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MAPPING EDUCATIONAL DISPARITIES IN LIFE-CYCLE CONSUMPTION

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Mapping Educational Disparities in Life-cycle Consumption*

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Abstract. This paper uses data taken from the tax returns of all Icelandic taxpayers in 2005-2019, a period that saw large changes in disposable income around the country's financial crisis in 2008, to plot the life-cycle path of consumption and income for different education groups and to estimate the level of consumption smoothing. We split households into three groups based on educational attainment: primary education, secondary school, and university. We find that the university educated engage in more consumption smoothing than those without a university degree. We also construct a measure for marginal propensity to consume (MPC) out of transitory income and find that the university educated tend to have a lower MPC than those with less education. This implies that investing in education is an investment not only in higher income and sometimes more fulfilling jobs but also a more stable standard of living. There is a corollary that a higher level of average education can be expected to reduce the magnitude of the business cycle through a lower multiplier.

Keywords: Education, consumption, inequality

JEL Classification: E21, E24

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1. Introduction

We take advantage of a rich administrative panel dataset of all Icelandic taxpayers from 2005 to 2019 to examine the extent to which education matters for behaving in line with the life-cycle model of consumption and saving. In so doing we estimate the life-cycle profiles of consumption and income for three groups of households with different educational attainment: primary education, secondary school, and university.

We proceed by estimating the marginal propensity to consume (MPC) out of transitory income shocks for the three groups. There are several reasons why higher education may be associated with a lower MPC. For example, individuals who choose to spend more years in school may also be more forward-looking and have lower rates of time discount than those who enter the labour market at an earlier age. Larger accumulated savings relative to income may then alleviate liquidity constraints and lower the MPC out of current income. Higher education can also be expected to generate higher income, which in turn has been shown in the literature to correlate with a lower MPC. Education may also be correlated with financial literacy and affect participation in financial markets.

Differences in consumption smoothing across education groups have implications for the business cycle and for the effectiveness of fiscal and monetary policy. In fact, Debortoli & Galí (2021) use a heterogeneous agent New Keynesian model to emphasize the role of financially constrained agents in amplifying or attenuating the transmission of monetary policy. A low average value of MPC generates a smaller business cycle and lowers the value of fiscal and monetary policy multipliers. Changes in the average length of education may then affect the multiplier, policy effectiveness and the business cycle. Conversely, the business cycle may affect education groups differently. Groups with lower MPC will suffer smaller falls in consumption during downturns. As such, education could provide insurance against macroeconomic shocks.

Our period of study, from 2005 to 2019, includes large changes in disposable income in Iceland. Disposable income rose during the financial boom from 2005 to 2008, then fell after the banking collapse in 2008 before rising again during the recovery phase before the Covid-19 pandemic. In a recent paper, Hall et al. (2021) find that real disposable income fell by one third or more for a large fraction of the population after the collapse of the country's banking system. These fluctuations in average earnings and income were unanticipated and exogenous to each household's decision. Moreover, we have data on the education of each individual, their age, marital status and number of children as well as a measure of their wealth. This enables us to estimate the propensity to consume for the different education groups over this turbulent period.

We avoid aggregation bias, see Attanasio & Weber (1995), by using individual data for every taxpayer in a country and following each over time. This enables us to test for heterogeneity in consumption

behaviour across both education groups and several other household characteristics, such as age, wealth and liquidity while controlling for household characteristics.

From here the paper proceeds as follows. Section 2 reviews parts of the literature relevant to our study, and Section 3 presents our data. Section 4 shows patterns of life-cycle household consumption, and Section 5 attempts to estimate the effect of education on household consumption. Section 6 offers some further perspectives based on survey evidence, and a number of robustness checks of our findings can be found in Section 7. Finally, Section 8 concludes.

2. A brief survey of the literature

There is a literature on heterogeneity in the marginal propensity to consume (MPC) out of unanticipated income shocks[1] and there is related literature on the life-cycle profile of consumption. Let us start with the former. The relevant papers have usually found that households are more sensitive to transitory changes in income than predicted by the permanent income hypothesis, a result attributed to the presence of liquidity constraints. It is not straightforward to establish which households are liquidity constrained. Hayashi (1985) uses savings, while Zeldes (1989) uses the asset-to-income ratio as an indicator of such liquidity constraints. Both find that constrained households are more sensitive to changes in disposable income. Similarly, Lusardi (1996) finds a relatively high MPC out of predictable changes in income for low-wealth households. In a recent paper, Karger & Rajan (2020) analyse the effect of Covid-19 payments from the federal government in April 2020 using data from bank accounts. They find large heterogeneity in the MPC across their sample of stimulus recipients. While some (12%) reduced their spending in the two weeks following a stimulus payment, others (12%) did not change their spending, but most increased their spending by varying amounts. Fagereng et al. (2021) study the response of lottery winners in Norway and find that spending peaks in the year of winning and that the MPC for low liquidity winners is close to one, while the MPC for high-liquidity winners is below one half. In 2011, the Singaporean government gave domestic citizens a one-time cash pay-out of 0.5% of GDP. Agarwal & Qian (2014), using this natural experiment, show that liquidity constrained consumers had a strong consumption response to the pay-out.

Our period of study covers the financial crisis in 2008 that hit Iceland hard. There are several papers that measure the MPC around a financial crisis: Canbary & Grant (2019) use the Family Expenditure Survey in the United Kingdom to find the relationship between the MPC and socio-economic status. They find that households with higher socio-economic status have lower MPCs. However, they do not have access to data on the level of education. Instead, they distinguish between professional, skilled, unskilled, and unoccupied individuals and hypothesize that individuals with higher socio-economic status will be less liquidity

[1] See, e.g., Browning & Collado (2001) and Jappelli & Pistaferri (2010).

constrained. Following the financial crisis in 2008, the MPC of the groups increased and only professional households continued to act according to the permanent income hypothesis.

Our data allows us to plot the life-cycle path of consumption for the different education groups. A body of research has established that consumption over the lifespan follows a hump-shaped path in contrast to the predictions of the permanent income hypothesis. Gourinchas & Parker (2002) emphasize the importance of the expected growth rate of income for consumption as individuals age and find that a steeper income profile generates a steeper consumption profile, implying that changes in disposable income have an important influence on consumption profiles. Moreover, they find that both income and consumption profiles are more hump-shaped for the higher education group (college and some graduate school). Fernández-Villaverde & Krueger (2007) compare the consumption profiles of high and low education workers. They find a smaller hump for workers with low education and a larger hump for workers with high education. For low-education workers, the hump for expenditures on durables disappears after controlling for demographics. They argue that because high-education workers have steeper income profiles - an observation also documented by Attanasio et al. (1999) - their consumption profile is expected to track income, and also be steeper in the presence of liquidity constraints. This pattern is at least partly due to variation in the size of the household over the lifespan, as shown by Attanasio & Weber (1995) and Attanasio et al. (1999). Fernández-Villaverde and Krueger (2007), using the Consumer Expenditure Survey to estimate life-cycle profiles of consumption, find that changes in household size account for around half of the hump in non-durable consumption while the hump-shaped pattern of durable consumption is not affected.

These findings have been attributed to liquidity constraints, as in Zeldes (1989) and Gross & Souleles (2002).[2] The latter used data on the credit card debt of individuals. Splitting the sample into those who had already borrowed close to the limit in the past and those who had not, showed that raising the credit limit affects subsequent credit card borrowing more for the former, but it still affects the borrowing significantly for the latter group.[3] Such liquidity constraints may prevent young people from borrowing against future income. Another explanation for consumption to track income over the life cycle is the computational difficulty of maximizing utility over time as pointed out by Tversky & Kahneman (1974). A third explanation for consumption to follow income over the life cycle goes back to Becker (1965) where utility is generated with both goods and time as inputs. Rising wages raise the opportunity cost of time, which

[2] See also Alessie et al. (1997), Attanasio et al. (2008); Barrow & McGranahan (2000), and Eberly (1994).

[3] Hsieh (2003) uses data on households in Alaska who receive annual payments from the state's oil royalties and tested whether consumption increases in the quarter when households receive the payment. The results suggest that consumption does not respond to the payment, which is supportive of the Permanent Income Hypothesis. This finding flies in the face of other studies using data on individuals, which find that consumption responds to predictable changes in income, such as Souleles (1999) on the response of household consumption to income tax refunds. See also Baugh et al. (2014), Parker (1999); Parker et al. (2013), and Stephens & Unayama (2011).

may make individuals substitute goods for time in the production of utility services, generating a correlation between labour income and consumption. Bullard & Feigenbaum (2007) derive a general equilibrium life-cycle model where households get utility from both consumption and leisure, producing an equilibrium with a life-cycle hump.

Others have looked at the relationship between education or financial literacy on consumption and saving behaviour. Cole & Shastry (2008) find that education has a considerable impact on financial market participation. Lusardi (2008) shows that financial literacy affects saving decisions of US households and low literacy can be linked to lack of retirement planning. Furthermore, in a recent study based on Canadian census and tax records, Messacar (2017) finds that secondary school completion increases saving rates by 2-6% annually.

We contribute to the literature by using an administrative data set that includes all taxpayers in Iceland to estimate consumption smoothing for three distinct education groups over a period that includes very large fluctuations in real disposable income, namely (a) the large increase in disposable income before the financial crisis of 2008; (b) the collapse in 2008-2009; and (c) the subsequent recovery. This enables us to better identify the propensity to consume out of disposable income for the education groups as well as distinguishing between the propensity to consume out of unexpected increases and decreases in disposable income. The results allow us to draw conclusions, and thereby add to the literature, about the relationship between education policy, business cycles and macroeconomic policy.

3. Data

We use a dataset of annual administrative tax records from all Icelandic taxpayers from 2005 to 2019. The data are collected by Statistics Iceland and Iceland Revenue and Customs and include third-party reported information on multiple sources of income and various assets and liabilities.[4] The data are linked with other administrative data and therefore also include socio-demographic factors.[5] We avoid complications caused by young people living with their parents and ensure enough observations within each age by restricting the sample to individuals aged 31 to 80 years and those born between 1935 and 1979. To further alleviate the effects of such complications, we also exclude students and individuals who live abroad a part of the year or have an abnormally low disposable income for other reasons by omitting households whose equivalized disposable income is below 40% of the median.[6]

[4] The data includes information on income, taxes, assets, and liabilities. Income includes labor income, capital income, income from pension funds, government transfers, and other income such as lottery winnings and grants. Furthermore, we add imputed rent as income for homeowners. Liabilities include student loans, mortgages, credit card debt and other forms of debt. Assets include market value of real estate and cars, stocks and bonds in mutual funds and money in savings accounts.

[5] This includes information on age, gender, education, marital status, occupation, education and number of children.

[6] In equivalizing household disposable income, we use a version of the OECD modified equivalence scale. The OECD scale assigns a value of 1 to the household head, 0.5 to each household member aged 14 and over and 0.3 to each child aged under 14. We use

Household measures are constructed by aggregating information across household members each year using unique household identifiers from the tax records. Each household consists of at most two adults in the case of jointly taxed couples. We treat intra-household inequality by assigning each household member an equal share of the household's income, assets and liabilities, while allowing background information such as age to vary across household members. This approach assumes that financial decisions within a household are made jointly based on the household's total income and wealth, rather than individually for each household member based on individual income and wealth.

We omit deficient tax records and individuals who have negative income.[7] Similarly, we discard the top 1 percentile in consumption to alleviate biases from potentially misattributing wealth declines to consumption when they might stem from unrealized capital losses or stock transactions not observed in the data. Finally, we remove from the sample individuals with saving to disposable income ratio lower than -1.[8] This leaves us with 1,754,611 observations from 167,838 individuals for our analysis.

