Income and Wealth: Is There a Need to Decompose Their Effects When Analysing Consumption? Evidence from Greece

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Abstract

The present paper indicates the need to decompose not only household wealth but also disposable income to efficiently analyse consumer spending, using as a case study the economy of Greece in 2003Q1-2020Q1. The results indicate that decomposing disposable income is essential for studying private consumption, as the estimated elasticities to consume of the different income components differ significantly. Labour income is shown to be the driving force of consumption in Greece throughout the period analysed, which encompasses the crisis period and the short recovery that followed it. The results provide useful implications for policies aiming at economic growth, as consumption accounts for the largest component of GDP in most economies.

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1. Introduction

Understanding the behaviour of private consumption is crucial for the assessment of the situation of all economies in the short and medium term. As the largest expenditure component of GDP, household spending plays a central role in the cyclical fluctuations of economic 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).

One conceptual drawback to this theoretical framework is that all the components of household disposable income and net wealth are assumed to have the same effect on consumption. Actually, the marginal propensities to consume (MPCs) 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. As a result, a large number of empirical studies on consumption propose the decomposition of total net wealth into financial and non-financial, (mainly housing) assets (see, *inter alia*, Cooper and Dynan, 2016). The idea has been adopted broadly, and by now the decomposition of wealth is commonly applied in the empirical literature (for a review of the relevant literature, see, *inter alia*, de Bondt et al., 2021).

Similarly, MPCs may differ across income types, labour and non-labour (mainly property and transfer) income. Households receiving property income have a low propensity to consume, an idea that goes back to Kaldor (1955), Klein and Goldberger (1955) and Samuelson and Modigliani (1966). This can happen for two reasons: (i) Those receiving property income have higher income than those receiving labour income (Klein and Goldberger, 1955) and they tend to have lower MPCs. (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). Transfer income may also imply different MPC compared to non-transfer income, as transfers are targeted to low income, liquidity constrained households which have higher MPCs. A few empirical studies disaggregate the effects of the disposable income into its labour and non-labour components when examining the determinants of consumption expenditure (for a review, see, *inter alia*, Jaramillo and Chailloux, 2015).

Recently, three studies propose to consider disaggregating disposable income as well as wealth, into their components, when analysing consumption: de Bondt *et al.* (2020), de Bondt *et al.* (2021) and Jaramillo and Chailloux (2015).

In the present study we emphasise the need to disentangle the income effects when analysing consumption in addition to wealth effects, using as a case study the economy of Greece in the period 2003Q1 – 2020Q1.[1] The time series data set used in the analysis explores all information available and stops just before the beginning of the pandemic episode and the supply constraining measures that were exogenously imposed by the Greek government to fight the pandemic in 2020Q2. We consider Greece to be an indicative case study as private consumption accounts for a particularly high share of GDP: 68% of GDP on average in the period under consideration. Thus, identification of the different effects that alternative components of income and wealth may have on consumption, becomes particularly important for economic policies which aim at GDP growth.

The analysis is of particular interest, as the period comprises the sovereign crisis shock in 2010 and distinct sub-periods characterized by the pursuance of different economic policies. The pre-2010 period is characterized by loose fiscal policies, extended government borrowing, and the deterioration in competitiveness which led to the twin deficits and the accumulation of large public and external debt. Nevertheless, the period also evidences high GDP growth rates, low unemployment, credit expansion and a boom in the housing market. The 2010-2016 years are characterised by a switch towards contractionary fiscal policies and the pursuance of the adjustment programmes of the Greek economy which included the

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[1] The work is along the lines of the work of de Bondt *et al.* (2020, 2021).

implementation of a number of structural reforms to restore competitiveness.[2] The period is marked by a severe deterioration of economic activity accompanied by very high unemployment rates, a severe decline in income, an increase in inequality and poverty, tight financial conditions, low sentiment and uncertainty (see, *inter alia*, Kaplanoglou and Rapanos, 2018).[3] In the recovery period 2017 -2019, GDP started to grow and unemployment to decrease despite the tight fiscal policies, mainly as a result of the restoration of competitiveness and the increase of exports.

In the analysis we decompose the income and wealth effects in order to show their different roles on consumption formation in the long and the short run. The idea is essentially to test for the impact of the different components of income to consumption in order to derive useful policy implications, without overlooking the effects of wealth. We separate the effects on consumption of the subcomponents of income (labour income and non-labour income), and different categories of wealth (financial wealth and housing wealth). The decomposition of the income effects is done for the first time for the economy of Greece and can be considered as a contribution to the empirical literature on consumption spending in Greece. Four alternative income splits 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 explanatory power of other determinants of private consumption, which are suggested by economic theory to affect consumption in the short run, (see, *inter alia*, Estrada et al., 2014) such as interest rates, household leverage and uncertainty, is also accounted for. In line with previous studies, we use an error correction specification where short-run effects can differ from the long-run effects, and the long-run equilibrium is reached gradually.

The results indicate the importance of decomposing disposable income as well as wealth to efficiently estimate private consumption. 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 strength of labour income effects on private consumption suggests that labour income should be monitored cautiously by both forecasters and policy makers. Measures to increase employment and compensation per employee should be applied when policy makers aim to GDP growth. The issue becomes even more interesting especially at present, as many economies have to face the impact of the energy supply constraints in the post – pandemic era, and aim to return to a state of recovery and to move along a path of long-term sustainable growth.

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 and concludes.

