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Savings and Wealth of the Lifetime Rich: Evidence from the UK and the US*

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Abstract

Whether higher lifetime income households do save a larger share of their income is one of the longstanding empirical questions in economics that has been surprisingly difficult to answer. We use both consumption data and a new dataset containing both individual survey data on wealth holdings and administrative data on earnings histories from the UK to examine this question. We find evidence of a positive relationship between saving rates (and wealth accumulation) and levels of permanent income. Our findings are consistent with earlier results from Dynan, Skinner & Zeldes (2004) using consumption data from the US, but somewhat at odds with evidence from the US which has examined retirement wealth and lifetime earnings in the Health and Retirement Study, HRS (Gustman & Steinmeier 1999, Venti & Wise 1998). We present new evidence using more recent HRS data, applying exactly the same methodology as we have used on the UK data, and find broadly the same results as these earlier papers. This suggests that the differences are not solely driven by differences in methodology or time period considered.

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JEL Classification: D12, D91, C81

1 Introduction

Whether higher lifetime income households do save a larger share of their income is one of the longstanding empirical questions in economics that has been surprisingly difficult to answer. It is surprising that no consensus has been reached on this issue both because the question is apparently simple – it is just a correlation – and because there is enormous interest in knowing this fact in order to make progress on a number of important policy issues.

One example of where this question has been much debated recently by economic researchers is in the optimal tax literature. Whether saving propensities vary systematically by ability level matters greatly for optimal taxation, in particular whether one wants to tax capital income or, whether one wants to select labour income or consumption as a base for taxation. Saez (2002) – generalizing the results from Atkinson & Stiglitz (1976) to the case of heterogeneous preferences – argues that, if high ability individuals do indeed save more, taxation of capital income can become welfare improving. Diamond & Spinnewijn (2011) extend this work and highlight the importance of the relationship between the willingness to work and saving propensities, conditional on ability. The general intuition behind these results is that, if ability is unobserved but high ability individuals act in a particular way (for example, by saving a lot) then this information can be used by the tax authorities to reveal the ‘types’ of taxpayers and thus reduce the efficiency cost of a given redistributive objective.

The corresponding empirical question is, however, only apparently simple. There is no controversy about the fact that households with high current income save more than those with low current income. This is a well-established fact. But there is a lot more disagreement about whether one can conclude from this that the “rich” do indeed save more. Friedman (1953, 1957) was the first to suggest that no such conclusion can be drawn from this stylised fact. If income is varying over the life cycle, individuals should be willing to smooth their consumption by saving in good times and borrowing in bad ones. He postulated that empirical evidence available at the time he was writing could not reject that saving rates were constant across the permanent income distribution.

The empirical difficulty is twofold: it is hard to find good measures of saving rates, as one needs either comprehensive and accurate measures of both income and consumption or panel data on wealth; and it is difficult to measure permanent or lifetime income with most of the available data sources. It is even rarer for datasets to allow the construction of good measures of both saving rates and permanent income. Previous literature has relied on two main methods to tackle this question. The first strand of the literature has used consumption and income data to measure saving and has instrumented for permanent income using education, current consumption or lagged earnings. Dynan, Skinner & Zeldes (2004), using this methodology, found that the “rich” do save a higher fraction of their income. A potential problem with this instrumental variables approach is the quality of the instrument. If, for instance, education has a direct impact on saving rates (in addition to its impact

on lifetime earnings), then the approach can be called into question, or at least leads to a different interpretation. In a second strand of the literature, Gustman & Steinmeier (1999) and Venti & Wise (1998, 1999, 2000) have used US administrative data on earnings histories linked to the Health and Retirement Study (HRS) to analyse how wealth in retirement is associated with different levels of lifetime earnings. They found that ratios of retirement wealth to lifetime earnings were roughly constant across the lifetime income distribution. This reinforces Friedman’s view but is at odds with conclusions from the literature using US consumption data.

Most of the earlier debate in the literature has been confined to the US for lack of evidence on other countries. This paper extends the evidence base to the UK by applying two different approaches, contrasting both the results obtained using different data sources within the UK and also comparing to results obtained from US data.

First we use consumption data from the UK – from the Living Costs and Food Survey (LCFS)¹ – and apply a similar methodology to that used by Dynan, Skinner & Zeldes (2004) (henceforth DSZ) and Alan et al. (2013) (henceforth AAC), using education as a proxy for earning ability. We find, as DSZ did using US data and AAC did using Canadian data, that long-term income predicted from educational attainment is positively related to savings rates. As DSZ do, we find a negative relationship between long-term income, using consumption as a predictor, and saving rates. This is in contrast to AAC, who find no evidence of either a positive or a negative relationship.

Our second and preferred approach is to use newly available information from the English Longitudinal Study of Ageing (ELSA) linked to administrative data on earnings and employment going back to 1948, as well as similar data from the HRS linked with earnings data from the Social Security Administration. For both the UK and the US case we can compute, with these data, measures of lifetime earnings based on a very long panel and relate ratios of wealth to lifetime earnings to the distribution of lifetime earnings. We find, in both countries, ratios of wealth to lifetime earnings positively correlated with education attainment measures. When use, however, lifetime earnings per year worked as a proxy for earning ability, we find strong positive correlations in the case of the UK and only a small positive link in the case of the US. In both countries, we find that numeracy explains a large part of the variation in ratios of private wealth to lifetime earnings, over and above standard controls for education and measures of lifetime earnings.

One difference between the institutional frameworks in the US and the UK is the impact of publicly funded pensions: state pensions in the UK are more redistributive than Social Security in the US, meaning that British high earners have to save more in private pensions to obtain similar replacement rates as American high earners. But this pension provision difference only explains part of the difference that we find between the two countries. We also

¹This survey was known as the Expenditure and Food Survey (EFS) between 2001 and 2007 and the Family Expenditure Survey (FES) before 2001.

discuss the possibility of other differences between the two countries like the higher prevalence of two career couples in the US and tax and benefit differences.

A caveat to our analysis that uses accumulated wealth as an indicator of saving is that we cannot take into account lifetime gifts and inheritances in England. If these unmeasured resources are correlated (positively or negatively) with measured lifetime earnings, our results could change. Using US data only we find relatively small influence of inherited wealth for those cohorts. A second caveat is that we make no claim that our results are generalisable as indicators of the behaviour of extremely wealthy households. Carroll (2010), for example, has shown that wealth accumulation amongst the very rich in the US is not well explained by standard life-cycle theories. Our data does not over-sample this small section of the population and we are therefore not able to examine their behaviour.

Section 2 presents a theoretical model of life-cycle consumption smoothing, which highlights the possible relationship between saving (and wealth) and lifetime earnings, and the importance of various sources of heterogeneity. Section 3 presents evidence from UK consumption data. Section 4 describes the data we use to construct measures of lifetime earnings and presents results on the correlations between ratios of wealth to lifetime earnings and different measures of lifetime earnings. Section 5 provides a cross-country comparison between US and UK data, including new evidence using the HRS linked to administrative Social Security records. Section 6 concludes.

2 Theory and empirical approaches

2.1 Background theory

In pursuit of an empirical stylised fact about whether “the rich save more” one has to define what is meant by “rich” and by “saving”. As mentioned above, there is no debate about the fact that those with high current incomes do indeed save a higher fraction of their current income. The question only makes sense in a life-cycle framework and it is therefore useful to characterise in what sense the lifetime-rich may be saving more or accumulating more wealth than the rest of the population.

To illustrate some of the features that determine the saving rate, we go back to a basic life-cycle model. A central assumption is that each individual (or household) maximises his lifetime utility, U , derived mainly from a consumption stream, C_t , and leisure, l_t , throughout his life. This lifetime utility also depends on his rate of time preference, δ , and his (known) length of life, T ²:

²This framework can be easily extended to one in which there is a positive probability of dying in each period.

$$U = E \left[\sum_{t=0}^T \frac{1}{(1+\delta)^t} u(C_t, l_t) + \frac{1}{(1+\delta)^{T+1}} B(A_{T+1}) \right] \quad (1)$$

The individual maximises his lifetime utility subject to his lifetime budget constraint. A lifetime budget constraint assuming constant returns to savings (r) is given in (2), which depends not only on net income ($\tau(Y_t)$) and consumption (and thus saving) in each period but also on any wealth inherited from previous generations (A_0) or bequeathed to subsequent ones (A_T):

$$A_0(1+r)^{T+1} + \sum_{t=0}^T (1+r)^{T-t} \tau(Y_t) = \sum_{t=0}^T (1+r)^{T-t} C_t + A_{T+1} \quad (2)$$

Consider a situation where we impose that the utility function is homothetic (which would include the frequently-used CRRA utility function), and that there are no constraints on borrowing or saving. Consider further two different individuals – one whose income is twice that of the other in each period. While the higher income individual will consume (and save) twice as much as the lower income individual in each time period – their saving rates (and accumulated wealth as a proportion of lifetime earnings) would be identical.

Embedded within equations (1) and (2), however, are a number of other factors related to preferences and the economic environment that are heterogenous across individuals and would affect the amount an individual saves in any year and the amount of wealth that an individual will have accumulated at a given point in his life. There is likely to be heterogeneity in preference for leaving bequests (?), life expectancies (?), rates of time preference (??), risk aversion (Parker & Fischhoff 2005, Frederick 2005). Further it is likely that some individuals will earn better rates of return than others, not simply as a reward to greater tolerance for risk but also coming from greater financial literacy (?) or through the leverage possible with larger asset portfolios.

If any of these factors (whether life circumstances or preferences) vary systematically with the level of lifetime resources, saving rates and the ratio of wealth to permanent income for individuals of a given age will vary systematically with the level of permanent income. There are many reasons why we might expect some of this to be the case.³ First, those with higher lifetime resources may have longer life expectancies (for example, if there is a direct association between lifetime resources and health). Second, if bequest motives are luxury goods, richer households would save more for bequests than what is implied by pure consumption smoothing. Third, there might be a correlation (either positive or negative) between the size of inheritances and gifts received and one's lifetime earnings. A positive correlation would lead to higher wealth to lifetime earnings ratios for high income households.⁴

³For a longer discussion of some of these issues see, for example, Masson (1988).

⁴It is also possible – though not captured by the simplified model presented here – that the propensity to save out of inheritances received is higher than from one's own earnings.

A second potential source of heterogeneity in individuals' outcomes stems from considering the role of uncertainty in this framework: savings decisions during the life-cycle are based on expectations of income flows, consumption needs and investment returns. Any unanticipated shocks likely to affect these (health shocks, unexpected property boom, redundancy etc.) could affect the amount of net wealth accumulated given individuals' lifetime earnings. These shocks could also be correlated with lifetime earnings and explain different patterns of wealth accumulation.

Third, the tax and benefit system can imply powerful incentives for some individuals to save more than others. In particular consumption floors (?) and means-tested retirement programmes (?) can discourage saving among those with low levels of wealth – a group that, regardless of heterogeneity in saving behaviour, is certainly to be drawn from those with lower permanent income.

The aim of this paper is not to assess the relationship between each of these factors and permanent income (much study has already been done on many of these relationships) but to assess their net effect. That is, we address the question: taking the effect of the differences in preferences, the economic environment and a progressive tax and benefit system together, what is the relationship between permanent income and the rate of wealth accumulation?

2.2 Empirical approaches

We develop two approaches to estimate the relationship between wealth accumulation and earning ability: first we look at annual saving rates using consumption data; second we look at wealth to lifetime earnings ratios using lifetime earnings data.

Our first empirical approach attempts to examine the relationship between saving rate $\frac{S}{Y}$ and earning ability E^A , controlling separately for other characteristics X that affect savings directly:

$$s_t = \frac{Y_t - C_t}{Y_t} = f(E^A) + X_t\beta + \epsilon_t \quad (3)$$

Equation (3) highlights the two main empirical difficulties of this analysis. First, one needs to find a measure of the saving rate. Saving is notoriously difficult to measure because one needs either: (i) simultaneously good measures of consumption and income, or (ii) good measures of wealth and its change over time. Second, one needs to find measures of earning ability, which is also very difficult to estimate. Two approaches have been used in the literature: (a) using a proxy for earning ability (or permanent income), and (b) measuring lifetime income with long panel datasets.

