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DISCUSSION PAPER SERIES

IZA DP No. 17876

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ABSTRACT

Life Cycle Saving in a High-Informality Setting*

Low- and middle-income countries are experiencing fast population aging and reductions in extreme poverty, increasing theoretical incentives to save for old age, but empirical evidence on household wealth accumulation over the life cycle is lacking. Using age-cohort-time decompositions on 18 years of micro-data from Pakistan, we show that the average household accumulates wealth equivalent to 5 years' worth of consumption between the ages of 25 and 65. Furthermore, this is mostly in the form of illiquid residential housing and land in rural areas. Examination of housing acquisitions, renovations, and dwelling characteristics over the life cycle reveals that wealth accumulation in 2001-2018 resulted partly from active investment in housing and partly from capital gains. To the extent that keeping all wealth in the form of housing may be sub-optimal, this constrained ability to save for the long term could motivate the extension of contributory pension instruments to informal sector workers, the majority of the workforce in this setting.

JEL Classification: D14, D15, J11, J26, J46, J55
Keywords: savings, social protection, informality, aging

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1 Introduction

Low- or middle-income (LMI) countries have experienced fast population aging and large reductions in poverty in recent decades, which should increase households' demand for wealth. Lower fertility rates imply fewer dependent children but also less support in old age, simultaneously increasing the ability and the need to save. Increases in longevity raise the number of unproductive years to be covered in old age, and poverty reductions and economic growth allow more people to delay some consumption into the future. Proponents of the "demographic dividend" predict that increased savings will raise capital intensity and labor productivity, and offset the negative economic impacts of population aging (Lee & Mason 2010*a*). From a policy perspective, households' ability to save in contributory pension programs has become a parameter of major policy relevance as governments strive to extend social protection coverage outside of formal salaried employment (Bloom & McKinnon 2013; Banerjee et al. 2024; Guven et al. 2021).

Despite these powerful trends, practical obstacles could restrict the life cycle saving behavior hypothesized by Modigliani & Brumberg (1954) and the demographic dividend could fail to materialize. 61.2 percent of employed individuals around the world worked informally in 2019 and did not contribute to social insurance programs (Bonnet et al. 2019). They must, therefore, find other ways to store wealth, but many lack access to basic banking services, let alone safe long-term saving instruments (Demirgüç-Kunt & Singer 2017). They may also underestimate their longevity and saving needs, overestimate future transfers from their children (Smith et al. 2001), or lack the ability (commitment, financial literacy, liquidity) to safely put money aside for decades (Ashraf et al. 2006; Lusardi & Mitchell 2014; Laibson 1997; Harris & Laibson 2001). While cross-country correlations suggest an impact of demographic variables on national savings and the saving ratio (e.g. Loayza et al. 2000; Li et al. 2007), micro evidence of the ability of households in LMI countries to long-term save is lacking.

To our knowledge, this paper provides the first estimates of life cycle wealth accumulation by households in a low formality emerging economy, using micro data from Pakistan. We construct consistent measures of individual households' net worth, sub-components of wealth (buildings, land, financial assets, business value, durable goods, and liabilities), income, and consumption in repeated representative cross-sections spanning 18 years from Pakistan's Household Integrated Economic Survey (HIES). We then apply age-year-cohort decompositions to the different components of household wealth as well as household consumption and income.[1] We also exploit information on real estate acquisition, renovations, and dwelling characteristics to investigate whether wealth accumulation

[1] See the discussion in Deaton (1997)

reflects active investment or capital gains.

The emerging field of household finance in LMI countries has documented cross-sectional patterns in household wealth (Badarinza et al. 2019) but quantitative assessments of life cycle wealth accumulation do not exist to our knowledge. This is likely due to the dearth of repetitive, consistent, and representative microdata with reliable wealth measures needed to disentangle age, year, and cohort effects. Shorter-term asset dynamics have been examined for evidence of poverty traps (Barrett et al. 2017) and gender inequality (e.g. Quisumbing 2011; Dillon & Quiñones 2011). Studies applying the National Transfer Accounts (NTA) methodology to cross-sectional data across the globe have documented whether the consumption of old and young dependents are financed by transfers or by asset income and reallocation but do not follow cohorts over time (United Nations 2013). Another strand of the literature does apply cohort analysis to saving flows rather than asset stocks (e.g. Deaton & Paxson (1994) for Taiwan, China). They examine the short-term prediction of Modigliani's life cycle hypothesis which is that household consumption should be disconnected from income fluctuations (see (Deaton 1997) for a review). Consumption is generally found to track income more closely than would be implied by the theory which could be evidence that households are under-saving (Attanasio & Davis 1996; Carroll & Summers 1991). However, other studies have examined the extent to which liquidity constraints (Deaton 1991), precautionary savings (Carroll 1997), and cohort effects (Deaton & Paxson 1994) can explain this puzzle. [2]

The studies that measure wealth stocks and their age profiles directly have focused on rich countries with dedicated data sets such as the U.S.'s Survey of Consumer Finances (SCF) (e.g., Lydall 1955; Shorrocks 1975; or more recently Cagetti 2003; Wolff 2016). Households often appear to save too little, and concerns abound that households do not adequately prepare for retirement (see Mitchell & Moore 1998 for the U.S.). Others argue that adequate modeling of household consumption decisions (buffer stock behavior, end-of-life uncertainty, medical expenditures, asset-tested public transfers, family structure, etc.) can rationalize the saving behavior of American households (Gourinchas & Parker 2002; Scholz et al. 2006).[3]

We find that Pakistani households accumulate significant levels of wealth (relative to their consumption levels) and that most of that wealth is relatively illiquid. The average Pak-

[2]Self-reported evidence on who saves, but not how much is saved, can be found in the Findex financial inclusion surveys. Demirgüç-Kunt et al. (2016)

[3]Another related puzzle is that households do not dissave enough in old age, compared to what the LCH would predict, and that consumption tends to drop after retirement (Banks et al. 1998). The literature has attempted to quantify the role of possible explanations including bequests, asset illiquidity and longevity and health expenditure risk (e.g De Nardi et al. 2010; Nakajima & Telyukova 2016; Poterba et al. 2011).

istani household's net worth grows by the equivalent of 60 months (5 years) of household consumption between ages 25 and 65. That is, a household could consume for 5 years by drawing down assets accumulated during active years. Households across the income distribution exhibit similar accumulation rates relative to their consumption levels. The bulk of this accumulation happens after age 40 and takes the form of residential housing – as well as land in rural areas. More liquid forms of wealth such as financial wealth or durable goods also grow with age but in much more modest amounts, and therefore do not play a significant role in life-cycle saving.

We also exploit information on homeownership, renovations, and house characteristics to argue that part of the increase in housing wealth reflects active saving rather than passive capital gains: homeownership rates increase with age, as do housing renovations and housing quality. We also find that the rate of asset accumulation triples after age 40, just when consumption slows down relative to income, supporting the claim that households actively save. The asset price time series across wealth components needed to further quantify active saving and capital gains are not available in our context, which constitutes an important avenue for future research.

These findings jointly suggest that households in Pakistan, throughout the income distribution, engage in active life cycle savings to ensure old age support. Public pension programs tailored to informal sector workers could in theory help households diversify away from housing as their old-age consumption needs grow. The limited take up of such schemes in many countries (Guven et al., 2021) implies the existence of behavioral and informational barriers to participation, or that pension products are an imperfect substitute for housing wealth. Further research into the nature of housing as a saving instrument in contexts where inter-generational transfers and co-residence remain the norm is needed to guide pension program design.[4]

The paper is organized as follows. Section 2 describes population aging, informality, and economic resources available to the elderly in Pakistan. It also presents the data and variables we use in the analysis. Section 3 presents the decomposition methodology and results. Section 4 discusses interpretation and the policy implications of the findings and section 5 concludes.

[4]For example, recent research by Barczyk et al. (2023) shows in the US context how illiquid housing can alleviate a lack of commitment inefficiency as parents seek to exchange bequests promises for elderly care with their children.

2 Context and Data Sources

Pakistan is an ideal setting for our analysis for three reasons. First, the country has experienced major economic and demographic transformations over the past two decades that should theoretically raise the demand for wealth (Lee & Mason 2010*b*). Second, informality is ubiquitous, and the coverage of public and private pension schemes is very low. Third, its main household survey captures the different components of household wealth homogeneously over several decades. This section provides details on each of these three features.