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[2] Greece signed three Economic Adjustment Programs in 2010, 2012 and 2015 with European partners and IMF (https://www.consilium.europa.eu/en/policies/financial-assistance-eurozone-members/greece-programme/).
[3] More specifically, the crisis led to a cumulative decrease in GDP of 26.4% in 2013 compared to 2008, a deterioration in labour market conditions with the unemployment rate escalating to 27.5% in 2013, from 7.6% in 2008 and the subsequent decline in disposable income, which registered a cumulative decline of 33% in 2016 compared to 2008. Changing conditions in financial and housing markets and their implications for household wealth were also quite dramatic (see*, inter alia*, Athanasiou and Tsouma, 2017). Housing investment and prices progressed to an era of unprecedented decline until 2017. Financial wealth went through major fluctuations reflected in the volatility of the Athens Stock Exchange General Index, as well as in household deposits in domestic banks, which experienced downward shocks, reflecting mainly a flight of funds in periods of escalating crisis conditions.

2. Survey of the Literature

The recent empirical literature on consumption is progressing towards two main dimensions, the examination of the effects of the financial and non-financial components of wealth and the impact of determinants, which are assumed to affect private consumption mainly in the short run. Fewer studies examine the impact of the income components on private consumption, whereas three recent studies analyse consumption by disaggregating both the wealth and the income effects.

(i) Decomposing the impact of wealth

A strand of the empirical literature decomposes the total wealth effects.[4] Revived interest in the differentiation between financial and non-financial (mainly housing) wealth effects has been motivated by major developments in financial and housing markets worldwide in the years of the Great Recession (Sousa, 2009; Slacalek, 2009; Carroll et al., 2011; Aron et al., 2012, Aron and Muellbauer, 2013; Cooper and Dynan, 2016; and de Bondt et al., 2020; de Bondt et al., 2021). These studies provide a wide range of MPCs out of wealth components across countries (see Cooper and Dynan, 2016; and de Bondt et al., 2021, for an overview). The differences in the estimated elasticities and MPCs out of wealth components reflect a number of reasons. The MPCs out of liquid assets (mostly financial assets) is likely to be greater than that of illiquid (mostly housing) wealth. Moreover, the components of financial wealth may differ in terms of their relative liquidity and thus induce different responses of consumption to wealth changes; it is easier to consume the liquid components of wealth, such as wealth from a savings bank account, or stock portfolio, than the illiquid components of wealth, such as the gains from a personal retirement account. In this respect, some articles further disaggregate financial wealth into its liquid and illiquid components to study the relationship between consumption and asset price changes (see, for example, Byrne and Davis, 2003, Aron et al., 2012; Duca and Muellbauer, 2013). 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; Ludwig and Slok, 2004; Barrell and Davis, 2007).

The different distribution of wealth across households within different countries may also influence the MPCs out of wealth. Lower income households tend to have higher MPCs out of wealth than richer households. Some assets, such as equities, are concentrated at the top of the income distribution and wealthy households tend to have low MPCs (Sierminska and Takhtamanova, 2012). On the other hand, housing is more broadly held than other types of wealth and its share in total wealth is much higher for lower-income households than for higher income households. The higher concentration of housing wealth in total wealth of lower income households, who are typically credit constrained, could make the MPC out of housing wealth higher than that out of financial wealth.

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, 2008; 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.

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[4] The two recent studies for Greece also fall in this category: Athanassiou and Tsouma (2017) disentangle financial wealth effects from housing wealth effects on private consumption for the period 2000Q1-2015Q3 and provide evidence that the housing wealth effect is higher than that of financial wealth. Manou et al. (2021) indicate the significance of housing wealth, financial assets and household debt on the formation of consumption spending for the period 1999Q4 - 2017Q4; they also provide evidence for larger housing effects than financial wealth effects.

Housing assets can be used as collateral to obtain a loan or, alternatively, owners could sell a house and earn capital gains. 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 (Cooper and Dynan, 2016). There might also be psychological reasons why homeowners increase their consumption in response to housing appreciation (Case et al., 2013).

(ii) The impact of short-run determinants

A number of recent studies examine the effects of short-run determinants of private consumption, other than the income and wealth components. They test the significance of alternative variables in order to assess the impact of: interest rates (de Bondt, 1999; Geiger et al., 2016; Estrada et al., 2014), household and public sector indebtedness (Al-Eyd et al., 2006; Rohn, 2010; Pacheco and Barata, 2005; Carroll et al., 2011; Dynan, 2012) and uncertainty (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 have a negative impact on consumption growth (de Bondt, 1999; Rodriguez-Palenzuela and Dees, 2016).

High debt and leverage impede consumer spending for a number of reasons (see, *inter alia,* Cooper and Dynan, 2016): High-debt households will bear high future debt servicing costs that may affect their consumption. The high-debt households may also become concerned about future credit availability and reduce their consumption in order to increase their savings. In case debt –to-income ratio increases, households would choose to cut down consumption in order to repay their debt. Most empirical studies indicate that high debt and deleveraging have a negative impact on consumption (Dynan, 2012; Cooper, 2012; Dynan and Edelberg, 2013; McCarthy and McQuinn, 2017). However, in some cases, leverage and new (current) debt may favour consumption (Mian et al., 2013, Estrada et al., 2014).

