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Saving behaviour in Malta: Insights from the Household Budgetary Survey

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Saving behaviour in Malta: Insights from the Household Budgetary Survey*

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WP/02/2021

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The views expressed in this paper are the authors' own and do not necessarily reflect the views of the Central Bank of Malta. Correspondence: publicrelations@centralbankmalta.org.

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Abstract

We use household-level data from the Household Budgetary Survey to study the saving patterns of Maltese households. We first establish a set of key observations from the data, showing that the likelihood of saving rises with income, age and education. We then estimate a Logit model of the probability of saving on a set of household characteristics. Our results support the observations from the raw data on income and age, but show that when we control for a host of factors, the probability of saving is actually highest among households with low education. We interpret these findings through the precautionary and bequest motives as predicted by theory. Other household characteristics, such as house tenure, marital status and the number of individuals in a household also affect the probability of saving. An extended Generalised Order Logit model sheds further light on the saving intensity of households based on their characteristics. These findings can inform both macroeconomic model development as well as guide policy formation.

JEL Classification: C25, D14, D15

Keywords: saving rate, Household Budgetary Survey, Logit model, precautionary saving

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1 Introduction

Household consumption and saving behaviour is at the heart of macroeconomics, explaining expenditure decisions as well as wealth accumulation in the wake of economic shocks. There are very few studies on saving behaviour in the Maltese economy, and most are either based on aggregate macroeconomic data or look at simple conditional mean or median saving rate patterns.¹ We therefore fill an important gap in the literature by exploring the full saving rate distribution of Maltese households using household-level data and map the probability of saving over a range of household characteristics. Our analysis puts focus on household heterogeneity, which is now more than ever taking center stage in macroeconomic analysis (Kaplan and Violante, 2018). Our work can therefore be informative for incorporating richer household behaviour in macroeconomic models as well as to better guide policy formation. More generally, our work also contributes to the broader literature on household saving behaviour, particularly given the relative scarcity of similar studies on the topic.

The theoretical starting points for most research on consumption and saving are the Permanent Income Hypothesis or the Life Cycle Hypothesis. The latter, most frequently the theoretical basis for empirical work, predicts that rational, forward-looking agents attempt to maintain a constant marginal utility of consumption expenditure over time (Ando and Modigliani, 1963; Browning and Lusardi, 1996; Modigliani and Brumberg, 1954). This results in a smoothed consumption profile over an individual’s lifetime, with younger individuals borrowing in advance of future income, saving in the middle years and dissaving in retirement. The basic life cycle model predicts saving during one’s working life in order to finance consumption after retirement, thus implying that the main saving motive within this model is saving for old-age provision. There are however other important drivers, such as the bequest motive and the precautionary motive, dating back to Keynes (1936). He defines the bequest motive as saving intended to ‘bequeath a fortune’ or to leave a stock of wealth to the successive generation. The precautionary motive explains saving aimed at building up a reserve against unforeseen circumstances (‘saving for a rainy day’), for instance, by keeping to a target wealth-to-permanent income ratio (Carroll, 1997).² Browning and Lusardi (1996) define the downpayment motive as saving to accumulate deposits to purchase durable goods or assets such as housing. Constrained liquidity is another factor which can drive saving (Browning and Lusardi, 1996; Carroll and Kimball, 2001; Le Blanc et al., 2016).

In this paper our main data source is the Household Budgetary Survey (HBS), a survey carried out with the principal aim of tracking household expenditure patterns. It features a rich dataset which we exploit to study saving behaviour in Malta.³ In earlier work we document that the median saving rate has doubled between the 2008 and 2015 waves (Abela and Gatt, 2020). Building on this, we observe here that indeed the entire interquartile range shifted upwards between 2008 and 2015. Perhaps the key explanation for this change is the underlying economic environment. In Figure 1 we plot the interquartile range for the saving rate over time together with the 3-year moving-average real GDP growth rate, which rose from 3.7% to 7.6% over the

¹See Gatt (2014), Gatt (2015) and Abela and Gatt (2020). An exception is Le Blanc et al. (2016), which we review further below.

²Other seminal studies on this topic are Skinner (1988) and Zeldes (1989).

³An alternative data source is the Household Finance and Consumption Survey (HFCS). We prefer to use the HBS as it contains detailed data on expenditure and income at the household level, which allows us to extract the entire saving rate distribution. The HFCS only provides a binary variable indicating whether a household expects to save or not. Although this could suffice for our benchmark results, it would not permit us to dig deeper, as we do in later parts of the paper.

same period. This apparent positive relationship between economic growth and aggregate saving is considered a stylised fact in macroeconomics (Jappelli and Pagano, 1998; Masson et al., 1998). Although this association does not control for a range of other potential factors, it likely captures the main upward shift in the conditional saving rate distributions that we show below.

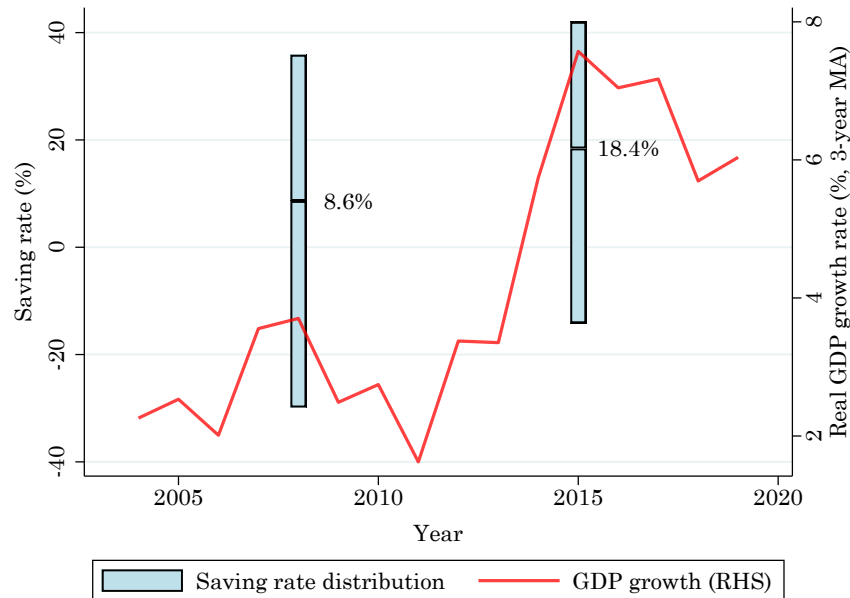


Figure 1: Saving rate distribution and real GDP growth

Notes: The blue bars span the interquartile range for the saving rate distribution, with the upper and lower edges denoting the 25th and 75th percentiles respectively. The horizontal lines within the blue bars denote the median saving rate, which is also show in figures next to them. Real GDP is in chain-linked volume terms as per NSO News Release NR142/2020, expressed as the 3-year moving average of the annual growth rate. The median saving rates differ slightly from those reported in Abela and Gatt (2020) as we drop a number of observations form our sample, as discussed in section 3.2.

We first establish a set of observations about household saving in Malta, showing that saving rate distributions have a left skew, and that the likelihood of saving rises with income, age and education. We then dig deeper to qualify these observations through the lens of a multivariate Logit model, which we use to explain the likelihood of saving conditional on a host of household characteristics. Our estimates confirm the observed raw patterns in the data that the probability of saving rises with income and age, although when controlling for other factors, we find that lower education is actually associated with higher savings. Although these results are not necessarily causal, they are in line with the precautionary and bequest motives predicted by theory. Unemployment, having an outstanding mortgage and renting are also associated with a higher probability of saving, all for different reasons. The result for unemployment likely stems from a precautionary motive, although we argue further below that this finding is puzzling. Saving while having an outstanding mortgage is possibly driven by data measurement, as mortgage payments are not entirely added to household expenditure. On the other hand, saving more while renting relates to peculiar historical events in the Maltese housing market which kept rents at below market prices, significantly lowering housing costs and the associated expenditure. The probability of saving is negative in the number of individuals in a household. A limitation in our analysis is that the HBS does not report household wealth, which is important for household saving decisions. We therefore use wealth proxies to try to capture wealth effects and limit model misspecification.

We show that our model is a good in-sample classifier, able to correctly predict whether a household saves conditional on a set of characteristics to a significant degree. Our key results do not change when we drop potential outliers or modify the thresholds to classify a particular category of households. We then divide saving behaviour in more categories and use a Generalised Order Logit model to shed further light on the saving intensity of households based on their characteristics.

The rest of this paper is structured as follows. In the next section we briefly review the related literature and in section 3 we discuss features about the main data source as well and data filtering. We then use the data to form a set of key observations on household saving rate patterns. In section 4 we lay out the main econometric model and in section 5 we show our key results, together with a set of sensitivity and robustness checks. Section 6 then presents our extended model estimates and the last section concludes.

2 Related literature

Micro-level data complements our understanding of household saving behaviour by exploring the relative importance of various characteristics. [Harris et al. \(2002\)](#) find a positive relationship between saving and homeownership in Australia, as well as between higher saving and higher levels of income and wealth. However, they find that the probability of higher saving is negatively linked to the number of children in a household and to having a mortgage. Interestingly, this study also finds that people aged over 65 are relatively more likely to have higher saving than respondents aged 35 to 65. [Alves and Cardoso \(2010\)](#) find that household saving in absolute terms peaks before retirement in Portugal. However, they find that households whose reference person (henceforth RP) is aged 75 and over have the highest saving rates when compared to the base category (ages 25–34). They also find a positive association of education and homeownership with saving, whilst household size and unemployment were found to be negatively related to saving. [Finlay and Price \(2014\)](#) also show that education and income are positively related to saving, and that saving tends to be highest in households at the pre-retirement stage.⁴

[Le Blanc et al. \(2016\)](#) use data from the first wave of the Household Finance and Consumption Survey to identify the determinants of saving and saving motives in fifteen euro area countries, including Malta. Larger households and households whose RP is divorced, self-employed, unemployed, or retired, are more likely to spend more than they earn in the euro area. On the contrary, households with a RP who is aged 71 or over or is single are less likely to report negative saving. Households with income in the third quintile or higher and households with wealth in the second-lowest quintile or higher are also less likely to have expenses exceeding income than the base category (the bottom income and wealth quintiles). In the case of Malta, this study finds that household size is a highly statistically significant predictor of negative saving, whilst having a ‘middle’ (but not high) level of education and being in the highest quintile of wealth and income significantly reduce the likelihood of negative saving relative to the base category.

Lastly, using household-level data for Ireland, [Le Blanc \(2016\)](#) finds that larger households and households with unemployed heads are more likely to report negative saving, whilst higher education is associated with a lower likelihood of negative saving. Higher household net wealth is also associated with a lower probability of negative saving, whilst the link with income is rather ambiguous. This is because households in the third and fourth income quintiles are found to be

⁴However, the authors estimate the model over two survey waves and find that the sign of the coefficient on education indicators switches from negative in 2003–4 to positive in 2009–10. This result highlights that the link between education and saving may not be totally clear-cut.

more likely to dissave than the reference category (households in the bottom income quintile). Households in the top income quintile, on the other hand, are significantly less likely to report negative saving. Lastly, households with heads aged between 41 and 70 are found to save less than the reference group (aged under 40), but this is not the case for households in the oldest age group, which comprises households whose RP is aged 71 and over.

Other studies use household-level data to focus on particular features or aspects of household saving behaviour. For instance, a number of studies consider the tendency of elderly people to continue to accumulate wealth or save, or else to dissave at a slower pace than that expected from theory. [Ventura and Horioka \(2020\)](#) examine such behaviour for Italy, where nearly 90% of the retired elderly were saving in 2014. They find that an intention to leave a bequest and the relative size of the intended bequest, or else saving to give inter vivos transfers and saving to leave bequests, predict higher wealth accumulation and saving levels by the retired elderly. Variables that proxy precautionary saving are also statistically significant, although somewhat weaker than those for bequests. These findings support the notion that elderly households may fail to dissave due to bequest motives as well as precautionary motives, such as saving to self-insure against longevity risk or medical expenditure.

[Olafsson and Pagel \(2018\)](#) also look at the phenomenon of higher saving and sharp drops in consumption upon retirement, using data for Iceland. Whilst this behaviour is difficult to explain in the context of the rational-agent life-cycle model, some authors postulate that this can be rationally explained due to, for instance, a reduction in work-related expenses post-retirement. However, [Olafsson and Pagel \(2018\)](#) argue that such explanations are insufficient, and that these findings could be explained by, for example, undersaving before retirement requiring an adjustment of consumption patterns, or overconsumption during the working life (when income is uncertain) which is corrected after retirement, when income uncertainty ceases. Meanwhile, [De Nardi et al. \(2010\)](#) find a significant role for health expenditures in explaining the saving behaviour of single elderly people in the United States, including for richer individuals who have poor coverage from publicly provided schemes. However, social insurance programs in general are found to lower asset holdings by retirees from all income groups.