In Section 3 we use household survey data on income and consumption to measure s_t as the difference between current income and current expenditure, as a fraction of current income. We then proxy for E^A using measures of education and consumption. This is an approach previously used by DSZ and AAC. There are two major difficulties with this approach. First,

there is the difficulty of obtaining good measures of saving from household surveys. We measure saving as the difference between current income and current consumption in each period. Importantly, this measure of saving is a measure of *active* saving only (see below). Second, there is the question of finding good proxies for earning ability. Education level has been used as a proxy for permanent income and can be considered as a good proxy for earning ability, although education is likely to have an independent effect on saving behaviour.

In our second, and main, approach (Section 4), instead of looking at annual flows of saving, we examine a measure of the ratio of wealth holdings at the end of working life to lifetime resources ($\frac{W_R}{LR}$) and examine how these are related to measures of earning ability (equation (4)). Flows of saving, as previously defined, and stocks of wealth are conceptually different. First, whereas current saving ratios incorporate saving for both short- and long-term objectives, the lifetime approach concentrates on net savings during the working life, whose purpose is mostly to finance consumption during retirement and bequests. Second, it is a measure of both active and passive saving. Wealth incorporates not only heterogeneity in saving rates (s_t) but also heterogeneity in returns to saving (r) or size of inheritances received (I_t).

$$\frac{W_R}{LR} = \frac{\sum_{t=0}^R (1+r)^{R-t} s_t [Y_t + I_t]}{\sum_{t=0}^R [Y_t + I_t]} = f(E^A) + X_t \beta + \epsilon_t \quad (4)$$

The expression to the right of the final equality represents our estimating equation, where E^A represents lifetime earnings. The development of various surveys over recent years means that there are now a number of datasets worldwide that provide reasonably good measures of wealth holdings (W_R). In our analysis we use data on private wealth and state pension wealth derived from ELSA. The major empirical difficulties in implementing this approach are, therefore, in finding: (i) measures of lifetime earnings (E^A), and (ii) measures of total lifetime resources. We use administrative data on past earnings and employment to construct a measure of lifetime earnings, which we use as our measure of lifetime resources. The calculation of lifetime earnings is described in more detail in Section 4. The major weakness of this as a measure of lifetime resources is that it does not capture the value of inheritances or gifts received. We return to discussion of this issue below. In order to account for the choice about the timing of retirement – a possible objective of higher savings – we use lifetime earnings normalised by the number of years worked.

We proxy earning ability (E^A) using measures of lifetime earnings. Lifetime earnings is, however, distinct from earning ability for two main reasons. First, earning ability is an *ex ante* concept not taking into account unanticipated shocks both to earnings capacity or to investment returns. We will aim to control for these shocks and assess whether they can undo any unconditional correlations between accumulated wealth and lifetime earnings. Second, earning ability differ from lifetime earnings in so far as lifetime earnings incorporate labour supply decisions during all of the working life. Unlike in the simplified theoretical framework

set out above, individuals' labour supply is not fixed, instead they are able to choose whether or not and to an extent how much to work in each year. In order to account for this effect, we use lifetime earnings normalised by the number of years worked. Whilst this normalisation does not account for individual choices over the intensive margin labour supply (that is, the number of hours worked), it does at least take into account the extensive margin (including the retirement decision).

Increasing ratios of wealth to lifetime earnings as lifetime earnings increase could be explained either by a higher propensity to save among higher earners ($\frac{\partial s}{\partial LE} > 0$), or by higher returns on savings being available to higher earners ($\frac{\partial r}{\partial LE} > 0$), or by inherited wealth being positively correlated with own lifetime earnings ($\frac{\partial I}{\partial LE} > 0$).

In both of our empirical approaches we specify the function f in equation (3) as either an affine function of Y^P or as a set of quintile/decile dummies to test for non-linearities.

3 Consumption data approach

Given a data set that contains income and expenditure at the household level as well as an instrument or proxy for permanent income, one can assess the correlation between saving rates (calculated as the difference between income and expenditure expressed as a proportion of income) and that proxy, and therefore conclude something about the relationship between permanent income and saving. This is the approach taken in DSZ and AAC in their investigation of the relationship between permanent income and saving in the US and Canada respectively. The first of these papers uses four proxies for permanent income: current consumption, education, lagged earnings and future earnings, while the second paper uses the first two of these. Both these papers discuss, in greater detail than will be given below, the rationale for the use of each of the proxies.

In this section we use the UK's household budget survey (the LCFS) to assess the relationship between each of consumption and education (as proxies for permanent income) and saving rates.

3.1 Data

The LCFS is an annual survey, with a nationally-representative sample of between 5,000 and 7,000 households. It is the only nationally-representative survey in the UK that collects comprehensive data on household spending and is the main source for the derivation of the weights that are used in the construction of the UK's official price indices. Importantly, for our purpose, the LCFS has, since 1978, asked respondents to record the year they left full-time education.

Household expenditure is collected in the LCFS using two methods. Respondents are given a diary in which they are asked to record all their purchases in a two-week period. In addition,

there is a detailed questionnaire which collects information on spending in recent months on infrequently-purchased items (the number of months varies across items). Respondents are also asked a number of questions on the income of household members as well as a range of socio-economic and demographic characteristics.

Our measure of saving is calculated as income less expenditure. Income is “usual” income, while expenditure, as discussed above, is partly based on a two-week diary and partly based on a questionnaire which covers a longer time period. Interpreting this as “usual” expenditure, the saving rate can be thought of an estimate of the saving rate of a particular household in the months leading up to the survey date. This interpretation follows that in, for example, Banks & Blundell (1994) and Crossley & O’Dea (2010); both papers discuss the data in more depth.

3.2 Results

Before showing the relationship between saving rates and education, we document (using LCFS data) the frequently-cited fact that saving rates are increasing in *current* income. Table 1 shows the results of median regressions of saving rates on dummies representing quintiles of current (equivalised) income (the dummy for the first income quintile is omitted). Also included are age dummies defined for ten-year age groups⁵ (the dummy for those in their twenties is omitted) and a set of dummies for household type⁶ and a dummy for each year.⁷ We give results on four three-year samples – one containing three recent years of data (2007 to 2009), one for 1997 to 1999, one for 1987 to 1989, and one for our first three years of data 1978 to 1980. We look at these four time periods separately as there is no reason, *a priori*, to believe that the relationship between current income, or indeed permanent income (or education), and saving rates is stable over time. The results in Table 1 confirm that saving rates, at the median, rise with current income – those in the top income quintile record saving rates that are, at the median, between 30 and 50 percentage points (depending on the sample) higher than the saving rate of those in the bottom quintile. This is in line with what DSZ found for the US but bigger than the numbers reported by AAC for Canada (where the top quintile exhibits saving rates that are only 25 percentage points higher than those in the bottom quintile).

This general pattern is likely to be driven by some combination of the following three factors. First, measurement error in current income will cause substantial measurement error in the saving rates. As an approximation that will hold for small saving rates, measurement

⁵As our measure of saving is defined at the household level so too must be our age of household variable. We define the age of the household as the age of the older of the HRP and his/her spouse.

⁶Households are defined as one of: five non-pensioner types (single male, single female, lone parent, couple with no children, couple with children); three pensioner types (single male, single female, couple); or two types that contain, in one household, more than one family (without children and with children).

⁷The constant gives the estimated median saving rate for a household with the characteristics of the omitted groups (that is a household in the first income quintile and in their twenties).

error of $x\%$ in income will yield measurement error of x percentage *points* in the saving rate. This mechanical relationship between current income and saving rates will yield positive coefficients in a regression context. Second, transitory innovations to income will also generate a positive relationship between income and saving rates. This comes from the fact that, if individuals are behaving in the manner suggested by the lifecycle model and are not borrowing constrained, most of a transitory increase (decrease) in income will be saved (dissaved). Third, is our correlation of interest – the relationship between permanent income (which will of course be correlated with measured current income) and saving. To attempt to understand the extent of the importance of this last factor, the remainder of this section looks at the relationship between education and non-durable consumption (as a proxy or instrument for permanent income) and saving rates.

Table 2 presents an instrumental variables approach for median regressions, used by DSZ and AAC, using age finished education⁸ as an instrument for long-term or permanent income. These results are obtained using a two stage procedure. In the first stage current income is regressed on education variables and controls (age, year, households composition) to obtain a predicted value for long-term income. In the second stage (reported in Table 2) the predicted values of long-term income (grouped into quintiles) are used as regressors in the median regression of saving rates. In all the samples, the dummy for the top permanent income quintile is statistically significantly larger than the other quintile dummies, indicating that richer households, as predicted using education as an instrument, have higher saving rates than the other households.

It is worth noting that the coefficients in Table 2 are of a substantially more modest magnitude than those in Tables 1. This implies that measurement error and transitory variation in income can explain most of the positive association observed between current income and saving rates.

Instead of implementing the IV procedure described above, a simpler approach can be taken. This simply involves regressing saving rates on education directly (i.e. treating education as a proxy for permanent income). In the results that follow, we place all individuals in one of four education groups: i) those who left full-time education (FTE) at or before the age until which their attendance at school was compulsory (where we take account of the fact that that age has varied between 10 and 16 for those in our sample, depending on the year in which they were born); ii) those who left FTE the year after they reached the compulsory school leaving age; iii) those who left FTE at or before the age of 18, but more than a year after they reached the compulsory school leaving age; iv) those who left FTE at or after the age of 19 (i.e. those who are likely to have attended a third level institution).⁹

⁸This is represented by a dummy for having left at or before the age of 14, dummies for each age between 15 and 20 inclusive and a dummy for at or after the age of 21. We take the education of the household to be the greater of the education level of the “Household Reference Person” (HRP) and his/her spouse.

⁹The results are qualitatively similar when we use the actual age completed full time education as above.

Table 3 shows the results. A reason for preferring this approach (also carried about by DSZ) is that the instrumental variable approach relies on the instrument being uncorrelated with the dependent variable except through its impact on the permanent income variable. This is unlikely to be the case, as education could well have a direct impact on saving rates. Moreover we are not really interested in the causal impact of permanent income on saving rate but simply on establishing a correlation between high long-term income and saving rates. We show our results in Table 3 using two different saving rates: the saving rate in panel A includes mortgage capital repayments (but not interest payments) as saving, while in panel B the saving rate does not. In both panels of Table 3, we show coefficient estimates from a median regression of the saving rate on a set of dummies for each education group (the least educated group is omitted) along with dummies for age, household type and year.

The results give a clear sense of the relationship between saving rates and education. Those with the most education (those households where a member stayed in FTE until at least the age of 19) save substantially and significantly more than those households where all members had less education. The difference in saving rates between the most educated households and all the others, at the median and controlling for age and household type, is approximately four percentage points. There is no discernable pattern between the saving rates of the other three groups.¹⁰

In Table 4 we present another approach used in the literature, that of using non-durable consumption as an instrument for permanent income. There are two concerns regarding the use of expenditure (or its components) as an instrument for permanent income: transitory consumption and measurement error in consumption will both generate a mechanical *negative* relationship between saving rates and the instrument. Therefore, the gradient of the saving rates with respect to permanent income will have a bias to the negative. This issue leads DSZ to argue (credibly) that while an estimated positive gradient should be considered persuasive (in the light of the bias to the contrary) a flat or negative gradient should be considered inconclusive. In each of the four periods we look at, we find a substantial and robustly-estimated negative relationship between saving rates and permanent income (see Table 4) – that is, the exercise yields results that are inconclusive.

Unlike DSZ and AAC, we do not take a firm stand on whether instrumenting by education or by consumption is better or worse. Both approaches have serious issues, well discussed in those papers. Our conclusion is that we find a robust positive relationship between saving rates and the highest education group, consistent with the view that those with higher permanent income save more. We find a negative relationship between saving rates and consumption, which, given the bias discussed above, is an inconclusive result. The use of consumption

¹⁰We have tested whether there is any significant difference between the median saving rates of each of the three pairwise combinations in all eight regressions (i.e. all four time periods under both definitions of the saving rates). In these 24 tests, we find no difference that is statistically significant at the 5% level and only three significant differences at the 10% level: that is, approximately the number of false rejections that we would be expect from that number of tests.

data is bound to face these limits. For these reasons, the next section presents an alternative approach using newly available administrative data with extremely rich lifetime earnings data and very precise information on wealth.