We calculate consumption for each household using the accounting identity that a household's consumption equals its disposable income minus changes in net wealth plus unrealized capital gains (Browning & Leth-Petersen, 2003; Eika et al., 2020). Implying that any income is either saved or consumed

$$C_{it} \equiv Y_{it} - (W_{it} - W_{it-1}) + \sum_k (p_{kt} - p_{kt-1}) A_{ikt-1} \quad (1)$$

where Y_{it} is disposable income (annual income in local currency) for individual i at time t. W_{it} is net wealth and $(p_{kt} - p_{kt-1})A_{ikt-1}$ is unrealized capital gains on asset k, A_k. Note that as $Y_{i,t}$, $W_{i,t}$ and $A_{i,t}$ are defined as the within-household averages of disposable income, net wealth and assets, respectively.

The idea underlying the identity in (1) is that income is either spent, thereby contributing to consumption, or saved, thereby showing up in increasing net wealth. However, net wealth is also influenced by factors other than income, namely unrealized capital gains, which are caused by changes in market prices and do not change current consumption. Unrealized capital gains include changes in housing prices, investment funds' prices, the effects of CPI-indexation of household debt and a 2015 mortgage relief, all of which we correct for. Finally, we have information on the value of vehicles, and we add imputed rent for homeowners, which are arguably the most significant components of durable consumption for most

the same values, but instead of using 14 years of age as a cut-off value we use 7 years, as we only have information on whether a child is above or below the age of 7.

[7] Although we account for several sources of unrealized capital gains, measured consumption is negative for some households, which can be due to misattributing wealth increases to saving out of income when it is due to unrealized capital gains or due to income not observed in the tax records, such as from inheritances or gifts or due to tax evasion (Kolsrud et al., 2020)

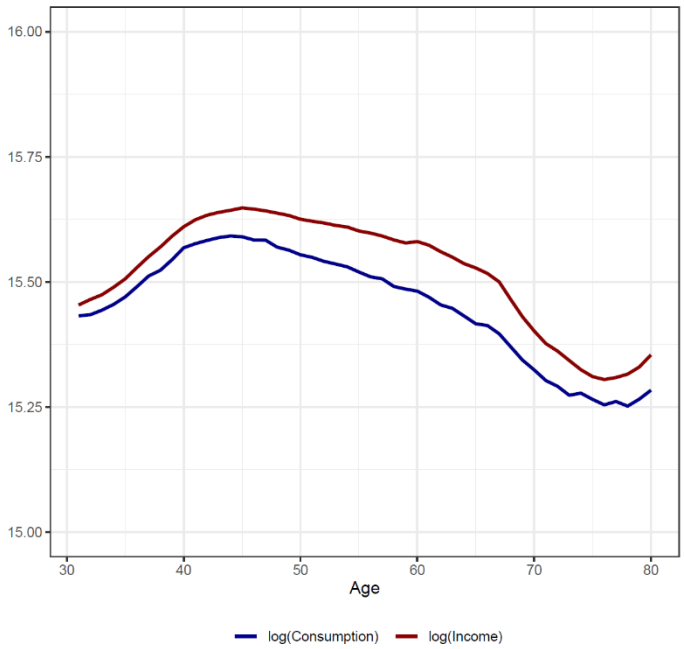
[8] Timing issues occasionally result in income or changes in assets or liabilities which occur in year *t* being registered in year *t+1* leading to extreme values for calculated consumption and savings in each year, while still producing a sensible average across the two years. By removing negative consumption values and highly negative saving ratios, we seek to omit those observations.

households. We assume that consumption derived from vehicles each year is equal to its depreciation, which is 10% according to Icelandic tax law, and that consumption of own housing equals imputed rent.[9]

4. Life-cycle patterns of consumption

We apply equation (1) to calculate the life-cycle profile of consumption and income. Figure 1 shows average consumption and income in logs over the life cycle for the whole sample in 2005-2019. As expected, we observe behaviour inconsistent with the permanent income hypothesis as consumption tracks disposable income over the life cycle. As income rises early in the life cycle, consumption also increases but to a lesser extent. After both variables peak in the mid-40s, consumption falls at a faster rate than income, reflecting increased saving for retirement. The drop in disposable income at retirement is more pronounced compared to that of consumption, reflecting some degree of consumption smoothing. Still, contrary to the predictions of the permanent income hypothesis, households continue saving deep into retirement.

Figure 1. Average disposable income and consumption by age



Note: Average log consumption and log income, at prices in 2019, by age for the full sample (1,754,611 observations) of individuals aged 31 to 80 in 2005 to 2019.

Interestingly, income and, to a lesser extent, consumption appear to rise in the late 70s. Survival bias is a plausible explanation for this as high-income and high-wealth households also have higher life expectancy

[9] We compute imputed rent of each household by dividing each household's value of real estate by the total value of real estate and multiply the outcome by the aggregate value of imputed rent from national accounts.

compared to low-income and low-wealth households.[10] Below we gauge the consumption smoothing behaviour of the three education groups by estimating the MPC out of transitory income shocks. Heterogeneity in life expectancy can be expected to result in different saving rates across households under the permanent income hypothesis. However, as households seek to distribute the effects of shocks over their lifetime, the MPC out of transitory income shocks should be close to zero independent of life expectancy.

Before introducing a model, we split households into three groups, based on the highest educational attainment within the household. The three groups are: primary school, secondary school, and university.[11] We do this to obtain life-cycle consumption paths for each group. Table 1 has the summary statistics for the variables used in the analysis by level of education.

The table shows that educational attainment is increasing with each cohort in the last decades, causing the university educated to be, on average, five to six years younger than those without a university education. A higher proportion of those with an education from either university or secondary school lives with a spouse compared to those with primary education and they are more likely to live in urban areas. The university educated have more children under the age of 18 than other education groups, which could be caused by the gap between the average ages of the groups. The university educated have higher income, consumption, and net wealth than those with a secondary school degree who in turn have higher income, consumption, and net wealth than those with a primary school degree. University educated households are more likely to own their place of residence than the secondary school educated who are more likely to own than those with primary school education only, which may reflect the income gap between the groups.

We then come to measures of liquidity constraints. Interestingly, net wealth to disposable income and liquid assets, proxied by deposits in bank accounts, to disposable income are lower for university graduates compared to secondary school graduates. The latter measure is even lower compared to that of primary educated households. The lower average age of the university educated likely explains this finding as younger households typically have accumulated less wealth relative to income compared to older households. Comparing the groups in terms of an absolute liquidity constraint, proxied by liquid assets below USD 8,200 for couples and USD 4,100 for singles, shows more binding constraints for primary

[10] Hougaard Jensen et al. (2021) report a six-year difference in life expectancy for men between the top and the bottom income group in Denmark and close to a four-year difference for women. Meara et al. (2008) show the effect of education on recent changes in life expectancy for the United States. Life expectancy is also positively linked to education in Iceland, but we are not aware of any study for Iceland that links life expectancy directly to income. In a recent paper, Andersen et al. (2022) find that individuals with primary or vocation education have higher risk factors of atherosclerotic disease and incidence of cardiovascular disease than the university educated in Iceland. While their study is not conclusive when it comes to the causes of the disparity, the authors conclude that socioeconomic inequality might be involved. Framke et al. (2020) reach similar conclusions for Denmark.

[11] Primary education refers to households where the higher educated individual has primary education, or lower secondary education. Secondary school refers to households where the higher educated individual has an upper secondary education, post-secondary non-tertiary education, or a short-cycle tertiary education without a diploma. University education refers to households where the higher educated individual has a bachelor's degree, a master's degree or a doctoral degree.

educated households, with 56% being liquidity constrained by this measure, than for university graduates, with 40% being liquidity constrained.

Table 1. Summary statistics

	Primary school (391,419 obs.)	Secondary school (739,941 obs.)	University (623,251 obs.)
Age	55.29	54.16	49.16
	(12.59)	(11.70)	(10.67)
Spouse	0.44	0.74	0.81
	(0.50)	(0.44)	(0.39)
No. children	0.35	0.54	1.03
	(0.80)	(0.92)	(1.14)
Urban	0.50	0.60	0.75
	(0.50)	(0.49)	(0.43)
Disposable income	40,161	48,463	63,625
	(26,637)	(36,062)	(47,190)
Consumption	39,657	47,556	61,497
	(21,565)	(26,195)	(33,995)
Net wealth	76,869	112,542	136,154
	(143,117)	(172,433)	(234,030)
Real estate	115,730	167,496	213,985
	(119,909)	(126,668)	(143,448)
Net wealth to income	2.23	2.72	2.31
	(3.29)	(3.35)	(3.34)
Liquid assets to income	0.64	0.70	0.62
	(1.58)	(1.55)	(1.32)
Liquidity constrained	0.55	0.47	0.39
	(0.50)	(0.50)	(0.49)

Note: Table 1 reports variable means for the whole sample period 2005-2019. Standard deviations are shown in parentheses. Disposable income, consumption, net wealth and the value of real estate are reported in USD. We use the average dollar/ISK exchange rate for 2019. A household is considered liquidity constrained if liquid assets are below USD 8,200 for couples and USD 4,100 for singles. Urban is 1 for those living in urban areas and zero for those living in rural areas.

Figure 2 shows consumption and income by age for the average household in each education group. Consumption follows income over the life cycle in all groups. Predictably, income and consumption clearly rise with education. Moreover, the income profile from 31 years of age becomes steeper as educational attainment rises, peaking at 27 log points above their level at 31 years of age for university graduates, compared to 18 log points for secondary school graduates and 6 log points for primary educated households.

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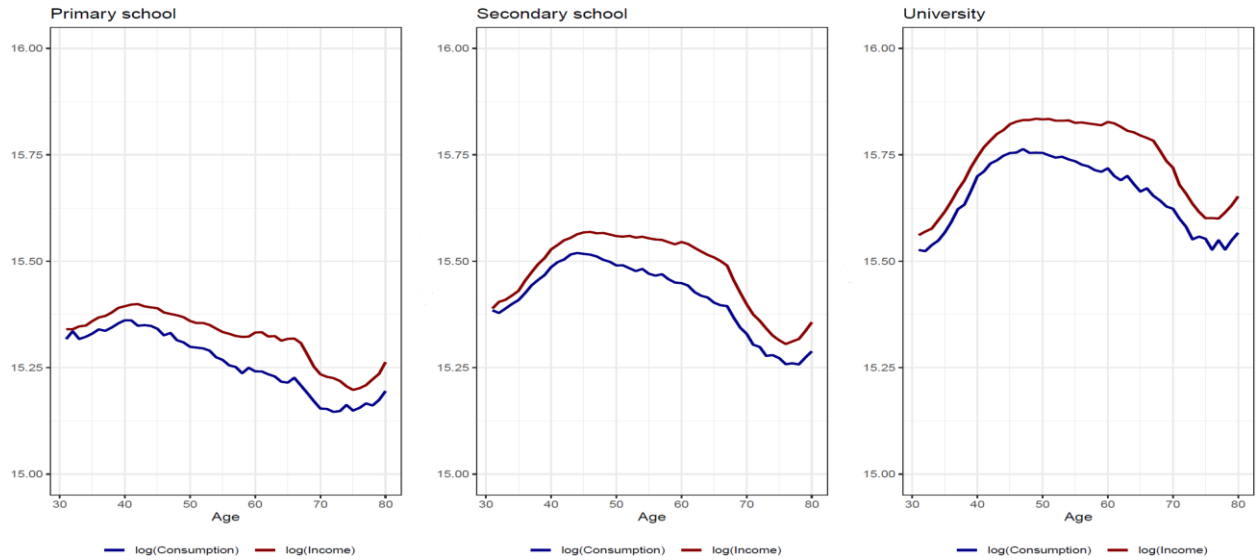
Figure 2. The average income and consumption by age for three education groups



Note: Average log consumption and log income by age for households aged 31 to 80 in 2005 to 2019. The left panel shows 391,419 observations of 42,116 primary educated households, the mid panel shows 739,941 observations of 79,169 of secondary school educated households, and the right panel shows 623,251 observations of 64,291 of university educated household.

