the review of income and wealth

Review of Income and Wealth
Series 64, Number 1, March 2018
DOI: 10.1111/roiw.12258

THE NATIONAL WEALTH–INCOME RATIO IN GREECE, 1974–2013*

BY NIKOLAOS CHARALAMPIDIS

Department of Economics, University of University of California, Irvine

Can the rise of wealth–income ratios observed in rich economies be found in the case of Greece as well? This paper uses a generalization of a two-good wealth accumulation equation to estimate the evolution of the national wealth–income ratio, and finds that, similarly to the European evidence, the ratio rises from about 280 percent in the 1970s to about 500 percent on the eve of the current financial crisis. On average, during 1974–96, the saving-induced wealth growth cancels out the capital losses, whereas in the subsequent decade, 1997–2007, the balance changes considerably when the saving effect vanishes and the prolonged capital gains result in a rising wealth–income ratio. During the recession, income falls faster than wealth. The results remain robust to several alterations of the benchmark framework.

JEL Codes: E21, E22

Keywords: Greece, foreign wealth, saving, wealth–income ratio

1. INTRODUCTION

A prominent, and recently documented, empirical observation in economics is the gradual rise of aggregate wealth–income ratios[1] since the 1970s from about 200–300 percent to 400–600 percent in the rich economies (Piketty, 2014; Piketty and Zucman, 2014). Existing evidence shows a U-shaped long-run evolution of wealth–income ratios since the 19th century, implying a strong comeback of capital, and shedding light on the structure of lifetime inequality (Piketty, 2011) and the balanced growth path—a central topic since the growth models of Harrod (1939), Domar (1947), and Solow (1956)[2]. This evidence calls for a further investigation of the existence of that regularity in other economies. The present paper

**Note*: I am deeply grateful to Thomas Piketty and Stergios Skaperdas for their guidance and advice. I have benefited greatly from the helpful comments and suggestions of two anonymous referees, Panos Tsakloglou, Emmanuel Saez, Gabriel Zucman, Pierre-Olivier Gourinchas, and seminar participants at University of California, Irvine and at the Centre of Planning and Economic Research in Greece. A detailed Appendix with complementary estimates and data analysis accompanies this work. The estimates of the paper feature in the project on global wealth and income disparities, available in the "World Wealth And Income Database." All comments are welcome. Support from the Onassis Foundation, Scholarship Program, is gratefully recognized.

*Correspondence to: Department of Economics, 3151 Social Science Plaza, University of California, Irvine, CA 92697-5100, U.S.A. Email: charalan@uci.edu.

[1]The wealth–income ratio shows the value of aggregate wealth in the economy in terms of years of national income.

[2]In those models, balanced growth implies $\beta=s/g$, where β is the wealth–income ratio, s is the net national saving, and g is the income growth. The constancy of capital-to-output ratio was considered as a *stylized fact* Kaldor (1961), whereas the "knife-edge" prediction of the previous formula for steady growth was recognized by Harrod (1939). β has a prominent place in the Life Cycle Hypothesis as well Modigliani and Brumberg (1954); Modigliani (1986).

investigates whether the rise of national wealth–income ratio can be also documented in the case of another European economy which has been in the eye of the storm during recent years, namely Greece. The profound changes that have taken place in the Greek economy since the 1970s render it a choice of particular interest. From the high inflation of the 1970s and 1980s, the economy started catching up with the European standards in the 1990s and then moved to a prolonged period of prosperity. Currently, it faces an unprecedented recession, with a cumulative reduction of net national income of more than 30 percent from 2009 to 2013.

Survey data show that Greek households were relatively affluent at the onset of the current recession. The private wealth–income ratio of individuals above 50 years old was about *seven* in 2004 (Christelis *et al*., 2009, using data from the Survey of Health, Ageing and Retirement in Europe) and the *median* household was relatively wealthier than the median northern European household (Eurosystem Household Finance and Consumption Survey [HFCS]; see ECB, 2013). According to the 2013 and 2014 Credit Suisse Global Wealth Reports (see Keating *et al*., 2013; Stierli *et al*., 2014), the economy is characterized by medium wealth inequality, with the top decile rapidly falling during 2000–7 but rising during 2007–14[3], and by an increase of more than 10 percent in household wealth in 2013 and 2014 despite the economic recession. During 1957–2010, top incomes exhibit a flat U-shaped evolution (Chrissis and Livada, 2014) while, during 1974–2013, the government shifted to large negative debt structures. The *foreign* wealth, although resembling that of a closed economy in the 1970s, became massively negative on the eve of the financial crisis (−125 percent in 2007; Lane and Milesi-Ferretti, 2001, 2007) due to the persistent current account deficits of the euro era that were not initially considered dangerous (Blanchard and Giavazzi, 2002).

The contribution of this paper is that it provides estimates for the evolution of the *national* wealth–income ratio in the Greek economy since 1974, which intrinsically includes all the above evidence and allows us to draw conclusions in a long-run perspective. The paper studies the wealth evolution by decomposing it into a saving and a relative-price effect. The results of Piketty and Zucman (2014) are based on wealth estimates obtained from national balance sheets compiled by central banks and statistical agencies. Although the *financial* wealth of the Greek economy is available for a limited number of years in the Financial Accounts, national balance sheets have not been compiled so far because of the non-existence of estimates for the value of *non-financial* wealth and, in particular, of housing and physical capital (i.e. residential housing, land, government property, structures, machines, equipment, valuables, etc.)[4]. Thus, it is not possible to proceed by using a methodology as straightforward and fruitful as the one based on national balance sheets. That problem has usually been dealt in other studies by the use of the Perpetual Inventory Method (PIM), which focuses on the formation of *domestic capital* by cumulating past investments (Caselli, 2005;

[3]Keating *et al*. (2013) give considerably larger estimates for Greek household wealth compared to the HFCS.

[4]The only available estimates of government's physical assets are produced by (Kamps, 2006), based on the Perpetual Inventory Method. Those estimates do not include the land owned by the government and the property of the Church; see also IMF (2009) and Appendix A.3 for a discussion of available wealth estimates.

Gourinchas and Jeanne, 2007). Typical applications of PIM consider an one-good model of growth, that is, a model in which the relative price between consumption and capital goods is always constant. In contrast, long-run relative price divergence is studied by Baumol (1967), and is empirically documented in Greenwood *et al*. (1997) and Karabarbounis and Neiman (2014). In the present paper, therefore, I use a generalization of a two-good wealth accumulation equation which takes into account past savings and the relative price of wealth (over the price of consumption goods), defined as a composite price index over various asset price indexes, in order to estimate the evolution of the wealth–income ratio. Contrary to PIM, the wealth accumulation equation allows us to capture two salient features of wealth dynamics: the *national* wealth rather than the domestic capital, and the *capital gains or losses* in the accumulation process. If, in the long run, asset prices move in the same way as the prices of consumption goods, then this setup boils down to the one-good model. It is crucial to account for capital gains in the wealth evolution of the late 1990s and 2000s in rich economies (Piketty and Zucman, 2014, figs. A129–A141). Thus, the empirical approach of this paper is placed between the balance-sheet approach and the PIM. Piketty and Zucman compare their evidence with estimates generated by various forms of the wealth accumulation equation and find that the latter captures the long-run wealth evolution but misses its year-to-year variations.

The main finding is that the national wealth–income ratio in Greece exhibits a rise compatible with the evidence observed in other European economies. The ratio rises from a relatively constant level of 280 percent in the 1970s to about 500 percent on the eve of the current recession. The average wealth-growth rate is 4 percent up to the recession, whereas the subsequent collapse of both asset prices and national saving reduce it to 2.1 percent. In particular, capital losses and income growth counterbalance the large saving effect during 1974–85, resulting in a relatively constant wealth–income ratio. The ratio, then, driven by two stock market booms and a decline in capital losses, rises and stabilizes to a plateau of 350–400 percent until the mid-1990s. After that point, wealth starts to gradually rise to about 500 percent in 2007. In contrast to the previous decades, net national saving falls dramatically after 1999, from 10 percent to about 0 percent, and exerts a negligible impact on the wealth–income ratio. In fact, capital gains, reflecting a general asset price rise in residential housing and the stock market, and the taming of domestic inflation, drive the wealth rise in that period. During the recession, the ratio initially declines, then remains to a lower plateau and, finally, exhibits a small rise. This behavior seems to contradict the negative saving rate and the asset price collapse of that period, but it emanates from the large decline in the denominator of the wealth–income ratio. Put differently, capital losses and negative saving do decrease aggregate wealth, but the decrease in wealth is smaller than the drop in national income.

