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DISAGGREGATE INCOME AND WEALTH EFFECTS ON PRIVATE CONSUMPTION IN GREECE

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Abstract

The aim of the present paper is to identify the main determinants of private consumption in Greece for the recent period 2003:Q1- 2020:Q1. The issue is of particular interest for Greece, now that the economy is trying to return to a sustainable growth path following the pandemic episode, since private consumption constitutes the main component of Greek GDP. The study analyses the determinants of private consumption, paying particular attention to the significance of income and wealth. The major novelty of the paper with respect to the Greek literature on consumption is that it assumes that different types of income play a different role in consumers' behavior: so, disposable income is decomposed into its labour and non-labour components. To this end, four alternative measures of labour income are computed based on quarterly non-financial accounts data of the households' sector. The results indicate that decomposing disposable income is essential for analyzing private consumption. Labour income turns out to be the most important determinant of private consumption in Greece in the long and the short run. Thus, labour income should primarily be monitored and targeted by the policy makers, in their policies aiming at domestic demand and GDP growth.

Keywords: Private Consumption, Labour income, Wealth, Cointegration, Error correction model.

JEL Classification: E21, E44, C22, D12

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1 Introduction

Understanding the behaviour of private consumption is crucial for the assessment of the situation of any economy in the short and medium term. As the largest expenditure component of GDP, household spending plays a central role in the cyclical fluctuations of activity around its long-term growth path.

According to economic theory, the consumption expenditure of an individual is linked to her/his lifetime resources that consist of human wealth, i.e. current and expected future income, and total net asset wealth. The idea that private consumption is largely determined by household wealth is firmly rooted in the Permanent Income Hypothesis (Friedman (1957)) and the Life Cycle Hypothesis (Modigliani and Brumberg (1954), Ando and Modigliani (1963)).

Since the publication of those papers, the literature has extended this basic consumption model along three main directions. First, different components of net wealth may generate different Marginal Propensities to Consume (MPCs) and thus, a strand of the literature proposes the decomposition of total net wealth into financial and non-financial assets (for a review of the relevant literature see, *among others*, Cooper and Dynan (2016) and de Bondt *et al.* (2020a)). Second, MPCs may also differ across income types (i.e. labour and non-labour income), an idea that goes back to Kaldor (1955), Klein and Goldberger (1955), Samuelson and Modigliani (1966) and Taylor (1971), who suggest that households receiving property income have a lower propensity to consume¹. Therefore, a number of recent studies consider disaggregating disposable income into labour and non-labour components (see, *among others*, de Bondt *et al.* (2019) and (2020a)). Third, other determinants such as interest rates, household leverage, public indebtedness, uncertainty, expectations and demographics may also affect consumption especially in the short run, and consequently are examined by the literature in great detail (see, *inter alia*, Estrada *et al.* (2014)).

In Greece, private consumption accounts for a particularly high share of GDP in the period 2003-2019: 68% of GDP on average, as against 55% in the euro area. Consumption expenditure therefore has been by far the driving force of economic

¹ This can happen for two reasons: (i) Those receiving property income have higher income than those receiving labour income (Klein and Goldberger (1955)). (ii) Those receiving property income have the tendency to save more with the aim to invest further on property in an effort to regenerate income from property (Kaldor (1955)).

activity. Thus, identification of consumption's main determinants becomes particularly important, especially at present, as the economy has to face the impact of the Covid-19 pandemic, and return to a state of recovery aiming to move along a path of long-term sustainable growth.

The present article analyses private consumption in Greece, paying particular attention to disaggregated income and wealth effects. The explanatory power of other determinants of private consumption, which are suggested by economic theory to affect consumption in the short run, such as interest rates, household leverage and uncertainty, is also investigated. The main contribution of this paper is the decomposition of disposable income into labour and non-labour income, as this type of analysis is conducted for the first time for the case of Greece. To this end, four alternative measures of labour income are computed as suggested by the relevant literature, using data from the quarterly non-financial accounts of households and Non Profit Institutions Serving Households (NPISH). The more granular analysis of disposable income is important, as MPCs may differ according to the income source.

The analysis is performed for the period 2003:Q1-2020:Q1. The results highlight the predominance of the labour income effect, relative to that of non-labour income. Additionally, non-financial wealth, -housing wealth essentially- is found to have a stronger positive effect on private consumption compared to financial wealth. The results stress the importance of decomposing not only household wealth, but also disposable income to efficiently estimate private consumption. The strength and persistence over time of labour income effects on private consumption suggest that labour income should be monitored cautiously by both forecasters and policy makers.

The rest of the paper is structured as follows. Section 2 provides a review of the relevant empirical literature. Section 3 presents the data employed and outlines the empirical methodology applied to the analysis. Section 4 reports the empirical results and Section 5 summarises the conclusions and policy implications of the paper.

2 Literature

The recent empirical literature on consumption is progressing towards three main dimensions: (i) the examination of the effects of the financial and non-financial

components of wealth; (ii) the analysis of the impact of the labour and non-labour income components on private consumption; and (iii) the impact of determinants which are assumed to affect private consumption mainly in the short run.

(i) The impact of wealth

The effects of wealth on consumption are directly related to the framework of the permanent income hypothesis (Friedman (1957)) and the life-cycle hypothesis (Modigliani and Brumberg (1954) and Ando and Modigliani (1963)). These models posit that households consume the present discounted value of their expected lifetime resources. Within this context, permanent changes in household resources result in changes in consumption, while transitory changes leave spending little changed.

One conceptual drawback to this theoretical framework is that all the components of household disposable income and net worth are assumed to have the same effect on consumption. Typically, the behaviour of utility maximizing consumers is analysed assuming unbounded rationality, perfect capital markets and the absence of distorting taxes or rigidities. In these ideal circumstances, where the composition of wealth can be changed without friction or cost, the MPCs out of different wealth components should naturally be equal. However, in imperfect capital markets, the MPC out of different wealth components may differ, as total wealth is not homogenous, but consists of several components with different risk, collateral and liquidity properties (Altissimo *et al.* (2005)). In this context, the empirical literature has extended the basic consumption model examining disaggregated wealth effects on consumption by decomposing total wealth into financial and non-financial assets, mainly housing. Revived interest in the differentiation between financial and housing wealth effects has also been motivated by major developments in financial and housing markets worldwide in the years of the Great Recession and their significant impact on household wealth (Sousa (2009), Slacalek (2009), Carroll *et al.* (2011), Aron *et al.* (2012), Cooper and Dynan (2016), and de Bondt *et al.* (2019), (2020a), (2020b)).

These studies provide a wide range of MPCs out of wealth components across countries. Cooper and Dynan (2016) and de Bondt *et al.* (2019), (2020a), (2020b) provide an overview. The differences in the estimated elasticities and MPCs out of wealth components reflect a number of aspects. The MPC out of liquid assets (mostly financial assets) is likely to be greater than that of illiquid (mostly housing) wealth. The

MPC out of assets associated with a strong bequest motive (housing wealth) is likely to be smaller. Even within financial wealth, different components may have different degrees of relative liquidity, which should affect the response of consumption to wealth changes: it is easier to consume the gains in one's savings account or directly held stock portfolio than gains in one's personal retirement account or company pension plan. As a result, some studies consider the relationship between consumption and asset price fluctuations after further dividing financial wealth into its liquid and illiquid components (see, for example, Byrne and Davis (2003), Aron *et al.* (2012), Duca and Muellbauer (2013)). Assets with less volatile prices, such as non-equity wealth, have higher MPCs as price changes are likely to be perceived to be more permanent.

Differences in financial systems, in regulatory and institutional frameworks, or the degree of credit constraints of households can possibly explain the variation of wealth effects across countries (Cooper and Dynan (2016)). Slacalek (2009) notes that for economies with well-developed mortgage markets, such as the Anglo-Saxon economies, there is evidence of large housing wealth effects. Ludwig and Slok (2004) find that consumption is more sensitive to asset prices in countries with market-based financial systems, such as the Anglo-Saxon countries, rather than in countries with bank-based systems, such as the continental European countries. Barrell and Davis (2007) find that enhanced financial markets reduce credit constraints and enable households to access more easily their net worth –especially their illiquid assets– to smooth through income shortfalls.

Differences in MPCs out of wealth may also reflect the particular time periods analysed and the asset price shocks realized during those time periods (see, for example, Ludwig and Slok (2004)). The different distribution of income and wealth across households within different countries and demographic characteristics also likely influence the MPC out of wealth. For instance, the homeownership rate is much lower in Germany and France than in the US, implying that the portion of the population exposed to house price fluctuations varies across countries. Financial wealth holdings also differ notably across countries among households in the bottom 75% of the income distribution (Norman *et al.* (2002)). Lower income households are typically thought to have a higher MPC out of wealth fluctuations than richer households. A recent strand of the literature assumes heterogeneous agents and makes use of microdata at the household level on income, wealth and consumption. There is ample evidence that

different households' groups have heterogeneous consumption responses to income shocks. Ampudia *et al.* (2018) find that spending of "hand-to-mouth" households who have large spending commitments compared to their regular income and liquid assets, is highly sensitive to small and temporary changes in income, i.e. these households have high MPCs. Some assets, such as equities, are concentrated at the top of the income distribution and wealthy households tend to have lower MPCs (Sierminska and Takhtamanova (2012)). On the other hand, housing is more broadly held than other types of wealth and the share of housing wealth in total wealth is much higher for lower-income homeowners than higher-income homeowners. Higher housing wealth concentration in lower parts of the income distributions should tend to make the aggregate MPC out of housing wealth higher than the aggregate MPC out of financial wealth. So, differences in income, financial and non-financial wealth distributions across households and countries may influence the size of the estimated income and wealth effects.

Concerning the large range of estimated housing wealth effects, there are two forces acting in opposite directions as households both own housing assets and consume housing services derived from these assets (Buiter (2010), Catte *et al.* (2004), Cheng and Fung (2005), Aron *et al.* (2012)). Higher house prices could force potential first-time buyers to save more in order to buy a property in the future, but also increase the wealth of those who already own a house. Housing assets can be used as collateral to obtain a loan or, alternatively, owners could sell a house and earn capital gains. When home prices rise, homeowners have more collateral against which they can borrow in order to finance additional purchases of goods and services and to meet other financial needs. Constrained homeowners are therefore likely to increase their spending when home prices increase as long as home equity loans are available in the country in which they live, and they can monetize the equity in their homes with relatively low transaction costs. Consequently, the size and sign of the overall MPC out of housing wealth depends on which effect dominates and it is subject to many factors, such as the country's homeownership rate, the size of the rental and mortgage market, and the possibility to benefit from equity withdrawal (see Cooper and Dynan (2016)). There might also be psychological reasons why homeowners increase their consumption in response to housing appreciation (Case *et al.* (2013)).

The majority of the relevant empirical studies refer to the US, (see Benjamin *et al.* (2004), Case *et al.* (2011) and Carroll *et al.* (2011)). Most of empirical findings for the US indicate the predominance of housing wealth effect relatively to the financial wealth effect. There is also a significant number of studies referring to other advanced economies and to country groups (see, *inter alia*, Slacalek (2009), Kerdrain (2011)).

Existing empirical evidence on disaggregated wealth effects on consumption for the euro area and some euro area countries is reviewed by de Bondt *et al.* (2019). The evidence supports a significant financial wealth effect on consumption in the long run in the euro area and the major countries. The housing wealth effect tends to be weaker than the financial wealth effect in both the long run and the short run, in all cases.

(ii) The impact of income

A recent strand of the literature stresses the importance of decomposing income effects on private consumption. The idea that MPCs may differ across income types goes back to Kaldor (1955), Klein and Goldberger (1955), and Taylor (1971), who suggest that households receiving property income have a lower propensity to consume. This can happen as those receiving property income have higher income than those receiving labour income (Klein and Goldberger (1955)), and have the tendency to save more with the aim to invest further on property in an effort to regenerate income from property (Kaldor (1966)). With respect to property income as a separate consumption determinant, several central banks, including the Federal Reserve, allow for property to enter the consumption function in their models used for macroeconomic simulations and forecasting (Brayton and Tinsley (1996), Fagan and Morgan (2005)). Brayton and Tinsley (1996) built a large-scale quarterly econometric model of the US economy and estimated the MPCs out of categories of income and tangible wealth.