Fiscal stance is also expected to have an impact on private consumption. Many empirical studies test for fiscal effects on consumption, but provide inconclusive results. Most of them reject Ricardian equivalence (Masson et al., 1995; Giavazzi et al., 2000; Estrada et al., 2014).

High uncertainty and income uncertainty is expected to reduce current consumption as a result of increased precautionary savings (Dees and Brinca, 2013; Bahmani-Oskooee et al., 2015; Gieseck and Largent, 2016). Precautionary savings models show that the saving rate climbs (consumption falls) in response to an increase in uncertainty (Carroll et al., 2012). Similarly, lower consumer confidence and economic sentiment are likely to have an adverse impact on consumption growth (Dees and Brinca, 2013; Estrada et al., 2014; Rodriguez-Palenzuela and Dees, 2016).

(iii) Decomposing the impact of income

A strand of the literature advocates to decompose income effects on private spending (see, *inter alia*, Jaramillo and Chailloux (2015) for a review of the relevant literature). Davis and Palumbo (2001), Lettau and Ludvigson (2001), Benjamin et al. (2004), Aladangady and Feiveson (2018) compare the consumption elasticities with respect to the transfer and the non-transfer income. Transfer income is estimated to have a higher propensity to consume than non-transfer income, and thus would be associated with more spending. This may be due to the fact that transfers are targeted to low income, liquidity constrained households which

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have higher MPCs. Some papers estimate the effect of alternative fiscal policy measures (tax cuts, transfers) on consumption and provide evidence of larger responses among liquidity constrained households (Parker, 1999; Souleles, 2002; Johnson et al., 2006; Oh and Reis, 2011).

Ouvrard and Thubin (2020) also split income to its sources: they indicate that labour income and benefits have higher MPCs than taxes and social contributions. Several central banks allow for property income to enter the consumption function as a separate consumption determinant in their macroeconomic models (Brayton and Tinsley, 1996; Fagan and Morgan, 2005).

(iv) Decomposing the impact of both income and wealth

Three recent studies disentangle income and wealth effects on consumption by disaggregating the different types of both income and wealth (Jaramillo and Chailloux, 2015; de Bondt et al., 2020; de Bondt et al., 2021). In Jaramillo and Chailloux (2015) labour income turns out to be the main driver of consumption for a group of 14 advanced countries. de Bondt et al. (2020) and de Bondt et al. (2021) also provide evidence that labour income is the strongest determinant of consumption in euro area countries.

3. The Data - The Empirical Methodology

3.1 The data sources - The alternative decompositions of income

The nominal private consumption series is retrieved from the National Accounts (NA) series of the Hellenic Statistical Authority (ELSTAT). The source of disposable income data is quarterly non-financial accounts of households and Non Profit Institutions Serving Households (NPISH) of ELSTAT.[5] 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 data.[6] Quarterly data are back-casted and interpolated using the quadratic smoothing. All series are defined in real terms as nominal series are deflated by the private consumption deflator, obtained from the ELSTAT NA database.

To decompose disposable income Y_d into labour (LY) and non-labour income (NLY), four different income splits are considered as proposed by the literature (de Bondt et al., 2020; de Bondt et al., 2021; Jaramillo and Chailloux, 2015).[7]

Income decomposition I

According to the first and simpler approach, labour income 1 (LY1) and non-labour income 1 (NL1) are defined as:

LY1 = compensation of employees - direct taxes on income and wealth paid by households.

NLY1= Y_d - LY1.

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

[6] 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.

[7] 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.

Income decomposition II

According to the second split, labour income 2 (LY2) and non-labour income 2 (NLY2) are defined as:

LY2 = compensation of employees - direct taxes - social security contributions + social benefits + net other current transfers.

$NLY2 = Y_d$ - LY2

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.

Income decomposition III

Following the third split, labour income 3 (LY3) is calculated as:

LY3 = compensation of employees + mixed income - social security contributions - labour income share of direct taxes.

The share of taxes paid on labour income is approximated by the share of labour income in the pre-tax income received by households before taking into account social security contributions. In this case, non-labour income is further split into property income (PY3), from which direct taxes are deducted, and transfer income (TY3):

PY3 = gross operating surplus (mostly imputed rents of home-owners) + net property income (net interest income plus net other property income such as dividends paid by companies) - imputed property taxes

TY3= social benefits + net other current transfers - imputed transfer taxes.

Income decomposition IV

According to the fourth decomposition of income, disposable income is disaggregated as:

Y_d = LY4 + PY4 + TY4 – TC4

where LY4, PY4, TY4 and TC4 stand for labour income 4 , property income 4, transfer income 4 and personal income taxes and social security contributions, respectively (see Jaramillo and Chailloux, 2015), and are computed as follows:

LY4 = compensation of employees + mixed income

PY4 = gross operating surplus + net property income + net other current transfers

TY4 = social benefits

TC4 = personal income taxes and social security contributions.

3.2 Consumption and its determinants – some stylised facts

3.2.1 Consumption and income

Figure 1 depicts the patterns of consumption and disposable income in levels in an attempt to investigate visually any relationship between them. As expected, private consumption C follows closely the pattern of disposable income, Y_d, suggesting that income is a significant determinant of consumption. It is also evident that before the onset of the crisis at the end of

2009, households consume less than their income, whereas after the crisis they consume more than their income, possibly using their savings in an effort to keep their consumption habits.