[Guariglia \(2001\)](#) focuses on the effects of income uncertainty on saving behaviour, and finds a positive relationship in support of the precautionary motive. [Engelhardt \(1996\)](#) and [Disney et al. \(2010\)](#) consider the effect on household saving of increases in housing prices. Both studies find a negative relationship between housing capital gains and saving. The former finds that such a relationship is however attributable to households suffering negative capital gains increasing saving, with homeowners enjoying positive capital gains not reducing saving. Meanwhile, the latter finds that there is no significant difference in response to housing capital gains between older and younger homeowners, but young renters actually increase saving relative to older homeowners. More recently, [Fagereng et al. \(2019\)](#) show that saving rates are almost always constant over, except at the bottom of, the wealth distribution in Norway. However, adding capital gains to the definition of saving leads to saving rates that are increasing in wealth. On another note, [Fuchs-Schündeln et al. \(2020\)](#) find that cultural factors are also important determinants of saving behaviour across countries, transmitting from one country to another through migrants.

3 Data

We work with the 2008 and 2015 HBS waves, focusing on the RP of each household. We first provide a brief discussion of the two waves, following with an explanation of how we rid the data

of outliers and prepare it for analysis. We then summarize the key patterns in the data.

3.1 The HBS waves

HBS 2008: The 2008 wave of the HBS had a sampling frame of about 142,000 private households based on the 2005 Census, which excludes residences such as hotels, hospitals, prisons and elderly homes (NSO, 2010). Out of a gross sample of 7,000 households selected via Systematic Random Sampling a total of 3,732 responses were obtained via face-to-face interviews held between February 2008 to February 2009. Respondents kept a diary tracking their expenditure over a two-week period. Although data was collected at the household level, the RP filling in the diary is the so-called head of the household or the person who contributes mostly to the total household income. It is important to note that some expenditure categories are excluded from expenditure, such as expenditure on overseas holidays, mortgage payments, donations to non-profit organizations and life insurance services amongst others.⁵ Income includes employment and self-employment income, social benefits, as well as income derived from rent, interests and dividends. Similar to the treatment of expenditure items, certain receipts which are either of an irregular or non-recurring nature are also excluded from income. These include, for example, the sale of assets and inheritance. Net income is therefore strictly not disposable income. Moreover, the HBS report notes that income is likely under-reported. Consequently, the 2008 HBS warns against a strict interpretation of the difference between income and expenditure as a measure of saving. We will therefore emphasize further below that any results from this wave based on saving should be interpreted with caution.

HBS 2015: The 2015 HBS wave was based on a gross sample of 6,325 households, based on about 153,000 households in Malta according to the 2011 Census (NSO, 2018). The wave contains a final sample of 3,691 participating households after accounting for households which were ineligible or which refused to participate. Data was collected over a period spanning from April 2015 to April 2016, where the sample was divided into batches ensuring that it is evenly distributed throughout the data collection period. Household income calculations within this wave pertain to the 2015 calendar year. As with the preceding wave, certain categories of income as well as expenditure, which are not considered to be regular components thereof, were excluded from the calculation of these variables. Although the 2015 HBS report carries a short discussion on aggregate household saving, the caveat discussed above is also likely to apply for this wave. Whilst the difference between a household's income and consumption expenditure is a suitable proxy for household saving or dissaving, it may not be error-free.⁶ Nevertheless, since income is likely to be imprecise in the 2008 wave, we rely on the 2015 dataset for our key findings.⁷

3.2 Data processing

We proceed to calculate saving rates at the household level. In a preliminary analysis we find a small number of households with extremely high negative saving levels due to very low income

⁵Only the interest component of a mortgage payment is included in expenditure, together with rent or imputed rent. We return to this issue in section 5. See 'Consumption expenditure classifications' in NSO (2010, p.93) for a full list of the items excluded from consumption.

⁶The 2015 HBS report (NSO, 2018) carries an explanation on the assumptions behind this saving calculation. Namely, disposable income does not include non-regular income such as inheritance, as well as social benefits. Expenditure includes good financed over several transactions, but not components such as fines and donations.

⁷This is because in the 2008 wave income was provided by the respondents, and is hence prone to under-reporting, while income in the 2015 wave is from administrative data.

declarations, some in multiple orders of magnitude. This is especially the case in the 2008 wave, notwithstanding the caveat associated with our estimate of saving.⁸ Instead of removing observations based on an arbitrary threshold for income, in our benchmark analysis we choose to remove outliers on the basis of the saving rate. We drop observations that lie outside of the lower 2.5th and upper 97.5th percentiles. This procedure removes 187 and 184 observations from the 2008 and 2015 waves respectively. While we may not want to drop observations that might appear outliers but are potentially explained by a fitted model, we also want to avoid outlier leverage potentially biasing our estimates. In our robustness checks in section 5.2 we also check the sensitivity of our results to an alternative truncation strategy.

Given that the indicator for renting is a variable of substantial interest in our study, the following explanation clarifies our treatment of rentals within the data and the regressions specified below. The rental market for residential properties in Malta is somewhat segmented between rental contracts entered into before 1 June 1995, and those on or after that date. The former type of contracts are subject to a number of legal provisions, some dating back to 1931, at the time intended to guarantee housing at affordable rent. These provisions do not apply to rental contracts entered into on or after 1 June 1995, meaning that under such contracts, market rents apply ([Ministry for Social Policy, 2008](#)).⁹ This therefore created a wedge between rents charged under contracts established in either period.¹⁰ An attempt to address this imbalance was made through the enactment of Act X of 2009, which amended the Civil Code such that as from 1 January 2010, a minimum annual rent of €185 per annum is stipulated for residential properties leased prior to 1 June 1995 ([Civil Code \(Amendment\) Act, 2009](#)). Under these amendments, rent must also be increased at the rate of inflation every three years thereafter; however, rents could also remain below the stipulated minimum in case of an agreement to that effect between the parties to the rental contract. Therefore, although a large number of properties were affected by these amendments, the level at which the minimum was set together with the possibility of waiving such a minimum still leaves a potential disparity between the rents paid on properties rented before 1 June 1995, and on those rented on or since that date.

Taking this into consideration, we therefore distinguish between the following three types of rents in our sample:

1. **Market rents:** rents with an annual rental expenditure that exceeds the threshold defined below;
2. **Social rents:** rents with an annual rental expenditure that is lower than the above-mentioned threshold, and therefore assumed to be rents under contracts entered into prior to 1 June 1995; and
3. **Other rents:** where households do not rent their residence yet incur a rental expenditure, which may indicate rental of other property, such as a garage or agricultural land.

Our prior expectation is that the majority of rents captured in the HBS waves are social rents. We define the threshold as the lowest average annual market rent observed for the year of the survey wave; this being the cheapest market rent across all regions in Malta. NSO data

⁸For example, in the 2008 wave there were 21 responses out of a sample of 3,732 that declared an income of less than €200 monthly, of which 11 earned less than €100 a month. The corresponding figures for the 2015 wave are 9 and 6 respectively out of 3,691 households. Around half of these observations relate to households whose RP is 60 years or older, and therefore likely retired.

⁹Additionally, security of tenure and lease inheritance no longer hold for these contracts.

¹⁰Indeed, some rents regulated by the pre-1995 laws are set at prices predating the Second World War.

indicates that in 2015 this was approximately €4,580 (€382 per month) for a one-bedroom flat.¹¹ While the corresponding amount for 2008 is not available, we estimate it to be about €4,350 (€363 monthly).¹² However, very few renters in our sample paid in excess of these figures; 13 in the first wave and 37 in the second.¹³ We test the sensitivity of our results to these thresholds in section 5.2. Figure 2 shows the distribution of rental expenditure for those households who rent their primary residence. It clearly illustrates that a big share of these rents are at less than €500 annually, or about €42 per month. This is in line with our prior, and we therefore drop households whose rental expenditure is higher than these cut-off thresholds.¹⁴

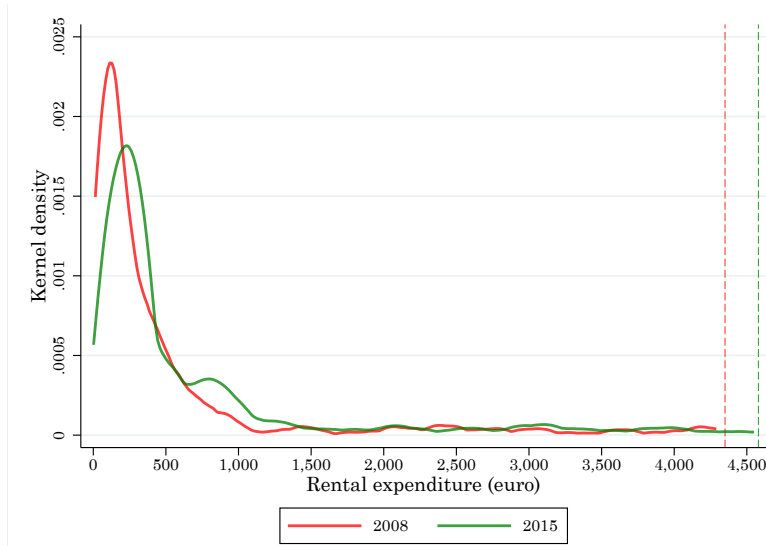


Figure 2: Distribution of annual rental expenditure for renters

Notes: The dashed vertical lines are the truncation limits for market rents of €4,350 and €4,580 for 2008 and 2015 respectively.

We also note that 7 observations in the 2008 wave and 9 in the 2015 wave relate to a RP who is less than 25 years old. Since there are so few observations we drop them from our analysis. These adjustments bring down the sample size to 3,525 households in the 2008 wave and 3,461 households in the 2015 wave. These samples form the basis of all the analysis that follows.

Tables 1 and 2 show the summary statistics of the key household variables and characteristics in our sample across the two waves. We split these into two, continuous variables and binary dummy variables. It should be noted that the observations included in these tables are those left in the sample after trimming and after dropping a number of other observations, as described above. The most salient characteristics of our sample are the following. In both waves, the

¹¹See [Gatt and Grech \(2016\)](#) for further details. However, the specific purpose for which the data was collected and the types of property considered may mean that the properties sampled command rents which are higher than the national average.

¹²Only the national average rent for a 1-bedroom apartment is available for 2008. We estimate the average rent of a 1-bedroom apartment in the cheapest region using the ratio of rent of such property to the national average for the period 2012-2019, and apply that to the national average rent for a 1-bedroom apartment in 2008 (€448), which returns €363 monthly or about €4,350 annually.

¹³In the 2008 wave, 640 of 3,538 households remaining in the sample (after trimming and dropping observations other than those discussed herein) rent their primary residence, of which 13 pay market rents according to our classification, whilst 501 rent other property or assets but not their primary residence. Correspondingly, in the 2015 wave, 529 of 3,478 remaining households rent their primary dwelling, of which 37 do so at market rents, whilst 681 rent only other property or assets.

¹⁴By dropping ‘market’ rents, we are implicitly removing all non-Maltese households from either sample, since these rent at market rates.

largest age group in the sample is that aged 40 to 54, while households with a RP aged 25 to 39 make up the smallest proportion of the sample. In the 2015 wave, the sample shifts towards older households, which may be consistent with ageing of the resident population.¹⁵ About half of the sample is made up of households whose RP is employed or self-employed, with a smaller proportion in 2015 being made up for by more retired and inactive respondents.¹⁶ One can also observe significant increases in mean and median household income between the two waves, with expenditure rising proportionally less. These are consistent with higher mean and median saving rates in the 2015 wave, and are also reflected by the higher proportion of households registering positive saving in this wave (66.1%, as opposed to 56.3% in the 2008 sample).

Table 1: Sample summary statistics - HBS 2008

Variable	Mean	Median	Std. dev.	Min	Max	Obs.
Continuous/non-binary variables						
Saving rate (%)	-4.53	8.62	54.84	-219.96	70.24	3,525
Saving (€)	1,069	1,301	11,278	-76,841	50,254	3,525
Total HH income (€)	20,853	18,591	12,451	1,284	113,633	3,525
Total HH expenditure (€)	19,784	16,830	13,313	1,760	134,555	3,525
No. of adults	2.34	2	0.95	1	6	3,525
No. of children	0.61	0	0.90	0	6	1,328
Dummy variables						
Positive saving	0.563		0.496	0	1	1,986
Age 25-39	0.189		0.392	0	1	667
Age 40-54	0.336		0.472	0	1	1,185
Age 55-64	0.238		0.426	0	1	838
Age 65+	0.237		0.425	0	1	835
Employed/Self-Employed	0.579		0.494	0	1	2,040
Unemployed	0.024		0.153	0	1	85
Retired	0.271		0.444	0	1	954
Inactive	0.127		0.332	0	1	446
Low Education	0.732		0.443	0	1	2,581
Med. Education	0.137		0.344	0	1	484
High Education	0.130		0.337	0	1	460
Single	0.085		0.280	0	1	301
Married	0.806		0.395	0	1	2,842
Separated/Widowed/Divorced	0.108		0.311	0	1	382
Owner without Mortgage	0.520		0.500	0	1	1,834
Owner with Mortgage	0.135		0.342	0	1	477
Rented	0.178		0.382	0	1	627
Used/Given for Free	0.167		0.373	0	1	587
Rents Other Property	0.142		0.349	0	1	501
Terraced House	0.446		0.497	0	1	1,571
Detached House	0.042		0.201	0	1	149
Maisonette	0.257		0.437	0	1	906
Flat/Penthouse	0.236		0.425	0	1	833
Owens Second House	0.107		0.309	0	1	378
Rents Second House	0.007		0.084	0	1	25

Notes: The count for dummy variables and the count of persons in a household is for values greater than zero. For instance, there are 1,986 households with a positive saving rate in the 2008 HBS.

