above graph coincides with the increase in its borrowing from abroad. The weak industrial sector of the country was hit by the two oil shocks of the 1970s, on the same time the trade deficits were starting to augment and the net foreign investments were declining. These led to a significant borrowing of the state from abroad during the late 1970s and the 1980s in order to counterbalance those economic conditions. The general pattern of the evolution of the government's

wealth is similar and compatible to evidence for the respective pattern in Italy[13]. In addition, there are other imperfections in the estimation procedure that may influence to a certain extent the differences in the magnitudes between the ratios. For example, the composite asset price indexes that we used do not include the housing prices for the period 1974-1994.

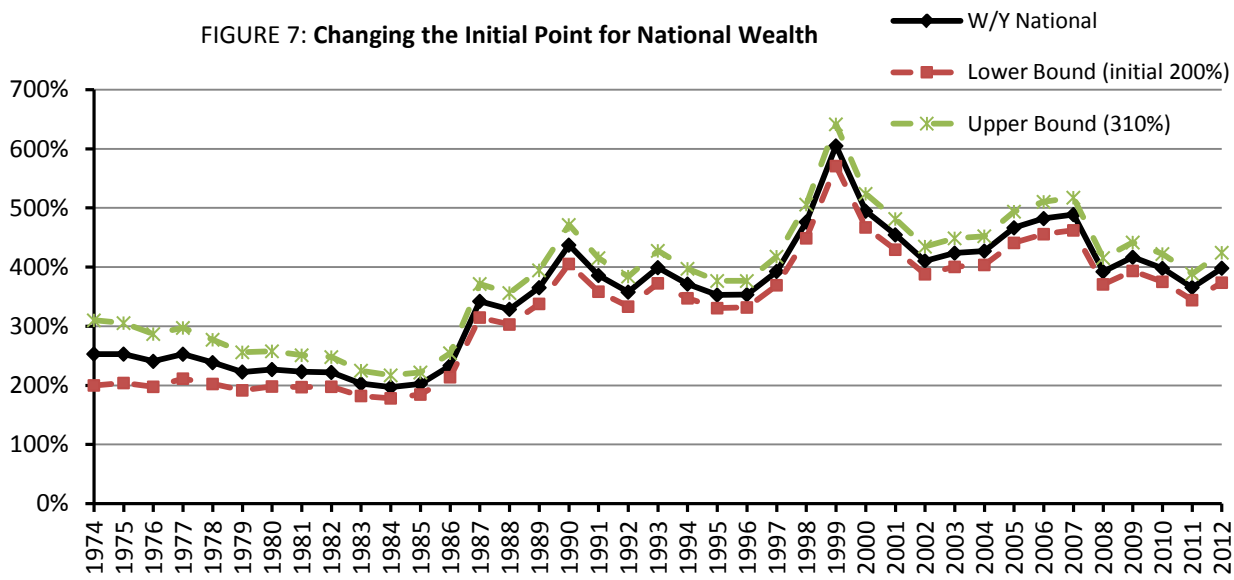
4. Sensitivity Analysis

In this part, the robustness of the results obtained via the Wealth Accumulation Equation **(1)** is tested. Four things are considered: the significance of the starting values for the national and the private wealth; the choice of the weights in the two composite asset price indexes; micro evidence; and an alternative estimation procedure. The obtained estimates seem robust to these tests.

4a. Changing the Initial Points

The estimation procedure for the initial national wealth-income ratio in 1974, conducted in section 1b, illustrated that the initial estimates lie in the range between 2.0 and 3.1. To measure the significance of the chosen value 2.5, the series for the national wealth-income ratio were reconstructed with initial values 2.0 and 3.1. Both values are relatively extreme but they are chosen to test the strength of the convergence of these series to the estimated series. The value 2.0 is viewed as the "lower bound" whereas the value 3.1 as the "upper bound". The hypothesis is that the actual series evolves within the range of the lower and upper bound and that the two bounds do not differ a lot. The graph below shows that there are no large differences among the series no matter the large range of initial values.

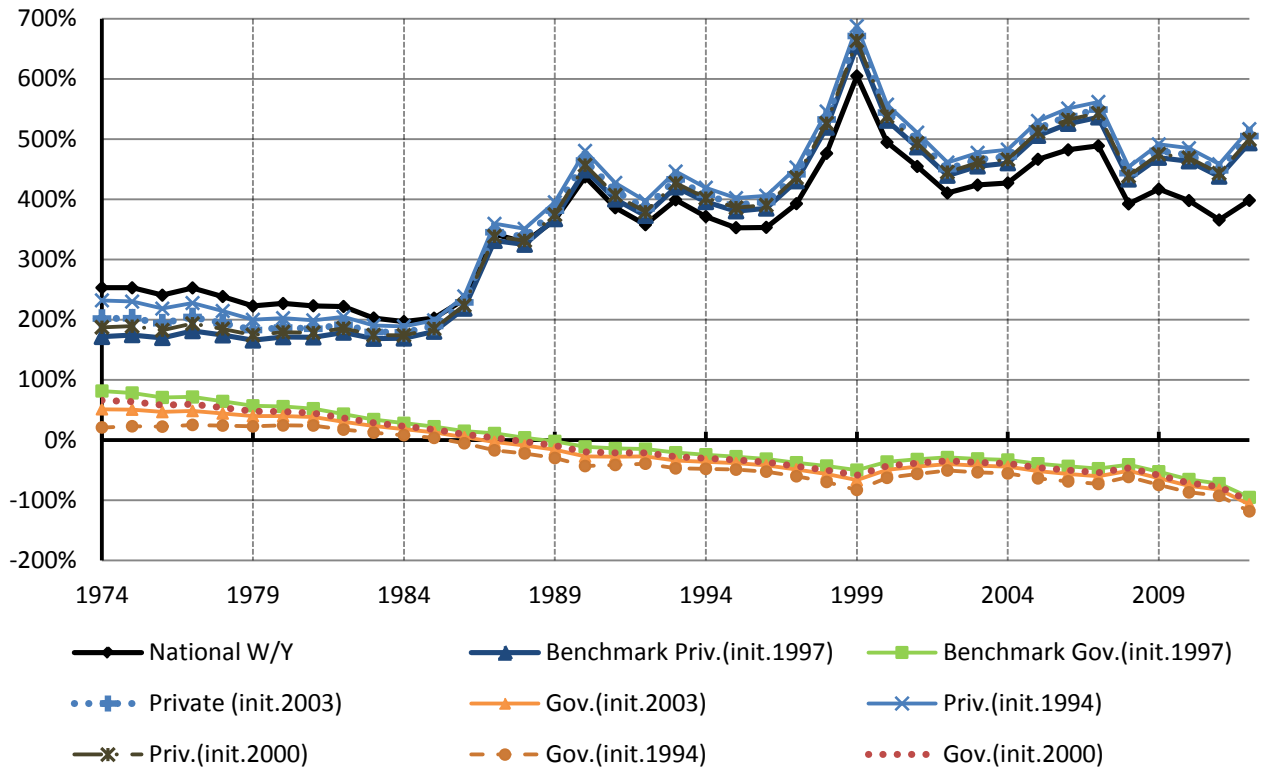
FIGURE 7: **Changing the Initial Point for National Wealth**



[13] See Piketty and Zucman (2013).

Different starting points for the private wealth were also attempted. These tests were performed by estimating the private wealth in other years than 1997 with the same procedure, described in section 3, which defines the private wealth as the difference between the estimated national wealth and a point estimate for the government's wealth given the financial position of the latter and a point estimate for its tangible wealth obtained by Kamps (2004) (by interpolating in the missing years). The financial accounts are available since 1994 and, hence, the above procedure is feasible only since then. The pattern of the evolution seems rigorous to these changes, although some differences in the early years of the evolution are observed. Such differences are usually observed when accumulation equations are run backwards in time.

FIGURE 8: **Different Starting Points for Private Wealth-Income ratio**



4b. Changing the weights in the Composite Asset Price Indexes

One key element that affects the path of the wealth-income ratios is the composite asset price index. It might be the case that the weights allocated to each separate asset price index are not the proper ones leading to misleading results. Generally, various puzzles exist around portfolio allocations and macroeconomics. Nevertheless, the following analysis explores various patterns for the weights of the composite indexes firstly for the national wealth and, secondly, for the private wealth.

The asset price index for the national wealth allocates 30% on the Athens Stock Exchange (ASE) index, 55% on CPI, and 15% on the level of the composite index in the previous period during the years 1974-1994, whereas during 1995-2012 the weights are 25% on ASE, 5% on MSCI, 30% on housing, 25% on CPI and 15% on the previous-year level. The following table groups all the different indexes used and the following graph depicts the emanating evolution of the national wealth-income ratio. When more weight is allocated on the stock market indexes rather than on inflation (index Q.1) or on housing (index Q.2) the evolution of the national ratio exhibits more sharp fluctuations. In early years it lies below the preferred series but in later years it lies above them. Moreover, the use of a 10% weight on the foreigh stock market index does not seem to greatly influence the evolution. The pattern is the opposite when more weight is attributed on inflation (index Q.3); the wealth is higher in the first decade because of the lower erosion of asset values when these are anchored to inflation, but in later years that specification produces lower estimates because it misses the rise of the significance of the ASE. When the national portfolio allocation coincides with the private by attributing more weight on the nominal assets (index Q.4) then in general the series lie below the preferred ones. When only domestic prices are used, the evolution almost coincides with the preferred one. In general, the pattern of the evolution and the three distinct periods, identified in section 2, remain the same under the different specifications but there are some differences in the levels, however they are of a small magnitude. Moreover, the preferred series exhibit a more smooth transition. Given that we are interested in the long-run evolution and not in the short-run variations we keep our benchmark series.