Figure 1: Private consumption and disposable income (sa data, at constant prices, in mn €)
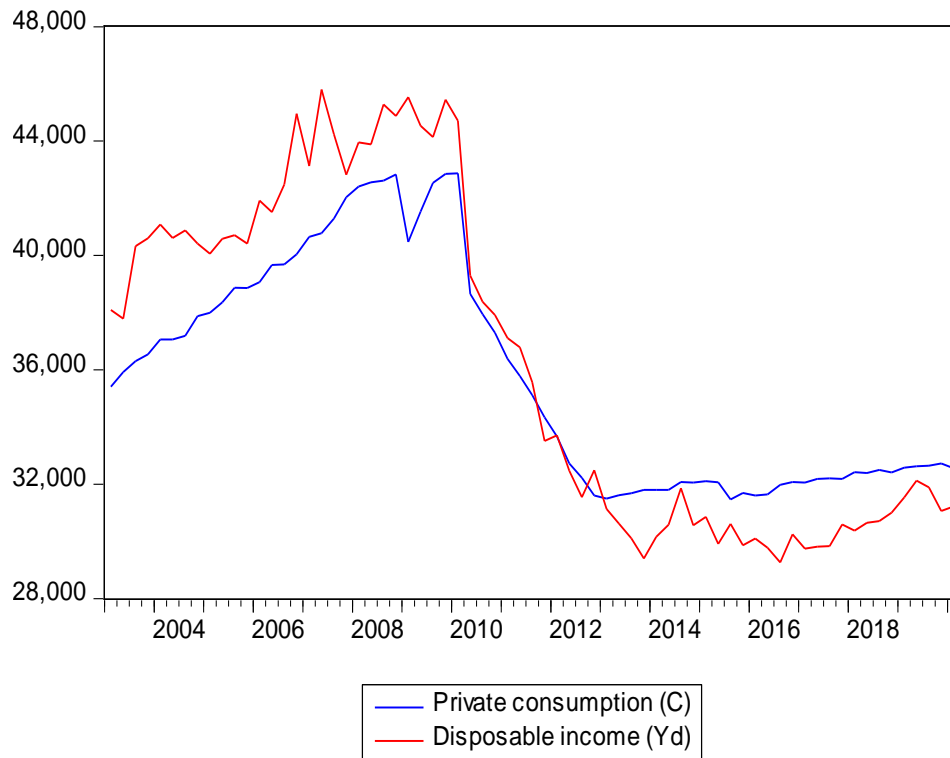
Source: ELSTAT, quarterly non-financial accounts of institutional sectors.

Figure 2: Disposable income
Figure 2.1: Household disposable income and components (in mn €, at current prices)
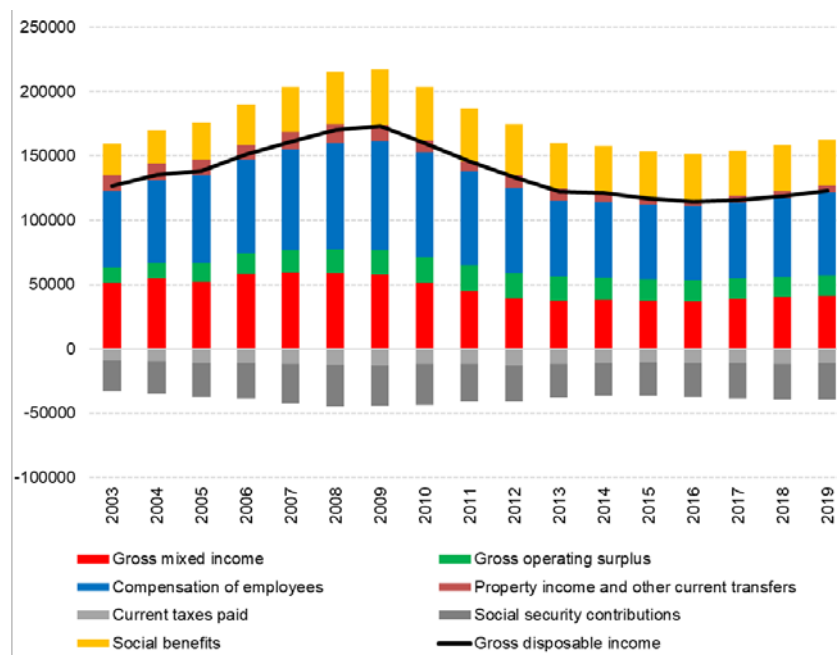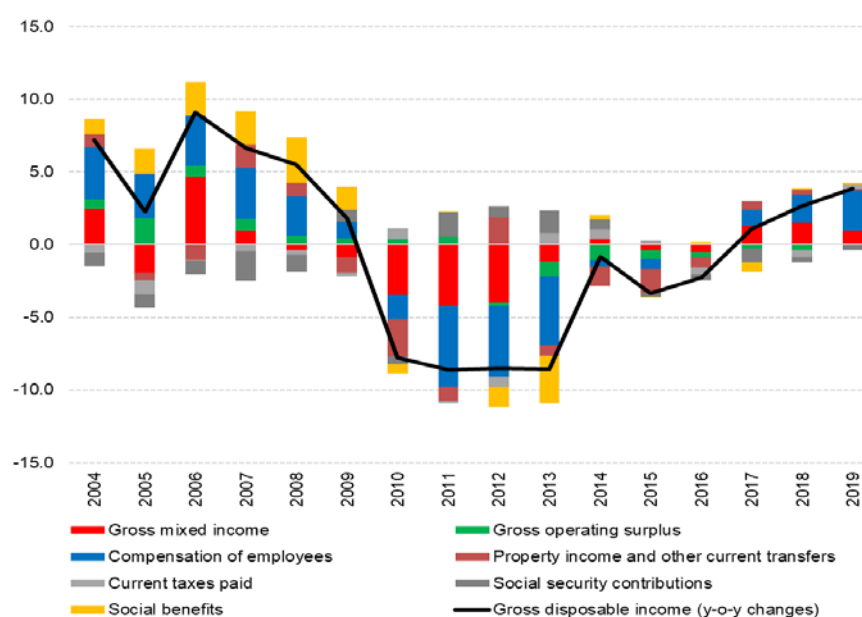
Figure 2.2: Household disposable income growth and components percent contributions

