Income and Wealth Inequality in Malta: Evidence from Micro Data

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Abstract

This paper studies the distribution of income and wealth in Malta over the period 2010-16, based on three waves of detailed micro-data from the Household Finance and Consumption Survey. This is the first paper that explores the evolution of income and wealth inequality jointly, and over time, using household-level data in Malta. In particular, the focus of the present paper is to examine how income and wealth are distributed over different socioeconomic characteristics, their joint distribution and its determinants, as well as factors that influence a household's ability to obtain credit, using decomposition methods and binary response models. Our results suggest that households with tertiary education experienced strong increases in their incomes and wealth in the period examined. With reference to wealth, household main residence (HMR) is the most equalising factor of wealth inequality and self-employment wealth is the most disequalising factor. Regarding the determining factors of the position of a household in the wealth distribution, the financing structure of HMR is particularly important to explain the household's position in the wealth distribution. Furthermore, the age and education level of the reference person of a household as well as increases in household's income affect positively the probability of being in a higher wealth quintile. This finding also holds true for households who have received inheritance or gifts.

Contents

1. Introduction

During the recent financial crisis many euro area countries experienced sizeable adverse shocks. At the macro level, gross domestic product (GDP) and employment rates declined substantially in most Member States, while at the micro level most households faced losses on their income and assets. Such losses, however, have not been uniformly distributed across different social strata. The crisis also highlighted the role of credit constraints and the marginal propensity of households to consume out of different sources in explaining aggregate consumption dynamics. As a result of these developments, income and wealth inequality has attracted renewed attention in recent years, both in the policy and the academic sphere, especially after the publication of "The Capital in the Twenty-First Century" by Piketty (2014) and the results by Stiglitz, Sen and Fitoussi (2009).

Contrary to economic developments in many euro area countries, Malta's performance remained favourable since the onset of the crisis (Grech, Micallef and Zerafa (2016)). Real GDP growth rate averaged 5.3% from 2010 to 2017 and unemployment rate decreased from 7.3% to 4.0% in 2017, despite an increasing labour participation rate. The home-ownership rate has remained elevated, standing around 82% in 2017 according to the European Union Survey of Income and Living Conditions (SILC).[2] The high prevalence of home-ownership in Malta persisted despite a prolonged and sluggish recovery in the housing market since the start of the recent crisis, with the transaction-based house price index registering a cumulative 22% increase from 2010 to 2017, though this increase largely occurred between 2013 and 2017. Rental costs in the private market have also risen rapidly, potentially amplifying inequality. Developments in Malta's booming housing market are important because of the widespread implications they have on wealth, private consumption, as well as on the respective ability of banks and borrowers to lend and borrow.

Nonetheless, aggregate figures can mask significant heterogeneity at the micro level and therefore, household-level data are more suitable for analysing inequality and its drivers in greater detail. For instance, GDP per capita based on purchasing power standards, which is an indicator of the average standard of living, in Malta, rose from 83.5% in 2010 to 97.5% in 2017 of the EU average. At the same time, micro data from the SILC show that the Gini coefficient for equivalised disposable income decreased from 28.6 to 28.3 in the same period. In contrast, examining the spectrum of the distribution of disposable income by deciles suggests that the ratio of the income of households in the ninth decile to the income of households in the first decile increased from 3.50 in 2010 to 3.62 in 2017.

Although income inequality is an extensively-researched topic in the literature, wealth inequality has received less attention until recently, due to, some extent, the lack of good quality data (Cowell (2012)). At the same time, there is evidence that wealth is much more concentrated and unequally distributed than income (see e.g. Jenkins (1990), Sierminska et al. (2006) and Kennickell (2012)). This is because apart from household income, financial flows and stock of wealth of a household also reflect the accumulation of past financial assets. However, wealth is highly concentrated even amongst the wealthiest households, which adds to challenges in the collection of representative data and measurement of inequality. Moreover, wealth is a source of consumption because assets can be converted into cash and can therefore cover consumption needs. To better understand inequality and

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[2] The Household Finance and Consumption Survey also suggests a high home-ownership rate.

its dynamics one needs to use data from a source which jointly collects detailed data on household income, consumption and wealth.

In the present paper, we draw data from the Household Finance and Consumption Survey (HFCS), which the Central Bank of Malta conducts every three years as part of a Eurosystem project coordinated by the European Central Bank. The HFCS, first held in 2010 and subsequently in 2014 and 2017, collects detailed micro-data on household assets and liabilities, wealth, income, consumption and savings. There are few papers studying aspects of inequality (see e.g. Darmanin, Georgakopoulos and Knoppe (2018)) in Malta and more specifically, how it has evolved over time. Moreover, up to date, studies on the wealth distribution are mostly lacking in Malta. The vast majority of the studies employ data from the SILC survey. However, SILC does not collect data on wealth, which as indicated earlier is an important determinant of economic inequality. One exception is a recent study, based on administrative data, by Knoppe (2018) who explores the evolution of wage distribution and wage mobility between 2000 and 2015 in Malta. However, administrative data restrict the unit of analysis for measuring economic resources to the individual rather than household unit, limit the concepts of income and wealth measured, and impose a rigid correlation between income and wealth to the extent that such data is highly aggregated (Bricker et al. (2015)). The aim of this paper is to fill this gap by examining how income and wealth inequality has evolved in a period during which the Maltese economy experienced strong macroeconomic growth. In many countries such episodes have frequently been characterised by rising inequality and therefore, not all households have been benefitting to the same extent from the expansion in economic growth.

In the first stage of our analysis, and given the multidimensional nature of inequality, we report summary distributional statistics and findings across a variety of dimensions, namely age, employment status and education. In addition, we present the components of income and wealth that tend to increase or decrease overall inequality, using Lerman and Yitzhaki's (1985) decomposition method. In the second stage, the paper uses a generalised ordered logit model to examine the joint distribution of income and wealth and its socioeconomic determinants across segments of their distribution. Furthermore, we explore the nature of credit constraints in relation to overall inequality. In doing so, we run regressions based on a literature-informed probit model.

Our results suggest that wealth inequality grew at a moderate but quicker pace than income inequality between 2010 and 2016. At the same time, households with tertiary education experienced strong increases in their median incomes and wealth. According to the decomposition method proposed by Lerman and Yitzhaki (1985), we find that labour income, given its high share in total income, is the main driver of the observed income inequality whereas income from pensions tends to reduce it. Similarly, household main residence is the most equalising factor for net wealth inequality and self-employment wealth is the most disequalising one. The role of financial assets appears to be rather marginal while indebtedness can plausibly exacerbate net wealth inequality. As regards the factors that influence the position of a household in the net wealth distribution, the age and education level of the reference person and a higher income level increase the probability of being in a higher wealth quintile. The financing structure of the main residence of a household is an important determinant in explaining the position of a household in the net wealth distribution. Lastly, inheritance or gifts affect positively and significantly the probability of a household to move to a higher quintile of wealth.

The rest of the paper is organised as follows: section 2 provides a brief overview of the literature. Section 3 describes the data and states the main stylised facts. Section 4 and 5 present the results of our descriptive analysis and socioeconomic dimensions of inequality, respectively. The decomposition of income and wealth by component is presented in Section 6. Section 7 examines the joint distribution of income and wealth. Section 8 assesses the role of various socioeconomic factors in explaining credit constraints. Section 9 concludes.

2. Literature review

Empirical research on economic inequality has historically employed different data sources to study the distribution of income and wealth. For example, Bricker et al. (2016) measure income and wealth inequality at the top quintiles in the United States (US) using administrative data and the Survey of Consumer Finances (SCF). The authors show that without accounting for the conceptual differences between the two sources, the estimates of inequality at the top quintiles, based on administrative tax data, are substantially higher than those based on the SCF. On the methodological side, there are various approaches to studying inequality but decomposition techniques have been the most widely used. Shorrocks (1982, 1983) proposes a method for decomposing inequality based on the covariance of total income and its components. Lerman and Yitzhaki (1985) extend this approach by providing a similar decomposition method using the Gini coefficient for each specific income component. Regression based methods to analyse inequality by subgroup have also been employed. Cowell and Fiorio (2009), for example, incorporate a decomposition method by subgroups into the single-equation regression framework to provide a fairly robust analysis of determinants of inequality. A more recent approach is based on counterfactual analysis (see e.g. Chernozhukov et al. (2009) and Fortin et al. (2011)). Both papers provide an analytical toolkit for applying counterfactual analysis with reference to inequality metrics, broadly defined as the result of either a change in the distribution of a set of covariates that determine the outcome variable, or as a change in the relationship of the covariates with the outcome.

With regards to income inequality and its decomposition, the literature is very extensive. A line of research examines differences in income and its distribution in relation to differences in the socioeconomic, labour force features and changes in the returns to these characteristics (see e.g. Machado and Mata (2005) or Bourguignon et al. (2008)). A second line of research focuses on the decomposition of income inequality by different income components. Rani and Furrer (2016) apply Lerman and Yitzhaki's (1985) method to decompose the Gini coefficient, using micro-data from household surveys in 13 G20 countries. They find that labour income is the most significant contributing factor to inequality in all countries, whereas transfers and benefits are the most important factors that reduce inequality.

With respect to wealth inequality, the empirical literature is more limited due to issues relating to the availability of good quality data. Moreover, available studies focus on the United States. Wolff (1994, 2004) track the evolution of US household wealth since the 1960 using the Survey of Consumer Finances. Bilias et al. (2005) apply decomposition techniques to SCF results to show that an increased participation rate in risky financial assets does not entail a reduction in the overall inequality of wealth. The literature on European countries was rather limited until recently, but developed significantly when the data from the first

HFCS wave became available to researchers. Brandolini et al. (2004) and Azpitarte (2010) study the composition and distribution of household wealth in Italy and in Spain, respectively. The results show that wealth inequality is primarily driven by inequality in real assets rather than by financial assets. Lindner (2011) decomposes financial wealth and gross income in Austria, finding that financial assets are only held by a small fraction of the economy's population and have a positive elasticity with respect to the overall distribution of financial wealth. Lindner (2015) extends his framework to study the distribution of wealth in 15 euro area countries based on HFCS data and finds that households' main residence contributes a higher proportion to inequality, while other assets (such as risky financial assets) display only a relatively weak contribution. Similar methodological approaches and findings are documented by Azpitarte (2010), Bezrukovs (2013) and Grejcz and Żółkiewski (2017), for Spain, the euro area and Poland, respectively.