2.1 Aging and pension coverage in Pakistan

Demographers put Pakistan in the third stage of the demographic transition, where mortality is low, population growth is fast and fertility starts declining (Goujon et al. 2020). The fertility rate in Pakistan has almost halved over the last thirty years from 6.2 births per woman in 1990 to 3.5 in 2018.[5]. Longevity has also improved significantly over the years spanned by our study. In 2019 a 65-year-old had a 25% chance of living beyond age 85, up 6pp from only a decade earlier.[6] In addition, Pakistan has experienced sustained growth and large reductions in extreme poverty, which could allow broader segments of the population to delay consumption into the future. GDP per capita increased by 53.1% in real terms between 2000 and 2018. Most striking: 65.1% of the population lived under USD2.5 a day (2017PPP) in 1990. That number was 4.9% in 2018.[7]

Most elderly individuals in Pakistan live with other family members whom they can presumably rely on for subsistence. In 2018, only 5.6% of elderly men and women lived either by themselves or only with their spouses. This proportion has not changed significantly between 2001 and 2018. Overall, elderly Pakistanis are less likely to live in poor households compared to non-elderly adults (Table 1). Among households that include an elderly member, assets jointly constitute the main source of income: when combining income from all types of assets, they represent 34.6% of household consumption (Table 2). For example, income from non-agricultural assets such as renting or selling the household's non-farm land or buildings amounts to 18.7% of household income. Labor market income is also central: labor income (from any household member) is equivalent to 31.2% of household consumption. In addition, 39.1% of men keep working after age 65. In contrast, only 6.5% of elderly women worked in the pooled sample.

[5]World Bank, World Development Indicators
[6]Own calculations from World Health Organization life tables
[7]World Development Indicators

88.5 percent of employment was informal in 2017 in Pakistan (Bossavie & Wang,2022) and active formal pension coverage (the fraction of workers who contribute to a pension scheme) is among the lowest in the world in Pakistan at 10.9%.[8] Public sector employees are covered by a defined-benefit program, the Civil Service Pension Scheme (CSPS), and receive a lump-sum benefit at retirement from the Employees Provident Fund. Pakistan also has a fragmented set of occupational pension schemes for private-sector workers. The Employees' Old Age Benefits Institution (EOBI) at the federal level provides age, disability, and survivor pensions through a voluntary pension scheme to private sector employees on a self-registration basis. Only around 1.5 of 40 million workers were insured under the scheme in 2000 (Mahmood & Nasir 2008).

Other dimensions of social protection are more developed. The Employees Social Security Institutions (ESSIs) at the provincial level provide health services (through Social Security Hospitals, medical centers, and dispensaries) and some cash benefits to employees of registered establishments. Punjab's ESSI serves above 2.5 million patients every year and requires employers to contribute 6 percent of the wages of their employees (having wages up to PKR 18000). While no non-contributory social pension exists in Pakistan, several well-established social protection programs assist households in poverty. The main safety net program run at the federal level is an unconditional cash transfer program called the Benazir Income Support Program (BISP). It targets women in means-tested households and aims to safeguard the minimum levels of consumption of the poor without a specific emphasis on the elderly.[9]

2.2 Data sources

Our analysis is based on data from the nationally representative Household Integrated Economic Survey (HIES). The data consist of eight irregularly spaced rounds (2001, 2005, 2007, 2010, 2011, 2013, 2015, and 2018) and contain individual-level data on various outcomes including education, health, employment as well as household-level data on assets, income, and expenditure. Without a direct measure of pension coverage, our sample consists of all households where neither the head nor the spouse is working for the public sector.

We extract the measures of household wealth, income, and consumption listed below from the 2001-2018 rounds of the HIES surveys. They are inflated to 2011 Pakistani rupees and adjusted for regional differences by the Paasche Index. All wealth measures are divided by household monthly consumption expenditures to obtain the number of months

[8] World Social Protection Database
[9] Oxford Policy Management

of consumption that the sale of an asset could sustain. Survey-based wealth measures are prone to measurement error and sensitive to outliers. Since our focus is not on the wealthiest households, we winsorize each component of wealth at the 99th percentile. We also perform our analysis on the 25th, 50th, and 75th percentiles of household net worth and find that the mean and median behave similarly, which implies that outliers are not a concern after winsorizing.

We construct the following household wealth variables (auxiliary variables used in the analysis are described in appendix B):

- **Household net worth:** The sum of all forms of household wealth included in the survey: housing wealth, land, financial wealth, and the value of agricultural and non-agricultural businesses operated by the household. The value of household durable goods was not available in all years and is therefore not included in household net worth. However, we analyze durable goods separately and show that they do not play a major part in household wealth accumulation.

- **Housing:** The self-reported value of all residential buildings owned by the household including the primary residence (if owned) and any other non-commercial buildings.

- **Land:** The self-reported value of agricultural and non-agricultural land owned by the household. In the module on agricultural activities, only the surface of agricultural land owned is reported by the household, not its value. However, a value per acre can be computed for each household from other owned agricultural land reported outside the agriculture module by dividing the declared value by the declared surface. We compute the median acre value within each round, province, and urban/rural groups. The missing land values are then imputed using the product of the declared surface and median acre value.

- **Durables:** The estimated resale value of durable goods owned by the household such as textiles, kitchen equipment, furniture, appliances, or vehicles.

- **Business value:** The resale value of equipment and property from agricultural and non-agricultural businesses owned by household members. This includes the expected resale value of animals (cattle, buffalo, camels, sheep, goats, poultry, fish, etc.) owned by the household. However, the value of agricultural machinery was not elicited in the questionnaire and is therefore not included.

- **Financial wealth:** The value of net savings/deposits, gold/silver/jewelry, and securities. We consider loans separately and therefore exclude them from this measure.

- **Loans:** The outstanding value of loans owed by the household, net of the value of loans owed to the household.

Table 3 shows some characteristics of the households in our sample: household heads are 46 years old on average; 28% of heads have primary education and 18% have secondary education; 66% of households are rural; and they earn and consume around PK20,000 (2011 PKR) on average. Average total net worth equals 72 months of the household's consumption, of which 32 correspond to housing, 34 to land, 1.4 to durable goods, 5.2 to farm and enterprise property, and 2.9 to financial wealth. Households in the sample also owe an average of 1.33 months of consumption in loans.

Appendix Table A1 provides additional heterogeneity information regarding the levels and types of private wealth owned by different categories of Pakistani households. It distinguishes between urban versus rural households and between households in different consumption quintiles.[10] In 2018, rural households owned 31.8% more wealth than urban households on average, relative to their consumption (76.5 months versus 58.0 months). Both groups have experienced substantial growth in their net worth over the period we consider (+52.6% for urban households and +20.6% for rural households). Households in the fifth quintile of the consumption distribution owned almost twice as much wealth as households in the first quintile, relative to their consumption (93.6 months versus 49.8 months). Net worth growth between 2001 and 2018 was much faster in quintile 5 (+24%) relative to quintile 1 (+7.4%).

All categories of households hold the bulk of their wealth in residential housing with no clear time trends. Rural households also hold significant amounts of land (around a third of their net worth). Real estate accounts for a larger percentage of the wealth of rural versus urban households (70.8% versus 56.6% in 2018) and of poorer versus richer households (Q1: 66.7% versus Q5: 54.5%). We also see a much higher saving rate for urban households relative to rural households and for the fifth quintile of consumption relative to the first. Note, however, that saving rates subtract logged household consumption from logged household incomes and that home production is accounted for in consumption but not in income. The value of what a smallholder farm household grows and consumes is therefore not counted as income, but it is subtracted as part of consumption when computing the saving rate, which could explain the negative saving rates obtained for rural and lower quintile households.

[10] As mentioned earlier in this section, consumption quintiles are computed for each survey round and for each age group (up to 25, 26-35, 36-45, 46-55, 56-65, over 65 years old), rather than for the overall pooled sample. This implies for example that Q1 households are among the 20% poorest households in their age group (based on the age of the head) and in that survey round.

3 Wealth Accumulation Over the Life Cycle

3.1 Decomposition Methodology

Our goal is to measure how average household net worth evolves with age, but using a single cross-section of data severely understates the rate of life cycle wealth accumulation. To see this, figure 1 plots household net worth measured in multiples of monthly household consumption against the age of the household head for the 2001, 2010, and 2018 HIES survey rounds. Age profiles thus constructed appear to increase by around 1 month of consumption per year of age. However, this fails to consider that each cohort is wealthier than the next: the 2018 cross-sectional profile is shifted upwards by around 20 months of consumption relative to the 2001 profile.