Capital gains during the stock market booms (1987, 1990, 1999) and the first part of the euro era exert a considerable influence on the short-run fluctuations of wealth. Over the entire period (1974–2013), however, their influence on wealth evolution weakens due to the capital losses of the 1970s and 1980s, and of the current recession. Therefore, in the long run, the saving effect accounts for the largest part of the Greek wealth evolution. Lastly, the long-run differential between

wealth and income growth is about 1.4 percent. A thorough sensitivity analysis shows that the rise of wealth–income ratio remains robust across alternative specifications. Although the paper does not decompose national wealth across institutional sectors, it does decompose the part of it that is allocated in the rest of the world to examine Greece's foreign wealth. Although the latter is largely negative, household foreign wealth is positive and about 20 percent of national income in 2005. In particular, household foreign wealth, although severely hit by the global financial crisis, quickly returns to the pre-crisis level in 2011. Between 1997 and 2012, the economy opens up to the international financial markets and both aggregate foreign assets and liabilities triple; assets increase from about 50 percent to 150 percent, whereas liabilities rise from about 80 percent to 300 percent, reflecting the indebtedness of the government and corporations.

The paper is organized as follows. Section 2 describes the methodology used in the construction of the accumulation equation. Section 3 presents and decomposes the benchmark estimates, and shows a cross-country comparison. Section 4 conducts the sensitivity analysis. Section 5 concludes.

2. Methodology and Data

In a world of no relative price difference between consumption and capital goods, the next period's wealth, W_{t+1}, equals the sum of accumulated wealth and current net national savings, S_t, to wit: $W_{t+1}=W_t+S_t$. Only savings *net of depreciation* contribute to the rise of wealth, that is, the resources required to compensate for the wear and tear of the existing capital have already been subtracted. Although estimates based on that equation appear in the sensitivity analysis (Section 4), the benchmark approach of this paper considers a model in which consumption and capital goods have a time-varying relative price, that is, *a two-good wealth accumulation model*. In such a model, the evolution of national wealth is influenced by two components: a *volume effect* stemming from the addition of new savings and a *relative price effect* stemming from the changes in the price of wealth above the general price level, that is, the real capital gain or loss. I generate estimates for the Greek national wealth–income ratio by cumulating past (net) national savings and pricing them according to a *composite asset price index* which captures the price of wealth by aggregating various asset price indexes corresponding to different forms of wealth (equity, housing, etc.). Let Q_t be the market price of wealth at the beginning of period t, and S_t be the period-t (net) national savings at current market prices for assets; then, the evolution of national wealth is described by

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

Dividing equation (1) by the (nominal) national income at $t+1$, Y_{t+1}, yields

$$\beta_{t+1}=\frac{(1+q_{t+1})(1+g_{ws,t})}{(1+g_{t+1})}\beta_t \tag{2}$$

where $\beta_t \equiv W_t/Y_t$ is the national wealth-to-national income ratio, $s_t = S_t/Y_t$ is the net national saving, $g_{ws,t} \equiv s_t/\beta_t = S_t/W_t$ is the *saving-induced wealth growth rate*, $g_t = (Y_{t+1}/Y_t)/(P_{t+1}/P_t) - 1$ is the *real* growth of national income, P_t is the general price level, and $q_{t+1} = (Q_{t+1}/Q_t)/(P_{t+1}/P_t) - 1$ is the *real-capital-gain/loss-induced wealth growth rate* (i.e. the asset price inflation relative to the price inflation of the consumption good). The wealth–income ratio rises, $\beta_{t+1} > \beta_t$, even when new savings are little with respect to income growth, $s_t/\beta_t < g_{t+1}$, as long as there are significant capital gains, $q_t > 0$. The steady state ratio, $\beta = \frac{(1+q)s}{g-q}$, implies that relative price effects persist in the long run, whereas it boils down to the one-good model, $\beta = s/g$, if $q = 0$. Equation (2) is an accounting identity that holds independently of saving motives and preferences. It is a first-order difference equation which generates the evolution of β_t given an initial value and the series for $g_{ws,t}, q_t$ and g_t. The following three subsections explain the data, the construction of the composite index, and how I obtain an initial value.

Data are taken from national sources; a thorough description of them and of the way they were collected is pursued in the Appendix (A.1–A.7). Briefly, data on financial assets are obtained from the 1997–2013 Financial Accounts compiled by the Bank of Greece (BoG)[5]. The Housing Price Index and the CPI are also obtained from the same source. National Accounts data cover the period from 1974 to 2013 and are obtained from the Hellenic Statistical Authority (ELSTAT). Post-2000 data are collected from electronic sources, whereas the 1974–99 data are hand-collected from the physical publications of National Accounts[6]. Therefore, an investigation over the long run is allowed. All data are in current market prices[7] and exhibit continuity in general. Some breaks that are detected reflect data revisions which have not been extended backwards and are recognized in the guidelines provided by ELSTAT. They are not expected to influence the results because in the accounting framework of this study, all variables are expressed as ratios to national income. The breaks, however, affect the growth rate of (net) national income and I correct for them[8]. For net national saving, the sum of net saving of all institutional sectors—households, NPISH, corporations, government; item code B.8n, ESA 2010 (see Eurostat, 2013)—and net capital transfers from abroad is used[9]. The latter is included because it contributes to capital accumulation—its size, however, is rather small (1–2 percent of national income). Table 1 summarizes the main data. Inflation declines from 18 percent in the 1970s

[5]I thank N. Philippas for sharing his data on the historical returns of the Athens Stock Exchange index.

[6]Scanned versions are available at www.elstat.gr. The reliability of the Greek national accounts is a concern. In particular, inaccurate measurement of the public deficits might have led to fictitiously higher public and, in turn, national savings. ELSTAT has recently embarked upon a process of revising all the post-1995 data. I use the most recent ones, and compare them with data from international sources in the Appendix.

[7]Pre-euro data are converted to euro according to the fixed exchange rate of the day of its introduction.

[8]The breaks occur in 1988, 1995, 2000, 2005, and 2006. I smooth the series simply by taking the (arithmetic) average of the nominal growth rates in the year after and the year before each break.

[9]Depreciation is another concern when net figures are used. Typically, statistical authorities estimate depreciation using micro-data on age–price, age–efficiency, and retirement profiles. Following the guidelines of the OECD, ELSTAT recently started using a geometric pattern. I show the series for depreciation in the Appendix.

TABLE 1
SUMMARY STATISTICS OF THE GREEK ECONOMY

Period	Real Growth, Net National Income	Net National Saving*	Inflation	Athens Stock Exchange Index	Housing Price Index
1974–85	1.9%	18.3%	18.0%	−4.2%	–
1986–96	0.5%	11.1%	14.9%	26.4%	–
(1986–90, 1991–6)	(−0.3%, 1.2%)	(11.1%, 11.1%)	(17.4%, 12.9%)	(67.4%, 0.0%)	(–, 9.5%)
1997–2007	3.5%	3.6%	3.6%	16.9%	9.9%
(1997–2001, 2002–7)	(3.6%, 3.4%)	(7.5%, 0.3%)	(3.9%, 3.3%)	(22.7%, 12.2%)	(11.6%, 8.5%)
1974–2007	2.0%	11.2%	12.0%	12.3%	9.8%
2008–13	−6.6%	−9.9%	2.3%	−22.0%	−6.0%
All-period: 1974–2013	0.6%	8.0%	10.4%	6.1%	4.6%

Source: National Accounts.
Notes: The table shows geometric averages. *Augmented with Net Capital Transfers from abroad and expressed as a percentage of net national income; arithmetic mean.

to 15 percent during 1986–96 and to 3.6 percent after 1997. Income growth declines from 1.9 percent to 0.5 percent and then rises to 3.5 percent. National saving declines from 18.3 percent to 11.1 percent and then to 3.6 percent. During the recession, growth and saving become negative, while inflation drops to 2.3 percent.

The use of a *composite asset price index* allows the updating of the market value of wealth via appropriately weighted individual asset price indexes. Ideally, we would like to have the allocation of both current wealth and savings across asset classes in order to *choose* the relevant price indexes and *weight* them accordingly. Had we had that amount of information for the asset portfolio of the country, we would not need to estimate β in the first place. I use a rather standard composite price index in which its (gross) nominal return, Q_{t+1}/Q_t, is defined as the weighted sum of the (gross) returns of the various asset price indexes, $P_{i,t+1}/P_{i,t}$, where $P_{i,t}$ stands for the individual asset price index i which is weighted by $w_{i,t}$[10]:

$$\frac{Q_{t+1}}{Q_t} = \sum_i w_{i,t} \left(\frac{P_{i,t+1}}{P_{i,t}} \right). \tag{3}$$

To fix ideas, recall that national wealth can be defined as the sum of domestic *physical* capital, K_t, and net foreign asset position, $NFAP_t$ (Eurostat, 2013 pp. 274, 407; Piketty and Zucman, 2014, p. 10): $W_t = K_t + NFAP_t$. K_t includes housing, agricultural land, and other domestic capital (i.e. the market value of corporations and other non-financial capital). I consider five asset price indexes that broadly capture the price evolution of the above asset categories: (i) the Housing Price Index (HPI) for housing assets; (ii) the Athens Stock Exchange index (ASE) for assets with returns similar to the returns of equity assets; (iii) the CPI to capture the prices of machines, equipment, public physical capital, and so

[10]For a discussion on the construction of composite asset price indexes, see Arthur (2005).