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

In Figure 2, Figure 2.1 depicts the evolution of disposable income and its components, whereas Figure 2.2 shows the annual growth rates of disposable income and the contribution resulting from the growth of its components.[8] 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 are expected 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.

As shown in Figure 2.1, the labour income components, compensation of employees and mixed income, have been the main components of disposable income throughout the period. Compensation of employees accounts for 50% of disposable income and constitutes the major component of labour income, in all four definitions of it. Following strong growth rates in the period of economic expansion 2003-2009, 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 the structural reforms providing for higher job-market flexibility.

Gross mixed income (a labour income component in definitions III and IV), which essentially accounts for the income of the self-employed, also contributes significantly to disposable income growth, probably as a result of the high self-employment rate in Greece (30% on average in the examined period). 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.

As regards non-labour income components, social benefits, which mostly refer to pensions (as well as maternity and family allowances and unemployment benefits), supported disposable income in the pre-crisis period. Social benefits increased in nominal terms in the

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[8] For the definition of disposable income sub-components, see ECB, 2021.

period 2003-2007, but decreased in the crisis period (especially in the years 2012 and 2013) as a result of the pension reform in the context of the economic adjustment programmes (Karavitis, 2018). They have stabilised since then at around the 2013 levels.

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 income exhibited a declining share in total income and had a small contribution to income's development, especially following the sovereign debt crisis.[9] As expected, social contributions and current taxes on income and wealth weighed on income.

3.2.2 Consumption and wealth

Figure 3 compares the evolution of private consumption C with that of wealth W in the period under consideration. It provides signs of comovement of the two variables.

Figure 3: Private consumption and wealth (sa data, at constant prices, in mn €)
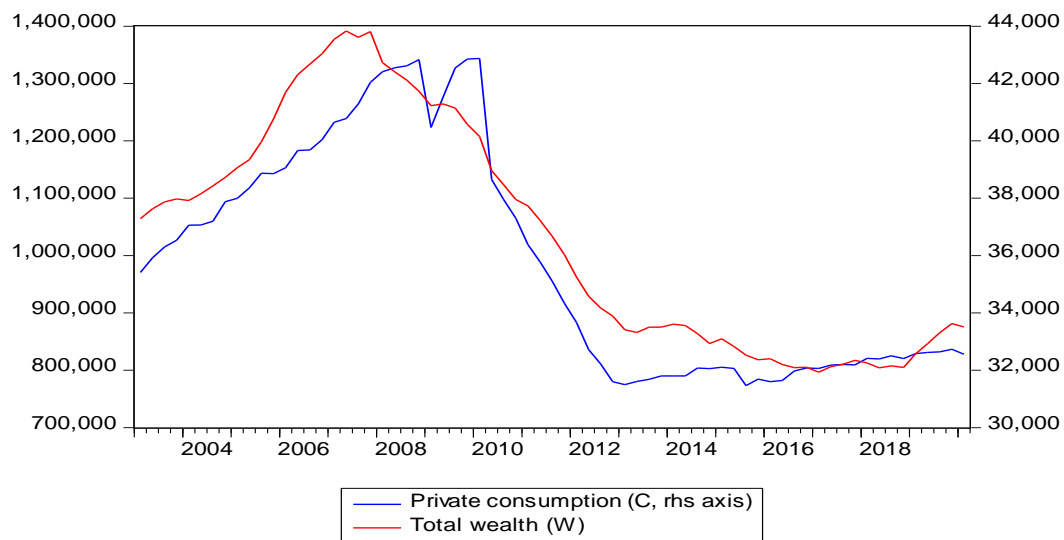
Source: Bank of Greece, ECB and ELSTAT.

Figure 4.1 presents the decomposition of total household wealth (W) in non-financial (NFW) and financial wealth (FW) and Figure 4.2 presents the annual growth rates of total wealth and the contributions of its components. 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. Prior to the crisis, households invested heavily in housing, being encouraged by ample availability of credit and low interest rates (see, *inter alia*, Athanasiou and Tsouma, 2017). Anyhow, the homeownership rate is very high in Greece (73.5%). 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 4b). The finding is in line with Charalambakis (2017). In 2018 and 2019, the residential property market showed signs

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[9] 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.

of gradual improvement. 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.

