Wealth impacts on health expenditures

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Abstract

Studies of health care expenditure often exclude explanatory variables measuring wealth, despite the intuitive importance and policy relevance. We use the Household, Income and Labour Dynamics in Australia Survey to assess impacts of income and wealth on health expenditure. We investigate four different dependent variables related to health expenditure and use three main methodological approaches. These approaches include a first difference model and introduction of a lagged dependent variable into a cross-sectional context. The key findings include that wealth tends to be more important than income in identifying variation in health expenditure. This applies for spending on health practitioners and on private health insurance. It also applies for being unable to afford required medical treatment. In contrast, the paper includes no evidence of different impacts of income and wealth on spending on medicines, prescriptions, or pharmaceuticals. The results motivate two novel policy innovations. One is the introduction of an asset test for determining rebate eligibility for private health insurance. The second is greater focus on asset testing, rather than income tests, for a wide range of general welfare payments that can be used for health expenditure. Australia's world-leading use of means testing can provide a test case for many countries.

Keywords: Health expenditure; wealth; financial assets; income; means testing; private health insurance; health policy

JEL: D14; I12; I13; I14; I18

1. Introduction

Health care expenditures vary significantly across different geographies and over time. Understanding the major determinants of health care expenditures is crucial to explain the optimal level of health care spending in countries and in the design of policies. There are different factors explaining variations in per-capita health care spending across countries such as institutional and socio-demographic factors (Gerdtham et al., 1992), the age profile of the population (Leu, 1986; Culyer, 1988; Hitiris and Posnett, 1992; Di Matteo and Di Matteo, 1998; Grossman, 1972; Baltagi and Moscome, 2010), the role of government funded health care (Leu, 1986; Culyer, 1988; Hitiris and Posnett, 1992), the role of real prices (Grossman, 1972; Hartwig, 2008; Okunade et al., 2004; Gerdtham et al., 1992; Murthy and Ukpolo, 1994), technological progress (Newhouse, 1992; Baker and Wheeler, 2000; Weil, 1995, Gerdtham and Lothgren, 2000; Di Matteo, 2003), and the R&D spending for health care (Okunade and Murthy, 2002). However, studies on impacts of other key variables such as wealth are scarce (Kendall et al., 2019; Pinilla and López-Valcárcel, 2020).

On the other hand, income has been defined as a key determinant explaining variety in the level of health care expenditure. Therefore, literature has mostly focused on the income elasticity of health care and its health policy implications for the financing of health care. The studies investigating the effect of income on health care expenditures have employed several methodologies including simple bivariate regressions on cross-sections, multivariate regressions on cross-sections, time-series techniques and error-correction models and these studies have used international, national, and regional level datasets (Di Matteo, 2003). These studies differ significantly in terms of their results due to heterogeneity in methodologies. The definition of health care being a luxury good with an income elasticity greater than one has been seriously criticized because intuitional dynamics often consider health care as a necessity good rather than a luxury good (Culyer, 1988). Moreover, single cross-section cross-country data may also create some problems for defining the income elasticity of health care spending. Getzen (2000) state that the value of income elasticity can differ based on the level of analysis. Accordingly, Getzen (2000) reports that income elasticities of health care expenditure at an individual level are close to zero while income elasticities at a national level generally exceed one.

Therefore; our study aims to shed light on these issues by (1) defining particular health care expenditures in the analysis that include spending on health practitioners, private health insurance, and medicines, prescriptions, or pharmaceuticals; (2) performing one country analysis with multiple controls; (3) implementing three different methodologies that accounts for trade-offs between identification and alignment with the research question; (4) focusing on the distinct influences of wealth and income to stimulate means-testing policy enhancements; and (5) analysing impacts of components of wealth rather than just aggregate measures.