A majority of studies in recent years explore the determinants of wealth accumulation, emphasising the importance of intergenerational transfers for wealth inequality and its dynamics. Leitner (2016) attempts to identify the sources of inequality in household gross, net wealth across eight euro area countries using data from the first wave of the HFCS. Dispersion in bequests and *inter vivos* transfers has a significant effect on wealth inequality and it is stronger than the one caused by income differences. Fessler and Schürz (2015), examine the role of inheritance, income and welfare state policies in explaining differences in household wealth within and between Eurozone countries and find that social services provided by the state are substitutes for private wealth accumulation and only partly explain observed discrepancies in the levels of households' net wealth across European countries. Cowell et al. (2016) exploit data from the HFCS and Luxembourg Wealth Survey to study how pension wealth, inheritance and total wealth accumulation over the life-cycle, affect measures of wealth and income inequality in Luxembourg.

The increasing availability of wealth data has also led to research on the joint distribution of income and wealth to identify the determinants of wealth accumulation. Jäntti et al. (2008) study the joint distribution of income and wealth in Canada, Germany, Italy, Sweden and the United States and observe that net household wealth and disposable income are highly, but not perfectly correlated between individuals within each country. Similarly, Arrondel et al. (2014) examine household wealth and income distributions for 15 European countries using the HFCS survey to provide evidence of heterogeneity in wealth accumulation behaviours. The authors also find that the effect of income or inheritance on wealth accumulation varies, depending on the rank of the households in the wealth distribution. Furthermore, a rise in income, or the event of receiving inheritance or gifts, increases the probability to be in higher wealth deciles.

Credit market participation is another channel that can affect inequality. The literature points to substantial household heterogeneity and a variety of different channels through which credit market participation affects economic inequality. First and foremost, current income is the main indicator that demonstrates the capacity of a household to repay debt in the present. Nevertheless, current income can vary significantly according to the job status of the borrowers (e.g. employee versus self-employed) or the type of job contract (e.g. permanent versus temporary contract). For example, households in the lower parts of the income distribution or on a temporary contract are more likely to be credit-constrained compared to high-income households on a permanency contract. More importantly, a growing literature suggests that the higher the income inequality the stronger is the

persistence of income position over time (see e.g. Kopczuk et al. (2010) and Stiglitz (2012)). Put differently, households at the bottom of the income distribution are more inclined to remaining there, and as do households at the top. In addition to the above, further increases in inequality are more likely to lead to a stronger persistence of the current household's position in the income distribution (see e.g. Stiglitz (2012), Galor and Zeira (1993) and Piketty (1997)). It is therefore evident that credit constraints can negatively affect inequality.

Nonetheless, apart from current income, the suggested household heterogeneity may reflect differences in economic circumstances such as education and age (see e.g. Lusardi (2009) and Crook and Hochguertel (2007)). In the empirical and theoretical considerations of the life-cycle framework, the existence of borrowing constraints has direct implications for savings (see e.g. Zeldes (1989) and Deaton (1991)). Credit-constrained households cannot engage in consumption smoothing as they cannot adopt their optimal consumption. For example, Jappelli and Pagano (1988, 1989) identify the gap in consumption that liquidity-constrained households face. This gap is largest for households whose reference person is less than 30 years old, unemployed and non-home-owners, while is lowest for those over 50. Crucially, this finding provides evidence in favour of the argument that banks view unemployment and lack of home-ownership as negative signals about the creditworthiness of their applicants. Given the considerations described above, it is apparent that there is a close association between credit constraints and inequality.

As mentioned earlier, for the case of Malta, research on micro aspects of inequality is limited. For instance, Betti et al. (2015) attempt to map economic poverty and inequality by district and locality for households with children based on SILC and Census data. Their findings show a considerable degree of heterogeneity across localities. Knoppe (2018) studies the distribution of wage incomes and wage mobility between 2000 and 2015, using administrative data from the Inland Revenue Department. One of the main findings is that the increased dispersion in the wage distribution reflects developments in structure of the Maltese economy, as well as the sluggish response of the labour supply to the evolving demand. Wealth inequality in Malta has to date been analysed in the context of countries participating in the HFCS survey without however examining its dynamics and trends over time. This study attempts to fill this gap.

3. Data and stylised facts

This paper is based on HFCS data and relies on the median statistic, unless otherwise stated. We prefer to focus on the median rather than the mean as the former is less sensitive to extreme values, especially when dealing with highly skewed distributions, such as that of net wealth. Therefore, the median is a better indicator of the typical household. In Malta's case, the survey was conducted for the first time in 2010 and repeated in 2014 and 2017 (Caruana and Pace 2013 and Gaskin et al. 2017).[3] The survey includes detailed questions about households' balance sheet, income and consumption patterns, and on specific forms of credit constraints. These questions are answered by the most financially knowledgeable household member. The probabilistic design of the survey entails that each household in the target population has an ex ante non-zero probability of being part of the sample, contributing to the representativeness of the survey, while survey weights are adjusted for

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[3] Fieldwork was conducted in those years but data refer to preceding year. Only exception is 2010 as data are for 2010.

the non-response items and coverage issues. As is well known, wealth surveys have a higher percentage of missing values as they contain more complex and sensitive questions. Ignoring this problem can significantly bias the results. To address the issue of missing values the dataset is multiply imputed using multivariate imputation by chained equations following the methodology presented in Rubin (1987). In particular, five imputations were made for every missing value. Moreover, variance calculation routines suitable for complex and multiply imputed data were applied according to the rescaling bootstrap of Rao and Wu (1988), as further specified by Rao et al. (1992).

This unit of analysis is the household and no equivalisation is made to account for differences in household size or composition. The reason is two-fold. Firstly, our aim is to study wealth and income inequality across households rather than individuals. Secondly, there is no consensus on whether household wealth should be equivalised as well as no common approach to account for household composition effects.[4]

It should be mentioned that for the definition of household, the HFCS uses a variation of the so-called "housekeeping concept". A household is defined as a person living alone or a group of people who live together in the same private dwelling and share expenditures, including the joint provision of the essentials of living (see HFCN 2013 for a detailed discussion).[5]

Net wealth is defined as the sum of real and financial assets, less liabilities. Real assets consist of the household's main residence, other real estate property, investments in self-employed businesses, vehicles, and other valuables. Financial assets are deposits, securities (bonds), listed shares, voluntary pension scheme investments in mutual funds, and life insurance and other financial assets (e.g. amount owned to household). Housing debt is the outstanding amount of mortgage on the main residence and other property. Liabilities are defined as the outstanding amount of mortgages, loans financing other real estate property, outstanding debt on credit cards and credit lines/bank overdrafts as well as outstanding amounts of other, non-collateralised, loans (including loans from commercial providers and private loans).

Gross household income is a measure of all before-tax income and includes employee income, self-employment income, income from pensions, regular social transfers, regular private transfers, income from real estate property, income from financial investments, income from private business and partnerships and other non-specified sources of income (e.g. income from regular private transfers).

3.1 Main stylised facts from the survey

This subsection presents the main stylised facts based on data from the three waves, which in some cases are supported by graphs. For simplicity, we present data from the third wave when it is deemed necessary.

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[4] For a debate about applying equivalence scales see Davies and Shorrocks (2000), Sierminska and Smeeding (2005) and Jäntti et al. (2013).
[5] It should be noted that two individuals who live in the same private dwelling but do not share expenditure are treated as separate households in the HFCS.

Real assets are the main component of household wealth.

The composition of household wealth is largely related to real assets. This is reflected in a share of households' real assets in total assets just above 86% across all waves. The largest component of portfolio of real assets is HMR, representing 46.9% of total assets in 2010 and around 47.7% in each of the two consecutive waves (see Figure 1, 1a). The home-ownership rate in Malta tends to be among the highest in Europe.

Income and education are important contributing factors to wealth accumulation

The level of income or education of the household's reference person has a significant effect on the household's position in the wealth distribution. More specifically, net wealth increases plausibly as household income increases (see Figure 1,1b). Similarly, education is also positively related to high levels of net wealth, acting as a wealth enhancing factor (see Figure 1, 1c). For instance, in 2016, the median net wealth for reference persons with tertiary education was €304,216 while for those with primary education was €181,293, suggesting a premium of around 68%.

Wealth is accumulated over the life-cycle

The distribution of net wealth along the age profile of a household's reference person is in line with the life-cycle hypothesis proposed by Modigliani and Brumberg (1954) as the age-variance profile of median net wealth is hump-shaped. It starts from very low levels for households whose reference person is between 16 and 34 years old, peaks for those in the 45-54 age cohort and declines slightly for households in the 55-64 bracket. It then falls significantly for those over 65 (see Figure 1, 1d).

Median income also varies according to the life-cycle, increasing with age, peaking for households whose reference person is within the 35 to 44 age group and declining for the older groups (see Figure 1, 1d).