Pooling multiple years of data allows us to follow each cohort as they age and measure the true rate of wealth accumulation. As an example, the three dots in figure 1 identify household heads born in 1960 whose net worth we observe at ages 41 in 2001, 50 in 2010, and 58 in 2018. It appears clearly that when the 1960 cohort reaches age 58, its average net worth is much higher than that of a 58-year-old in 2001. Therefore, the line that goes through the three data points corresponding to the 1960 cohort is much steeper than the cross-sectional profiles: over 20 years, the average net worth for that cohort increases by nearly 40 months of consumption. In other words, considering household net worth by age in a specific year significantly understates the rate at which households accumulate net worth over time. In the example from figure 1, the rate would look two times slower.

To measure the rate of wealth accumulation experienced by households over their life cycle net of differences across cohorts and years, we apply the age-year-cohort decomposition methodology described in Deaton (1997). For each of the variables of interest (measures of wealth, consumption, and income), we compute the means by cohort and year and stack these values in a vector y. We then estimate the following model using simple OLS regression after applying cross-sectional sampling weights:

$$y = \beta + A\alpha + C\gamma + D^*\delta + u \tag{1}$$

where A and C are matrices with columns of each age and cohort dummy respectively.[11] Similarly, D^* is a matrix of transformed year dummies d_t^* defined as:

$$d_t^* = d_t - ((t-1)d_2 - (t-2)d_1) \tag{2}$$

As in Deaton (1997), the above restriction solves the multicollinearity problem by en-

[11] The first column in each matrix is omitted to avoid collinearity with the constant term.

suring that: (1) all year effects sum up to zero and (2) year effects are orthogonal to a time-trend. This implies that time trends are interpreted as age and cohort effects whereas year effects capture short-term fluctuations that add to 0 in the long-term, such as business cycles.

We normalize the first age dummy and the first cohort dummy to be equal to zero. The focus of the analysis is the coefficients α which capture increments to the variable attributable to the aging of the household head relative to household heads aged 25. In the decompositions, we restrict the sample to household heads aged between 25 and 65. Effectively α in the above equation is a vector with each element corresponding to the isolated effect of each of the ages (between 25 and 65) on the decomposition's variable of interest. The cohort coefficients γ capture an additive endowment that shifts the whole age profile of each cohort relative to the first one.

Because asset measures and our decomposition are at the household level, results must be interpreted through the lens of a virtual "household life cycle". A household is "born" when headship is transferred to a younger household member and dies when the headship is transferred again. We implicitly attribute ownership of all household assets to the head in the sense that asset values in a household are associated with the age of the head to estimate the decomposition. This is as if individuals inherited all the assets of other members of the family when they become household heads regardless of whether the asset owner has died and a formal inheritance transfer had happened.

Empirically, individuals who become heads of their household at a younger age may belong to richer or poorer households than average, which could bias age effect coefficients. Appendix Table A2 shows that most males between the ages of 40 and 64 are heads of their household. Therefore age coefficients for those years are not tainted by selection bias. However, the proportion of men who are household heads drops when moving up the ages, down to 28.6% between ages 25 and 29. Households headed by younger individuals may be a selected sample regarding saving behavior or initial net worth making this type of household difficult to compare with those with older heads. Therefore, it is important to keep this source of selection bias in mind when interpreting the early segments of the life cycle profiles presented in this paper. Still, households with younger vs. older heads are similar on at least three observable dimensions: the gender of the head, the level of education of the head, and the fraction of households that are in rural areas.

3.2 Household wealth accumulation over the life cycle

Before examining wealth stocks directly, we replicate the approach of Deaton & Paxson (1994) and examine the age profile of saving rates extracted as the difference between age effects in income and consumption. Equation (1) is estimated with the logarithms of household income and household consumption as dependent variables. The difference between the two sets of coefficients on the age dummy variables captures the saving rate changes associated with each age relatively to age 25.

Appendix figure A1 plots the estimated coefficients. It shows that household income starts outpacing household consumption in the early 40s allowing the household saving rate to grow by 20 percentage points by age 55. In the 20s and 30s, income and consumption grow at the same rate which implies that the saving rate is constant through that age range. The profiles we obtain are very similar to those measured using Taiwanese data in Deaton & Paxson (1994). Deaton and Paxson show that the acceleration of saving after age 40 could be attributed to children exiting the household around that time which is also the likely explanation here.

We now turn to our main objective which is to quantify the accumulation of household wealth over the lifecycle. The decomposition of the saving rate tells us whether saving tends to accelerate or slow down with age but does not give us a sense of how much is accumulated overall. To quantify this, we apply the same decomposition to measures of the stock of household wealth. The estimated coefficients capture the additional average household net worth relative to age 25 and are shown in Figure 2, panel c. They imply that households on average accumulate an amount of net worth equivalent to around 5 years (60 months) worth of consumption between the ages of 25 and 65.[12] Life expectancy for men at age 65 in Pakistan was 13.7 in 2020. Therefore, a back-of-the-envelope calculation implies that 31% of consumption needs after age 65 could be covered by savings on average.

The accumulation is gradual but it accelerates significantly in the second part of the life cycle. The slope of the age profile becomes three times as steep between ages 40 - 65 compared to 25-40: net worth increases by 10 months on average between ages 25 and 40 or 2/3 months per year and by 50 months between ages 40 and 65 or 2 months per year. This acceleration is consistent with the increase in the saving rate measured at the same ages in Appendix figure A1.

[12]Using quantile regressions, we decompose the median and percentiles 25 and 75 of total household net worth (results available upon request). The median behaves similarly to the mean suggesting that outliers are not a concern. The percentiles 25 and 75 exhibit slopes that are half as steep and twice as steep, respectively, as the median.

Cohort effects are reported in figure 2, panel b. In our decomposition model, cohort effects simply shift by a constant the household wealth age profile, which is assumed to have the same slope across all cohorts. Under these restrictions, we find that younger cohorts have significantly higher initial endowments than older ones. The point estimate for the difference in endowments between cohorts born 40 years apart is about 36 months of consumption. However, if we ignore the three oldest cohorts (observed only one round and thus imprecisely estimated) and extrapolate the cohort profile linearly we are closer to 30 months. This amounts to roughly half of the life cycle accumulation measured by the age effect at age 65 (60 months). In a stationary overlapping generations economy, this number can be interpreted as the share of life cycle savings that are bequeathed to the next cohort, thereby growing their endowment relative to previous cohorts. In turn, the difference between age effects and cohort effects can be interpreted as the share of life cycle savings that are consumed in old age. Therefore, our estimates suggest that around half of the life cycle wealth accumulation is bequeathed to the new incoming cohorts, and half is spent financing the retiring cohort in old age. We report year effects in figure 2, panel d. The average size of year effects is much smaller than that of age or cohort effects (recall that they are constrained to sum to 0). The pattern in year effects follows quite closely the evolution of Pakistan's GDP growth rate over time.

Next, we estimate profiles for each component of wealth, distinguishing between rural and urban households (Figure 3). Housing wealth accounts for most of the net worth households accumulate (panel a). Residential real estate increases by 45 months of household consumption which represents about 75% of the total increase in net worth. Land constitutes more than a quarter of total net worth among rural households (see appendix table A1), and grows by 25 months of consumption over their life cycle. In contrast, urban households' net worth is only 5.2% land and it grows by only 5 months.

Other forms of wealth play much smaller roles in the life cycle accumulation of household net worth. The value of durable goods tends to decline slightly with age, more so for urban households. The value of business and farm assets (including cattle) increases slowly. Financial wealth (net savings and deposits, gold, silver, jewelry, and securities) tends to stagnate or decline slightly until age 45 before growing. The net average increase is 1 month of consumption over the life cycle. We also observe that households steadily de-cumulate debt over the life cycle for an improvement in their net position of around 3 months over the life cycle. Overall, financial wealth represents a negligible fraction of life cycle net worth accumulation. It may serve to finance lumpy expenditures or form a buffer stock of liquid funds in case of a shock but is not sizeable enough to finance retirement consumption needs.

The decomposition of age profiles can also be applied to subgroups of lifetime or permanent income. We approximate quintiles of permanent income by computing per capita equivalent consumption quintiles over 5-year age bins as described in the data section.[13]

Wealth accumulation is not exclusive to rich households. In fact, saving rates follow similar life cycle progressions across all consumption quintiles as shown in Figure 4, panel a: saving rates are constant in the 20s and 30s before increasing by 15-30 percentage points in the second half of the life cycle. While households in the bottom quintile exhibit average saving rates that are much lower in levels than those in the top (Table 3), their progressions over the life cycle are very similar. In keeping with saving rate patterns, household wealth accumulation is comparable across consumption quintiles 2 through 5 (see Appendix figure 4, panels b, c, d). Patterns differ somewhat for the first consumption quintile: residential wealth growth is markedly slower even expressed in terms of their lower consumption levels.