5. The effect of education on household consumption

In this section we first estimate a life-cycle consumption profile of the three education groups and then we estimate the MPC out of transitory income shocks.

In estimating the life-cycle consumption profile we start with the following individual fixed effects specification:

$$c_{it} = \alpha_i + \beta y_{it} + u_{it} \tag{2}$$

where c_{it} is the log of real consumption, y_{it} the log of real disposable income and u_{it} is an error term for individual i at time t. The subscripts refer to household, i, and time, t. All nominal variables are deflated by the CPI.

Equation (2) is equivalent to

$$c_{it} - \bar{c}_i = \beta(y_{it} - \bar{y}_i) + (u_{it} - \bar{u}_{it}) \tag{3}$$

where, $\bar{y}_i = \frac{1}{T_i}\sum_{t=0}^{T_i} y_{it}$ is the average income over the sample period 2005-2019, and $\bar{c}_i = \frac{1}{T_i}\sum_{t=0}^{T_i} c_{it}$ is a measure of average consumption over the same period. The denominator T_i refers to the fact that we do not require each household in our sample to be in the data for the whole sample period, creating variation in the number of observations on each household.

Based on equation (3), we estimate the following equation separately for each education group using OLS to obtain three life-cycle consumption paths:

$$c_{it} = \psi\bar{c}_i + \gamma y_{i,t} + \rho\bar{y}_i + \beta_{Age} D_{i,t}^{Age} + \phi Z_{i,t} + \varepsilon_{i,t} \quad (4)$$

where $\bar{c}_i$ controls for unobserved and time-constant household characteristics such as attitudes, unreported income and preferences and also proxies for permanent income. β_{Age}, the coefficients on age dummies ($D_{i,t}^{Age}$), are the main objects of interest. $Z_{i,t}$ includes various controls. Notably, controlling for cohorts is important as individuals might have experienced different shocks throughout their lives, which potentially have lasting effects on preferences, for example preferences towards risk (Malmendier & Nagel, 2011). Time effects capture the common variation in consumption across all households, for example due to changes in the macroeconomic environment, at a given time and need to be controlled for. However, as time and age effects move in tandem, identification is not possible within the fixed effects framework without further assumptions. To enable the simultaneous estimation of age effects and time effects, we follow Deaton (2019) by constructing year dummies which are orthogonal to a time trend and normalized to sum to zero.[12] Other controls include dummy variables for marital status and the number of children and interactions between the two, residence (urban versus rural), net wealth deciles and occupation. Finally, we assume a linear relationship between log of consumption and the log of value of housing, which is included in $Z_{i,t}$. The estimated coefficients of interest are shown in Table 1. Note that equation (3) predicts $\psi = 1$ and $\gamma = -\rho$.

Table 2. Equation 4 parameter estimates

	Primary school (1)	Secondary school (2)	University (3)
ψ	0.973*** (0.0010)	0.975*** (0.0007)	0.967*** (0.0008)
γ	0.703*** (0.0062)	0.677*** (0.0044)	0.664*** (0.0045)
ρ	-0.699*** (0.0061)	-0.665*** (0.0044)	-0.641*** (0.0046)
R^2	0.477	0.449	0.469
N	391,419	739,941	623,251

Note: Table 2 presents estimates from equation (4). The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

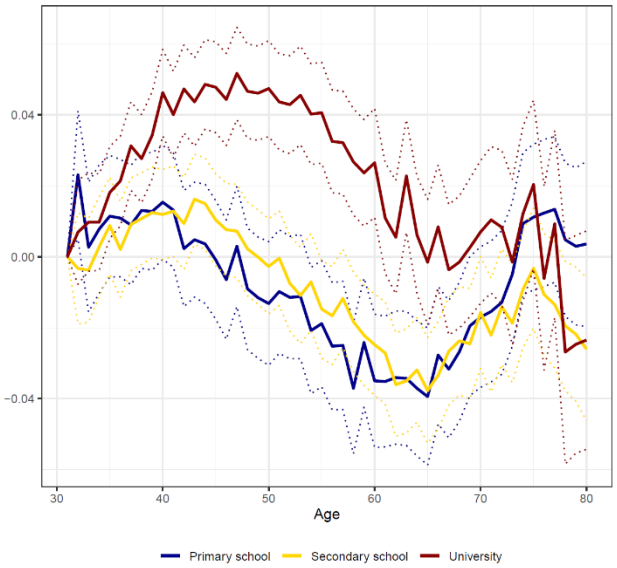
In line with our expectations from equation (3) we also find the coefficients on income and permanent income are similar in absolute values; $\gamma \approx -\rho$. Furthermore, consistent with the prediction of the same

[12] We do this by defining the time dummies as $\tilde{D}_t = D_t + (1-t)D_2 + (t-2)D_1$ where D_t is the conventional time dummy, which equals 1 in year t and zero otherwise. Due to the construction of D_t, the first two-time dummies are dropped in the estimation. These effects can be recovered using the fact that all year effects sum to zero and are orthogonal to a time trend.

equations, the estimated coefficient on average consumption, ψ, which proxies for permanent income and other time-independent unobserved household characteristics is close to 1 for all education groups.

Figure 3 plots the age effects (β_{Age}) from equation (4). Age 31 serves as a benchmark for each group and, thus, the age effect is zero for 31-year-olds by definition with the rest of the life-cycle path defined in relation to that benchmark point. First, between the ages of 31 and 40 the consumption of the university educated rises more steeply than for those without a university degree. This could be due to those with a university degree having expectations of higher future income, but being liquidity constrained they are unable to consume as they otherwise would. We do not observe the same rise for the other groups who, as observed in Figure 2, do not experience the same increase in disposable income in their 30s and 40s. This could be due to them not expecting their future income to rise as sharply as the university educated and therefore not being liquidity constrained to the same extent.

Figure 3. Life-cycle profile for consumption



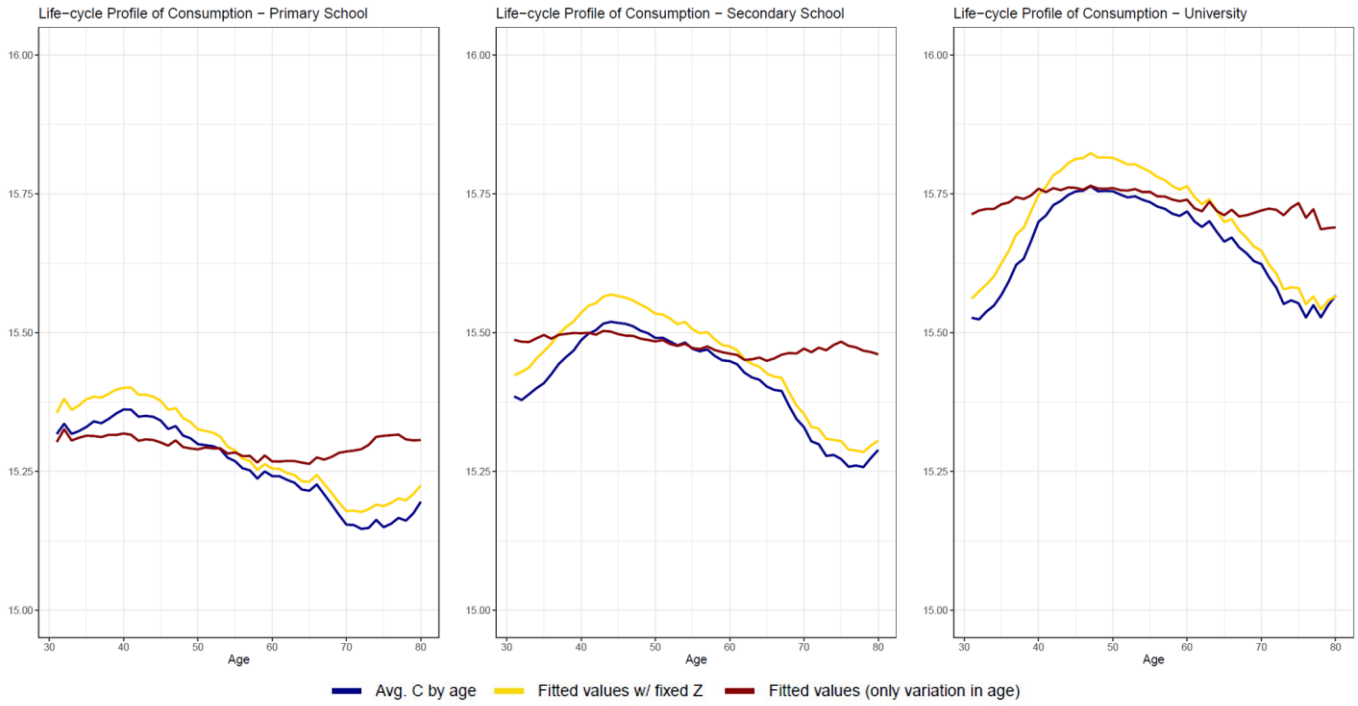
Note: Figure 3 shows the age effects (β_{Age}) estimated from equation (4) for each education group. The estimates are based on households aged 31 to 80 in 2005 to 2019. The dotted lines who the 95 % confidence interval.

Second, the age effect of consumption drops for all groups around middle age, suggesting increased preferences for retirement saving. This is consistent with the findings of Gourinchas and Parker (2002). Lastly, we see that after retirement, consumption rises again for non-university educated households, more so for the primary school educated than the secondary school educated households. This reflects those households reducing their saving once they reach retirement. However, the age effect does not rise in retirement for university educated households, so a similar reduction in saving during retirement is not

observed for that group. Taking education as a proxy for permanent income, the above finding lends support to the hypothesis that bequests are a luxury good resulting in higher post-retirement saving among high income households (De Nardi, 2004) [13, 14]

Figure 4 uses equation (4) along with the coefficient estimates to decompose consumption over the life cycle into the estimated role of income and demographics such as household size and occupation.

Figure 4. Decomposition of the life-cycle profile of consumption for three education groups



Note: Figure 4 shows fitted values based on estimates from equation (4) for households aged 31 to 80 in 2005 to 2019. The blue lines show average consumption by age (logs). The yellow lines show fitted consumption with variables in Z held fixed, the value of housing at its average value over the time period and dummy variables for marital status, the number of children, residence (urban versus rural), net wealth deciles and occupation set at zero, but income and age allowed to vary. The red lines show fitted consumption with both variables in Z and income held fixed and only age is allowed to vary. The left panel shows estimates based on 391,419 observations of 42,116 primary educated households, the mid panel shows estimates based on 739,941 observations of 79,169 of secondary school educated households, and the right panel shows estimates based on 623,251 observations of 64,291 of university educated households.