Figure 1: Graphs for the main stylised facts from the survey

1a: Share of real and financial assets in total assets

1b: Net wealth quintiles vs. income quintiles

1c: Net wealth by education level of reference person (median)

1d: Net wealth and gross income by age of reference person (median)
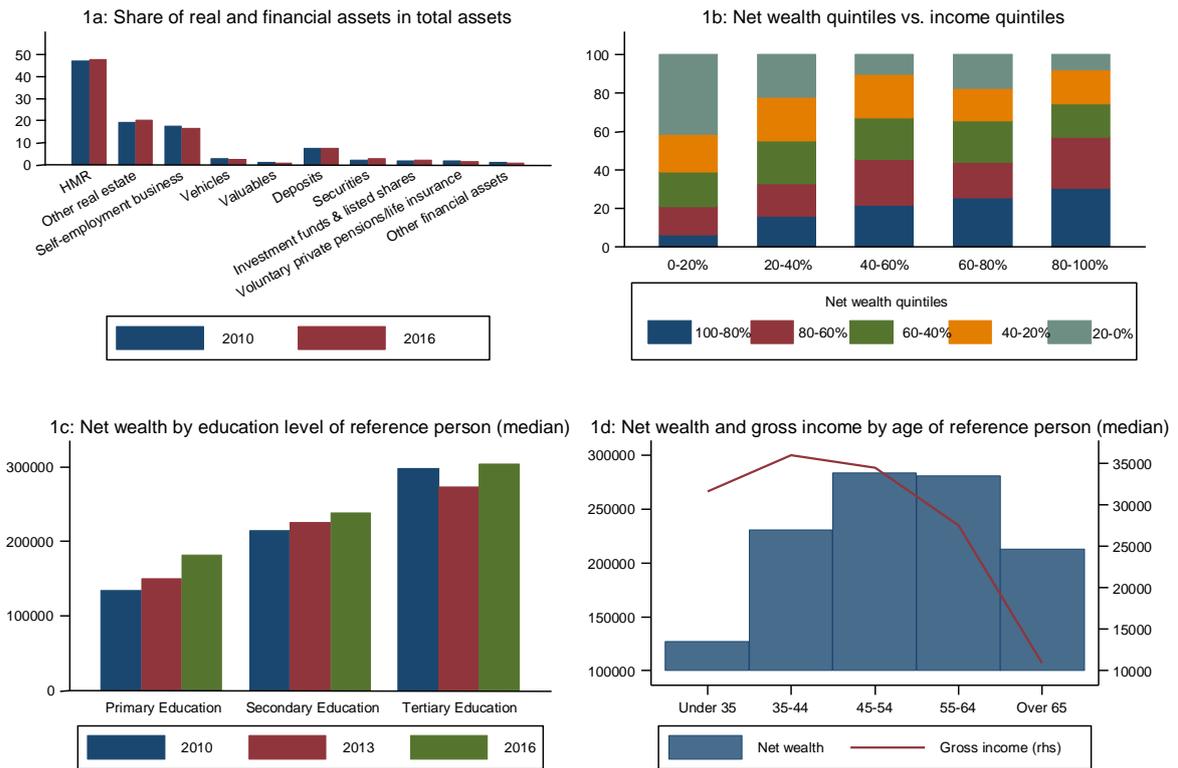
Source: MT-HFCS, Author's calculations

4. Descriptive results

4.1 A description of the distribution of income and wealth

Figure 2 plots the distribution of gross household income and net wealth by different percentiles. Since 2010, the distribution of gross income has moved upwards, notably for households between the 60th and 80th percentiles where the income gain has been considerable. Income for households in the lowest 30% of the distribution remained relatively flat. At the same time, the distribution of net wealth did not change as much as the income distribution because the accumulation of wealth over the life-cycle is a lengthy process and is not easily reversible. The most significant changes are noted in the upper parts of the distribution (80th percentile and upwards), with small changes in the other parts of the wealth distribution. Overall, wealth is distributed less equally compared to gross income, which is also indicated by the less progressive slope of the wealth curves.

Figure 2: Percentile distribution of gross income and net wealth
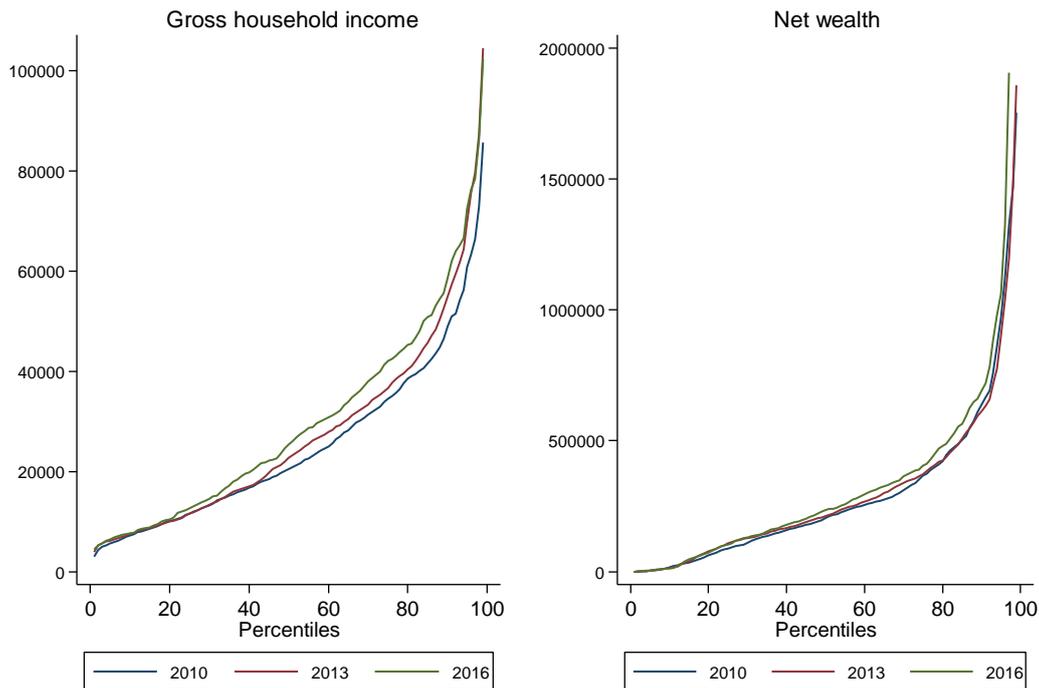
Source: MT-HFCS, Author's calculations

Qualitatively, the percentile plots of real income and real wealth are very similar and we have chosen to omit them for the sake of brevity.

4.2   Distributional statistics

Table 1 reports some widely used measures of inequality for gross household income, net wealth, real assets, financial assets and liabilities. The first observation is that the mean is always higher than the median, indicating distributions that are more skewed to the right. The second observation is that financial assets are the most unequally distributed variable among the ones chosen. This statement is also supported by the Gini coefficient and by two of the three relative measures of inequality considered here. For example, the 90-50 ratio which captures differences in the top half of the distribution increased at a faster rate than the 50-10 ratio between 2010 and 2016, which concerns the bottom half of the distribution. The third observation is that generally inequality increased moderately since 2010 and may even have decreased according to some relative measures. However, this is not the case for financial assets. The Gini coefficient for gross household income, net wealth and real assets increased in the period 2010-16. When looking at a more granular level, the 90-50 ratio decreased in all the variables above, whilst a decrease in the 75-25 ratio is also noted, except for household income. The final observation is the sizeable decrease in the value of the Gini coefficient for household liabilities.

Concerning net wealth, the 90-50 ratio suggests that divergence within the top half of the distribution became less pronounced over time, indicating that the net wealth of the middle 50% exerts more weight on the distribution. This is also supported by the decline in the 75-25 ratio. However, inequality in the bottom half increased as indicated by the rise in the 50-10 ratio. Although not shown in Table 1, the 90-10 ratio reveals a marked increase in inequality, from 40.10 in 2010 to 54.90 in 2016. Consequently, the Gini coefficient for net

wealth rose from 0.566 in 2010 to 0.598. In addition to the above, it is interesting to mention that the lowest 20% of income groups held most of its wealth in main residence, while the highest 20% held wealth in the form of main residence and self-employment business. Similarly, households in the lowest income quintile held most of their financial assets in deposits and investment funds and listed shares. In contrast, households in the top income quintile have a high propensity to hold most of their financial wealth in deposits and securities.

Table 1: Summary of distributional statistics for the sample households

Variable	Mean	Median	P10	P25	P50	P90	P90/P50	P50/P10	P75/P25	Gini
Gross household income										
2010	25,299	20,562	7,292	11,657	20,562	49,022	2.38	2.82	2.97	0.378
2013	27,682	22,718	7,597	11,566	22,718	54,997	2.42	2.99	3.17	0.396
2016	31,203	25,417	7,668	12,655	25,417	58,639	2.31	3.31	3.32	0.409
Net wealth										
2010	324,576	204,908	15,937	88,319	204,908	639,102	3.12	12.86	4.15	0.566
2013	340,652	212,067	14,298	107,857	212,067	612,576	2.89	14.83	3.45	0.562
2016	402,611	236,529	12,612	105,600	236,529	692,368	2.93	18.75	3.87	0.598
Real assets										
2010	306,669	193,511	5,300	91,187	193,511	583,564	3.02	36.51	3.76	0.573
2013	327,313	209,840	*19,361*	129,684	209,840	574,893	2.74	10.84	2.65	0.538
2016	382,895	225,752	9,387	127,302	225,752	643,001	2.85	24.05	2.98	0.584
Financial assets										
2010	46,860	23,454	1,876	7,562	23,454	104,856	4.47	12.50	7.73	0.622
2013	53,140	22,150	2,722	8,184	22,150	140,101	6.33	8.14	6.81	0.653
2016	57,498	22,512	1,751	7,000	22,512	130,166	5.78	12.86	8.36	0.679
Liabilities										
2010	39,868	17,122	496	3,057	17,122	105,201	6.14	34.52	14.67	0.682
2013	46,676	19,273	401	2,134	19,273	131,949	6.85	48.09	36.09	0.643
2016	63,937	40,000	1,000	6,500	40,000	162,751	4.07	40.00	15.91	0.559

Source: MT - HFCS, Author's calculations

Note: Italic indicates low sample size. A low number of observations can distort the data because of big variations in values

The distribution of gross household income is less concentrated than that of net wealth as suggested by lower Gini values. In 2016, households at the top of the income distribution earned 2.31 times more than those at the median of the distribution, down from 2.38 in 2010. At the same time, households in the middle-to-upper parts of the distributions saw higher income increases which led to small increases in the Gini values over the period under review. It is also interesting to note that the lowest income quintile includes households that rely mainly on income from pensions. On average around 73% of their income stems from pensions. In addition, households whose reference person is over 65 years old make up more than 50% of the lowest income quintile. As we move up the income ladder, an increasing share of income comes from earnings while for those in the highest income quintile the bulk of their income relates to employment activities.[6]

With reference to liabilities, the average value grew by around 60% in the period 2010-2016. This increase largely reflected an increase in mortgage debt, which is the main component of household liabilities. The share of mortgages in total household debt averaged 83% in the same period. Overall inequality in liabilities, measured by the Gini index, dropped to 0.55 in 2016 from 0.68 in 2010. Inspection of the percentile ratios reveals that the main driver of such reduction in the Gini coefficient is the increasing availability of housing loans to

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[6] This is specific to the Maltese HFCS.

households in the bottom half of the distribution of liabilities since 2010. By the end of 2016, the 90-50 ratio dwindled from 6.14 to 4.07 as liabilities held by households at the median of the distribution grew by 134%. Similarly, strong increases in household debt are noted in the lowest parts of the total household debt distribution (i.e. P10 and P25).