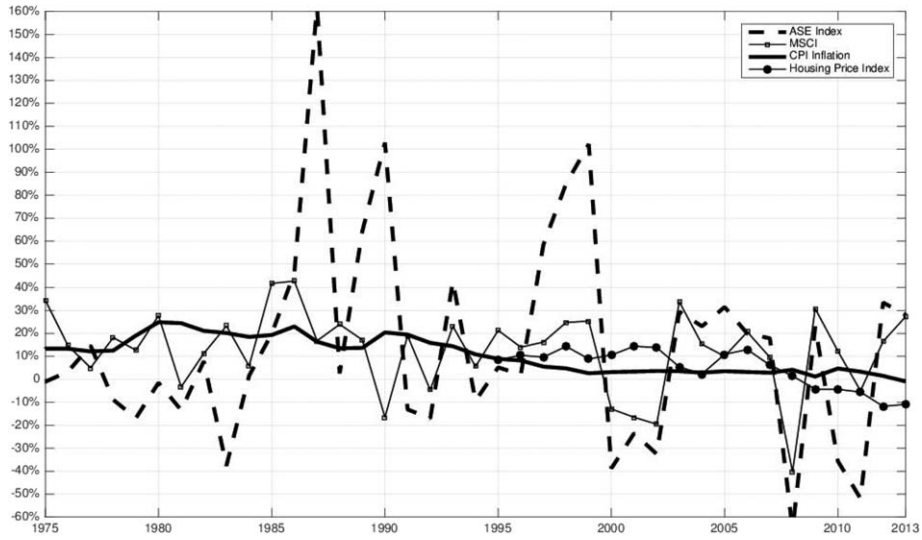

Figure 1. Asset Price Indexes

Notes: See Methodology and Data.

on ("*CPI-type assets*"); (iv) the MSCI World (i.e. a global equity index maintained by MSCI Inc.) for assets held abroad; and (v) a price index (denoted by "*CP*") that is constant and equal to unity in all periods to capture nominal assets characterized by constant nominal price and zero nominal returns, such as debt priced at face value, money holdings, and checking accounts. These choices largely follow the suggestion of Piketty (2011). In Figure 1, the stock exchange index is the most volatile; its peaks in 1987, 1990, and 1999 reflect stock market booms. The foreign equity index follows, to some extent, the same evolution with the domestic equity price index but its fluctuations are smoother. The housing price index starts in 1994 and exhibits returns as high as 10 percent up to the current recession (Table 1).

The construction of the *time-varying weights* $w_{i,t}$ in equation (3) is challenging because there is no optimal way to choose them and, hence, the paper is susceptible to critique in that respect. According to (Piketty, 2011, appendix, p. 56), attributing 30 percent on an equity index, 30 percent on a housing index, 20 percent on CPI, and 20 percent on assets held at nominal prices forms a composite index which generates an evolution for the French private wealth that approximates the actual one. Instead of using the time-invariant weights found to work in the case of France[11], I use the Financial Accounts (FA) and residential investment data from national accounts in order to construct *smooth* time-varying weights in the way explained in detail below. In particular, by regrouping the various asset classes of the FA into five categories, I obtain the share of (the stock of) financial assets of each category in (the stock of) total assets. Additionally, I use

[11]Which would imply that the composition of national wealth in Greece is the same as in France.

the share of residential investment in aggregate investment, but because that share is based on flow data, rather than on stocks, it tends to be volatile and, hence, I take its cumulative mean (starting in 1974) which exhibits a smoother evolution. The assumption is that the evolution of the various shares of assets and of the share of residential investment provide information on which asset price indexes, from the available five, should be weighted more or less. I finally combine those shares in the way explained below to obtain smooth time-varying weights. Then, I subject this approach to a battery of sensitivity tests to investigate whether, and by how much, it influences the results. The alternative series remain close to the benchmark one. Moreover, in Appendix C, I use exactly the same approach to construct time-varying weights based on French data, and compare the estimated French wealth–income ratio from a two-good wealth accumulation equation to the ratio observed in the French national balance sheet. The comparison suggests that the accumulation equation performs reasonably well over long periods in the sense that the estimated long-run wealth evolution and its characteristics (saving and relative price effect) approximate the national balance sheet evidence satisfactorily. In the short run, the two approaches predict wealth fluctuations of the same sign but of a different magnitude in some years.

Methodologically, I first assume that the weight on the housing price index should in general depend on the share of residential investment in aggregate investment at time t, denoted by $\hat{z}_t$. That is, if in a year there is an increase in residential investment, then the composite index Q_t should allocate a higher weight to the housing price index[12]. The share $\hat{z}_t$ fluctuates between 20 percent and 40 percent and in order to smooth its evolution I take the cumulative mean of that share, denoted by z_t, from 1974 up to every subsequent year t, to wit: $z_t=(1/(t-1974))\sum_{j=1974}^{t}\hat{z}_j$, where $t\in[1974,2013]$. Both z_t and $\hat{z}_t$ are shown in the right panel of Figure 2. Assuming that the weight on HPI is z_t, then the weights on the rest indexes should add up to $(1-z_t)$. Second, I use FA data. Given the five asset price indexes at hand, I classify the various gross assets of the FA (not net of liabilities[13]) into five categories according to which of the available five asset price indexes best approximates the returns of each individual asset of the FA. Therefore, I assume that the returns of listed, unlisted, and investment fund shares are aligned with the returns of the ASE index; the returns of debt and loans are aligned with the returns of the HPI; the returns of gold, SDRs, and deposits are aligned with the returns of the CPI; the returns of currency and other accounts receivable are zero; and the returns of all foreign assets are aligned with the returns of the MSCI. This assumption is used to categorize the various assets into five categories—the grouping is shown in the first two columns of Table 2. Then, I obtain the share, $s_{i,t}$, of each of those asset categories (indexed by the

[12]To illustrate the underlying rationale of this step, consider an accumulation equation for housing capital, $K_{h,t+1}=(1-\delta_h)K_{h,t}+I_{h,t}$, and another one for aggregate capital, $K_{t+1}=(1-\delta)K_t+I_t$, where $I_{h,t}$ is residential investment, I_t is total investment, $K_{h,t}$ is housing capital, K_t is aggregate capital, δ_h is depreciation of housing capital, and δ is aggregate depreciation. Taking their ratio in steady state yields: $\frac{K_h}{K}=\frac{I_h}{I}\times\frac{\delta}{\delta_h}$. As a first approximation, we can assume $\delta_h\approx\delta$. Then, the share of housing in aggregate capital equals the share of residential investment.

[13]I do not consider net assets because resident-to-resident financial assets and liabilities cancel out at the national level and, thus, I would end up taking shares of foreign assets over the NFAP which do not provide any information on how to weight domestic indexes such as the HPI, CPI, and ASE.

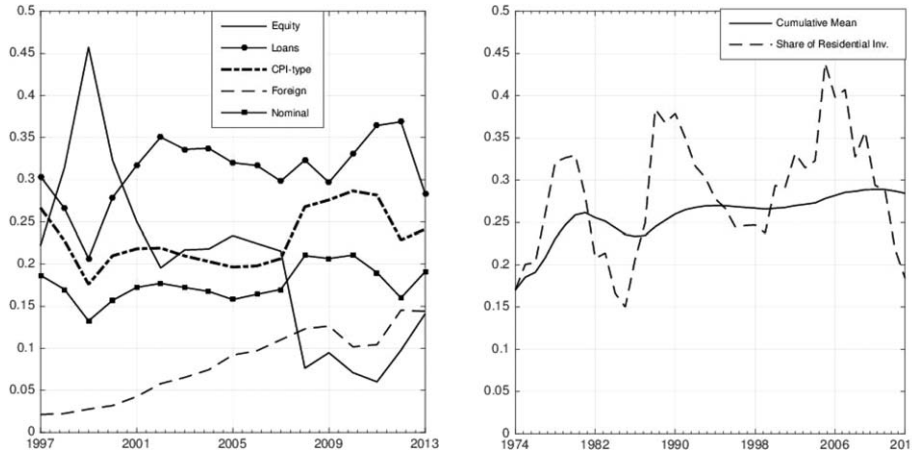

Figure 2. Asset Classes and Residential Investment

Left panel: the share of the (gross) assets of each asset category in aggregate (gross) assets. See Table 2 for the grouping. *Right panel*: the share of residential investment in aggregate investment, and its cumulative mean, starting in 1974.