¹⁵Some of the differences across the two samples can also be due to sampling variation.

¹⁶'Inactive' refers to RPs who are either students, are unable to work or are homemakers.

Table 2: Sample summary statistics - HBS 2015

Variable	Mean	Median	Std. dev.	Min	Max	Obs.
Continuous/non-binary variables						
Saving rate (%)	8.21	18.41	46.33	-194.03	73.14	3,461
Saving (€)	5,152	3,721	14,937	-104,726	137,226	3,461
Total HH income (€)	28,158	24,285	18,711	1,301	234,002	3,461
Total HH expenditure (€)	23,006	19,710	14,890	2,135	161,557	3,461
No. of adults	2.35	2	1.00	1	7	3,461
No. of children	0.48	0	0.83	0	7	1,057
Dummy variables						
Positive saving	0.661		0.474	0	1	2,286
Age 25-39	0.146		0.353	0	1	506
Age 40-54	0.302		0.459	0	1	1,044
Age 55-64	0.235		0.424	0	1	812
Age 65+	0.318		0.466	0	1	1,099
Employed/Self-Employed	0.490		0.500	0	1	1,695
Unemployed	0.023		0.149	0	1	79
Retired	0.302		0.459	0	1	1,045
Inactive	0.185		0.389	0	1	642
Low Education	0.617		0.486	0	1	2,137
Med. Education	0.217		0.412	0	1	751
High Education	0.166		0.372	0	1	573
Single	0.105		0.307	0	1	365
Married	0.722		0.448	0	1	2,499
Separated/Widowed/Divorced	0.172		0.378	0	1	597
Owner without Mortgage	0.576		0.494	0	1	1,995
Owner with Mortgage	0.165		0.371	0	1	572
Rented	0.143		0.350	0	1	494
Used/Given for Free	0.116		0.320	0	1	400
Rents Other Property	0.198		0.398	0	1	684
Terraced House	0.418		0.493	0	1	1,447
Detached House	0.048		0.214	0	1	167
Maisonette	0.284		0.451	0	1	982
Flat/Penthouse	0.243		0.429	0	1	841
Owens Second House	0.145		0.352	0	1	501
Rents Second House	0.006		0.076	0	1	20

Notes: The count for dummy variables and the count of persons in a household is for values greater than zero. For instance, there are 2,286 households with a positive saving rate in the 2015 HBS.

Household composition is relatively unchanged between the waves, with households in both waves being composed of a median of 2 adults, with the median household having no children. Moreover, a large majority of households are married in both waves, but the proportion of households that are married in 2015 is smaller than in the preceding wave. This possibly reflects the changing social trends over time. Meanwhile, the share of households with RP having a low level of education (primary/lower-secondary) also diminishes in the 2015 wave when compared to 2008, but remains overwhelmingly the largest classification of respondents in terms of educational attainment. Correspondingly, the share of RPs having medium (secondary/post-secondary) and high (tertiary) levels of education increase between the two waves, particularly in the case of those with a medium attainment.

In terms of housing, over half of the households making up the sample in both waves reside

in dwellings owned without a mortgage, with this proportion increasing from the 2008 to the 2015 wave. In contrast, the share of renters in the sample diminishes from close to 18% in 2008 to under 15% in the 2015 wave. Since we drop respondents who are considered to be renting at market rents, the drop in the rental rate does not reflect the general trends in the Maltese private rental market, which has seen significant growth in recent years (see, for instance, [Micallef and Debono \(2020\)](#)). Rather, it reflects a decline in the share of households renting at sub-market rents, as these phase out naturally over time. Proportions of the type of dwelling in which households in the sample reside remain fairly constant over the two waves. Terraced houses remain the most prevalent dwelling type. Lastly, around 15% of households in the sample own a second house in 2015, up from under 11% in 2008, and the majority of respondents do not own or rent a second house.

3.3 A look at the saving rate distributions

In Figure 3 we show the unconditional distribution of saving rates across the two waves. There is higher density at positive saving rates in the 2015 wave, however both densities have fat left tails. It is because of this that we prefer to use the median rather than the mean as a measure of central tendency in this paper. The median saving rate was 8.6% in 2008 and rose to 18.4% in 2015. However, both median and mean saving rates rise over this period, as we show in Tables 1 and 2. As discussed above, the differences between the two waves likely reflect the underlying economic environment, but it could also be driven by better measurement of income in the 2015 wave.

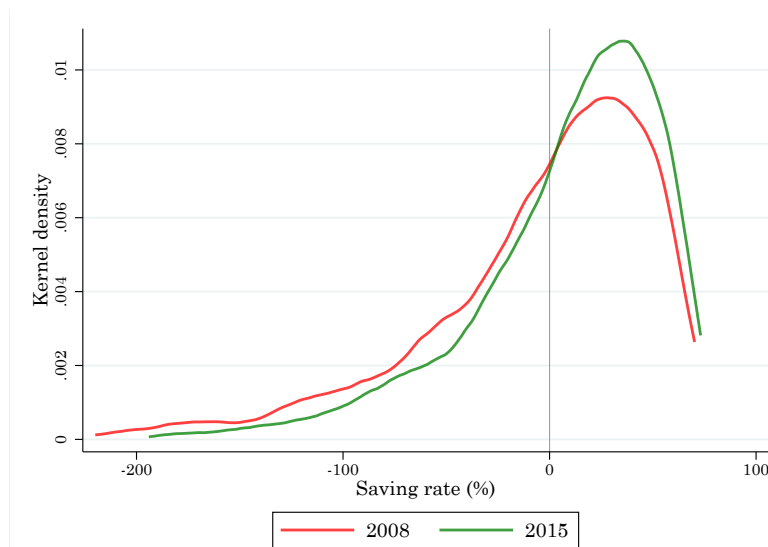


Figure 3: Unconditional saving rate densities

Note: Based on the trimmed samples.

We next analyse the saving rate distribution across selected characteristics to draw a set of key observations. Figures 4–7 show saving rate densities conditional on income, age, education and house tenure status across the two waves. These classifications capture the broad characteristics that we focus on in more detail in econometric analysis further below. We find:

Observation 1 (Income). *Higher income households are progressively more likely to have positive saving.*

Observation 2 (Age). *Middle to old age households (55-64) and old age households (65+) are somewhat more likely to save than young (24-39) and young to middle age (40-54) households.*

Observation 3 (Education). *Households whose RP has up to a tertiary level of education tend to have a higher saving rate compared to those with primary or secondary/post-secondary levels of education.*

Observation 4 (Housing tenure). *There are no major differences in saving behaviour between homeowners and renters, irrespective of whether a house is wholly owned or still on a mortgage. However, owners with an outstanding mortgage and renters were more likely to save in 2015.¹⁷*

Observation 5 (Fat left tails). *All conditional saving rate distributions possess a fat left tail. High negative saving rates for some households is a general feature of the data, rather than limited to a specific sub-group.¹⁸*

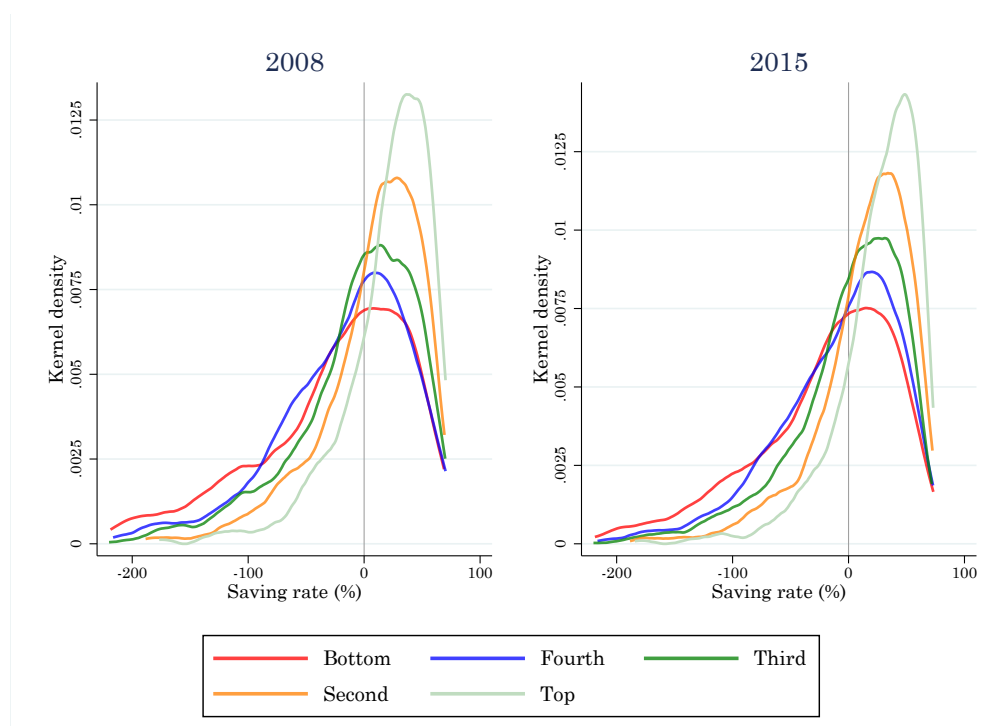


Figure 4: Saving rate kernel density – Income quintiles

Note: Based on the trimmed samples.

¹⁷We argue below that there are fundamentally different reasons why renters and owners with a mortgage are more likely to save.

¹⁸This finding is similar to what [Finlay and Price \(2014\)](#) find in the case of Australia.

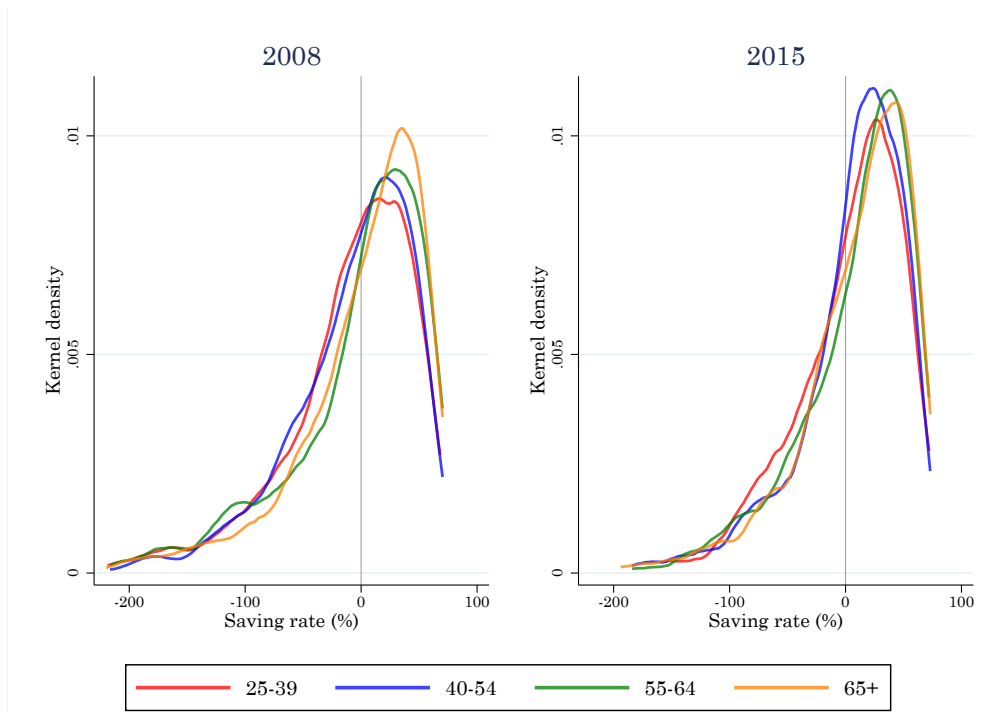


Figure 5: Saving rate kernel density – Age

Note: Based on the trimmed samples.

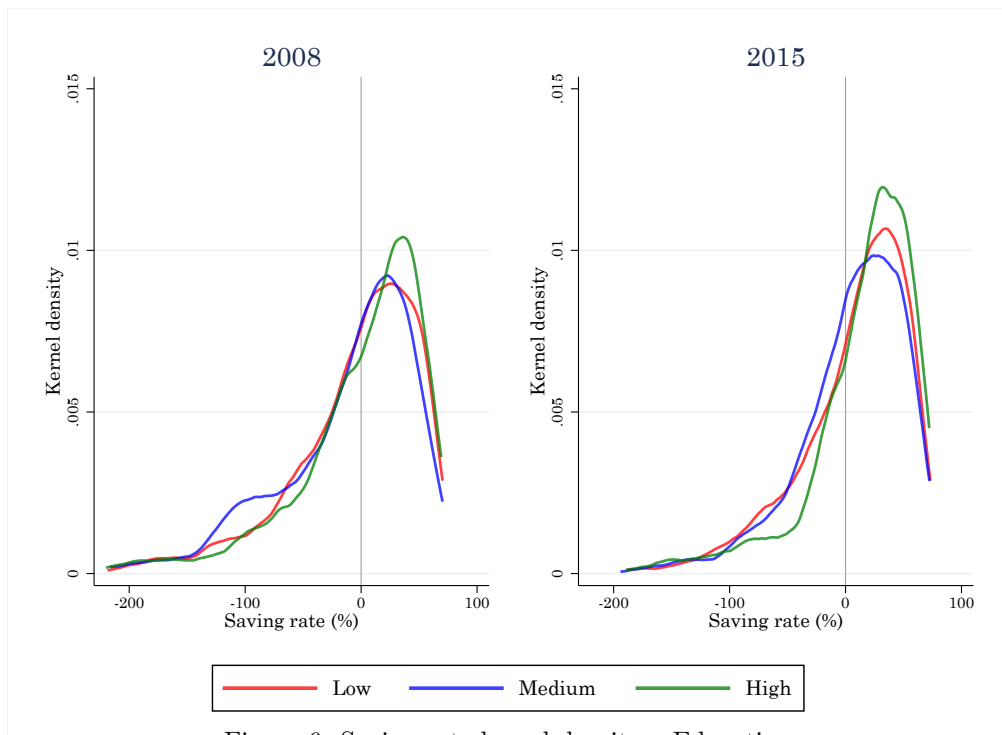


Figure 6: Saving rate kernel density – Education

Notes: Low - primary/lower-secondary, Medium - secondary/post-secondary, High - tertiary. Based on the trimmed samples.