4.3   Distributional statistics decomposition

To further investigate what drives inequality we repeat the same analysis as in the previous subsection but the sample size is restricted to households whose reference person is between 20 and 60 years old, which broadly corresponds to the working-age category in Malta (see Table 2).

The picture of inequality changes slightly for gross household income and financial assets. For gross income, the Gini index is lower by some 0.04-0.05, while all of the displayed percentiles ratios are lower. This suggests that the group of pensioners pushes up overall measures of inequality since their incomes are considerably lower compared to those of other low income households. Inequality in financial assets also decreases when households with a retired reference person are excluded from the sample.

Although life-cycle features are important for income and financial assets, their impact on real assets and net wealth seems to be limited as inequality indicators for the working-age group are close to those of the whole population. This is most likely because most pensioners are asset rich at the household level, but income poor. The only notable change is that in the 50-10 ratio, which drops markedly for households whose reference person is between the age of 20 and 60, indicating that there is higher inequality among retired households in the bottom of the wealth and real assets distribution.

5. Socioeconomic dimensions of inequality

As is well-documented, some household characteristics such as age, education and employment status are related to income and wealth. For example, wealth can influence whether to invest in further education which in turn influences employment outcomes or decisions to purchase assets that can generate a future income stream. In Figure 3, we examine how median income and net wealth are distributed across different age cohorts, by educational attainment level and employment status of the household reference person.

Table 2: Summary of distributional statistics for working-age households

Variable	Mean	Median	P10	P25	P50	P90	P90/P50	P50/P10	P75/P25	Gini
Gross household income										
2010	29,209	25,872	10,088	15,668	25,872	51,398	1.99	2.56	2.48	0.334
2013	32,651	28,665	10,211	17,080	28,665	59,578	2.08	2.81	2.40	0.342
2016	38,976	33,301	12,630	21,027	33,301	65,281	1.96	2.64	2.25	0.357
Net wealth										
2010	346,872	218,672	24,107	107,819	218,672	642,187	2.94	9.07	3.40	0.565
2013	360,607	214,859	36,494	117,060	214,859	569,684	2.65	5.89	3.08	0.567
2016	418,487	237,690	30,802	118,452	237,690	681,328	2.87	7.72	3.49	0.601
Real assets										
2010	333,278	204,709	7,154	108,085	204,709	598,118	2.92	28.62	3.20	0.576
2013	353,780	215,448	*40,247*	134,807	215,448	559,190	2.60	5.35	2.54	0.552
2016	409,102	228,752	17,501	135,302	228,752	640,001	2.80	13.07	2.84	0.581
Financial assets										
2010	41,918	22,937	1,339	7,938	22,937	103,018	4.49	17.13	7.32	0.586
2013	45,319	22,067	2,930	8,673	22,067	110,181	4.99	7.53	6.10	0.614
2016	49,696	21,520	1,590	6,667	21,520	100,000	4.65	13.54	8.33	0.654
Liabilities										
2010	42,017	18,701	500	4,174	18,701	113,000	6.04	37.40	11.35	0.667
2013	51,549	24,900	467	3,826	24,900	138,000	5.54	53.27	21.28	0.619
2016	68,941	45,946	1,200	10,000	45,946	175,001	3.81	38.29	10.95	0.531

Source: MT - HFCS, Author's calculations

Note: Italic indicates low sample size. A low number of observations can distort the data because of big variations in values

5.1 Inequality by age

Differences in income and wealth across households can be attributed to differences in the age of the reference person. In fact, there exists an extensive literature that builds models around the households' life-cycle. The top panel of Figure 3 displays the median income and net wealth by age. Income and wealth display the typical hump shape that is found in the literature and usually attributed to the life-cycle profile. Median income tends to monotonically increase until the age of the household's reference person reaches 45-54, where it peaks. It declines thereafter because of retirement. Net wealth also exhibits the hump shape profile, but it is less pronounced compared to that of the income distribution.

In terms of developments between 2010 and 2016, all income quintiles recorded an increase in median income over this period, but the increase has been very small for those over 54 years. Similarly, developments in net wealth were more mixed across income quintiles. The most significant increase was recorded among households with a reference person aged 55-64 years. This is primarily due to a sizeable increase in the value of "other real estate" holdings. It is also notable that households within the 45-54 age bracket barely saw an increase in the median net wealth[7].

5.2 Inequality by employment status

The middle panel of Figure 3 depicts the distribution of income and wealth according to the employment status of the reference person of the household.[8] Employee income has been

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[7] Households report a self-assessed value of their main residence. Most of the households in that age bracket bought their main properties a long time ago. Taken together, these households might be detached from developments in the housing market.

[8] The 'Other' category includes those classified as unemployed, student/pupil/unpaid intern, permanently disabled, those in compulsory military service or equivalent social service, those fulfilling domestic task and those classed as other not working for pay.

on the rise since 2010. This contrasts with an arguably flat profile for self-employed income. In fact, while median self-employed income initially was broadly equal to median employee income, by 2016 it stood lower. Nonetheless, differences between employee and self-employee income remain relatively small. As regards net wealth, the self-employed, which account for less than 8% of the sample in each of the three waves, on average, had 2.4 times the wealth of employees in 2010, who are the majority of households (around 40% of respondents). In 2016 this ratio stood lower, at 2.1, reflecting a decrease in the median net wealth of self-employed persons.

Figure 3: The distribution of median gross income and net wealth by age, employment status and education
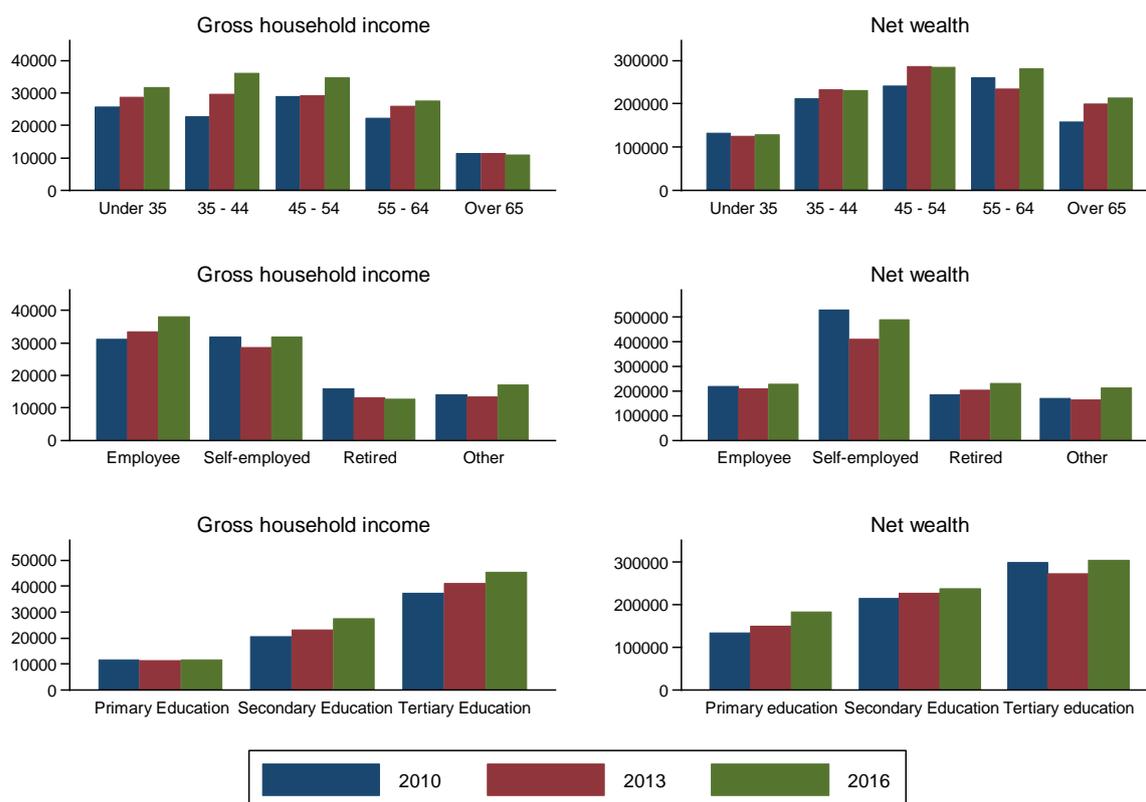
Source: MT-HFCS, Author's calculations

5.3   Inequality by education

The distribution of income and wealth by education level is displayed in the bottom row of Figure 3. It is evident that there is a close association between education and economic performance. Households with better-educated reference persons have higher incomes than their less-educated counterparts and the absolute gap has widened across the three waves. However, in relative terms, those with tertiary education earned 1.7 times the income of those with secondary education in 2016 (or €45,295 vs €27,370). This ratio is lower than the 1.8 ratio (€37,094 vs €20,433) recorded in 2010. The income gap between households with secondary and primary education widened considerably. The ratio stood at 2.4 in 2016, from 1.8 in 2010. When examining net wealth, the gap between those with secondary education and primary education has decreased since 2010, standing at 1.3 in 2016. In addition, in 2016, households with tertiary education held 1.3 times as much wealth as secondary education households (€304,216 vs €237,751). This ratio stood at 1.4 in 2010 (€298,244 vs € 214,749).

6. Income and wealth inequality decomposed by component

Having described the main distributional aspects of inequality and to deepen our analysis we now turn to examine which components of wealth and income are the most important determinants of overall inequality. Such exercise may also provide some interesting insights from an economic policy perspective, particularly in relation to social housing and welfare policies. To this end, we use the decomposition technique developed by Pyatt et al. (1980) and refined by Lerman and Yitzhaki (1985). According to this method, we can quantify the contribution of different income and wealth components to overall inequality by taking into account the share of each individual source in the total distribution, its own Gini index and its correlation with the given total distribution. In particular:

$$G = \sum_{i=1}^{I} S_i G_i R_i$$

where:

G –net wealth (income) Gini coefficient

S_i – share of source i in total net wealth (income)

G_i – Gini index of source i

R_i – The relative Gini correlation between net wealth (income) source i and the distribution of total net wealth (income). R_i is a form of rank correlation coefficient, similar to Pearson's correlation coefficient and its values are within the range [−1, 1].