Figure 4: Household net wealth

Figure 4.1: Household net wealth and components
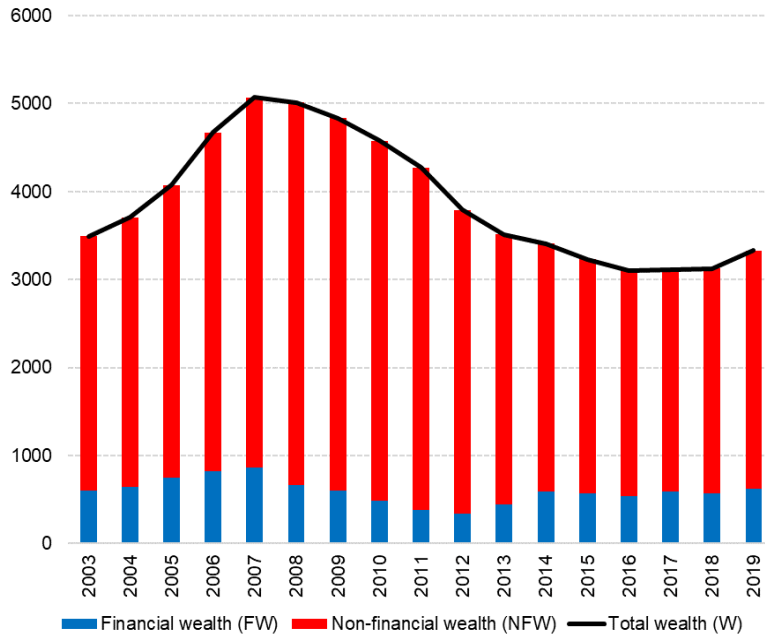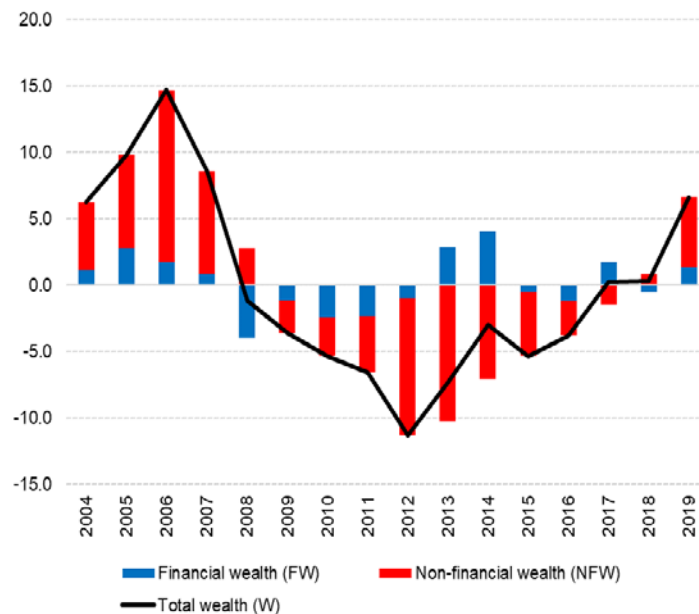
(outstanding amounts in €bn, current prices)

Figure 4.2: Household wealth growth and components percent contributions.

Source: Bank of Greece, ECB and authors' calculations.

3.2.3 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.

Alternative interest rate measures have been considered to capture the intertemporal budget constraint of households: the mortgage rate, the consumer loan rate, the deposit rate, the three-month EURIBOR rate and the ten-year government bond yield. 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 long-term rates on loans and short-term rates related to deposits have been also advocated in the literature to be used, to reflect external financing costs for households (see, *inter alia,* Geiger et al., 2016). The external finance premium (EFP) defined as the spread between the mortgage rate and the deposit rate, and the deposit interest rate (IR) turned out significant in the estimations and were finally kept in the specifications, which are reported in section 4.

The impact of household debt on consumption is also estimated. It seems that there has been 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 have weighed on consumer spending. High leverage ratios 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 (for similar arguments, see, *inter alia,* Mian et al., 2013; Cooper and Dynan, 2016). The variable (HDEBT) included in the specifications is the ratio of the stock of loans to households over the 4-quarter moving sum of household real disposable income.

Variables indicating higher income or macroeconomic uncertainty are expected to lead to lower consumption growth because of increased precautionary savings (Dees and Brinca, 2013; Estrada et al., 2014). A number of uncertainty and sentiment measures such as consumer confidence, expected unemployment and inflation expectations have been considered in the present work. Consumer confidence (CONF), turned out to be significant in the estimated models.

3.3 The empirical 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-run 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 et al., 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 the other determinants of private consumption, X_i's 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, the Engle-Granger (1987) and Phillips-Ouliaris (1990) tests are applied. For each of the four different specifications of income decomposition, the long-run equation is formulated as follows:

$$\log(C_t) = a_0 + b_1*\log(LY_{mt}) + b_2*\log(NLY_{mt}) + b_3*\log(FW_{t-1}) + b_4*\log(NFW_{t-1}) + e_t \quad (1)$$

LY_m and NLY_m stand for real labour and real non-labour income respectively and m takes the values 1 to 4 to denote the four alternative definitions of labour and non-labour income. The real 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).

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 ($100*$elasticity$*C_a/Z_a$), where C_a is the average level of real consumption level and Z_a is the average level of the relevant income/wealth component over 2003Q1 - 2020Q1.