TABLE 7: **Various Composite Asset Price Indexes for National Wealth**

		Benchmark	Q.1	Q.2	Q.3	Q.4	Q.5
1974 - 1994	Equity	**30%**	40%	40%	25%	30%	30%
	Housing	**-**	-	-	-	-	-
	CPI-assets	**55%**	45%	45%	60%	50%	55%
	Constant Prices	**15%**	15%	15%	15%	20%	15%
1995 - 2012	Equity (ASE, MSCI)	**25%, 5%**	30%, 10%	30%, 10%	20%, 5%	25%, 5%	30%, 0%
	Housing	**30%**	30%	20%	30%	30%	30%
	CPI-assets	**25%**	15%	25%	30%	20%	25%
	Constant Prices	**15%**	15%	15%	15%	20%	15%
Notes			More weight on Stocks rather than on CPI	More weight on Stocks rather than on Housing	Small ASE – More CPI-assets	More weight on Nominal Assets – same index for private wealth	Benchmark weights – only domestic indexes

FIGURE 9: **National Wealth-Income Ratio W/Y, Different Composite Indexes** (Q.1,Q.2,Q.3)

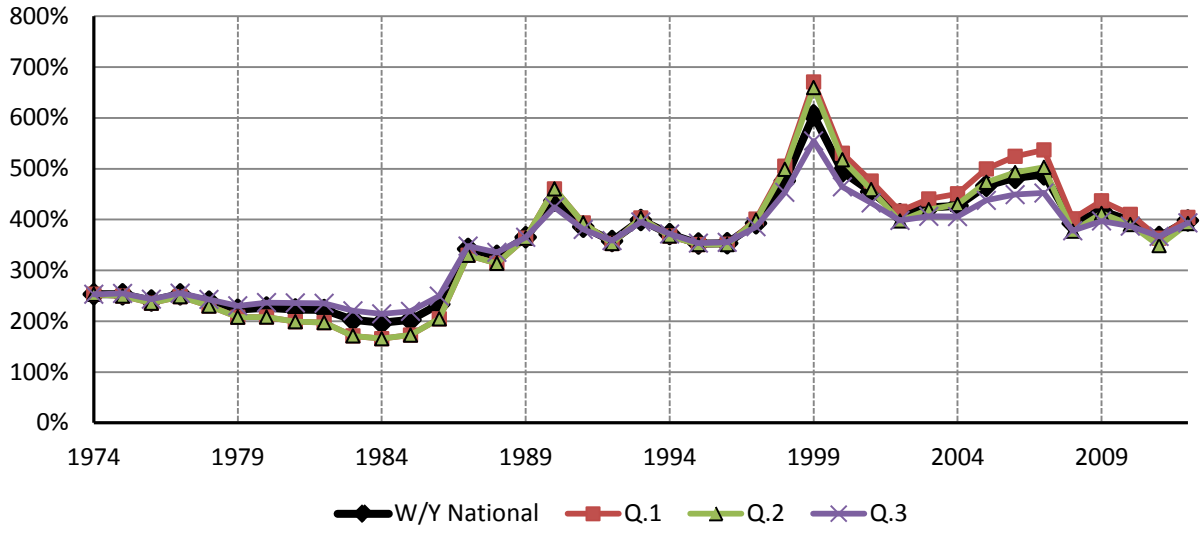
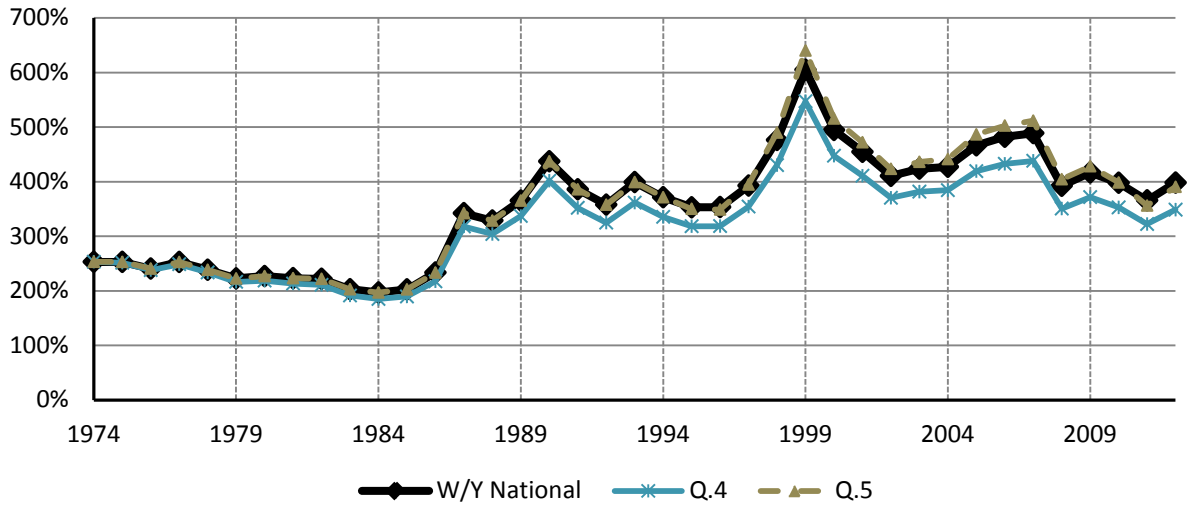


FIGURE 10: **National Wealth-Income Ratio W/Y, Different Composite Indexes** (Q.4, Q.5)



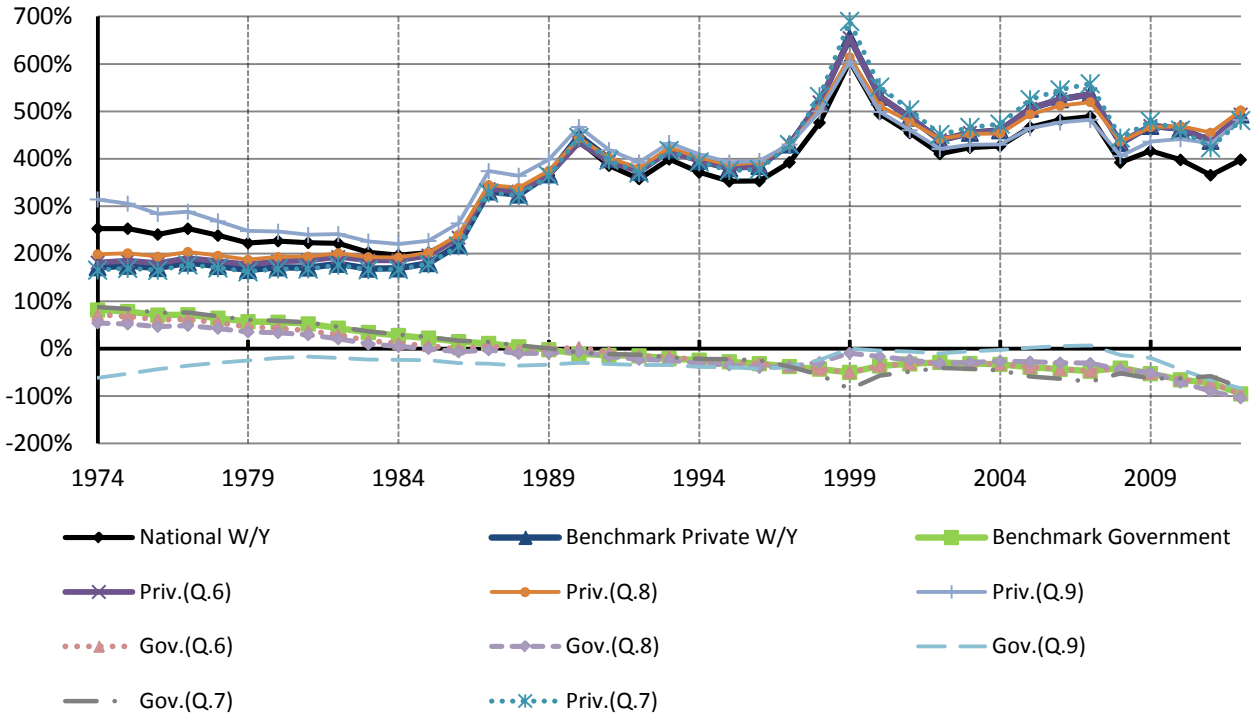
Here we turn to the composite index for the private wealth. The following table presents the different specifications in the weights and the graph reveals the results. The graph shows that the specifications for the indexes Q.6, Q.7 and Q.8 produce estimates almost identical with the preferred series. This means that attributing slightly less weight on the ASE (Q.6), or using only domestic prices (Q.7), or even allocating more weight on the housing prices (Q.8) the resulting differences in the levels of the ratio are quite small. The final index Q.9 makes the simplest assumption of equal weights among all the asset classes. The resulting private ratio is fairly close to the preferred series since the mid-80s but it lies above them in the earlier years. Similarly, the evolution of the wealth of the government is close to the benchmark since the mid-80s but it lies below it in the first decade. That

negative asset position of the government seems far-fetched, but this index implies that there is convergence to the estimated series even if the very early levels of wealth take some extreme values.

TABLE 8: Various Composite Asset Price Indexes for Private Wealth

		Benchmark	Q.6	Q.7	Q.8	Q.9
1974 - 1994	Equity	**30%**	25%	30%	25%	25%
	Housing	-	-	-	-	-
	CPI-assets	**50%**	55%	50%	55%	50%
	Constant Prices	**20%**	20%	20%	20%	25%
1995 - 2012	Equity (ASE, MSCI)	**25%, 5%**	25%, 5%	30%, 0%	20%, 5%	20%, 5%
	Housing	**30%**	30%	30%	35%	25%
	CPI-assets	**20%**	20%	20%	20%	25%
	Constant Prices	**20%**	20%	20%	20%	25%
Notes			Changing Impact of Stock Exchange Between the two periods	Only domestic Stock Exchange (no global index)	More Weight on Housing Prices Index	Equal Allocation of Weights

FIGURE 11: **Private and Government Wealth-Income Ratios, Different Composite Indexes**



Finally, a different specification for the Wealth Accumulation Equation (1) is tested. The question is whether savings are priced in period t or in period t+1. Equation (1) assumes that all savings become assets from the beginning of period t and therefore the asset inflation between t and t+1 applies to them too. If the savings, collected in period t, become assets at the end of that period

they should be priced at next period's prices and therefore the equation should be: $W_{t+1} = \frac{Q_{t+1}}{Q_t} W_t + S_t$. Neither of the two specifications is completely accurate given that the savings occur *during* the year. This alternative leads to an accumulation equation similar to (1) [14]. It has been tested and the results are identical.

4c. Micro-evidence

The estimates in the aggregate level can be qualitatively compared with micro-level evidence from household surveys that compute the private wealth-income ratio too. The recently conducted European household survey "SHARE" which considers individuals solely above 50 years old in 11 countries, finds that the wealth-income ratio of the median household of Greece in its sample is around 7[15]. That estimate seems consistent with the level obtained from our calculation based on the Wealth Accumulation Equation and macro data in the same year (4.6 in 2004). That difference should be expected and it stems from the fact that SHARE considers only the people above 50 years old who exhibit higher wealth profiles as it is normally the case.

4d. Perpetual Inventory Method

This part implements a different estimation procedure for the National Wealth, attempting to test whether the results obtained in the previous sections are similar to the ones obtained below. That procedure is the Perpetual Inventory Method (PIM) which estimates the *domestic* capital stock of an economy. Nevertheless, we are interested in the *national capital* and, hence, we correct the estimates with the capital that belongs to country's citizens but it is held abroad (national wealth equals the sum of domestic capital plus the net foreign asset position). That procedure is not completely equivalent to the wealth accumulation equation (1) implemented above for various reasons, which we briefly list below, but we investigate whether the general picture is consistent.

According to PIM the capital level of an economy is defined by the accumulation of past investments. The basic idea is that the value of capital in each period is the sum of the value of capital that remained from the previous period (net of depreciation) plus the new realised investments in this period. It has the following form:

$$K_t = K_{t-1} + I_t - dK_t$$

Where, K_t is the value of the *domestic* capital stock of the economy at time t; dK_t the capital depreciation that takes place in time t; and I_t the investments in time t.