Several studies compare the consumption elasticities with respect to the transfer and the non-transfer income for the US (Davis and Palumbo (2001), Benjamin *et al.* (2004), Aladangady and Feiveson (2018)) or split transfer income further into retirement transfers and non-retirement transfers and also look at capital income (Hawkins and Wallace (2006)). Transfers are estimated to have a higher average propensity to consume than non-transfer income, and thus would be associated with more spending.

Jaramillo and Chailloux (2015) disentangle income and wealth effects on consumption by disaggregating both the different types of income and wealth. They estimate a consumption function for a panel dataset of 14 advanced economies, using an error correction specification. They find a significant long-term relationship between consumption and the different components of income and wealth. Labour income remains the main driver of consumption. Personal income taxes and social security contributions are found to have a negative impact on consumption, while social benefits have a large positive impact. Financial assets and housing assets are estimated to have positive impact, while household debt has a negative impact. Furthermore, the results suggest that the contribution to consumption from an increase in financial or housing assets would be more than offset if financed fully through an increase in household debt.

According to the Banque de France (2018, 2020), the composition of household income helps to understand changes in the household saving ratio in France. MPCs differ according to income source. In their estimated equations, a shock to labour income or benefits, assuming other income remains stable, is consumed nearly in full, leaving the saving ratio almost unchanged. Conversely, in the case of a reduction in direct taxes and social security contributions, half of the gains are spent while the rest are saved, resulting in a rise both in consumption and in the saving ratio.

de Bondt *et al.* (2019), (2020a) analyse consumption in the euro area and the largest euro area countries including disaggregated income and wealth components as determinants. They are the first to examine in detail labour and non-labour income effects on consumption and provide a comparison of disaggregated income effects for the euro area. They revisit the relative importance of financial and non-financial wealth in determining private consumption. They find that it is essential to distinguish between components of wealth and income, because estimated long-run elasticities differ across income and wealth components. Their model estimates for the euro area (de Bondt *et al.* (2019)) add evidence to the relative importance of financial versus the non-financial wealth effects and highlight that labour as well as non-labour income matter for consumption. The estimates of the labour income elasticities are larger than for non-labour income in the long and the short run. de Bondt *et al.* (2019) provide a wide range of estimated elasticities with respect to income and wealth across the largest euro area

countries and the euro area as a whole. They indicate that the aggregate euro area income and wealth effects mask striking cross-country differences.

(iii) Short-run determinants

A great body of the recent literature examines the effects of short-run determinants of private consumption, other than income and wealth components. Among these alternative variables are: interest rates (de Bondt (1999), Geiger *et al.* (2014), Estrada *et al.* (2014)), measures of household and public sector indebtedness (Al-Eyd *et al.* (2006), Rohn (2010), Pacheco and Barata (2005), Carroll *et al.* (2011), Dynan (2012)) and uncertainty measures (Aron *et al.* (2012), Dees and Brinca (2013), Estrada *et al.* (2014), Gieseck and Largent (2016)).

Low interest rates mainly redistribute resources from net savers to net borrowers. As net borrowers typically have a higher propensity to consume than net savers, this redistribution channel of lower interest rates supports private consumption. Thus, increases in real interest rates and interest spreads are expected to have a negative impact on consumption growth. De Bondt (1999) finds that liquidity constrained consumers not only use current income for financing their consumption, but also external finance, which availability depends on the external finance premium (EFP), that is the wedge between the rates on mortgages or consumer loans as compared to a short rate paid on household deposits: the greater the EFP, the lower consumption growth is expected to be. Higher real interest rates dampen consumption spending as it becomes more expensive to finance it through loans as well as it encourages saving due to higher return (Rodriguez-Palenzuela and Dees (2016)).

Higher income uncertainty is expected to reduce current consumption as a result of increased precautionary savings. Precautionary savings models show that the saving rate climbs (consumption falls) in response to an increase in uncertainty (see Carroll *et al.* (2012)). For instance, lower consumer confidence and economic sentiment are likely to have an adverse impact on consumption growth (Dees and Brinca (2013), Estrada *et al.* (2014)). Euro area evidence for the impact of variables capturing income uncertainty on private consumption can be found in Dees and Brinca (2013) and Bahmani-Oskooee *et al.* (2015) and of macroeconomic uncertainty in Gieseck and Largent (2016). Dees and Brinca (2013) show that consumer confidence is a significant determinant of real consumption expenditure for the euro area. Rodriguez-Palenzuela and Dees (2016) also

report evidence supportive of a negative short-run impact on consumption from increased income uncertainty in euro area countries, as measured by changes in the unemployment rate.

Private consumption is also determined by the dynamics of housing debt accumulation and deleveraging. According to Cooper and Dynan (2016), high debt and leverage impede consumer spending as: (i) Households with high debt face high future debt servicing costs that may impact their consumption, especially in countries where debt contracts typically have floating interest rates and future payments are somewhat uncertain. (ii) Some households may target a given level of debt relative to their income or assets; if the events of recent years increased these ratios, one might expect these households to choose to pare back their consumption in order to pay down debt. Eggertsson and Krugman (2012) show that in the presence of a deleverage shock, the level of debt matters. Highly indebted households face different constraints to low indebted households. (iii) High-debt households may become more worried about future credit availability, and cut their consumption so as to increase their savings. (iv) Households whose current income is lower than their permanent income may be forced to reduce their consumption because their high debt ratios prevent them from obtaining the additional credit they may need to finance their desired spending.

Dynan (2012) and Cooper (2012) find that high debt, conditional on other standard consumption predictors, has a negative impact on consumption growth during the Great Recession. Dynan and Edelberg (2013) show that high-debt households are more likely to scale back their consumption in 2009, after controlling for other drivers of spending. Mian *et al.* (2013) show that leverage amplified the negative wealth effect on consumption associated with declining house prices during the Great Recession. Estrada *et al.* (2014) find that both credit availability and excessive household debt affect private consumption, with current debt accumulation favouring consumption, whereas past household debt accumulation being negatively related to consumption. McCarthy and McQuinn (2017) indicate that households' deleveraging has negative implications for consumption.

Fiscal stance is expected to have an impact on private consumption. Many empirical studies test for fiscal effects on consumption, but provide rather inconclusive results. Most of them reject Ricardian equivalence. Masson *et al.* (1995) find a Ricardian offset from fiscal expansion, while Giavazzi *et al.* (2000) reject Ricardian equivalence.

Estrada *et al.* (2014) measure the possible public debt effect through the changes in the long-term interest rate spread. That does not have a significant effect on private consumption once the households' debt dynamics are taken into account. However, Al-Eyd *et al.* (2006) find evidence of strong Ricardian behavior as an improvement in the fiscal position leads to stronger consumption.

(iv) Literature on Greece

There exist three recent studies, which provide empirical evidence on private consumption determination in Greece for the recent period. Rodriguez-Palenzuela, and Dees (2016) estimate empirically the long-run determinants of private consumption for a group of selected euro area countries, which includes Greece. For the case of Greece, for the pre-crisis period 2001-2007, they find that real disposable income has the highest contribution to average consumption growth; real house prices and loans, which proxy the availability of credit, are also positively related to consumption.

Athanassiou and Tsouma (2017) assess the effects of household wealth on private consumption expenditure with emphasis given on disentangling financial wealth effects from housing wealth effects. A two-step Engle-Granger cointegration and ECM analysis is implemented. The results for the period 2000:Q1-2015:Q4 point to positive and significant financial and housing wealth effects in the long and the short run.

Manou *et al.* (2021) evaluate the asymmetric transmission effects of housing wealth, financial assets and household debt on consumption spending in Greece for the period 1999:Q4 - 2017:Q4. They indicate that the changes of all three factors are significant for consumption behaviour. Their results also show that consumption responds asymmetrically to all types of changes applied, with predominance of negative changes compared to positive ones. They conclude that the driving force of the rapidly reducing consumption spending is the deleveraging change.

3 Data and methodology

3.1 Data

3.1a Data sources

The nominal private consumption series is retrieved from the National Accounts (NA) series of ELSTAT (the Hellenic Statistical Authority). The source of disposable income data is quarterly non-financial accounts of households and Non Profit

Institutions Serving Households (NPISH) of ELSTAT². Financial wealth data is retrieved from financial sector accounts of households and NPISH of the Bank of Greece (BoG). Housing wealth of households and NPISH is estimated using BoG's data³. Quarterly data are back-casted and interpolated using the quadratic smoothing. Nominal series are deflated by the private consumption deflator, obtained from the ELSTAT national accounts database.

3.1b The definitions of the variables

The definitions of the variables are presented in the Appendix Table.

The labour and non-labour income

To decompose disposable income (B.6g) into labour (ly) and non-labour income (nly), four different income splits are considered as proposed by the literature (see de Bondt *et al.* (2020a), and Jaramillo and Chailloux (2015))⁴. Variables' names of labour income components (i.e. D.1R, D.5, D.61, D.62, D.7, B.2g/B.3g, D.4) follow codes used in ELSTAT quarterly non-financial accounts of households and NPISH.

Labour income definition 1

According to the first approach, disposable income is decomposed as follows:

$$ly1 = D.1R - D.5$$

where labour income (ly1) is defined as compensation of employees (D.1R) minus direct taxes on income and wealth paid by households (D.5). Then, non-labour income (nly1) is simply derived as the difference between disposable income (B.6g) and labour income (ly1). It is reasonable to deduct all income and wealth tax from the total compensation of employees and consider remaining income in gross terms because the share of income tax paid by households on wage earnings is typically much greater than that paid on property or transfer income.

² Quarterly non-financial accounts data with base year 2010 are used in the analysis.

³ In more detail: Housing wealth of households and NPISH is provided on an annual frequency based on BoG's estimates up to 2012. In 2013-2020, housing wealth is estimated using the dwellings price index of the BoG, gross fixed capital formation of households and the assumption of a yearly depreciation rate of 1.3%. The depreciation rate is consistent with the range of housing depreciation rates reported in the literature and employed by statistical agencies in various countries (e.g. Bokhari and Geltner (2014), Kostenbauer (2001)). For the estimation methodology see, also, Hofmeister and van der Helm (2017).

⁴ The decomposition of income following these four approaches is constrained by the fact that there is no information available on the shares of income taxes paid on different income types and on the shares of social security contributions paid out of income of employees and self-employed.

Labour income definition 2

According to the second approach, labour income (ly2) is calculated by subtracting direct taxes (D.5) and social security contributions (D.61) from total compensation of employees (D.1R) and adding social benefits (D.62) and net other current transfers (D.7):

$$ly2 = D.1R - D.5 - D.61 + D.62 + D.7$$

Non-labour income (nly2) is the remaining part of disposable income. In this case, labour income is measured as net of taxes and social contributions, i.e., it is a measure of net wages and transfers. As social benefits include unemployment and old-age-related transfers to households, it is likely that the MPC out of such income is similar to the MPC out of wage income. Hence, net social benefits are allocated to labour income. Net other current transfers, which consist of various types of payments, such as non-life insurance claims/premiums, grants, donations, penalties, are also included in labour income. Accordingly, non-labour income (nly2) broadly matches the sum of property income (D.4) and households' gross operating surplus/mixed income (B.2g/B.3g).

Labour income definition 3

Following the third split, labour income (ly3) is calculated as the sum of total compensation of employees (D.1R) and mixed income (B.3g, i.e. income of self-employed) less social security contributions (D.61) and labour income share of direct taxes. The share of taxes paid on labour income $D.5 \cdot (D.1R + B.3g) / (D.1R + B.2g/B.3g + D.4 + D.62)$ is approximated by the share of labour income (compensation of employees (D.1R) and gross mixed income (B.3G)) in the pre-tax income received by households (compensation of employees (D.1R) + operating surplus/mixed income (B.2g/B.3g) + net property income (D.4) + social benefits (D.62)) before taking into account social security contributions.

$$ly3 = D.1R + B.3g - D.61 - D.5 \cdot (D.1R + B.3g) / (D.1R + B.2g/B.3g + D.4 + D.62)$$

$$py3 = B.2g + D.4 - D.5 \cdot (B.2g + D.4) / (D.1R + B.2g/B.3g + D.4 + D.62)$$

$$ty3 = D.62 + D.7 - D.5 \cdot (D.62) / (D.1R + B.2g/B.3g + D.4 + D.62)$$

In this case, non-labour income (nly3) is further split into property income (py3), from which direct taxes are also deducted on a pro rata basis, and transfer income (ty3). Property income (py3) is defined as the sum of gross operating surplus (B.2g, mostly imputed rents of home-owners) and net property income (D.4, i.e. net interest income plus net other property income such as dividends paid by companies) minus imputed property taxes, that is net capital income after taxes. Finally, transfer income (ty3) is defined as the sum of social benefits (D.62) and net other current transfers (D.7) minus imputed transfer taxes, i.e. net transfer income after taxes.