We start with the blue lines, which simply depict the average log consumption of the three groups by age without controlling for any of the factors discussed above. These lines are identical to the ones shown in Figure 2. The yellow lines plot the average fitted values by age when household characteristics and year effects, included in $Z_{i,t}$, are held fixed for the whole sample. The difference between the blue and the yellow

[13] The effective retirement age in Iceland in 2015 was 69.4 for males and 68 for females (Ólafsson, 2017).
[14] Appendix Figure A1 shows a version of Figure 3 obtained without controls for income.

lines captures the effect of controlling for household characteristics such as cohorts, number of children, marital status, occupation, residence, net wealth deciles and real estate assets in the regression. Finally, the red line shows the average fitted values by age when, in addition to household characteristics, income is also held fixed at its mean values and in the case of dummy variables we set its value equal to one for the reference group. As such, the only variation comes from the age effect

The figure shows that keeping household characteristics fixed does not materially reduce the size of the consumption profile's hump as measured by the difference in log consumption at its peak and at the age of 31. Only once income is also held fixed does the consumption profile become relatively flat. As such, our model suggests that current income, rather than household characteristics, explains the lion's share of the hump in life-cycle consumption paths.

We next turn to estimate the MPC out of transitory income shocks to gauge the consumption smoothing behaviour by educational attainment. In particular, we follow the methodology proposed by Blundell et al. (2008) and further examined by Kaplan & Violante (2010). First, we regress log income and log consumption on individual fixed effects, dummies for age, year, gender, education, marital status, number of children, the interaction between marital status and the number of children, residence and net wealth deciles, and the log of real estate assets. We proceed by obtaining the first differenced residuals of log consumption, $\Delta\tilde{c}_{i,t}$, and log income, $\Delta\tilde{y}_{i,t}$. As in Blundell et al. (2008), the income process for each household is decomposed into a permanent component, *P*, and a mean-reverting transitory component, ν. Hence, income growth is given by:

$$\Delta\tilde{y}_{i,t} = P_{i,t} + \Delta\nu_{i,t} \tag{5}$$

Finally, we obtain the MPC out of transitory income shocks using an IV regression of $\Delta\tilde{c}_{i,t}$ on $\Delta\tilde{y}_{i,t}$, which is instrumented by $\Delta\tilde{y}_{i,t+1}$ because it is correlated with the transitory shock at *t*, but not with the permanent one. Specifically:

$$\Delta\tilde{y}_{i,t} = \alpha_0 + \beta_{0,E}\Delta\tilde{y}_{i,t+1} \times E_{i,t} + \epsilon_{0,i,t}$$

$$\Delta\tilde{c}_{i,t} = \alpha_1 + \beta_{1,E}\Delta\hat{\tilde{y}}_{i,t} \times E_{i,t} + \epsilon_{1,i,t} \tag{6}$$

where $E_{i,t}$ is a dummy for the education groups, with primary education serving as a benchmark. Thus, the above specification is estimated for the whole sample, and not separately for each group as in the previous section.

The estimates of β_1 are reported in Table 3. The MPC out of transitory shocks is lower for university educated households compared to primary educated and secondary educated households. The difference is between university educated households and secondary educated households is highly significant, and the difference between university educated households and primary educated households is only significant at

a 41% significance level. We conclude that university educated households smooth consumption to a larger extent than other households.

Table 3. MPC by education

$\Delta\hat{\tilde{y}}_{i,t}$ ×primary educated	0.550^{***}
	(0.021)
$\Delta\hat{\tilde{y}}_{i,t}$ × secondary educated	0.601^{***}
	(0.016)
$\Delta\hat{\tilde{y}}_{i,t}$ × university educated	0.523^{***}
	(0.017)
R^2	0.034
N	1,423,797

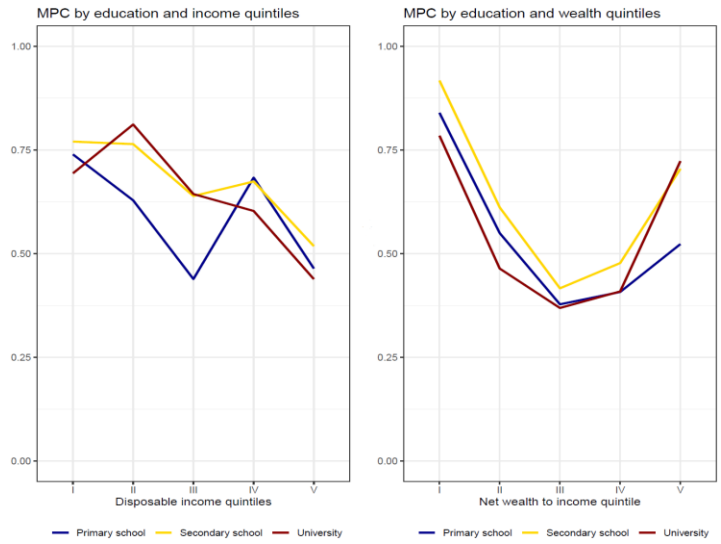
Notes: Table 3 presents IV estimates from equation (6). The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

Our results thus far do not necessarily imply that education causes consumption smoothing. University educated households, on average, have higher income (see Table 1) and evidence suggests higher income households save a larger share of their income than lower income households (Dynan et al., 2004). Thus, it could be the level of income, and not education itself, which explains the relatively lower average MPC out of transitory income among university educated households. Therefore, we are also interested in the distribution of MPC across the distribution of income and liquidity, which are proxied by disposable income and wealth-to-income quintiles. Now we have more endogenous variables, namely the transitory income shock for each education group interacted with the aforementioned quintiles. Hence, we need additional instruments. These are, like before, $\Delta y_{i,t+1}$ interacted with the education groups but now also with the quintiles.

The resulting MPCs are depicted in Figure 5.[15] First, the MPC broadly falls in income and that of university educated households is lower than that of secondary educated households. However, there is no clear difference across the education groups, except perhaps that primary educated households have a relatively low MPC in the second- and third-income quintile. Therefore, the relatively lower MPC of university educated found in Table 3 is to an important extent driven by the fact that relatively many lower educated households are placed in lower income quintiles and, thus, have a high MPC, while relatively few lower educated households are placed in higher quintiles. The opposite is true for higher educated households.

[15] See Table A16 in the appendix for more detailed regression results.

Figure 5. MPC by income and wealth quintiles



Notes: Figure 5 show the MPC estimates from equation (6) with additional interactions with income quintiles (left panel) and net wealth to income quintiles (right panel). The estimates are based on 1,423,797 households aged 31 to 80 in 2005 to 2019

Second, the MPC by our proxy of liquidity constraints follows a similar trend. It is clearly larger for liquidity constrained households (first two quintiles) than for households in the third and fourth quintile. Interestingly, however, the MPC rises significantly for the wealthiest quintile suggesting the presence of wealthy hand-to-mouth households with a high MPC a la Kaplan et al. (2014). Appendix Figure A2 shows results for alternative definitions of liquidity constraints. We conclude that higher educational attainment is associated with lower MPC for liquidity constrained households.

Next, we allow for MPC asymmetry depending on whether households face a positive or negative income shock. Our motivation is that responding to a negative transitory income shock might be practically more challenging than responding to a positive shock, for example due to liquidity constraints or capital markets imperfections. The specification is the same as before, except we separate those with positive transitory income shocks from those with negative shocks using dummy variables. Specifically, we estimate the following modification of equation (6):

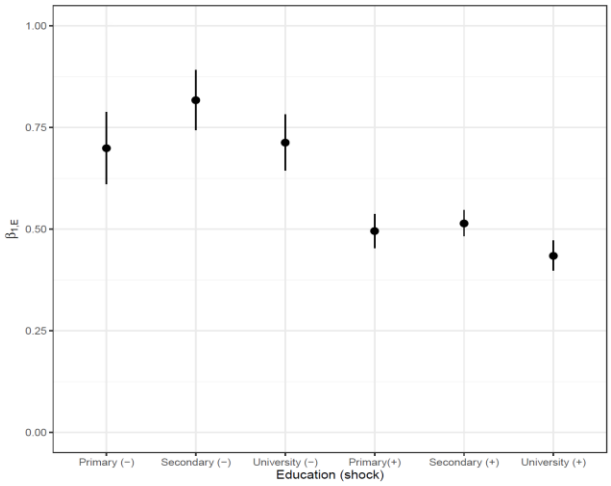
$$\Delta y_{i,t} = \alpha_0 + \beta_{0,E,-}\Delta y_{i,t+1} \times E_{i,t} \times I^- + \beta_{0,E,+}\Delta y_{i,t+1} \times E_{i,t} \times I^+ + \epsilon_{0,i,t}$$

$$\Delta c_{i,t} = \alpha_1 + \beta_{1,E,-}\Delta \widehat{y_{i,t}} \times E_{i.t} \times I^- + \beta_{1,E,+}\Delta \widehat{y_{i,t}} \times E_{i,t} \times I^- + \epsilon_{1,i,t} \quad (7)$$

where I^- and I^+ are dummy variables for negative transitory income shocks and positive transitory income shocks, respectively.

The results are reported in Figure 6.

Figure 6. MPC by education out of negative and positive transitory income shocks



Note: Figure 6 shows the MPC estimates from equation (7) with additional interactions with income quintiles (left panel) and net wealth to income quintiles (right panel). The estimates are based on households aged 31 to 80 in 2005 to 2019.

Two lessons come out of this. First, all households smooth positive income shocks to a much larger extent than negative income shocks as the MPC for positive shocks is significantly lower than that for negative shocks. Second, the MPC for university educated households is lower than for secondary educated households for both types of shocks. Although the MPC of university educated households is lower than that for primary educated households for positive shocks, the same is not true for negative shocks.

6. Further perspectives based on survey evidence

We have demonstrated three ways in which the education groups differ in consumption behaviour. First, the life-cycle consumption profile of the university educated features a more prominent hump-shape than for the lower education groups, even after controlling for income. As discussed above, this might be due to liquidity constraints. Second, the MPC out of current income decreases with education. Third, the MPC out of transitory income shocks is lower for the university educated, implying a higher degree of consumption smoothing.

To understand the reasons for these results we conducted a survey. The survey covered 946 individuals. Of these, 33.6% work in the private sector, 27.3% in the public sector, 22.9% are not employed, 11.5% are in self-employment and the rest work for private institutions and voluntary associations.[16] The first question is:

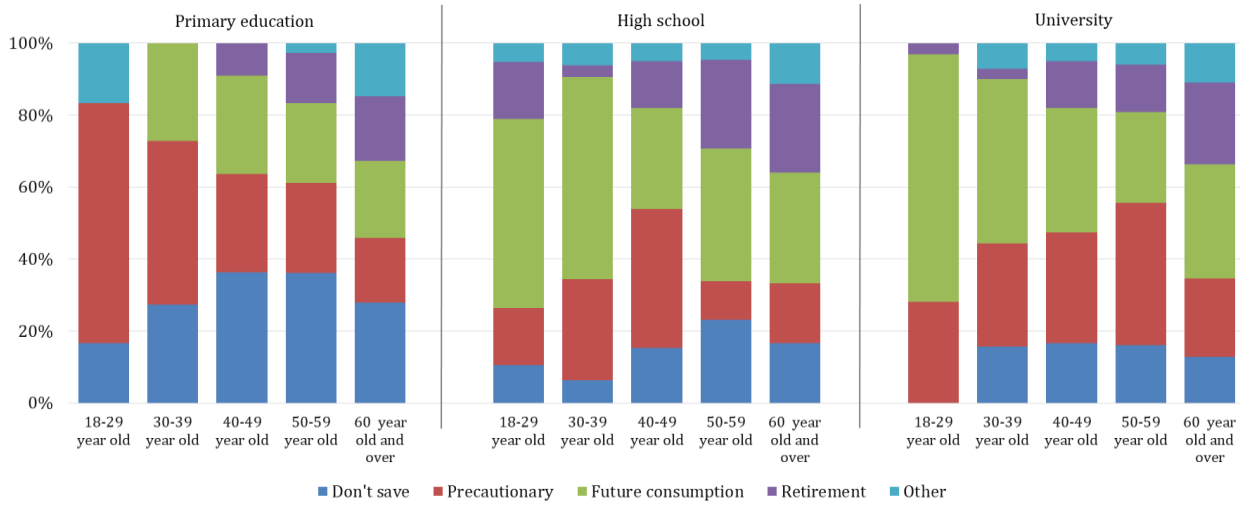
[16] The survey was conducted by the firm *Maskina* for the purpose of this study between 27 September and 7 October 2021.