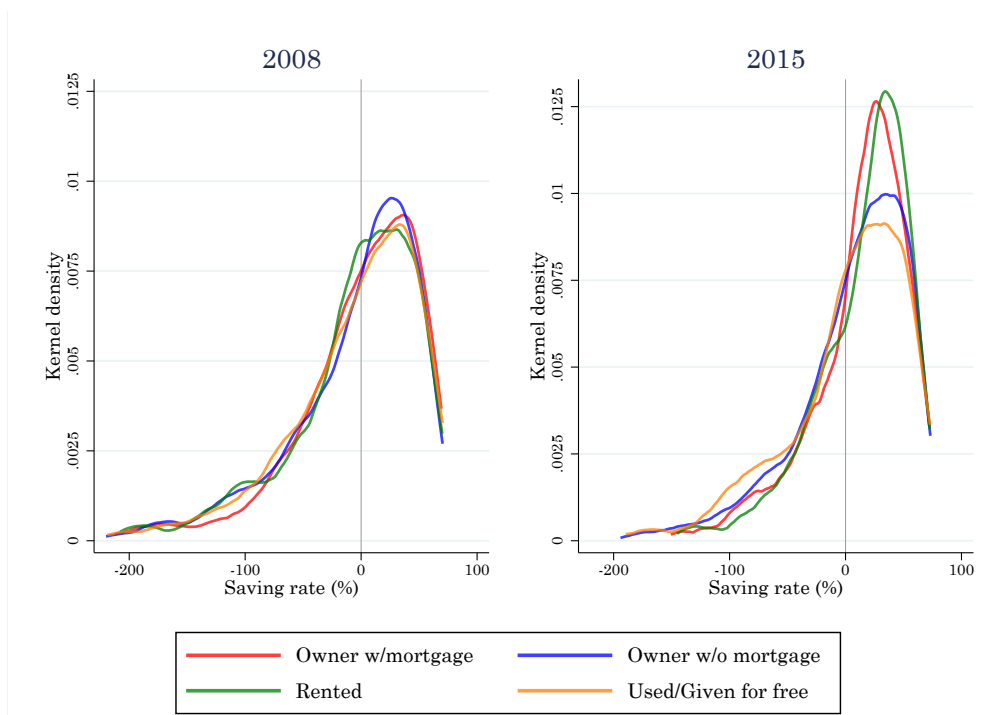


Figure 7: Saving rate kernel density – Housing tenure

Note: Based on the trimmed samples.

4 The econometric model

We now proceed to specifying a regression model that controls for key saving determinants that are captured in the HBS. Since income may be under-declared, saving rates are likely to be biased downwards. Furthermore, it is not clear a priori which household characteristics are more likely to be associated with under-declaration of income. Consequently, we prefer making statements about the likelihood of a household having positive saving as this, in principle, is less affected by the issue of under-declaration of income.¹⁹ Our dependent variable is therefore an indicator variable s_i taking the value of 1 when income is larger than expenditure and 0 otherwise.²⁰ As we show in Tables 1 and 2 above, this indicator takes the value of 1 in 56.3% (66.1%) of the observations in the 2008 (2015) wave.

We model the probability of saving p_i for household i using a Logit model:

$$p_i = \Pr(s_i = 1 | \mathbf{x}_i) = \Lambda(\mathbf{x}_i' \beta) \quad (1)$$

where \mathbf{x}_i is a vector of household characteristics and a constant, β is a vector of coefficients and $\Lambda(\cdot)$ is the logistic function.²¹ The vector \mathbf{x}_i includes the characteristics listed in Tables 1 and 2 above. We base our choice of covariates on both theoretical and empirical considerations. Apart from income, we control for a number of other key predictors including the household's age profile, employment and education. Household age profiles are of particular interest in the context of both the life-cycle model, and the precautionary and bequest motives which are found to characterise the saving behaviour of the elderly in the literature. Different levels of educational attainment and employment status can meanwhile indicate varying levels of income risk faced by households, which can affect the extent of households' precautionary saving. Wealth is another important control variable when considering household saving behaviour. Our model misses household wealth since it is unfortunately not surveyed in the HBS. Nevertheless, we use ownership of a second property and the type of residential property the household resides in as rough proxies for wealth. Ownership of a second property can indicate higher absolute levels of wealth, in the absence of information on households' bank balances and/or asset portfolios. Property type could meanwhile reflect effects of house price appreciation on saving behaviour.²²

We also control for homeownership, which is associated with higher wealth accumulation in the literature (Di et al., 2007; Dietz and Haurin, 2003; Turner and Luea, 2009). Homeowners with outstanding mortgages are subject to 'mandatory' saving in the form of mortgage repayments (Alik-Lagrange and Schmidt, 2015). Meanwhile, the saving behaviour of renters can depend on their intentions to purchase property. Renters who intend to purchase property are expected to save more in line with the down-payment motive (Dietz and Haurin, 2003), but their behaviour can also be affected by house prices. Sheiner (1995) finds that renters in cities with higher house prices save more, whilst Engelhardt (1994) finds that high house prices can discourage down-

¹⁹Of course, the issue remains if households under-declare to the extent that they report dissaving when they actually save.

²⁰The cutoff for creating the two categories can be subjective to a certain extent, but in this paper the primary question that we want to ask is: who is likely to save? In section 6 we dig deeper and divide the dependant variable into more categories.

²¹The logistic function over a variable x is given by:

$$\Lambda(x) = \frac{e^x}{1 + e^x}.$$

²²For instance, a terraced house is on average more expensive than an apartment or a maisonette.

payment saving, particularly for more impatient households. However, as we explained above, the particular characteristics of renters in our sample are affected by historical developments in the Maltese rental market. This means that this cohort is made up primarily of older households on longer-term contracts and paying rents significantly below market rates, which makes them less likely to be saving for the purpose of purchasing a primary residential property; instead, these renters have lower housing costs.²³ We also include in our model variables relating to households’ marital status and size. Marital status can reflect both a certain level of financial obligations and the ability to fall back on one income in the case of the other spouse being laid off. This can also determine an element of precautionary saving that a household undertakes. Lastly, given that we control for household income, a larger number of adults in a household mainly reflects additional consumption, as is the case for the number of dependent children.

Equation (1) can be re-written, in its stochastic form, in terms of the log-odds ratio:

$$\ln\left(\frac{p_i}{1-p_i}\right) = \mathbf{x}_i'\beta + \varepsilon_i \quad (2)$$

where ε_i is the residual. We estimate (2) separately for each wave using Maximum Likelihood, where observations are weighted using sample weights.²⁴ We specify a baseline household whose RP is aged 40–54, is married, is employed or self-employed, fits in the middle income quintile, holds a secondary or post-secondary level of education, owns and lives in a terraced house without an outstanding a mortgage, does not rent other property and does not own a second house. In what follows we present results in the form of average marginal effects, reflecting the average change in the probability of saving for a change in any household characteristic relative to the baseline.

5 Results

5.1 Benchmark specification

Our benchmark estimates are summarized in Table 3. A negative (positive) marginal effect denotes a fall (rise) in the probability that a household with that particular characteristic has positive saving relative to the baseline household. Our estimates cannot be given a causal interpretation since we do not control for possible selection effects. In general, our econometric results corroborate the observations that we list in section 3.3. In both waves, income is strongly associated with positive saving, a result that is consistent with findings in the literature. The probability of positive saving increases progressively from the bottom to the top income quintiles. Furthermore, the increase in the probability of saving between income quintiles is almost linear in both waves.²⁵ Positive saving is also positively associated with age, although the estimated marginal effect for a young household (RP aged 25–39) is not statistically significant.

²³As we outline in section 3.2, we also isolate renters who rent property other than their primary residence.

²⁴See [Cameron and Trivedi \(2005, p.467\)](#) for further details on the log-likelihood function of binary outcome models. The use of sample weights implies that the estimated standard errors through which we do inference are robust to residual heteroscedasticity due to misspecification.

²⁵This contrasts with the findings of [Le Blanc et al. \(2016\)](#), who find small and insignificant movements in the probability of saving between the first to the fourth income quintiles but a strong rise at the fifth income quintile.

Table 3: Benchmark Logit Model (Average Marginal Effects)

	(1) 2008	(2) 2015
Income		
Bottom quintile	-0.285***	-0.321***
Fourth quintile	-0.125***	-0.116***
Third quintile (<i>benchmark</i>)		
Second quintile	0.174***	0.147***
First quintile	0.294***	0.254***
Life cycle		
Age 25–39	-0.017	-0.032
Age 40–54 (<i>benchmark</i>)		
Age 55–64	0.078***	0.048*
Age 65+	0.166***	0.129***
Employment status		
Employed/self-employed (<i>benchmark</i>)		
Unemployed	-0.011	0.099**
Retired	0.020	0.005
Inactive	0.038	0.034
Education		
Low education	0.053**	0.112***
Med. education (<i>benchmark</i>)		
High education	-0.035	0.019
Marital status		
Single	0.155***	0.056*
Married (<i>benchmark</i>)		
Sep./wid./div.	0.086***	0.058**
Housing tenure		
Owner with mortgage	0.007	0.070**
Owner without mortgage (<i>benchmark</i>)		
Rented	0.009	0.079***
Used/given for free	-0.008	0.047*
Rents other property		
No (<i>benchmark</i>)		
Yes	-0.008	-0.016
Property type		
Terraced house (<i>benchmark</i>)		
Detached house	-0.026	-0.096**
Maisonette	0.067***	0.000
Flat/penthouse	-0.018	-0.009
Owns second house		
No (<i>benchmark</i>)		
Yes	-0.097***	-0.062**
Household size		
No. of adults	-0.041***	-0.051***
No. of children	-0.036***	-0.036***
Observations	3,525	3,461
Log-Likelihood	-81534.8	-87883.3

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Average Marginal Effects relative to baseline household. Columns (1) and (2) present estimates based on the 2008 and 2015 waves, respectively.

On the other hand, old households (65+ years) are much more likely to save than the reference household. These are in line with the findings in the literature discussed in section 2 and point to precautionary and bequest motives. Older households may also save relatively more than younger households due to liquidity constraints. It is well known that in light of their age, older households generally have fewer options to obtain credit, which likely compounds upon their precautionary saving needs.²⁶ Insufficient old-age planning during a household's working life or corrections to its consumption patterns upon retirement, as argued by [Olafsson and Pagel \(2018\)](#),

²⁶ Anecdotal evidence also suggests that the elderly in Malta tend to be somewhat culturally averse to borrowing, even in the absence of borrowing constraints. This would be expected to have an effect of similar nature to actual liquidity constraints.

can be other plausible explanations for this finding. Marginal effects related to income and age fall slightly in absolute terms from the 2008 to the 2015 wave. For instance, old households are 16.6 percentage points more likely to save than a household with RP aged 40-54 in 2008, but this falls to 12.9 percentage points by 2015. Although mean income is lowest for this age group among all age groups, so is mean expenditure. Furthermore, there is considerable heterogeneity between old-age households, with some old-age households receiving income much higher than the average. Figure 8 shows the income and expenditure distribution for old-age households from the 2015 HBS wave. Therefore, in our work we emphasize the significant heterogeneity across households even within the same age bracket.

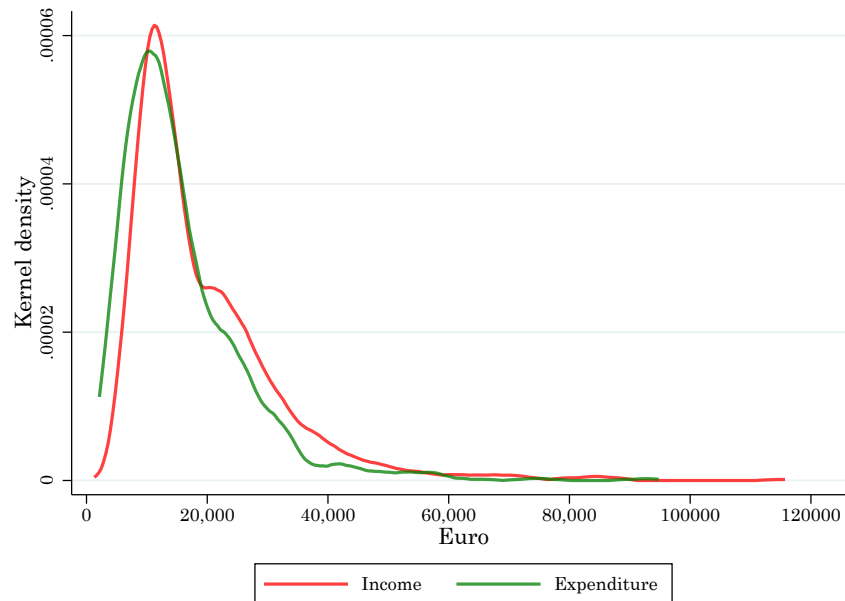


Figure 8: Income and expenditure for households aged 65+, 2015 wave

Note: Based on the trimmed samples.