4 Lifetime earnings data approach

Survey data on consumption and income allows us to examine how active saving is related to measures of permanent income. As discussed in Section 2, there may be a number of reasons why this may be the case, which have potentially important implications for public policy, including what the optimal structure of taxation is. However, there are also other reasons why wealth accumulation may differ among individuals with different levels of permanent income even if the propensity to save out of income does not. These, as discussed in Section 2, include the fact that individuals with higher permanent incomes may also have access to higher rates of return than lower permanent income individuals, or they may receive greater inheritances. In this section we therefore use a different approach to answering the question of “do the rich save more?” – using data on wealth holdings in early retirement, coupled with information on earnings during working life to examine whether the ratio of wealth holdings to lifetime resources is correlated with “permanent income” (as measured by lifetime earnings).

4.1 Data

The data we utilise in this section is a newly available dataset based on the linkage of the English ageing survey ELSA and administrative data from the UK National Insurance (NI) system. We discuss each in turn.

ELSA is a biennial longitudinal survey of a representative sample of the English household population aged 50 and over (plus their partners). The first wave was conducted between April 2002 and March 2003 and sampled 12,099 individuals (of whom 11,391 were core sample members; the remainder were individuals aged under 50 who were the partners of core sample members) from 7,934 households. There are currently four waves of data available (2002–03, 2004–05, 2006–07 and 2008–09). However, we focus in this paper on evidence from the first wave of ELSA (2002–03) because this is currently the only wave for which all the data required for our analysis is available. ELSA collects a wide range of information on individuals’ circumstances. This includes detailed measures of their financial situation: income from all sources (including earnings, self-employment income, benefits and pensions), non-pension wealth (including the type and amount of financial assets, property, business assets and antiques) and private pension wealth (including information on past contributions and details of current scheme rules). ELSA also collects information on individuals’ physical and mental health, cognitive ability, social participation and expectations of future events (such as surviving to some older age or receiving an inheritance). The presence of these other measures

of individual circumstances and abilities, alongside detailed measures of wealth and income allows us to shed some light on the factors (hinted at by the theoretical literature) that may be important in driving the relationship between lifetime earnings and wealth accumulation that we find – we return to this point below.

ELSA has been recently linked to NI records, which are administrative data collected by the UK Government since 1948 in order to establish individuals' contribution records and thus their rights to claim contributory benefits such as state pensions (for a history of state pensions in the UK, see Bozio, Crawford & Tetlow 2010). ELSA respondents were asked for permission to link to their NI records. Among respondents to the 2002–03 wave of ELSA, 79.0% gave permission for a link to be made to their NI records and 71.8% have been successfully linked. While there are differences in some dimensions between the full ELSA sample and the linked subset, the samples do not look very dissimilar.¹¹ The very old and the self-employed were both found to be under-represented in the matched sample. However, the former of these is not included in our analysis at all and the latter will largely also be excluded as we drop those with significant spells of self-employment – see below.

NI records report the number of weeks' contributions paid (that is, the number of weeks in which an individual earned above the Lower Earnings Limit (LEL)) for the period 1948 to 1975. For each year since 1975, earnings between the LEL and the Upper Earnings Limit (UEL) have also been recorded. Self-employed individuals pay a flat-rate contribution (known as class 2 contributions) for weeks in which their self-employment profits are sufficiently high. The NI records, therefore, contain information on the number of weeks of self-employment that an individual had during any given year, but no measure of their actual self-employment income. Given that NI records were designed to assess the state pension rights of individuals, we compute estimates of state pension wealth using the information contained in this data (Bozio, Crawford, Emmerson & Tetlow 2010).

A last element of data that we make use of is the information from the life history interview fielded as part of the third (2006–07) wave of ELSA. This asked respondents about their past cohabiting relationships (including marriage), any children they had had, their past employment and health histories. We use the employment history as a complement to the data from NI records but (largely owing to attrition from the survey between 2002 and 2006) only half of our sample were asked this additional ELSA module.

The sample we look at is couples in early retirement, specifically those where the oldest partner was aged between 60 and 75 at the time of the survey. We focus in most of our analysis only on those in couples, rather than currently single individuals because the vast majority of single individuals in this age group had previously been married. As we only have information on the lifetime earnings of current ELSA respondents, and not those of former partners, there is a potentially large component of the lifetime resources for single pensioners

¹¹For a more detailed discussion of the extent to which the linked sample is representative of the full sample, see (Bozio, Crawford, Emmerson & Tetlow 2010).

(namely, former partners' earnings) that is not observed in our data. Given that we do not observe income of the self-employed during their lifetime, we exclude from our analysis any couples in which one individual had more than five years in which they paid self-employed NI contributions. We end up with a sample of 1,073 couples for which we have detailed information on both wealth at retirement and earnings during their lifetime.

The measure of wealth we examine is total wealth from all sources, net of outstanding debts. Specifically we include: wealth from private pensions, state pensions,¹² owner-occupied housing, other property, business assets and financial assets. Wealth is measured net of outstanding secured and unsecured debts. The measures of private and state pension wealth that we use are the present discounted value of the future stream of pension income to which an individual is entitled (for further details on the calculation of private pension wealth in ELSA, see Banks et al. 2005).

For the purposes of this paper, we are interested in constructing a measure of total lifetime earnings. However, for the sample that is the focus of our analysis, there are some limitations to the NI data in this respect. First, earnings are recorded only if they were above the LEL (i.e. only if they gave rise to a liability to pay NI contributions). However, given the low level of the LEL, this will only marginally affect our estimates of lifetime earnings for most individuals. Second, prior to 1997 the NI data only record earnings up to the UEL. Third, the NI records only contain details of earnings back to 1975. Since the focus of this paper is individuals aged 60 to 75 (inclusive) in 2002–03, this means we will have earnings from age 48 for the oldest individuals in our sample and from age 34 for the youngest individuals in our sample.

To address the issue of recorded earnings being capped in the NI data, we use a tobit specification to estimate how log earnings varies with age and its square. This analysis is conducted separately for each year by sex and three different education levels (defined on the basis of formal qualifications). We then predict estimated earnings above the threshold.

The second stage of our estimation is to simulate earnings in years before 1975. From the NI data we know how many weeks the individual made NI contributions (i.e. earned above the LEL) between 1948 and 1975, but we do not know what his/her earnings were in those years nor when exactly he/she made the contributions. However, for a subset of the sample we have information on employment over the life-course from the life history interviews fielded as part of the 2006–07 wave of ELSA. We use this information to augment the information available from the administrative records. Our estimation of earnings prior to 1975 proceeds in two stages: (i) we back-cast “potential” earnings in years prior to 1975 based on the earliest observation of earnings in the NI data in or after 1975 and assumptions about the shape of the age-earnings profile and economy-wide average earnings growth in each year; (ii) we make an assumption about which years the individual was actually in employment based on

¹²State pensions are the UK equivalent of Social Security in the US.

the number of weeks of work recorded in the administrative data, and employment patterns reported in the life history data.

The final step necessary to construct measure of lifetime earnings is to sum the earnings for each benefit unit. First, we up-rate earnings from the year in which they were earned to 2002 using average earnings growth.¹³ Then we sum, for each family unit, all the earnings for each individual from age 16 to 64 (inclusive). Full details of our estimation procedure are provided in Appendix A.

In the main analysis we use the sum of gross earnings as our measure of lifetime earnings, therefore excluding employer's NI contributions. We have also computed a measure of net lifetime earnings, by applying the UK's NI contribution and income tax schedules to earnings in each year from 1948 to 2002. Details can be found in Appendix B.

4.2 Descriptive statistics

Before assessing the relationship between wealth at retirement and lifetime earnings, it is worth documenting our measure of lifetime earnings. Table 5 presents average lifetime earnings by decile of lifetime earnings for couples only, and Table 6 presents average lifetime earnings by quintile for three groups of households: couples, single men and single women.¹⁴ Couples in the bottom decile earned, on average, £435,000 during their lifetime while couples in the top decile earned, on average, more than £2,310,000. The ratio of the 90th percentile to the 10th percentile is 2.8. For comparison, this ratio was 4.1 for the distribution of current income in the UK in 2002, and 3.2 in 1961. This provides some tentative evidence of lower inequality in lifetime earnings than in current income.¹⁵ Single women in the UK have a very different distribution of lifetime earnings from single men or couples. In the bottom four deciles, very few of these women have had more than a few years in work and thus appear to have very limited lifetime earnings. A very large proportion of these single women are either divorced or widowed and have levels of retirement income and wealth that seem very likely to have been inherited from their former husband.

Lifetime earnings are the product of the number of hours worked during the course of a lifetime and the average hourly wage that each individual was able to earn. We do not observe hours worked in each year but we can normalize lifetime earnings by the number of years worked to account for possible changes in the extensive margin of labour supply. The last

¹³While our measure of wealth includes pension wealth that is due to *employer* contributions, our measure of lifetime earnings will not include these flows. If these contributions increase (decrease) in proportionate terms with lifetime earnings, our results will be somewhat biased in favour (against) of finding increase saving by the rich.

¹⁴The quintiles are defined separately for each family type.

¹⁵The measures of current income inequality cannot be compared straightforwardly with lifetime earnings inequality for a number of reasons: first the distribution of current income is more unequal than the distribution of current labour earnings distribution; second the lifetime earnings distribution incorporates 50 years of past earnings distribution; third our estimates of lifetime earnings might underestimate lifetime earnings inequality if we mismeasure high earnings above capped earnings.

two columns of Table 5 present average lifetime earnings per year worked for couples in each decile of the lifetime earnings distribution. This might be a better measure of permanent income or ability if economic inactivity largely reflects an individual’s choice to consume leisure rather than an inability to find work. In the next subsection we examine how both total lifetime earnings and lifetime earnings normalised by years worked are related to wealth at retirement.

As shown by the first column of Table 7, mean total wealth among couples is, unsurprisingly, increasing with lifetime earnings. Mean total wealth is £275,000 for couples in the bottom decile, compared to £902,000 in the top decile. In subsequent columns total wealth is decomposed into private and state pension wealth, housing wealth and financial wealth. State pension wealth is flat across the lifetime earnings distribution reflecting the broadly flat-rate nature of state pensions in the UK. Unsurprisingly, private pension wealth is closely tied to the level of lifetime earnings. Financial wealth is very concentrated in the top two deciles of the lifetime earnings distribution while housing wealth is much less dispersed.

One issue with comparing accumulated wealth to lifetime earnings – as highlighted by equation (2) – is how to account for the impact of the tax and benefit system. Taxes are applied to gross earnings and benefits should be added to provide a better measure of net resources in each year. Although a complete assessment of the impact of taxes and benefits over an entire lifetime is outside the scope of this paper, we have constructed an additional measure of lifetime earnings based on after-tax earnings.¹⁶ In Table 8 we present this net measure of lifetime earnings for each decile along with measures of the mean and median average tax rates. Given the progressive nature of the income tax system in the UK, this measure reduces inequality in after-tax lifetime earnings. The mean average lifetime tax rate ranges from 23% in the bottom decile to 30% in the top decile. This measure does not include benefits or differences in life expectancy and therefore does not fully represent the actual degree of redistribution produced by the tax and benefit system.

4.3 Results

For three different measures of wealth and for each decile of the lifetime earnings distribution, Table 9 shows the ratio of wealth to lifetime earnings among couples. Couples in the bottom decile exhibit higher ratios on average than couples further up the lifetime earnings distribution. This is not the case when we look at private wealth, reflecting the fact that significant redistribution is achieved by state pensions in the UK in favour of the lifetime poor. In addition, there may be issues of measurement error in lifetime earnings. The data we use has poor coverage of four sources of income: self-employment income, income of previous partners, previously received welfare benefits and income earned abroad.

¹⁶Appendix B describes how the UK tax system has been applied for every year of earnings from 1948 to 2002.

For most of the lifetime earnings distribution, ratios of private wealth to lifetime earnings are increasing gently with lifetime earnings, rising from 18% to 25% across the third to eighth deciles. Across the last two deciles the average ratios are somewhat higher at 30%.

When we use our net lifetime earnings measure (i.e. deducting NI Contributions and Income Taxes paid) we obtain an even steeper positive relationship between wealth to lifetime earnings ratios and lifetime earnings. The ratio of private wealth to net lifetime earnings increases from 17% in the bottom decile of lifetime earnings to 42% in the top decile. This is unsurprising given that we have seen that income taxes paid are progressive with respect to lifetime earnings.