In order to compute the current value of the past capital stock one should either compute it in constant prices or update past to current values each time. We chose to follow a simple update of past

[14] See Piketty (2010), Appendix A.
[15] See Christelis et al. (2006)

("historical") values according to the CPI index, where P_t is the value of the price level at time t. Therefore, the equation we estimate is the following:

$$K_t = \left(\frac{P_t}{P_{t-1}}\right) K_{t-1} + I_t - dK_t$$

By dividing with the National Income, Y_t, and by defining as g_{yt} the nominal growth, and by small letters the ratio of the above variables with respect to National Income we obtain:

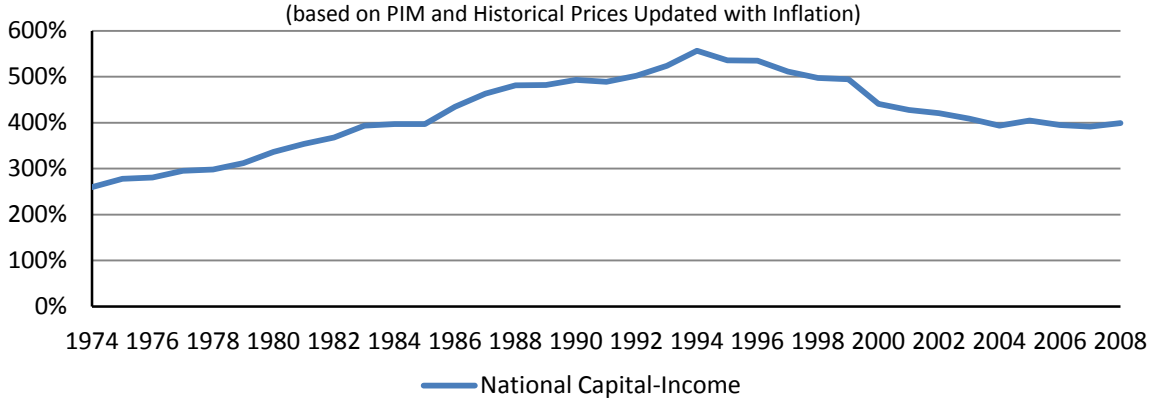
$$k_t = \left(\frac{P_t}{P_{t-1}}\right) \frac{k_{t-1}}{(1 + g_{yt})} + i_t - dk_t$$

We run that equation, using data from National Accounts, and we deduct the Net Foreign Asset Position from the estimate of each year; from 1974 until 1994 the NFAP of the country[16] but later[17], given data availability, only the NFAP of the government and the households assuming that the wealth of corporations is reflected "one-to-one" in the households' balance sheets. The next step is how to initialise the PIM. In the literature there is no consensus on that, but there is a consensus that the initial point does not have an effect on the long-run evolution of the capital stock. The European Central Bank (Monthly Bulletin, May 2006 p.45) initialise it by assuming the same capital-output ratio for the countries that do not have such data with the countries that do provide such data. The other way, more common in economic papers, is to use the type for steady state growth from Solow model: K=I/(g+δ). Where K is the estimated initial capital, I the investments of that year, δ the depreciation rate always assumed at 6%, and g the real growth rate of investments. On the calibration of g there are different approaches. For example Caselli (2004) uses the average real growth rate of Investment for a time horizon of twenty years from 1950, whereas Gourinchas and Jeanne (2007) use the average of a ten-year period. Both of these papers use data from the Penn World Tables and measure investments in constant PPP prices. Kamps (2004) use as g the average of the period 1960-2001, and exploits the OECD dataset.

Here, the initial capital is estimated from the Solow type, in 1974. We define the growth rate of real investment over an interval of twenty-five years (1960-1985) and we find a real growth of investments above inflation equal to 6.7%. We implement the Solow formula and we correct for the NFAP. Finally, we obtain a national capital-income ratio at 2.6 which is very close to the 2.5 found in section 1b. The following graph documents the evolution of that ratio.

[16] Obtained from Lane and Milesi-Ferretti (2006)
[17] Obtained from Bank of Greece; Financial Accounts

FIGURE 12: **National Capital-Income Ratio, 1974-2008**
(based on PIM and Historical Prices Updated with Inflation)



Source: Calculations based on data from Penn World Table, World Bank, and Lane and Milesi-Ferretti (2006)

The general picture confirms the high levels of wealth in the late-80s and the 1990s. The subsequent decline is not so obvious in FIGURE 3 but the stabilisation of the ratio around 400% during 2002-2008 is similar to the previous estimates. The general rise of wealth is identified in the figure. The obtained levels are, on average, close to the estimates from the wealth accumulation equation although there are differences in some periods. The main difference is that the PIM generates a smoother evolution. That should be expected because the pricing of capital according to inflation is very imperfect in PIM because it treats homogeneously all the asset price movements and, hence, the notion of real capital gains is not captured sufficiently. On the contrary, wealth was priced according to a composite asset price index which captures different asset price movements. Moreover, the PIM method accumulates past investments of fixed capital and inventories. Therefore, it might not capture the pure financial part of wealth that is reflected in speculation, financialisation etc. The uncertainly of depreciation figures is another factor that casts some doubts about the estimates of PIM[18].

5. Conclusion I

In this part we estimated the evolution of the National Wealth since 1974. The estimation procedure for wealth was based on the accumulation of past savings with the implementation of the appropriate price adjustments via a composite asset price index. In order to initiate the wealth accumulation equation we relied on an estimate for the initial wealth-income ratio in 1974 which was obtained based on accounting identities and estimates for the capital share and an underlying interest rate. We were able to map the evolution of Private wealth, as well as of Government wealth by using further data-sources. A thorough robustness analysis was conducted and the obtained results seem rigorous to changes in the estimated initial value and in the weighting pattern of the composite asset price index.

[18] Piketty and Zucman (2013) offer a survey of the drawbacks of PIM in their Appendix.

The results indicate that the evolution of Wealth in the modern history of Greece is characterised by three distinct periods. The first period, 1974-1985, was characterised by real capital losses, stemming from the high inflation (19%), which counterbalanced the savings'-induced wealth growth of 8%. As a result the national wealth-income ratio was declining until 1986. Between 1986 and 2007 the real value of wealth faced a spectacular growth of 6.7%. The national ratio increased from 220% to 490% whereas the private reached the level of 540% in 2007. Real capital gains at that time were inducing a growth of wealth of 4.4%, and they were emanating from the two stock market booms, the decline of inflation and the rise of housing prices. After the economic recession, the ratios declined because of the fall of asset prices and the "collapse" of savings that had started from the early years of the euro era. The private and national ratios declined to 440% and 370% in 2011, respectively, while the indebtedness of the government increased further.

The increase in national and private wealth and the levels they reached in the last decade are comparable with the evidence for other European countries such as Italy, France and Germany. Nevertheless, there are two main differences. First, the rise of wealth started only in the middle of 1980s – not in the early 1970s. Second, the rise took place from a relatively lower level because the high inflation had eroded the asset values. Moreover, it is very likely that the huge tax evasion, the capital controls in the foreign transactions, and the elusive shipping revenues led to an underestimation of the private external wealth and of the private savings in the national accounts and, in turn, of the private wealth in that period. Moreover, we presented evidence showing that the general picture should be considered as consistent and that a relatively low level of wealth should be expected at that period given the investment and production characteristics of the previous decades. When the particularity of the later rise from a lower point is combined with the fact that wealth managed to "catch-up" with the levels of the other European countries, the implication is that a substantial growth of wealth should have taken place in a shorter time period; and that is indeed the case with the spectacular annual growth of 6.7% during 1986-2007.

Moreover, we identified one significant observation for the long-run evolution of wealth. The long-run evolution is almost entirely determined by the realised savings – a volume effect – whereas the contribution of real capital gains phases out. Nevertheless, the year-to-year variations in the value of wealth are mainly explained by asset price fluctuations. Such evidences provide indications for the dynamics of wealth and they are also found in other papers.

Part II. External Wealth Analysis

The analysis conducted in this part complements the study of the evolution of wealth achieved in Part I. It complements it by focusing on the wealth of Greece held in and by the rest of the world – this part of wealth is dubbed "External Wealth" and "Net Foreign Asset Position" (NFAP) interchangeably. *Therefore, we study the External Wealth in the light of a novel research orientation in the literature, and we investigate whether it applies in the case of Greece.* This orientation studies the valuation effects in the NFAP and their potential explanations. This approach places the study of the *price*, rather than the volume, of wealth in an open-economy framework.

6. The Deterioration of the NFAP, and its Institutional Decomposition

The notion of the "External Wealth"[19] is central indicating the claims of one country to the wealth of another. It indicates the claims at the end of each period (year-end stock positions), and has only the form of financial wealth even if it constitutes property of a tangible asset such as real estate property (ESA95 classifications). Recently there is a new interest in the external wealth of the countries and the international balance sheets, mainly driven by the literature of International Macroeconomics.

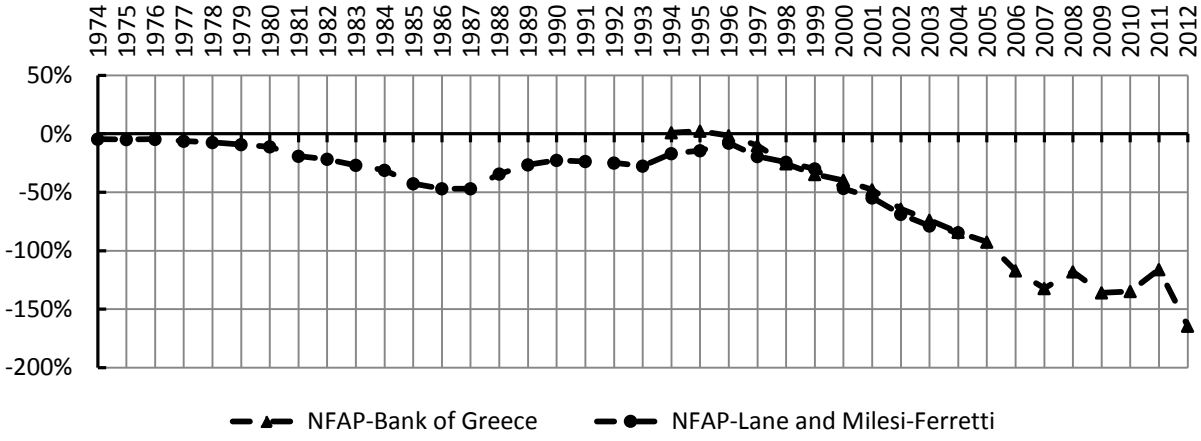
To introduce the underlying motivation for the analysis of Part II we begin by a striking observation, namely the large deterioration of the country's Net Foreign Asset Position during the last twenty years (2% in 1995, -130% in 2007 and -160% in 2012). That deterioration was continuous, and its level in 2012 meant that the payment obligations of the country to the rest of the world amounted to one year and seven months of national income.

The following graph presents the striking deterioration of the NFAP. For the period 1994-2012 we consider as Net *Foreign* Asset Position the Net *Financial* Asset Position of the Rest of the World calculated in the "Financial Accounts" of the Bank of Greece. In other words, NFAP equals the total value of the financial assets of Greece abroad minus the total value of liabilities of Greece to the Rest of the World. However this term is not named NFAP by the Bank of Greece but it is extremely close to that, and it is the best existing choice given that the International Investment Position (IIP) of the country is available only for the last three years in the same database. The fundamental advantage of the selected measure is its computation in market prices, not historical cost, which is exactly what is needed in the analysis of the market price of wealth. Although we restrict the analysis in the period 1994-2012, the following graph also presents the evolution of the NFAP since 1974 with data from the papers of Lane and Milesi-Ferretti (2001, 2006), who estimate the NFAP for many countries, in

[19] A note of clarification is that the terms "External Wealth" and "NFAP" are used equivalently due to literature convention and data limitations. From a distributional perspective this is not entirely accurate because the NFAP considers also the corporations' wealth vis-à-vis the rest of the world (on top of the households' and government's wealth). Based on the External Wealth, it should be reflected "one-to-one" in households' wealth.

order to put the evolution in perspective. For the period 1994-2012 we deduct the term "Gold and Special Drawing Rights" (F1 code in ESA 1995) from the NFAP because it does not constitute liabilities for any other country and this correction is usually performed in the literature. The Net Foreign Asset Position is expressed as percentage of the National Income.