Sources: Financial Accounts, 1997–2013, and National Accounts, Greece.

corresponding asset price index i, for $i=\{\text{HPI, ASE, MSCI, CPI, CP}\}$) in aggregate gross assets. Figure 2 shows the evolution of those shares. The share of equity assets skyrockets in the 1999 stock market boom and falls dramatically after 2007; the share of loans fluctuates between 25 percent and 35 percent; the share of CPI-type assets is between 20 percent and 25 percent; the share of nominal assets is between 15 percent and 20 percent; and the share of foreign assets steadily increases, reflecting the openness of the economy. An increase in share $s_{i,t}$ of asset category i indicates an increase in the importance of that category's assets in the economy and, thus, the composite price index Q_t should allocate a higher weight to the asset price index to which the returns of the asset category i are best aligned.

To capture the above rationale, I define the weights of the composite index as follows: for the ASE index $w_{\text{ASE},t}=s_{\text{ASE},t}\times(1-z_t)$, for the CPI index $w_{\text{CPI},t}=s_{\text{CPI},t}\times(1-z_t)$, for the MSCI index $w_{\text{MSCI},t}=s_{\text{MSCI},t}\times(1-z_t)$, and for the constant prices $w_{\text{CP},t}=s_{\text{CP},t}\times(1-z_t)$. Note that I assume that the returns of loans are aligned to the returns of the housing price index. Therefore, the final weight on HPI should reflect the importance of both residential investment and loans in the economy. Thus, the weight is defined as $w_{\text{HPI},t}=s_{\text{HPI},t}\times(1-z_t)+z_t$, in order for the weights $w_{i,t}$ to add up to unity[14]. The resulting 1997–2013 average weights, $w_{i,t}$, on the five asset price indexes are: 15 percent on ASE, 50 percent on HPI, 17 percent on CPI, 13 percent on constant prices, and 6 percent MSCI (Table 2). The evolution of the constructed weights is reported in the left panel of Figure 3. The

[14]For the 1974–96 period in which the Financial Accounts are not available, I use as a share of each asset category the share that the same category has in the first year of available observations (1997).

TABLE 2
CLASSIFICATION OF ASSETS AND TIME-VARYING WEIGHTS

Asset Classes and Price Indexes	Asset Class of Financial Accounts	Benchmark Time-Varying Weights (Mean, SD)	
		1974–2013	1997–2013
Equity assets, Athens Stock Exchange Index	Listed shares (F511 S1) Unlisted shares and other equity (F512 + F519 S1) Investment fund shares (F52 S1)	0.16 (0.05)	0.15 (0.08)
Housing, Index of Prices of Dwellings, Bank of Greece	Short-term debt securities (F31 S1) Long-term debt securities (F32 S1) Short- and long-term loans (F41 S1, F42 S1) Financial derivatives and employee stock options (F7)	0.49 (0.03)	0.50 (0.03)
CPI-type assets, CPI, ELSTAT	Monetary gold and special drawing rights (F1) Insurance, pensions, and standardized guarantees (F6) Half of currency and deposits (F2 S1 and S2)	0.19 (0.02)	0.17 (0.02)
Nominal assets, constant prices	Half of currency and deposits (F2 S1 and S2) Other accounts receivable (F8)	0.14 (0.01)	0.13 (0.01)
Foreign assets, MSCI World, Morgan Stanley	Foreign assets in loans, debt, listed and unlisted shares, and investment fund shares (F31 S2, F32 S2, F41 S2, F42 S2, F511 S2, F512 + F519 S2, F52 S2)	0.03 (0.03)	0.06 (0.03)

Notes: The housing price index starts in 1994; I substitute it with CPI for 1974–1993.

weight on housing prices rises from about 42 percent in 1974 to 50 percent in 2013. The weight on the stock market index peaks in 1999 and declines after 2007. The weights on CPI and constant prices are relatively stable across the whole period. The weight on MSCI remains close to zero until 1999, when it starts to rise steadily. The real returns (above CPI) of the resulting composite asset price index, Q_t, are plotted in the right panel of Figure 3. Capital losses take place during the 1970s, most of the 1980s and 1990s, and the current recession, whereas capital gains occur during the stock market bubbles (1987, 1990, and 1999) and the early euro period.

To *initialize the recursion* in equation (2), a value for the wealth–income ratio in 1974, β_{1974}, is required. By definition, the capital income share, α_k, satisfies $\alpha_k = \frac{Y_k}{Y}$, where the national capital income, Y_k, is the product of the aggregate return, r, and the national capital, K: $Y_k = rK$. By straightforward manipulation and using $\beta \equiv \frac{W}{Y} \equiv \frac{K}{Y}$, the following accounting identity is obtained: $\alpha_k = r\beta$. The wealth–income ratio is positively associated with the capital share but inversely related to the aggregate return. In order to compute β_{1974}, I calibrate a steady state r and estimate the 1974 capital share, α_k, from national accounts data.

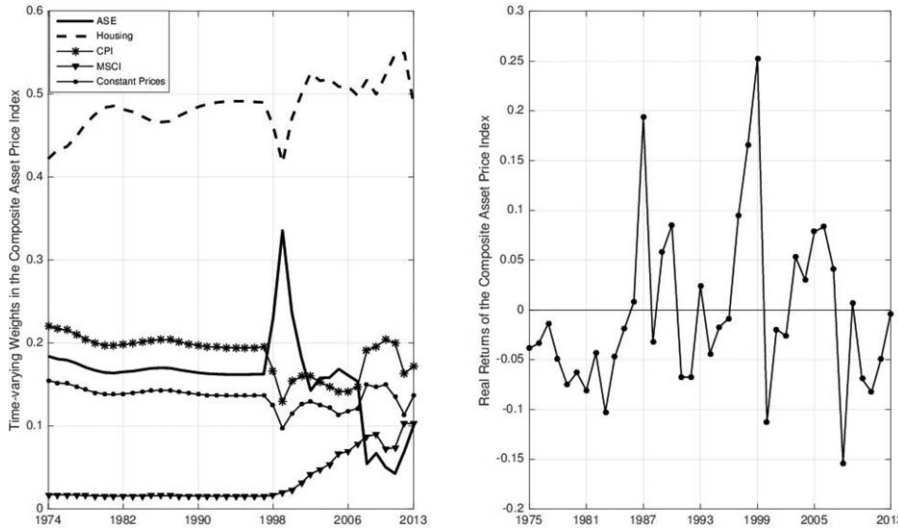

Figure 3. Time-Varying Weights and Real Returns, Composite Asset Price Index Q_t

Left panel: constructed weights for the composite price index. *Right panel*: real returns (above CPI) of the composite price index.

Source: Author's computations, based on data from National and Financial Accounts.

The interest rate is calibrated based on the Euler equation at the balanced growth path of the typical Dynastic model, with a representative agent maximizing lifetime CES utility under perfect foresight in perfectly competitive markets: $r=(1+\rho)(1+g)^{\sigma}-1$, where g is the growth rate of income, σ is the inverse of the Inter-temporal elasticity of substitution, and ρ is the discount rate. In the calibration, I use the 1959–2013 real average growth rate of national income (2.47 percent), $\sigma=2$, and $\rho=1.5$ percent. The resulting interest rate is $r=6.57$ percent. Gollin (2002) discusses various ways to estimate labor and capital income shares. The labor share is estimated based on the method that assumes the same average wage across employees and self-employed in order to decompose the *mixed* income from self employment and agriculture to a capital and a labor component. This assumption *prima facie* seems extreme in a developed economy, but for Greece in the 1970s—an economy with 80 percent of its production being consumption goods and 11–15 percent being low-technology capital goods from the 1950s and up to the 1980s (see Germidis and Negreponti-Delivanis, 1975)—it might not be far-fetched. Using labor data from the Population Censuses of 1971 and 1981[15],

[15]For the 1974 observation, I interpolate using a linear function. In addition, I exclude unpaid workers (those employed at home or in a family business) and people under 19 years of age because for those categories a wage would not have been registered since population censuses at that time used only a loose concept of employment in the week before the census for someone to be considered as employed. Excluding only unpaid workers, gives a capital share of 22 percent. In the sensitivity analysis, I show that such small differences in the starting point do not exert a significant influence on the path of wealth.