In summary, the above decomposition formula informs us about the importance of a specific component vis-à-vis total distribution, how equally or unequally distributed a source is and the correlation of source i with the cumulative distribution. There are two implications of the above formula. Firstly, sources with a high share in total wealth (income) can have mitigating effects on the Gini coefficient provided that they are equally distributed among households. If they are unequally distributed, though, they will inflate measures of inequality. Secondly, an increase in the level of component i can decrease (or increase) inequality if the source has a higher (or lower) share in the portfolio of poor people against rich people.

Following the literature, we focus on the relative contribution ($S_i G_i R_i / G$) and marginal contribution ($S_i G_i R_i / G - S_i$) of source i to the overall Gini coefficient. The former represents how much of the observed inequality in income or wealth is due to inequality in source i. The latter measures the first round effect of a percentage change of the overall Gini coefficient in response to a unit change in one of the components of net wealth (income).

6.1 Income decomposition

As can be seen in Table 3, income from employment and pensions accounts for around four fifths of total household income, while other income sources contribute significantly less. As evidenced from the marginal contribution row, income from pensions and social transfers tend to decrease inequality, with an increasing equalising effect of transfers since 2010. This reveals the significant impact of (direct) government benefits in reducing gross household income inequality. In the period examined, the average value of transfers increased and the

Table 3: Gini decomposition of total gross household income by component

		Employee income	Self-employed income	Income from pensions (including widows and disability)	Regular social transfers (except pensions)	Income from financial investment	Other household income
Income share S_i	2010	0.630	0.109	0.162	0.020	0.038	0.042
	2013	0.640	0.092	0.166	0.029	0.033	0.040
	2016	0.674	0.088	0.136	0.029	0.021	0.053
Gini correlation R_i	2010	0.842	0.539	-0.172	-0.127	0.423	0.680
	2013	0.872	0.497	-0.109	-0.107	0.446	0.766
	2016	0.908	0.565	-0.271	-0.178	0.308	0.765
Gini index G_i	2010	0.579	0.894	0.678	0.864	0.752	0.959
	2013	0.587	0.899	0.690	0.842	0.808	0.968
	2016	0.568	0.913	0.674	0.791	0.885	0.968
Relative contribution $S_i G_i R_i / G$	2010	0.812	0.139	-0.050	-0.006	0.032	0.072
	2013	0.828	0.105	-0.031	-0.006	0.030	0.076
	2016	0.851	0.111	-0.061	-0.010	0.014	0.095
Marginal contribution $S_i G_i R_i / G - S_i$	2010	0.182	0.030	-0.212	-0.025	-0.006	0.030
	2013	0.188	0.012	-0.197	-0.035	-0.003	0.035
	2016	0.177	0.023	-0.197	-0.039	-0.007	0.043

Source: MT - HFCS, Author's calculations

proportion of households receiving such transfers stood at 49% in 2016, up from 34% in 2010. In relative terms, households in the bottom income quintile had a median income from social transfers that was 2.0 times that of those in the third quintile in 2016, down from 4.3 in 2010.

**Figure 4: The distribution of (median) regular social transfers by income quintiles**
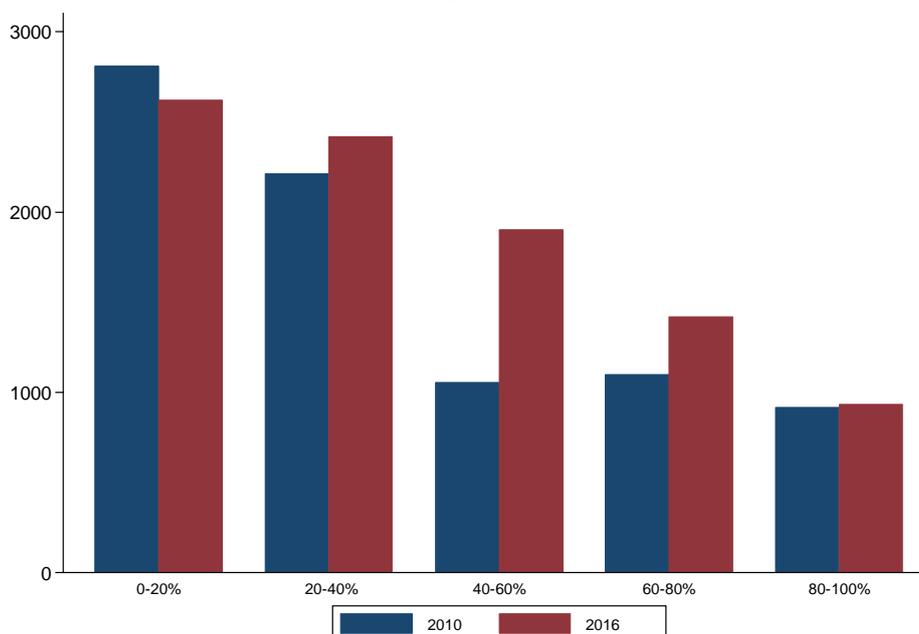
Source: MT- HFCS, Author's calculations

Firstly, this is indicative of the high median income from regular social transfers for households in the lowest part of the distribution. Secondly, such a reduction is in part affected by a non-negligible decrease in income from social transfers in the 1st income quintile, but to a large extent due to high increases in transfers to households in the middle of the income quintiles (Figure 4) by the end of the sample period.

As expected, the main driver of income inequality is employee income having by far the highest marginal contribution to inequality. Its contribution was slightly lower in 2016 than in 2010 (see marginal contribution panel in Table 3). On average, a 1% increase (ceteris paribus) in employee income edges up inequality by some 0.1%. Interestingly, an increase in income from pensions tends to decrease income inequality by roughly 0.2%. It is worth mentioning that, on average, increases in income from pensions have explained much of the change in gross incomes and inequality in the 1st income quintile and to some extent in the 2nd income quintile, whilst, as expected, labour income contributed more for those in the higher income quintiles. Alternatively, this is also supported by Figure 5, where income increases in the lower parts of the distribution have outweighed decreases in the upper parts of the distribution in relative terms.

Figure 5: The distribution of (median) income from pensions by income quintiles
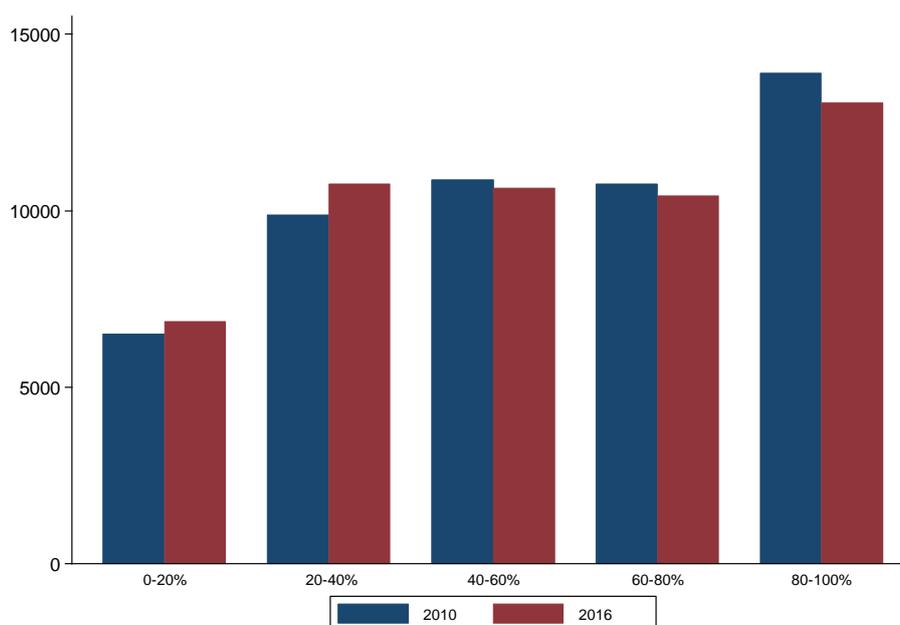
Source: MT- HFCS, Author's calculations

As mentioned earlier, employee and self-employed income are important contributors to overall income inequality, given their weight in gross household income. We define a new variable, labour income, as the sum of employee and self-employed income to further examine what has been its main driving factor across the three waves. A visual inspection of the kernel density distributions of labour income can provide useful insights.[9] To avoid capturing price effects, labour income is adjusted for inflation according to the method suggested in HFCN (2016). However, we employ the retail price index (RPI) instead of the Harmonised Index of Consumer Prices as it is a better measure for the price level for the

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[9] The right tails of the distributions are cut off at incomes of €180,000 to focus on the main part of the distribution.

Maltese households. Figure 6 shows that the distribution of real labour income has become flatter in the upper tail, as well as more dispersed over time (Knoppe (2018) reports a similar finding). Median labour income increased from €19,594 in 2010 to €30,001 in 2016. Moreover, the distribution has shifted rightwards over time, and as can be seen from the widening range of the green line, its increased (decreased) density at higher (lower) levels of income, significantly more households earn higher incomes than they did in the past, particularly in the range €30,000 to €80,000. This has led to a decrease in inequality in labour income, as measured by the Gini coefficient from 0.387 in 2010 to 0.339 in 2016.