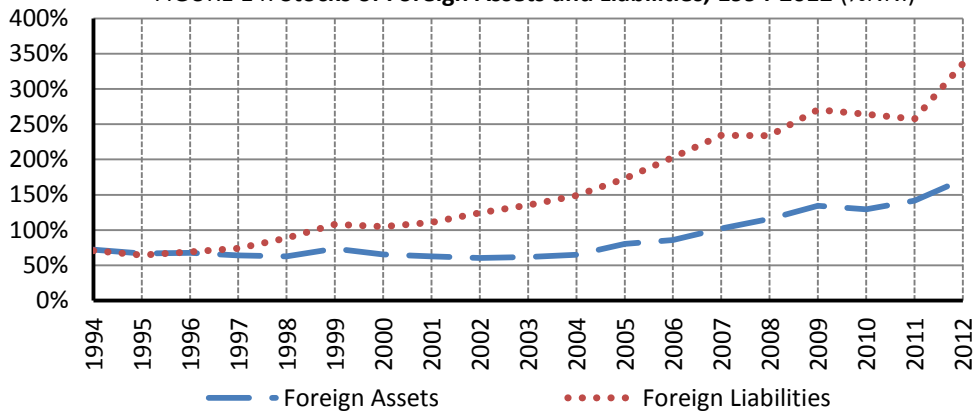
FIGURE 13: **Net Foreign Asset Position, 1974-2012** (%of National Income)



Source: Bank of Greece – "Financial Accounts", Lane and Milesi-Ferretti (2006)

The Net Foreign Asset Position although close to zero during the 1970s, it reached the -50% in 1986 and then it returned to zero in 1996. Until that point in time the evolution seemed relatively stable. Nonetheless, after 1996 the decline was continuous and without any rebalancing period until the current recession in which it seemed to stabilise at the level of -130%, whereas in 2012 it seemed to decline even further. That evolution is to the opposite of the rising NFAP of northern and central European countries such as Germany, France etc, documented by Lane and Milesi-Ferretti. The following graph shows the higher rise of Gross Foreign Liabilities with respect to the rise of the Gross Foreign Assets, both as percentages of Net National Income. The increase of both assets and liabilities reflects the financialisation of the economy.

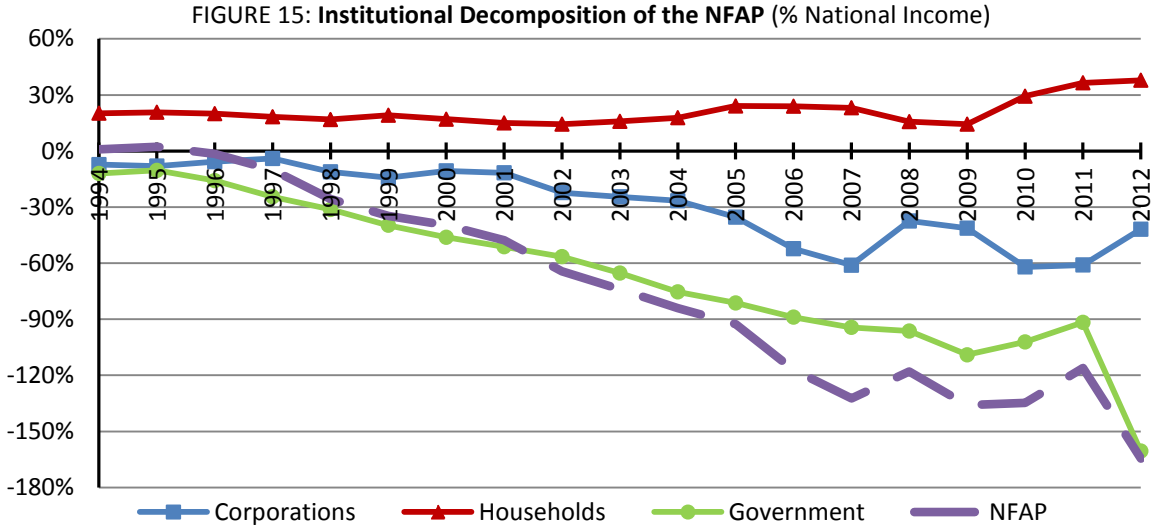
FIGURE 14: **Stocks of Foreign Assets and Liabilities, 1994-2012** (%NNI)



We go further the analysis and decompose the NFAP into the institutional sectors: Households – Government – Corporations. We use the same database and simply group the asset positions of each sector vis-à-vis the rest of the world. We are able to reach approximately the 82% of the NFAP; the remaining unexplained part concerns the assets and/or the liabilities of the "Financial Derivatives", the "Currency and Sight Deposits", the "Insurance Technical Reserves" and the "Other Accounts Payable/Receivable". The following mild assumptions are made in order to attribute all the NFAP. The content is that they do not weight significantly on the results.

We attribute 1/3 of the external assets of "Currency and Sight Deposits" to each institutional sector, whereas its liabilities by 1/2 to the Government and the Corporate Sector (it is stated in these accounts that the Households do not have such liabilities). That assumption is the one that bears the largest impact given that the magnitudes of the other terms are small. External Assets of "Financial Derivatives" are by construction attributed all to the Corporate Sector who also bears 1/2 of the external Liabilities of this term, and the rest liabilities are attributed to the Government. The external Assets of "Insurance Technical Reserves" are attributed equally across the sectors while all the Liabilities to the corporate sector – this can be inferred by the accounts directly. Finally, the assets and liabilities of the "Other Accounts Payable/Receivable" are again distributed equally across the three sectors. The result is the following.

FIGURE 15: **Institutional Decomposition of the NFAP** (% National Income)



Source: Bank of Greece; Author's computations and assumptions

From the graph it appears that during the whole period under study the net position of the households is always positive and relatively stable whereas the corporate sector and the government have always a negative position with respect to the rest of the world. Moreover, the net *external* liabilities of the government seem to continuously augment since 1994 reaching the -100% in the recent years. The net *external* liabilities of the corporate sector were above the -30% for the pre-crisis

period but fell close to -60% during the realisation of the crisis. On the contrary the net position of households during the whole period lies close to the value of 30%.

The goal of this Master Thesis is to provide new evidence in order to understand that huge decline in the NFAP. The question we pose is the following: *Is the decline of the position of Greece vis-à-vis the rest of the world solely due to the continuous current account deficits or there are other reasons such as valuation losses and asymmetries in the external balance sheet that can account for the above-mentioned decline?* In other words, the emphasis is on the *nature* of the external wealth.

In order to provide new evidences for the above question we study the relation between the accumulation of past current account deficits and the NFAP. The idea is that the estimated "valuation effects" would stem from possible differences between the return of foreign assets and the return of foreign liabilities because of fluctuations in the asset prices of external securities, and in the exchange rate given a difference in the currency denomination of foreign assets and liabilities. Therefore, in section 7 we attempt to quantify the existence of valuation effects. In section 8 we study one candidate explanation of the reasons that can account for these valuation effects, namely the currency-denomination of the external wealth.

7. Valuation Losses on External Wealth

The existence of valuation effects appeared in the paper of Lane and Milesi-Ferretti (2001) and has been rigorously documented in a series of papers by Gourinchas and Rey (2005 and 2007) and Gourichas et al. (2012). The main idea is that the difference between the NFAP of two consecutive years cannot be explained only by the size of the Current Account. The intuition is that even when the trade deficits and the net factor payments are accumulated over the years the result still differs from the level of the NFAP. In other words, there is an unexplained discrepancy. That discrepancy is called "Valuation Effect". This Valuation Effect reflects the change of the value of the position *per se*.

The Valuation Effect can emanate from two candidates: first, price movements in the exchange rates such as a depreciation of domestic currency with respect to foreign currencies; and second, price movements in the asset values, for example a foreign stock market boom that influences the value of equities held abroad, which are also associated with the composition of external wealth (ex. risky high-yield assets relative to liquid safe liabilities). In any case this Valuation Effect reflects a capital gain (or loss) for the asset owner on top of the standard flow of capital income (yield; including interests, rents, dividends etc). Gourinchas and Rey showed that this Valuation Effect can be positive or negative for long periods, in the case of USA, and it is associated with the combination of exchange rate fluctuations and currency denomination of foreign assets and liabilities. They found that almost all the foreign liabilities of USA are denominated in Dollars whereas its foreign assets have a large part in other currencies. Therefore, a depreciation of the Dollar reduces the market value of liabilities more than it reduces the value of assets because the part that is denominated in foreign

currencies appreciates. Hence, the NFAP of USA does not decrease as much as it would in case of no valuation effects. The depreciation of the Dollar leads to a capital gain – or, equivalently, a Wealth Transfer – from the rest of the world to USA. Therefore, the valuation effects are *changes in prices* that generate *wealth gains*. In this section we investigate and quantify them in the case of Greece.

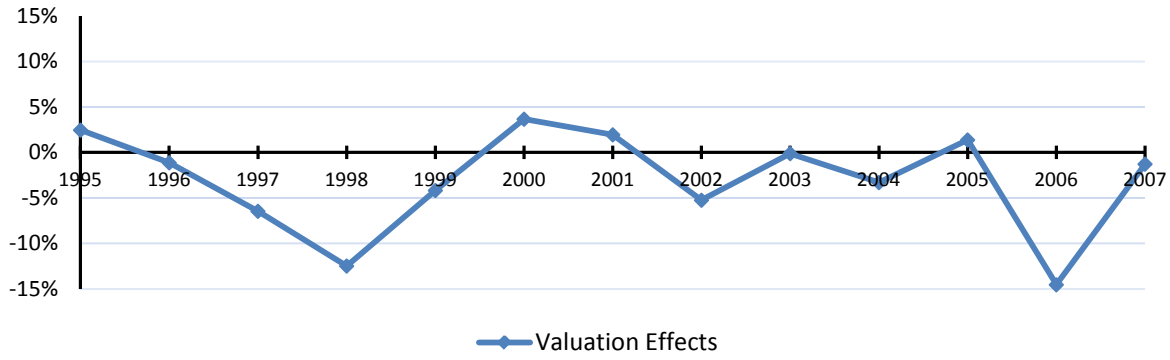
In the data, these price effects appear because the current account figures are calculate in historical cost from customs data and other sources whereas the NFAP is calculated in year-end market prices using data from various Monetary Financial Institutions. One shall be aware that these price effects may be completely fictitious and the mere result of inconsistent data revision processes from the statistical offices. Such arguments have been maintained by Curcuru et al. (2008, 2013).