On the other hand, we observe the opposite trend with respect to labour market status. A household whose RP is unemployed is as likely to save as when in employment in the 2008 data, but in the 2015 wave that household has a higher likelihood of saving. On the other hand, retirement or inactivity is not associated with a different likelihood of saving compared to the benchmark.²⁷ The findings on older and retired households are in line with empirical findings in the literature documenting that these households actually increase or maintain the same saving patterns rather than eat through their accumulated earnings. Meanwhile, our finding on households with unemployed heads is rather puzzling and contrasts with results in the literature. We hypothesise that upon the RP becoming unemployed, the household, which may have other sources of labour and non-labour income, likely responds by cutting back on expenditure.

Households whose RPs have a low level of education (up to lower secondary) are more likely to save than households with a medium (higher secondary) and high (tertiary) level of education. On the other hand, households with a high level of education are as likely to save as those with a medium level of education. This finding goes against the general findings in the literature, where higher education is typically associated with higher earnings and higher saving. We conjecture that higher education likely makes a RP more employable and therefore face lower

²⁷The category ‘Retired’ does not capture only old households. In fact, around a third (a fifth) of it is composed of households with a RP who is younger than 65 years in 2008 (2015).

unemployment risk, all else equal. This can be related to the relatively greater degree of labour market mobility which is generally enjoyed by more educated persons. Conversely, low education could be associated with higher income risk, setting off a precautionary saving motive.²⁸

Characteristics relating to marital status also matter, although the strength of the effects falls between 2008 and 2015. A household whose RP is single has a higher probability of saving than when married. The likelihood of saving increases by 15.5 percentage points in 2008, and is statistically significant at the 1% level, while in 2015 the increase is by 5.6 percentage points, significant only at the 10% level. Since in the model we control for the number of residents in the household, this effect is related purely to marital status. In fact, in about 38% of households in both samples, at least one additional adult lives in the same house with a RP who is single. As alluded to above, the increase in the probability of saving for a RP who is single likely stems from fewer financial obligations relative to a RP who is married, but also a precautionary motive given that the person is not further supported by a spouse's income. We observe similar behaviour by a RP who is either separated, widowed or divorced, as the estimated marginal effect is positive and statistically significant in both waves. The same logic as for single RPs applies here. Indeed, the estimated increase in the probability of saving is about the same as for a single RP in 2015.

Turning to indicators of housing tenure, we estimate an increase in the probability of saving in the 2015 wave if the RP either owns their property with an outstanding mortgage, rents the property or uses it without cost. These patterns are intuitive. Since mortgage payments are not included in expenditure, the increased saving by mortgagors likely corresponds to an allocation for debt financing. Meanwhile, renters (who are paying low 'social' rents) as well as people living in a house without cost, spend relatively less on housing and therefore have more resources at their disposal.²⁹ Therefore, while owners with a mortgage are more likely to save because they need to pay their mortgage, renters save because their housing expenses are low.³⁰ The marginal effects in the 2008 data are both small in absolute terms and not statistically significant across all tenure possibilities.

We find mixed results related to the type of house a given household resides in. Households living in a maisonette have a slightly higher probability of saving than those living in a terraced house in 2008, but this is not the case in 2015. In light of findings about a negative relationship between house price appreciation and saving in the literature, we postulate that our finding could reflect the lower appreciation of maisonettes vis-à-vis terraced houses as at 2008, but no significant difference when maisonettes appreciated faster than terraced houses during the second HBS wave.³¹ However, there is no difference in behaviour between households living in a terraced house and an apartment in either wave, despite apartments appreciating by slightly less than maisonettes between 2000 and 2008, and by more thereafter. Meanwhile, the opposite occurs in the case of a detached house; households living in this property type are less likely to save

²⁸This result is not concentrated to a particular age cohort, since we control for age in the model. In fact, more than half of respondents have low education levels in both waves, including a non-trivial share of households with RP aged 25–39.

²⁹In fact, the 2015 HBS reports that on average renters spent €6,000 less annually, although they spend more on average on the expenditure category 'Housing, water, electricity, gas and other fuels'. Our estimates control for factors that might be contributing to this, such as number of persons in a household, age of the tenant or property type.

³⁰As discussed in section 3.1 it is only the interest component of a mortgage payment that is included in expenditure. This means that for a recently issued mortgage, a large share of the payment is included in expenditure as the interest component, while an older mortgage features a much lower interest component in the payment.

³¹The Central Bank of Malta's advertised property price index shows that since 2000, prices of terraced houses in Malta had increased by approximately 17% more relative to apartments by 2008, and by about 11% relative to maisonettes. The story then reverses, with apartments and maisonettes appreciating by around 12% and 7% more than terraced houses between 2008 and 2015.

compared with the baseline, but only in 2015.³² In sum, there is no meaningful evidence to link saving behaviour with household residence type.

As discussed in section 4, we use ownership of a second property as another rough proxy for wealth. We find that having a second property is associated with a lower probability of saving, varying between -6.2 and -9.7 percentage points across the two datasets. This suggests that, controlling for other factors, wealthier households are less likely to save compared with households who do not own a second house, possibly because they have a bigger stock of wealth to fall back on in the event of a negative economic shock.³³

Finally, we find a negative association between the number of inhabitants within a household and the probability that the household has positive saving. For every additional adult (child) the probability of saving falls by 4.1 (3.6) percentage points in 2008 and by 5.1 (3.6) percentage points in 2015. This is in line with the findings in [Le Blanc et al. \(2016\)](#), who estimate a positive relationship between the probability that expenses exceed income and total household size in Malta of 4.6 percentage points. In our model we can decompose this estimate and find that at the margin an additional adult decreases the probability of saving somewhat more than an additional child.³⁴

Readers might note that in the table above we do not report the pseudo- R^2 as the measure of in-sample fit. It is well-known that in binary outcome models this measure of goodness of fit tends to be very low and in general is not a useful metric for model fit. Instead, we resort to the receiver operating characteristic (ROC) curve and the associated area under the ROC curve (AUROC), a technique typically used in medicine and machine learning research to evaluate the performance of binary classifier models ([Bradley, 1997](#); [Pepe, 2003](#); [Mandrekar, 2010](#)).³⁵ An AUROC of 1 implies that the model is a perfect classifier, able to correctly label all outcomes. On the other hand, an AUROC of 0.5 implies that the model is unable to distinguish outcomes and is therefore no better than a random coin toss, returning true positives only half of the time on average. The closer an AUROC is to 1, the better. We sketch the ROC curves for our estimated Logit models at the point estimates and present them in Figure 9. The curves for the two models are very similar, illustrating a rise in the true positive rate that is faster than the rise in the false positive rate. The AUROC is about 0.72 for each model, implying that our models are able to capture the association between household characteristics and the probability of saving well.³⁶

³²The advertised property price index, however, does not include separate values for detached houses, so we cannot relate this finding to actual house price dynamics here.

³³Although we include a dummy for renting (rather than owning) a second house, we do not report the results for the sake of brevity. The marginal effect on renting a second house is 0.078 and insignificant in 2008 but falls to -0.241 and is statistically significant only at the 10% level in 2015. Since there are only 20 such households in 2015 and the sign on the marginal effect switches between waves we do not attribute much importance to the effects of this characteristic.

³⁴Although the effect is relatively higher in absolute terms for adults, the 95% confidence interval for these two estimates largely overlap.

³⁵The ROC curve traces the mapping between the true positive rate and the false positive rate, for a given threshold on the predicted probability $\hat{p} > c$. At $c = 0$ the outcome is always classified as positive, both when it is true and when it is not. Conversely, at $c = 1$ all outcomes are classified as negative. The ROC therefore has a locus of points (0,0) and (1,1) in the true positive rate/false positive rate space.

³⁶Is our AUROC for the two models high? [Hosmer and Lemeshow \(2000\)](#) note that an AUROC of between 0.7 and 0.8 implies a good classifier, while it is unusual to observe an AUROC higher than 0.9 in practice.

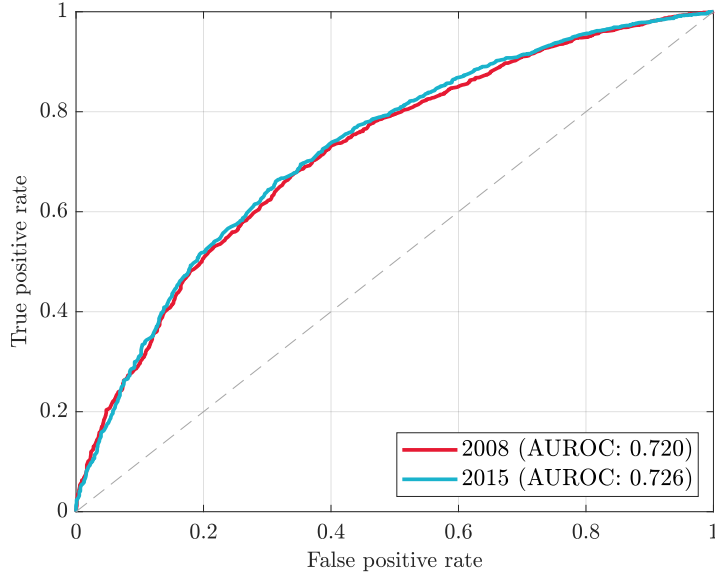


Figure 9: ROC curves for the benchmark model

Notes: The grey 45-degree line traces the reference ROC for a coin toss.

5.2 Sensitivity and robustness checks

In this section, we carry out several robustness checks to assess the sensitivity of our benchmark estimates to different data filtering and model specification. These robustness checks consist of applying asymmetric trimming to our sample, controlling for self-employment, and applying different cut-off points for rent at market prices, which we exclude entirely from our benchmark estimates. The estimated average marginal effects under these scenarios are presented in Table 4 for the 2008 wave and Table 5 for the 2015 wave. In each case, we also present the benchmark results in the first column for reference. We also re-calculate the AUROC for each sensitivity check and report them collectively in Figure 10.

5.2.1 Asymmetric trimming

We estimate our benchmark model with data that is trimmed symmetrically by 5%. Yet, we note in section 3.3 that saving rate distributions in Malta tend to have a fat left tail, with some saving rates lower than -100%, especially in the 2008 data. As we argue, this could be due in part to under-declaration of income, but also these observations could simply be outliers. To test whether our findings are sensitive to these data we apply an asymmetric trim, removing all observations in the lower 5th percentile only. When we re-estimate the model we find marginal effects that are largely unchanged. The pattern of results remains the same across both waves, with the exception that in the 2015 wave the characteristics ‘Age 55-64’ and ‘Detached House’ are no longer statistically significant. This means that in this case, only households with heads aged 65 or over have a different probability of positive saving from the benchmark category (ages 40 to 54), *ceteris paribus*. With the exception of the indicator for ‘Detached House’ in 2015, none of the estimated marginal effects vary by more than 3 percentage points, with most changing by less than 1 percentage point.³⁷ Therefore, our estimates are largely robust to outlier removal.

³⁷For example, the marginal effect for ‘Unemployed’, one of our categories of interest, increases by 1.5 percentage points when compared to the benchmark estimate in the 2015 wave. However, further investigation reveals that dropping more observations from the lower end of the saving rate distribution removes four unemployed observations with strongly negative saving rates, which are large outliers compared to the saving rates of the

5.2.2 Controlling for self-employment

In our benchmark model we include labour market categories for employed/self-employed, unemployed, retired and inactive. To keep the model contained we do not distinguish further between employed and self-employed. However, since the latter may be associated with higher income risk as well as different decision-making than in the case of employment, we re-estimate our model by separating these two characteristics. As a result, the benchmark category in this specification now relates to reference persons who are employed only. As we show in Table 5 below, we find a negative effect for self-employed RPs in the 2015 wave, although only statistically significant at the 10% level. Households with self-employed RPs are on average 7.2 percentage points less likely to register positive saving than households with employed reference persons, all else equal. A possible explanation for this finding is that a self-employed individual may re-invest a significant portion of income generated back into their business. Another explanation is the higher possibility for under-reporting income relative to an employee on a payroll system, thus lowering the share of self-employed RPs in our sample who save. We find no such effect in the 2008 wave.