Labour income definition 4

According to the fourth decomposition of income (proposed by Jaramillo and Chailloux (2015) to capture fiscal policy effects), disposable income is disaggregated into labour income (ly4) (consisting of compensation of employees (D.1R) and mixed income (B.3G)); property income (py4) which is defined as the sum of gross operating surplus (B.2g), net property income (D.4) and net other current transfers (D.7); transfer income (ty4) which corresponds to social benefits (D.62); personal income taxes (D.5) and social security contributions (D.61).

$$ly4 = D.1R + B.3g$$

$$py4 = B.2g + D.4 + D.7$$

$$ty4 = D.62$$

Figure 1 plots annual growth rates of real disposable income (B.6g) and the contributions of its components as measured by the four decompositions. Nominal disposable income and its components are deflated using the private consumption deflator. No matter which decomposition is used, labour income turns out to be a significant component of households' income throughout the period under consideration.

[Insert Figure 1 here]

3.2 Consumption and its determinants– some stylized facts

3.2a Consumption and income

Figure 2 depicts the patterns of consumption and disposable income in levels in an attempt to investigate visually any relationship between them. As expected, private consumption follows closely the pattern of disposable income, suggesting that income

may be a significant determinant of consumption. It is also evident that before the onset of the crisis in 2009, households consumed less than their income, whereas after the crisis they consume more than their income, possibly using their savings in order to ensure relatively stable and smooth consumption expenditure.

[Insert Figure 2 here]

Over the upswing of the typical business cycle, compensation of employees, operating surplus/mixed income and property income tend to increase, as the economy generates more jobs, real wages are bid upwards and the business of the self-employed is buoyant. In a recession, the opposite patterns tend to take hold. By contrast, net social transfers tend to behave in a counter-cyclical fashion, with unemployment and other benefits rising in a recession and social security contributions declining with the reduction of employment levels. Net social transfers are a key element in helping to stabilise households' disposable income and, thereby, household consumption over the cycle. These features are evident in Figure 3, which depicts the evolution of disposable income and its components.

[Insert Figure 3 here]

As shown in Figure 3, compensation of employees (D.1R) (average share of 50%) was the driving force of disposable income throughout the period. Following strong growth rates in the period of economic expansion 2003-2009 (42.1% cumulative growth), compensation of employees declined with the onset of the financial crisis and was 31.5% below its pre-crisis levels in 2015. It started recovering in 2016 largely reflecting improved economic activity in the period 2017-2019 and labour market recovery, also as a result of structural reforms providing for higher job-market flexibility. Nevertheless, in 2019, compensation of employees was still significantly below its pre-crisis levels (by 23%) on account of both crisis induced wage moderation and high unemployment.

Mixed income (B.3g), which essentially accounts for the income of the self-employed, also has a significant contribution to disposable income growth, which can be attributed to the high self-employment rate in Greece (30% on average in the period 2003-2019, as against 14% in the euro area). Its share in total income declined from 41% in 2003 to 33% in 2019. In the aftermath of the financial crisis, household enterprise owners had liquidity constraints and suffered a major reduction in their

activity. Mixed income increased by 16% over the period 2003-2007, then followed a downward path and reached its trough in 2016, before starting recovering in 2017. Still, in 2019, mixed income was 31% lower than its pre-crisis level.

Social benefits (D.62), which mostly refer to pensions (as well as maternity and family allowances and unemployment benefits), supported disposable income throughout the period. Although social benefits increased by a cumulative 74% in the period 2003-2007, they declined in the crisis period as a result of the pension reform in the context of the economic adjustment programmes⁵ (see also Karavitis (2018)) and have stabilised since then at around the 2013 levels. Their share rose from 19% in 2003 to 29% in 2019.

Operating surplus in the household sector essentially accounts for imputed rental income from owned-occupied housing, and has a limited effect on disposable income growth. Similarly, property income⁶ (D.4) exhibited a declining share in total income and a small contribution to income's development, especially following the sovereign debt crisis. As expected, social contributions and current taxes on income and wealth weighed on income.

Figure 4 compares the evolution of private consumption and labour income as measured by the four alternative definitions. Private consumption seems to follow closely labour income, no matter how this is measured.

⁵ Greece signed three Economic Adjustment Programmes (2010, 2012, 2015) with European partners and IMF (<https://www.consilium.europa.eu/en/policies/financial-assistance-eurozone-members/greece-programme/>).

⁶ Property income consists of interest, the distributed income of corporations (i.e. dividends and withdrawals from income of quasi-corporations), reinvested earnings on direct foreign investment, property income attributed to insurance policy-holders, and rent. For the definition of disposable income sub-components, see ECB (2021).

[Insert Figures 4 and 5 here]

Figure 5 compares the evolution of private consumption with that of the non-labour income variables and components. Graphs indicate that private consumption follows the pattern of non-labour income as measured by *nly1* and *nly2*. Transfers (*ty4*) also seem to be correlated with private consumption. Property income (*py4*), taxes and social security contributions (*taxcontr*) do not show noteworthy signs of co-movement with private consumption, especially in the post-2010 period.

3.2b Consumption and wealth

Figure 6a presents the decomposition of total household wealth and Figure 6b presents the annual growth rates of total wealth and the contributions of non-financial and financial wealth. The figures indicate the leading role of housing in the wealth portfolios of Greek households. The share of housing wealth to total wealth amounts to 84% on average for the whole period. Housing wealth increased rapidly up to 2008, as a result of high investment in new housing and increasing house prices. House prices almost doubled between 2000 and 2007 (index of urban area house prices, BoG). Prior to the crisis, households invested heavily in housing, being encouraged by ample availability of credit and low interest rates (see, *among others*, Athanasiou and Tsouma (2017)). Anyhow, the homeownership rate is very high in Greece (73.5%, as against 66.2% in the euro area in 2018). Since the outbreak of the crisis, housing wealth followed a downward path due to the continuous fall in house prices and the sharp contraction in housing investment. The drop in household net wealth is primarily attributed to the reduced value of housing wealth and secondarily to the lower value of their financial assets (see Figure 6), which is in line with the findings in Charalambakis (2017)⁷. In 2018 and 2019, the residential property market showed signs of gradual improvement⁸. The pattern of the financial wealth, after the decline in the years 2008-2013 due to the financial and sovereign debt crises, reflects largely the impulses of the international environment on financial asset prices.

[Insert Figure 6 here]

⁷ Charalambakis (2017) uses data from the two waves (2009 and 2014) of the Eurosystem's Household Finance and Consumption Survey (HFCS) to explore to what extent Greek households' net wealth, assets, loans, income and consumption have changed over the crisis period.

⁸ For recent developments in the Greek housing market, see the Bank of Greece Interim Report on Monetary Policy 2021 (December).

Figures 7a and 7b compare the evolution of private consumption with those of financial and housing wealth in the period under consideration. Figure 7b provides some signs of comovement of private consumption with the housing wealth.

[Insert Figure 7 here]

3.2c Consumption and its short-run determinants

Short-run determinants other than income and wealth components are grouped in three categories: (i) real interest rate variables, including several measures of the external finance premium; (ii) measures of consumer indebtedness; and (iii) uncertainty measures.

In the short-run specification of private consumption, a real interest rate measure is included to capture the intertemporal budget constraint of households. Alternative interest rate measures have been considered: the mortgage rate, the consumer loan rate, the deposit rate, the three-month EURIBOR rate and the ten-year government bond yield⁹. As depicted in Figure 8a, deposit rate is negatively correlated to private consumption. Higher real interest rates dampen consumption spending as it becomes more difficult to finance it through loans, while an increase in deposit rates encourages saving due to higher returns. To estimate the impact of credit constraints, spreads between longer-term rates on loans and short-term rates related to deposits are calculated, to reflect external financing costs for households (de Bondt (1999), Geiger *et al.* (2016)). The external finance premium defined as the spread between the mortgage rate and deposit rate also seems to be negatively correlated to private consumption (see Figure 8b).

[Insert Figure 8 here]

The impact of household debt on consumption is also estimated. It seems that there is a positive relation between debt and private consumption in the period up to the outbreak of the sovereign debt crisis, evidence which probably indicates that in that period, households were partly financing their consumption by borrowing. However, the situation changed after the crisis: debt accumulation and deleveraging observed since 2010 (see Figure 9) have weighed on consumer spending. High leverage ratios, (defined as the ratio of the stock of loans to households to 4-quarter moving sum of

⁹ A number of variables have been tested to affect consumption. Not all variables are depicted in the present paper, for space reasons.

household real disposable income), prevented households from obtaining additional credit to finance their consumption and created high future debt servicing costs, thus forcing households to pare back their consumption in order to pay down debt (see, *among others*, Mian *et al.* (2013), Cooper and Dynan (2016)).

[Insert Figures 9 and 10 here]

Variables indicating higher income or macroeconomic uncertainty are expected to lead to lower consumption growth as a result of increased precautionary savings (Dees and Brinca (2013), Estrada *et al.* (2014)). Uncertainty measures considered in the present work are survey indicators such as consumer confidence, expected unemployment and inflation expectations. Figure 10 depicts the pattern of consumer confidence, which turned out to be significant in the estimated models. There seems to be a positive correlation between developments in the consumer confidence indicator and the changes in private consumption, in the examined period.

3.3 Methodology

In the present paper, the standard cointegration and error correction model (ECM) approach is applied to examine potential income and wealth effects on consumption. The two-step Engle and Granger (1987) procedure is applied to test for cointegration. The error correction specification of the consumption function goes back to Davidson *et al.* (1978), who suggest that consumption in the current period may move in a way to correct a previous “error”. The ECM approach assumes that there is a long equilibrium relationship between the variables of interest, while allowing for different dynamics and determinants in the short run. This two-step methodology is widely used in the relevant empirical literature which investigates the relationship between consumption, income and wealth (Byrne and Davis (2003), Catte *et al.* (2004), Al-Eyd (2006), Hamburg *et al.* (2008), Kerdrain (2011), Rodriguez-Palenzuela and Dees (2016), Winkler (2016)). In a first step, it enables a straightforward investigation of the long-run link between the core variables examined. In a second step, it allows for the inclusion of short-run dynamics in the equations under estimation, in which stationarity is ensured by using variables in first differences.

Income and wealth variables are assumed to affect private consumption in both the short and the long run. All other determinants of private consumption considered are assumed to affect private consumption in the short run only. They have been

checked for stationarity, found to be non-stationary and are therefore typically included in the equations by taking their first differences.

In a first step, the long-run equilibrium relationship is estimated using the Fully Modified Ordinary Least Squares technique (FMOLS) (Phillips and Hansen (1990)). This technique is based on a modification of least squares in order to account for both serial correlation effects and for endogeneity among regressors, resulting from the existence of a cointegrating relationship. In order to test the cointegration hypothesis, we apply the Engle-Granger (1987) and Phillips-Ouliaris (1990) tests. The long-run equation is formulated as follows:

$$\log(c_t) = \alpha + \beta_1 \log(ly_t) + \beta_2 \log(nly_t) + \beta_3 \log(fw_{t-1}) + \beta_4 \log(nfw_{t-1}) + e_t \quad (1)$$

Real variables are computed as nominal variables deflated by the private consumption deflator. In equation (1) c_t denotes real private consumption expenditure, ly_t and nly_t stand for real labour and real non-labour income respectively; fw_{t-1} and nfw_{t-1} denote real financial wealth (i.e. financial assets less financial liabilities) and real non-financial wealth, respectively.¹⁰

$ly1$, $ly2$, $ly3$ and $ly4$ stand for real labour income according to the four alternative definitions. $nly1$ and $nly2$ denote non-labour income according to the respective definitions. At the more detailed decompositions of labour income, $ty3$ and $ty4$ stand for real transfer income (i.e. pensions, allowances and benefits) after and before taxes, respectively. $py3$ and $py4$ indicate real property income in income decompositions III and IV, respectively. $taxcontr$ stands for real taxes on income and wealth (D.5) and real social security contributions (D.61). fw and nfw indicate real financial wealth and real non-financial wealth, respectively. Wealth variables (fw , nfw) are lagged by one period, as current consumption is assumed to be dependent on the stock of financial and non-financial wealth as recorded in the previous quarter (see, *inter alia*, Lettau and Ludvigson (2001), Barrell and Davis (2007), Sousa (2009), Estrada *et al.* (2014)). To test whether there is cointegration among the variables of interest, the Engle Granger and the Phillips –Ouliaris tests are performed.