Following Gourinchas et al. (2012) we define the Valuation Effects, VE_t, as the part of the change of the NFAP between two years that cannot be explained by the Current Account CA_t. We observe the current account from the National Accounts[20] and the NFAP from the Bank of Greece and we focus on the period 1995-2007. The reason is that during the recent years debt haircuts and restructuring buyback programmes for bonds took place and, therefore, we should correct for these debt reductions otherwise we would overstate the liabilities. Nevertheless, some of these programmes have not been finalised yet, or the new asset values have not been calculated entirely in market prices. Consequently, we choose to neglect these years.

$$VE_t = NFAP_t - NFAP_{t-1} - CA_t$$

The following graph reveals the level and the evolution of the Valuation Effects.

FIGURE 16: **Valuation Effects, 1995-2007** (% National Income)



Source: National Accounts, Bank of Greece; Author's computations

[20] We observe the current account as Net Borrowing minus Net Capital Transfers. Balance of Payment data collected from the Bank of Greece cover a shorter period, stem from financial institutions and record transactions above a certain amount, whereas NA data are based also on customs data. The results for the shorter period from Bank of Greece generate also Valuation Losses at the level of -7%.

The striking result is that the valuation effects are **valuation losses** for the largest part of the period. This means that each year the net position of the Country with respect to the rest of the world was deteriorating much more than what its trade deficits would indicate. The yearly average valuation loss of the foreign asset position of Greece is calculated at the level of **-3%.**

A formal explanation for these valuation losses would require the currency denomination and country weights of all foreign assets and liabilities as well as cross-country evidence for the asset price fluctuations. In purely narrative terms, the pattern seems very consistent with the **evolution of the ECU/Euro** since 1999. The effective ECU/Euro was depreciating from 1999 and up to 2001 and at that time we observe a valuation gain, whereas the ECU/Euro started to rise since 2001 and then we observe continuous valuation losses. Therefore, the exchange rate fluctuations might be a candidate explanation. For the early period 1995-1999 it is difficult to find a strong explanation because we would have to know the country and currency allocation of foreign assets and liabilities in order to look at the bilateral exchange rates with the Greek Drachmae. That said, in the years 1998-9 the second stock market boom took place leading to real returns of the ASE around 80%-90%. Hence, the explanation might be that in these years the equity liabilities of Greece over-performed the equity assets and therefore the valuation gain was negative.

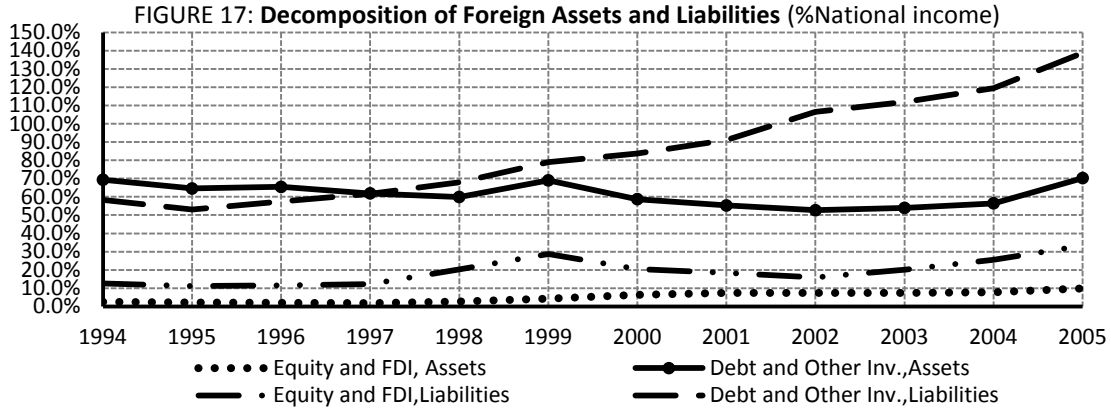
The following table shows that the Foreign Equity Assets and Liabilities are a small part of the External Portfolio of the country, 8% and 18% respectively. It also shows that the composition of external assets of Greece is very similar to the composition of external liabilities, and it is characterised mainly by debt assets. Moreover, the following graph depicts the rise of debt liabilities in the period under investigation.

TABLE 9: **External Portfolio Composition, 1994-2005**

Asset Class	Foreign Assets	Foreign Liabilities
Equity and FDIs	7.8%	18.3%
Debt and Other Investment	92.2%	81.7%

Notes: Each asset class is % of total foreign assets, and each liability class is % of total foreign liabilities
Figures do not include the terms “Monetary Gold and SDRs” (F.1) and “Financial Derivatives” (F.34) in ESA 1995. They both have a very small share.
Source: Bank of Greece, Financial Accounts

FIGURE 17: **Decomposition of Foreign Assets and Liabilities** (%National income)



To explore further the nature of the valuation losses we provide evidences for the decomposition of valuation effects to each asset class. Because of data restrictions, we group the foreign assets into two groups: one with the risky assets (Equity and FDIs) and the one with the safe assets (Debt and Other Investment)[21]. We compute the Valuation effects for gross assets, liabilities, and for each asset class based on the following updating formula; in which PX_t is the year-end stock position of asset X in time t, FX_t is the flow of that asset during the year t, and VE_t is the valuation effect we want to calculate.

$$PX_t = PX_{t-1} + FX_t + VE_t$$

The following table reveals that the foreign assets of the country have almost zero valuation effect, i.e. the flows explain completely the changes in the positions. On the contrary, the foreign liabilities in Equities and FDIs have a sizeable capital loss at the level of 2.4%. The interpretation of that capital loss would require the analysis of the geographical distribution of foreign equity assets and liabilities of the country. On the other hand, the foreign liabilities in Debt and Other Investment exhibit a substantial capital loss at the level of 1.2%. The latter shows that even the safe assets, such as debt, are influenced significantly by price fluctuations. The magnitude of the level of 1.2% is close to the evidences for the case of USA[22] but the particularity is that this finding is of the opposite sign: the value of debt liabilities increased further because of adverse price movements. That capital loss implies that the fluctuations in the exchange rate play a role as well. The possibility that our findings reflect the dynamics only of the short period under investigation is left open; a further long-run analysis with the introduction of the yield of each asset class would shed more light on the level of the total returns of each asset.

[21] We use the "Financial Accounts" from the bank of Greece which are based on the ESA 1995, and not on BoP, classifications. We group the term "Shares and Other Equity" in the category of Equity and FDI, whereas the terms "Currency and Transferable Deposits", "Other Deposits", "Securities other than Shares", "Loans", "Insurance Technical Reserves" and "Other Accounts Receivable/Payable" in Debt and Other Investment. We neglect the terms "Monetary Gold and SDRs" and "Financial Derivatives". Both of them comprise a small share in total assets.

[22] See Gourinchas and Rey (2005).

TABLE 10: **Valuation Gains/Losses, 1995-2005** (% National Income)

	Total	Foreign Assets	Foreign Liabilities	Equity & FDI Assets	Equity & FDI Liabilities	Debt &Other Inv. Assets	Debt & Other Inv. Liabilities
Average	-3.5%	0.0%	3.5%	0.1%	2.4%	-0.1%	1.2%
St. Dev.	6.3%	1.0%	6.4%	0.4%	5.0%	0.8%	2.6%

Notes:
The Table presents the Capital Gains and Losses on the foreign assets. They are defined as the unexplained part of the difference between the stock position of two consecutive years and the flow between these years. They are computed based on the formula: $PX_t^i = PX_{t-1}^i + FX_t^i + VE_t^i$.
One noteworthy distinction is that the return figures are % of National Income, and not % of the previous year-end stock position of each asset class, in order to be directly comparable.
The terms "Monetary Gold and SDRs" (F.1) and "Financial Derivatives" (F.34) in ESA 1995 are not included. They both have a very small share.

After having documented the valuation losses in the NFAP we proceed to estimate the **Total Return on NFAP, i.e. on the External Wealth.** Similarly to the way of computing the return of an asset by adding the yield to the price change, the Total Return on the NFAP equals the sum of the net capital income from the foreign asset position plus the valuation effect. We measure the net capital income as the capital receipts from abroad minus the capital payments abroad from the National Accounts. The total return on the previous year-end external wealth is the following:

$$r * NFAP_{t-1} = Net\ Capital\ Receipts_t + VE_t$$

Where, $r * NFAP_{t-1}$, represents the **total value** of the interest payment on the previous year-end external wealth. We divide both parts by the National Income and the following table groups the results, namely the total return obtained, or paid, on the External Wealth as percentage of National Income. The trade deficits are also presented for comparison.

TABLE 11: **Total Returns on External Wealth, and Trade Deficits** (%National Income)

Year	Net Capital Income	Valuation Gain/Loss	Total Return	Trade Deficits
1995	-3%	2%	0%	-8%
1996	-2%	-1%	-4%	-9%
1997	-3%	-6%	-9%	-8%
1998	-3%	-12%	-15%	-9%
1999	-4%	-4%	-8%	-9%
2000	-2%	4%	2%	-15%
2001	-1%	2%	1%	-15%
2002	-2%	-5%	-7%	-15%
2003	-2%	0%	-2%	-14%
2004	-2%	-3%	-6%	-12%
2005	-3%	1%	-2%	-11%
2006	-4%	-15%	-18%	-13%
2007	-5%	-1%	-6%	-17%
Average	**-3%**	**-3%**	**-6%**	**-12%**

Notes: Net Capital Income is the Capital Payments of the country minus the Capital Receipts, as % of NNI. The Valuation Gain/Loss is the difference between the change of the NFAP between two consecutive years and the Current Account (%NNI). Total Return of External Wealth is the sum of Net Capital Income and Valuation Gain/Loss.
Source: Bank of Greece, National Accounts; Author's Computations

- It appears that the Net Capital Income from abroad is always negative since 1995 and until the current crisis. It amounts to -3% on average – in the same level with the average loss in the value of the external wealth.

- **The average Total Return on the External Wealth reaches the -6% per annum**, meaning that each year the net capital loss of the country due to its negative foreign position equals 7.5 billion Euros (calculated on the average net national income in 1995-2007).

- The total return of -6% amounts to half of the average trade deficit of that period. ***Put differently, each year the actual capital income paid abroad, due to the previous-year position, was half the trade deficit that would occur during that period. This is an indication of a very unbalanced path.***

- Moreover, the above magnitudes provide indications for the ***cost of the external adjustment***. It means that even in the case of a zero trade deficit, the country would still have to pay on capital income abroad an amount that would equal half the value of the (net) imported goods of last year. Therefore, the country would still have a current account deficit at the level of -6% and, hence, its foreign asset position would deteriorate further.

8. Asymmetries in the Structure of External Wealth

In this part, we attempt to investigate one of the two candidate explanations of the valuation effects, namely the asymmetries in the international balance sheet of the country, by studying the *Structure of External Wealth*. The undertaken task is held simple given the importance of the subject as well as the severe data limitations. We simply attempt to provide first evidence towards an explanation for the above de-valuation effects and leave a further and more thorough investigation for future research.

The exchange rate fluctuation might have a different impact on the *value* of the stocks of foreign assets and liabilities. In a world in which all the assets and liabilities are denominated in the same currency then a change in the exchange rate would have no impact at all. But if, hypothetically, the assets are in Dollars and the liabilities are in Euros then a drop of the value of Dollar with respect to the value of Euro would lead to a decrease in the value of assets and in an increase in the value of liabilities *ceteris paribus*.