Which of the following choices does best describe your main motivation for saving? (multiple options not possible).

(1) I don't save; (2) I save for retirement; (3) I save to be able to react to unanticipated expenditures or drop in income; (4) I save for specific future expenditures such as housing and vehicles; (5) I save for future expenditures such as hobbies or vacations; (6) I save to finance future consumption; (7) I save out of habit; (8) I save to provide bequests; or (9) Other.

The responses are presented in Figure 7 below. The primary educated are more motivated by buffer savings, labelled as *precautionary*, while young, whereas buffer savings motivations seem to peak for the university educated later in life. The university educated are more motivated to save for future consumption while young compared to their less educated counterparts. This could be explained by the life-cycle income profile of the two groups. The higher educated expect their income to rise substantially during their 30s and 40s, which alleviates precautionary savings pressures, making future consumption the main motivation for saving.

Figure 7. Main motivation for saving by education and age



Notes: Results of question 1 by education and age. Choices (4), (5) and (6) are grouped together and labelled as *future consumption* while choices (7), (8) and (9) are grouped together and labelled as *other*. Based on 785 observations, of which the highest educational attainment of 136 individuals is primary education, for 269 it is secondary school education and 380 are university educated.

Retirement seems to play less of a role in motivating the savings of the university educated, which harmonizes with our results from Figure 4 where we observed a larger drop in consumption in anticipation of retirement for primary and secondary school educated compared to the university educated. A higher proportion of the non-university educated report that they do not save, which is in line with decreasing MPC in income.

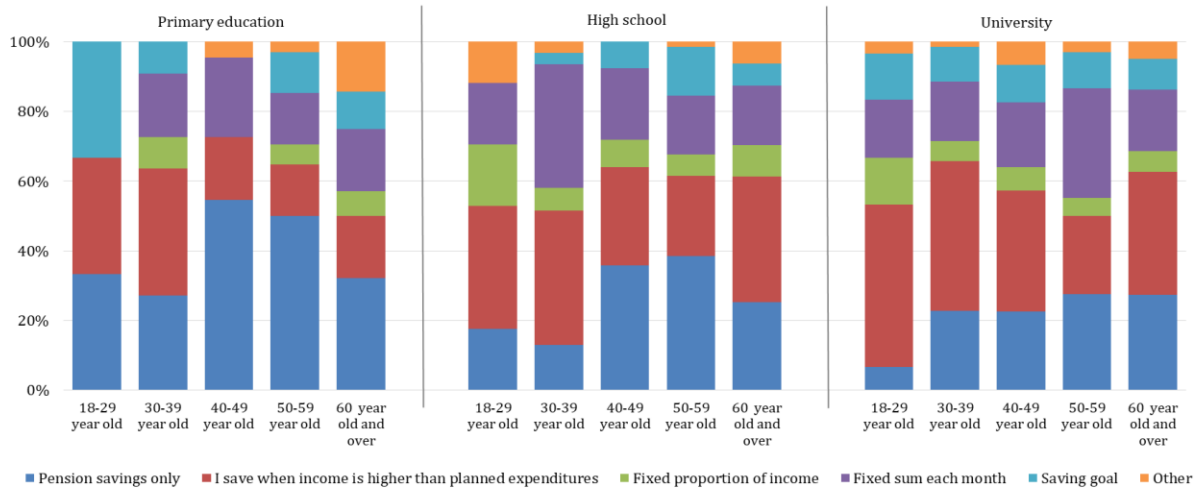
The second question is:

Which of the following options does best describe how you save outside of pension savings?

(1) I don't save outside of pension savings; (2) I have specific expenditures each month, I save if my income is higher, (3) I save a fixed proportion of my income each month, (4) I save a fixed sum each month, (5) I set myself a specific goal for savings over a period and organize my saving accordingly, (6) Other. Again, multiple options are ruled out.

Figure 8 decomposes savings behaviour by education and age. It turns out that individuals without a university degree are more prone to only save through pension savings. This implies that any changes in disposable income would directly lead to a change in current consumption. On the other hand, consumption smoothing behaviour, captured by saving when income is higher than planned expenditures, increases with education. This corresponds to our findings that those with a higher level of education have a lower propensity to consume out of current income, consistent with the estimation results in Table 2 and Figure 5.

Figure 8. Saving behaviour by education and age



Note: Results of question 2 by education and age. Based on 767 observations, of which the highest educational attainment of 129 individuals is primary education, for 263 it is secondary school education and 375 are university educated

7. Robustness checks

7.1 Fixed effects

In our main model specification, we estimate a version of the standard fixed effects model using a pooled regression. We chose this approach over a fixed effects specification as it allows us to simultaneously estimate the relationship between current disposable income and consumption and that between permanent income and consumption. Here we also estimate a fixed effects version of equation (4):

$$c_{it} = \alpha_i + \beta_g D_{i,t}^{g} + \delta_t D_{i,t}^{Year} + \gamma y_{i,t} + \phi Z_{i,t} + \varepsilon_{i,t} \quad (8)$$

The main difference is that we no longer control for cohort effects, which were included in $Z_{i,t}$ in equation (4), and permanent income, as those are absorbed by the household fixed effects. Furthermore, instead of using time dummies that are orthogonal to a time trend to deal with the fact that time and age move in tandem, thereby making identification impossible, we now use traditional time dummies. To distinguish time and age effects we use dummy variables for each five-year age group and, hence, as time passes some individuals remain in the same age group while others move on to the next one.

The estimates of the coefficient on disposable income γ remain similar to our main specification.

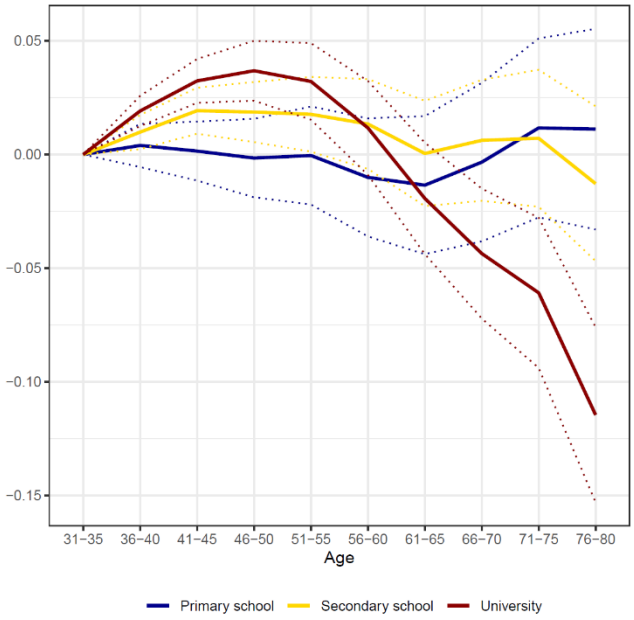
Table 4. Parameter estimates for fixed-effect estimation

	Primary school OLS (1)	Primary school FE (2)	Secondary school OLS (3)	Secondary school FE (4)	University OLS (5)	University FE (6)
γ	0.703***	0.722***	0.677***	0.703***	0.664***	0.687***
	(0.0062)	(0.0065)	(0.0044)	(0.0046)	(0.0045)	(0.0047)
R^2	0.477	0.420	0.449	0.388	0.469	0.413
N	391,419	391,419	739,941	739,941	623,251	623,251

Notes: The even columns in Table 4 present estimates from equation (8). The estimates are based on households aged 31 to 80 in 2005 to 2019. For comparison, the odd columns show the baseline estimates and are the same as the ones presented in Table 2. Standard errors clustered at the individual level are in parentheses and the probability that the estimated parameters are equal in the last column. *** denotes significance at the 1% level. N is the number of observations.

Figure 9 shows the resulting life-cycle profiles for consumption. The profiles are very similar to those depicted in Figure 3 from our main specification. The consumption profile for non-university graduates peaks early on in life before saving rises as individuals approach retirement age. Consumption then rises during retirement, reflecting consumption smoothing. For university graduates, consumption rises until it reaches a peak in the late 40s. It subsequently falls, reflecting increased saving before retirement. However, in contrast to the life-cycle profile depicted in Figure 3, the age effect continues to decline during retirement.

Figure 9. Life-cycle profile for consumption



Note: The solid lines in Figure 9 show the age effects (β) estimated from equation (8) for each education group. The dotted lines show 95% confidence intervals based on standard errors clustered at the individual level. The estimates are based on households aged 31 to 80 in 2005 to 2019.

7.2 Robustness to sample restrictions

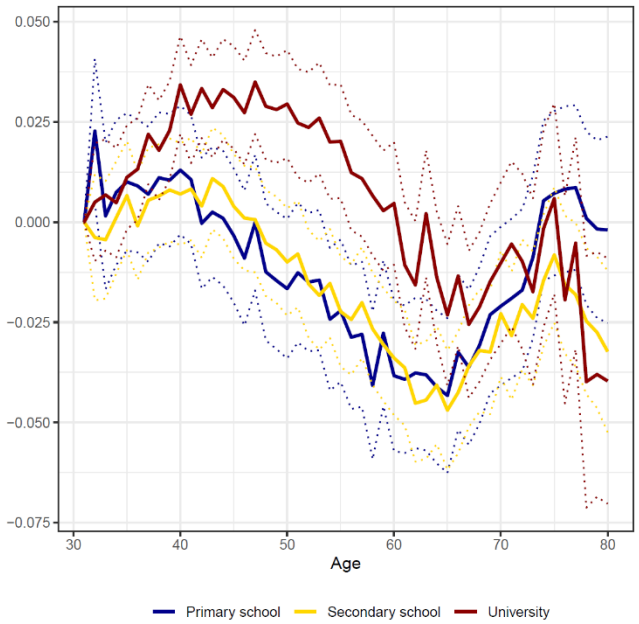
We next check robustness to the sample restrictions where the top 1 percentile of consumption was eliminated. We know there are measurement issues, so we analyse the robustness of our results by first expanding the sample to include the top 1 percentile of consumption (Figure 10) and then by dropping the top 5 percentiles of consumption (Figure 11). Comparing Figures 11 and 12 with Figure 3 shows that the same patterns emerge in all model specifications. Furthermore, Table 5 shows that although the income coefficient γ changes somewhat when including the whole sample, irrespective of consumption, the broad patterns remain unchanged in that the coefficient decreases with education.