Meanwhile, all other estimates from this robustness check change only minimally from the benchmark model; this also applies to the other control variables related to employment status, although the statistical significance and the magnitude of the marginal effect for unemployed RPs weaken slightly in 2015. Moreover, the coefficient associated with a house that is used or given for free becomes statistically insignificant in the 2015 wave when controlling for self-employment, although the size of the effect stays about the same.³⁸

5.2.3 Market rent thresholds

We also re-estimate our model after tweaking the baseline thresholds set for market rent that we discuss in section 3.2, in order to examine the sensitivity of our results to the level at which these cut-off points are set. These baseline thresholds lead us to drop 13 and 37 observations in the 2008 and 2015 waves, respectively. Since we set minimum market rent on the basis of the cheapest *average* rent, it is possible that some rents below this average are still not ‘social’ rents. Furthermore, since we only have a national average for 2008, we approximate the cheapest regional average rent. To ensure that our findings relate only to social rents, we vary these thresholds twice by lowering them further. In the first case, we lower the cut-off levels by 10%, such that we now consider households paying more than €3,915 annually in 2008 and more than €4,126 in 2015 to be renting at market rates. These changes result in 10 and 7 additional observations being dropped from the sample in the 2008 and 2015 waves respectively. Once again, most of our benchmark estimates are not sensitive to these changes. The marginal effect for renters remains statistically insignificant in 2008, while in the 2015 wave its magnitude is significant and increases slightly from 7.9% to 8.3%. This makes sense; as we lower the share of renters who rent at close to market rents, the average probability that renter households save rises when controlling for other factors.

In the second test we lower the thresholds further to 20% below their original levels (i.e. €3,480 in 2008 and €3,668 in 2015), removing an additional 7 observations from each wave. Once again, the marginal effect for renters remains statistically insignificant in 2008, but it

remaining unemployed observations. This can therefore explain the positive change in the marginal effect for ‘Unemployed’ when applying asymmetric trimming.

³⁸The log-likelihood for this model is slightly higher than for the benchmark specification in both waves, implying that the data favours a model that distinguishes between employed and self-employed individuals. The associated AUROC is also marginally higher.

increases further to 9.1% in the 2015 wave. These results reinforce our view that most renters in our sample rent at significantly below market prices and register positive saving, given that very few additional observations are dropped when lowering the threshold and also given the increasingly positive marginal effect for renters as these observations renting at higher rates are dropped.³⁹ Changes in the marginal effects estimated for most other variables are once again minimal. One exception is the marginal effect for property that is used or given for free, which is only weakly significant in the 2015 benchmark model (p-value 0.095), but becomes statistically insignificant in both models with lower market rent thresholds. The same argument applies for the marginal effect of RPs aged 55-64 in the 2015 wave. The only other significant change regards being unemployed, which increases by 2 percentage points as more market rent observations are dropped. Once again, this is likely due to outliers.⁴⁰

Lastly, we estimate a model without dropping any observations on the basis of rent paid. As in all other cases, the majority of estimated marginal effects do not change materially from the benchmark results. However, the marginal effect associated with renting in 2015 diminishes from 7.9% in the benchmark specification to 4.6%, and this coefficient is estimated with less precision. The pattern that emerges is that the less rent a household incurs, the more it is likely to save relative to a household which owns property without an outstanding mortgage.

In general, the results presented in this section indicate that our estimates are robust to the different changes we apply to our estimated model. Most estimated marginal effects change by less than or close to 1% in all robustness specifications, and minimal changes are observed in terms of statistical significance. Furthermore, all associated ROC curves for these alternative estimations mostly overlap with those from the benchmark estimation. Nevertheless, the results relating to the 'Self-Employed' control variable and the behaviour of the marginal effect for renters as we drop more observations renting at market rates, are noteworthy in that they could indicate distinct characteristics in the saving behaviour of these cohorts relative to other households.

³⁹In fact, only 2.7% and 2.8% (for 2008 and 2015 respectively) of the renters in our benchmark estimation sample are dropped when the threshold is lowered by 20%.

⁴⁰In fact, just two observations with RP registered as unemployed are dropped when moving from the benchmark dataset to the specification with a 20% lower rent threshold; nevertheless, these two observations have strongly negative saving rates, and their removal increases the median saving rate for unemployed respondents in the 2015 wave by 0.7 percentage points.

Table 4: Benchmark Logit Model and Robustness Checks (2008 wave, Average Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	Bench.	Asym. T.	Self-Emp.	R.T. -10%	R.T. -20%	No R.T.
Bottom income quintile	-0.285***	-0.290***	-0.285***	-0.281***	-0.278***	-0.281***
Fourth income quintile	-0.125***	-0.133***	-0.126***	-0.124***	-0.120***	-0.127***
Third income quintile (<i>benchmark</i>)						
Second income quintile	0.174***	0.159***	0.174***	0.175***	0.176***	0.171***
First income quintile	0.294***	0.286***	0.294***	0.294***	0.295***	0.294***
Age 25-39	-0.017	-0.008	-0.017	-0.019	-0.020	-0.018
Age 40-54 (<i>benchmark</i>)						
Age 55-64	0.078***	0.082***	0.076***	0.077***	0.077***	0.081***
Age 65+	0.166***	0.164***	0.163***	0.161***	0.162***	0.164***
Employed (<i>benchmark</i>)						
Self-employed			0.045			
Unemployed	-0.011	-0.000	-0.002	-0.010	-0.010	-0.013
Retired	0.020	0.027	0.029	0.023	0.022	0.018
Inactive	0.038	0.046	0.047	0.037	0.037	0.036
Low education	0.053**	0.053**	0.050**	0.051**	0.053**	0.052**
Med. education (<i>benchmark</i>)						
High education	-0.035	-0.025	-0.034	-0.034	-0.032	-0.035
Single	0.155***	0.153***	0.155***	0.152***	0.152***	0.159***
Married (<i>benchmark</i>)						
Sep./wid./div.	0.086***	0.082***	0.087***	0.091***	0.093***	0.089***
Owner with mortgage	0.007	0.002	0.007	0.008	0.009	0.009
Owner without mortgage (<i>benchmark</i>)						
Rented	0.009	-0.001	0.010	0.012	0.013	0.000
Used/given for free	-0.008	-0.013	-0.008	-0.008	-0.008	-0.008
Does not rent other property (<i>benchmark</i>)						
Rents other property	-0.008	-0.018	-0.007	-0.009	-0.009	-0.008
Terraced house (<i>benchmark</i>)						
Detached house	-0.026	-0.026	-0.031	-0.023	-0.023	-0.028
Maisonette	0.067***	0.074***	0.067***	0.067***	0.067***	0.069***
Flat/penthouse	-0.018	-0.009	-0.018	-0.015	-0.015	-0.017
No second house (<i>benchmark</i>)						
Owms second house	-0.097***	-0.094***	-0.099***	-0.097***	-0.097***	-0.096***
No. of adults	-0.041***	-0.045***	-0.041***	-0.041***	-0.041***	-0.039***
No. of children	-0.036***	-0.038***	-0.037***	-0.035***	-0.035***	-0.036***
Observations	3,525	3,525	3,525	3,515	3,508	3,538
Log-Likelihood	-81534.8	-80437.3	-81484.2	-81342.7	-81159.5	-81927.9

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. M.E. - Marginal Effects. Model (1) is the benchmark specification, (2) includes the same specification with asymmetric trimming applied, (3) includes a control variable for 'self-employed', (4) uses a 'market rent' threshold 10% lower than that of the benchmark model, (5) uses a 20% lower threshold, and (6) does not drop observations paying market rents.

Table 5: Benchmark Logit Model and Robustness Checks (2015 wave, Average Marginal Effects)

	(1) Bench.	(2) Asym. T.	(3) Self-Emp.	(4) R.T. -10%	(5) R.T. -20%	(6) No R.T.
Bottom income quintile	-0.321***	-0.321***	-0.318***	-0.324***	-0.324***	-0.315***
Fourth income quintile	-0.116***	-0.127***	-0.114***	-0.121***	-0.120***	-0.114***
Third income quintile (<i>benchmark</i>)						
Second income quintile	0.147***	0.126***	0.144***	0.142***	0.147***	0.161***
First income quintile	0.254***	0.235***	0.252***	0.253***	0.255***	0.264***
Age 25-39	-0.032	-0.033	-0.033	-0.027	-0.025	-0.039
Age 40-54 (<i>benchmark</i>)						
Age 55-64	0.048*	0.045	0.048*	0.044	0.042	0.052*
Age 65+	0.129***	0.125***	0.131***	0.125***	0.124***	0.140***
Employed (<i>benchmark</i>)						
Self-employed			-0.072*			
Unemployed	0.099**	0.114**	0.086*	0.108**	0.119***	0.116**
Retired	0.005	0.015	-0.010	0.009	0.012	0.005
Inactive	0.034	0.037	0.020	0.036	0.035	0.040
Low education	0.112***	0.105***	0.113***	0.115***	0.114***	0.116***
Med. education (<i>benchmark</i>)						
High education	0.019	0.028	0.018	0.020	0.018	0.007
Single	0.056*	0.051*	0.056*	0.056*	0.061**	0.060**
Married (<i>benchmark</i>)						
Sep./wid./div.	0.058**	0.069***	0.058**	0.058**	0.063**	0.059**
Owner with mortgage	0.070**	0.057**	0.067**	0.068**	0.066**	0.079***
Owner without mortgage (<i>benchmark</i>)						
Rented	0.079***	0.071***	0.077***	0.083***	0.091***	0.046*
Used/given for free	0.047*	0.050*	0.046	0.044	0.043	0.047*
Does not rent other property (<i>benchmark</i>)						
Rents other property	-0.016	-0.014	-0.014	-0.016	-0.016	-0.017
Terraced house (<i>benchmark</i>)						
Detached house	-0.096**	-0.065	-0.091**	-0.093**	-0.092**	-0.095**
Maisonette	0.000	0.002	-0.001	-0.000	0.002	0.000
Flat/penthouse	-0.009	-0.010	-0.010	-0.009	-0.009	-0.015
No second house (<i>benchmark</i>)						
Owms second house	-0.062**	-0.067***	-0.061**	-0.061**	-0.062**	-0.063**
No. of adults	-0.051***	-0.052***	-0.048***	-0.052***	-0.051***	-0.050***
No. of children	-0.036***	-0.033***	-0.033**	-0.037***	-0.037***	-0.035***
Observations	3,461	3,467	3,461	3,454	3,447	3,498
Log-Likelihood	-87883.3	-85590.0	-87772.7	-87460.8	-86947.0	-89253.9

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. M.E. - Marginal Effects. Model (1) is the benchmark specification, (2) includes the same specification with asymmetric trimming applied, (3) includes a control variable for 'self-employed', (4) uses a 'market rent' threshold 10% lower than that of the benchmark model, (5) uses a 20% lower threshold, and (6) does not drop observations paying market rents.