However, in addition to these patterns across deciles, there is also considerable dispersion in levels of wealth holding within each decile of the lifetime earnings distribution – this is shown in Figure 1. The large dispersion of wealth for a given decile of lifetime earnings is striking. Even if one disregards the bottom and top deciles, the variation of wealth conditioning on lifetime earnings remains large. The 90th percentile of wealth among the second decile of the lifetime earnings distribution is higher than the 10th percentile of wealth among the 9th decile of the lifetime earnings distribution. This is in line with previous studies in the US (Gustman & Steinmeier 1999, Venti & Wise 1998). This dispersion could be explained by inherited wealth (from parents or previous partners) and unfortunately we only have limited information on inherited wealth to check this hypothesis. As Figure 2 (which examines only private wealth, that is excluding state pension wealth) shows, a significant proportion of those in the bottom half of the lifetime earnings distribution have very little private wealth at all at retirement.

To establish more formally the relationship between ratios of wealth to lifetime earnings and “permanent income” (as captured by different measures of lifetime earnings), we present median regression analysis using ratios of wealth to lifetime earnings as dependent variable.

We examine two alternative proxies for “permanent income”. First, we use total lifetime earnings per year of the couple.¹⁷ Second, we use a measure of average earnings per year worked – as mentioned above, this measure aims to control for individual choices over the extensive margin of labour supply. The difference between our results using these alternative measures sheds some light on how wealth accumulation is related to the quantity of labour supplied.

The first column of Table 10 presents results of median regressions of the ratio of wealth to gross lifetime earnings on lifetime earnings per year. The coefficient on lifetime earnings is not significantly different from zero. When instead we use as our dependent variable average earnings per year worked, the coefficient on lifetime earnings increases and becomes statistically significant. This measure is a better measure of ability or permanent income in

¹⁷Specifically, we sum the earnings of both partners between the ages of 16 and 64, and normalise by the 98 (i.e. two times the number of years between ages 16 and 64 inclusive). This normalisation is done to aid comparison between coefficients estimated using our second measure of “permanent income”.

the sense that it controls for labour supply decision at the extensive margin. In specification (3) we add age dummies as controls, as our sample includes individuals aged 60 to 75 who are likely to be at different stages of their life cycle. The positive association between the wealth to lifetime earnings ratio and lifetime earnings is made slightly stronger but, more interestingly, the age dummies become negative and statistically significant as age increases. While we cannot definitively assess whether this is due to cohort or age effects, it seems likely that it reflects the fact that older individuals are further into their retirement and may already have depleted some of their accumulated wealth. In part this effect is largely mechanical as annuitised wealth (such as that from state and private pensions) will naturally decumulate as one ages. In specifications (4) and (5) we decompose total wealth into the public (state pensions) and a private component (private wealth). Not surprisingly the ratio of state pension wealth to lifetime earnings is negatively correlated with lifetime earnings per year worked. Given that state pensions in the UK are only weakly related to earnings and maximum entitlements are capped, state pension wealth varies relatively little across individuals with low or high lifetime earnings, reflecting the significant redistribution in the system.¹⁸ Private wealth, in contrast, is significantly positively related to lifetime earnings.

In Table 11 we reproduce the same specifications as in Table 10 but using as dependent variable the ratio of wealth to net lifetime earnings. The positive relationship between our measure of “saving” and our measure of lifetime earnings is reinforced when we take into account the redistributive effects of income taxes. The coefficient in specification (5) suggests that a £1,000 increase in average annual earnings of a couple is (significantly) associated with a 1.5 percentage point increase in the ratio of private wealth at retirement to net lifetime earnings. Overall the higher levels of private wealth held by high lifetime earners more than outweighs the relatively lower levels of state pension wealth that they have accumulated.

In Table 12 we test for non linear relationship between private wealth and lifetime earnings by using quintiles of lifetime earnings per year worked in addition to the age dummies. In addition to looking at total private wealth, in columns (4), we look specifically at private pensions, net housing wealth and financial wealth. We test whether each quintile is significantly different from the precedent. First, private pension wealth as a share of net lifetime earnings seem to be increasing monotonically with quintiles of lifetime earnings, each coefficient being statistically bigger than the precedent. This is not the case of housing wealth, only higher for the top quintile, nor for financial wealth which is markedly higher for the top quintile only. Overall private wealth as a share of net lifetime earnings is increasing significantly at each quintile of the lifetime earnings distribution.

We conclude from these results that there is a robust positive association between wealth to earnings ratios and measures of lifetime earnings using English data. In other words, there is evidence that in England the “rich save more”. The following analysis attempts to

¹⁸We do not account here for differences in life expectancy which might undo part of this redistribution.

shed some further light on which of the factors suggested by theory might be underlying the relationship between lifetime earnings potential and wealth accumulation, and what other factors may explain the additional large degree of dispersion in wealth holdings even among couples with similar levels of lifetime earnings, by including in the regressions some other indicators of individual abilities and circumstances.

Tables 13 and 14 include age dummies and deciles of lifetime earnings per year worked, in addition to other controls. A number of points are worth stressing. First, in all specifications, measures of further education have significant positive coefficients, with the dummy for higher education having a higher coefficient than the dummy for only secondary level education. This is in line with the findings in Section 3 using consumption data, although here we find that higher levels of education are associated with higher levels of wealth even after controlling for lifetime earnings. This could be driven by a tendency for those with low discount rates to both invest more in education and save more or could be indicative of a causal effect of education on saving behaviour. If either of these is the case, it would reinforce our concern about the validity of education as an instrument for earnings ability in this context.

Second, individuals who declare that they are in fair or poor health, exhibit lower wealth to earnings ratios than those who report being in better health. If health shocks were unanticipated and resulted in higher consumption needs, individuals might have had to use some of their savings earlier than they might have expected. This effect is in addition to any the direct effect of health shocks on lifetime earnings.

Third, numeracy leads to a large, positive and significant coefficient. Even controlling for education and lifetime earnings, individuals who are able to compute compound interest rates and other simple calculations, seem to exhibit higher wealth to earnings ratios. This measure of cognitive ability could act as proxy for low time preference or, indeed, an ability to earn higher returns on savings. We find a large and significant relationship with private wealth, where investment decisions are likely to matter.

Surprisingly, some variables whose effect on wealth to earnings ratios might have been expected to be significant, do not show up as being significant. This includes high self-assessed life expectancy (measured as reporting at least a 75% chance of surviving for the next 10 to 15 years) and the number of children.

In Table 14 we add a number of UK-specific variables to account for institutional or regional settings. For instance, since house price growth has been much stronger in London and the South East of England over recent decades (to an extent that was arguably not fully anticipated by many home owners) we test for whether owning a home living in the London area matters over-and-above simply being a home owner, but the evidence is rather weak. As part of the state pension system, individuals who have had spells in receipt of unemployment or disability benefits, can receive credits for state pensions for these periods. As a result, those who have received credits tend to have higher state pensions given their lifetime earnings but

no significant link can be established with other sources of wealth, perhaps surprisingly.

5 Comparison of findings in the United States and the United Kingdom

Most of the empirical evidence in the literature has focussed on the United States, in large part for want of adequate data from other countries. In this paper we have presented new evidence using UK consumption data and newly available UK data on lifetime earnings and wealth holdings. In some respects our findings are consistent with those previously presented using US data, but in other dimensions we find different results. In this section we examine how our results compare to those in previous papers and also present and discuss some new evidence using exactly the same methodology as presented in section 4 applied to US data from the HRS.

5.1 Evidence from US and UK consumption data

In their seminal paper, DSZ concluded, using consumption and income data from the US, that saving rates increased with permanent income, when permanent income was proxied by education level, level of current non-durable consumption, or lags of earnings. Using a similar methodology, the results that we are able to obtain using UK data are broadly in agreement with these findings. Though (as discussed in section 3) we actually find a negative relationship between saving and “permanent income” when non-durable consumption is used as an instrument for permanent income, concerns that measurement error in our measures of saving rate and consumption may be highly correlated lead us to be suspicious of this particular result. When education level is used as an instrument for permanent income instead we, like DSZ, find a positive relationship between saving rate and “permanent income” in each of the four time periods that we examine. In particular we find that median saving rates among college graduates were significantly higher than those with lower levels of education. College graduates’ saving rates were found to be about 4 percentage points higher than those with lower levels of education. However, unlike DSZ, we find no significant difference between the saving rates of any of the other lower education categories.

The magnitude of the differences we find – around 4 percentage point higher saving rates among college graduates than less educated groups at the median– is smaller than the differences that DSZ find. Using data from the Consumer Expenditure Survey (CEX) they find that saving rates among college graduates are about 6 percentage points higher than those of individuals with only a high school diploma, and nearly 19 percentage points higher than high school dropouts’ saving rates.

5.2 Evidence from lifetime earnings and retirement wealth in the US and the UK

Previous papers using data on lifetime earnings and wealth at retirement from the 1992 wave of the HRS (Gustman & Steinmeier (1999), Venti & Wise (1998, 1999, 2000)) have examined how wealth in later working life (ages 51 to 61) varied with lifetime earnings for the cohort born between 1931 and 1941. All of these papers concluded that the ratio of wealth to lifetime earnings is flat across most of the lifetime earnings distribution. This is in contrast to our findings from the ELSA data that the ratio of wealth to lifetime earnings is positively correlated with lifetime earnings. However, these earlier papers use a different age group and time period from that which we use in our analysis in section 4 and examine all family types (not just couples). Furthermore, and perhaps more importantly, they use a different empirical strategy. To assess whether it is solely these differences that are driving the differences in results, we present analysis of the 2004 wave of the HRS using the same methodology as we applied to the ELSA data.¹⁹ Even using the same methodology, we also find that the ratio of wealth to lifetime earnings among HRS respondents is essentially flat across most of the distribution of lifetime earnings. After presenting these results, we discuss below some possible reasons why the patterns are estimated to be different in the US than in the UK.

The data available from the HRS on wealth and lifetime earnings are very similar in many ways to those available from ELSA. In the case of measures of wealth, this is by construction – the ELSA survey was modelled on the HRS and designed to aid cross-country comparison. For comparability with the results from ELSA, we include assets held in IRAs and Keogh accounts as “private pension wealth” in our analysis below. In the case of lifetime earnings, features of the NI system in the UK and the Social Security (SS) system in the US mean that the administrative data on earnings over the lifetime suffer from some of the same limitations in each of the two countries (as well as enjoying the same benefit of being a hugely valuable source of long-run data on earnings). In particular, as individuals in the US were only liable to pay SS contributions on earnings up to the earnings cap, prior to 1980 the administrative data only provide information on capped annual earnings. (From 1980 onwards the administrative data available for HRS respondents also provide information on earnings above the cap.) In order to estimate total lifetime earnings, therefore, we imputed earnings above the cap in years before 1980, using the same method as described in section 4 for ELSA. The earnings cap in place in the US seems to be at least as binding as the one in place in the UK ; between 15% and 25% of the HRS sample earned at or above the earnings cap in the 1960s and 1970s, while between 7% and 14% of the ELSA sample earned at or above the earnings cap throughout the

¹⁹We use the 2004 wave of the HRS, despite the fact that we have examined the 2002 wave of ELSA, because administrative data on lifetime earnings and comprehensive measures of wealth are only currently available for the 2004 – and not the 2002 – wave of HRS, while they are (conversely) only available for the 2002 – and not the 2004 – wave of ELSA.

1980s and 1990s. However, the US SS data has two notable advantages over the UK NI data as a source of information on lifetime earnings. First, data on (capped) earnings is available back to 1951 (rather than 1975). Second, information on uncapped earnings is available from 1980 onwards (rather than 1997 onwards).

Table 18 presents the results of median regressions of wealth to gross lifetime earnings ratios in both England and the United States. Lifetime earnings per year worked is expressed in both countries in thousand of 2004 USD. The first three specifications show qualitatively similar result to Table 10 as only the scaling of the coefficients is changed by the change of exchange rate. The results are markedly different in both countries. If one compares columns (3) and (6), looking at total private wealth, \$1000 increase in average annual earnings leads to an increase of 0.5 percentage points in the ratio of wealth to lifetime earnings in England versus 0.06 in the US. As is the case with state pension wealth of older English couples, SS wealth among older US couples is negatively related to lifetime earnings. Given elements of redistribution inherent in the systems and the fact that there is a cap on the maximum benefits that can be accrued under each, these patterns are not surprising. A \$1,000 increase in average earnings per year worked over the lifetime is associated with a 0.09 percentage point reduction in the ratio of SS wealth to lifetime earnings among older US couples. This compares with a \$1,000 increase in average earnings per year worked over the lifetime being associated with a 0.17 percentage point reduction in the ratio of state pension wealth to lifetime earnings among older English couples.