Table 5. Parameter estimates for different sample restrictions

	Primary education (0.95)	Primary education (0.99)	Primary education (1)
	(1)	(2)	(3)
ψ	0.974***	0.973***	0.973***
	(0.0010)	(0.0010)	(0.0010)
γ	0.665***	0.703***	0.729***
	(0.0066)	(0.0062)	(0.0060)
ρ	-0.664***	-0.699***	-0.721***
	(0.0065)	(0.0061)	(0.0059)
R^2	0.459	0.477	0.491
N	389,397	391,419	391,835
	Secondary school (0.95)	Secondary school (0.99)	Secondary school (1)
	(1)	(2)	(3)
ψ	0.975***	0.975***	0.975***
	(0.0007)	(0.0007)	(0.0007)
γ	0.608***	0.677***	0.723***
	(0.0048)	(0.0044)	(0.0041)
ρ	-0.602***	-0.665***	-0.709***
	(0.0047)	(0.0044)	(0.0041)
R^2	0.421	0.449	0.475
N	730,687	739,941	741,728
	University (0.95)	University (0.99)	University (1)
	(1)	(2)	(3)
ψ	0.967***	0.967***	0.966***
	(0.0008)	(0.0008)	(0.0008)
γ	0.569***	0.664***	0.733***
	(0.0049)	(0.0045)	(0.0043)
ρ	-0.556***	-0.641***	-0.707***
	(0.0049)	(0.0046)	(0.0043)
R^2	0.421	0.469	0.504
N	598,159	623,251	626,421

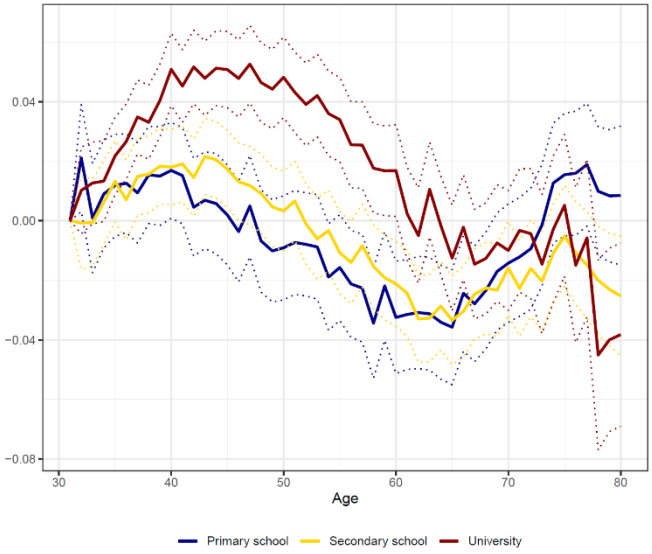
Note: Table presents estimates from equation (4) for each education group and for different sample restrictions. The first column shows the estimates with the sample trimmed at the 95th consumption percentile. For comparison, the second column shows the estimates for the baseline sample, with consumption trimmed at the 99th percentile. These estimates are the same as those presented in Table 2. The third column shows the estimates without trimming. The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses and the probability that the estimated parameters are equal in the last column. *** denotes significance at the 1% level. N is the number of observations.

Figure 10. Effect of age on consumption over the life cycle – No upper bound on consumption



Note: The solid lines in Figure 10 show the age effects (β) estimated from equation (4) for each education group without trimming the top percentile of consumption. The dotted lines show 95% confidence intervals based on standard errors clustered at the individual level. The estimates are based on households aged 31 to 80 in 2005 to 2019.

Figure 11. Effect of age on consumption over the life cycle – top 5 percentiles excluded



Note: The solid lines in Figure 11 show the age effects (β) estimated from equation (4) for each education group with consumption trimmed at the 95th percentile. The dotted lines show 95% confidence intervals based on standard errors clustered at the individual level. The estimates are based on households aged 31 to 80 in 2005 to 2019.

7.3 Alternative definition of university educated households

In our main specification, we define the household's level of education as the educational attainment of the more educated member of the household. However, some households with mixed educational attainment might have more in common with households with the same education as the lower educated spouse. To ensure that our main results are robust to our education classification, we redo our analysis for three alternative education groups; households in which all members have primary education (this is the same sample as in our main specification), households in which all members have a secondary school degree, and households in which all members have a university degree. Households with mixed educational attainment are thus omitted. Table 6 shows that the main coefficients of interest are similar across the two specifications.

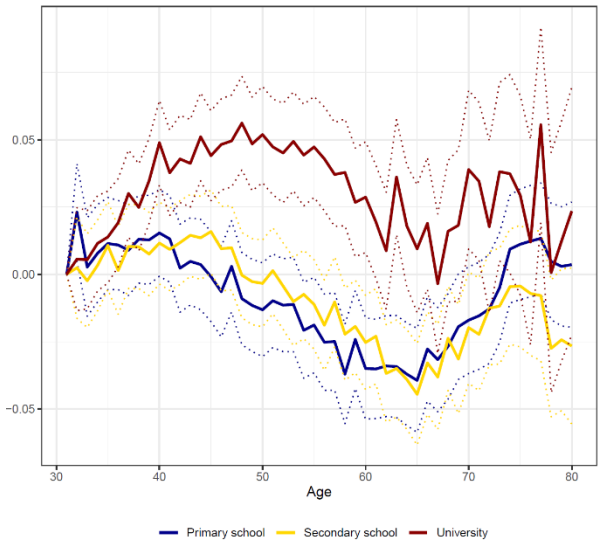
Table 6. Parameter estimates for alternative definition of households

	Primary education (1)	Primary education alternative (2)	Secondary school	Secondary school alternative	University (3)	University alternative (4)
ψ	0.973***	0.974***	0.975***	0.971***	0.967***	0.964***
	(0.0010)	(0.0010)	(0.0007)	(0.0018)	(0.0008)	(0.0023)
γ	0.703***	0.703***	0.677***	0.713***	0.664***	0.669***
	(0.0062)	(0.0062)	(0.0044)	(0.0057)	(0.0045)	(0.0060)
ρ	-0.699***	-0.699***	-0.665***	-0.698***	-0.641***	-0.644***
	(0.0061)	(0.0061)	(0.0044)	(0.0059)	(0.0046)	(0.0063)
R^2	0.477	0.477	0.449	0.469	0.469	0.489
N	391,419	391,419	739,941	423,151	623,251	313,153

Note: The even columns in Table 6 present estimates from equation (4) using a definition of education that differs from the baseline, presented in Table 2 and the odd columns in Table 6, in that the household is assigned to an education group if, and only if, all members within the household belong to that education group. This differs from the baseline where the education group of the household is determined by the household's highest educational attainment. The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses and the probability that the estimated parameters are equal in the last column. *** denotes significance at the 1% level. N is the number of observations.

Figure 12 shows the resulting life-cycle profile of consumption for both education groups. The results are broadly similar to those depicted in Figure 3. However, as the sample of the top two education groups is smaller than in our main specification, especially as individuals age, the profile is less precisely estimated.

Figure 12. Life-cycle profile for consumption



Note: The solid lines in Figure 12 show the age effects (β) estimated from equation (4) for each education group using an alternative definition of the education groups. A household belongs to an education group if, and only if, all members of the household belong to that education group. The dotted lines show 95% confidence intervals based on standard errors clustered at the individual level. The estimates are based on households aged 31 to 80 in 2005 to 2019.

8. Concluding remarks

Previous research suggests that education matters for a number of outcomes related to household behaviour. For example, a higher level of educational attainment may increase saving rates and impact positively on financial market participation. Also, compared to workers with lower education, there is a finding of a larger hump in consumption for highly educated workers who in addition have been found to have relatively steeper income and consumption profiles.

In this paper we have further explored the role of education for life-cycle patterns of consumption. Using 1,792,047 observations on 170,182 individuals over the period 2005-2019, a period that saw large fluctuations in real disposable income due to a financial crisis in 2008, we have compared the consumption behaviour across households with different levels of education: primary educated, secondary school educated, and university educated households. Our results suggest that consumption smoothing rises with education, as higher educated households respond less to changes in transitory income than do lower educated households.

Nevertheless, consumption has a hump-shape for all groups over the life cycle. Holding household characteristics, such as family size, fixed does not materially reduce the hump. However, when holding income fixed in addition to other household characteristics, the hump in life-cycle consumption disappears for non-university educated households, while there remains a hump-shaped life-cycle profile for university educated households, although a smaller one. The rising age effect during retirement for both groups, which

offsets the effect of lower disposable income, also indicates consumption smoothing in retirement. The steeper consumption profile for the university educated in the first half of their working life mirrors their steeper income path, suggesting the presence of liquidity constraints.

These results are complemented with survey evidence, which suggests university educated households are more likely to report consumption smoothing behaviour, in particular as saving to finance future consumption. Lower educated households are, on the other hand, more likely to report behaviour consistent with a high propensity to consume out of transitory income, such as only saving through mandatory pension contributions.

Our key result, that consumption smoothing is most pronounced among university educated households, is found to hold when we control for the ratio of net worth to disposable income as a measure of liquidity constraints. As expected, the marginal propensity to consume is greater for households with a low ratio of net worth to disposable income and a low level of liquid assets.

It follows that the inequality of consumption should be lower than the inequality of disposable income. To illustrate this, we compute the Gini coefficient for both disposable income and consumption for households aged 31 to 80 over the sample period (2005 to 2019), see Figure A3. There is a rise in inequality during the financial bubble from 2005 to 2007 when capital income of the higher income individuals rose. Then inequality fell after 2008 when the stock market collapsed, and capital income fell. Thereafter, inequality has increased gradually. The inequality of consumption is smaller than that of income as expected. It also increased during the bubble, but by less. The fall after 2008 was also smaller, as is the recent increase.

Finally, with the MPC decreasing with education, the business cycle will affect the consumption of the least educated most, the consumption of the university educated being least affected. This implies that investing in education is an investment not only in higher income and sometimes more fulfilling jobs, but also a more stable standard of living. There is a corollary that higher education lowers the value of fiscal multipliers - but then policy is less important if individuals can protect themselves against fluctuations in income. Thus, a higher level of average education can be expected to reduce the magnitude of the business cycle through a lower multiplier and reduce the need for countercyclical economic policy. Pursuing this in further detail seems like an important avenue for future research.

References

Agarwal, S., & Qian, W. (2014). Consumption and Debt Response to Unanticipated Income Shocks: Evidence from a Natural Experiment in Singapore. *American Economic Review*, 104(12), 4205–4230. https://doi.org/10.1257/aer.104.12.4205

Alessie, R., Devereux, M. P., & Weber, G. (1997). Intertemporal Consumption, Durables and Liquidity Constraints: A Cohort Analysis. *European Economic Review*, 41(1), 37–59. https://doi.org/10.1016/0014-2921(95)00128-X

Andersen, K., Aspelund, T., et al. (2022). The Relationship Between Lack of Educational Attainment, Cardiovascular Risk Factors, Atherosclerosis and Coronary Artery Disease. *The Icelandic Medical Journal*, 07, 346-355.