In a second step, the ECM specification which models the short-run dynamics, 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 dynamics are formulated as follows:

$$\Delta\log(C_t) = \beta_0 + \beta_1*\Delta\log(LY_{m\,t-j}) + \beta_2*\Delta\log(NLY_{m\,t-j}) + \beta_3*\Delta\log(FW_{t-k}) + \beta_4*\Delta\log(NFW_{t-k}) + \gamma*(ECT_{t-1}) + \delta_i*(\Delta X_{it-j}) + u_t. \quad (2)$$

where Δ denotes the first difference operator. The consumption change in the current quarter t is assumed to be affected by the changes in income and wealth that have taken place in the previous four quarters at most. Thus, the income changes might be included with lags (j) varying between 1 and 4, whereas wealth components differences might be included with lags (k) varying from 2 to 5, as they represent stocks at the end of the previous period. The β_is represent the short-run elasticities of the income and wealth components.

X_i stand for the variables which are assumed to affect private consumption in the short run other than wealth and income, with estimated elasticities δ_i. The number of the additional short-run determinants (i) can range between 1 and 3, as they are supposed to account for the effect of (1) interest rates (e.g. real deposit rate and external finance premium), (2) consumer indebtedness (e.g. leverage ratios), and (3) uncertainty and sentiment (e.g. the consumer confidence indicator). They might be included with lags (j) varying between 1 and 4.

The coefficient γ on the error correction term (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 The long-run equilibrium relationships

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 tests. The test outcomes are presented in the Appendix. Statistical criteria advocate for the adequate ADF performed (i.e. the lag length of the test, whether or not to include a trend, a constant, or a break in the examination). 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.

The long-run relationship between consumption and the income and the wealth components is estimated, using the FMOLS technique. Table 1 summarises the estimation results. It reports the long-run equilibrium relationships of the form of (1) for the four income decompositions. In the Tables, low case letters define logs of the respective variables. 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 tests.[10] The test outcomes are presented in Table 2.

The main conclusion emerging from the estimation results is that it is essential to distinguish between components of income and wealth when analysing private consumption, as each component affects consumption differently. 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.

Labour income is estimated to be the driving force of private consumption. More specifically, the long-run labour income elasticities are in most cases greater than those of non-labour and transfer income. Out of the four income decompositions, labour income ly1, ly2 and ly4 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 elasticities and the MPCs out of labour income are about twice as high as those of non-labour income under income specifications I and II. [11]

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[10] See Engle, R. F. and Granger, C.W.J., 1987.

[11] 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., 2020; de Bondt et al., 2021).

Table 1: Private consumption, income and wealth: the long-run relationship

Income decomposition I					
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					
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					
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					
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.

In the more granular income decompositions III and IV, transfer income turns out significant in determining private consumption. The effects of property income and taxes and social contributions did not turn out significant so these variables were not included in the reported specifications.[12] Interestingly, MPC out of transfer income turned out to be very high in significations III and IV. 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 consume.[13]

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[12] The results of the initial long-run specifications are not reported, for space reasons. Nevertheless, they are available upon request.

[13] 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 (Brayton and Tinsley, 1996; Alandangady and Feiveson, 2018) and for France and Italy (de Bondt et al., 2021).

Table 2: 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

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 wealth. [14]This could be related to the leading role of housing in the wealth portfolios of Greek households and the high homeownership rate in Greece. 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.

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. Strategies aiming to mobilise resources for job creation and participation in the labour market, as well as training, upskilling and reskilling of the workforce are expected to contribute to an increase in employment and labour income. In addition, policies to increase labour compensation, such as an increase in the minimum wages, to the extent that such an increase does not have any negative effect on employment and competitiveness, would result to labour income growth. Policy makers should also take fiscal measures such as transfers to support the most vulnerable households, especially in periods of low demand.

4.2 The short-run dynamics

The analysis provides four alternative specifications for the short-run dynamics of consumption, as formed using the four decompositions of income. The model selection technique follows the General to Specific econometric methodology (Hendry, 1995): In the equations, the growth rates of the short-run explanatory variables are entered initially with four lags; then they are kept based on their statistical significance and economic consistency. The dynamic specifications yield the results presented in Table 3.

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[14] 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.

In all specifications, the error correction terms ECT1, ECT2, ECT3 and ECT4 as estimated using the four alternative definitions of labour income, enter 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.

In all specifications, consumption growth in the current period is shown to be 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, finding consistent with 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 indicator. As expected, low consumer confidence has an adverse effect on consumption as a result of precautionary savings behaviour (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 (TC4) has a significantly negative short-run effect on private consumption.[15] 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 short run.

An increase in deposit interest rates (IR), or a rise in the external finance premium (EFP), i.e. the wedge between mortgage rates and deposit rates, negatively affect private consumption growth, as shown in specifications II and IV, respectively.

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.[16] 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. The impulse dummy D102 accounts for the signing of the 1st adjustment programme for the Greek economy in 2010Q2, which included a radical switch in fiscal policy. D102 turned out significant in specifications I and II.[17]

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[15] 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.

[16] This finding is in line with the relevant literature on the effect of debt dynamics on private consumption (see, inter alia, Mian et al., 2013; Estrada et al., 2014; Cooper and Dynan, 2016).

[17] Given that the programme included a number of fiscal consolidation measures, such as the reductions in transfers, D102 did not turned out significant in specifications III and IV which use a more granular decomposition of income, and thus estimate the effect of e.g. the reduction in transfers, independently.