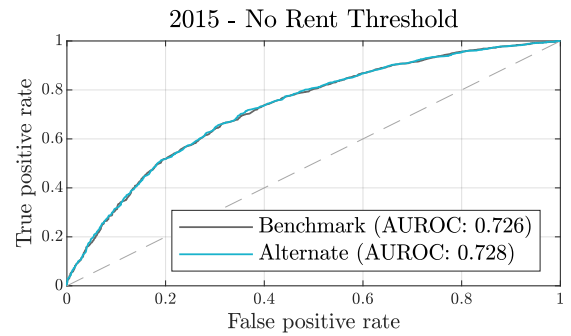
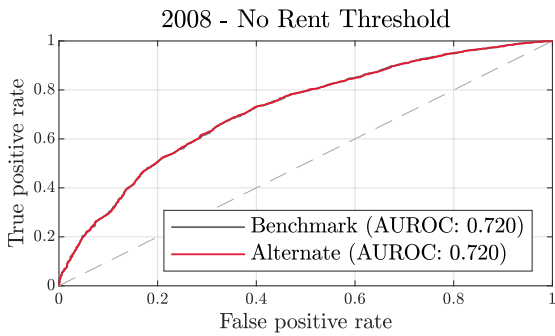
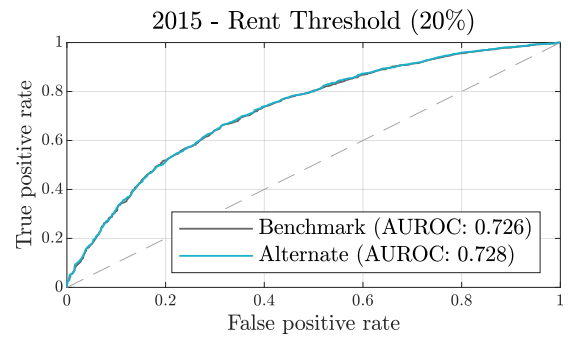
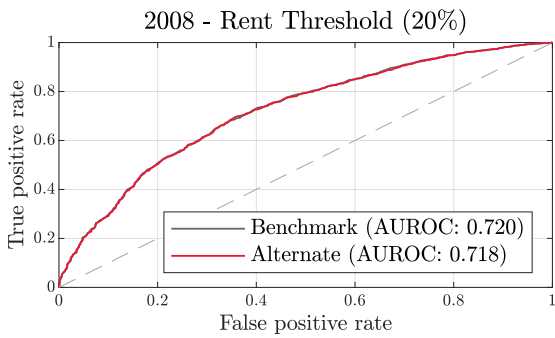
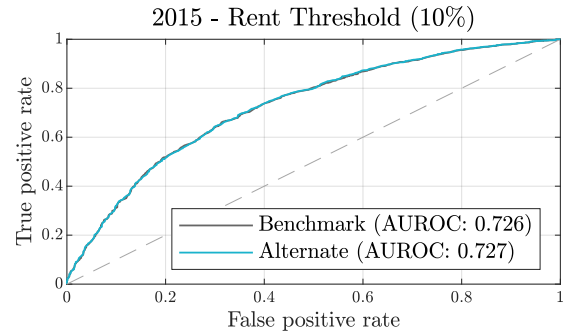
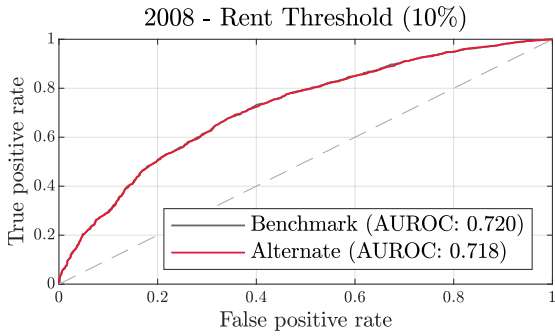
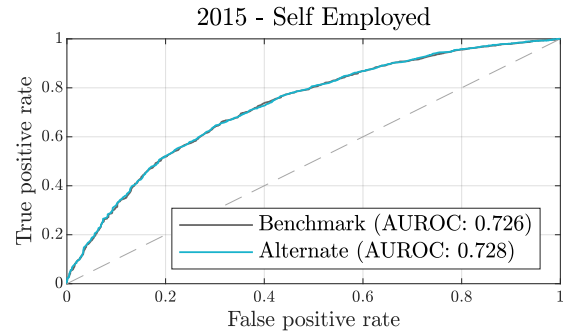
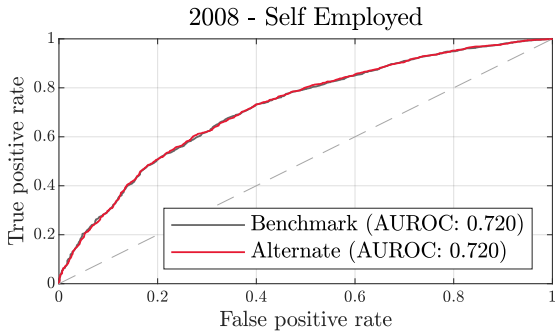
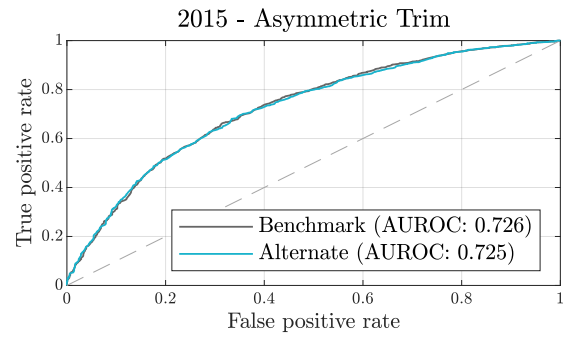
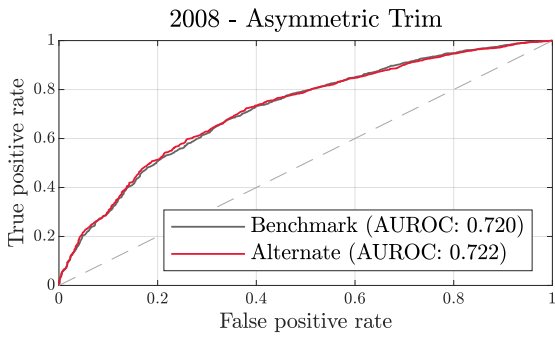


Figure 10: ROC curves for the alternative models

Notes: The grey 45-degree line traces the reference ROC for a coin toss. Each title refers to the corresponding sensitivity check discussed in the text.

6 Allowing for more saver states

In this section we generalize the analysis by splitting households into 4 states indexed by $j = 1, \dots, J$, such that a household can be a high dissaver, moderate dissaver, moderate saver and high saver. Therefore our indicator variable now takes on four values which are associated with cutoffs τ_m , $m = 1, \dots, J - 1$ conditional on the saving rate SR_i :

$$s_i = \begin{cases} 1 & \text{if } SR_i < \tau_1, \\ 2 & \text{if } \tau_1 \leq SR_i < \tau_2, \\ 3 & \text{if } \tau_2 \leq SR_i < \tau_3, \\ 4 & \text{if } \tau_3 \leq SR_i. \end{cases} \quad (3)$$

We set the cutoff τ_2 at 0, such that we still distinguish between dissavers and savers. The other two cutoffs (τ_1, τ_3) create two categories within both dissavers and savers, and are based on the standard deviation of the saving rate distribution.⁴¹ Figure 11 shows the saving rate distribution and the three cut-offs which yield the four categories which we try to model, focusing on the 2015 wave, which is less prone to income measurement error than the 2008 wave. We denote as ‘high dissavers’ those households with saving rates lower than one standard deviation below the mean and ‘high savers’ those households with saving rates greater than one standard deviation above the mean of the saving rate distribution. Meanwhile, we define as ‘moderate dissavers’ those who fall within one standard deviation below the mean and zero, and as ‘moderate savers’ those whose saving rates fall between zero and one standard deviation above the mean. In numerical terms, ‘high dissavers’ are households with saving rates below about -35%, while ‘high savers’ have saving rates above 51%.⁴²

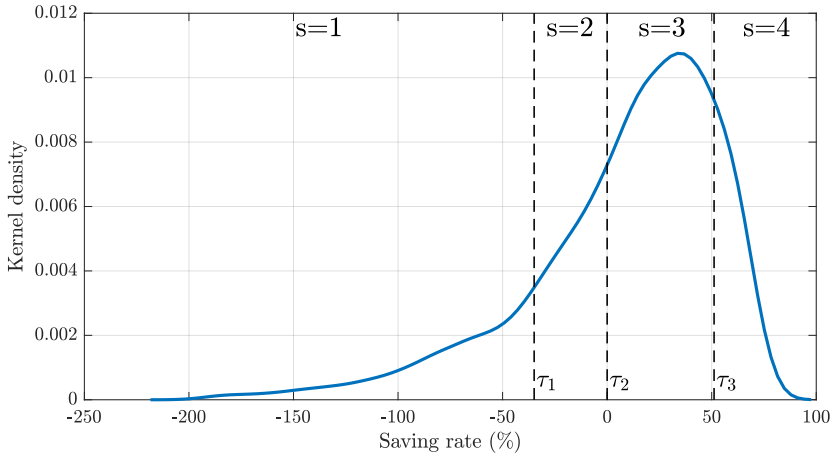


Figure 11: Saving categories in the 2015 saving rate distribution

Note: The figure shows the thresholds that denote the cut-offs τ_m , $m = 1, \dots, J - 1$ and the classification for the indicator variable $s = j$, $j = 1, \dots, J$.

⁴¹We calculate the standard deviation of the saving rate distribution that is transformed to approximate a Normal distribution, and then apply an inverse transformation to get back the cutoffs that apply to the actual distribution. This implies that around 68% of the observations lie within the ‘moderate dissaver’ and ‘moderate saver’ categories.

⁴²Since the choice of thresholds that determine the cutoffs can be subjective, we also use the median saving rate conditional on dissaving and saving respectively, as alternative cutoffs and obtain qualitatively similar results. The results can be found in Appendix A.

We model the saving states using a Generalised Ordered Logit model:

$$P(s_i > j) = \Lambda(\mathbf{X}_i\beta_j) = \frac{e^{(\alpha_j + \mathbf{X}_i\beta_j)}}{1 + e^{(\alpha_j + \mathbf{X}_i\beta_j)}}, \quad \forall j = 1, 2, \dots, J - 1 \quad (4)$$

where α_j is the intercept at each j , β_j is the vector of coefficients (excluding the intercept), \mathbf{X}_i is the same vector of explanatory variables used in the benchmark analysis and $J = 4$ is the total number of saving categories. Specifically, we estimate a Generalised Ordered Logit model with Partial Proportional Odds (Williams, 2006) since our variables do not satisfy the ‘parallel regression assumption’ inherent in the Ordered Logit model. Therefore, only a few of the coefficients actually vary across saving states.^{43,44} The estimation results, once again in terms of Average Marginal Effects, are presented in Table 6 below. In this instance, the marginal effect shows how much more or less likely a household with a particular characteristic is in each of the four saving categories relative to the benchmark household, all else equal.

Starting with income, as a household scales the income quintiles, it becomes progressively less likely to be in the lower saving categories and increasingly likely to be a ‘high saver’. This is in line with expectations. Notably, we find that households in the top income quintile are less likely to be in the ‘moderate saver’ category than households in the middle quintile, and much more likely to be in the highest saving rate category. Not only are they more likely to save, the highest-earning households are particularly more likely to be saving at the highest rates relative to households in lower income quintiles.

In terms of age, we once again find no significant difference in the saving behaviour of the youngest households relative to the benchmark household (i.e. Age 40-54). On the other hand, we find that households whose RP is aged 55-64 are up to 3 percentage points more likely to be ‘moderate savers’ or ‘high savers’ and correspondingly less likely to be in the dissaving categories. The eldest households, in turn, have similar patterns for high and moderate dissaving to young-to-middle-aged households, but are close to 15 percentage points more likely to be in the highest saving rate category. Again, this indicates that the elderly are not only more likely to save overall, but particularly more likely to be strong savers.

In our benchmark estimation for 2015, we find that households with unemployed heads are more likely to save than those with employed or self-employed RPs, whilst ‘retired’ and ‘inactive’ households are not found to differ from the base category in terms of the probability of saving. The finding for ‘unemployed’ households is corroborated by these results, as these households are found to be less likely to be ‘moderate dissavers’ than the base category, but not less likely to be savers, or more likely to be highly dissaving. Meanwhile, we do not find any significant effects for retired households, as in the benchmark results.

The estimated probabilities across characteristics related to education and marital status are in line with those from our benchmark model. In fact, households with less-educated RPs are more likely to be ‘high savers’ or ‘moderate savers’ and less likely to dissave than households

⁴³The Generalised Ordered Logit with Partial Proportional Odds estimates different coefficients across j only for those variables which violate the parallel regression assumption. We use the `gologit2` function in Stata (Williams, 2006) and its `autofit` function to decide which coefficients are allowed to vary across categories in the estimation. For a more detailed discussion and practical demonstrations, see Williams (2006) and Williams (2016). The coefficients vary over ‘Age 65+’, ‘Unemployed’, ‘Low Education’ and ‘Rented’.

⁴⁴The probabilities that s_i takes each of its 4 values are given by:

$$\begin{aligned} P(s_i = 1) &= 1 - \Lambda(\mathbf{X}_i\beta_1), \\ P(s_i = j) &= \Lambda(\mathbf{X}_i\beta_{j-1}) - \Lambda(\mathbf{X}_i\beta_j) \quad \forall j = 2, \dots, J - 1, \\ P(s_i = J) &= \Lambda(\mathbf{X}_i\beta_{J-1}). \end{aligned}$$

with RPs having a ‘medium’ level of education. There is also no significant difference in the probability of being in any of the four saving categories between households with highly-educated RPs and the base category. Households whose RP is either single or else separated, widowed or divorced are more likely to be high or moderate savers and less likely to be dissaving than married households, with very similar marginal effects in all four categories, also mirroring our baseline results.

Table 6: Generalised Ordered Logit Model - 2015 (Average Marginal Effects)

	(1) High Dissaver	(2) Moderate Dissaver	(3) Moderate Saver	(4) High Saver
Income				
Bottom income quintile	0.251***	0.059***	-0.201***	-0.110***
Fourth income quintile	0.072***	0.037***	-0.057***	-0.051***
Third income quintile (<i>benchmark</i>)				
Second income quintile	-0.082***	-0.078***	0.026***	0.133***
First income quintile	-0.122***	-0.140***	-0.057***	0.319***
Life cycle				
Age 25-39	0.011	0.005	-0.009	-0.007
Age 40-54 (<i>benchmark</i>)				
Age 55-64	-0.035**	-0.020**	0.026**	0.029**
Age 65+	-0.078***	-0.041**	-0.028	0.148***
Employment status				
Employed/Self-Employed (<i>benchmark</i>)				
Unemployed	0.005	-0.098***	0.026	0.067
Retired	-0.008	-0.006	0.006	0.008
Inactive	-0.001	-0.029	-0.043*	0.072***
Education				
Low Education	-0.037**	-0.073***	0.064***	0.047***
Med. Education (<i>benchmark</i>)				
High Education	-0.013	-0.008	0.010	0.011
Marital status				
Single	-0.045***	-0.030***	0.026***	0.049**
Married (<i>benchmark</i>)				
Sep./Wid./Div.	-0.044***	-0.029***	0.026***	0.047***
Housing tenure				
Owner with Mortgage	-0.029**	-0.019**	0.018**	0.030**
Owner without Mortgage (<i>benchmark</i>)				
Rented	-0.067***	-0.004	0.061**	0.010
Used/Given for Free	-0.018	-0.011	0.011	0.017
Rents other property				
No (<i>benchmark</i>)				
Yes	0.008	0.005	-0.005	-0.008
Property type				
Terraced House (<i>benchmark</i>)				
Detached House	0.067**	0.037***	-0.049**	-0.055***
Maisonette	0.001	0.000	-0.000	-0.001
Flat/Penthouse	0.015	0.010	-0.010	-0.016
Owns second house				
No (<i>benchmark</i>)				
Owns Second House	0.044***	0.026***	-0.031***	-0.040***
Household size				
No. of adults	0.027***	0.018***	-0.017***	-0.027***
No. of children	0.026***	0.018***	-0.017***	-0.027***
Observations	3,461	3,461	3,461	3,461

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Average Marginal Effects, being the average change in probability of being in each of the four saving categories relative to baseline household. Note that all row entries sum to zero.