3.3 Evidence of active wealth accumulation

Wealth accumulation can result from three mechanisms that could have distinct policy implications: active saving, capital gains, or transfers (Wolff 2016). If households actively acquire assets to transfer resources over time, they may be willing – and able – to contribute to pension instruments instead, if offered the opportunity. If, on the contrary, they passively benefited from capital gains on their inherited assets or from transfers, wealth accumulation in itself may not reflect an ability or willingness to long-term save.

The life cycle wealth growth estimated in the previous section cannot be attributed to asset transfers. Asset transfers between co-residing parents and children are captured by cohort effects because ownership of household assets is implicitly assigned to the household head, as we discuss in the methodology section. Asset transfers to and from individuals external to the household are recorded in the survey but are extremely rare (see table 2).

In the decomposition, capital gains occurring when asset prices systematically outpace inflation are interpreted as age effects. This is because we assume that year effects are orthogonal to a time trend. Time-series of asset prices for each wealth component are not available for Pakistan over the period we consider, so we cannot quantify the relative importance of capital gains and active saving. We extracted transaction prices for the

[13]We could also have disaggregated by strongly but this would result in coarser and uneven groups.

2010-2018 period from the website Zameen for a few major urban areas and types of housing units (see appendix table A3), showing large real price increases in some cases but also real decreases in others. However, their relevance to the average household in our sample –which includes a majority of rural households and many urban areas not covered by the Zameen data– cannot be assessed.

We can document several indirect indications of active saving in our data. Wealth accumulation rates triple at the same time as the saving rate increases, around age 40 (see figures 2 and A1). This pattern could not be plausibly explained by changes in asset prices and suggests an important role for active saving. As a rough bounding exercise, we could attribute the full increase in wealth between ages 25 and 40 to a price effect and further assume households do not actively save throughout their lifecycle. In that case, total life cycle accumulation would only come up to 26.7 months, instead of 60 months. In other words, active saving would account for a little more than half the total wealth accumulation.

Since most wealth accumulation happens in the form of housing, we can also exploit survey information on homeownership rates, home renovations, and dwelling characteristics to look for further evidence of active investment in housing over the life cycle. Table 2 shows measures of housing wealth flows that reflect active investment in housing, disaggregated by age of the household head for the pooled survey rounds. The first column considers investment at the extensive margin, i.e. becoming a homeowner. Homeownership rates are high at around 85% but increase by 8pp between 25 and 65. Homeownership rates are flat throughout the first half of the life cycle and only pick up in the second half, which is consistent with the age profile of the saving rate. Conditional on owning housing wealth, the value of those housing assets is around 3 years of consumption on average (table 3). In addition, between 1.5 and 2.3% of households report investing in house renovations each year. This fraction again remains flat until age 40 and increases thereafter. The average (unconditional) amount spent on renovations annually equals around .13 months' worth of annual consumption. In appendix figure A2 we also report evidence that the characteristics of the household's dwelling improve with the age of the household head. The percentage of dwellings with no drainage system declines, whereas the fraction of those with piped water (versus a well or a hand pump), with burnt brick walls (vs. mud bricks), or with flush toilets (vs. dry toilets or no toilets), increases with age.

4 Discussion

Despite lacking access to formal pension programs, Pakistani households store and accumulate sizeable economic resources over the long term in the form of illiquid housing and

land assets. What does this reveal about their ability and willingness to long-term save, and what are the implications for pension design?

The first interpretation is that current saving behavior is optimal in a "first-best" sense. The fact that households primarily own real estate and land suggests that they are valued as safe investments that cannot easily be stolen, or appropriated by other family members. In addition, households can extract utility from a house by living in it, which partly insulates the returns to this asset from market price fluctuations. While sophisticated financial instruments such as reverse mortgages are almost absent from LMI countries, older individuals who seek to de-cumulate housing wealth may be able to draw value from it in multiple ways, including renting out, downsizing, or through implicit intergenerational arrangements in which children support their elderly parents in exchange for lodging and real estate bequests (Badarinza et al.,2019). For example, Barczyk et al. (2023) propose and estimate a limited-commitment model in which parents invest in illiquid housing as a way to commit to a bequest and obtain informal care from children in exchange. Further research is needed to understand the complex roles that housing plays in LMI country contexts and the degree of substitutability between housing and pension wealth.

The patterns measured in this paper likely also reflect financial exclusion, i.e. a lack of access to other safe, high-return, and trustworthy long-term saving instruments (Demirgüç-Kunt et al., 2018). Low financial literacy, numeracy, and familiarity with formal banking institutions can all create barriers to participation in other forms of saving. If that is the case, offering informal workers access to pension programs could help them diversify away risks associated with housing wealth. Owning only housing wealth leaves households exposed to catastrophic events such as the floods that affected much of Pakistan in 2022, causing USD5.6 billion in housing damage. With the advent of climate change, such weather shocks may become more frequent, raising the value of combining several long-term saving solutions.

Housing also remains a relatively illiquid asset so exposure to short-term shocks may limit the long-term saving ability of households. According to the Findex surveys, only 3 percent of those aged 15 years and above in Pakistan report being able to rely on savings for emergency funds while 49 percent say it is not possible to come up with emergency funds. The main source of emergency funds tends to be family or friends according to 41 percent of the population aged 15 years and above; 25 percent report borrowing for medical expenditures. Pension instruments could be made more attractive to households concerned with economic shocks by coupling pension expansion with short-term risk insurance instruments against medical expenditures, work injuries, or index insurance. Flexibility in

contribution schedules and the ability to withdraw some funds in specific circumstances, to use accumulated pension balances as collateral, or as proof of creditworthiness could alleviate this problem.

Overall, our results suggest that Pakistani households across the income distribution have a contributory capacity in the sense that they do not live hand-to-mouth throughout the life cycle or rely exclusively on transfers to finance consumption in unproductive years. Rather, they own large amounts of assets to transfer resources across time. This conclusion is in line with the analysis of National Transfer Accounts in Pakistan (Nayab & Siddique, 2020) which concludes from cross-sectional age profiles that asset reallocation is a key contributor to financing the life cycle deficit. Age patterns in wealth accumulation and the saving rates further suggest that the contributory capacity is lower early in the life cycle but grows after age 40 and that age-dependent contribution rates may be appropriate. While we find evidence for active investment in housing, data limitations prevent us from assessing the exact role that differential housing inflation may have played in growing household net worth. Further research is therefore needed to quantify precisely the scale that an informal sector pension scheme could reach. This parameter is crucial for the viability of pension schemes, as fund management costs must be kept low to ensure positive returns to affiliates (Guven et al. (2021)).

5 Conclusion

Low- and middle-income (LMI) economies are aging faster than rich countries did in the past. In addition, formal pension coverage is likely to remain low as a fraction of the labor force: in many countries large cohorts of young workers enter the labor market, exceeding the availability of formal jobs offering fringe benefits, even when GDP growth is strong (La Porta & Shleifer 2014). In other words, LMI economies are becoming old before they are rich and formalized. While the challenge of rich countries is to reform their pension systems to ensure their sustainability, LMI countries are trying to design innovative social insurance systems to ensure that their populations, who operate largely outside of formal employment structures, are protected against poverty in old age. Governments will need to integrate contributory and non-contributory schemes, to protect all despite limited fiscal resources.

A key determinant of the viability of contributory pension schemes is their scale. In LMI countries we lack evidence on what fraction of the population can afford to give up some liquidity to pay into a pension program. This paper provides intuition into this question by quantifying how much illiquid long-term saving households already engage in the ab-

sence of a pension program. Yet key pension design questions remain poorly documented empirically outside of rich countries, requiring further research. To what extent do individuals anticipate their longer lifespans and population aging more generally? Will they have access to family and network support systems when they reach old age and what are their beliefs about it? How do they value their different options to prepare financially for old age, including formal pension systems in contexts where trust in institutions remains low?