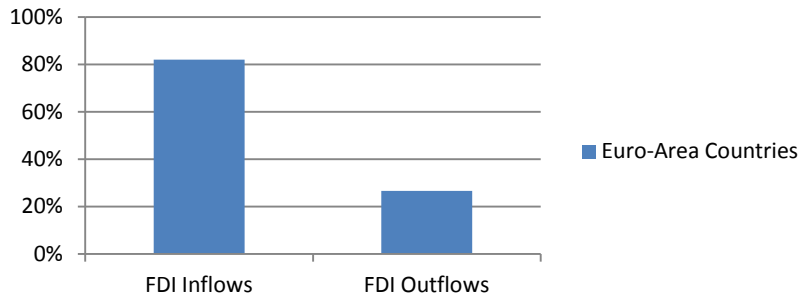
Here, the underlying understanding is that the currency denomination of the foreign assets of Greece differs from the currency denomination of its foreign liabilities, and that this difference may have contributed to the valuation losses. Therefore, we attempt to put forward some indications and group existing evidences showing that a part of the assets of Greece might be denominated on foreign currencies whereas almost all its liabilities are in Euros. If that is the case then a rising Euro would lead to an appreciation of the value of debts more than proportional to the value of its assets, and therefore a valuation loss would be generated.

The analysis lies close to the rising literature that studies the bilateral asset positions between countries [see Kubelec and Sá (2010), Forster et al. (2011), and Milesi-Ferretti et al. (2010)]. Firstly, we present the best available data from the Bank of Greece that propel towards that direction. Secondly, we use the dataset from the paper of Waysand et al. (2010) who construct the intra-euro positions for the period 2001-2008. Their data come from IMF (Coordinated Portfolio Investment Survey), ECB, National Sources and OECD but do not include reserve assets and financial derivatives. In general, we search whether the indications from both the datasets are aligned to the narrative that the liabilities of the country are in Euros whereas the assets have a part in foreign currency and, thus, an appreciation of the euro relative to the rest currencies would lead to a decrease in the value of the NFAP.

From the Bank of Greece we collect the Foreign Direct Investment flows in Greece by country of origin (liabilities), and of Greece by country of destination (assets) for the years 2003-2011. Of course looking at flows and not year-end stocks is incomplete, but having in mind a logic of accumulation the flows could approximate the stocks in a sufficient time period. Following a common empirical assumption in International Finance, we consider that all the FDI liabilities are denominated

in the currency of the issuer, so in Euro in this case. This assumption is not far-fetched given that the 82% of the yearly-average inflow of FDI comes from Euro-area countries. With regards to the asset side, approximately 70% of the yearly-average FDI outflow from Greece goes to non - Euro-area countries (roughly 25% to European countries that did not adopt the Euro, 35% to Balkan countries, and 7% in USA). Therefore, *based on observed flows*, it is likely that the FDI liabilities are mainly denominated in Euro and that the FDI assets have a large part denominated in other currencies.

FIGURE 18: **Average Flows of FDIs to and from Greece, 2003-2011**



Notes: Flows are percentages of the total flow in the corresponding year.
Source: Bank of Greece; Author's Calculations

We would like to complement the above findings with evidence for the Portfolio Investment. Nevertheless, the portfolio investments are not provided by country of destination or currency denomination and, thus, we cannot say something more on that. With regards to the "Other Investments" what is usually assumed is that the assets and liabilities of this term are fully hedged to exchange rate fluctuations because this term consists of loans, deposits etc. One should note that the magnitude of the flows of "Other Investments" is very high (the asset flows are five times the asset flows of FDIs) and, hence, they reduce a lot the importance of the FDI asset flows denominated in foreign currency in the total flow of assets each year. With respect to foreign exchange reserves (we do not include gold, SDRs, reserve position at IMF or financial derivatives) there is a huge decline from approximately 2.5 billion of euro in 2004 to 37 million at the end of 2012. This is an indication that the valuation losses probably do not emanate from the reserve assets.

To provide more evidence towards that direction, this analysis uses the dataset created in Waysand et al. (2010) which contains a large part of **bilateral stocks** of assets and liabilities of Greece. Based on that dataset and some "crude" empirical assumptions we are able to obtain indications for the currency denomination of a large part of Greece's External Wealth. These assumptions are the following and they are close to what is usually assumed in International Finance (see Gourinchas et al. (2012) p.13): Foreign Direct Investments and Portfolio Investments (equities and debt) are in the currency of the issuer whereas Other Investments (bank loans, deposits etc) are immune to exchange rate fluctuations. The assumptions probably weigh in the findings but the

intuition is that they do not weigh too much to alter the general trend of the results. For instance, using the Public Debt Bulletins (in Greek) of the Ministry of Finance one can observe that usually a 5% of public debt is on foreign currency but our assumptions misallocate it. Approximately more than 50% of that 5% is on US Dollars. Nonetheless its small magnitude, only 5%, enables us to proceed and keep the assumptions. Moreover, we use their dataset[23] based on a different approach. We collapse the bilateral positions of Greece with all the other countries in two groups of assets: one with the euro-denominated and one that concerns all the other currencies (given our assumptions).

Given our assumptions one should expect all the liabilities of Greece to be in Euros. To strengthen this fact we also present the percentage of total liabilities that is held by euro-area countries. Besides, the underlying question is the currency of liabilities with respect to the currency of the assets. Consequently, we turn our attention to the asset side. The following table presents the results for the first and last available year of data (2001 and 2008).

TABLE 12: **Structure of External Wealth**

	% of Liabilities held by Euro-Area countries*		**% of Assets denominated in Euros***	
	2001	2008	**2001**	**2008**
FDIs	80%	77%	6%	37%
Portfolio Equity	23%	31%	48%	33%
Portfolio Debt	71%	79%	39%	14%
Other Investment	56%**	41%**	Assume fully hedged	Assume fully hedged
Total	65%	63%	**59%*** **	**56%*** **

Notes: *The assumptions made are that the Portfolio Securities are denominated in the currency of the issuer and that Other Investments are immune to exchange rate fluctuations.
The data come from the public version of Waysand et al. (2010) and they do not allocate the complete IIP. The unallocated assets and liabilities reach roughly the 30% and 33% of their allocated counterparts. Only allocated positions are included in the calculations and they are expressed as % of the explained assets and liabilities.
**The respective unallocated assets amount to 115% and 40% of their allocated counterparts.
***We included the Other Investment as assets denominated in euro because the purpose is to find how many assets **are not** denominated in euro and, thus, influenced by exchange rate fluctuations. Other Investments are assumed to be immune to exchange rate fluctuations.
Source: Public dataset of Waysand et al. (2010); Author's Calculations and Assumptions

The main finding of the above table is that there is a significant part of foreign assets, approximately **40%** (residual from the 4th and 5th column) of the explained assets, that is probably denominated in non-Euro currencies. Although we do not present such evidence but just to provide a more complete view, the assets that are (probably) denominated in other currencies are allocated mainly in UK, USA, Balkan countries (Bulgaria, Romania, Albania etc..) and some Eastern European

[23] Two things should be noted. Firstly, their dataset cannot allocate the total International Investment Position of Greece. Therefore, we express our results only on the share of the explained allocation. Secondly, we use their publicly available dataset which is more restricted than their actual dataset which contains data that are available only on a confidentiality base.

countries (Poland etc..). Therefore, *based on empirical assumptions the main result is that almost all the liabilities of Greece are in Euro whereas there is a significant part of the foreign assets that is denominated in other currencies*. In that context, the rising value of the Euro since its creation may have contributed to the Valuation Losses found before. For example, under our assumptions, and if the finding of the 40% of foreign assets denominated in other currencies remains when the unallocated assets are included, then an appreciation of the Euro by 10% would increase the value of liabilities more than the value of assets, resulting in a Wealth Transfer from Greece to the Rest of the World approximately equal to 7.8 billion Euros (4% of National Income in 2008).

Two caveats are important. The first is that the data are not complete. There is a significant part of foreign assets and liabilities, roughly 30% of each one of them, which is not allocated to any country. Although that this part is large, it is still possible that our findings remain significant even if the majority of it is denominated in Euros. Our results simply indicate the existing evidences. The second caveat is that we considered all the liabilities to be denominated in Euros (the currency of the issuer). Nonetheless, this is not perfect and we presented two indications to strengthen our assumptions: the fact that on average only 5% of the Greek public debt is denominated in foreign currency and that a large part of liabilities are held by Euro-Area countries (2nd and 3rd column).

9. Conclusion II

In Part I we found that the National Wealth increased from 220% in 1986 to 490% in 2007. Nevertheless, in this Part II we observed that the External part of the National Wealth exhibited a huge decline from 2% in 1995 to -130% in 2007. That deterioration implies that the claims of the rest of the world to the annual income of the country were continuously augmenting, and surpassed the annual level of the latter. Here, we placed the attention specifically on the decline of the External Wealth. The traditional view holds that the NFAP is mainly driven by the competitiveness of the economy and it is indeed the case that Greece experienced continuous and large trade deficits for a large part of its recent history (-12% in 1995-2007). Nonetheless, we investigated another, recently proposed, channel that affects the NFAP, namely the *Valuation Channel*. We found that there are valuation losses in the NFAP that amount, on average, to -3% of NNI for the period 1995-2007. That evidence suggests a very unbalanced path because it implies that the price movements were "de-stabilising" the external position even further. A further decomposition showed that the valuation effects emanate from both the foreign Equity and Debt liabilities. These valuation losses lead to a total return of -6% on the External Wealth. The latter implies a costly external adjustment, in particular that even zero trade deficits do not suffice to propel towards a positive current account. Given the finding of valuation losses, the analysis put forward one candidate explanation and searched its relevance and its strength. Because of tremendous data limitations a formal proof was not followed, but simple indications were presented. The indications revealed that the candidate explanation – the asymmetries

in the currency denomination of the external wealth under exchange rate fluctuations – is relevant and showed that there is a part of Greek foreign assets that it is likely to be denominated in currencies towards which the euro appreciated for the largest period since its creation. Nevertheless, the rigorous investigation of the quantitative importance of that explanation was left as a future endeavour.

Epilogue

This part synthesises the results of the Master Thesis and discusses possible interpretations, implications and linkages with further research. The results *per se* are summarised in the Conclusions of Sections 5 and 9. The orientation of this Master Thesis was to place the questions of the long-run evolution of Aggregate Wealth, and of the nature of External Wealth in Greece during the last four decades.

The Thesis provided novel evidences for the course of wealth covering a broad historical period and cross-country comparisons. With regards to the historical period, we identified three distinct phases in the evolution of the wealth and we highlighted its forces. Therefore, we set a preliminary stage upon which more detailed analysis of other historical and socio-economic phenomena could be built. By depicting the evolution of wealth over the entire modern history of the country we were able to aggregate numerous characteristics and reflect them in the long-run picture. With regards to the cross-country view, the evidences suggest that the Greek economy managed to reach wealth levels comparable with other Euro-countries in the pre-crisis period. On the same time the important role of country-heterogeneous characteristics was brought forward. The rise took place fifteen years later, from a lower level and, hence, it was more rapid and in a shorter time interval. The evidence of that rise may stimulate further research questions about the convergence to the European standards, the integration within them, and the distribution of the wealth gains.