The log-linear specification is used to estimate elasticities directly and then the respective MPCs are calculated based on average consumption-to-wealth/income ratios. MPC is reported in euro cents ($100 \cdot \text{elasticity} \cdot C/X$), where C is the average level

¹⁰ See also in the Appendix Table the definition of variables used in estimated equations.

of real consumption level and X is the average level of relevant income/wealth over 2003:Q1 to 2020:Q1, or 2010:Q1-2020:Q1.

In a second step, the ECM specification is estimated by OLS. The model specified is in first differences, in order to investigate the adjustment process to the long-run equilibrium, and the short-run dynamics. The long-run residuals obtained from the first stage equation are included as an error correction term (ECT) lagged by one period. The short-run equation is formulated as follows:

$$\Delta \log(c_t) = \alpha + \beta_1 * \Delta \log(l_t) + \beta_2 * \Delta \log(nl_t) + \beta_3 * \Delta \log(fw_{t-1}) + \beta_4 * \Delta \log(nfw_{t-1}) + \gamma * (ECT_{t-1}) + \delta * (\Delta x_{it-j}) + u_t. \quad (2)$$

where Δ denotes the first difference operator, γ is the coefficient of the error correction term (ECT) and δ represent the short-term coefficients. x_i stand for the variables which are assumed to affect private consumption in the short run. More specifically, in the short-run dynamics, the variables considered are: interest rate variables (real deposit rate and external finance premium), measures of consumer indebtedness (leverage ratios), and uncertainty measures (the consumer confidence indicator). The coefficient on the ECT measures the speed of adjustment to the long-run relation from a deviation in the short run caused by shocks to the system. It is expected to have a negative sign, so when consumption moves away from its equilibrium value, it then adjusts back to that value in the next period. When using quarterly data, γ reflects the adjustment within the period of one quarter; it implies that the higher the coefficient in absolute terms, the quicker the corresponding adjustment will be.

4 Empirical results

4.1 Unit root tests

The first step in the analysis is to test for stationarity the variables of interest, by applying the Augmented Dickey-Fuller (ADF), (Dickey and Fuller (1979), Said and Dickey (1984)) and the Phillips-Perron (PP), (Phillips and Perron (1988)) unit root and stationarity tests. The test outcomes are presented in Tables 1a and 1b. Statistical criteria advocate for the adequate ADF performed (i.e. whether or not to include a trend, a constant, or a break in the examination). The lag length used is based on the suggestion of the SIC criteria. When applying the PP unit root tests, the selection of bandwidth is made using Bartlett Kernel. Based on testing results at the 1% significance level, tests

in levels indicate that the variables are non-stationary, while tests in first differences suggest stationarity. As a result, the evidence obtained is in favour of the argument that the underlying variables are integrated of order one. On the basis of this finding we proceed with the implementation of the Engle-Granger cointegration and ECM analysis.

[Insert Table 1 here]

4.2 The long-run equilibrium relationships

The long-run relationship between consumption and the income and the wealth components is estimated, using the FMOLS technique. Table 2 summarises the estimation results. It reports the long-run equilibrium relationships of the form of (1) for the four income decompositions.

[Insert Table 2 here]

The long-run MPCs out of each income and wealth component are also estimated. All four specifications express cointegrating relationships, as evidenced by the Engle-Granger and Phillips-Ouliaris tests¹¹. The test outcomes are presented in Table 3.

[Insert Table 3 here]

The main conclusion emerging from the estimation results is that it is essential to distinguish between components of income and wealth when analyzing private consumption. The results highlight the predominance of the labour income effect relative to the effect of non-labour income. Additionally, non-financial wealth is found to have a stronger positive effect on private consumption compared to financial wealth. The results stress the importance of decomposing not only household wealth but also disposable income to efficiently estimate private consumption. The strength and persistence over time of labour income effects on private consumption suggest that labour income should be monitored cautiously by both forecasters and policy makers.

As expected, the main determinant of private consumption in Greece during the period under consideration is disposable income (labour and non-labour income). Labour income is estimated to be the driving force of private consumption¹². Transfer

¹¹ See Engle, R. F. and Granger, C.W.J. (1987).

¹² The results are in line with Lettau and Ludvigson (2001), who estimate a cointegrating relationship among consumption, asset holdings and labour income using US data.

income is also shown to have a positive and significant impact on consumer spending. More specifically, the long-run labour income elasticities are in most cases greater than those of property and transfer income. Out of the disaggregated income specifications, labour income ly1, ly2 and ly4 (under the specifications I, II and IV, respectively) turns out to be the main determinant of private consumption. Its elasticity is estimated within a range of 0.21-0.37. The estimated long-run elasticity and the MPC out of labour income are about twice as high as those of non-labour income under income specifications I and II¹³. In the more granular income decompositions 3 and 4, transfer income turns out significant in determining private consumption. Property income doesn't seem to have any explanatory power; so it is not included in the reported specifications¹⁴. Interestingly, MPC out of transfer income outpaces that of labour income. This finding probably reflects the fact that income subsidies are targeted to vulnerable households in the lower part of income distribution (young, low-educated, low-income workers) who typically have a higher propensity to consume¹⁵.

Wealth plays a secondary role in forming private consumption, in the long run. The elasticity to consume out of financial wealth is lower than that out of non-financial wealth¹⁶. This could be related to the leading role of housing in the wealth portfolios of Greek households and the high homeownership rate in Greece. Moreover, housing is more broadly held than other types of wealth in lower parts of the income distribution where households typically have higher propensity to consume. The positive impact of housing wealth on consumption could also be attributed to psychological reasons (Case *et al.* (2013)); households who own a house may feel safe to increase their consumption. In addition, homeowners may increase their consumption in response to housing appreciation. Even if rising home prices do not actually yield welfare gains to homeowners, they may spend their housing gains because of societal perceptions that home appreciation makes one better off. Another explanation provided by the literature is that households can affect their consumption by borrowing against home equity

¹³ These results are in line with labour and non-labour income estimates for the euro area and the largest euro area countries (de Bondt *et al.* (2019), (2020a), (2020b)).

¹⁴ The results of the initial long-run specifications, which include property income are not reported, for space reasons. Nevertheless, they are available upon request.

¹⁵ The results are conforming to the results of relevant studies for other economies: Higher MPC out of transfer income as against other income components is evidenced for the US (see, e.g. Brayton and Tinsley (1996), Alandangady and Feiveson (2018)) and for France and Italy (see de Bondt *et al.* (2019)).

¹⁶ This finding is consistent with the findings of Catte *et al.* (2004) for Italy and Spain and Rodriguez-Palenzuela and Dees (2016) for the euro area.

(home equity lines of credit, home equity loans, *etc*). However, this mortgage equity mechanism which is common in Anglo-Saxon countries, has a very limited role for boosting consumption in the case of Greece.

The results have significant policy implications for the case of Greece. Policy makers should primarily monitor labour income and take measures to support it. Therefore, policies aiming at increasing the participation rate in the labour market in Greece which still lags behind EU-average, are expected to support the labour income of households. Such policy measures should aim at establishing a well-performing public employment service and an effective system of active labour market policies to deliver effective labour market support to jobseekers –in particular young individuals and women– and help the labour market reintegration of beneficiaries of social assistance. The economic strategy in the context of the National Recovery and Resilience Plan (Greece 2.0) aiming to mobilise resources for job creation and participation in the labour market, as well as training, upskilling and reskilling of the workforce is expected to contribute to an increase in employment and labour income.

Policy makers should also take fiscal measures such as transfers to support the most vulnerable households, especially in periods of low demand. At the present juncture, fiscal measures to deal with the implications of the Covid-19 pandemic, such as targeting stimulus payments to households with lower income and low levels of liquidity have supported the disposable income of households' severely affected by the pandemic thus stimulating private consumption.

4.3 Consumption in the post-reform years

Another issue of interest is whether the different economic conditions prevailing in the aftermath of the sovereign crisis shock in 2010, as a result of the implementation of structural reforms targeted to ease labour and product market rigidities, had any impact on households' consuming behaviour. In other words, it is interesting to examine whether the structural reforms that took place in Greece after 2010, had any impact in the formation of private consumption. To this end, the Engle and Granger analysis is performed for the period 2010:Q1 -2020:Q1. The analysis can also be considered as a test of the robustness of the specifications estimated for the whole period. The specifications and the estimated coefficients do not change substantially in the reduced sample. Labour income again is estimated to be the main determinant of

private consumption (see Table 4). Its effect even strengthened (to 0.29 – 0.39) in the post crisis years. Transfers play again an important role, whereas the wealth effects exert low but significant impact on the consumers' behaviour.

[Insert Table 4 here]

4.4 The short-run dynamics

The analysis provides four alternative specifications for the short run dynamics of consumption, as formed using the four alternative measures of labour income. The model selection technique follows the General to Specific econometric methodology (see Hendry (1995)). The dynamic specifications yield the results presented in Table 5.

[Insert Table 5 here]

In all specifications, the error correction term (ECT) enters the dynamic equations significantly with the expected negative sign and the highest estimated elasticities. The result implies that the long-run equilibrium relationship is the main determinant of the short-run dynamics and that any misalignment from the equilibrium is “corrected” quite fast.

Consumption growth in the current period is positively related to its own growth a year ago and labour income growth in previous quarters. The finding indicates that consumers try to keep their consumption standards in line with their previous consumption and labour income, as maintained by the relative income hypothesis.

Another short-run determinant of private consumption as evidenced in most specifications (specifications II, III, and IV) is uncertainty, captured by the consumer confidence. As expected, low consumer confidence has an adverse effect on consumption as a result of precautionary savings behavior (see *inter alia* Dees and Brinca (2013), Bahmani-Oskooee *et al.* (2015), Christelis *et al.* (2016)).

In the income decomposition IV, where fiscal policy effects are examined, it is found, that a rise in personal income taxes and social security contributions has a significantly negative short-run effect on private consumption. The results are in line with Jaramillo and Chailloux (2015), Parker *et al.* (2011) and Johnson *et al.* (2006), who find that personal income taxes and social security contributions have a negative impact on consumption. Thus, measures to reduce the high tax wedge on labour, such as a reduction in income taxes and social security contributions, are expected to

positively affect labour income and increase households' consumption. In the current juncture, COVID-19 fiscal measures comprising deferral of tax obligations and social security contributions have supported disposable income of households and are expected to have a positive short-run impact on consumers' spending. Similarly, the suspension of the solidarity tax and reduction in the rate of social security contributions by 3 pp for the private sector in 2021 are measures expected to underpin private consumption.

As expected, an increase in deposit rates, or a rise in the external finance premium, i.e. the wedge between mortgage rates and deposit rates (efp), negatively affect private consumption growth (see also de Bondt (1999), Geiger *et al.* (2014)).

Debt dynamics turned out significant in specifications I and IV. Debt accumulation and deleveraging reflect changes in the credit conditions affecting households' decisions. The results indicate that the excessive household debt and deleveraging observed since the sovereign debt crisis (captured by the change in leverage ratio entered with a hysteresis of two or three quarters) negatively affects consumption. This finding is in line with the relevant literature on the effect of debt dynamics on private consumption (see, *among others*, Mian *et al.* (2013), Estrada *et al.* (2015), Cooper and Dynan (2016)). Households with a high level of debt relative to their income are expected to pare back their consumption in order to pay down their debt. Moreover, high debt ratios may prevent households from obtaining additional credit to finance their spending.

5. Conclusions

This study aims to identify the determinants of private consumption in Greece paying particular attention to the significance of income and wealth. The novelty of the paper with respect to the Greek literature on consumption is that it allows for different types of income to play a different role in consumers' behavior. Overall, the results stress the importance to decompose disposable income for analyzing private consumption. The estimates show that the composition of income matters for consumption. It is found that labour income is the most important determinant of private consumption in Greece. It is also shown that social transfers and fiscal measures (such as lower direct taxes and social contributions) have a positive impact on private

consumption in the short run¹⁷. Thus, modellers as well as policy makers should focus on income components, rather than on total disposable income, as the latter might mask different effects on consumption from labour income and non-labour income.