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6 Tables and Figures

Table 1: Sources of income for households that include elderly members, by year

Year	Labor force participation		Income sources of households with elderly members (% of hh consumption)						
	Elderly women (%)	Elderly men (%)	Labor income	Remittances	Safety nets	Agri. Assets	Non-agri. Assets	Fin. Assets	Other Transfers
2001	7.7	40.2	27.4	17.0	1.3	11.0	15.4	1.4	2.6
2005	8.0	41.9	37.5	23.1	0.8	12.4	19.9	0.6	1.8
2007	5.6	40.0	34.1	16.5	0.5	10.8	24.1	0.3	4.7
2010	4.9	37.6	28.6	18.7	0.6	8.1	16.0	0.5	4.9
2011	6.3	38.3	27.5	17.2	0.3	19.5	18.1	2.5	4.6
2013	5.9	37.1	31.0	21.4	0.7	5.3	16.3	1.2	6.0
2015	6.9	39.3	34.8	22.5	0.3	9.2	19.9	1.0	3.6
2018	6.4	38.7	29.0	25.3	0.8	9.2	20.0	3.4	5.2
Avg.	6.5	39.1	31.2	20.2	0.7	10.7	18.7	1.5	4.2

Note: Entries in the first two columns correspond to labor force participation rates of men and women aged 65 or more. Entries in columns 3-9 correspond to household income from each source divided by household consumption, averaged among households that include an individual aged 65 or more. Data is sourced from the Household Integrated Economic Survey (HIES) survey rounds pooled from 2001 to 2018.

Table 2: Homeownership, renovations, acquisitions and transfers, by age

Age	% Home-owner	% Renovated house (past 12 months)	Average renovation value	% Received housing as transfer (past 12 months)	Average Transfer Value
25-29	82.3	1.52	0.12	0.02	0.42
30-34	82.1	1.47	0.12	0.01	0.06
35-39	82.4	1.54	0.12	0.00	0.05
40-44	82.9	1.66	0.11	0.05	0.00
45-49	83.3	1.87	0.15	0.00	0.00
50-54	85.6	2.11	0.12	0.06	0.44
55-59	87.3	2.33	0.15	0.02	0.52
60-64	88.2	1.95	0.13	0.01	0.22
65+	91.4	2.15	0.16	0.00	0.00
Total	84.9	1.84	0.13	0.01	0.15

Note: Age refers to the age of the household's head. Columns 3 and 5 contain averages conditional on strictly positive values and expressed as multiples of monthly household consumption. Data is sourced from the Household Integrated Economic Survey (HIES) survey rounds pooled from 2001 to 2018.

Table 3: Summary statistics

				Mean by survey round							
	N	Mean	sd	2001	2005	2007	2010	2011	2013	2015	2018
Age of the household head	141034	46.0	13.8	45.8	46.0	45.9	46.5	46.2	45.8	46.1	46.1
Household rural	141034	65.9%	-	71.8%	65.9%	66.5%	66.5%	66.1%	64.4%	64.1%	62.7%
Household head with primary education	140918	27.9%	-	27.4%	27.0%	27.9%	28.0%	28.3%	28.1%	26.9%	29.5%
Household head with secondary education	140918	18.4%	-	11.1%	17.5%	20.5%	20.6%	20.9%	20.4%	14.6%	20.9%
Household consumption expenditure	139797	20136	15367	15636	19035	18989	19549	20219	21344	23224	22355
Household income	141034	21956	34734	14941	21806	22230	20684	22200	23205	24926	24954
Household wealth (multiples of monthly household consumption)											
Household net worth (excl. durables)	139797	72.60	118.46	60.18	72.29	82.04	68.18	74.37	74.17	74.17	75.72
Housing	139797	31.58	38.38	20.63	29.26	34.72	29.25	31.60	30.94	36.15	38.47
Land	139797	34.24	106.94	35.37	36.02	37.97	32.59	35.50	34.86	31.40	30.65
Durables	139797	1.42	2.78	1.48	1.77	1.83	1.43	1.47	1.41	–	1.95
Enterprise property (incl. livestock)	139797	5.24	19.42	4.64	5.77	6.47	4.98	5.28	5.14	4.94	5.03
Financial wealth (excl. loans)	139797	2.87	6.10	1.89	2.86	3.00	2.59	3.17	2.81	2.59	2.57
Loans	139797	1.33	4.22	2.36	1.62	1.15	1.37	1.18	1.20	0.91	0.99
Homeownership rate (%)	141034	85.9	88.2	88.3	87.4	85.6	84.0	842	84.2	84.2	86.0
% households who renovated house	140351	2.19	-	2.64	2.93	2.45	1.43	1.57	2.60	2.73	1.30
Net value of renovations made	2536	7.47	10.16	6.14	6.30	9.94	7.89	10.60	4.92	6.43	10.73

Note: Wealth variables winsorized at 1%. The value of household durable goods was not available in 2015. Data is sourced from the Household Integrated Economic Survey (HIES) survey rounds pooled from 2001 to 2018.

Table 4: Economic situation of elderly Pakistanis

Year	Household Net Worth			Elderly poverty ratio[1]	Co-residence rate[2]	Res. Wealth/net worth (%)[3]	Net worth > 6mo.(%)[4]	Net worth > 60mo.(%)[4]	Non-resid. wealth > 6mo.(%)[4]
	1st Quartile	Median	3rd Quartile						
2001	14.3	36.8	91.6	57.0	84.0	34.5	50.9	24.9	0.91
2005	20.7	51.4	111.7	67.6	91.9	45.1	56.9	27.4	0.91
2007	25.2	59.7	127.8	55.2	93.2	49.9	58.8	29.9	0.84
2010	17.9	46.8	105.4	54.9	87.9	42.4	53.4	24.2	0.82
2011	20.9	49.9	112.3	59.6	91.5	43.6	54.1	25.8	0.90
2013	22.5	55.3	118.9	57.9	90.9	47.2	55.0	27.2	0.77
2015	26.6	57.0	120.8	59.2	91.7	47.9	53.1	25.6	0.78
2018	24.5	61.6	120.6	60.8	91.4	50.8	53.5	24.1	0.84
Avg.	21.6	52.3	113.6	59.0	90.3	45.2	54.5	26.1	0.85

Note: The table outlines the economic characteristics of elderly Pakistanis, including household net worth, elderly poverty ratio, co-residence rate, and the composition of net worth.
Elderly poverty ratio: percentage of elderly Pakistanis living in households below the national poverty line over the percentage of households with non-elderly household head under the national poverty line.
Co-residence: percentage of elderly individuals living with family members other than their spouse.
Res. wealth/net worth: residential wealth as percentage of total wealth of households (average).
Net worth (or Non-resid. Wealth) > 6 (or 60) months: percentage of households that have net worth (or non-residential wealth) greater than 6 (or 60) months of the household's consumption needs. Data is sourced from the Household Integrated Economic Survey (HIES) survey rounds pooled from 2001 to 2018.

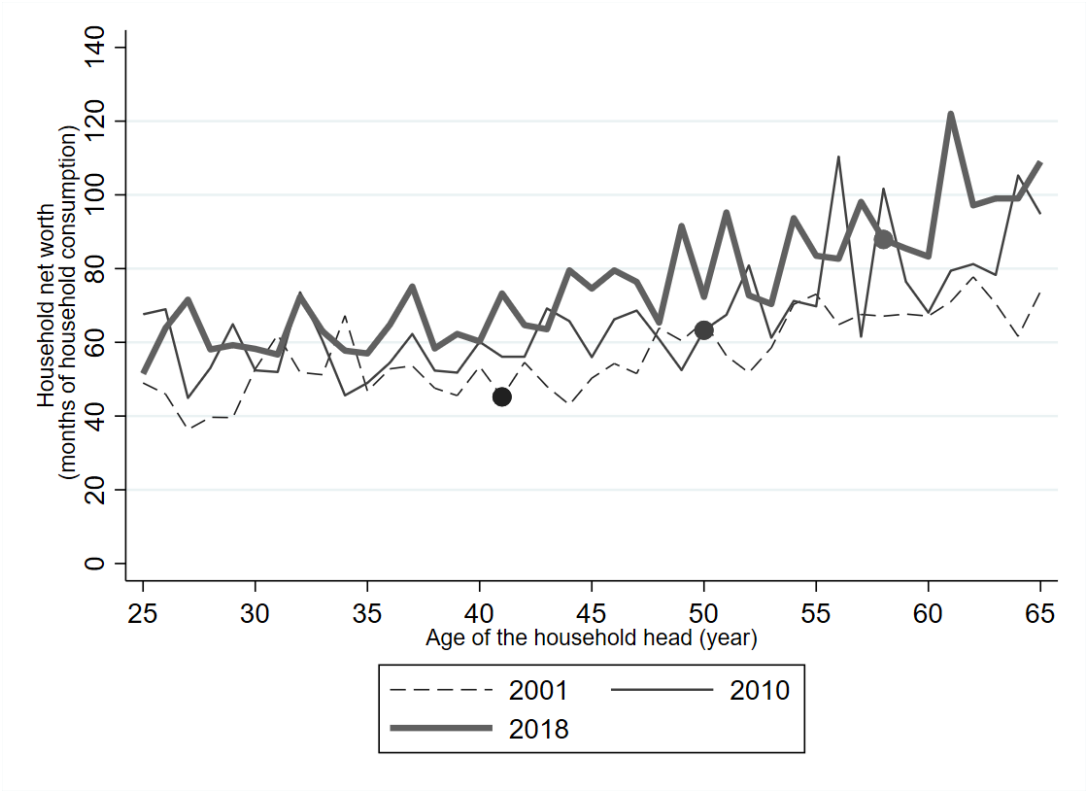
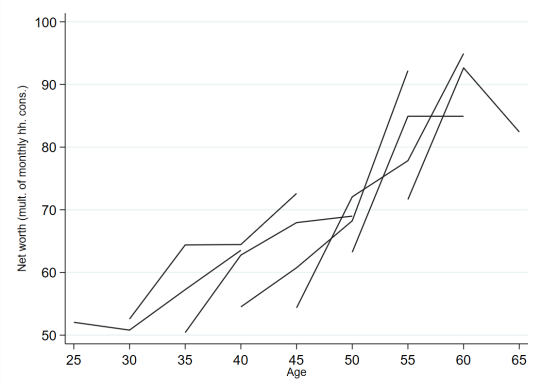