Attanasio, O. P., Banks, J., Meghir, C., & Weber, G. (1999). Humps and Bumps in Lifetime Consumption. *Journal of Business & Economic Statistics*, 17(1), 22–35. https://doi.org/10.1080/07350015.1999.10524794

Attanasio, O. P., Koujianou Goldberg, P., & Kyriazidou, E. (2008). Credit Constraints in the Market for Consumer Durables: Evidence from Micro Data on Car Loans*. *International Economic Review*, 49(2), 401–436. https://doi.org/10.1111/j.1468-2354.2008.00485.x

Attanasio, O. P., & Weber, G. (1995). Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey. *Journal of Political Economy*, 103(6), 1121–1157. https://doi.org/10.1086/601443

Barrow, L., & McGranahan, L. (2000). The Effects of the Earned Income Credit on the Seasonality of Household Expenditures. *National Tax Journal*, 53(4.2), 1211–1243. https://doi.org/10.17310/ntj.2000.4S1.08

Baugh, B., Ben-David, I., & Park, H. (2014). Disentangling Financial Constraints, Precautionary Savings, and Myopia: Household Behavior Surrounding Federal Tax Returns (No. w19783). *National Bureau of Economic Research*. https://doi.org/10.3386/w19783

Becker, G. S. (1965). A Theory of the Allocation of Time. *The Economic Journal*, 75(299), 493–517. https://doi.org/10.2307/2228949

Blundell, R., Pistaferri, L., & Preston, I. (2008). Consumption Inequality and Partial Insurance. *American Economic Review*, 98(5), 1887–1921. https://doi.org/10.1257/aer.98.5.1887

Browning, M., & Collado, M. D. (2001). The Response of Expenditures to Anticipated Income Changes: Panel Data Estimates. *American Economic Review*, 91(3), 681–692. https://doi.org/10.1257/aer.91.3.681

Browning, M., & Leth-Petersen, S. (2003). Imputing Consumption from Income and Wealth Information. *The Economic Journal*, 113(488), F282–F301. https://doi.org/10.1111/1468-0297.00135

Bullard, J., & Feigenbaum, J. (2007). A Leisurely Reading of the Life-cycle Consumption Data. *Journal of Monetary Economics*, 54(8), 2305–2320. https://doi.org/10.1016/j.jmoneco.2007.06.025

Canbary, Z., & Grant, C. (2019). The Marginal Propensity to Consume for Different Socio-economic Groups. *London: Brunel University London*, Working Paper No. 1916

Cole, S. A., & Shastry, G. K. (2008). If You Are So Smart, Why Aren't You Rich?: The Effects of Education, Financial Literacy and Cognitive Ability on Financial Market Participation. *Harvard Business School Working Paper*. 09-071

De Nardi, M. (2004). Wealth Inequality and Intergenerational Links. *The Review of Economic Studies*, 71(3), 743–768.

Deaton, A. (2019). The Analysis of Household Surveys (Reissue Edition with a New Preface): A Microeconometric Approach to Development Policy. *World Bank Publications.*

Debortoli, D., & Galí, J. (2021). Monetary Policy with Heterogeneous Agents: Insights from TANK Models. *In Economics Working Papers* (No. 1686; Economics Working Papers). Department of Economics and Business, Universitat Pompeu Fabra. ttps://ideas.repec.org/p/upf/upfgen/1686.html

Dynan, K. E., Skinner, J., & Zeldes, S. P. (2004). Do the Rich Save More? *Journal of Political Economy*, 112, 2, 397-444.

Eberly, J. C. (1994). Adjustment of Consumers' Durables Stocks: Evidence from Automobile Purchases. *Journal of Political Economy*. https://doi.org/10.1086/261940

Eika, L., Mogstad, M., & Vestad, O. L. (2020). What Can We Learn about Household Consumption Expenditure From Data on Income and Assets? *Journal of Public Economics*, 189, 104163. https://doi.org/10.1016/j.jpubeco.2020.104163

Fagereng, A., Holm, M. B., & Natvik, G. J. (2021). MPC Heterogeneity and Household Balance Sheets. *American Economic Journal: Macroeconomics*, 13(4), 1–54. ttps://doi.org/10.1257/mac.20190211

Fernández-Villaverde, J., & Krueger, D. (2007). Consumption over the Life Cycle: Facts from Consumer Expenditure Survey Data. *The Review of Economics and Statistics*, 89(3), 552–565. https://doi.org/10.1162/rest.89.3.552

Framke E, Sörensen J., Andersen P., et al. (2020). Contribution of Income and Job Strain to the Association between Education and Cardiovascular Disease in 1.6 Million Danish Employees. *European Heart Journal*, 41, 1164-78.

Gourinchas, P.-O., & Parker, J. A. (2002). Consumption over the Life Cycle. *Econometrica*, 70(1), 47–89. https://doi.org/10.1111/1468-0262.00269

Gross, D. B., & Souleles, N. S. (2002). Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data. *The Quarterly Journal of Economics*, 117(1), 149–185. https://doi.org/10.1162/003355302753399472

Hall, A., Scheving, A. S., & Zoega, G. (2021). The Effect of a Financial Crisis on Household Finances: A Case Study of Iceland's Financial Crisis. *Journal of financial Crises*. 3, 4, 1-24.

Hayashi, F. (1985). The Permanent Income Hypothesis and Consumption Durability: Analysis Based on Japanese Panel Data*. *The Quarterly Journal of Economics*, 100(4), 1083–1113. https://doi.org/10.2307/1885676

Hougaard Jensen, S. E., Sveinsson, T. S., & Zoega, G. (2021). Longevity Adjustment of Retirement Age and Intragenerational Inequality. *Economica*, 88(350), 339-363.

Hsieh, C.-T. (2003). Do Consumers React to Anticipated Income Changes? Evidence from the Alaska Permanent Fund. *American Economic Review*, 93(1), 397–405. https://doi.org/10.1257/000282803321455377

Jappelli, T., & Pistaferri, L. (2010). The Consumption Response to Income Changes. *Annual Review of Economics*, 2(1), 479–506. https://doi.org/10.1146/annurev.economics.050708.142933

Kaplan, G., & Violante, G. L. (2010). How Much Consumption Insurance beyond Self-Insurance? *American Economic Journal: Macroeconomics*, 2(4), 53–87. https://doi.org/10.1257/mac.2.4.53

Kaplan, G., Violante, G. L., & Weidner, J. (2014). The Wealthy Hand-to-Mouth, *Brookings Papers on Economic Activity*, 45, 77-153.Working Paper No. 20073; Working Paper Series). *National Bureau of Economic Research*. https://doi.org/10.3386/w20073

Karger, E., & Rajan, A. (2020). Heterogeneity in the Marginal Propensity to Consume: Evidence from COVID-19 Stimulus Payments (SSRN Scholarly Paper No. 3612828). *Social Science Research Network*. https://doi.org/10.2139/ssrn.3612828

Kolsrud, J., Landais, C., & Spinnewijn, J. (2020). The Value of Registry Data for Consumption Analysis: An Application to Health Shocks. *Journal of Public Economics*, 189, 104088. https://doi.org/10.1016/j.jpubeco.2019.104088

Lusardi, A. (1996). Permanent Income, Current Income, and Consumption: Evidence from Two Panel Data Sets. *Journal of Business & Economic Statistics*, 14(1), 81–90. https://doi.org/10.1080/07350015.1996.10524631

Lusardi, A. (2008). Household Saving Behaviour: The Role of Financial Literacy, Information, and Financial Education Programs (Working Paper No. 13824; Working Paper Series). *National Bureau of Economic Research.* https://doi.org/10.3386/w13824

Malmendier, U., & Nagel, S. (2011). Depression Babies: Do Macroeconomic Experiences Affect Risk Taking?. *The Quarterly Journal of Economics*, 126(1), 373–416. https://doi.org/10.1093/qje/qjq004

Meara E, Richards S & Cutler D (2008). The Gap Gets Bigger: Changes in Mortality and Life Expectancy by Education 1981-2000. *Health Affairs*, 27, 350-60

Messacar, D. (2017). The Effects of Education on Canadians' Retirement Savings Behaviour. *Analytical Studies Branch Research Paper Series. In Statistics Canada. Statistics Canada.* https://eric.ed.gov/?id=ED585312

Ólafsson, S. (2017). ESPN Thematic Report: Assessment of Pension Adequacy in Iceland. *Brussels: European Commission.*

Parker, J. A. (1999). The Reaction of Household Consumption to Predictable Changes in Social Security Taxes. *American Economic Review*, 89(4), 959–973. https://doi.org/10.1257/aer.89.4.959

Parker, J. A., Souleles, N. S., Johnson, D. S., & McClelland, R. (2013). Consumer Spending and the Economic Stimulus Payments of 2008. *American Economic Review*, 103(6), 2530–2553. https://doi.org/10.1257/aer.103.6.2530

Souleles, N. S. (1999). The Response of Household Consumption to Income Tax Refunds. *The American Economic Review*, 89(4), 12.

Stephens, M., & Unayama, T. (2011). The Consumption Response to Seasonal Income: Evidence from Japanese Public Pension Benefits. *American Economic Journal: Applied Economics*, 3(4), 86–118. https://doi.org/10.1257/app.3.4.86

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases. *Science*, 185(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

Zeldes, S. P. (1989). Consumption and Liquidity Constraints: An Empirical Investigation. *Journal of Political Economy*, 97(2), 305–346.

Appendix A

Equation (5) estimated separately for five disposable income quintiles.

Table A1. Parameter estimates (bottom quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.972***	0.990**	0.998***
	(0.0079)	(0.0080)	(0.0149)
γ	0.873***	0.858***	0.840***
	(0.0094)	(0.0097)	(0.0148)
ρ	-0.827***	-0.831***	-0.836***
	(0.0131)	(0.0123)	(0.0210)
R^2	0.300	0.280	0.307
N	154,847	151,626	44,457

Notes: Tables A1-A5 present estimates from equation (5), with each table showing estimates for one income quintile and for each education group. The income quintiles are constructed based on a household's position in the disposable income distribution in a given year. The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

Table A2. Parameter estimates (second quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.940***	0.942***	1.002***
	(0.0138)	(0.0105)	(0.0179)
γ	0.737***	0.748***	0.808***
	(0.0204)	(0.0164)	(0.0253)
ρ	-0.713***	-0.707***	-0.810***
	(0.0171)	(0.0136)	(0.0220)
R^2	0.195	0.185	0.207
N	104,061	176,299	70,559

Table A3. Parameter estimates (third quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.934*** (0.0174)	0.945*** (0.0121)	0.943*** (0.0166)
γ	0.745*** (0.0299)	0.702*** (0.0191)	0.735*** (0.0231)
ρ	-0.665*** (0.0208)	-0.666*** (0.0148)	-0.714*** (0.0198)
R^2	0.202	0.177	0.189
N	66,848	170,766	113,306

Table A4. Parameter estimates (fourth quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.940*** (0.0222)	0.963*** (0.0138)	0.920*** (0.0120)
γ	0.737*** (0.0330)	0.698*** (0.0191)	0.724*** (0.0167)
ρ	-0.683*** (0.0250)	-0.671*** (0.0155)	-0.653*** (0.0142)
R^2	0.209	0.187	0.180
N	40,297	141,913	168,707

Table A5. Parameter estimates (top quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	1.079*** (0.0231)	0.993*** (0.0110)	0.964*** (0.0062)
γ	0.499*** (0.0165)	0.534*** (0.0090)	0.557*** (0.0069)
ρ	-0.647*** (0.0215)	-0.567*** (0.0109)	-0.555*** (0.0075)
R^2	0.288	0.275	0.293
N	25,366	99,337	226,222

Table A6. Parameter estimates (first quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.841*** (0.0119)	0.874*** (0.0102)	0.882*** (0.0103)
γ	0.931*** (0.0071)	0.907*** (0.0074)	0.836*** (0.0072)
ρ	-0.782*** (0.0142)	-0.798*** (0.0131)	-0.751*** (0.0128)
R^2	0.552	0.514	0.520
N	98,667	128,564	123,696

Notes: Tables A6-A10 present estimates from equation (5), with each table showing estimates for one net worth quintile and for each education group. The net worth quintiles are constructed based on a household's position in the net worth distribution in a given year. The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

Table A7. Parameter estimates (second quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.939*** (0.0201)	0.922*** (0.0140)	0.912*** (0.0149)
γ	0.687*** (0.0123)	0.683*** (0.0093)	0.649*** (0.0097)
ρ	-0.678*** (0.0226)	-0.644 *** (0.0161)	-0.588*** (0.0171)
R^2	0.571	0.562	0.559
N	89,471	140,832	120,622