The analysis faced the limitation of a significant degree of data unavailability. Nevertheless, we brought together various datasets from National Sources that include relevant data and they have not been used so far to address the questions put forward. Generally, estimating the wealth evolution based on the accumulation of past savings seems fruitful because it enables to cover a long time horizon and captures the notion of path dependency, namely that the past characteristics of the economy partly affect the present too. Nevertheless, the main limitation of that approach comes from the composite asset price index. It is not clear how to attribute the proper weights to the available price indexes especially when the composition of a country's portfolio does not remain stable over time. The conducted sensitivity analysis provides a comfort by showing that the general pattern does not change under deviations from benchmark weights but the results are not appropriate for short-term analysis.

To the largest extent this Thesis followed an empirical perspective but the following evidences have also implications for theoretical questions associated with the role of price effects, and their interplay with the savings. First, the thesis showed that during the rise of wealth, the real capital gains were substantial. On the same time the external wealth faced adverse valuation losses. These observations are compatible: the real capital gains reflected the *domestic* asset price recovery of the stock exchange, the housing prices and the fall of inflation; while the valuation losses reflected the

impact of the fluctuations in the exchange rate and the asset prices. Generally, we did not talk about a bubble in asset prices, such as the one that took place in other European countries, because our evidences do not provide such clear indications, however they do not rule out that interpretation either. A rise in the general level of asset prices can be inferred but we should take into account that it started from a very low level. Along the analysis, reasons pertaining to the structure of the economy, savings, investments, over-borrowing, trade deficits etc, seemed more relevant. Second, with regards to the interplay between price and saving effects we showed that the long-run wealth is determined by savings while the price effects phase out. On the contrary, in the short run the price effects set the tone. For the savings, we identified a striking and novel observation that certainly calls for future investigation: the "collapse" of personal savings during the period of the euro[24].

Finally, the investigation produced evidences for the external adjustments process. The existence of Valuation Effects has been documented for the case of Greece, and it was shown that these effects may work against the NFAP by destabilising it further for over a decade. The investigation also generated returns on the NFAP that were substantially negative implying that the generation of current account balances will require significant trade surpluses.

[24]That observation is not relevant only for Greece; Coeurdacier et al. (2013) document the general fall of personal savings in the advanced OECD economies. Hence, the empirical evidences are in favour of the current research orientations of International Macro and of the association between savings and current account.

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Appendix A – Data Sources, Treatment, and Comparisons

The data for the macroeconomic indicators used in Part I come from the Publications and the database of the National Accounts, and the Population Censuses for the Employment, and they can be found via the Hellenic Statistical Authority (www.statistics.gr). The data for Part II are taken from the "External Sector" and "Financial Accounts" of the Bank of Greece, and from the Ministry of Finance.

The macroeconomic data for Part I are in electronic format for the years 2000-2012 and in pdf publications for the years 1974-1999. They are expressed in Euros for the period 1995 – 2012 and in Drachmas for the period 1974 – 1994, although the Euro Currency officially entered in January 1st, 2001. Alternatives of the data we used could be the World Bank's database "Wold Development Indicators" and Eurostat.

Therefore, three general issues arise:

1. How the pdf versions cope with the revisions?
2. How to deal with the different currency?
3. Why not use the WB or Eurostat dataset?

1. There is a possible weakness in the data used. Figures are sometimes revised in the course of time and these revisions are not always captured by the pdf versions of the National Accounts. Certainly, the more we go back in time the more discrepancies may exist. In all cases, the available data from the most recent official publications were used and, thus, many revisions that occurred were taken into account because such publications presented also the revised data for the exactly previous years. For example, the publication of 1979 has figures for the years 1973-1979, whereas the publication of 1981 presents figures for 1976-1980. In that case only the 1974 and 1975 figures were used from the former publication while the figures for the years 1976-1979 were taken from the latter publication, although they may not differ from the ones in the former publication. In any case the discrepancies will not be of a huge magnitude because we use variables in relative terms in a long-run perspective and, therefore, the measurement errors will probably be small.

A note has to be stated. With the publications of SNA1993 and ESA1995 a major revision of the Greek data took place in 1997 in order to comply with them. This attempt had started in 1990 with the contribution of experts from INSEE and the Statistical Office of the European Community. The data that were revised extended back to 1988, and took that year as the base. Therefore, there is a break in the series between the period 1974-1987 and the later years. This revision led to an upward correction of the data since 1988, whereas this upward correction has not been implemented in earlier years. Nonetheless, this correction does not change the evolution of the variables, and although it is important it is not of a huge magnitude. Moreover, the rates of change and the ratios are almost the same before and after the revision, with the exception of the rate of change of any variable between

1987 and 1988. For example, the NNI and the Investments of 1988 before the revision were 17,322 and 4,048, whereas after the revision they were 24,475 and 5,928 million euro respectively. The ratio of Investments to NNP was 0.234 initially, and 0.242 in the revised data, but the rate of change of investment over inflation between 1987 and 1988 is 76%. These results indicate that our focus on ratios eliminates the lack of revision for the previous data. When we have to take average growth rates over long periods and the latter rate of change falls in that interval, then we exclude it and take as rate of change the average rate of change between 1986-87 and 1988-89. The data since 1988 are off course the revised data.

2. The matter of the currency is not important in our investigation because all the variables are expressed relative to national income (NNI) and therefore the price of the nominator and the denominator cancel each other. Nevertheless, in order to present a homogenised dataset all numbers are converted into "Current Euros". To do that we divided the Drachmas of the period 1974 – 1994 by the Euro Irrevocable Fixed Conversion Rate that was establish in 2001 (1 EUR=340.75 DRS). The figures for the 1995-2000 are directly expressed in euros with the above methodology. This monetary convention is usually adopted (ex. by INSEE and proposed by the Eurostat for time series analysis). This transformation is suited in order to convert a national currency for all periods before the insertion of the Euro to the same currency value that prevailed after its insertion. This transformation is not suited for cross-country analysis, in which a transformation of the "euro fixed series" (the above series) to the euro/ECU would be more appropriate. Just to clarify, we could still compare countries with the conversion implemented here, but then it would mean that we make the comparison in the constant prises that prevailed at the time of the euro insertion and not at current market values for each period.

3. The orientation of this Master Thesis is to gather together all relevant data and exploit the information emanating from National Sources. The validity of the collected data is compared with the data from World Bank, and some discrepancies are detected. Namely, it appears that the data from national accounts underestimate the GDP for the period of the Drachmae. The intuition is that this discrepancy mainly emanates from the fact that the 1997-revision did not took place for the years 1974-1987 – the average discrepancy for the revised period (1988-2012) is only 7.7% of the NNI from National Accounts, and more specifically for the euro-period is only -0.4%. The above revision probably has been performed for the early years by the statistical offices of World Bank and, therefore, the discrepancy is larger in the period 1974-1987. The difference in the Net Saving ratios is much less pronounced. The average differences for the overall and the Drachmae period are -0.5% (National Accounts underestimate) and 0.8% (National Accounts overestimate) respectively. The following graphs and table provide more evidence. We propose to follow our choice. This proposition is based on the fact that this thesis focuses on ratios and as it appears the differences in net saving (one key variable here) between this dataset and World Bank's are negligible. Moreover, for certain

years figures do not exist in the WB dataset as we go back in time, and hence the element of continuity matters too. Moreover, National Accounts provide information for a richer set of variables that are used across the thesis. Using some variables from WB and some others from National Accounts may cause data not to match each other. In addition, we do not investigate the short-run fluctuations and responses of some variables to some specific changes in the economy, but rather the medium-run trend. Eurostat presents data only from mid 1990s.

For the years 2005-2011 there has been released a second revision with base the year 2005, which has not been extended backwards. Nevertheless, we do not expect that this revision would change figures a lot. This is because the revision took place due to discrepancies in data measurement, economic uncertainty and political turmoil that appeared mostly in the late 2000s, rather than a change in the method of calculation. Trying to extend backward in time the revision of the data that occurred in 2005 seems a herculean task given the number of variables we use and the fact that in order to reach the saving variables one has to revise too many other variables. Besides we do not actually have to do it, because we are not interested in short run fluctuations and we mainly use ratios of variables and, hence, any measurement error in the nominator is (partially) balanced by the one in the denominator.

FIGURE A.1: **Comparison of GDP, National Sources - World Bank** (in current million euros)

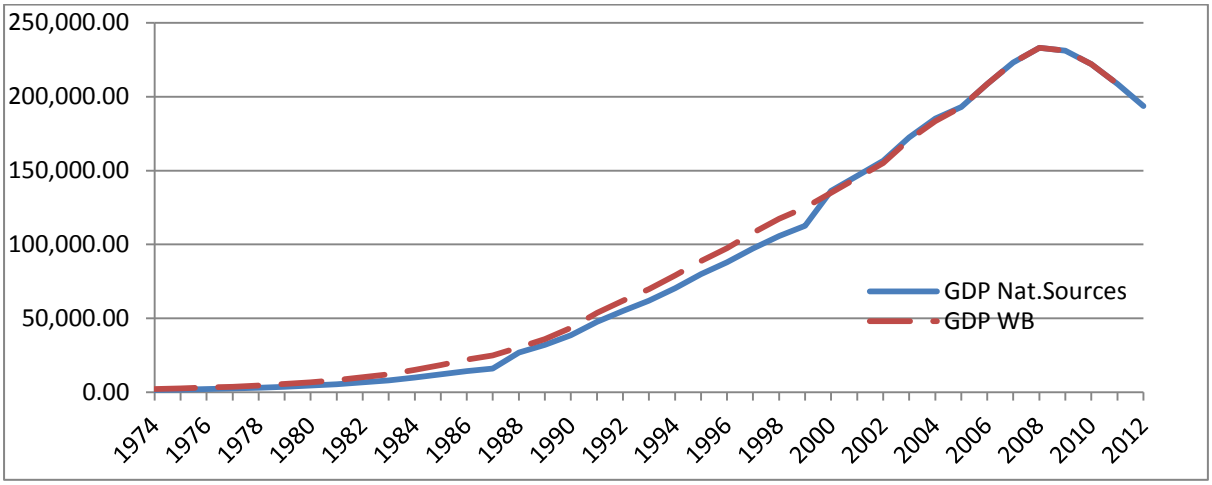


FIGURE A.2: **Comparison of Net Saving as %NNI, National Sources - World Bank, 1974-2012**