In Table 19, we present the results using quintile dummies to test for the shape of the relationship between lifetime earnings and wealth to lifetime earnings ratios. Whereas in the UK each quintile of lifetime earnings is significantly higher from the precedent, in the US only the first quintile of lifetime earnings is lower than the rest of the distribution.

Even though we find a different relationship between lifetime earnings and the ratio of wealth to lifetime earnings using the HRS than we find in ELSA, we nonetheless find similar relationships between wealth holdings and other characteristics in the two countries. Table 20 presents the results of regressions of the ratio of (different measures of) retirement wealth to lifetime earnings on average annual earnings per year worked and other family characteristics, similar to the analysis using ELSA that is presented in Table 13. First, in both the US and England those with higher levels of education are found to have higher levels of wealth, even after controlling for differences in lifetime earnings. Similarly, those with higher levels of numerical ability are also found to hold more wealth in the US, as they are in England.²⁰ However, in the US numeracy is only found to be significantly related to total wealth and private wealth holdings, and not to SS wealth or private pension wealth. Using English data

²⁰The numeracy questions asked in the HRS are slightly different from those asked in ELSA. In the HRS respondents are asked up to three questions of increasing difficulty. We classify individuals on a scale from 0 to 3 based on the number of correct answers they gave. The comparison group in Table 20 is those who reported no correct answers (i.e. the least numerate).

we also found a positive relationship between private pension wealth and numeracy.

6 Conclusion

In this paper we have used two sources of data in the UK to assess the relationship between saving propensities and permanent income. Using consumption data we have shown that, proxying permanent income with education variables, higher earners so defined do indeed appear to save more. This is in line with previous research based on other countries, although we only find evidence of a positive relationship among the most highly educated compared to everyone else – the relationship between education and saving rates across lower educational groups is found to be flat. Using new and unique administrative data on earnings and employment in the UK since 1948 linked with the ageing survey ELSA, we have also been able to look at the relationship between wealth to earnings ratios and various measures of lifetime earnings. We have shown that there is a robust positive relationship between these ratios and lifetime earnings in the UK, a relationship that is stronger with respect to net lifetime earnings, i.e. when we include the effect of the tax system over the last forty years. We have also shown evidence that both education and measures of numerical ability are positively associated with wealth to earnings ratios (over-and-above lifetime earnings). This finding has potentially important implications for policymakers, including for the design of optimal tax systems.

We have reproduced our analysis using US data with the 2004 wave of the HRS, thus updating the work from Gustman & Steinmeier (1999) and Venti & Wise (1998). We find similar results to these previous studies. Our results suggest a significant (though small) negative relationship in the US between wealth to earnings ratios and lifetime earnings, particularly across the lower part of the distribution of lifetime earnings.

Appendices

A. Computation of lifetime earnings using UK administrative data

UK National Insurance (NI) records provide a unique source of panel data on employment and earnings since the introduction of the National Insurance system in the UK in 1948. This data has been linked with ELSA which samples the household population aged 50 and over in England in a similar way as the HRS does for the US. The NI data, although a richer source than most existing, is not without some limitations if one wants to estimate lifetime earnings. First, earnings are recorded only if they were above a minimum amount, i.e. only if they gave rise to a liability to pay NI contributions.²¹ However, given the low level of the LEL, this will only marginally affect our estimates of lifetime earnings for most individuals. Second, prior to 1997 the NI data only record earnings up to an upper threshold, the Upper Earnings Level (UEL). Third, on the period from 1948 to 1974, the NI records report only weekly periods of employment but not actual earnings. We now turn to describe how we address each of the last two problems in turn. Details on the procedure and references to other data used can be found in Bozio, Emmerson & Tetlow (2011).

First, in order to estimate earnings above the UEL, we use a tobit specification to estimate how log earnings varies with age and its square. This analysis is conducted separately for each year by sex and three different education levels (defined on formal qualifications). We then predict with that procedure the estimated earnings above the threshold. This procedure is similar to the one used by Poterba et al. (2007).

The second stage of our estimation is to simulate earnings in years before 1975. From the NI data we know how many weeks the individual made NI contributions (i.e. earned above the LEL) between 1948 and 1975, but we do not know what was his/her earnings were in those years nor when exactly he/she made the contributions. For a subset of the sample we have the life histories collected from ELSA respondents in wave 3, which traces back employment spells of individuals since they left full-time education. Our estimation of earnings prior to 1975 thus proceeds in three steps:

1. For each individual we estimate what their earnings growth would be in each year (based on their age, sex and education level) had they been in paid work. This is done taking average economy-wide earnings growth for each year (which are available from the ONS) and then adjusting this to account for the fact that individuals of different ages, sexes and education levels experience, on average, different increases in earnings. This adjustment was done using estimated coefficients on age and age squared from regressions using data from the Labour Force Survey from 1996 to 2006, split by educational qualifications and sex.

²¹This minimum is called the Low Earnings Level (LEL) and amounted to £90 per week (£4680 annually) in 2008-09.

2. In order to get the level of possible earnings for each individual for each year prior to 1975, we backcast by applying the estimates of earnings growth from step (i) to the earliest estimate of the level of earnings available in the NI data. So, for someone who has earnings observed in 1975, we use these earnings together with estimated earnings growth from step (i) to impute potential earnings in earlier years. If earnings were not observed for an individual in 1975, we instead use the first observation of earnings after 1975 to impute potential earnings for all years before 1975.
3. Finally, to obtain an estimate of actual earnings using the computed information on potential earnings from step (ii), we have made an assumption about which years the individual was in paid work. For men we have assumed that all contributing weeks between 1948 and 1975 occurred just before 1975 without any breaks. This is equivalent to assuming that all periods of unemployment (and other periods spent not in paid work) were at the start of the working life. For women we made the opposite assumption: i.e. we have assumed that periods of work (as captured by weekly NI contributions paid between 1948 and 1975) ran continuously from the year in which a woman left full-time education. This is equivalent to assuming that all periods of unemployment (and other periods spent not in paid work) were experienced directly prior to 1975. This seemed a more appropriate assumption for women, as they are more likely to have entered the labour market immediately after leaving school, but then left the labour market when they had their first child.²² We assume that individuals did not have any earnings prior to 1948 unless they are among the small minority of men and women who are recorded as having made contributions to the pre-1948 old age pension. For these individuals we estimate earnings from the exact date at which their contributions started.

The final step necessary to construct the lifetime earnings measure is to sum the earnings for each benefit unit. First, we up-rate earnings from the year in which they were earned to 2002 using average earnings growth. Then we sum, for each individual or family unit, all the earnings simulated from age 16 to 64 (inclusive). For current couples, we add the earnings of both partners.

²²Sensitivity analysis shows that making the same assumption for women as for men does not affect the results significantly.

B. Simulating the UK tax system

In order to estimate lifetime net earnings we have computed the tax schedule for the UK of the National Insurance Contributions (NIC) and the Income Tax for the years 1948 to 2002. This includes the weekly flat-rate employee NIC from 1948 to 1974, the earnings related graduated contribution from 1961 to 1974, the earnings related NIC from 1975/76 to 2002/03, the joint income tax from 1948/49 to 1989/90, the surtax from 1948/49 to 1972/73 and the individual income tax from 1990/91 onwards. These tax systems imply complex schedules and we have therefore made a number of simplifications:

1. We have only included labour earnings - as we do not have information on other sources of income. Given that our objective is to obtain net earnings from gross earnings, this is a benign assumption.
2. We have considered that annual earnings were earned continuously during the fiscal year. This matters for the computation of NICs, the schedule for which operates based on pay period (which is typically weekly or monthly). Before 1975, NICs were weekly flat-rate contributions and individuals who had worked only a subset of the year would have paid less contributions than our procedure implies.
3. We have assumed that individuals pre 1975 were all contracted in to the graduated pension, whereas they could have contracted out and paid reduced rates.
4. We have considered every member of couples to be single without children even when this mattered for tax liability. This is an important assumption as families with children would have received tax credits for children and/or bigger personal allowance. The marital status could also be of importance when the tax system was a joint system before 1990, although couples had always the choice to elect individual taxation if they wanted.
5. We have not included benefits.
6. We have not considered employer's NIC neither in the gross lifetime earnings nor in the amount of tax paid.

References for the parameters can be found in Fiscal Facts on the webpage of the Institute for Fiscal Studies, at <http://www.ifs.org.uk/fiscalFacts>.

C. Health and Retirement Study

The Health and Retirement Study (HRS) is sponsored by the National Institute on Aging (grant number NIA U01AG009740) and is conducted by the University of Michigan. It is the US counterpart to (and forebear of) ELSA. It started as a longitudinal, multidisciplinary

survey of US households with at least one adult between the ages of 51 and 61 in 1992 (individuals born between 1931 and 1941). Subsequently additional cohorts (those born between 1924 and 1930 and those born between 1942 and 1953) have been added to the sample. The coverage of the ELSA survey, the question structure and survey methodologies are - by design - very similar in many dimensions to those used in the HRS. For a detailed description of the HRS see Juster and Suzman (1995).

In this paper, we study the sample of individuals and couples aged approximately 61 to 75 in the 2004 wave of the HRS - that is, individuals (or couples in which the older partner was) born between 1929 and 1943. Some of these are members of the original HRS cohort, while some are drawn from the Children of the Depression and War Babies cohorts that were added to the survey later on.

The HRS also asked respondents for permission to link to their Social Security Administration (SSA) records. Like the NI records in the UK, Social Security (SS) records provide information on respondents' past earnings and employment. The SS data provide information on most forms of earnings up to the SS earnings cap between 1951 and 1979, and complete information on most forms of earnings from 1980 onwards. The cohorts that we study in this paper were aged between 8 and 22 in 1951. Thus the SS data cover (almost) their entire working lives. However, as with the administrative earnings data available in England (see Appendix A), there are limitations to the coverage of the SSA data: the capping of earnings prior to 1980 and the fact that some earnings are not covered by (and therefore not recorded in) the SS records. These limitations, and our approach to overcoming them in order to calculate lifetime earnings, are described below.

In the analysis presented in section 5, we include only those individuals (or couples for which both partners) have been linked to their SS records or who reported during their interviews in the HRS that they had never done any paid work up to 2004, even if these individuals were missing SS records - we assumed zero earnings in all years for these individuals. Matched records are not available for some individuals either because they did not give permission for this matching to be done or because they never worked in a SS covered sector. This leaves us with a sample of 1,799 couples, 330 single men and 1,218 single women. (The analysis presented in section 5 uses only those in couples.) Our sample is potentially a non-random sample of the HRS population. Haider & Solon (2000) present analysis of the similarities and differences between the linked and unlinked samples; though they find some differences in the observed characteristics of the two groups, they conclude that "as far as can be told from observable data, the HRS Social Security earnings sample seems to be reasonably representative". However, this potential selection issue should be borne in mind when interpreting the results in this paper.

D. Computation of lifetime earnings using US administrative data

The SSA data provide an unusually rich source of information about HRS respondents' earning histories; the information is considerably more detailed than what can be obtained from short panels of earnings observations, which have been used in many other studies to proxy for lifetime earnings. However, there are some limitations to the coverage of the SS data; some parts of some individual's lifetime earnings will not be captured. There are two major limitations and we will discuss our approach to addressing each in turn.

First, prior to 1980, earnings are only recorded up to the Social Security (SS) earnings cap.²³ Among the sample of HRS respondents that we study in this paper, the proportion of the sample with earnings capped at the limit peaks at just over 25% in 1971. Over the entire period from 1951 to 1979, 39% of our sample have earnings capped in at least one year. From 1980 onwards, full detail is available on higher earnings levels from the tax return form W2.²⁴

In order to estimate earnings above the cap for years prior to 1980, as we did for the ELSA sample, we use a Tobit regression (that is, a multivariate regression technique that takes into account the fact that the variable of interest - annual earnings - is censored at the annual earnings cap). This analysis was conducted separately for each year by sex and education level.²⁵ From 1980 onwards, we use the uncensored figures for earnings derived from the W2 form.

The final step necessary to construct the lifetime earnings measure is to sum the earnings for each benefit unit. First we up-rate earnings from the year in which they were earned to 2004 using average earnings growth, as measured by the SSA National Average Wage index.²⁶ Then we sum, for each individual or family unit, all the earnings simulated from age 16 to 64 (inclusive). For current couples we add the earnings of both partners.