the share of employees in the labor force (employees, employers, and self-employed), e_l, is computed at 46.5 percent and, then, its inverse is multiplied by the wage bill to yield the total labor income in the economy. The latter is divided by national income to yield the labor share α_l: $\alpha_l = \frac{\text{Wage Bill} * (1/e_l)}{\text{National Income}}$. The

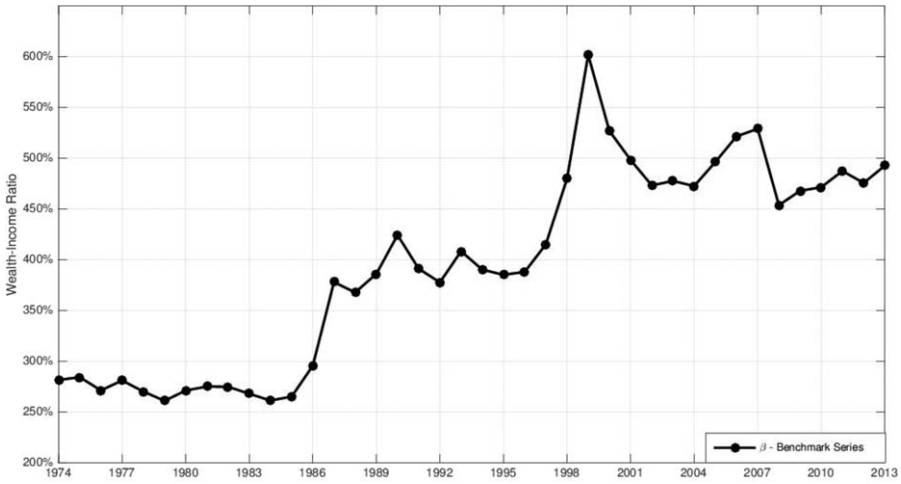

Figure 4. National Wealth–Income Ratio, Greece 1974–2013

Source: Author's computations, based on a two-good wealth accumulation equation, $\beta_{t+1} = (1+q_{t+1})(1+g_{ws,t})/(1+g_{t+1})$. For methodological details and data sources, see Methodology and Data.

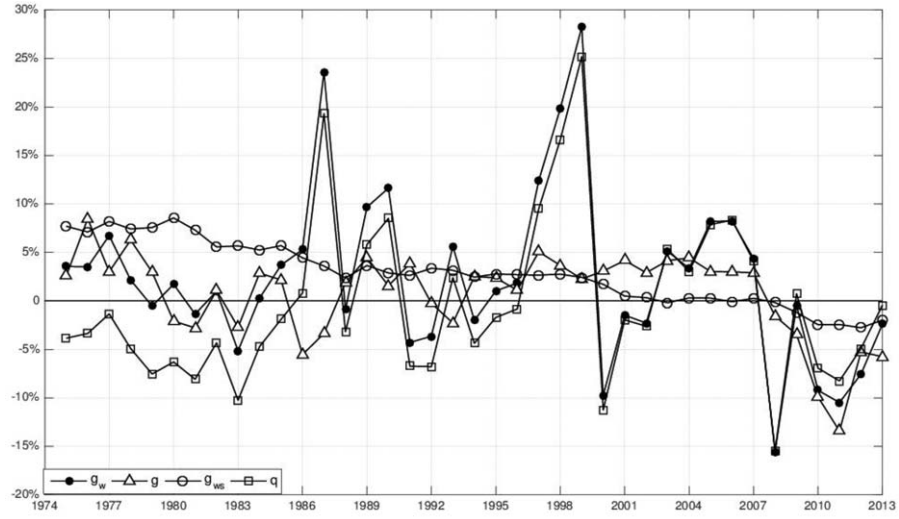

Figure 5. Decomposition of National Wealth–Income Ratio Growth, 1974–2013

Notes: Real wealth growth $\equiv g_{w,t+1} \equiv (W_{t+1}/P_{t+1})/(W_t/P_t) - 1 \approx q_{t+1} + g_{ws,t}$. Wealth–income ratio growth rate $\equiv \beta_{t+1}/\beta_t - 1 \approx q_{t+1} + g_{ws,t} - g_{t+1}$.

Source: Author's computations, based on a two-good wealth accumulation equation, $\beta_{t+1} = (1+q_{t+1})(1+g_{ws,t})/(1+g_{t+1})$.

TABLE 3
DECOMPOSITION OF WEALTH GROWTH, 1974–2013

		Decomposition of 1974–2013 Wealth Growth Rate			
	Wealth–Income Ratio at the Beginning of the Period	Real Growth Rate of Wealth	Real-Capital-Gain/Loss-Induced Wealth Growth Rate	Saving-Induced Wealth Growth Rate	Average Excess Growth Rate of Wealth over Income
Period	β_t	$g_{w,t}$	q_t	$g_{ws,t}$	$g_{w,t}-g_t$
1974–85	281%	1.4%	−5.2%	6.9%	−0.6%
1986–96	295%	4.1%	0.9%	3.1%	3.4%
(1986–90, 1991–6)	(295%, 391%)	(9.6%, −0.3%)	(6.0%, −3.1%)	(3.4%, 2.8%)	(9.6%, −1.6%)
1997–2007	415%	6.5%	5.4%	1.0%	2.9%
(1997–2001, 2002–7)	(415%, 527%)	(9.0%, 4.4%)	(6.8%, 4.3%)	(2.0%, 0.2%)	(5.3%, 1.0%)
1974–2007	281%	4.0%	0.3%	3.7%	1.9%
2008–13	454%	−7.7%	−6.0%	−1.8%	−1.3%
All-period: 1974–2013	281%	2.1%	−0.7%	2.8%	1.4%

Notes: Author's computations based on a two-good wealth accumulation equation.

resulting capital share at 18.5 percent implies that capital was relatively scarce and a high wealth–income ratio should not be expected. Bernanke and Gurkaynak (2002), using the same technique, obtain a compatible estimate for the average 1980–95 capital income share at 14 percent[16]. For $r = 6.57$ percent and $\alpha_k = 18.5$ percent, β is 281 percent in 1974 and lies above the wealth–income ratio in Italy in 1970, but below those in France and Germany (Table 4).

3. National Wealth–Income Ratio

Figure 4 shows the benchmark estimate for the evolution of β and Figure 5 depicts the decomposition of real wealth growth, $g_{w,t+1} = (W_{t+1}/P_{t+1})/(W_t/P_t) - 1$, to *saving-induced* wealth growth, $g_{ws,t}$, and *real-capital-gain/loss-induced* wealth growth, q_{t+1}. Table 3 summarizes the evidence. The main observation is that the wealth–income ratio rises from about 200–300 percent in the early 1970s to 400–600 percent on the eve of the current recession.

[16]In contrast, Feenstra *et al*. (2015) estimate α_l at 52 percent assuming the same labor-capital mix in the income of the self-employed as in the rest of the economy. Undoubtedly, the method used in this paper tends to raise concerns about overstating the labor share in less developed economies in which the average wage of employees differs substantially from the wage of self-employed. In such cases, the group of self-employed involves more street traders than owners of private unincorporated businesses. Feenstra *et al*.'s 52 percent, however, seems to understate the labor share for the following reasons. First, conventional wisdom considers labor shares of about 70 percent in the rich economies (Gollin, 2002; Caselli, 2005). Second, extending the approach of Feenstra *et al*. to include the 1974 agricultural income yields $\alpha_l = 89.6$ percent, which is close to the 81.5 percent. Finally, a labor share of 52 percent would lead to a β above 700 percent in 1974, which is very unrealistic with respect to what is observed in the rich economies of that time. See also Appendix A.9.

TABLE 4
Cross Country Comparison of Wealth Growth, 1970

		Decomposition of 1970–2010 Wealth Growth Rate			
	National Wealth–Income Ratio in 1970 and 2010	Real Growth Rate of Wealth	Real-Capital-Gain/Loss-Induced Wealth Growth Rate	Saving-Induced Wealth Growth Rate	Average Excess Growth Rate of Wealth over Income
Country	β_t	$g_{w,t}$	q_t	$g_{ws,t}$	$g_{w,t}-g_t$
Greece*	(281%, 471%)	2.8%	−0.4%	3.3%	1.4%
Italy	(259%, 609%)	4.1%	1.5%	2.6%	2.2%
France	(351%, 605%)	3.6%	0.9%	2.7%	1.4%
Germany	(313%, 416%)	2.7%	−0.4%	3.1%	0.7%
U.K.	(314%, 523%)	3.5%	2%	1.5%	0.9%
U.S.A.	(404%, 431%)	3%	0.8%	2.1%	0.2%

Notes: *For Greece the time period is 1974–2010.
Sources: The estimates for Italy, France, Germany, the U.K., and the U.S.A. are obtained from Piketty and Zucman, 2014, Tables 5 and A99.