In this paper, we investigate the determinants of health care expenditures in Australia, where per-capita health expenditure has increased markedly in recent years. Australia spent $185 billion on health care in 2017–2018 period, that is $7,485 per person. In 2018–2019 period, total health spending was $195.7 billion, equating to $7,772 per person and this was $111 (1.5%) more per person than in 2017–2018 in real terms. Health spending constituted 10% of overall economic activity. After adjusting for inflation, total health spending was 3.1% more than in 2017–2018 equating to an additional $5.9 billion. During 2018–2019, more than two-thirds (68.3%) of health spending was by governments, $80.6 billion by the Australian Government and $53.0 billion by state and territory governments. Government health spending represented 24.3% of government tax revenue, marginally decreased from 24.5% in 2017–2018. Non-government entities (including individuals, private health insurance providers, injury compensation insurers and other private sources) spent $62.1 billion on health in 2018–2019. Individuals were the largest contributor to this at $31.8 billion, that is 2.3% more than 2017–2018 (Australian Institute of Health and Welfare, 2020). Spending by private health insurance providers was $17.2 billion in 2018–2019. The proportion of funding by these insurers ranged between 7.4% in 2011–2012 and 8.9% in 2017–2018. This may have been, at least in part, a result of introducing means testing of the private health insurance premium rebate in 2012, which shifted funding from the Australian Government to private health insurance providers (Australian Institute of Health and Welfare, 2020).

As it is seen, health care structure in Australia has been complicated and this is reflected in its funding system. The health system is funded by governments and non-government organizations such as individuals, private health insurance providers, and injury compensation insurers (Australian Institute of Health and Welfare, 2020). Funds often pass through several entities before health providers (such as hospitals, general practices and pharmacies) use them to deliver goods and services (Australian Institute of Health and Welfare, 2020). The Australian welfare system uses both income and asset tests for determining eligibility for the full welfare benefit. This welfare policy setup in Australia also provides an interesting case for examining the relationship between health care spending and wealth variables and income. Therefore, we aim to contribute to the literature by presenting this complex and interesting case where both temporal and cross-sectional contexts are considered. We use Australian household data from the Household, Income and Labour Dynamics in Australia (HILDA) survey (2021) for the most recent years and we employ three types of models; a first differences model, a cross-sectional model, and a lagged variable approach applied to the cross-sectional model. Our results suggest the greater importance of wealth compared to income in explaining variation in health care expenditures. Accordingly, higher levels of economic resources (financial assets) are associated with greater spending on health practitioners and private health insurance. We also report that demographic and health variables have impacts on health spending; never smoking and older respondents are associated with higher health care spending, all else equal.

The rest of the paper is organized as follows. The next section provides literature review, Section 3 presents background information on the health policy in Australia, Section 4 describes the data, Section 5 explains the empirical strategy, results are given in Section 6, and Section 7 concludes.

2. Literature Review

There is a substantial literature that addresses the determinants of health care expenditures and, particularly, the income elasticity of health care expenditures. Existing studies have used national and international datasets and emphasized whether the elasticity is greater than or less than one. Gerdtham et al. (1992) explore the effect of GDP and several socio-demographic factors on health care spending for a single cross section of 20 OECD countries between 1960 and 1987 and they state that health care is a luxury good with an income elasticity larger than one. Similarly, Kleiman (1974), Newhouse, (1977, 1987, 1992) and Leu (1986) provide empirical evidence that health care is a luxury good. Among these studies, Newhouse (1977) and Newhouse (1987) investigate the effect of GDP per capita on per capita health care expenditures for 13 countries in 1970 and state that GDP per capita is a very significant explanatory variable for the variations in per capita health care expenditure in the sample countries. Findings suggest that health care is a luxury good with an income elasticity of health care expenditure greater than one. On the other hand, in another study, Newhouse (1992) reports that while health care expenditure is defined as a normal good, it is income inelastic. Leu (1986) investigates the income elasticity of health care expenditure using cross-section data for 19 OECD countries in 1974 and states that income elasticity values are greater than one. Similarly, Parkin et al. (1987) and Brown (1987) using same techniques and datasets define income as a major determinant of health care expenditure with an income elasticity greater than one.