Figure 6: Kernel density estimation of the distribution of labour income
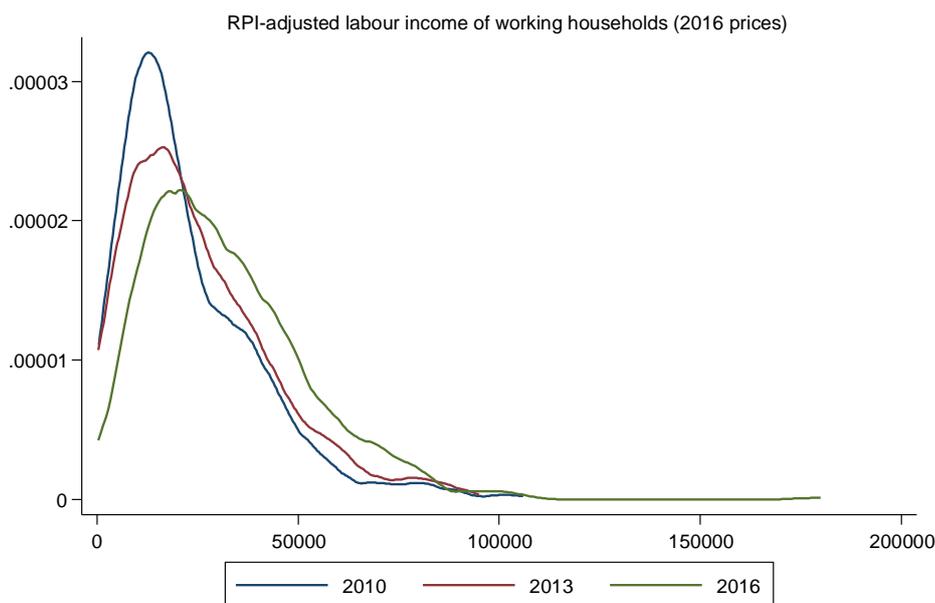
Source: MT- HFCS, Author's calculations

Note: Labour income is the sum of employee income and self-employed income

Although increased wages played an important role in shaping the distribution of labour income over time, increased participation in the labour market was a contributing factor as well. Moreover, average hours supplied increased and such increase is noted both for households with a reference person in full-time employment and those whose reference person had a part-time job.

6.2   Net wealth decomposition

This subsection presents the results of the decomposition of net wealth. Table 4 suggests that the most important equalising asset is household main residence, with a marginal contribution of around 0.2%. This is not surprising not only because home-ownership in Malta is around 81% according to the HFCS but also due to the high values of HMR compared to other forms of assets. Houses are more often than not associated with mortgage debt, especially for young households, and we find that housing loans (marginal contribution of around 0.12%) and other forms of loans (marginal contribution of around 0.01%) tend to increase net wealth inequality.

Self-employment business is the most unequally distributed real asset and is very strongly correlated with the distribution of net wealth. Its relative contribution to the net wealth is high compared to the rest of the real assets, whereas its marginal contribution is positive and on the high side, indicating that self-employment business increases net wealth inequality.

In terms of marginal contribution, other real estate assets display a decreasing contribution, from around 0.12% in 2010 to around 0.07% in 2016, while self-employment business is increasingly positively affecting inequality. The negative contribution of HMR to wealth inequality is now stronger than that for 2010. This is due to changes in the composition of wealth components, and as can be seen in the table other real estate and self-employment business are the main contributors to wealth inequality in 2016.

With regards to financial assets, their contribution to net wealth is much lower compared to real assets. This is related to a rather low share of financial assets in total net wealth as well as a relatively even distribution of the most widely held safe financial assets, namely deposits. Comparing wealth shares and the relative contribution of riskier financial assets (e.g. stocks, shares) we see that their contribution is relatively higher than their respective share of net wealth. This is because this form of assets is mainly held by wealthier households. Lastly, an increase in the value of deposits tends to decrease wealth inequality but their equalising effect has decreased over time.

Table 4: Gini decomposition of net wealth by component

		HMR	Other real estate	Self-employment business	Vehicles	Valuables	Deposits	Securities	Investment funds and listed shares	Voluntary private pensions/whole life insurance	Other financial assets	Housing loans	Other loans
Wealth share S_i	2010	0.544	0.285	0.100	0.034	0.014	0.073	0.019	0.020	0.028	0.009	-0.105	-0.022
	2013	0.588	0.219	0.182	0.039	0.007	0.055	0.013	0.019	0.021	0.007	-0.127	-0.023
	2016	0.443	0.267	0.281	0.031	0.006	0.047	0.007	0.017	0.019	0.011	-0.113	-0.016
Gini correlation R_i	2010	0.788	0.867	0.857	0.458	0.676	0.448	0.670	0.570	0.405	0.789	-0.254	-0.174
	2013	0.743	0.830	0.825	0.417	0.727	0.512	0.715	0.654	0.225	0.774	0.065	0.242
	2016	0.710	0.894	0.957	0.481	0.524	0.600	0.472	0.729	0.432	0.851	0.081	-0.186
Gini index G_i	2010	0.378	0.826	0.941	0.527	0.936	0.603	0.889	0.905	0.813	0.978	-0.773	-0.782
	2013	0.327	0.798	0.934	0.524	0.951	0.579	0.920	0.919	0.804	0.983	-0.694	-0.807
	2016	0.364	0.902	0.943	0.523	0.882	0.637	0.941	0.957	0.874	0.983	-0.628	-0.821
Relative contribution $S_i G_i R_i / G$	2010	0.325	0.409	0.162	0.017	0.018	0.040	0.023	0.021	0.018	0.014	-0.041	-0.006
	2013	0.288	0.292	0.281	0.017	0.010	0.033	0.017	0.023	0.008	0.010	0.012	0.009
	2016	0.177	0.333	0.393	0.012	0.004	0.028	0.005	0.019	0.011	0.015	0.009	-0.004
Marginal contribution $S_i G_i R_i / G - S_i$	2010	-0.219	0.124	0.062	-0.018	0.004	-0.034	0.004	0.001	-0.009	0.005	0.064	0.016
	2013	-0.300	0.073	0.099	-0.022	0.003	-0.022	0.004	0.004	-0.013	0.004	0.139	0.033
	2016	-0.266	0.066	0.111	-0.019	-0.002	-0.019	-0.002	0.001	-0.008	0.003	0.122	0.012

Source: MT - HFCS, Author's calculations

Overall, our decomposition results, and in particular those related to equalisation or disequalisation of net wealth inequality are similar to the results for the euro area as a whole (see Bezrukovs 2013).

7. The joint distribution of income and wealth

Given that we have examined income and wealth separately, and to enrich our analysis, we now turn to explore their joint distribution. The HFCS survey permits the analysis of the joint distribution of income and wealth and consequently, how they co-vary across household quintiles. It is therefore possible to study the position of households across the income and wealth distribution. To this end, we first construct a transition matrix based on the quintile distributions of both variables. To assess how re-ranking among households has evolved

over time we present the results from 2010 and 2016. We also report the Shorrocks mobility index to complement the analysis (see e.g. Azpitarte (2010)).[10]

Table 5 shows that there is a high re-ranking between the two distributions as indicated by the high values of the Shorrocks index. Indeed, around 31% of households in the bottom income quintile were in the bottom wealth quintile in 2016, compared to 37% in 2010. Similarly, in the top income quintile around 40% were in the top wealth quintile in 2016 as opposed to 38% in 2010. A different interpretation of the aforementioned is the existence of a weak relationship between income and wealth, which is also supported by the low correlation coefficient between income and wealth (less than 0.45 in all waves, Table A1 in Appendix).[11]

Table 5: Joint distribution of income and wealth across quintiles

2010	Net wealth quintile (Shorrocks index = 0.909)				
Income quintile	1	2	3	4	5
1	**36.9**	22.4	19.7	12.5	8.6
2	23.8	**22.9**	20.2	18.2	14.9
3	20.5	26.5	**19.4**	19.3	14.3
4	13.8	20.5	22.4	**19.3**	24.0
5	5.7	8.2	18.0	30.5	**37.6**
2016	Net wealth quintile (Shorrocks index = 0.918)				
Income quintile	1	2	3	4	5
1	**30.5**	26.7	17.8	16.5	8.5
2	25.7	**18.4**	21.4	16.9	17.7
3	21.8	23.8	**21.4**	22.4	10.6
4	16.0	16.8	22.7	**22.3**	22.1
5	6.2	14.9	16.2	22.8	**39.9**

Source: MT - HFCS, Author's calculations

This suggests that the position of a household in the income distribution is not a very good predictor of its position in the wealth distribution, except for households in the top income and wealth quintile. This is largely driven by pensioners who have low income levels due to low pensions, but are asset rich as a result of their large housing wealth.[12] For example,

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[10] The Shorrocks index is based on the information on the diagonal of the transition matrix M = [n − trace(P)]/(n − 1). A Shorrocks index of 1 means that there is complete mobility, while when there is no mobility the index is equal to zero. It is important to keep in mind that mobility in this analysis does not measure the joint evolution over time of the same individuals in the wealth and income distributions. It rather measures mobility within the joint distribution at two separate times. However, we note that when we repeat the analysis for the panel component of survey to trace rank mobility of households over time, the qualitatively results do not differ significantly compared to those in Table 5.

[11] The weak correlation between income and wealth is often found in the literature (see e.g. Kontbay-Busun and Peichl (2015)). Self-employment and housing (or home equity) are wealth components that provide highly idiosyncratic returns. Owner-occupied houses provide a financial return but they also provide nonpecuniary returns. Given their importance in the Maltese household portfolio, the weak correlation of income and wealth is possibly due to the components of wealth.

[12] We also repeat the same analysis but excluding self-employed from the sample. Results indicate that self-employed have high assets. With regards to income, however, changes in the income quintiles tend to be relatively small. Therefore, based on the findings of Figure 3 for self-employed (relatively low income but high assets) one may argue that our findings provide some tentative evidence that self-employed tend to under-report income but not assets in such surveys.

around 26% of households are in the bottom two income quintiles but in the highest net wealth quintile. To provide some evidence in favour of our argument, Table 6 shows the joint distribution of income and net wealth across quintiles excluding pensioners. A first observation is that the value of the mobility index is now lower compared to that found for the whole sample, whilst, in 2016, stood at a lower value than that for 2010. Restricting the sample to working-age households (a household reference person aged between 20 and 60) appears to attenuate mobility, decreasing the Shorrocks index from 0.905 to 0.893. This result is a consequence of excluding from the sample retired households whose income shows less variability. Nevertheless, the difference in mobility between working-age households and the total sample is rather small. A second observation relates to the fact that around 28% of households are in the two bottom income quintiles but in the highest wealth quintile in 2016. This percentage is close to the one found for the whole sample. Examining the percentage of households in the bottom two quintiles of income of the sample size as a whole and of the restricted sample, we find that 56% and 67% of households belong to the lower two income quintiles in 2016, respectively. Therefore, and vis-à-vis whole sample, it seems that the inclusion of pensioners only reduces the percentage of households in the lower quintiles of income, while the percentage of households in the bottom two income quintiles and in the highest wealth quintile is very similar (or even slightly higher) for both sample sizes. Hence, in the context of the joint distribution of income and wealth, retired households tend to push up net wealth and at the same time put downward pressure on income levels. These opposite effects tend to weaken the correlation between income and wealth, amongst other things.