In fact, β exhibits four distinct phases: β is roughly 280 percent in 1974, and remains at that level up to the mid-1980s; it then quickly rises and stabilizes to a plateau of 380 percent; after 1996 and up to the current recession, significant capital gains allow for wealth to soar above 500 percent; during the economic recession, β declines, and after a few years of stability it exhibits an upward trend.

In the first phase, 1974–84, β remains relatively stable. The capital losses of 5.2 percent (Table 3), along with the income growth of 1.9 percent, cancel out the impact of the large saving-induced wealth growth of 6.9 percent (Table 3), which reflects the saving rates of 15–20 percent (Figure 6). As a result, real wealth growth, g_w, oscillates around zero. The picture changes during 1985–96. Two stock market booms in 1987 and 1990, with nominal returns on equity skyrocketing above 100 percent (Figure 1), raise the wealth–income ratio to about 380 percent. Note that the first stock market boom is *not* followed by a bust at all, whereas the second one is followed by only a modest one. These features play a key role in stabilizing β to a higher plateau. The third phase, 1997–2007, is characterized by fundamental changes in the economy and the wealth dynamics. The economy grows with a rate of about 3.5 percent, catches up with European standards, enters the monetary union, and fully opens up to the international financial markets. Optimism and euphoria are widespread. β rises, but this time the rise is gradual and prolonged over a decade. Changes in the driving forces of wealth evolution take place as well. That is, the rise of β is not driven by the saving effect, which vanishes during that period ($g_{ws} \approx 0$, Figure 5), but by capital gains ($q \approx 5.4$ percent, Table 3). As can be seen in Figure (6), the frugality of the 1970s to early 1990s disappears and the national saving rate drops from 20 percent in the 1970s to 10 percent in the 1980s to early 1990s and to about 0 percent after 1999. In Appendix A.4, I present evidence showing that this fall was mainly driven by a fall of private saving from 20 percent in 1993 to 2–5 percent in 2000. In contrast to the weakening of the saving effect, a general asset price rise takes place. Inflation is tamed to

Figure 6. Long-Run Net National Saving, Greece 1948–2013

Notes: Net national saving is expressed as a percentage of national income.
Source: National Accounts.

3.6 percent, a stock market boom occurs in 1999, while the subsequent bust of −40 percent (Figure 1) reduces β only to 450 percent—that is, β remains higher than where it was before the boom (400 percent). β remains relatively constant until 2004 when it starts rising again, to reach about 500 percent in 2007. Apart from the stock market gains, and consistently with the evidence observed in other European economies, the general asset price rise is also reflected in a prolonged rise in housing prices (10 percent on average during 1994–2007), which contributes considerably to the rise of β. For instance, during the post-1999 stock market bust, the housing price index exhibits a gain of 10 percent and, hence, dampens down the negative impact of stock prices (Figure 1). Thus, during the 2002–7 period, the real wealth growth of 4.4 percent is driven entirely by the real-capital-gain-induced wealth growth of 4.3 percent, while the saving-induced wealth growth is negligible at 0.2 percent (Table 3). The entire 1997–2007 period is very similar; real-capital-gain-induced wealth growth (5.4 percent) accounts for almost all wealth growth, while saving-induced wealth growth is rather small.

During the last phase, 2008–13, which includes the current economic recession (2009 is the first year of negative income growth), the 2008 stock market collapse (−80 percent) drives β down. β remains relatively constant for a few years and then exhibits a modest rise. This rise should not come as a surprise, for it shows that wealth matters relatively more given the unprecedented decline in income. It does not imply that the *real value* of wealth is rising. On the contrary, in Figure 5, g_w, led by capital losses ($q = -6$ percent) and dissaving ($g_{ws} = -1.8$ percent), is negative during the post-2008 period. The wealth–income ratio rises in later years because the sum of g_{ws} and q lies

above the post-2009 income fall[17]. That is, the denominator of β falls faster than the nominator. In addition, in the midst of the recession (2009, 2012, and 2013), the stock market, driven by speculation and the performance of foreign stock markets, exhibits capital gains which affect β positively.

The average 1974–2007 real wealth growth of 4 percent is mainly driven by the saving effect (3.7 percent). Including the current crisis reduces g_w to 2.1 percent, with the saving effect still exerting a larger influence than the price effect, with that influence, however, being weakened considerably during 1997–2007. The relative price effect, on the other hand, dominates in the years of the stock market booms and during 1997–2007, but nets to zero (0.3 percent) in the pre-crisis period and turns slightly negative (-0.7 percent) when the current recession is included. Therefore, asset price fluctuations exert a significant influence on the evolution of Greek wealth in the short run, but the long-run evolution of β cannot be understood without considering the behavior of saving. To shed further light on the role of saving-induced wealth growth, Figure 6 presents the long-run evolution of (net) national saving in Greece since 1948[18]. After the end of World War II, the net national saving rate is close to 0 but quickly rises to about 10–15 percent in the 1950s, remains at that level throughout the 1960s, and even exceeds 20 percent in the 1970s. Since then, it declines and stabilizes to 10 percent only in the mid-1980s. After 1999, it drops dramatically to about 0–2 percent and goes significantly below zero after 2007. Therefore, the resulting large value of g_{ws} keeps β relatively constant in the 1970s and 1980s in spite of the capital losses, but its influence weakens after 1999 when saving declines substantially. By the same token, are the Greek wealth estimates relevant with respect to the European and U.S. evidence? Table 4 shows that this is indeed the case. In the early 1970s, the wealth–income ratio is close to, but lower than, what is observed in the rich economies, most likely reflecting the fact that the economic, political, and social conditions after World War II in Greece did not allow the accumulation of capital. The rise of β and its level in 2010 are comparable to the European evidence—it would seem odd for β to be higher than the β's in the European economies given the large negative NFAP of Greece in 2010 (-125 percent). The decomposition of wealth evolution is also comparable across countries (Table 4): wealth growth is between 2.7 percent and 4.1 percent, saving-induced wealth growth is between 1.5 percent and 3.3 percent, while long-run capital-gain/loss-induced wealth growth is close to zero in most economies. Note that the 1974–2010 saving effect is the largest in Greece. The average differential between wealth and income growth, at 1.4 percent, is close to the evidence found in the other economies.

To elaborate further on the evolution of Greek wealth, I now focus on the part of national wealth that is allocated in the rest of the world—that is, *foreign* wealth (or, equivalently, net foreign asset position). As was mentioned earlier in the introduction, foreign wealth is usually a small part of national wealth in rich economies, but for the Greek economy its evolution exhibits a large change. To

[17]A positive excess growth rate of wealth over income (last column, Table 3) should be observed during 2008–13. The rate of -1.3 percent, however, is driven entirely by the 2008 wealth growth being much lower than the 2008 income growth, whereas in the rest of the years, that is 2009–13, wealth growth lies above income growth (Figure 5).

[18]For private and government saving, and a cross-country comparison, see Appendix A.5.

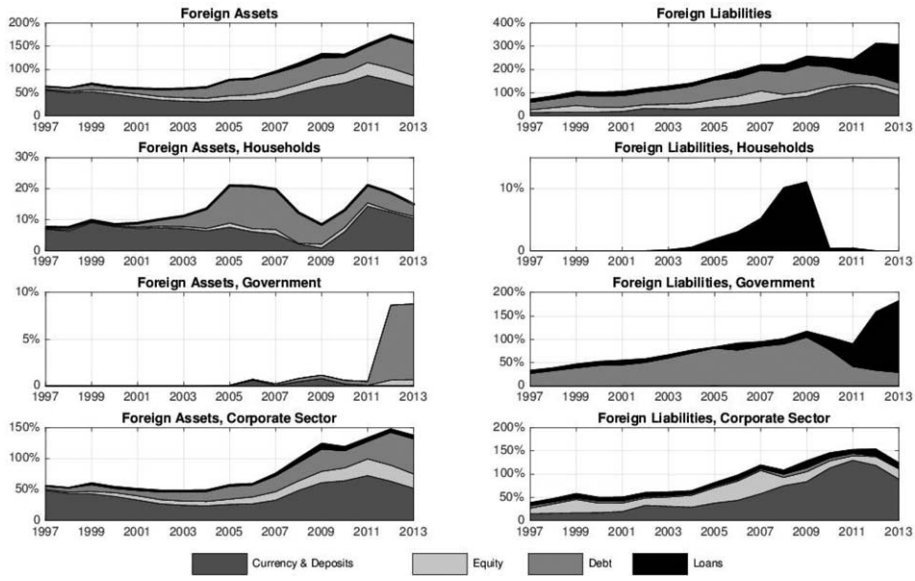

Figure 7. Decomposition of Foreign Wealth, Greece 1997–2013

Notes: "Currency and deposits" includes foreign currency and deposits and monetary gold and SDRs. "Equity" includes foreign listed and unlisted shares, other equity, and investment fund shares. "Debt" includes foreign short- and long-term debt securities. "Loans" includes foreign short- and long-term loans. From the calculations, I exclude insurance, pensions, and standardized guarantees, other accounts receivable/payable, financial derivatives, and employee stock options vis-à-vis the rest of the world, because only net positions are shown in the FA—these categories are small.