Other studies using lifetime earnings estimated from SS records for HRS respondents, such as Venti & Wise (1998, 1999, 2000) have taken a different approach. These papers instead used the capped SS earnings data to divide individuals into deciles of lifetime earnings - arguing that, while the capped earnings information may not accurately record total lifetime earnings, it does maintain the ranking of individuals. Others, such as Duckworth and Weir (2010) have examined a measure of lifetime SS earnings (that is, the highest 35 years of earnings covered by SS, up to the SS cap). However, as we are interested in looking specifically at the ratio of wealth to lifetime earnings, we have chosen instead to impute exact earnings levels above

²³For details of the earnings cap applying in each year, see Table 2.A3 of Social Security Administration (2010).

²⁴For reasons of confidentiality, however, the detailed earnings data available for HRS respondents is collapsed above \$250,000 into three bands: \$250,000-\$299,999, \$300,000-\$499,999 and \$500,000+. For the very small number of individuals in these bands, we assume actual earnings were at the mid-point of the band (or twice the lower bound in the case of the top category).

²⁵The sample is divided into four education groups based on years of schooling: less than 12 years (high school drop-out); 12 years (high school graduate, no college); 13-15 years (some college); 16+ years (college graduate).

²⁶See <http://www.ssa.gov/oact/cola/AWI.html>

the cap. Table 15 shows mean and median lifetime earnings within each decile of the lifetime earnings distribution for couples, while Table 16 shows the same information within lifetime earnings quintiles for single men and single women.

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Table 1: Median regressions of saving rates on current income

	Sample			
	2007-2009	1997-1999	1987-1989	1978-1980
Current income rel. quintile 1				
Quintile 2	19.13*** (1.11)	12.93*** (0.98)	8.23*** (0.95)	8.50*** (0.79)
Quintile 3	29.61*** (1.10)	23.36*** (1.00)	20.49*** (0.99)	16.38*** (0.84)
Quintile 4	38.02*** (1.10)	30.52*** (1.03)	26.31*** (1.01)	23.93*** (0.86)
Quintile 5	50.50*** (1.12)	42.30*** (1.06)	37.62*** (1.04)	31.52*** (0.90)
Age (rel. 20-29)				
30-39	1.06 (1.39)	3.57*** (1.16)	4.65*** (1.07)	2.28** (.90)
40-49	2.56* (1.35)	4.26*** (1.19)	5.95*** (1.09)	2.76*** (.95)
50-59	3.10** (1.36)	5.60*** (1.22)	10.09*** (1.14)	5.85*** (.94)
60-69	4.28*** (1.62)	8.66*** (1.62)	14.98*** (1.48)	5.96*** (1.25)
70-79	13.92*** (2.38)	18.54*** (2.08)	23.41*** (1.90)	15.07*** (1.58)
Above 80+	28.61*** (2.76)	32.11*** (2.31)	32.14*** (2.16)	23.43*** (1.87)
Constant	-13.56*** (1.71)	-22.31*** (1.49)	-20.40*** (1.51)	-12.63*** (1.51)
Observations	15,466	20,051	22,071	20,721

NOTES: Also included are controls for year and households types. Standard errors are given in parentheses. *** indicates significant at the 1% level, ** indicates significant at the 5% level, * indicates significant at the 10% level.

SOURCE: Living Costs and Food Survey.

Table 2: Median instrumental variable regressions of saving rate on income using education as an instrument

	Sample			
	2007-2009	1997-1999	1987-1989	1978-1980
Permanent income rel. quintile 1				
Quintile 2	-1.23 (1.64)	-1.56 (1.36)	-0.55 (1.21)	0.45 (1.07)
Quintile 3	-3.76*** (1.34)	-0.20 (1.27)	-0.23 (1.07)	-0.44 (1.11)
Quintile 4	-1.05 (1.27)	-0.59 (1.23)	0.18 (1.07)	-0.42 (1.04)
Quintile 5	4.83*** (1.29)	3.13** (1.29)	3.62*** (1.03)	2.20** (0.90)
Age (rel. 20-29)				
30-39	6.04*** (1.49)	5.78*** (1.19)	7.44*** (1.04)	3.67*** (0.99)
40-49	5.84*** (1.46)	7.59*** (1.21)	8.51*** (1.00)	5.25*** (1.01)
50-59	5.73*** (1.49)	6.37*** (1.30)	11.90*** (1.22)	7.13*** (1.10)
60-69	3.63* (1.96)	5.34** (2.13)	10.83*** (1.43)	3.16** (1.36)
70-79	8.95*** (2.63)	12.03*** (2.56)	15.63*** (1.81)	8.52*** (1.69)
Above 80+	24.22*** (2.86)	24.58*** (2.59)	22.87*** (2.05)	16.59*** (2.00)
Constant	8.29*** (2.05)	-2.02 (1.92)	-3.39** (1.65)	4.55*** (1.55)
Observations	15,466	20,051	22,071	20,721

NOTES: Saving excludes mortgage capital repayments. Also included are controls for year and households types. Standard errors are given in parentheses. *** indicates significant at the 1% level, ** indicates significant at the 5% level, * indicates significant at the 10% level.

SOURCE: Living Costs and Food Survey.

Table 3: Median regressions of saving rate on education

	Sample			
	2007-2009	1997-1999	1987-1989	1978-1980
A. Saving includes mortgage capital repayments				
Education (rel. compulsory only)				
Compulsory plus one	-0.08 (1.08)	0.28 (0.87)	0.52 (0.77)	1.41* (0.84)
More than comp. plus one, no college	-0.53 (1.07)	1.32 (0.85)	1.37* (0.74)	1.55* (0.80)
Some college	4.36*** (0.97)	4.44*** (0.90)	5.48*** (0.89)	4.26*** (1.08)
B. Saving excludes mortgage capital repayments				
Education (rel. compulsory only)				
Compulsory plus one	0.01 (0.96)	0.06 (0.93)	0.02 (0.81)	1.10 (0.81)
More than comp. plus one, no college	-1.34 (0.95)	0.42 (0.90)	0.63 (0.77)	0.24 (0.77)
Some college	4.40*** (0.86)	3.56*** (0.96)	4.51*** (0.93)	2.74*** (1.04)
Observations	15,466	20,051	22,071	20,721

NOTES: Also included are controls for age groups, year and households types. Standard errors are given in parentheses. *** indicates significant at the 1% level, ** indicates significant at the 5% level, * indicates significant at the 10% level

SOURCE: Living Costs and Food Survey.

Table 4: Median instrumental variable regressions of saving rate on income using non-durable consumption as an instrument

	Sample			
	2007-2009	1997-1999	1987-1989	1978-1980
Permanent income quintile (rel. Quintile 1)				
2	-14.90*** (1.17)	-12.96*** (1.15)	-14.97*** (1.47)	-11.80*** (0.78)
3	-21.29*** (1.32)	-19.45*** (1.25)	-24.90*** (1.72)	-20.79*** (0.99)
4	-28.56*** (2.10)	-25.92*** (1.39)	-38.34*** (3.02)	-31.45*** (1.32)
5	-39.09*** (2.27)	-37.01*** (1.42)	-55.82*** (3.39)	-50.21*** (1.64)
Age (rel. 20s)				
30s	4.76*** (1.66)	7.07*** (1.33)	13.12*** (1.41)	11.29*** (1.14)
40s	5.06*** (1.78)	8.19*** (1.41)	10.07*** (1.38)	8.98*** (1.20)
50s	1.17 (1.69)	0.29 (1.53)	-0.13 (1.49)	-0.46 (1.21)
60s	-0.26 (2.19)	-0.84 (2.14)	5.82*** (1.94)	4.54*** (1.70)
70s	10.16*** (2.99)	9.00*** (2.76)	19.20*** (2.64)	17.07*** (2.01)
80+	25.73*** (3.35)	24.76*** (2.95)	30.55*** (3.09)	26.88*** (2.29)
Constant	32.16*** (2.84)	17.34*** (2.31)	21.72*** (2.91)	32.39*** (2.37)
Observations	15,466	20,051	22,071	20,721

NOTES: Also included are controls for year and households types. Standard errors are given in parentheses. *** indicates significant at the 1% level, ** indicates significant at the 5% level, * indicates significant at the 10% level.

SOURCE: Living Costs and Food Survey.

Table 5: Average lifetime earnings by decile of lifetime earnings (UK)

Decile of lifetime earnings	Lifetime earnings		LE per years worked	
	Mean	Median	Mean	Median
1	435,250	473,226	10,623	10,601
2	831,105	839,765	14,500	13,858
3	1,009,390	1,012,268	16,320	15,794
4	1,121,303	1,124,670	17,296	16,693
5	1,223,779	1,222,464	18,333	17,638
6	1,330,038	1,330,699	18,968	18,262
7	1,444,759	1,444,206	20,675	20,092
8	1,591,192	1,587,357	21,936	20,498
9	1,801,248	1,798,399	25,493	23,766
10	2,309,669	2,190,710	31,152	29,215
All	1,308,908	1,276,012	19,520	18,688

NOTES: In GBP, 2002 prices. Sample size: 1,073 couples.

SOURCE: ELSA linked with NI records.

Table 6: Average lifetime earnings by quintile of lifetime earnings (UK)

Quintile of lifetime earnings	Couples		Single men		Single women	
	Mean	Median	Mean	Median	Mean	Median
1	632,257	715,677	289,533	330,408	2,331	25
2	1,065,606	1,063,352	641,655	654,703	77,453	73,829
3	1,276,908	1,276,286	831,137	834,275	217,126	213,199
4	1,517,635	1,511,207	1,005,605	1,005,572	413,927	404,395
5	2,055,458	1,937,632	1,387,499	1,271,781	877,775	821,638
All	1,308,908	1,276,012	829,377	832,477	317,269	212,626

NOTES: In GBP, 2002 prices. Sample size: 1,073 couples, 317 single men and 696 single women.

SOURCE: ELSA linked with NI records.

Table 7: Mean wealth measures by decile of lifetime earnings (UK)

Decile of lifetime earnings	Total wealth	Private pension wealth	State pension wealth	Housing wealth	Net financial wealth
1	274,892	31,237	113,111	73,773	16,876
2	261,284	54,864	112,528	69,600	19,591
3	326,889	79,674	110,714	95,658	27,656
4	309,760	80,610	107,558	85,962	23,623
5	377,419	96,965	108,256	116,369	37,647
6	424,948	135,578	116,227	116,843	42,425
7	481,849	142,226	111,617	145,717	45,065
8	551,020	179,316	111,030	164,918	71,203
9	742,404	275,982	115,442	216,775	101,312
10	901,738	343,990	128,829	241,394	131,580
All	465,350	141,884	113,523	132,615	51,711

NOTES: In GBP, 2002 prices. Sample size: 1,073 couples.

SOURCE: ELSA linked with NI records.

Table 8: Lifetime earnings taxes - couples (UK)

Decile of lifetime earnings	Mean net lifetime earnings	Median net lifetime earnings	Mean lifetime tax rate	Median lifetime tax rate
1	331,546	362,690	22%	23%
2	615,683	617,596	26%	26%
3	739,919	742,099	27%	27%
4	818,420	817,343	27%	27%
5	885,812	879,912	28%	27%
6	966,014	966,749	27%	28%
7	1,043,889	1,045,031	28%	28%
8	1,148,138	1,145,218	28%	28%
9	1,284,240	1,291,369	29%	28%
10	1,616,954	1,539,316	30%	29%
All	944,464	930,476	27%	28%

NOTES: Sample size: 1,073 couples.

SOURCE: ELSA linked with NI records.

Table 9: Median ratios of wealth to lifetime earnings by decile of lifetime earnings (UK)

Decile of lifetime earnings	Total wealth to gross lifetime earnings	Private wealth to gross lifetime earnings	Total wealth to net lifetime earnings	Private wealth to net lifetime earnings
1	0.38	0.13	0.53	0.17
2	0.27	0.13	0.36	0.17
3	0.29	0.18	0.39	0.24
4	0.25	0.16	0.35	0.22
5	0.29	0.20	0.40	0.28
6	0.27	0.20	0.37	0.27
7	0.29	0.22	0.41	0.30
8	0.32	0.25	0.43	0.34
9	0.37	0.30	0.52	0.41
10	0.35	0.30	0.50	0.42
All	0.30	0.42	0.21	0.29

NOTES: Sample size: 1,073 couples.

SOURCE: ELSA linked with NI records.