The results have significant policy implications for the case of Greece. Policy makers should primarily monitor labour income and take measures to support it. Therefore, policies aiming at increasing the participation rate in the labour market in Greece are expected to support labour income of households. The economic strategy in the context of the National Recovery and Resilience Plan (Greece 2.0) aiming to mobilise resources for job creation and participation in the labour market, as well as training, upskilling and reskilling of the workforce is expected to contribute to an increase in employment and labour income. Moreover, fiscal policy measures aiming to support the most vulnerable households, such as the unemployed, and reduce the high tax wedge on labour income are estimated to have a significant positive effect on consumers' spending.

Since it is found in the literature that there is substantial heterogeneity across the income distribution, with households with low cash-on-hand (or low income and wealth) exhibiting a much higher MPC than affluent households¹⁸, a promising avenue for future research is to consider also distributive information on income and wealth for private consumption by further improving the micro-macro link.

¹⁷ These results are in line with the relevant literature on European and the US economies. See *among others* Brayton and Tinsley (1996), Furceri and Zdzienicka (2012), Jaramillo and Chailloux (2015) and Aladangady and Feiveson (2018).

¹⁸ See, *inter alia*, Jappelli and Pistaferri (2013) and Ampudia *et al.* (2018).

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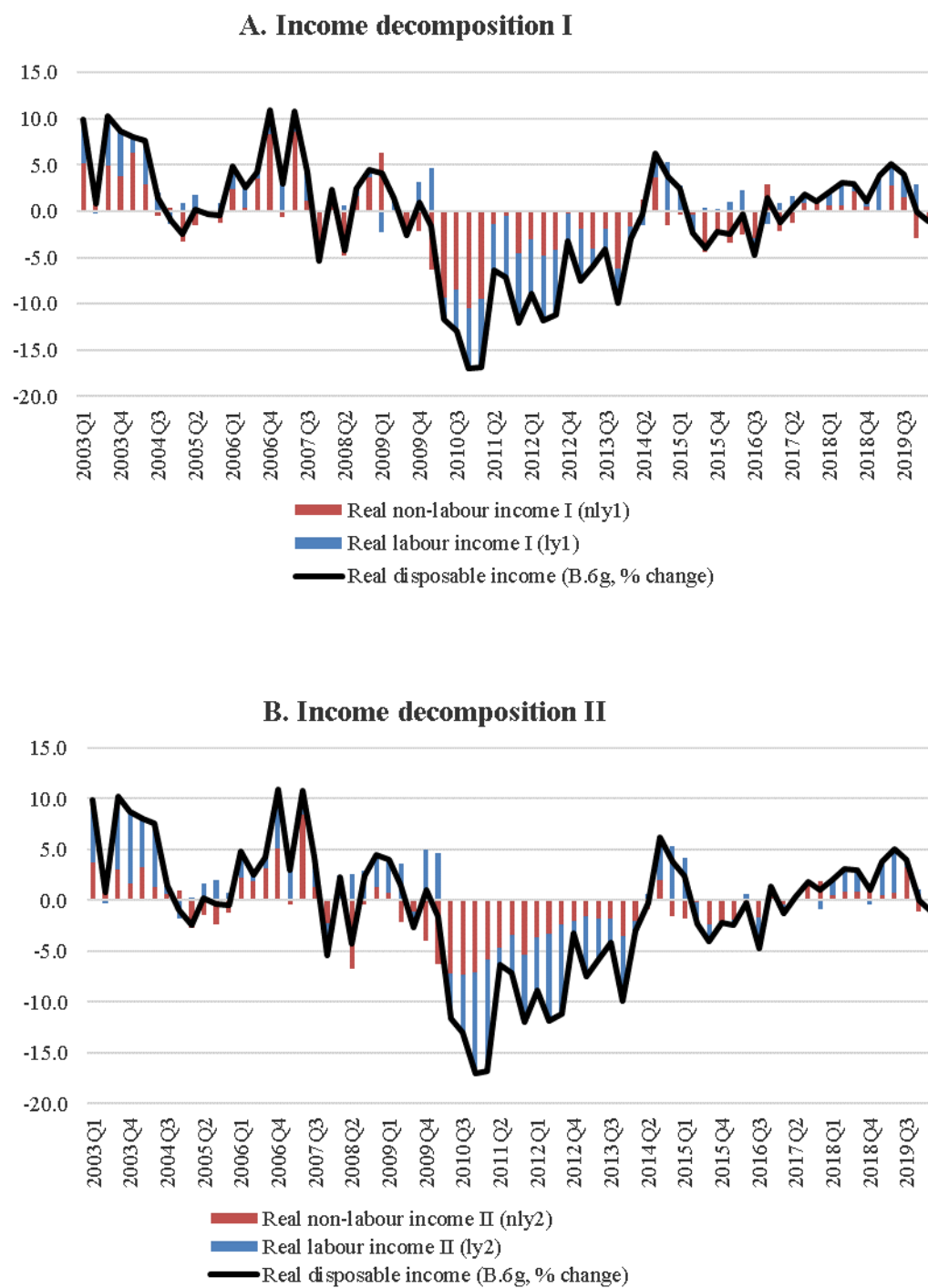
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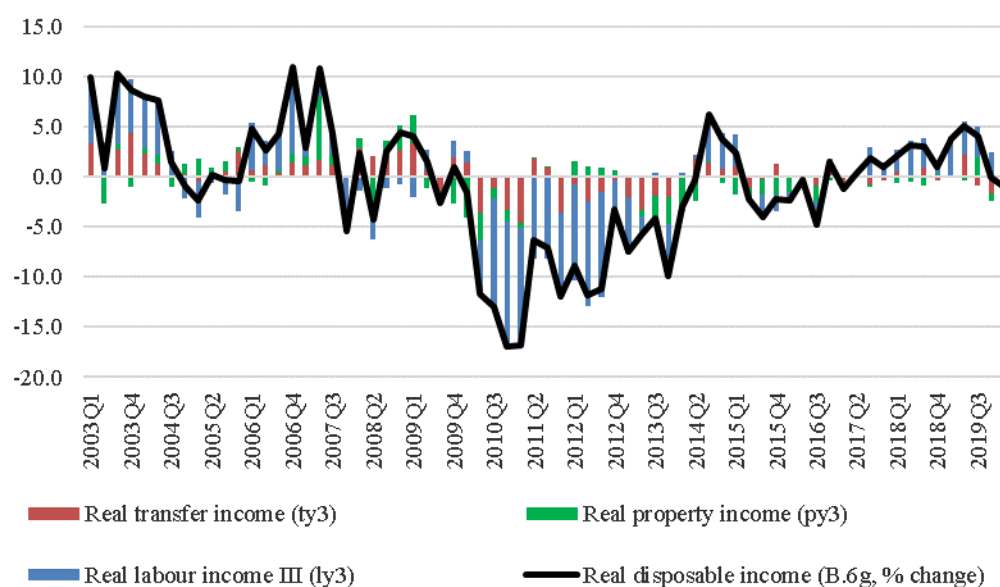
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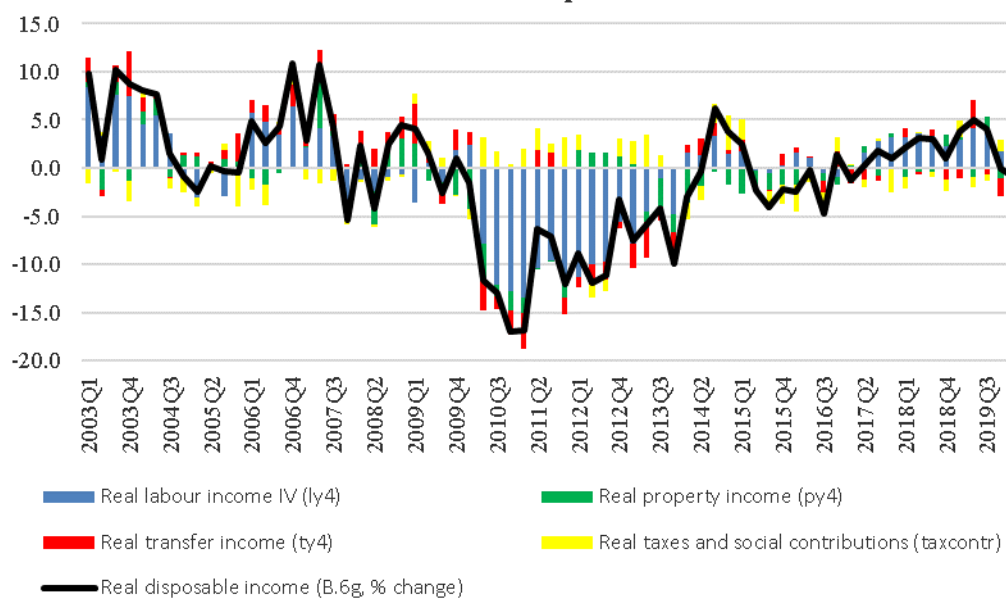
Figure 1: Contributions of components to income growth



C. Income decomposition III



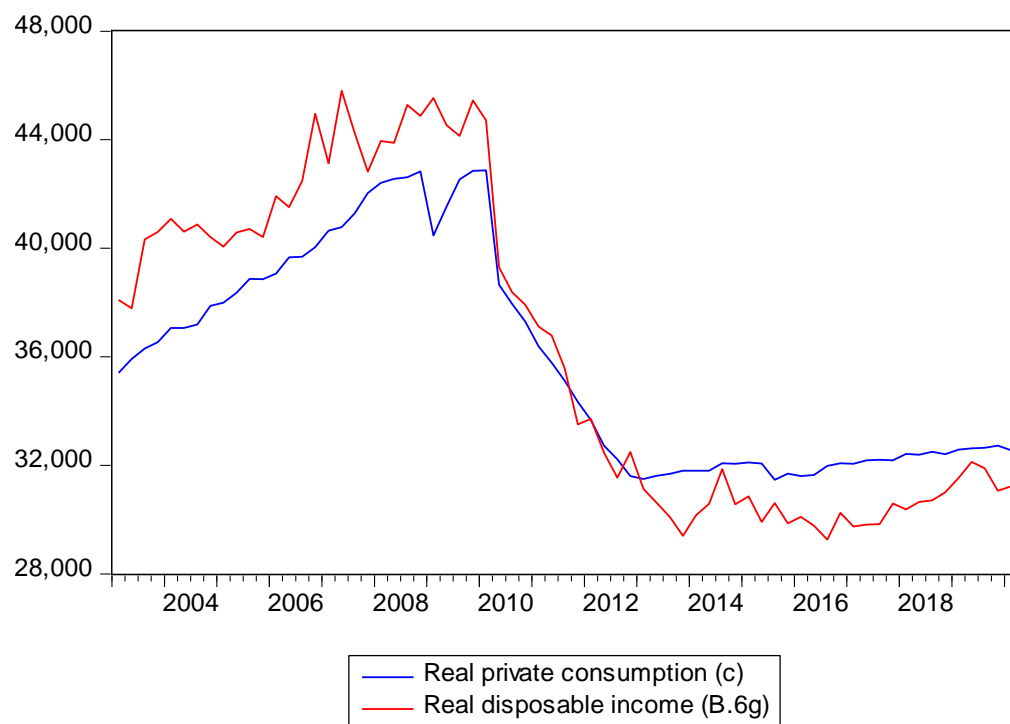
D. Income decomposition IV



Sources: ELSTAT and authors' calculations.

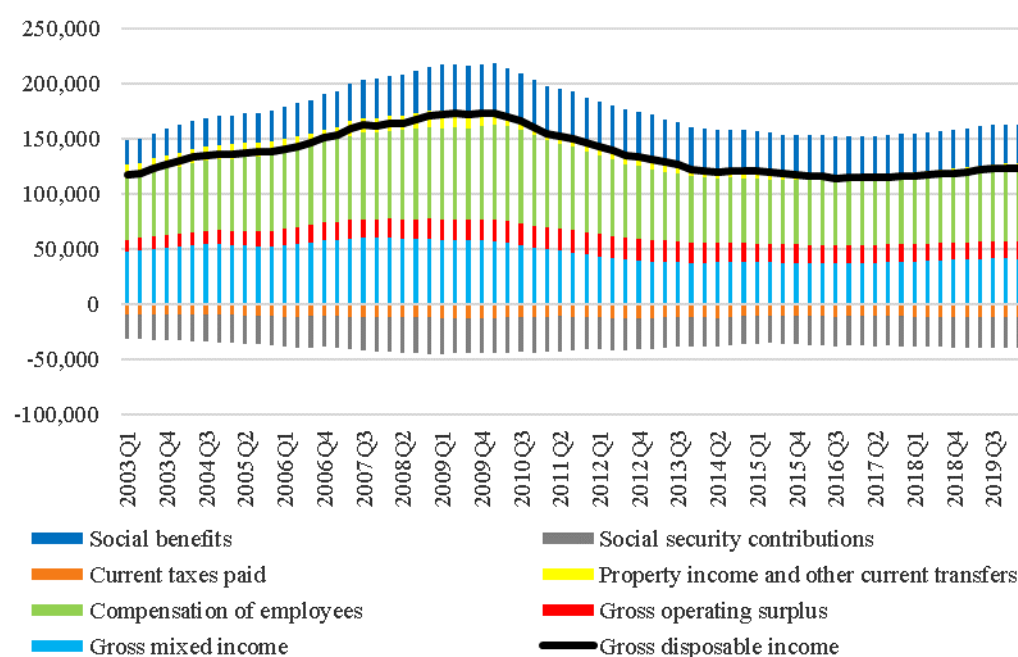
Note: annual growth rates of total disposable income together with respective contributions from its labour and non-labour components based on four decompositions (A-D).