Another strand of the literature argues that the aforementioned research has the problem of small single cross-sections. These studies use the pooling of cross-sections over time and report lower values of income elasticity. Among these studies, Hitiris and Posnett (1992) estimate the relationship between health care expenditure and income employing 560 pooled time-series and cross-sections for the same data used in Gerdtham et al. (1992), and they additionally use country-specific effects and find an income elasticity smaller than but close to one. Barros (1998) investigates 24 OECD countries between 1960 and 1992 for the differences in growth rates and reports an income elasticity smaller than but close to one. Gerdtham et al. (1998) use a pooled time-series cross-section for 22 countries between 1970 and 1991 and find income elasticity of health expenditure to be less than one. Similarly, Di Matteo and Di Matteo (1998) explore the relationship between government health care expenditure and income in Canada using a pooled time-series cross-section between 1965 and 1991 and find that income elasticity is smaller than one, thus finding that government health care expenditure is not a luxury good. Thus, these studies cast doubt on the luxury attribute of health care.

Further studies have argued that literature conducting times series approaches have created certain problems on the issue of stationarity regarding the measurement of the determinants of health care expenditures and they have used a cointegration method. For instance, Hansen and King (1996) use the same data as Gerdtham et al. (1992) and Hitiris and Posnett (1992) and follow a different empirical strategy using Dickey Fuller statistics for each country separately and considering non-stationarity in health care expenditure and income. They do not show any evidence for income as a determinant of health care spending. McCoskey and Seldon (1998) re-evaluate Hansen and King's study (1996) by employing Im, Pesaran, and Shin (2003) tests and using panel unit root tests for the same OECD data and they also consider long-run equilibrium relationships between non-stationary time series. They state that previous empirical results on the income elasticity of health care expenditure that is larger than one have mostly used international cross-section data, pooled cross-sections and time series. And, they state that their results do not entirely support the idea of an income elasticity greater than one.

Similar to McCoskey and Seldon (1998), Gerdtham and Lothgren (2000, 2002) investigate the relationship between GDP and income using the tests by Im, Pesaran, and Shin (2003) for 21 countries between 1960 and 1997 and they find supporting evidence of non-stationarity and cointegration between health care expenditure and GDP (please see also Okunade and Karakus, 2001). Dregen and Reimers (2005) also explore the relationship between health care expenditures and GDP for 21 OECD countries between 1975 and 2001 and they use panel cointegration techniques. Differently from previous studies summarized above, their analysis accounts for life expectancy, infant mortality and the share of the elderly in addition to income as a determinant of health care expenditure. They conclude that the income elasticity is not different from unity and health care expenditure is not a luxury good. Baltagi and Moscone (2010) examine the long-run relationship between health care expenditure and income, investigating whether health care is a luxury or a necessity. They use a panel data for 20 OECD countries between 1971 and 2004 and employ a heterogenous panel model with cross sectionally correlated errors to explore the non-stationarity and cointegration properties between health care spending and income and thus to measure income elasticity of health care. They found that health care expenditure and most of its determinants are non-stationary, and they are related in the long-run. And, they show that health care is a necessity good. Blomqvist and Carter (1997) study 18 OECD countries between 1960 and 1991 in the context of non-stationary time series, including autonomous trends and they also report non-stationarity and apply cointegrated models. Their results also raise questions regarding an income elasticity larger than one. Similarly, Murthy and Ukpolo (1994) use time series dataset and employ cointegration approach to examine the United States between 1960 and 1987 and find that the income elasticity of health care expenditure is not significantly different from one. Ariste and Carr (2001) employ error correction and cointegration methods to estimate income elasticity of health care expenditure in Canada between 1966 and 1998 and report that health care expenditure is not a luxury good with an income elasticity smaller than one.

On the other hand, Di Matteo (2003) suggests that income elasticity does vary by level of analysis with international income elasticities being generally larger than national or regional studies. This study uses three-time series cross-section data sets that include United States state level data between 1980 and 1997, Canadian province level data between 1965 and 2000, and national level data for 16 OECD countries between 1960 and 1997, and implements non-parametric techniques, namely locally weighted scatterplot smoothing approach, where there is a room for variations in the income elasticity of health expenditure as income changes. Di Matteo (2003) finds that income elasticities are higher at low-income levels and lower at higher income levels.