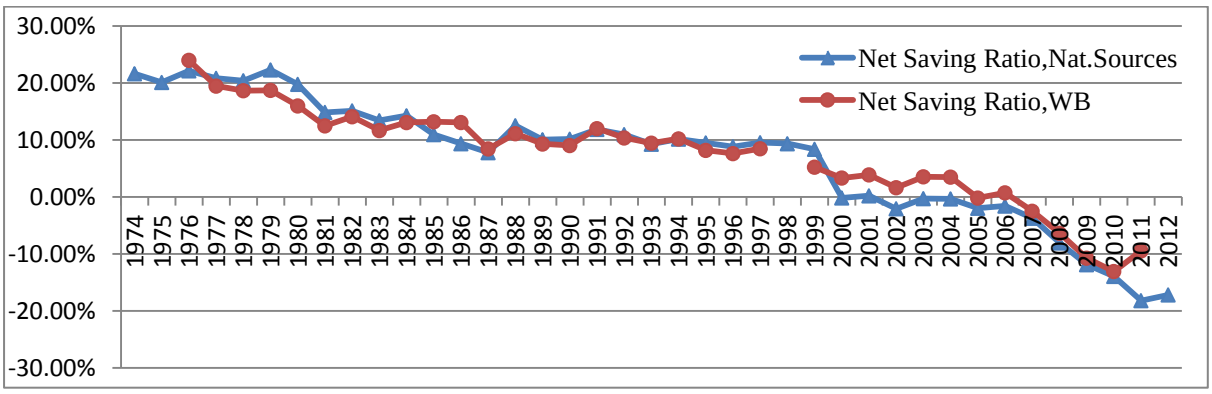


TABLE A.1: **Comparison of GDP and Net Saving, National Accounts – World Bank**

Period	Average GDP in current million euro		Average Net Saving Ratio to NNI	
	National Sources	World Bank	National Sources	World Bank
1974-80[(i)]	2,708.10	4,082.53	21.0%	19.4%**
1981-90[(i)]	17,002.46	22,077.44	11.9%	11.6%
1991-00	85,486.96	93,611.87	8.8%	8.3%*
2001-12	197,856.82	197,684.90*	-6.6%	-2.6%*
Overall	87,644.43	88,421.17*	7.1%	7.4%

*One missing value **Two missing values

[(i)]The major revision of historic data to comply with ESA1995 started from 1988. Figures for previous years have not been changed.

It is appropriate to clarify the term "Net" that is widely used along the dissertation. The term "Net" is usually used in two ways. When it is about saving, investment and income it means that the corresponding capital depreciation has been deducted. When it concerns the income flows with respect to the rest of the world it means income receipts minus the income payments to the rest of the world. In the publications of the National Accounts for the years 1974-1987 there is not an item "Net Saving" directly observable. Generally, the Net Saving is calculated as the difference between the National Disposable Income and the (National) Consumption[25]. The problem is that neither the disposable income is calculated. Certainly, the National Disposable income can be computed by adding the Net Current Transfers to the National Income but as we go back in time the differences in the items included in the term Current Transfers may rise – especially in the items of production and import taxes. Therefore, we calculate the Net Saving by the other equivalent way. Net Saving equals Net Investments (Net Capital Formation) less Net Borrowing of the country from abroad less the Net Capital Transfers to the country. In other words, the Net Saving term is the savings of the country which remain exclusively for investment after deducting consumption expenditures, which along with the foreign capital that enters the country (under the form of borrowing and net transfers) finance the realised investments.

Schematically:

$$Net\ Saving_t + Net\ Borrowing_t + Net\ Capital\ Transfers_t = Net\ Investments_t$$

Although the conventional way is:

$$Net\ Saving_t = National\ Disposable\ Income_t - Consumption_t$$

It can be reassured that the results found are the correct ones by summing up the private and public saving components that are observed in these accounts.

[25] National Consumption is the consumption of permanent residents of Greece in the country and in the rest of the world, along with the consumption of the government and of the NPISH. The consumption of the foreign tourists in Greece is not included in this calculation.

Appendix B – Factor Shares, 1958-2007

This appendix studies the functional distribution of National Income. It presents the long-run evolution of the labor and capital shares. Due to data limitations we split the sample in two sub periods, 1958-1987 and 1988-2007, and we apply different estimation procedures in each of them. The reason is that the results may differ depending on the estimation procedure. Therefore, by applying different specifications we aim to provide a general picture.

In the first sub-period we follow the method that assumes the same average wage in the economy as it is discussed in paragraph 1.b. If we do not consider any modification in the ratio of employees to the total working population we find very low and even negative capital shares which seem paradoxical. Such a result is usually expected when such an estimation procedure takes place. We propose two modifications and present the results for both. In the first one we exclude from the total working population the unpaid workers and, in the second, we also exclude the workers of age between ten and nineteen. We discussed the rationales in the paragraph 1.b. The data for the share of employees for the period 1958-1981 come from the Population Censuses of 1951, 1961, 1971, 1981. To find the labor share in each intermediate year we interpolate by assuming a linear function between two observations from the censuses. For the years 1982-1987 we use the annual Labor Surveys from the Statistical Office of Greece. The two generated series seem to perform relatively well and close to each other.

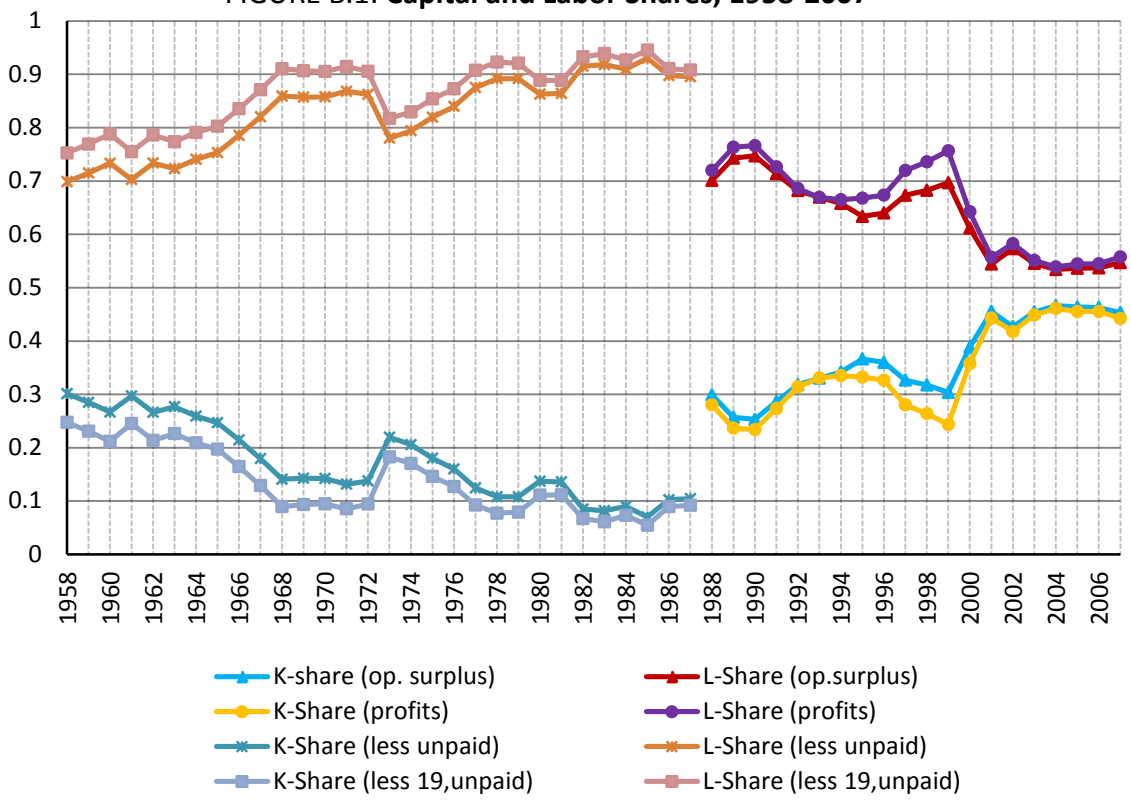
In the second sub-period, given the higher data availability, we follow the method that assumes that the labor share in self-employment equals the labor share in the corporate sector. This method is generally considered as the most satisfactory procedure in estimating the factor shares. Again two specifications are followed. In the first one, the operating surplus of the corporations, net of depreciation, is used as their capital income. In the second one, we deduct from the operating surplus the property income payable and add the property income receivable by the corporations in order to approach closer to the notion of "profits". The reason is that from the operating surplus the payments on tangible and financial capital have not been deducted. Such payments are interest payments, rents, various charges for using production facilities etc. Dividends and reinvested earnings on foreign direct investments should not be included in the payable property income but given data limitations we cannot account for that correction. (See ESA1995, "*Generation of income account*" and "*Allocation of primary income account*")

We focused on the above dimensions. One could find different results depending on the exclusion or not of capital depreciation, net factor payments from abroad, and capital income for the government[26]. Here the emphasis is always on figures net of capital depreciation given that is not a

[26] See Gollin (2002) for a survey of different methodologies. The main differences come from the way of decomposing the self employment income into a labor and a capital component. Other methodologies include

capital income for someone; the factor payments are always included because we are interested in the "national" wealth; and the property income for the government as well as its interest payments on debt are always considered. If we had not considered the debt payments as negative capital income and the capital depreciation then we would obtain higher estimates for the capital share. The subsequent graph presents the evolution of labor and capital shares given all the above assumptions and specifications.

FIGURE B.1: **Capital and Labor Shares, 1958-2007**



Notes:

*The K/L- share (op. surplus) takes the whole operating surplus of corporations as their capital income whereas the K/L- share (profits) deducts from the operating surplus the property income payable by the corporations and adds the property income receivable. Both series refer to the years 1988-2007 in which the method of the same capital share in the corporate and the self-employment sector has been assumed.

* In the years 1958-1987 the method that assumes the same average wage in the economy has been implemented. The K/L- share (less unpaid) deducts from the total working population the unpaid workers stated in the population censuses, whereas the K/L- share (less 19, unpaid) deducts the unpaid and the workers that are less than nineteen years old.

*In all figures, the interest payments of the government, the capital depreciation and the net capital payments of the country have been deducted. All of them contribute to push downwards the estimated capital shares.

Source: National Accounts; Author's Calculations

Although one should be aware of the impreciseness of the above exercise some conclusions can be drawn for the general trends. During the 1960s and the 1970s labor income appears to exhibit a

the full attribution of self-employment income to the capital income although literature has moved away from this definition due to its underestimation of the labor share.

rising trend in the total income. The capital shares seem to have remained low until the early 1980s, although estimates for the capital share close to 10%-13% seem too low. During the last decades the above trend seems to have been reversed. The capital share rises and the labor share declines significantly since the end of the 1980s.

Appendix C – Depreciation Rates

Along the course of the dissertation all the variables we used are net of depreciation; for example net national income, net savings, net investments etc. The reason is that the savings going to repair the existing capital are not income for someone. The amount spent goes to sustain the capital at its current value – otherwise it would value less. That approach leads to the negative (net) savings which is a striking result – to the opposite of the public debate which focuses on gross savings which remained positive, yet low.

The following table presents the average depreciation rates, as percentages of national income, which can be directly compared with the figures for the private and public savings of TABLE 1. It also presents the Gross Saving and the Net Saving (%NNI) to complete the picture.

TABLE C.1: **Depreciation Rates**

Period	Depreciation Rate	Gross National Saving	Net National Saving
1974-1980	9%	30%	21%
1981-1990	11%	22%	12%
1991-2000	10%	19%	9%
2001-2007	14%	13%	-1%
Pre-Crisis Average	11%	21%	10%
2008-2012	21%	7%	-14%
Total-Period Average	12%	19%	7%

Source: National Accounts