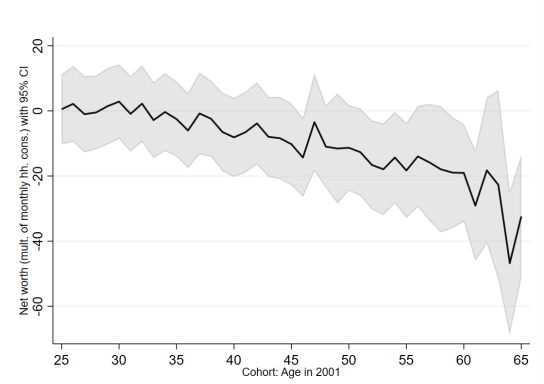
Figure 1: Household net worth in 2001, 2010, and 2018, by age

Note: The figure plots the net worth of Pakistani households, by age of the household head, in 2001, 2010, and 2018, expressed as multiples of monthly household consumption. The round markers identify the cohort born in 1960. Data is sourced from the Household Integrated Economic Survey (HIES) survey rounds conducted in 2001, 2010, and 2018.

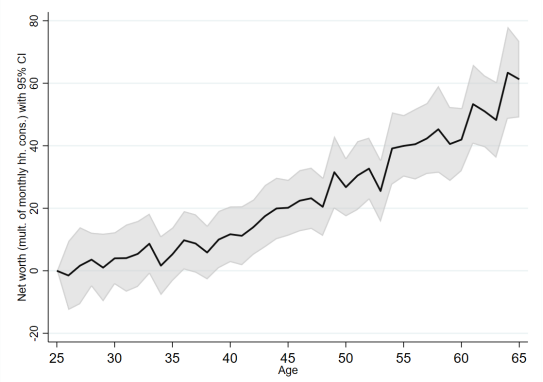
(a) Av. household net worth, by birth cohort



(b) Cohort Effects



(c) Age Effects



(d) Year Effects

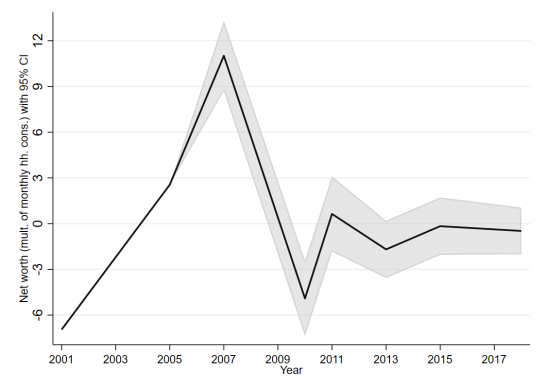


Figure 2: Decomposition of household net worth into age, cohort, and year effects

Note: Panel (a) plots average household net worth over the age of the household head, disaggregated into birth cohort series. Panels (b), (c), and (d) plot the coefficients on birth cohort, age, and year obtained from an age-year-cohort decomposition of household net worth. The estimation sample is the pooled 2001-2018 rounds of Pakistan's HIES. Standard errors are estimated by bootstrapping.

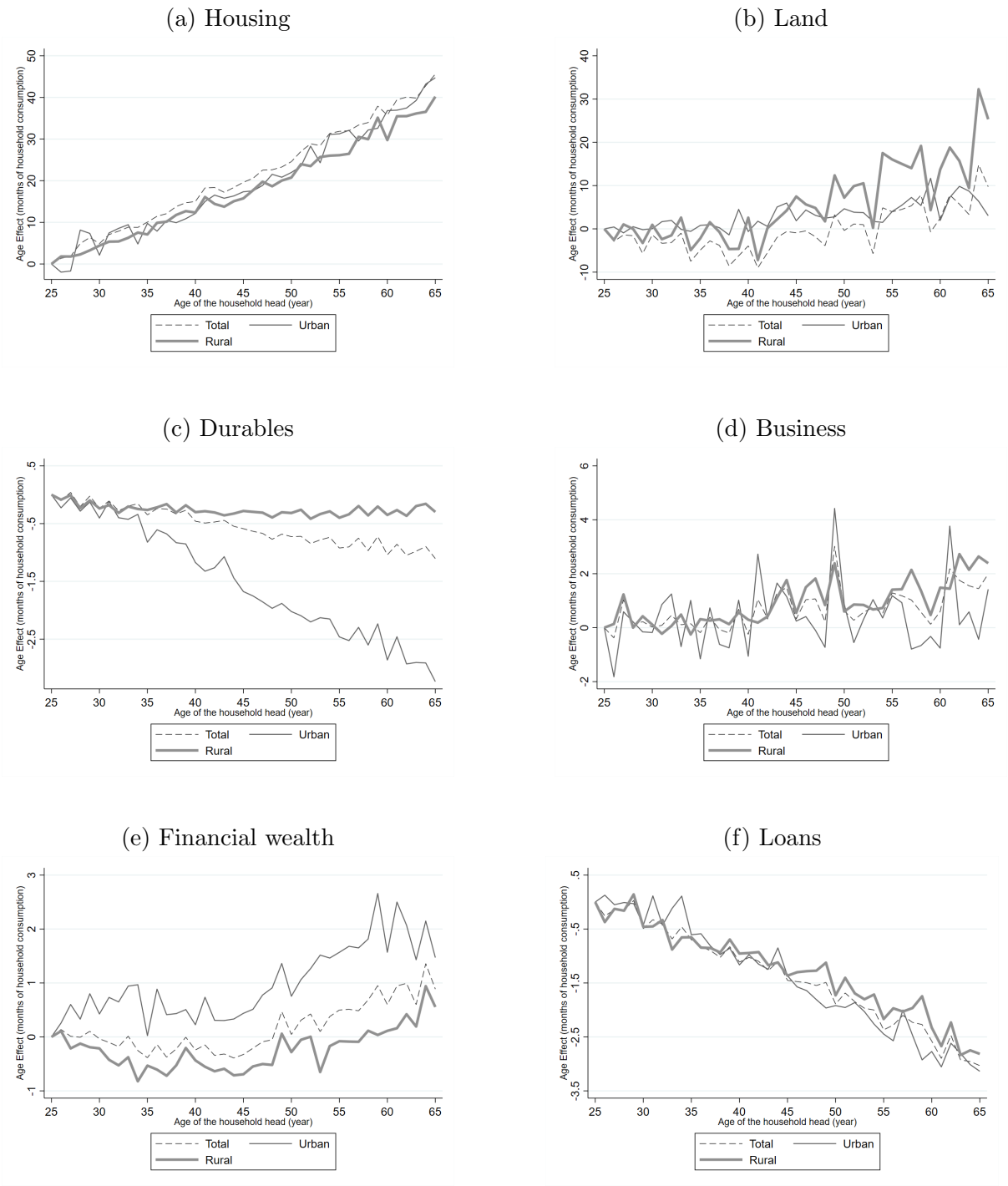


Figure 3: Age effects in rural and urban households' wealth, by wealth components

Note: This figure presents estimates of the age coefficients in an age-year-cohort decomposition of components of housing wealth. The six components are defined in section 2. The estimation sample contains the pooled 2001-2018 rounds of the HIES.