Table 6: Joint distribution of income and wealth across quintiles for working-age households

2010	Net wealth quintile (Shorrocks index = 0.905)				
Income quintile	1	2	3	4	5
1	**38.9**	20.0	21.4	11.6	8.1
2	26.7	**26.2**	22.6	13.0	11.5
3	17.0	28.7	**21.5**	19.7	13.1
4	14.2	20.0	25.4	**18.5**	22.0
5	5.8	6.7	20.9	33.6	**33.1**
2016	Net wealth quintile (Shorrocks index = 0.893)				
Income quintile	1	2	3	4	5
1	**36.1**	37.8	7.7	5.9	12.4
2	31.3	**21.9**	18.0	13.2	15.5
3	14.9	30.2	**27.1**	20.9	6.9
4	17.0	18.9	26.0	**20.1**	18.0
5	5.7	16.6	16.6	23.7	**37.4**

Source: MT - HFCS, Author's calculations

Lastly, a closer inspection of the two transition matrices for both sample sizes reveals the life-cycle effect. The concentration of households in the lower left of the diagonal increased between 2010 and 2016, as there are more high-income households with relatively less wealth in 2016.

Motivated by the findings described above, we further investigate the relationship between income and wealth and more specifically, the factors that influence the position of a household in the wealth distribution. For this purpose, we estimate a generalised ordered logit model for the probability of a household to be in a wealth quintile given its position in the income distribution after also controlling for socioeconomic and demographic features:

$$\Pr(y_i > j) = F\left(a_j + \beta'_j x_i\right), \qquad\qquad j = 0,1,...,J-1$$

where, y_i is an ordered categorical variable, J is the number of categories of y_i, $J-1$ is the number of thresholds required to divide the range of y into J categories, x_i is a vector that contains control variables other than the constant term and F is the standard cumulative distribution function. The model estimates $J-1$ binary regressions, that is, for values $j = 1,....J-1$, equation $J-1$ compares the choice between categories $1,....,J-1$ versus category J, while the higher the β_j ($\beta_j > 0$) is the higher the probability of moving from one category to another j. The generalised ordered model, as opposed to a standard ordered model, allows for greater flexibility in linking wealth and income, but, more importantly, it allows for heterogeneous effects of the explanatory variables across the categories of the dependent variable (Williams (2006) and Greene and Hensher (2010)). This model estimates the odds of being beyond a certain category relative to being at or below that category. More specifically, the model estimates a separate vector of coefficients β'_j for each of the $J-1$ categories of the response variable. That is, we divide up the J categories into $J-1$ dummy variables, and estimate separate regressions of x_i on each. For example, in Table 7 each column shows the parameters associated with the probability of being over the specific wealth threshold. The first column displays the parameters related to the probability of being over the first wealth threshold. The second column shows the parameters associated with being over the second wealth threshold, and so on. Concerning the income variable, the estimated coefficients indicate the probability to move up in the wealth distribution.

To motivate the selection of the independent variables to be included in the model, a brief literature review is provided. Differences in the relative position of a household in the wealth and income distribution could be attributed to a variety of factors related to households. For instance, the life-cycle hypothesis, in its most basic form, postulates that a rational forward looking consumer accumulates wealth for consumption smoothing. This is manifested in an age-wealth profile over the lifetime that is hump-shaped, and three variables can explain wealth distribution: age, permanent income and preferences. This framework and the one provided in Friedman (1953) suggest that, at a given age, the distribution of household wealth should be similar to that of permanent income, given the proportional link between the two variables. However, income shocks (either permanent or transitory) are not uniformly distributed across the population at large and are likely to affect the relationship between income and wealth distribution via changing accumulation behaviours of part of the population. For instance, Lise (2011) provides evidence that frictions in the labour market and unemployment can create strong inequality in wealth among workers. Another factor that has been recently put forward as an important determinant in explaining discrepancies in the position of a household in the distribution of wealth and income is gifts and inheritance received, which contribute to wealth accumulation and perpetuate wealth inequality across generations (see e.g. Arrondel et al. (2014) and Piketty (2013)). Furthermore, education also plays a key role in explaining income and wealth inequality. Research indicates that the

relationship between education (or human capital) and income is strong (see e.g. Wolla and Sullivan (2017)). In general, individuals with more education earn higher incomes and the higher income that results from such level of education is known as the "wage premium". Similarly, the relationship between education and wealth is also strong. Higher income makes saving easier, and saving is necessary to build wealth. Furthermore, well-educated households tend to make financial decisions that contribute to building wealth (see e.g. Boshara et al. (2015)). With regards to employment and marital status and financing structure of a household's main residence, Budria (2010), Bourguignon et al. (2005) and Martinez and Uribe (2018) highlight their importance for determining the position of a household both in the income and wealth distribution. Finally, the presence of credit-constrained households can plausibly affect the position of a household in the wealth distribution.

Following the considerations described above, we now turn to describe the empirical framework used in this paper. In the model, the dependent variable is the wealth quintile of each household. Control variables include the income quintile, the number of household members, the gender and age of the reference person, his/her level of education and labour status, a dummy which is one if a household has received inheritance or gifts, as well as two dummies related to the financing structure of the HMR, namely owner-outright and owner with mortgage (as distinct from renters). The former indicates whether a household financed part or all of its HMR with its own resources, namely savings used for down payment or for the total purchase. The latter shows if a household financed its HMR with mortgage either completely or partially. These dummy variables can be thought of as proxies to capture the economic condition of a household in the past, which is also an indication of the wealth accumulation process of each household over time. In our setup, the reference groups are households in the first income quintile, whose reference person is an employee, has a primary level of education and belongs to other/renter category. Overall, the methodological approach of this paper is closely related to Arrondel et al. (2014) and Martinez and Uribe (2018).

Table 7: Generalised ordered logit regression results

	1st Wealth threshold	2nd Wealth threshold	3rd Wealth threshold	4th Wealth threshold
2nd Income quintile	0.115	0.591**	0.434*	0.825**
3rd Income quintile	1.038**	1.281***	1.122***	1.279***
4th Income quintile	0.928*	1.642***	1.340***	1.758***
5th Income quintile	1.662***	2.117***	2.252***	2.879***
Gender	-0.282	-0.104	0.185	0.041
Age of reference person	0.429***	0.456***	0.375***	0.418***
Household size	-0.049	0.141	0.055	-0.146
Secondary education	0.926***	0.349	0.354*	0.397
Tertiary education	1.425***	1.111***	1.103***	1.155***
Self-employed	0.757	1.223***	1.844***	2.426***
Retired	-0.329	0.135	0.173	0.508
Other	-1.156**	0.001	0.116	0.388
Owner outright	5.251***	3.484***	4.622***	17.273
Owner with mortgage	3.961***	2.406***	3.527***	16.704
Credit-constrained households	-1.707***	-0.451	0.338	0.763
Inheritance/gifts	0.953***	1.149***	0.877***	0.491**
Pseudo R2	0.28			
N.Obs	996			

Source: MT - HFCS, Author's calculations

*** denotes significant at 1-percent level; ** denotes significant at 5-percent level; * denotes significant at 10-percent level

All estimates are weighted using household weights and take the multiple imputation structure into account

The estimated coefficients of the income quintiles are positive and in most cases significant. A rise in income increases the probability of being in a higher wealth quintile with the exception of the fourth income quintile in the first wealth threshold. Within a given wealth threshold, the estimated coefficients increase with income, suggesting that the probability of being in a given wealth quintile increases along the income distribution, except for the first wealth threshold and fourth income quintile. The significance of income in the stock of household wealth and distribution is very common in the literature (e.g. see Fessler and Schürz (2015) and Arrondel et al. (2014)). There are studies, however, that show that income can only partially explain the observed wealth inequality. For instance, Leitner (2016) finds that around 11% of the observed wealth inequality in a number of euro area countries is attributable to income.

The age of the reference person is found to have a positive impact on the positon in the distribution of wealth. Gender seems to have mixed effects on the position of a household in the wealth distribution, but this dummy variable is not statistically significant. It has a negative effect in the lower parts of the wealth distribution and turns positive for higher wealth quintiles. One possible explanation to these results is the relative homogeneity in gender across the distribution of wealth. Fessler and Schürz (2015) show that a female reference person has a negative impact on the position of the household in the distribution of wealth, while Mathä et al. (2014) show a positive and significant effect over the median wealth level for a male reference person. As regards labour status, households with a self-employed reference person are more likely to be in a higher wealth quintile (compared to households with an employed reference person) because they hold high value assets. Household size is ambiguous and statistically insignificant. This could be attributed to the

similar household structure across wealth quintiles. A similar result is found by Mathä et al. (2014). Finally, education has a positive impact on the position in the wealth distribution.

For households who own their homes with no outstanding mortgages, there is a positive and significant impact on the probability of a household moving to a higher quintile in the wealth distribution, except for the highest wealth quintile. Therefore, households that can save up enough money to partly or fully finance the purchase of a house have a high probability of being in the wealthiest quintiles in the future. With regards to households with a mortgage, this variable explains the position of households in the wealth distribution in a positive and significant way. This is related to the fact that households with mortgage are those with higher (expected) incomes and therefore represent a lower risk to financial institutions. One could argue that the financing structure of the household home is an indicator of the household wealth position today.

Credit-constrained households in the first wealth quintile are negatively affected by the lack of credit, but there is no a statistically significant effect in the rest of the wealth distribution. Finally, the estimated coefficients of the inheritance dummy are significant and positive, indicating that having received gifts or inheritance has a positive impact on the position in the wealth distribution. This is in line with the results found in Arrondel et al. (2014) and Fessler and Schürz (2015).