Figure 2: Private consumption and disposable income
(sa data, at constant prices, in mn €)



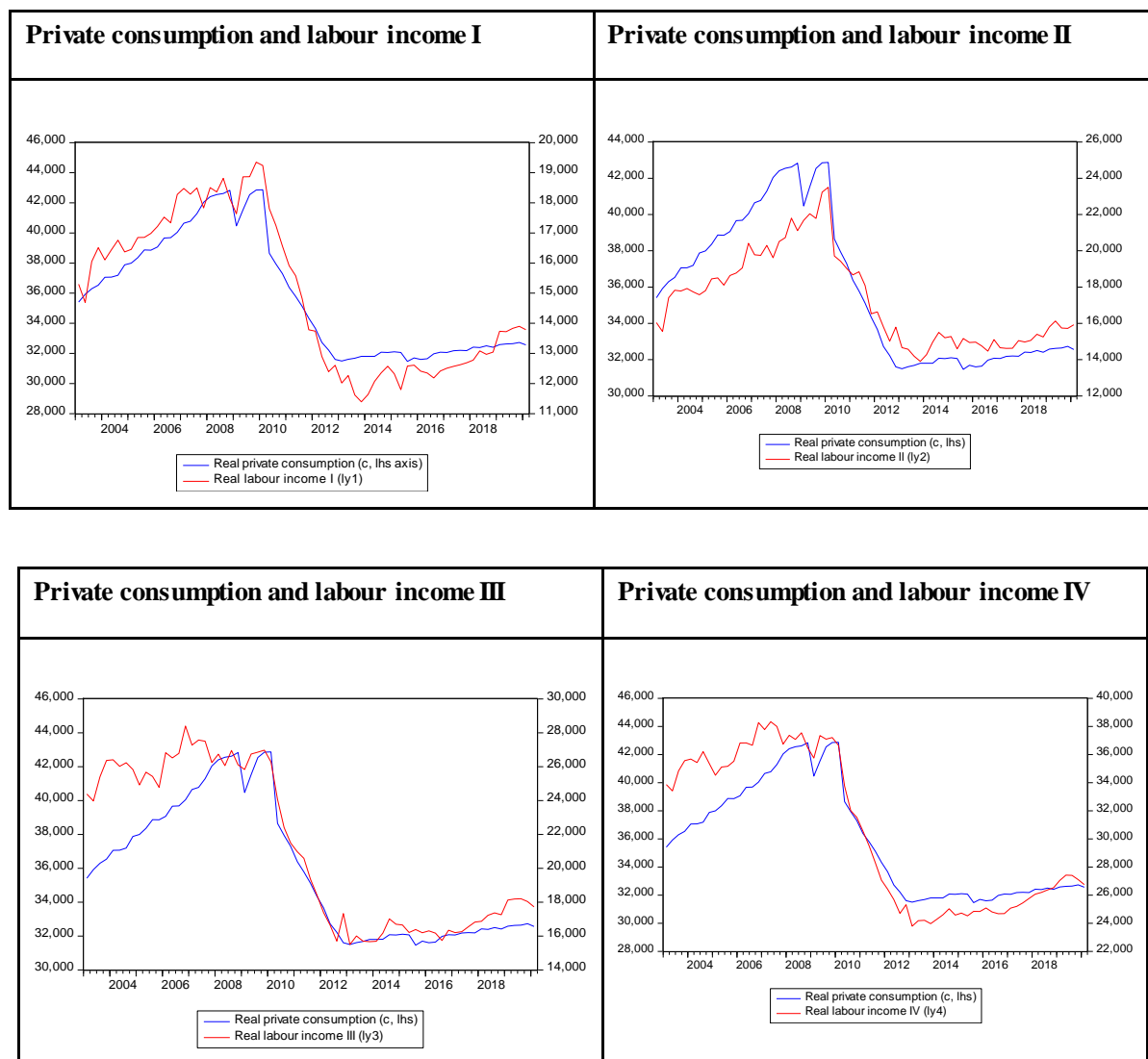
Source: ELSTAT, quarterly non-financial accounts of institutional sectors.
Note: Variables are deflated using the private consumption deflator.

Figure 3: Household disposable income and components
(in mn €, four-quarter moving sum)



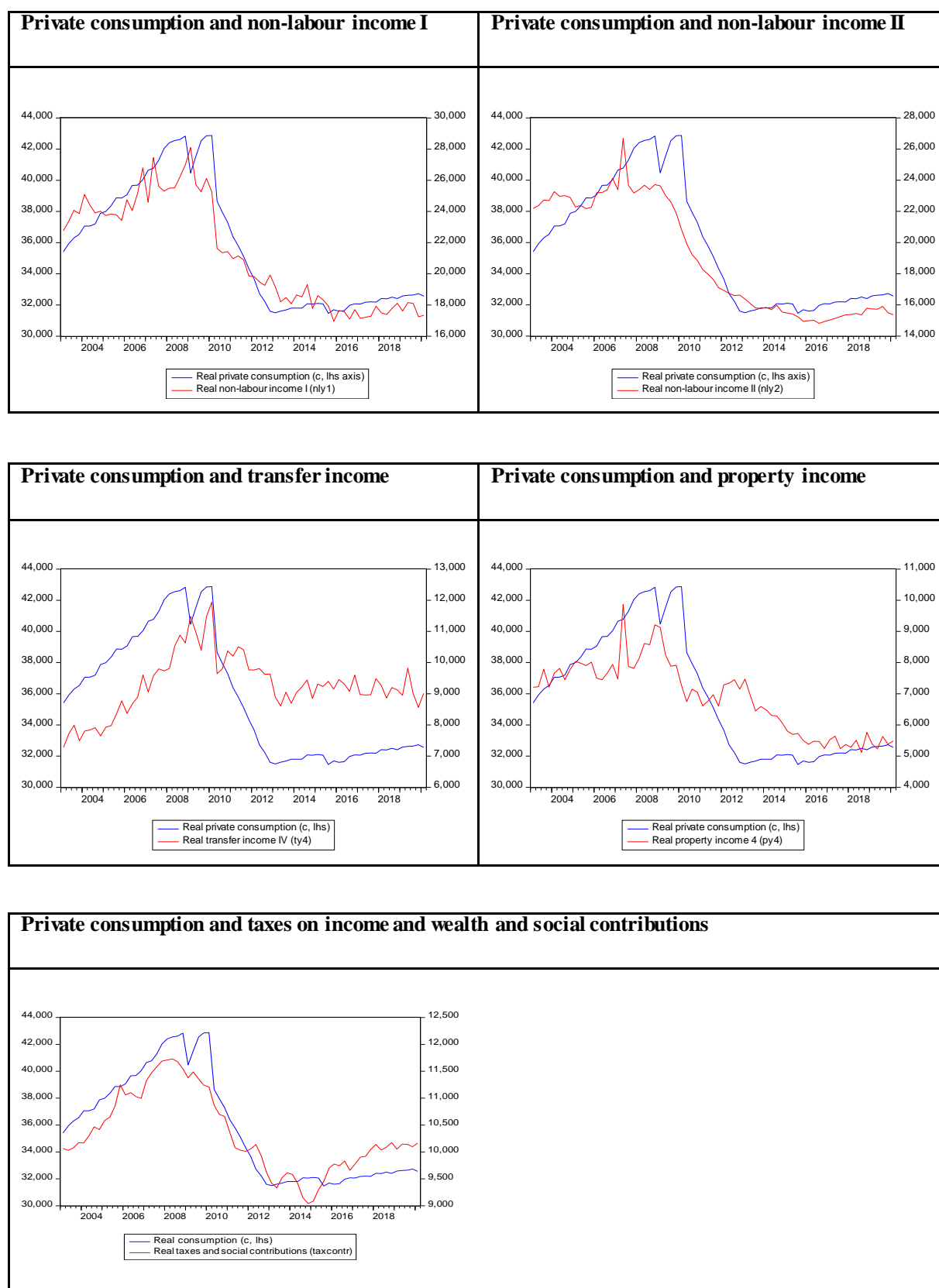
Source: ELSTAT, quarterly non-financial accounts of institutional sectors.

Figure 4: Private consumption and labour income
(in mn €, sa data, at constant prices)



Source: ELSTAT, quarterly national accounts of households and NPISH.

Figure 5: Private consumption and non-labour income and components
(in mn €, sa data, at constant prices)



Source: ELSTAT, quarterly national accounts of households and NPISH.

Figure 6: Household net wealth

Figure 6a: Household net wealth decomposition

(outstanding amounts in € bn)

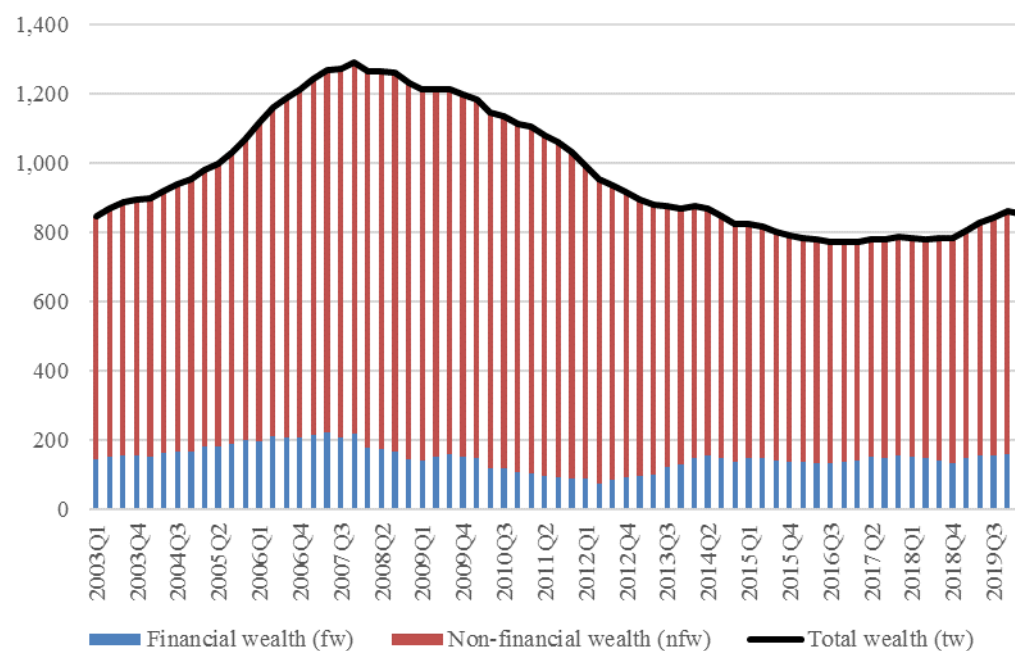
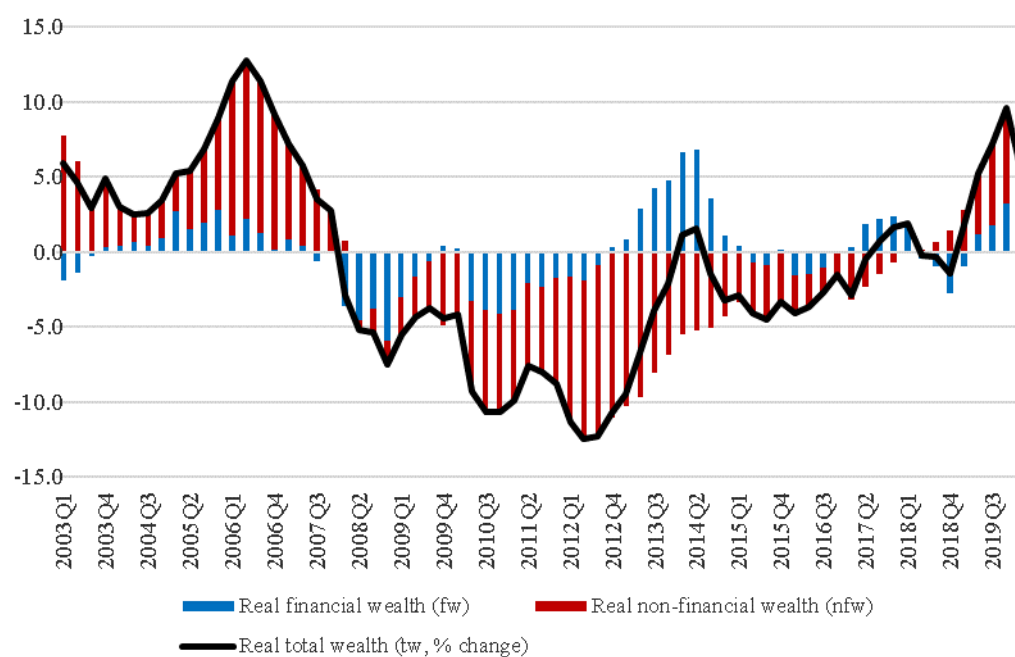