Bernard et al. (2009) use a nationally representative United States household survey from Medical Expenditure Panel Survey Household Component for the years 2002 and 2003, and they pool data on the financial assets and wealth of families, by insurance status and income, and they examine the correlation between wealth and private insurance purchase. They employ a multivariate analysis to control for income and socio-demographic variables such as age, gender, marital status, family size, education, mental health, self-reported physical health etc. They structure two measures of wealth; financial assets and net worth. The wealth model predicts the demand for insurance based on wealth in addition to income and all other controls. The dependent variable is whether the family has private health insurance. The wealth model includes indicators for wealth quartiles and income quartiles. They find that privately insured families had higher levels of financial assets and wealth than the uninsured families in 2002 and 2003. Accordingly, results suggest that assets and total wealth are important determinants of demand for insurance; when income is controlled for, families with private insurance have significantly higher assets and net wealth than the uninsured families.

3. Health funding and means testing in Australia

Health policy in Australia relies on a mix of public and private funding. Public funding is used to cover fees for some general practitioner (GP) health services which are financed by the federal government through bulk-billed payments. Means testing is not relevant for these publicly provided health services. Other general health practitioners, who do not use bulk billing, charge patients for services.

Private health insurance is a private strand of the Australian health system. This is not used for general practitioner services. Instead, private health insurance can cover payments for other non-GP services such as dental, physiotherapy, chiropractic, and hospital visits. Hospital services are also provided through a mix of public and private institutions. An annual rebate which can be around 30% of private health insurance premiums is available for families or individuals depending on income for the respective financial year. Asset thresholds are not used.

Subsidised medication is available to Australian citizens and permanent residents through the Pharmaceutical Benefits Scheme (PBS). While general eligibility for this scheme is not subject to means testing, the amounts of co-payments required by individuals may indirectly be subject to means testing. For instance, to be eligible for the concessional co-payment of $6.80 instead of the larger co-payment of $42.50, individuals must qualify through one of several avenues, such as having a Pensioner Concession Card or a Commonwealth Seniors Health Card. Both cards are means-tested.

General welfare policies are relevant in the context of health policies. This was evident in relation to the PBS description above and it is also evident when considering that welfare payments are a source of income that can be used for health payments which are not covered by government funding or insurance benefits. There are many categories of welfare payments including the Age pension, disability and carer payments, and unemployment benefits. The Australian welfare system uses both income and asset tests for determining eligibility. Households or individuals must pass both tests (and other criteria according to the specific benefit) to receive the full welfare benefit.

4. Data

This paper uses Australian household data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. Data are available at either the individual or household level. This paper primarily uses the household level because key variables are at the household level, health policies consider families/households, and because economic resources are shared across households. Some individual-level variables for people responding on behalf of their household are used as controls. Variables are described in detail in Table 1.

HILDA provides an annual panel of socioeconomic variables. However, key wealth variables are only available every four years, with the two most recent years being 2014 and 2018. There were approximately 9,500 responding households in the 2018 wave, although the results in this paper have slightly smaller samples due to unavailability of some variables such as prior-year variables or probability weights. 41 households are also dropped when “person 1” has an age below 15 years.

This paper considers both temporal and cross-sectional contexts. The temporal context can reduce concerns over unobserved time-invariant heterogeneity. After establishing significant relationships in this context, the paper switches to a cross-sectional context, given the nature of the research question and data. This includes the context for health policies which includes some inherently cross-sectional aspects. For example, eligibility for a rebate for private health insurance in Australia depends on income for the previous year. Income above a threshold in other preceding years is not relevant. Also, wealth variation is far more pronounced cross-sectionally compared to temporally. The correlation between wealth in 2014 and in 2018 is 0.8, indicating that if a household is wealthy in one period, they are also likely to be wealthy in subsequent years. In contrast, the standard deviation of wealth across a population, at a point in time, is very large. For example, the standard deviation for household net wealth in this paper's sample is A$1.4 million, which is larger than the mean of A$0.9 million. Other descriptive statistics are provided in Table 2.