Source: Author's computations, based on data from the Financial Accounts.

that end, I use the Financial Accounts to decompose foreign wealth across institutional sectors (households, government, and corporations) and across asset classes (equity, debt, loans, currency, and deposits; for the categorization of assets, see the notes in Figure 7). Several insights are obtained. The evidence in Figure 7 shows that both aggregate foreign assets and liabilities as percentages of national income have tripled since 1997, reflecting the openness of the economy to the international financial markets. Foreign assets increase from about 50 percent in 1997 to 160 percent in 2012, driven by an increase in households' foreign assets from about 10 percent to 20 percent and an increase in corporate foreign assets from about 50 percent to 150 percent. Interestingly, households' foreign wealth, although severely hit by the global crisis in 2008–9, quickly returns to the pre-crisis level in 2011. The return is marked by an increase of foreign deposits—that is, low-return assets—by a factor of nearly five, which reflects capital outflows from Greece under the fear of a bankruptcy. The crisis increases only temporarily the foreign liabilities of households in terms of loans. Therefore, although country's foreign wealth is negative, household foreign wealth is positive and of a significant magnitude (about 20 percent). On the other hand, the increase of foreign liabilities from about 80 percent to 300 percent is characterized by the indebtedness of the government and corporations. Government foreign wealth is significantly negative; foreign liabilities, mainly consisting of debt, are about 40

percent in 1997 but amount to 100 percent in 2009. After the application of the financial programs aiming to guarantee the stability of the economy, government foreign liabilities stabilize and then increase again. Their synthesis changes as well, with an increase in the share of loans. The evolution of corporate foreign assets and liabilities resembles to a large extent the evolution of their aggregate counterparts.

4. Sensitivity Analysis

Thirteen alternative series for the wealth–income ratio are generated under variations of the main framework. Table 5 summarizes and compares them in terms of g_w, q_t, g_{ws}, and β, while Figure 8 presents several of them. The alternative series are situated close to the benchmark one, with the discrepancy being larger in the early 2000s (i.e. during the general asset price rise).

Alternative time-varying weights: the way in which the time-varying weights of the composite index are constructed is a debatable issue. As mentioned before, there is no optimal way to construct them and the available data on the composition of national wealth are relatively scarce. In Appendix C, I examine whether the approach chosen in this paper provides reasonable estimates for the French wealth for which balance sheet data are available. In this section, I estimate the wealth–income ratio under what is the most straightforward alternative way of choosing the weights. In particular, I adopt the same approach as before but I now use data only from the FA. That is, I do not use the share of residential investment in aggregate investment, and, hence, the weight on each asset price index is entirely defined by the share of the corresponding asset category in aggregate assets (Figure 2), that is, $w_{i,t}=s_{i,t}\forall i$. This series confirms the benchmark rise of β but because a smaller weight is now placed on the housing price index (about 30 percent instead of 50 percent) and a larger weight on all other indexes, the 1997–2007 general asset price rise is less pronounced, resulting in a smaller overall increase in wealth (β is about 480 percent rather than above 500 percent in 2007; series (2) in Figure 8). Table 5 shows that wealth growth (1.7 percent) is lower than in the benchmark case (2.1%), while capital losses are larger (−1.2 percent). The European experience, however, indicates that a large part of the post-1999 capital gains emanates from housing prices. Thus, it seems more appropriate to choose the benchmark series which attributes more weight on housing prices by taking into account the share of residential investment, even though this choice is admittedly *ad hoc*.

Alternative asset classifications and evidence from other economies: in the benchmark grouping of the financial classes of the FA, it is assumed that the returns of loans are aligned with the returns of the housing price index. Here, I regroup them assuming that those returns are aligned with the stock exchange index and, hence, end up placing more weight on the ASE index. The alternative series lies close to the benchmark one; series (3) in Table 5. Moreover, I modify the suggestion of Piketty (2011) about time-invariant weights in private wealth in two ways: by attributing 5 percent, which was previously placed on the domestic equity index, to the foreign equity index to capture wealth placed abroad, and by

TABLE 5

SUMMARY OF ALTERNATIVE RESULTS

Approach		Decomposition of 1974–2013 Wealth Growth Rate			β_t			
		$g_{w,t}$	q_t	$g_{ws,t}$	1986	1997	2008	2013
(1)	Benchmark series	2.1%	−0.7%	2.8%	295%	415%	454%	493%
(2)	Weights based only on Financial Accounts	1.7%	−1.2%	3.0%	257%	381%	367%	433%
(3)	Alternative allocation of asset classes in FA	2.3%	−0.6%	3.0%	262%	429%	453%	535%
(4)	Time-invariant weights, evidence from the literature	2.1%	−0.8%	3.0%	262%	417%	448%	502%
(5)	One-good model (no price effect, PIM)	2.2%	–	2.3%	460%	499%	395%	523%
(6)	Sensitivity to the Initial Observation, $\beta(1974)=200\%$	2.7%	−0.7%	3.5%	256%	375%	413%	444%
(7)	Sensitivity to the Initial Observation, $\beta(1974)=350\%$	1.7%	−0.7%	2.4%	329%	449%	488%	534%
(8)	Multiplicative vs Additive Formulation	2.1%	−0.7%	2.8%	304%	422%	457%	494%
(9)	CPI vs GDP Deflator	2.1%	−0.6%	2.8%	299%	425%	463%	495%
Alternative Time-Invariant Weights (ASE, Housing Index, CPI, Constant Prices, MSCI):								
(10)	Only Domestic Indexes (30%, 30%, 25%, 15%, 0)	2.1%	−0.9%	3.0%	244%	423%	466%	497%
(11)	Private Wealth Weights (25%, 30%, 20%, 20%, 5%)	1.8%	−1.2%	3.1%	243%	375%	399%	438%
(12)	More Weight on Housing (20%, 35%, 25%, 15%, 5%)	2.1%	−0.7%	2.9%	280%	410%	444%	493%
(13)	More Weight on ASE (30%, 30%, 25%, 10%, 5%)	2.5%	−0.3%	2.9%	264%	472%	520%	585%

Sources: Author's computations based on variations of the benchmark framework.
Notes: Small discrepancies in the difference between g_w and (g_{ws} q) are due to rounding.

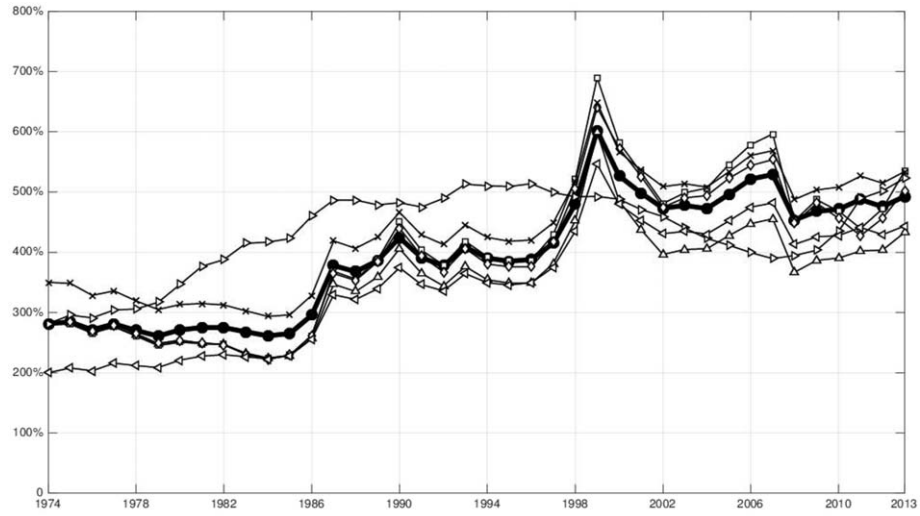

Figure 8. Alternatives Series for β

Source: Author's computations, based on variations of the benchmark framework.

attributing another 5 percent, which was previously placed on assets held at nominal values, to CPI[19] because nominal assets, such as bonds, are more prominent in the private rather than in the national portfolio. Series (4) in Figure 8 coincides with the benchmark one.