Table 10: Median regressions of the ratio of wealth to gross lifetime earnings (UK)

	(1)	(2)	(3)	(4)	(5)
	Total	Total	Total	State pension	Private wealth
Lifetime earnings (LE)	0.160 (0.116)				
LE per year worked		0.379*** (0.0661)	0.429*** (0.0829)	-0.336*** (0.0179)	1.010*** (0.0626)
Age 60/61			1.407 (2.196)	1.482** (0.475)	-0.276 (1.668)
Age 62/63			1.642 (2.360)	0.872 (0.510)	-1.030 (1.793)
Age 66/68			-6.440** (2.073)	-2.560*** (0.449)	-4.016* (1.577)
Age 69/71			-8.807*** (2.090)	-2.866*** (0.452)	-6.088*** (1.588)
Age 72/75			-11.90*** (2.097)	-3.398*** (0.454)	-8.430*** (1.592)
Constant	27.94*** (1.649)	22.85*** (1.373)	26.90*** (2.237)	16.73*** (0.484)	4.715** (1.694)
Observations	1070	1070	1070	1073	1070
Adjusted R^2					

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

SAMPLE: Couples, all lifetime earnings distribution.

Lifetime earnings in specification (1) is lifetime earnings from 16 to 64 per annum.

Table 11: Median regressions of the ratio of wealth to net lifetime earnings (UK)

	(1)	(2)	(3)	(4)	(5)
	Total	Total	Total	State pension	Private wealth
Lifetime earnings (LE)	0.358* (0.162)				
LE per year worked		0.654*** (0.0914)	0.813*** (0.114)	-0.419*** (0.0251)	1.530*** (0.0940)
Age 60/61			1.201 (3.020)	1.894** (0.665)	-0.594 (2.513)
Age 62/63			1.249 (3.245)	1.110 (0.714)	-1.049 (2.702)
Age 66/68			-9.732*** (2.851)	-3.559*** (0.630)	-5.377* (2.376)
Age 69/71			-12.88*** (2.874)	-3.948*** (0.633)	-8.145*** (2.393)
Age 72/75			-16.55*** (2.883)	-4.564*** (0.636)	-11.13*** (2.401)
Constant	36.51*** (2.309)	28.91*** (1.896)	33.38*** (3.072)	22.21*** (0.678)	4.024 (2.549)
Observations	1070	1070	1070	1073	1070
Adjusted R^2					

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

SAMPLE: Couples, all lifetime earnings distribution.

Lifetime earnings in specification (1) is lifetime earnings from 16 to 64 per annum.

Table 12: Median regressions of the ratio of private wealth to net lifetime earnings (UK)

	(1)	(2)	(3)	(4)
	Private pension	Housing wealth	Financial wealth	Private wealth
Quintile 2 of LE	2.505 (1.074)	1.327 (0.976)	0.664 (0.365)	2.952 (2.014)
Quintile 3 of LE	4.803** (1.077)	2.010 (0.977)	1.396** (0.367)	7.655** (2.022)
Quintile 4 of LE	8.679*** (1.075)	3.789* (0.977)	1.946 (0.366)	14.05*** (2.024)
Quintile 5 of LE	13.95*** (1.074)	6.861*** (0.978)	4.863*** (0.366)	25.78*** (2.020)
Constant	8.191*** (1.136)	8.494*** (1.033)	0.868* (0.385)	24.60*** (2.130)
Observations	1070	1073	1070	1070
Adjusted R^2				

Standard errors in parentheses

* Coefficient different from previous one at 10% confidence interval.

** Coefficient different from previous one at 5% confidence interval.

*** Coefficient different from previous one at 1% confidence interval.

SAMPLE: Couples, all lifetime earnings distribution.

CONTROLS: We also have included age dummies in all specifications.

Table 13: Median regressions of the ratio of wealth to net lifetime earnings (UK)

	(1)	(2)	(3)	(4)
	Private pension	Housing	Financial	Total private
Male secondary edu	3.503*** (0.838)	4.573*** (0.990)	1.451*** (0.295)	7.569*** (1.753)
Male went to higher edu.	4.484*** (0.892)	4.464*** (1.054)	1.546*** (0.312)	10.49*** (1.865)
Female secondary edu	3.646*** (0.823)	1.576 (0.965)	0.584* (0.286)	5.454** (1.725)
Female went to higher edu.	4.662*** (0.951)	0.523 (1.118)	1.568*** (0.331)	7.330*** (1.997)
Male in fair/poor health	-1.158 (0.730)	-1.800* (0.859)	-0.611* (0.256)	-4.258** (1.532)
Female in fair/poor health	-0.753 (0.749)	-1.343 (0.882)	-0.572* (0.263)	-3.878* (1.573)
No kids	-0.672 (1.362)	-0.326 (1.616)	0.247 (0.476)	-0.476 (2.852)
Three kids or more	-0.947 (0.635)	-0.699 (0.747)	-0.487* (0.222)	-0.756 (1.333)
Male life expectancy	0.148 (0.703)	0.521 (0.829)	-0.265 (0.247)	-0.193 (1.469)
Female life expectancy	1.231 (0.651)	0.892 (0.769)	0.186 (0.228)	2.545 (1.364)
High numeracy	2.013** (0.690)	1.916* (0.814)	0.661** (0.242)	5.400*** (1.445)
Observations	1070	1070	1070	1070
Adjusted R^2				

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

SAMPLE: Couples, all lifetime earnings distribution.

Controls: We also have included age dummies in all specifications and lifetime earnings decile dummies.

Table 14: Median regressions of the ratio of wealth to net lifetime earnings (UK)

	(1)	(2)	(3)	(4)
	Private pension	Housing	Financial	Total private
Male secondary edu	2.971*** (0.891)	4.071*** (0.796)	1.289*** (0.267)	6.571*** (1.505)
Male went to higher edu.	4.352*** (0.946)	5.484*** (0.840)	1.070*** (0.282)	10.10*** (1.582)
Female secondary edu	3.541*** (0.866)	1.515 (0.775)	0.383 (0.259)	5.335*** (1.462)
Female went to higher edu.	4.313*** (1.003)	1.158 (0.901)	1.320*** (0.297)	10.61*** (1.691)
Male in fair/poor health	-0.572 (0.781)	-1.609* (0.695)	-0.379 (0.232)	-2.835* (1.309)
Female in fair/poor health	-0.495 (0.805)	-0.554 (0.722)	-0.545* (0.240)	-1.969 (1.352)
No kids	-0.154 (1.461)	-0.462 (1.313)	0.101 (0.439)	-1.317 (2.429)
Three kids or more	-0.223 (0.683)	0.190 (0.607)	-0.0919 (0.203)	0.387 (1.153)
Male life expectancy	0.506 (0.744)	1.041 (0.664)	-0.180 (0.220)	0.619 (1.254)
Female life expectancy	0.996 (0.689)	0.795 (0.614)	0.109 (0.205)	1.332 (1.157)
High numeracy	1.253 (0.732)	1.464* (0.650)	0.447* (0.218)	3.924** (1.233)
Owner occupier	1.324 (0.845)	5.863*** (0.754)	1.511*** (0.252)	10.33*** (1.434)
Owner occ. in London/SE	1.426 (1.609)	6.906*** (1.439)	0.176 (0.474)	5.032 (2.720)
In London or SE	-0.348 (1.283)	0.627 (1.150)	0.203 (0.376)	4.050 (2.177)
Female received credits	-0.724 (0.739)	-1.048 (0.654)	-0.500* (0.220)	-3.148* (1.252)
Male received credits	-1.720* (0.711)	-0.195 (0.632)	-0.0315 (0.211)	-0.921 (1.199)
Reduced rate	0.589 ⁴⁴ (0.679)	-1.248* (0.607)	-0.104 (0.203)	-2.809* (1.146)
Observations	1070	1070	1070	1070
Adjusted R^2				

Standard errors in parentheses

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Table 15: Average lifetime earnings among couples by decile of lifetime earnings (US)

Decile of lifetime earnings	Mean	Median
1	741,760	801,629
2	1,445,675	1,450,451
3	1,878,324	1,891,092
4	2,293,591	2,302,254
5	2,662,356	2,662,885
6	2,957,387	2,945,812
7	3,315,713	3,326,131
8	3,782,867	3,756,044
9	4,506,229	4,469,131
10	6,984,606	6,276,708
All	3,054,591	2,811,278

NOTES: In USD, 2004 prices. Sample size: 1,799 couples.

SOURCE: HRS linked with SSA earnings data.

Table 16: Average lifetime earnings among singles by quintile of lifetime earnings (US)

Quintile of lifetime earnings	Single men		Single women	
	Mean	Median	Mean	Median
1	337,693	288,924	47,034	35,034
2	985,217	918,143	271,062	264,912
3	1,541,364	1,501,440	558,987	565,033
4	2,188,081	2,141,158	922,747	919,772
5	3,952,510	3,180,271	1,696,376	1,549,469
All	1,795,418	1,495,898	698,371	560,480

NOTES: In USD, 2004 prices. Sample size: 330 single men and 1,218 single women.

SOURCE: HRS linked with SSA earnings data.

Table 17: Median ratio of wealth to lifetime earnings by quintile of lifetime earnings (US)

Quintile of lifetime earnings	Couples	Single men	Single women
1	0.40	0.27	2.89
2	0.32	0.21	0.75
3	0.29	0.27	0.52
4	0.28	0.23	0.34
5	0.27	0.20	0.39
All	0.31	0.22	0.52

SOURCE: Health and Retirement Study.

NOTES: Ratios shown are the ratio of total wealth to gross lifetime earnings. Sample size: 967 couples, 330 single men and 1,218 single women.

Table 18: Median regressions of the ratio of wealth to gross lifetime earnings (England-US)

	England			United States		
	(1) Total	(2) State pension	(3) Private wealth	(4) Total	(5) Social Security	(6) Private wealth
Lifetime earnings per year worked	0.223*** (0.0432)	-0.175*** (0.00935)	0.526*** (0.0326)	-0.0431*** (0.0114)	-0.0887*** (0.00251)	0.0657*** (0.0128)
Age 60/61	1.407 (2.196)	1.482** (0.475)	-0.276 (1.668)	-0.749 (3.124)	-1.177 (0.689)	1.005 (3.511)
Age 62/63	1.642 (2.360)	0.821 (0.510)	-1.030 (1.793)	-0.189 (1.799)	-1.610*** (0.397)	1.798 (2.022)
Age 66/68	-6.440** (2.073)	-2.568*** (0.449)	-4.016* (1.577)	1.802 (1.531)	0.371 (0.338)	0.608 (1.721)
Age 69/71	-8.807*** (2.090)	-2.866*** (0.452)	-6.088*** (1.588)	-2.375 (1.607)	-0.454 (0.354)	-0.389 (1.807)
Age 72/75	-11.90*** (2.097)	-3.398*** (0.453)	-8.430*** (1.592)	-5.380*** (1.541)	-2.153*** (0.340)	-3.236 (1.732)
Constant	26.90*** (2.237)	16.73*** (0.484)	4.715** (1.694)	35.00*** (1.438)	19.71*** (0.317)	12.50*** (1.616)
Observations	1070	1070	1070	1599	1599	1599

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

SAMPLE: Couples.

NOTE: Lifetime earnings per year worked is expressed in thousand of 2004 US dollar in both countries.

Table 19: Median regressions of the ratio of wealth to gross lifetime earnings (England-US)

	England			United States		
	(1) Total	(2) State pension	(3) Private wealth	(4) Total	(5) Social Security	(6) Private wealth
Quintile 2 of LE	-4.608*** (1.689)	-5.566*** (0.302)	1.947 (1.553)	-0.525 (1.805)	-4.135*** (0.325)	6.595*** (1.528)
Quintile 3 of LE	-2.945 (1.691)	-6.753*** (0.302)	5.159** (1.551)	-4.625** (1.830)	-6.728*** (0.328)	6.555 (1.547)
Quintile 4 of LE	0.203* (1.695)	-8.010*** (0.301)	9.702*** (1.556)	-4.359 (1.840)	-8.463*** (0.331)	8.180 (1.558)
Quintile 5 of LE	6.150*** (1.692)	-8.971*** (0.302)	17.36*** (1.554)	-5.207 (1.892)	-11.29*** (0.339)	9.345 (1.600)
Observations	1070	1073	1070	1599	1599	1599
Adjusted R^2						

Standard errors in parentheses

* Coefficient different from previous one at 10% confidence interval.

** Coefficient different from previous one at 5% confidence interval.

*** Coefficient different from previous one at 1% confidence interval.

SAMPLE: Couples, all lifetime earnings distribution.

CONTROLS: We also have included age dummies in all specifications.