Table 2 also indicates that quantile variables are used, such as quartiles. This is useful in the context of means testing of health policies, where families/households are eligible for support when they have economic resources which are less than a threshold, at a point in time. This approach is also useful to reduce concerns over measurement error. For example, there may be concerns over the accuracy of wealth variables, as described in Table 1. For instance, non-financial assets primarily include housing assets (for homeowners), which requires estimates to be made. To protect privacy, large values of assets and income are also top-coded, where an average of the highest values is used for households which are at the top of the distribution. The variables also include imputations when there are some missing variables. When using quartiles, these measurement issues are likely to have negligible impacts, since very few households would change from one quartile to another on account of measurement issues.

A key pattern is evident in the data, prior to more comprehensive regression analysis. Figure 1 gives an example of asset variables being more effective in identifying diversity in health outcomes. The bottom quartile based on financial assets are more likely to have the adverse health experience of being unable to afford medical treatment, compared to the bottom income quartile. Non-financial assets give an intermediate case in-between income and financial assets. For above-median households (quartile 3 and 4), there are lower proportions for assets compared to income, confirming the greater variability which is identified by the asset variables. This pattern is repeated for the other health dependent variables in this paper: spending on health practitioners, private health insurance, or medicines, prescriptions, or pharmaceuticals.

Another data issue is that some variables have both zero/negative values and skewed distributions. Net wealth is a key example, as the difference between assets and debt can be negative. For health expenditure, some households have zero spending in a given year for some spending types. In this context, standard log transformations would lead to many households being dropped due to logs of zero or negative values being undefined. One approach to retain these households is the inverse hyperbolic sine (IHS) transformation, which is given in equation (1):

$$\text{IHS transformation of z: } \ln[z + (z^2 + 1)^{0.5}] \quad (1)$$

The data allow for a range of robustness tests in Section 6. This includes results either with or without probability weights. These probability weights give a higher weight to households which represent higher numbers of other households for the purpose of giving a nationally representative sample. Probability weights can be particularly useful for assessment of unconditional relationships but may be less useful in the context of less efficient regression coefficients where many other control variables can be included. The panel structure of the underlying survey data also allows for an instrumental variables approach where lagged wealth can be used as an instrument for current wealth. Lags can be used more generally, such that health expenditure can be explained by variables from prior years, reducing the risk of reverse causation such that health expenditure is perceived to influence economic resources including assets. This possible reverse causation is likely to be only a minor issue given that the types of health expenditure in Table 2 have mean values between $400 and $1,400 per year, while income and asset levels tend to be much higher. Indirect influences through health variables are accounted for with additional controls.

5. Method

The paper uses three types of models. A first differences model is included initially (where each variable is a first difference). Then, a cross-sectional model with all variables in levels is used. Third, a lagged variable is introduced to the cross-sectional model to give an intermediate outcome where levels are used for the explanatory variables, but their effect is interpreted on the change (i.e. difference) in the dependent variable. This three-model approach accounts for trade-offs between identification and alignment with the research question. The first-differences model is preferred for identification but is not ideal for the research question. The model in levels aligns well with the research question, since there is pronounced cross-sectional wealth variation which is relevant for means-testing of health policies, which occurs at a point in time. The intermediate model helps to address identification concerns for the model in levels, since the lagged dependent variable captures some otherwise unobserved heterogeneity.

More specifically, health expenditure (E) can initially be stated as a function of wealth (W), income (I), and control (X) variables in equation (2). Households are identified by the i

subscript and time is denoted by t. Equation (2) also shows a term which is constant with respect to time (α_i) to capture time-invariant heterogeneity that is not accounted for by the measured variables, and an error term (ε_{it}).

$$E_{it} = \alpha_i + \beta W_{it} + \gamma I_{it} + \zeta X_{it} + \varepsilon_{it} \text{ for } t = 1 \text{ and } 2. \tag{2}$$

The first model used in the paper is given in equation (3). This is obtained by taking the first difference of each variable in equation (2).

$$\Delta E_i = \beta \Delta W_i + \gamma \Delta I_i + \zeta \Delta X_i + \Delta \varepsilon_i \tag{3}$$

The time-invariant unobserved heterogeneity (α_i) is removed by taking the first difference. Controls (X) from the cross-sectional model are generally not included in Section 6 below as there is often no variation across time in some variables (e.g. country of birth) or very little variation (e.g. state of residence).