Figure 6b: Household wealth growth



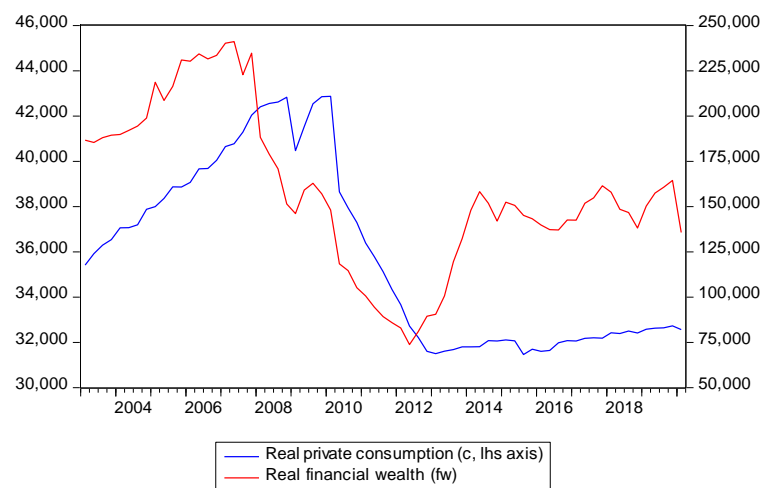
Source: Bank of Greece, ECB and authors' calculations

Note: Figure 6b plots annual growth rates of total real wealth and contributions from its financial and non-financial components.

Figure 7: Private consumption and the wealth components

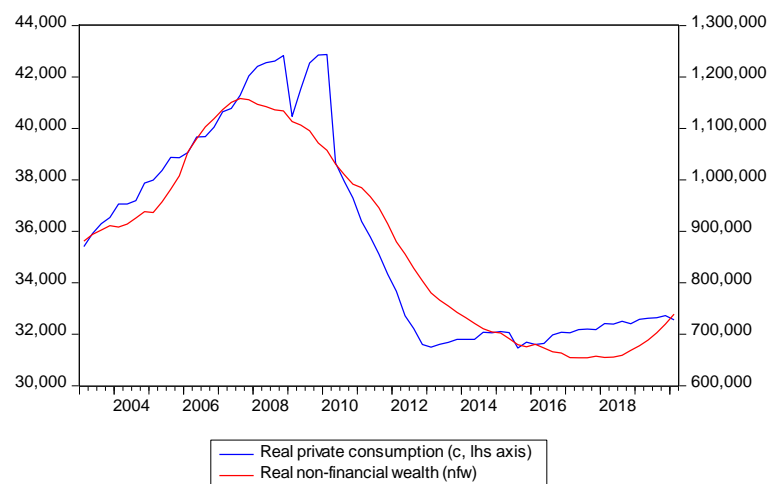
7a Private consumption and financial wealth

(in mn €, sa data, at constant prices)



7b Private consumption and non-financial wealth

(in mn €, sa data, at constant prices)



Source: Bank of Greece, ECB and authors' calculations

Figure 8a: Annual growth rates of private consumption and deposit rate

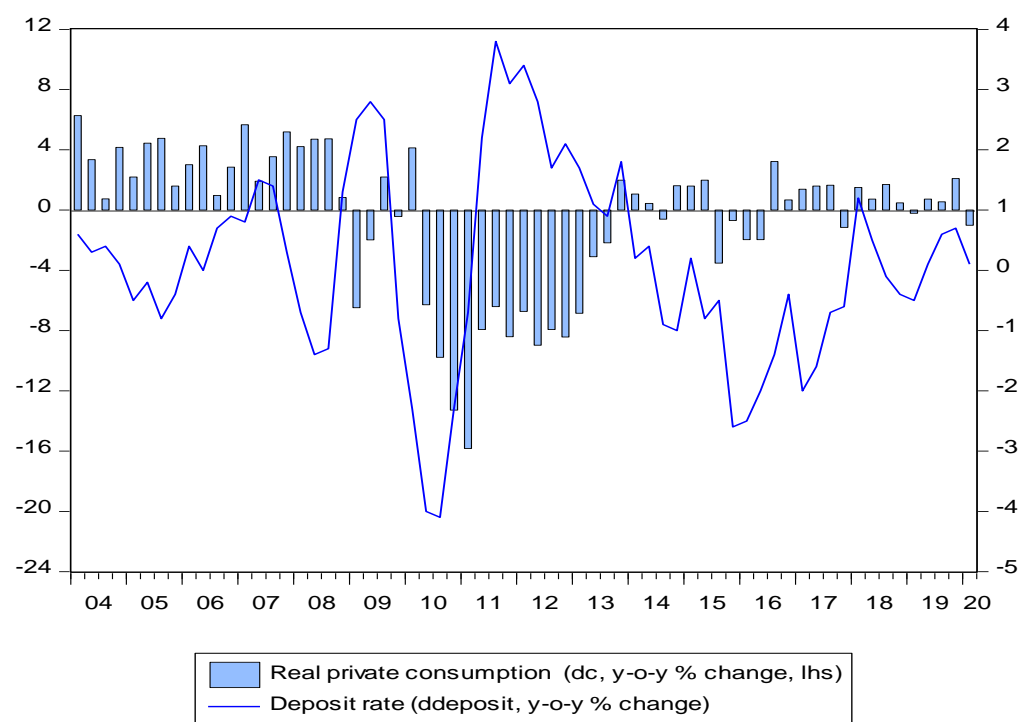
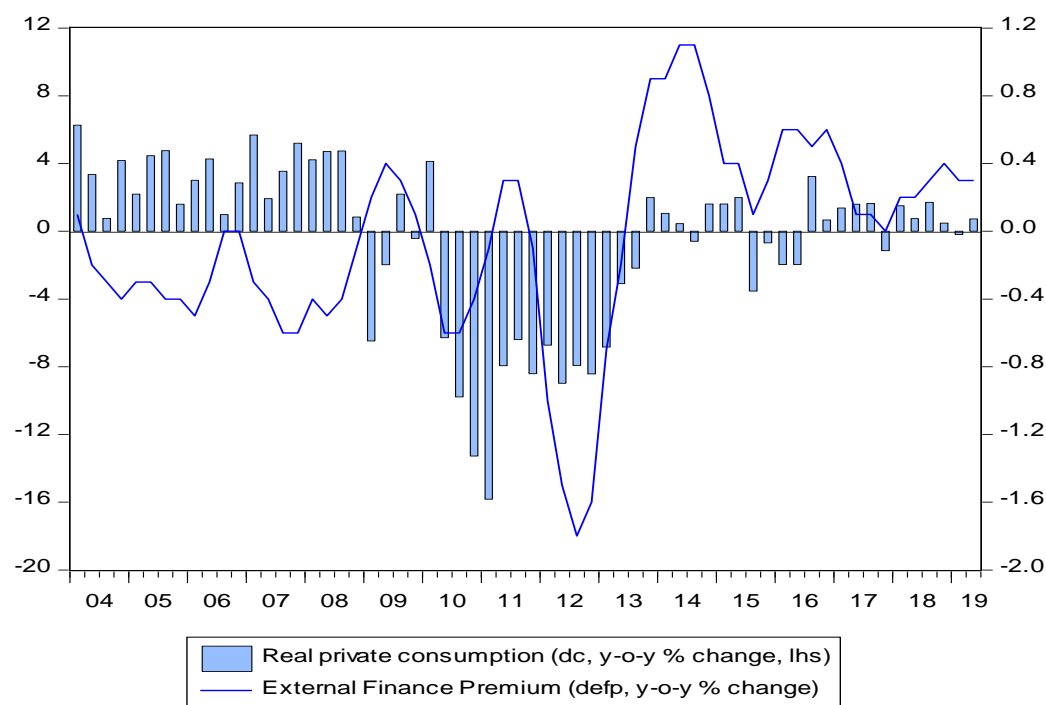


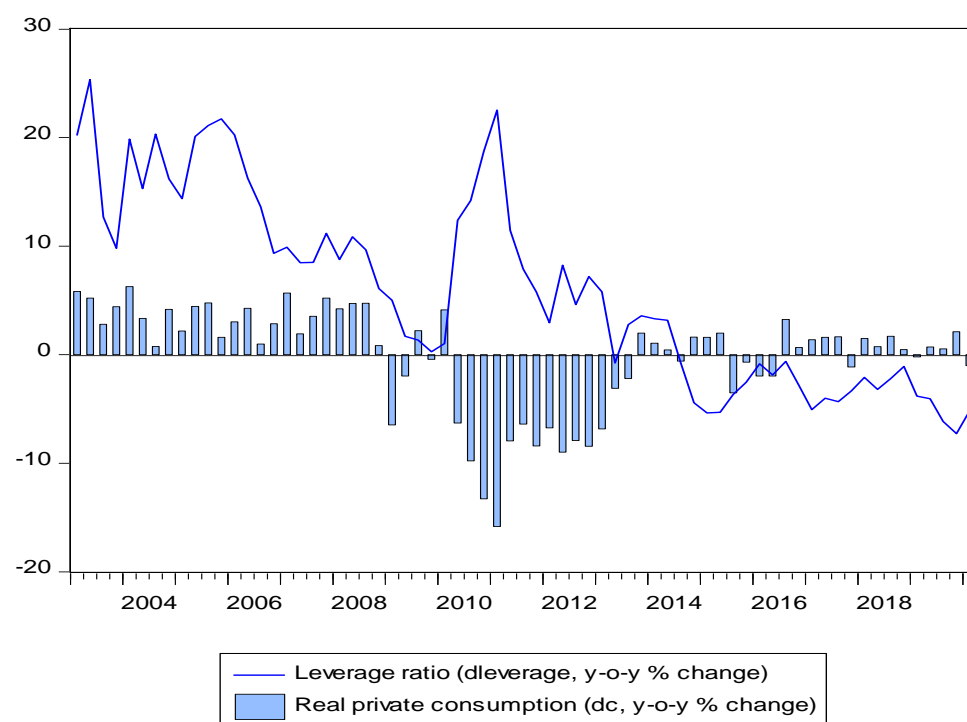
Figure 8b: Annual growth rates of private consumption and external finance premium*



Sources: ELSTAT quarterly national accounts and Bank of Greece

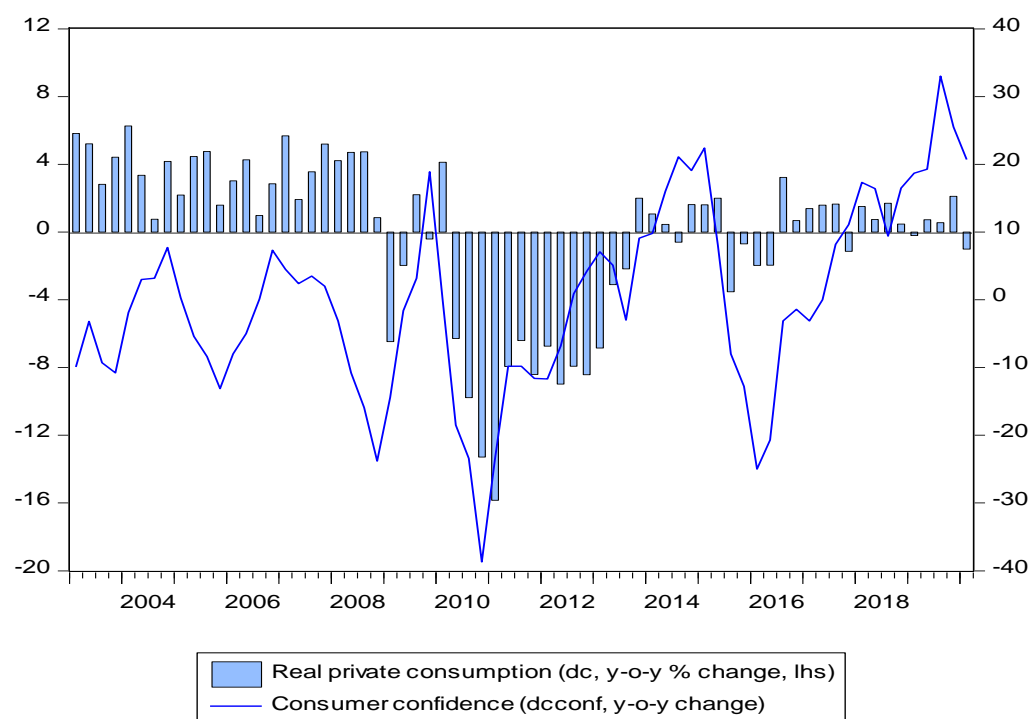
*External finance premium is defined as the spread between the mortgage rate and the deposit rate.