One-good capital accumulation model, and alternative starting points: the one-good capital accumulation equation, abstracting from capital gains/losses but taking into account national savings (rather than domestic investments as in PIM), yields the wealth–income ratio $\beta_{t+1} = \frac{(1+g_{ws,t})}{(1+g_{t+1})}\beta_t$. I start this equation with the same value as in the benchmark case. The estimated long-run wealth growth, 2.2 percent, almost coincides with the benchmark case, implying that capital gains vanish over long time periods (Table 5). Series (5) lies persistently above the benchmark estimates during 1974–98 and below during the 2000s, failing to capture the erosion of asset values in the former period and the general asset price rise in the latter. Additionally, I test whether the benchmark β varies a lot when the starting point of the accumulation equation changes. In this way, I examine the implications of potential mismeasurement of the labor share and, in turn, of the wealth–income ratio in 1974. For that matter, I rerun the estimation procedure, under the benchmark composite asset price index, using as starting points two observationally far-fetched values, in particular, 200 percent and 350 percent. The first series is considered as the lower bound, whereas the second one is the upper bound. To add some economic context, the lowest observed wealth–income ratio in rich countries in 1970 was 259 percent (Italy) and the highest was 404 percent (U.S.A.)—see Table 4. Figure 8 shows that the benchmark series fluctuates

[19]That is 30 percent on HPI, 25 percent on ASE, 5 percent on MSCI, 25 percent on CPI, and 15 percent on constant prices.

between the lower and the upper bound and that the two bounds converge to the benchmark series across time.

Additive wealth accumulation, and alternative price indexes: the formulation of equation (2) assumes that savings take place at the beginning of each year. Conversely, assuming that savings occur at the end of the year and, hence, are used to buy assets at price Q_{t+1} yields $\beta_{t+1} = \frac{(1+q_{t+1}+s_t/\beta_t)}{(1+g_{t+1})}\beta_t$, but it does not change the estimates by a lot. Substituting CPI with the GDP Deflator (obtained from World Bank) to account for the price of goods not included in the consumer basket does not alter the results either. The reported series (8) and (9) in Table 5 are close to the benchmark one and, hence, they are not plotted. Finally, I test various time-invariant weighting patterns in Q_t. Series (10) considers only domestic asset price indexes and disregards the price of assets held abroad. Series (11) considers the suggested weights of Piketty (2011) (the weight on equity prices is split into 25 percent on ASE and 5 percent on MSCI). Series (12) attributes more weight on housing rather than on equity prices, whereas series (13) places more weight on equity prices rather than on constant prices. These alternatives series do not differ significantly from the benchmark one (Table 5) and their figure is relegated to the Appendix. In general, when housing or equity prices are weighted more, β is slightly higher. Conversely, β is lower when a larger weight is placed on constant prices. Those differences are more pronounced in the post-1997 period when the general asset price rise takes place. Long-run wealth growth still lies in the ballpark of 2.1 percent, the saving effect is close to 2.8 percent, and the relative price effect is at about -0.7 percent.

5. Conclusion

This paper provides estimates for aggregate Greek wealth. The investigation pursued admittedly has its limits. Despite this, it shows that the rise of the wealth–income ratio in the country's modern economic history, and its similarities with what is observed in the other European economies, remain in all the specifications. This evidence fits in the broader picture of the "rise of wealth–income ratios." Key issues to be addressed in future research include estimating the value of housing stock and government capital, the compilation of national balance sheets, and the study of the personal distribution of wealth.

References

Arthur, S., "Experience with Constructing Composite Asset Price Indexes," BIS Papers No. 21, 2005.

Baumol W. J., "Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis," *American Economic Review*, 57 (3), 415–26, 1967.

Bernanke, B. S. and R. S. Gurkaynak, "Is Growth Exogenous? Taking Mankiw, Romer and Weil Seriously," in B. S. Bernanke and K. Rogoff, eds., *NBER Macroeconomics Annual*, The MIT Press, Cambridge, MA, 16, 1–57, 2002.

Blanchard, O. J. and F. Giavazzi, "Current Account Deficits in the Euro Area: The End of the Feldstein Horioka Puzzle?" *Brookings Papers on Economic Activity*, 2002.

Caselli, F., "Accounting for Cross-Country Income Differences," in P. Aghion and S. Durlauf, eds., *Handbook of Economic Growth*, Elseiver, Amsterdam, 1A, 679–741, 2005.

Chrissis, K. and A. Livada, "Trends and Cycles of Top Income Shares in Greece: 1957–2010," *Procedia Economics and Finance*, 9, 14–23, 2014.

Christelis, D., T. Jappelli, O. Paccagnella, and G. Weber, "Income, Wealth and Financial Fragility in Europe," *Journal of Europan Social Policy*, 19 (4), 359–76, 2009.
Domar, E. D., "Expansion and Employment," *American Economic Review*, 37 (1), 34–55, 1947.
ECB (European Central Bank), "The Eurosystem Household Finance and Consumption Survey: Results from the First Wave," Statistical Paper Series No. 2, and "Statistical Tables," 2013.
Eurostat, *European System of Accounts, ESA 2010*, Publications Office of the European Union, Luxembourg, 2013.
Feenstra, R. C., R. Inklaar, and M. P. Timmer, "The Next Generation of the Penn World Table," *American Economic Review*, 105 (10), 3150–82, 2015.
Germidis, D. and M. Negreponti-Delivanis, *Industrialisation, emploi et répartition des revenus: le cas de la Grèce*, OECD, Paris, 1975.
Gollin, D., "Getting Income Shares Right," *Journal of Political Economy* 110 (2), 458–74, 2002.
Gourinchas, P. O. and O. Jeanne, "Capital Flows to Developing Countries: The Allocation Puzzle," NBER Working Paper 13602, 2007.
Greenwood J., Z. Hercowitz, and P. Krusell, "Long-Run Implications of Investment-Specific Technological Change," *The American Economic Review*, 87 (3), 342–62, 1997.
Harrod, R. F., "An Essay in Dynamic Theory," *Economic Journal*, 49 (193), 14–33, 1939.
IMF Country Report No. 09/245, Greece, August 2009.
Kaldor, N., "Capital Accumulation and Economic Growth," in F. A. Lutz and D. C. Hague, eds, *The Theory of Capital*, 177–222, St. Martin's Press, New York, 1961.
Kamps, C., "New Estimates of Government Net Capital Stocks for 22 OECD Countries 1960–2001," IMF Staff Papers, 53 (1), 2006.
Karabarbounis, L. and B. Neiman, "The Global Decline of the Labor Share," *Quarterly Journal of Economics*, 129 (1), 61–103, 2014.
Keating, G., M. O'Sullivan, A. Shorrocks, J. B. Davies, R. Lluberas, and A. Koutsoukis, *Global Wealth Report 2013*. Zurich: Credit Suisse Research Institute (CSRI), 2013.
Lane, P. R. and G. M. Milesi-Ferretti, "The External Wealth of Nations: Measures of Foreign Assets and Liabilities for Industrial and Developing Countries," *Journal of International Economics*, 55, 263–94, 2001.
———, "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004," *Journal of International Economics*, 73, 223–50, 2007.
Modigliani, F., "Life Cycle, Individual Thrift and the Wealth of Nations," *American Economic Review*, 76 (3), 297–313, 1986.
Modigliani, F. and R. Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," in K. Kurihara, ed., *Post Keynesian Economics*, Rutgers University Press, New Brunswick, NJ, 1954.
Piketty, T., "On the Long-Run Evolution of Inheritance: France 1820–2050," *Quarterly Journal of Economics*, 126 (3), 1071–131, 2011.
———, *Capital in the 21st Century*, Harvard University Press, Cambridge, MA, 2014.
Piketty, T. and G. Zucman, "Capital is Back: Wealth–Income Ratios in Rich Countries, 1700–2010," *Quarterly Journal of Economics*, 129 (3), 1255–310, 2014.
Solow, R. M., "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, 70, 65–94, 1956.
Stierli, M., A. Shorrocks, J. B. Davies, R. Lluberas, and A. Koutsoukis, *Global Wealth Report 2014*. Zurich: Credit Suisse Research Institute (CSRI), 2014.

Supporting Information

Additional Supporting Information may be found in the online version of this paper at the publisher's web-site:

Appendix A: 1974–2013 Data, National, private, and government saving, Capital account
Appendix B: Further wealth estimates
Appendix C: Empirical assessment of the composite price index