Table 20: Regressions of the ratio of different measures of wealth to lifetime earnings (US)

	(1)	(2)	(3)	(4)
	Total	Social Security	Private pension	Private wealth
LE per year worked	-0.291*** (0.0416)	-0.112*** (0.00746)	-0.0429 (0.0223)	-0.179*** (0.0413)
High school grad (male)	1.401 (2.346)	-0.267 (0.421)	1.501 (1.260)	1.668 (2.329)
Some college (male)	0.864 (2.761)	-0.629 (0.495)	3.908** (1.483)	1.493 (2.742)
College grad (male)	11.73*** (3.044)	-0.138 (0.546)	7.345*** (1.635)	11.87*** (3.023)
High school grad (female)	0.0323 (2.472)	-0.175 (0.443)	-1.323 (1.327)	0.207 (2.455)
Some college (female)	1.240 (2.826)	-0.119 (0.507)	-1.819 (1.518)	1.359 (2.807)
College grad (female)	10.72** (3.335)	0.241 (0.598)	3.679* (1.791)	10.48** (3.312)
In fair/poor health (male)	-2.372 (2.057)	0.0521 (0.369)	-0.682 (1.105)	-2.424 (2.043)
In fair/poor health (female)	0.0553 (2.150)	-0.296 (0.386)	1.526 (1.155)	0.352 (2.135)
No kids	2.673 (5.870)	1.631 (1.053)	3.923 (3.153)	1.042 (5.830)
Three kids or more	-3.042 (1.801)	0.798* (0.323)	-0.407 (0.967)	-3.840* (1.789)
Life expectancy (male)	-1.453 (1.737)	-0.0881 (0.312)	0.239 (0.933)	-1.365 (1.725)
Life expectancy (female)	3.024 (1.701)	-0.168 (0.305)	2.221* (0.914)	3.192 (1.690)
Numeracy=1	6.585* (3.160)	0.278 (0.567)	3.074 (1.697)	6.307* (3.138)
Numeracy=2	9.670** (3.084)	0.277 (0.553)	3.299* (1.656)	9.392** (3.063)
Numeracy=3 (highest)	11.50** (3.713)	-0.223 (0.666)	2.705 (1.994)	11.73** (3.688)
owner	11.44*** (2.600)	-0.565 (0.466)	2.559 (1.396)	12.00*** (2.582)
Observations	1139	1139	1139	1139
Adjusted R^2	0.111	0.279	0.073	0.107

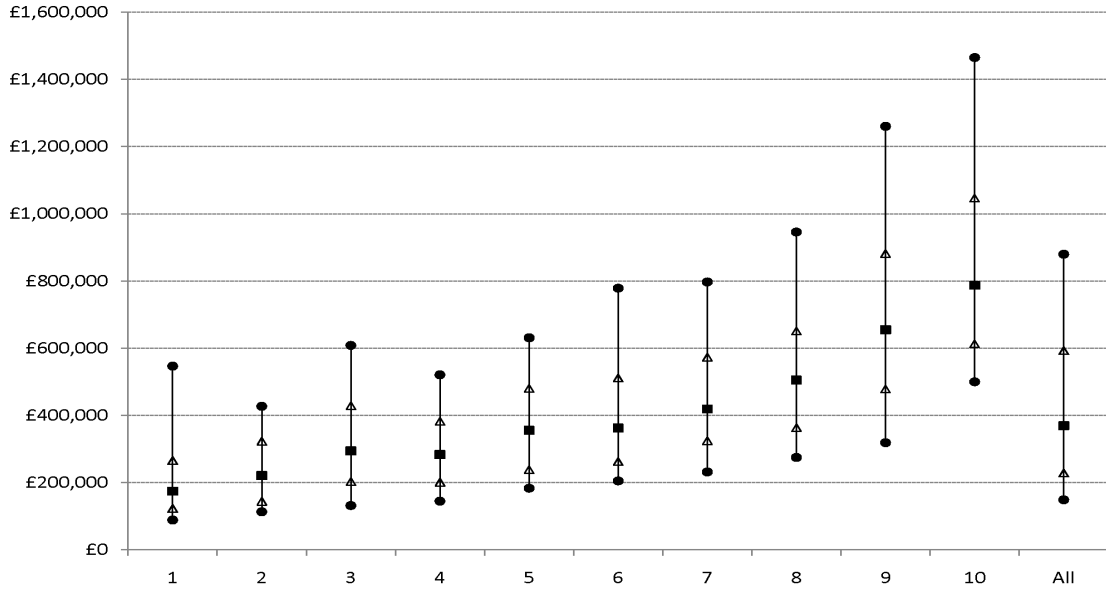
Standard errors in parentheses

Sample: Couples excluding bottom and top decile of lifetime earnings distribution.

Controls: we have also included age dummies in all specifications and linear lifetime earnings.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

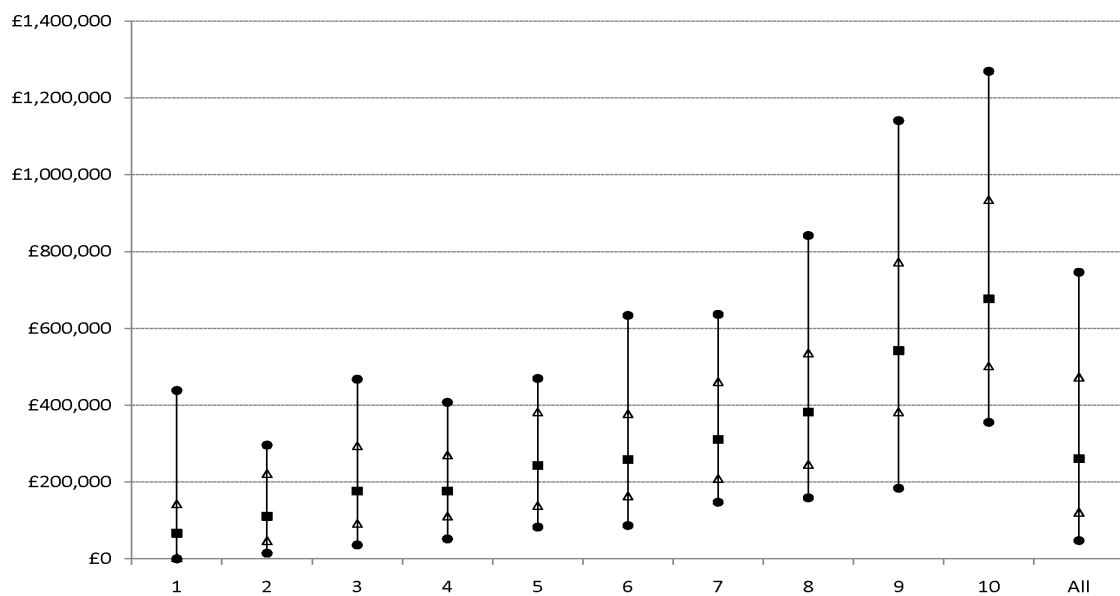
Figure 1: 10th, 25th, 50th, 75th and 90th percentiles of total net wealth, by lifetime earnings decile - couples (UK)



NOTES: Sample size = 1070; one observation per couple. Total wealth is the sum of all financial, owner-occupied housing, state and private pension wealth, plus the value of any other physical assets (such as other property or business assets) held by the couple, less the value of any outstanding secured or unsecured debts. Non-housing wealth is total net wealth, less the (net of any outstanding mortgage) value of owner-occupied housing.

SOURCES: ELSA data linked with NI records.

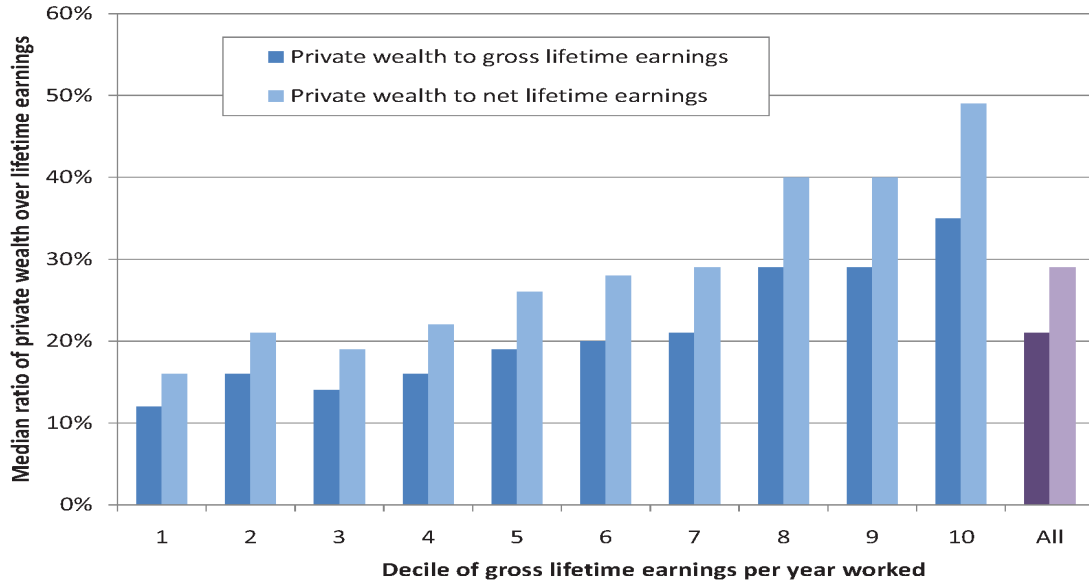
Figure 2: 10th, 25th, 50th, 75th and 90th percentiles of total net private wealth, by lifetime earnings decile - couples (UK)



NOTES: Sample size = 1070; one observation per couple. Private wealth is the sum of all financial, owner-occupied housing and private pension wealth, plus the value of any other physical assets (such as other property or business assets) held by the couple, less the value of any outstanding secured or unsecured debts. Non-housing wealth is total net wealth, less the (net of any outstanding mortgage) value of owner-occupied housing.

SOURCES: ELSA data linked with NI records.

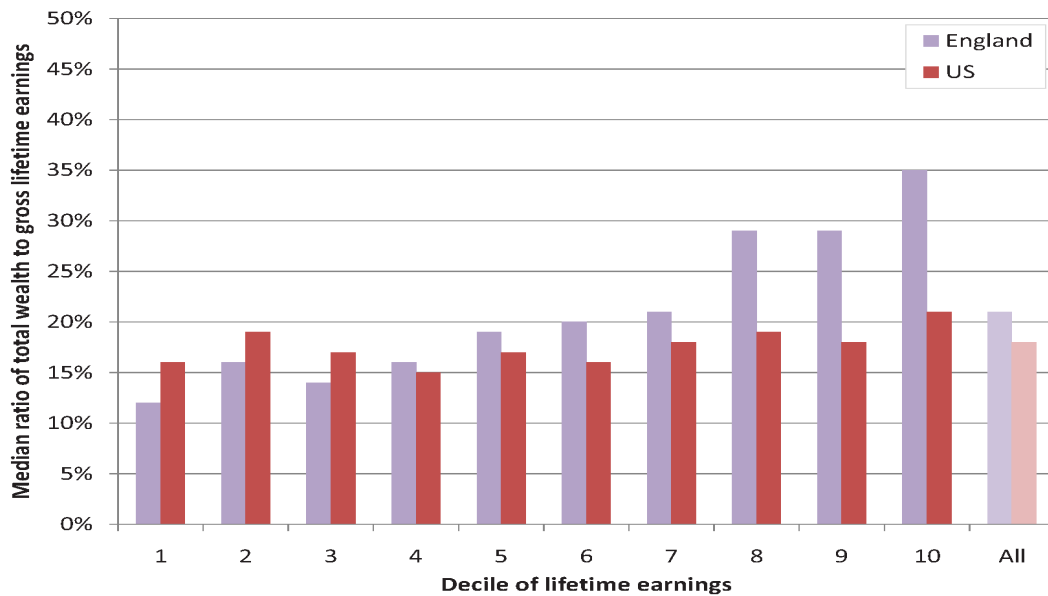
Figure 3: Total private wealth to gross/net lifetime earnings (couples, England)



NOTES: Sample size = 1070; one observation per couple.

SOURCES: ELSA data linked with NI records.

Figure 4: Total private wealth to gross lifetime earnings (couples, England vs US)



NOTES: Sample size = 1070 for England, 1599 for the US; one observation per couple.

SOURCES: ELSA data linked with NI records. HRS linked with SSA earnings data.