Figure 9: Annual growth rate of private consumption and the leverage ratio



Source: ELSTAT, quarterly non-financial accounts of institutional sectors and Bank of Greece financial accounts.

Figure 10: Annual growth rate of private consumption and consumer confidence



Sources: ELSTAT quarterly national accounts and European Commission Business and Consumer Surveys.

Table 1a: ADF unit root tests and stationarity testing results

Variables	t(ADF)	lags	Variables	t(ADF)	lags, trend
ly1	-1.18	(4)	Δ ly1	-3.42 **	(3, trend)
nly1	-0.47	(4)	Δ nly1	-4.14 **	(3, -)
ly2	-1.33	(4)	Δ ly2	-3.91 **	(3, -)
nly2	-1.07	(5)	Δ nly2	-2.07 **	(4, -)
ly3	-1.26	(4)	Δ ly3	-2.83 **	(3, -)
ly4	-1.48	(4)	Δ ly4	-2.39 *	(3, -)
ty3	-2.69	(3)	Δ ty3	-13.53**	(2, trend)
py3	-0.45	(4)	Δ py3	-4.85 **	(3, -)
py4	-0.38	(4)	Δ py4	-5.10 **	(3, -)
ty4	-2.24	(3)	Δ ty4	-16.47**	(2, trend)
taxcontr	-1.33	(4)	Δ taxcontr	-5.48 **	(3, -)
fw	-1.14	(0)	Δ fw	-3.88 **	(1, -)
nfw	-2.29	(4)	Δ nfw	-1.12	(4, -)

Note: * and ** indicate rejection of the null hypothesis at the 5% and 1% level of significance, respectively.

Table 1b: Phillips-Perron unit root and stationarity testing results

Variables	t(PP)	Bandwidth	Variables	t(PP)	Bandwidth
ly1	-0.45	(13)	Δ ly1	-17.42 **	(27)
nly1	-0.95	(13)	Δ nly1	-15.05 **	(13)
ly2	-0.3	(13)	Δ ly2	-20.52 **	(18)
nly2	-1.19	(12)	Δ nly2	-13.30 **	(12)
ly3	-1.07	(13)	Δ ly3	-14.26 **	(15)
ly4	-0.87	(13)	Δ ly4	-14.02**	(15)
ty3	0.56	(14)	Δ ty3	-17.47 **	(20)
py3	-0.65	(13)	Δ py3	-20.61 **	(14)
py4	-0.89	(13)	Δ py4	-21.97 **	(14)
ty4	0.77	(13)	Δ ty4	-25.37 **	(15)
taxcontr	0.12	(13)	Δ taxcontr	-22.21 **	(14)
fw	-1.46	(4)	Δ fw	-6.97 **	(3)
nfw	-0.44	(6)	Δ nfw	-3.49 **	(3)

Note: * and ** indicate rejection of the null hypothesis at the 5% and 1% level of significance, respectively.

Table 2: Private consumption, income and wealth 2003-2020: the long-run relationship

Income decomposition I

Sample Period	2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly1	0.25 **	0.062	4.007	(0.000)	59.5
nly1	0.13 *	0.078	1.700	(0.094)	21.9
fw	0.05**	0.022	2.297	(0.025)	1.1
nfw	0.18**	0.074	2.458	(0.017)	0.7
R ² (Adjusted)	0.933				
S.E. of Regression	0.029				

Income decomposition II

Sample Period	2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly2	0.30 **	0.059	5.108	(0.000)	62.1
nly2	0.13 **	0.064	1.995	(0.050)	24.5
fw	0.07 **	0.022	2.978	(0.004)	1.6
nfw	0.15 **	0.072	2.158	(0.035)	0.6
R ² (Adjusted)	0.933				
S.E. of Regression	0.028				

Income decomposition III

Sample Period	2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly3	0.21 **	0.050	4.236	(0.000)	35.6
ty3	0.28 **	0.044	6.378	(0.000)	110.3
fw	0.07 **	0.020	3.381	(0.001)	1.6
nfw	0.19 **	0.047	4.015	(0.000)	0.8
R ² (Adjusted)	0.942				
S.E. of Regression	0.027				

Income decomposition IV

Sample Period	2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly4	0.37 **	0.062	6.059	(0.000)	43.5
ty4	0.19 **	0.032	6.111	(0.000)	73.2
fw	0.05 **	0.019	2.537	(0.014)	1.1
nfw	0.16**	0.044	3.776	(0.000)	0.7
R ² (Adjusted)	0.946				
S.E. of Regression	0.026				

*, ** denote significantly different from zero in at least 90% and 95%, respectively.

Table 3: Tests for cointegration

	Income decomposition I	Income decomposition II	Income decomposition III	Income decomposition IV
Engle-Granger tau-statistic	-5.5	-5.9	-6.7	-7.0
Engle-Granger z-statistic	-42.6	-47.8	-55.7	-59.1
Phillips-Ouliaris tau-statistic	-5.4	-5.9	-6.6	-7.0
Phillips-Ouliaris z-statistic	-39.6	-45.1	-50.5	53.7

Note: significant at 5% level.

Table 4: Private consumption, income and wealth 2010-2020: the long-run relationship

Income decomposition I

Sample Period	2010:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly1	0.29 **	0.051	5.766	(0.000)	71.8
nly1	0.29 **	0.082	3.563	(0.001)	51.3
fw	0.06 **	0.024	2.501	(0.017)	1.5
nfw	0.07	0.070	1.031	(0.310)	0.3
R ² (Adjusted)	0.91				
S.E. of Regression	0.02				

Income decomposition II

Sample Period	2010:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly2	0.31 **	0.064	4.755	(0.000)	64.6
nly2	0.31 **	0.091	3.416	(0.002)	63.4
fw	0.07 **	0.025	2.719	(0.010)	1.8
nfw	0.06	0.075	0.861	(0.395)	0.3
R ² (Adjusted)	0.907				
S.E. of Regression	0.021				

Income decomposition III

Sample Period	2010:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly3	0.31 **	0.07	4.723	(0.000)	58.3
ty3	0.17 **	0.077	2.27	(0.030)	64.9
fw	0.04 *	0.026	1.699	(0.098)	1.1
nfw	0.14**	0.056	2.513	(0.017)	0.6
R ² (Adjusted)	0.92				
S.E. of Regression	0.02				

Income decomposition IV

Sample Period	2010:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value	MPC
ly4	0.39 **	0.058	6.697	(0.000)	48.9
ty4	0.08	0.062	1.374	(0.178)	29.9
fw	0.06 **	0.019	2.892	(0.007)	1.5
rmfw	0.19 **	0.040	4.763	(0.000)	0.7
R ² (Adjusted)	0.92				
S.E. of Regression	0.02				

*, ** denote significantly different from zero in at least 90% and 95%, respectively.

Table 5: Private consumption growth 2003-2020: the short-run dynamics

Income decomposition I

Sample Period 2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value
dc(-4)	0.22**	0.09	2.471	(0.016)
dly1(-1)	0.10 **	0.041	2.453	(0.017)
dly1(-2)	0.07 *	0.036	1.811	(0.075)
d(rleverage(-2))	-0.124	0.081	-1.517	(0.135)
D102	-0.076**	0.020	-3.787	(0.000)
ECT(-1)	-0.43 **	0.101	-4.207	(0.000)
R ² (Adjusted)		0.811		
S.E. of Regression		0.018		

Income decomposition II

Sample Period 2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value
dc(-4)	0.24 **	0.084	2.82	(0.006)
dly2(-2)	0.06 *	0.032	1.828	(0.073)
d(cconf(-1))	0.001 **	0.000	1.967	(0.0540)
d(deposit(-1))	-0.007	0.003	-1.979	(0.0526)
D102	-0.07 **	0.019	-3.603	(0.001)
ECT(-1)	-0.58 **	0.086	-6.775	(0.000)
R ² (Adjusted)		0.825		
S.E. of Regression		0.017		

Income decomposition III

Sample Period 2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value
dc(-4)	0.24 **	0.089	2.700	(0.009)
dly3(-1)	0.18 **	0.053	3.455	(0.001)
d(cconf(-1))	0.001 **	0.000	2.112	(0.0389)
ECT(-1)	-0.50 **	0.104	-4.813	(0.000)
R ² (Adjusted)		0.789		
S.E. of Regression		0.019		

Income decomposition IV

Sample Period 2003:Q1 - 2020:Q1				
Variables	Coefficients	Std error	t-statistic	p-value
dc(-4)	0.22 **	0.0871	2.545	(0.0138)
dly4(-1)	0.35 **	0.0820	4.335	(0.000)
d(taxcontr(-1))	-0.10 **	0.037	-2.726	(0.008)
d(cconf(-1))	0.001 **	0.000	2.124	(0.038)
d(efp(-4))	-0.033 **	0.012	-2.658	(0.010)
d(rleverage(-3))	-0.14	0.097	-1.465	(0.148)
ECT(-1)	-0.46 **	0.106	-4.328	(0.000)
R ² (Adjusted)		0.816		
S.E. of Regression		0.018		

Note: In May 2010 the government signed the 1st adjustment programme for the Greek economy, which included a number of fiscal consolidation measures. The measures had an immediate effect on consumption growth as captured by the impulse dummy D102. D102 turns out significant in specifications I and II.

*, ** denote significantly different from zero in at least 90% and 95%, respectively.

Appendix Table: Definition of variables¹

c	private consumption
ly1	labour income 1: compensation of employees - direct taxes on income and wealth paid by households
nly1	non-labour income 1: disposable income - labour income I
ly2	labour income 2: compensation of employees - direct taxes - social security contributions + social benefits
nly2	non-labour income 2: disposable income - labour income II
ly3	labour income 3: compensation of employees + mixed income - social security contributions - labour income share of direct taxes
py3	property income 3: gross operating surplus + net property income - imputed property taxes
ty3	transfer income 3: social benefits + net other transfers - imputed transfer taxes
ly4	labour income 4: compensation of employees + mixed income
py4	property income 4: gross operating surplus + net property income + net other current transfers
ty4	transfer income 4: social benefits
taxcontr	direct taxes on income and wealth and social contributions
fw	financial wealth: financial assets - financial liabilities
nfw	non-financial wealth: housing wealth
tw	total wealth: financial + non-financial wealth
rlverage	leverage ratio: ratio of the stock of loans to households to 4-quarter moving sum of real household disposable income
cconf	consumer confidence
deposit	real deposit interest rate for households
efp	external finance premium: the spread between the mortgage rate and deposit rate
B.6g	gross disposable income of households and non-profit institutions serving households
D.1R	compensation of employees
D.5	direct taxes on income and wealth paid by households
D.61	social security contributions
D.62	social benefits
D.7	net other current transfers
B.3g	mixed income
B.2g/B.3g	gross operating surplus/mixed income
D.4	net property income

¹ All variables used in estimated equations are in real terms, deflated using the private consumption deflator.

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