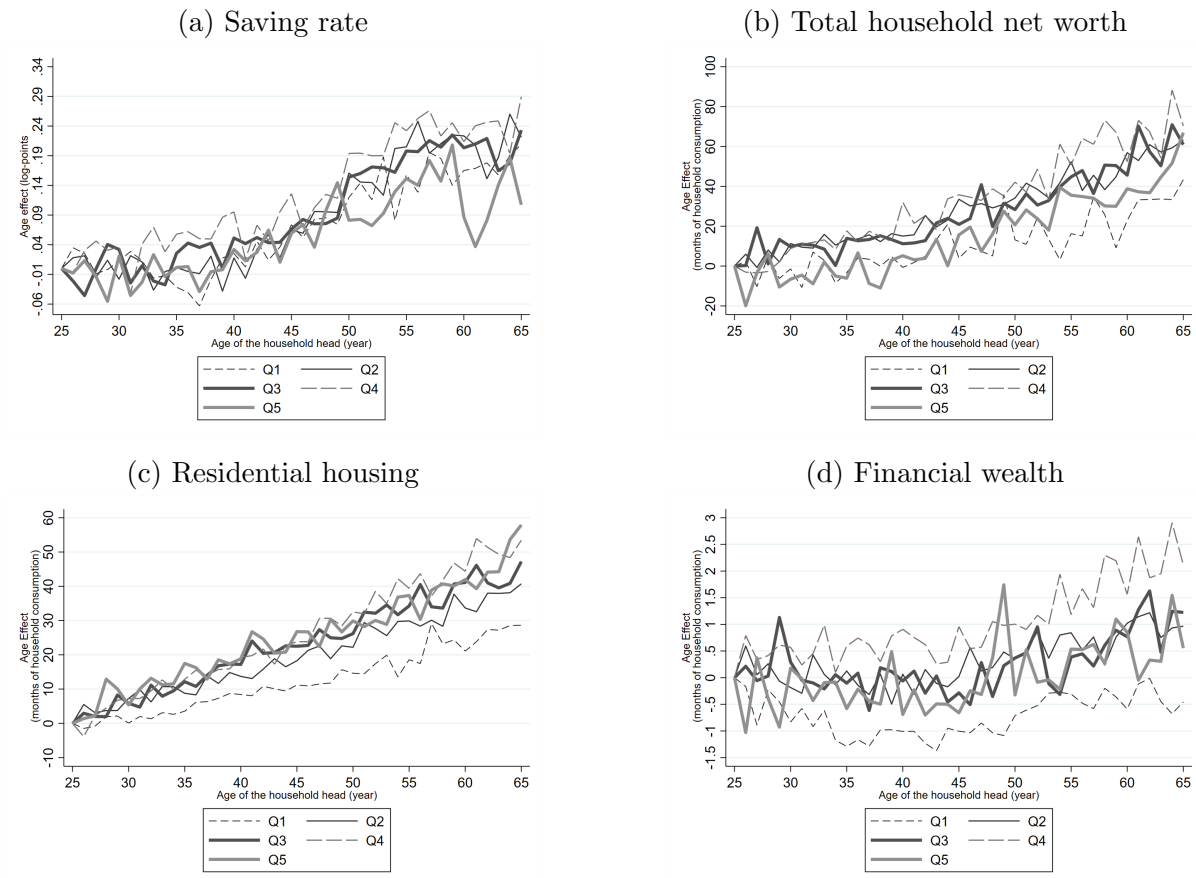


Figure 4: Age effects in household wealth accumulation, by wealth component and consumption quintiles

Note: The figure plots the age coefficients in an age-year-cohort decomposition of household saving rates and components of household wealth. Each series is estimated on households belonging to one of the 5 consumption quintiles in Pakistan's HIES, rounds 2001-2018.

7 Appendix A – Supplementary Tables and Figures

Table A1: Household wealth characteristics, by categories of households and year

	Average Net Worth					% Housing					% Land					Average saving rate (%)				
Year	Urban	Rural	Q1	Q3	Q5	Urban	Rural	Q1	Q3	Q5	Urban	Rural	Q1	Q3	Q5	Urban	Rural	Q1	Q3	Q5
2001	40.9	65.1	47.0	59.1	72.2	77.8	52.9	64.0	62.2	48.9	5.6	33.5	19.7	27.3	29.3	4.8	-24.2	-17.4	-18.1	-8.3
2005	58.8	76.1	49.6	62.3	99.3	75.2	55.2	68.0	60.7	59.4	5.7	31.8	17.9	24.2	25.5	10.6	-11.9	-7.8	-7.3	6.1
2007	68.7	85.6	57.6	73.6	111.1	69.9	53.8	62.6	59.3	53.6	5.4	27.9	17.2	20.7	24.0	10.6	-7.1	-6.4	-3.9	9.6
2010	56.6	69.7	43.5	59.2	99.6	63.6	54.9	66.3	59.8	46.7	5.6	26.8	13.5	19.7	26.9	5.0	-15.0	-15.9	-11.3	4.8
2011	61.6	76.7	46.3	69.9	104.1	72.4	54.9	70.9	62.1	56.2	4.5	25.9	12.4	19.0	23.4	6.8	-10.1	-10.2	-6.9	7.8
2013	56.6	80.5	51.4	66.5	98.7	67.5	56.6	64.4	62.3	53.3	5.4	27.8	14.9	20.2	24.7	4.9	-11.7	-11.1	-8.3	4.0
2015	58.8	79.9	52.9	76.3	95.3	71.8	57.7	67.3	61.6	59.3	4.2	26.7	14.8	21.4	19.9	3.9	-9.1	-8.6	-7.0	7.1
2018	62.4	78.5	50.5	70.2	90.0	68.3	62.1	70.1	64.7	58.9	5.4	24.4	14.4	18.8	17.6	7.4	-6.2	-5.4	-5.1	8.7
Avg.	58.0	76.5	49.8	67.1	96.3	70.8	56.6	66.7	61.6	54.5	5.2	28.1	15.6	21.4	23.9	6.7	-11.9	-10.3	-8.5	4.9

Note: This table describes the wealth portfolio characteristics different categories of Pakistani households. The categories are distinguished by urban versus rural locations and across the distribution of household consumption quintiles. Consumption quintiles (Q1, Q3, and Q5) are based on per capita equivalent household consumption (see data section on the permanent income variable). Data include the pooled 2001 to 2018 rounds of Pakistan's HIES. Net worth is expressed as a multiple of the household's monthly consumption.

Table A2: Household head characteristics, by age.

	Age of the household head								
	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+
Men who head their household (%)	28.6	53.6	74.2	86.3	92.0	92.5	91.9	87.2	69.0
Women who head their household (%)	3.2	6.0	8.4	9.5	10.1	8.8	8.5	7.8	6.8
Households with secondary educated head or more (%)	29.5	31.3	31.2	29.6	28.1	26.5	25.5	22.6	18.0
Rural households (%)	70.0	67.8	64.6	62.9	62.3	61.8	62.5	65.4	69.3

Note: This table summarizes characteristics of the head of the household in the pooled 2001-2018 rounds of Pakistan's HIES. The first two line consider all men (resp. women) in the data and report the proportion of those individuals who are described as heads of their household. The last two line consider all households headed by an individual in a given age group and report the proportion of those households with a given characteristic.

Table A3: Housing prices in Select urban areas in Pakistan, 2010-2018

Location	Size	Total Increase	Avg. Annual Increase	Year Span
Lahore	675 sq ft	63%	8.94%	2011-2018
Lahore	1125 sq ft	33%	10.89%	2010-2018
Lahore	1575 sq ft	22%	8.92%	2010-2018
Lahore	2250 sq ft	63%	12.55%	2010-2018
Lahore	3375 sq ft	45%	11.95%	2010-2018
Lahore	4500 sq ft	48%	11.81%	2010-2018
Karachi	675 sq ft	-8%	-1.82%	2015-2018
Karachi	1125 sq ft	57%	12.11%	2010-2018
Karachi	1575 sq ft	-19%	-3.97%	2014-2018
Karachi	2250 sq ft	-14%	-1.72%	2010-2018
Karachi	3375 sq ft	24%	3.23%	2010-2018
Karachi	4500 sq ft	71%	7.31%	2010-2018

Note: The table shows the percentage increase in housing prices for different apartment sizes in Lahore and Karachi. The percentage increase is calculated from the CPI-adjusted price at the earliest available date to the CPI-adjusted price in 2018. The prices are extracted from listings posted by sellers on the Zameen platform, the largest real estate platform in Pakistan. These prices reflect the market value within a small negotiation range.