Table A8. Parameter estimates (third quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	1.031***	1.005***	0.999***
	(0.0176)	(0.0130)	(0.0138)
γ	0.589***	0.607***	0.603***
	(0.0134)	(0.0092)	(0.0087)
ρ	-0.662***	-0.635***	-0.632***
	(0.0223)	(0.0158)	(0.0161)
R^2	0.470	0.463	0.481
N	65,446	144,249	141,219

Table A9. Parameter estimates (fourth quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.996***	1.005***	0.985***
	(0.0167)	(0.0116)	(0.0115)
γ	0.637***	0.619***	0.653***
	(0.0154)	(0.0088)	(0.0088)
ρ	-0.648***	-0.639***	-0.642***
	(0.0226)	(0.0143)	(0.0140)
R^2	0.402	0.400	0.443
N	62,503	156,309	132,109

Table A10. Parameter estimates (fifth quintile)

	Primary education (1)	Secondary school (2)	University (3)
ψ	1.011***	1.001***	1.007***
	(0.0065)	(0.0055)	(0.0075)
γ	0.643***	0.666***	0.656***
	(0.0149)	(0.0087)	(0.0100)
ρ	-0.651***	-0.665***	-0.651***
	(0.0161)	(0.0102)	(0.0128)
R^2	0.419	0.378	0.385
N	75,332	169,987	105,605

Equation (5) estimated separately for five disposable income quintiles for whole period, 2005-2019

Table A11. Parameter estimates

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.973*** (0.0017)	0.978*** (0.0019)	0.967*** (0.0033)
γ	0.807*** (0.0089)	0.783*** (0.0093)	0.799*** (0.0141)
ρ	-0.796*** (0.0092)	-0.770*** (0.0095)	-0.786*** (0.0144)
R^2	0.341	0.318	0.388
N	163,244	147,715	39,969

Notes: Tables A11-A15 present estimates from equation (5), with each table showing estimates for one income quintile and for each education group. The income quintiles are constructed based on a household's average disposable income over the sample period. The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

Table A12. Parameter estimates

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.971*** (0.0032)	0.974*** (0.0027)	0.966*** (0.0043)
γ	0.766*** (0.0111)	0.729*** (0.0083)	0.741*** (0.0126)
ρ	-0.789*** (0.0123)	-0.718*** (0.0093)	-0.741*** (0.0143)
R^2	0.269	0.248	0.283
N	103,219	178,120	69,580

Table A13. Parameter estimates

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.966***	0.971***	0.961***
	(0.0065)	(0.0030)	(0.0059)
γ	0.717***	0.700***	0.743***
	(0.0133)	(0.0083)	(0.0103)
ρ	-0.707***	-0.687***	-0.748***
	(0.0173)	(0.0094)	(0.0139)
R^2	0.271	0.247	0.263
N	65,473	172,991	112,458

Table A14. Parameter estimates

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.983***	0.970***	0.952***
	(0.0105)	(0.0035)	(0.0047)
γ	0.672***	0.688***	0.715***
	(0.0149)	(0.0089)	(0.0086)
ρ	-0.702***	-0.673***	-0.688***
	(0.0202)	(0.0106)	(0.0111)
R^2	0.300	0.255	0.250
N	38,416	144,111	168,388

Table A15. Parameter estimates

	Primary education (1)	Secondary school (2)	University (3)
ψ	0.975***	0.977***	0.970***
	(0.0048)	(0.0030)	(0.0020)
γ	0.538***	0.591***	0.603***
	(0.0166)	(0.0091)	(0.0066)
ρ	-0.528***	-0.574***	-0.580***
	(0.0170)	(0.0094)	(0.0069)
R^2	0.371	0.334	0.329
N	21,067	97,004	232,856

Table A16. MPC by income and wealth quintiles

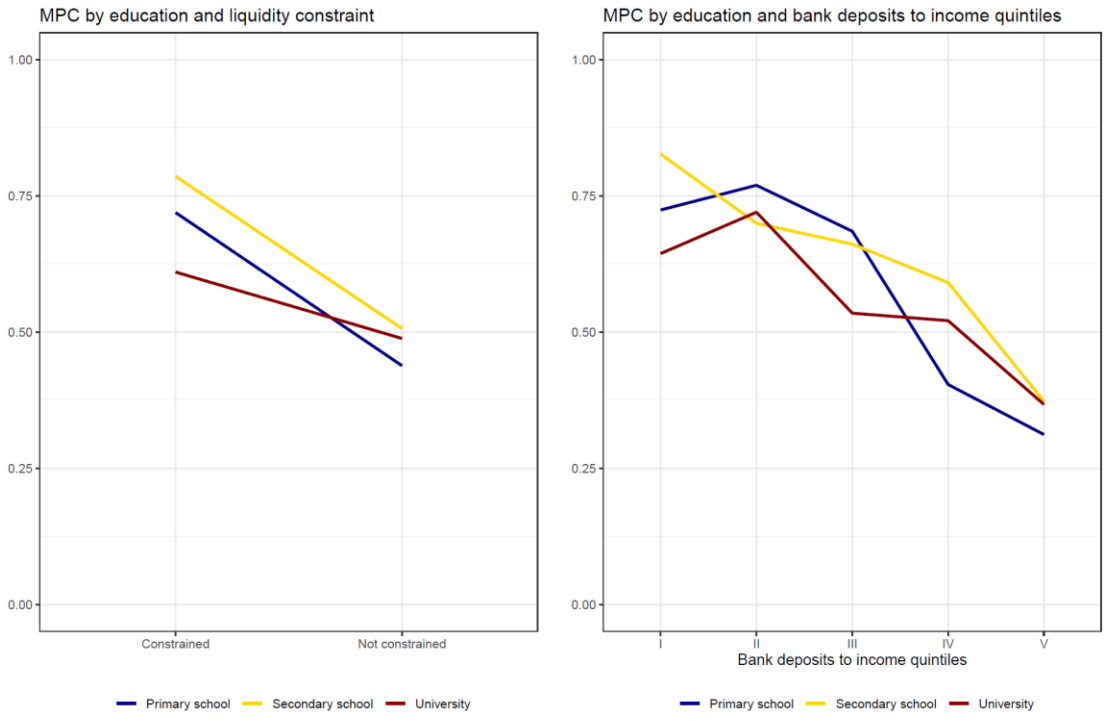
	Income quintiles	Wealth-to-income quintiles
$\Delta\widehat{y_{i,t}}$ ×primary school× $quintile$ 1	0.739***	0.840***
	(0.0426)	(0.0378)
$\Delta\widehat{y_{i,t}}$ ×primary school× $quintile$ 2	0.629***	0.550***
	(0.0750)	(0.0268)
$\Delta\widehat{y_{i,t}}$ ×primary school× $quintile$ 3	0.439***	0.378***
	(0.0822)	(0.0384)
$\Delta\widehat{y_{i,t}}$ ×primary school× $quintile$ 4	0.683***	0.408***
	(0.0669)	(0.0737)
$\Delta\widehat{y_{i,t}}$ ×primary school× $quintile$ 5	0.464***	0.523***
	(0.0245)	(0.0816)
$\Delta\widehat{y_{i,t}}$ ×secondary school× $quintile$ 1	0.770***	0.918***
	(0.0358)	(0.0376)
$\Delta\widehat{y_{i,t}}$ ×secondary school× $quintile$ 2	0.764***	0.612***
	(0.0573)	(0.0237)
$\Delta\widehat{y_{i,t}}$ ×secondary school× $quintile$ 3	0.639***	0.417***
	(0.0685)	(0.0233)
$\Delta\widehat{y_{i,t}}$ ×secondary school× $quintile$ 4	0.674***	0.477***
	(0.0540)	(0.0469)
$\Delta\widehat{y_{i,t}}$ ×secondary school× $quintile$ 5	0.518***	0.705***
	(0.0170)	(0.0490)
$\Delta\widehat{y_{i,t}}$ ×university× $quintile$ 1	0.694***	0.785***
	(0.0380)	(0.0393)
$\Delta\widehat{y_{i,t}}$ ×university× $quintile$ 2	0.811***	0.464***
	(0.0562)	(0.0262)
$\Delta\widehat{y_{i,t}}$ ×university× $quintile$ 3	0.644***	0.369***
	(0.0669)	(0.0274)
$\Delta\widehat{y_{i,t}}$ ×university× $quintile$ 4	0.603***	0.409***
	(0.0599)	(0.0490)
$\Delta\widehat{y_{i,t}}$ ×university× $quintile$ 5	0.439***	0.723***
	(0.0200)	(0.0500)
N	1,423,797	1,423,797

Notes: Table A16 presents estimates of MPC, shown in Figure 5, obtained from equation (7) with additional interactions with income quintiles and net wealth to income quintiles The estimates are based on households aged 31 to 80 in 2005 to 2019. Standard errors clustered at the individual level are in parentheses. *** denotes significance at the 1% level, ** denotes significance at the 5% level. N is the number of observations.

Figure A1. Life-cycle profile of consumption without controls for income

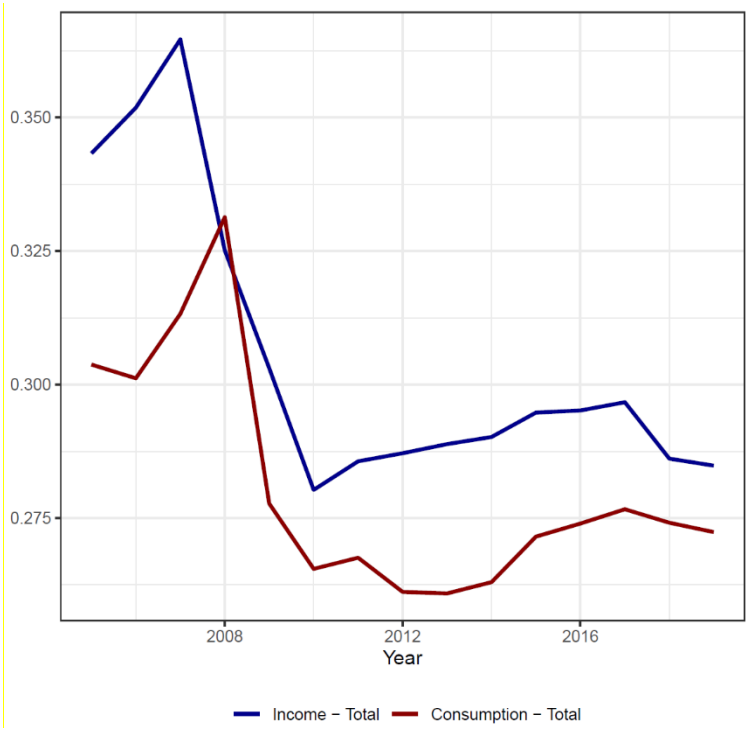
Notes: Figure A1 shows the age effects (β_{Age}) estimated from equation (4) for each education group without controls for income. The estimates are based on households aged 31 to 80 in 2005 to 2019.

Figure A2. The MPC using alternative proxies for liquidity constraints



Notes: Figure A2 MPC estimates from equation (7) with additional interactions with a proxy for an absolute liquidity constraint (left panel) and bank deposits to income quintiles (right panel). Those are alternative proxies for liquidity constraints from that of Figure 5. The estimates are based on 1,423,797 households aged 31 to 80 in 2005 to 2019

Figure A3. Income and consumption inequality



Notes: Figure A3 shows the within year Gini coefficient for consumption and disposable income. The estimates are based on households aged 31 to 80 in 2005 to 2019.

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