Moving to results by tenure status, our finding for households who own their residential property with a mortgage are consistent with our benchmark results, as these households are more likely to be in the higher saving rate categories. Conversely, when we look at the extent of saving and dissaving, we do not find any differences in behaviour between households who use their property without cost and the base category, being owners without an outstanding

mortgage. In the case of renters, meanwhile, we find that these are more likely to be ‘moderate savers’ and less likely to be highly dissaving than owners without a mortgage, but have no statistically different likelihood of being ‘high savers’ than the reference tenure category. This not only tells us that renters tend to save more than owners without a mortgage, but that renters’ saving rates are somewhat more concentrated closer to the middle of the saving rate distribution whilst fewer renters are dissaving highly.

For the remaining categories, results from this model once again reflect those from our benchmark model. Namely, non-renters renting other property as opposed to not doing so is not associated with any difference in saving behaviour, whilst ownership of a second house is linked with a higher probability of being a moderate dissaver and more so with a higher probability of having high dissaving. In terms of property type, which is a rough wealth proxy, we find no difference in saving behaviour between the base category (households who reside in terraced houses) and households who reside in either maisonettes or in apartments or penthouses, whilst households residing in detached houses are more likely to be in the dissaving categories and correspondingly less likely to be classified as ‘moderate savers’ or ‘high savers’. Lastly, both the number of adults and the number of dependent children in a household are progressively linked to a larger probability of dissaving.

In summary, this exercise paints a clearer picture of the saving behaviour of Maltese households by also considering how different characteristics interact with the extent of their saving or dissaving. Although most of the findings of this section reflect those from our binary outcome model, we gain additional insights on the behaviour of certain household groups. For instance, we affirm that being in the highest income quintile and being elderly make a household particularly likely to be saving at high rates, rather than solely more likely to save, and also uncover additional features about the behaviour of ‘inactive’ households and renters. These findings therefore further enrich our knowledge about the saving behaviour of Maltese households, and the heterogeneity between households with different characteristics.

7 Conclusion

In this paper we use Maltese household level data from two HBS waves in an attempt to understand the cross-sectional saving behaviour. We first establish five key observations on saving behaviour and key characteristics, such as income, age, education and tenure, as well on the general shape of saving rate distributions. We then estimate a Logit model of the probability of saving on a rich set of household characteristics. Our results are in line with key findings in the literature, such as the roles of precautionary saving in driving up saving rates of households with low education attainment or who are not married. The bequest motive is also likely behind the higher probability of saving for old-age households. Renting in Malta is associated with a higher likelihood of saving, given that these rents are at low levels due to policies that shaped Malta’s housing market over several decades.

The model has good ability to correctly classify households who save based on characteristics, as measured by the AUROC, and our results are robust to a set of sensitivity checks. Sub-diving the saving indicator into more categories yields a deeper understanding of the intensity of saving conditional on household characteristics. This paper therefore contributes to the understanding of saving patterns of Maltese households, going beyond simple analysis of means and yielding the contribution of specific characteristics to the likelihood of saving and emphasizing such heterogeneity. It therefore can serve as a useful input to model development as well as policy formation. The main limitation in our analysis is that we cannot suitably control for wealth and

its link with saving patterns. In future work we plan to leverage the Household Finance and Consumption Survey, which contains detailed information on household wealth, to better study the role of wealth in saving patterns.

References

- Abela, G. and Gatt, W. (2020). A cross-sectional saving profile of Maltese households. In *Quarterly Review 2020:1*, pages 35–39. Central Bank of Malta.
- Alik-Lagrange, A. and Schmidt, T. (2015). The pattern of home ownership across cohorts and its impact on the net wealth distribution: Empirical evidence from Germany and the US. Discussion Paper No 11/2015, Deutsche Bundesbank.
- Alves, N. and Cardoso, F. (2010). Household saving in Portugal: Micro and macroeconomic evidence. *Economic Bulletin* 16(4), Banco de Portugal.
- Ando, A. and Modigliani, F. (1963). The “Life Cycle” hypothesis of saving: Aggregate implications and tests. *American Economic Review*, 53(1):55–84.
- Bradley, A. P. (1997). The use of the area under the ROC curve in the evaluation of machine learning algorithms. *Pattern Recognition*, 30(7):1145 – 1159.
- Browning, M. and Lusardi, A. (1996). Household saving: Micro theories and micro facts. *Journal of Economic Literature*, 34(4):1797–1855.
- Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. Cambridge University Press.
- Carroll, C. D. (1997). Buffer-stock saving and the life cycle/permanent income hypothesis. *The Quarterly Journal of Economics*, 112(1):1–55.
- Carroll, C. D. and Kimball, M. S. (2001). Liquidity constraints and precautionary saving. *NBER Working Paper no. w8496*.
- Civil Code (Amendment) Act (2009). <https://legislation.mt/eli/act/2009/10/eng/pdf>.
- De Nardi, M., French, E., and Jones, J. B. (2010). Why do the elderly save? The role of medical expenses. *Journal of Political Economy*, 118(1):39–75.
- Di, Z. X., Belsky, E., and Liu, X. (2007). Do homeowners achieve more household wealth in the long run? *Journal of Housing Economics*, 16(3-4):274–290.
- Dietz, R. D. and Haurin, D. R. (2003). The social and private micro-level consequences of homeownership. *Journal of Urban Economics*, 54(3):401–450.
- Disney, R., Gathergood, J., and Henley, A. (2010). House price shocks, negative equity, and household consumption in the United Kingdom. *Journal of the European Economic Association*, 8(6):1179–1207.
- Engelhardt, G. V. (1994). House prices and the decision to save for down payments. *Journal of Urban Economics*, 36(2):209–237.
- Engelhardt, G. V. (1996). House prices and home owner saving behavior. *Regional Science and Urban Economics*, 26(3-4):313–336.
- Fagereng, A., Holm, M., Moll, B., and Natvik, G. (2019). Saving behavior across the wealth distribution: The importance of capital gains. *NBER working paper no. 26588*.
- Finlay, R. and Price, F. (2014). Household saving in Australia. Research Discussion Paper 2014-03, Reserve Bank of Australia.

- Fuchs-Schündeln, N., Masella, P., and Paule-Paludkiewicz, H. (2020). Cultural determinants of household saving behavior. *Journal of Money, Credit and Banking*, 52(5):1035–1070.
- Gatt, W. (2014). The determinants of household saving behaviour in Malta. Working Paper WP/03/2014, Central Bank of Malta.
- Gatt, W. (2015). A profile of household saving behaviour in Malta. In *Quarterly Review 2015:1*, pages 35–38. Central Bank of Malta.
- Gatt, W. and Grech, O. (2016). An assessment of the Maltese housing market. Policy note, Central Bank of Malta.
- Guariglia, A. (2001). Saving behaviour and earnings uncertainty: Evidence from the British Household Panel Survey. *Journal of Population Economics*, 14(4):619–634.
- Harris, M. N., Loundes, J., and Webster, E. (2002). Determinants of household saving in Australia. *Economic Record*, 78(241):207–223.
- Hosmer, D. W. and Lemeshow, S. (2000). *Applied logistic regression*. John Wiley & Sons.
- Jappelli, T. and Pagano, M. (1998). The determinants of saving: Lessons from Italy. Working Paper No. 1, Centro Studi in Economia e Finanza.
- Kaplan, G. and Violante, G. L. (2018). Microeconomic heterogeneity and macroeconomic shocks. *Journal of Economic Perspectives*, 32(3):167–94.
- Keynes, J. M. (1936). *The general theory of employment, interest, and money*. MacMillan, London.
- Le Blanc, J. (2016). Household saving behaviour in Ireland. *Central Bank of Ireland Economic Letter Series*, 5.
- Le Blanc, J., Porpiglia, A., Teppa, F., Zhu, J., and Ziegelmeier, M. (2016). Household saving behaviour in the euro area. *International Journal of Central Banking*, 44.
- Mandrekar, J. N. (2010). Receiver operating characteristic curve in diagnostic test assessment. *Journal of Thoracic Oncology*, 5(9):1315–1316.
- Masson, P. R., Bayoumi, T., and Samiei, H. (1998). International evidence on the determinants of private saving. *The World Bank Economic Review*, 12(3):483–501.
- Micallef, B. and Debono, N. (2020). The rental sector and the housing block in STREAM. Working Paper WP/03/2020, Central Bank of Malta.
- Ministry for Social Policy (2008). Rent laws: The need for reform. White Paper, Government of Malta.
- Modigliani, F. and Brumberg, R. (1954). Utility analysis and the consumption function: An interpretation of cross-section data. In Kurihara, K., editor, *Post-Keynesian Economics*, pages 388–436. Rutgers University Press, New Brunswick.
- NSO (2010). Household Budgetary Survey 2008. Technical report, National Statistics Office.
- NSO (2018). Household Budgetary Survey 2015. Technical report, National Statistics Office.
- Olafsson, A. and Pagel, M. (2018). The retirement-consumption puzzle: New evidence from personal finances. *NBER working paper no. 24405*.

- Pepe, M. S. (2003). *The statistical evaluation of medical tests for classification and prediction*. Oxford University Press.
- Sheiner, L. (1995). Housing prices and the savings of renters. *Journal of Urban Economics*, 38(1):94–125.
- Skinner, J. (1988). Risky income, life cycle consumption, and precautionary savings. *Journal of Monetary Economics*, 22(2):237–255.
- Turner, T. M. and Luea, H. (2009). Homeownership, wealth accumulation and income status. *Journal of Housing Economics*, 18(2):104–114.
- Ventura, L. and Horioka, C. Y. (2020). The wealth decumulation behavior of the retired elderly in Italy: The importance of bequest motives and precautionary saving. *NBER working paper no. 26986*.
- Williams, R. (2006). Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *The Stata Journal*, 6(1):58–82.
- Williams, R. (2016). Understanding and interpreting generalized ordered logit models. *The Journal of Mathematical Sociology*, 40(1):7–20.
- Zeldes, S. P. (1989). Optimal consumption with stochastic income: Deviations from certainty equivalence. *The Quarterly Journal of Economics*, 104(2):275–298.

Appendix A Other results

Table 7: Generalised Ordered Logit Model - 2015 (Median-based cutoffs, Average Marginal Effects)

	(1)	(2)	(3)	(4)
	High Dissaver	Moderate Dissaver	Moderate Saver	High Saver
Income				
Bottom income quintile	0.282***	0.045***	-0.107***	-0.221***
Fourth income quintile	0.083***	0.034***	-0.020***	-0.097***
Third income quintile (<i>benchmark</i>)				
Second income quintile	-0.085***	-0.066***	-0.027***	0.178***
First income quintile	-0.133***	-0.127***	-0.120***	0.379***
Life cycle				
Age 25-39	0.006	0.002	-0.001	-0.007
Age 40-54 (<i>benchmark</i>)				
Age 55-64	-0.029*	-0.013*	0.004*	0.038*
Age 65+	-0.094***	-0.052***	-0.005	0.151***
Employment status				
Employed/Self-Employed (<i>benchmark</i>)				
Unemployed	-0.044	-0.027	-0.003	0.075
Retired	-0.004	-0.002	0.000	0.005
Inactive	-0.007	-0.023	-0.060***	0.090***
Education				
Low Education	-0.038**	-0.076***	0.030	0.084***
Med. Education (<i>benchmark</i>)				
High Education	-0.014	-0.007	0.003	0.018
Marital status				
Single	-0.045***	-0.025***	-0.000	0.071***
Married (<i>benchmark</i>)				
Sep./Wid./Div.	-0.043***	-0.023***	0.000	0.066***
Housing tenure				
Owner with Mortgage	-0.023	-0.012	0.001	0.034
Owner without Mortgage (<i>benchmark</i>)				
Rented	-0.046***	-0.027***	-0.002	0.074***
Used/Given for Free	-0.018	-0.010	0.001	0.027
Rents other property				
No (<i>benchmark</i>) Yes	0.013	0.007	-0.001	-0.019
Property type				
Terraced House (<i>benchmark</i>)				
Detached House	0.079***	0.034***	-0.014*	-0.099***
Maisonette	-0.001	-0.000	-0.000	0.001
Flat/Penthouse	0.006	0.004	-0.000	-0.010
Owens second house				
No (<i>benchmark</i>) Owns Second House	0.043***	0.021***	-0.004	-0.060***
Household size				
No. of adults	0.036***	0.019***	-0.001	-0.054***
No. of children	0.031***	0.003	0.032***	-0.065***
Observations	3,461	3,461	3,461	3,461

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Average Marginal Effects, being the average change in probability of being in each of the four saving categories relative to baseline household. Note that all row entries sum to zero. The thresholds (τ_1, τ_3) are based on the median saving rate of the dissavers and savers, respectively, which are -31.2% and 35%.