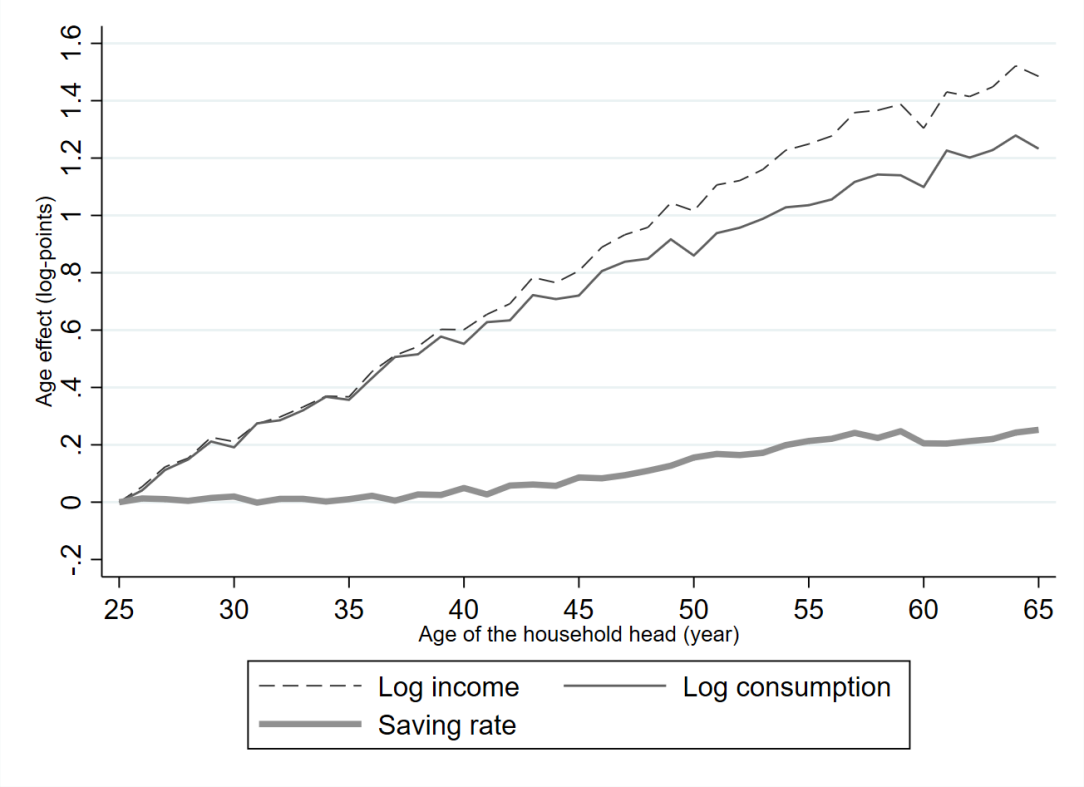
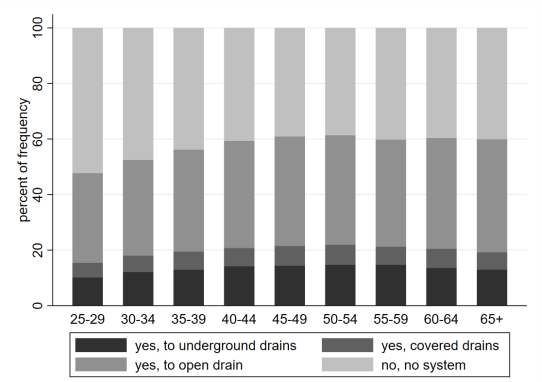


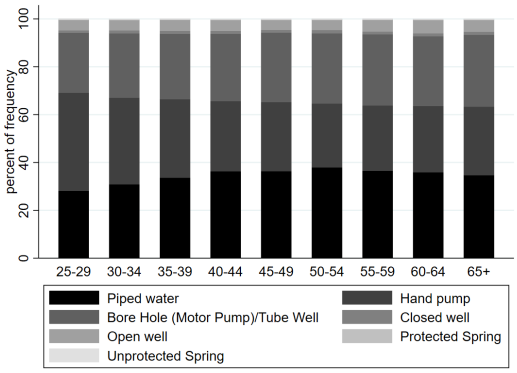
Figure A1: Age effects in household income, consumption, and saving rates

Note: The figure shows estimated age coefficients in an age-year-cohort decomposition of household income, consumption, and saving rates. The estimation data are the pooled 2001-2018 round of Pakistan's HIES.

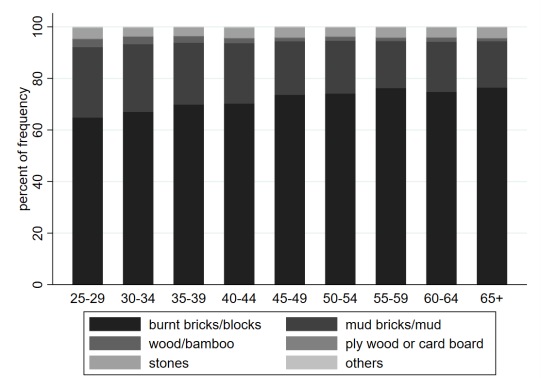
(a) Drainage System



(b) Water Source



(c) Type of Walls



(d) Type of Toilets

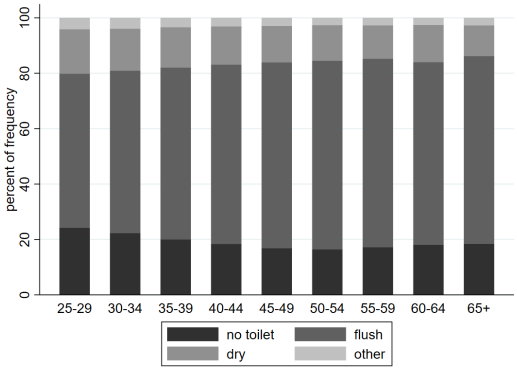


Figure A2: Housing Quality, by Age

Note: This figure presents the distribution of dwelling characteristics by age group of the household head in Pakistan. The sample contains households in the pooled rounds of the HIES from 2001 to 2018.

8 Appendix B – Auxiliary variables description

- **Age of the household head:** The age of the head of the household.
- **Elderly:** Individuals aged 65 or above. When considering the stock of household wealth at the end of the accumulation phase of the life cycle, we consider households where the head is between 60 and 65, which is the typical range of retirement ages offered by formal pension systems around the world (60 in Pakistan). It corresponds to the age range at which individuals are generally expected to switch from being a net saver to being a net dis-saver.
- **Education of the household head:** Schooling attainment of the household head. It is categorized into Primary (or less), Secondary, or Tertiary education.
- **Rural:** Whether the household resides in an urban or rural area.
- **Household consumption:** Consumption is calculated as the sum of household expenditures including food and nondurable goods purchased during the year, the value of home-produced goods and flow of services from the household's stock of durable goods and housing, and services purchased by the household such as education or health care.
- **Permanent income:** We approximate the concept of permanent income using per capita equivalent monthly household consumption. Under the permanent income hypothesis, consumption is proportional to lifetime (aka "permanent") income. We conduct heterogeneity analysis by quintiles of this measure. An added difficulty is that the permanent income hypothesis predicts that household consumption can follow an age trend determined by the discount factor and interest rate. This implies that households will move between consumption quintiles over the life cycle if those quintiles are computed based on the overall population. However, under the assumption that the age trend is the same for all households, they will stay in the same age-specific quintile of household consumption over time. Therefore, we first split the sample in each survey into 5-year age bins before computing quintiles within each bin.
- **Household income:** The sum of income from household-managed activities including the following sources: (1) labor income, (2) remittances, (3) social safety programs, (4) income from agricultural assets (rent/sale of land, equipment, animals), (5) income from non-agricultural assets (rent/sale of household's land, enterprise land, and equipment, as well as imputed rental income from living in own dwelling), (6) income from financial assets (including jewelry, insurance, providence,

and lending), as well as (7) transfers from pensions, sadqa, inheritance, and other sources.

- **Net acquisitions:** The net value of acquisitions made by the household for each category of real estate wealth is calculated as the difference between the value of assets purchased and sold during the past year.
- **Net transfers** The net value of transfers for each type of real estate wealth is determined by subtracting the value of assets received as a gift over the past 12 months from the value of assets given away over the past year.