Table 3: Private consumption growth: the short-run dynamics

Income decomposition I				
Variables	Coefficients	Std error	t-statistic	p-value
$\Delta c(-4)$	0.22**	0.09	2.471	(0.016)
$\Delta ly1(-1)$	0.10**	0.041	2.453	(0.017)
$\Delta ly1(-2)$	0.07*	0.036	1.811	(0.075)
$\Delta(HDEBT(-2))$	-0.124	0.081	-1.517	(0.135)
D102	-0.076**	0.020	-3.787	(0.000)
ECT1(-1)	-0.43**	0.101	-4.207	(0.000)
R^2 (Adjusted)	0.811			
S.E. of Regression	0.018			
Income decomposition II				
$\Delta c(-4)$	0.24**	0.084	2.820	(0.006)
$\Delta ly2(-2)$	0.06*	0.032	1.828	(0.073)
$\Delta(CONF(-1))$	0.001**	0.000	1.967	(0.054)
$\Delta(IR(-1))$	-0.007	0.003	-1.979	(0.053)
D102	-0.07**	0.019	-3.603	(0.001)
ECT2(-1)	-0.58**	0.086	-6.775	(0.000)
R^2 (Adjusted)	0.825			
S.E. of Regression	0.017			
Income decomposition III				
$\Delta c(-4)$	0.24**	0.089	2.700	(0.009)
$\Delta ly3(-1)$	0.18**	0.053	3.455	(0.001)
$\Delta(CONF(-1))$	0.001**	0.000	2.112	(0.039)
ECT3(-1)	-0.50**	0.104	-4.813	(0.000)
R^2 (Adjusted)	0.789			
S.E. of Regression	0.019			
Income decomposition IV				
$\Delta c(-4)$	0.22**	0.087	2.545	(0.014)
$\Delta ly4(-1)$	0.35**	0.082	4.335	(0.000)
$\Delta(tc4(-1))$	-0.10**	0.037	-2.726	(0.008)
d(CONF(-1))	0.001**	0.000	2.124	(0.038)
d(EFP(-4))	-0.033**	0.012	-2.658	(0.010)
d(HDEBT(-3))	-0.14	0.097	-1.465	(0.148)
ECT4(-1)	-0.46**	0.106	-4.328	(0.000)
R^2 (Adjusted)	0.816			
S.E. of Regression	0.018			

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

5. Conclusions

This study stresses the need to decompose disposable income as well as wealth, in the analysis of private consumption, using as a case study the economy of Greece. 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 non-labour income (and, in particular, transfers) have a positive impact on private consumption. The wealth components exert a low but significant effect. 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. Labour income should primarily be monitored and targeted by the policy makers, in their policies aiming at domestic demand and GDP growth. Policy makers should primarily monitor labour income and take measures to support it. Therefore, policies aiming to mobilise resources for job creation and participation in the labour market, as well as training, upskilling and reskilling of the workforce are expected to contribute to an increase in employment and labour income. Measures to increase labour remuneration, (such as an increase of the minimum wage) to the extent that they would not have negative consequences to employment and price competitiveness, are also expected to increase labour income (and hence consumption). Fiscal policy measures aiming to support the most vulnerable households, such as the unemployed, and reduce the high tax wedge on labour income are also expected to have a significant positive effect on consumers' spending. The results thus provide useful implications for the return to a growth pattern for economies for which consumption constitutes the main component of GDP. These implications become even more relevant in recessions or periods of low growth, as, for example, the current post-pandemic period.

APPENDIX

Unit root test results

ADF unit root tests and stationarity testing results					
Variables	**t(ADF)**	**lags**	**Variables**	**t(ADF)**	**lags, trend**
ly1	-1.18	(4)	Δly1	-3.42**	(3, trend)
nly1	-0.47	(4)	Δnly1	-4.14**	(3, -)
ly2	-1.33	(4)	Δly2	-3.91**	(3, -)
nly2	-1.07	(5)	Δnly2	-2.07**	(4, -)
ly3	-1.26	(4)	Δly3	-2.83**	(3, -)
ly4	-1.48	(4)	Δly4	-2.39*	(3, -)
ty3	-2.69	(3)	Δty3	-13.5**	(2, trend)
py3	-0.45	(4)	Δpy3	-4.85**	(3, -)
py4	-0.38	(4)	Δpy4	-5.10**	(3, -)
ty4	-2.24	(3)	Δty4	-16.47**	(2, trend)
taxcontr	-1.33	(4)	Δtaxcontr	-5.48**	(3, -)
fw	-1.14	(0)	Δfw	-3.88**	(1, -)
nfw	-2.29	(4)	Δnfw	-1.12	(4, -)
Table 1b: Phillips-Perron unit root and stationarity testing results					
Variables	**t(PP)**	**Bandwidth**	**Variables**	**t(PP)**	**Bandwidth**
ly1	-0.45	(13)	Δly1	-17.42**	(27)
nly1	-0.95	(13)	Δnly1	-15.05**	(13)
ly2	-0.3	(13)	Δly2	-20.52**	(18)
nly2	-1.19	(12)	Δnly2	-13.30**	(12)
ly3	-1.07	(13)	Δly3	-14.26**	(15)
ly4	-0.87	(13)	Δly4	-14.02**	(15)
ty3	0.56	(14)	Δty3	-17.47**	(20)
py3	-0.65	(13)	Δpy3	-20.61**	(14)
py4	-0.89	(13)	Δpy4	-21.97**	(14)
ty4	0.77	(13)	Δty4	-25.37**	(15)
taxcontr	0.12	(13)	Δtaxcontr	-22.21**	(14)
fw	-1.46	(4)	Δfw	-6.97**	(3)
nfw	-0.44	(6)	Δnfw	-3.49**	(3)

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

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