8. Credit constraints

A different channel through which inequality is affected is the existence of tight credit constraints. In the related literature, the role of house prices and tenure status are often highlighted as important factors. For example, Carozzi (2015) in a housing model with renting and credit constraints in which households differ in age and income shows that steady states with tighter lending conditions have a lower number of first-time buyers and that tighter credit leads to more let-to-buy (households keeping their homes and renting them when trading up) and less buy-to-let (households buying a home as an investment). According to the author, the driving mechanism of all these results is the pricing out of young buyers by wealthier, older households when credit is tighter. On the other hand, Balta and Ruscher (2011) highlight the role of house prices in mortgage decisions. In particular, the authors find that for homeowners an increase in house prices implies an increase in wealth and that changes in house prices also have strong distributional effects between homeowners and tenants. Moreover, high house prices may benefit homeowners that wish to trade down at the expense of other resident households, such as first-time buyers or young households trading up.

As mentioned in the introduction, increases in house prices in Malta were steep in recent years, with the transaction-based house price index registering a cumulative 22% increase from 2010 to 2017. Rental costs in the private market have also risen rapidly, potentially amplifying inequality. In addition to the above, as shown in Table 4, housing loans tend to increase wealth inequality, while the incidence of owning the main residence has a marked impact on lowering inequality. Furthermore, results from the generalised ordered logit model suggest that home-ownership irrespective of the way it was financed is an important determinant of the relative position of a household in the joint distribution of income and wealth. In view of the considerations described above, the presence of credit constraints can plausibly affect the ability of a household to own their home, which in turn affects wealth

inequality. In other words, changes in income inequality may affect welfare distribution differently depending on the credit constraints facing households as well as the insurance mechanisms available to them.

The modelling approach of this paper and, more particularly, of the inclusion of explanatory variables, is informed by the literature. The majority of empirical studies focus on the characteristics of households who are more likely to be credit constrained. In doing so, they rely on self-reported survey data. The main objective of these studies is to estimate the probability of being credit constrained and the demand for household credits. For the US, and based on Survey of Consumer Finance data, early empirical evidence is provided by Jappelli (1990), Cox and Jappelli (1993), Duca and Rosenthal (1993) and Crook (2001). Other studies mostly focus on the OECD countries: Crook and Hochguertel (2005) for the US, Italy and the Netherlands, Del-Rio and Young (2005) and Benito and Mumtaz (2006) for the U.K.

The above-mentioned studies indicate that household income and the age of the household reference person are important determinants of demand for debt. Crook (2001) for the US finds that a household demands more debt when its income is higher, when it owns a home, when the family size is larger and when the head is working. In addition, lower probability of being credit constrained is observed when a household owns a home, has high net wealth, the reference person is older than 55 and has been at a job for a long time. Crook and Hochguertel (2005) provide further evidence in relation to credit demand and credit constraints in the US, Italy and the Netherlands. The authors find that higher age and wealth reduces the chance of being constrained. Moreover, the self-employed face a greater chance of being discouraged or turned down in all three countries, especially in the US.

To examine the economic and sociodemographic characteristics that determine households' ability to obtain credit and can also affect inequality, we run probit regressions on liquidity constrained households. Following Jappelli (1990), credit-constrained households are defined as those who responded affirmative to any of the following questions:[13]

1. "Turned down/discouraged" indicator:
- *In the last three years, has any lender or creditor turned down any request you [or someone in your household] made for credit, or not given you as much credit as you applied for?*
- *In the last three years, did you (or another member of your household) consider applying for a loan or credit but then decided not to, thinking that the application would be rejected?*

The specification of the probit model is as follows:

$$\text{Pr}(credit-constrained\ household_i = 1) = \Phi\big(\alpha + \beta_i^{'} x_i\big)$$

where, Φ is the cumulative normal distribution function, α is the constant of the model, x is the vector for control variables and β contains the coefficients associated with x. In this setup, the dependent variable takes value 1 for credit-constrained households and 0 otherwise. To control for the main economic and sociodemographic characteristics of the

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[13] Jappelli (1990) used data from SFC to define credit constraints households when their application for a loan was rejected or they didn't apply for a loan, thinking that it would be rejected.

household, apart from household size we include dummies for income and wealth quintiles, education level, age and employment of the reference person as well as for marital status, in line with those commonly used in the literature (see e.g. Blanc et al. (2015) and Crook and Hochguertel (2007)). For the sake of brevity, we present estimates based on data from the third wave of the survey. Regressions based on data from the previous two waves do not change the results significantly.

Before presenting the results of our analysis, we should mention two caveats. In the HFCS, reference persons have to be constructed ex post based on the household information that has been collected during the interview (Albacete et al. (2012) and HFCN (2013)). Results for some characteristics such as age, education or work status that can be assigned only at the level of individual persons, one person most represent the household as a whole. However, Fessler et al. (2012), Andreasch et al. (2012) note that this selection criterion is arbitrary to some degree and might not always represent the household as a whole. To put it into the context of credit constraints, a household would be considered as credit-constrained even in the case of where only one member applied for credit but the application was rejected. The second caveat relates to the sample size of the dependent variable. There are only 36 credit-constrained households in the third wave and in view of the considerations described above, the findings of this section should be interpreted with caution.

Table 8 presents the estimates of the probit model as well as the average marginal effects of the discouraged borrower effect, with the latter being the more meaningful variables for interpretation purposes.[14] Gender appears not to affect the probability of being credit-constrained in a significant way. Households with older reference persons are less likely to be liquidity constrained than younger households, possibly because old households are more likely to have accumulated significant assets, as displayed in Figure 3. As regards marital status, divorced households are more prone to reporting that they are liquidity constrained than married households. Households whose reference person has completed tertiary education appear to be less likely to face liquidity constraints.

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[14] The results for categorical variables must be interpreted against the omitted categories in the probit regression which correspond to households whose reference person has less than 35 years, has completed primary education, is an employee, is considered as a couple, with income in the 1st income quintile as well as wealth in the 1st wealth quintile.

Table 8: Credit constraints – probit estimates

	Probit estimates	Average marginal effects
	Turned down / discouraged	Turned down / discouraged
Male	-0.104	-0.008
Age 35-44	-0.011	-0.001
Age 45-54	-0.052	-0.004
Age 55-64	-0.439 ***	-0.033 ***
Age 65+	-0.750 ***	-0.056 ***
Household size	0.049	0.004
Secondary education	0.083	0.006
Tertiary education	-0.261	-0.020
Self-employed	0.242 *	0.018 *
Retired	-0.036	-0.003
Other	0.179	0.013
Single	-0.167	-0.013
Widowed	-0.420 ***	-0.032 ***
Divorced	0.276 *	0.021 *
2nd income quintile	0.151	0.011
3rd income quintile	-0.465 ***	-0.035 ***
4th income quintile	-0.201 *	-0.015
5th income quintile	-0.029	-0.002
2nd wealth quintile	-0.699 ***	-0.052 ***
3rd wealth quintile	-0.746 ***	-0.056 ***
4th wealth quintile	-0.650 ***	-0.049 ***
5th wealth quintile	-0.239 *	-0.018 *
Pseudo R2	0.117	
N.Obs	1,004	

Source: MT - HFCS, Author's calculations

*** denotes significant at 1-percent level; ** denotes significant at 5-percent level; * denotes significant at 10-percent level.

All estimates are weighted using household weights and take the multiple imputation structure into account

This may be related to higher incomes of these well-educated households, but the estimated coefficient is not significant. Household size is positively related to the liquidity constraints indicator but not significant. Households for which the reference person is self-employed are more likely to face credit constraints compared to employed counterparts. Household income and household net wealth are negatively associated with credit constraints, indicating that households with higher incomes and/or wealth have more access to credit, which may allow them to accumulate further assets and widen inequality. Overall, the results presented here are line with those in Blanc et al. (2015).

9. Conclusions

The objective of this paper is to study income and wealth inequality in Malta between 2010 and 2016. Based on micro data from the HFCS, this study analyses how income and wealth are distributed by different socioeconomic characteristics. It also explores factors that drive a household's position in the income and wealth distribution, mobility across the distributions as well as determinants of a household's ability to get credit.

Similar to findings for other countries, wealth inequality in Malta is more pronounced than income inequality. However, wealth inequality increased moderately between 2010 and 2016, mainly driven by self-employment business, followed by other real estate properties and widened at a quicker pace than income inequality. In relative terms, wealth and income distribution changed somewhat in favour of households in the upper parts of the distributions. Moreover, households with a reference person with tertiary education experienced sizeable increases in their incomes and wealth in the period examined.

The decomposition of Gini coefficients by its income sources suggests that labour income, given its share, is the main driver of the observed income inequality, while income from pensions tends to reduce inequality. With regards to wealth, household main residence is the most equalising factor of wealth inequality and self-employment wealth is the most disequalising factor. The role of the financial assets and indebtedness seems to be rather marginal.

As regards the factors that influence the position of a household in the wealth distribution, results indicate that higher household income tends to increase the probability of being in a higher wealth quintile. Moreover, the financing structure of a household's main residence is important to explain its position in the wealth distribution. In addition, having received inheritance or gifts is positively associated with the probability of being in a better position in the wealth distribution.

The findings suggest that targeted wealth equalisation policies with regards to home-ownership status can potentially alleviate economic inequality. Furthermore, economic policies that aim to improve educational attainment can have dual effects. On the one hand, better-educated households can earn more and by extension, quicken the process of wealth accumulation. On the other hand, households with higher education may be less likely to be credit-constrained. This can positively affect the outcome of taking out a mortgage in view of becoming home-owner, which as remarked in this paper can decrease inequality.

The Maltese Household Finance and Consumption Survey has the advantage of having a panel structure. This offers a unique opportunity for future research and contributions to the literature, especially in relation to wealth mobility. Moreover, in our paper wealth and income categories are defined according to quintiles. However, given the importance of the top of the distribution in explaining overall inequality, it would be interesting to focus on the very top of the distribution (e.g. to be in the top 5% or top 10%). Given the availability of three HFCS waves, one interesting research question may revolve around whether explanatory factors of being in the top wealth vary over time.

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Appendix

Table A1: Correlation coefficients for income and net wealth

	2010		2013		2016	
	Income	**Net wealth**	**Income**	**Net wealth**	**Income**	**Net wealth**
Income	1		1		1	
Net wealth	0.3184	1	0.2475	1	0.4414	1

Source: MT - HFCS, Author's calculations