The second model in the paper focuses on cross-sectional variation. A single value of t is investigated, meaning that the t subscript can be dropped from equation (2) to give the model in levels in equation (4).

$$E_i = \alpha + \beta W_i + \gamma I_i + \zeta X_i + \varepsilon_i \tag{4}$$

Adding a lagged dependent variable to the model in levels helps to control for some otherwise unobserved heterogeneity. Intuitively, health spending in a lagged period should be a good indicator of health spending in the current period. This intuition is based on the persistence of some health outcomes, as well as persistence in many forms of human tendencies and behaviour.

Adding the lagged dependent variable effectively implies that all other explanatory variables can be interpreted as being associated with the change in the dependent variable, rather than the level. This is evident when viewing equation (5) which adds the lagged explanatory variable to equation (4), before subtracting the same term ($E_{i,lag}$) from both sides of equation (6), which maintains the equality of both sides in equation (5). The model described by equations (5) and (6), which effectively explains changes in the dependent variable with levels of the explanatory variables, can therefore be interpreted as an intermediate model between the first-differences approach in equation (3) where all variables are changes, and the levels model in equation (4) where all variables are in levels. Note that subtracting $E_{i,lag}$ on both sides of equation (6) has no impact on the coefficients for W, I, and X.

$$E_i = \alpha + \sigma E_{i,lag} + \tau W_i + \upsilon I_i + \varphi X_i + \varepsilon_i \quad (5)$$

$$E_i - E_{i,lag} = \alpha + (\sigma - 1)E_{i,lag} + \tau W_i + \upsilon I_i + \varphi X_i + \varepsilon_i \quad (6)$$

6. Results

Table 3 shows the first differences model for the impact of wealth and income variables on expenditure for health practitioners. In column (1), the change in net wealth is positively associated with the change in spending on health practitioners, with statistical significance at the 1% level. In contrast, the change in income is not a significant explanatory variable.

The wealth variable is split into its components for the other columns of Table 3. There are positive and significant coefficients for both asset components (financial and non-financial). The change in debt is not significantly related to the change in spending on health practitioners. Each of the variables uses the change from 2014–2018, as these are the two most recent dates for the wealth variables. First differences of variables transformed by the inverse hyperbolic sine transformation are used, since some households have zero values for variables such as debt. Column (3) does not use probability weights and produces coefficients with similar magnitudes to column (2) which does use probability weights. The remaining tables do not use probability weights, as Table 3 shows that this raises standard errors, lowers the R-squared, and it also restricts the sample size as probability weights are unavailable for a small number of households (column (3) dropped these other households to produce an identical sample to column (2)).

Table 4 switches to the models in the levels, after having established significant coefficients for wealth variables in the first-differences model in Table 3. Column (1) of Table 4 shows positive and significant coefficients for both income and components of wealth when explaining the level of expenditure on health practitioners (with the IHS transformation). These positive and significant coefficients are for quartile variables, relative to the reference category of quartile 1 in each case. The point estimates of these coefficients increase from quartile 2 to 4, as expected. This indicates that being in a successively higher quartile, which shows higher levels of economic resources, is associated with greater spending on health practitioners.

A key outcome in Table 4 is that the coefficients are larger in magnitude for the financial asset quartiles, as compared to the corresponding income coefficients. For example, the financial asset coefficient for quartile 2 is 1.008, compared to the income coefficient for quartile 2 of 0.353. These coefficients are statistically different to each other at the 1% level, as are the other sets of corresponding coefficients (i.e. financial-asset quartile 3 versus income quartile 3, and similarly for quartile 4). This is also true in column (2) when controlling for the lagged dependent variable, although statistical significance for the difference for quartile 4 coefficients (1.011 versus 0.581) has a *p*-value of 0.012. These results imply that health spending is impacted more by being in the lowest quartile (1) for financial assets than it is by being in the lowest quartile for income. The differences between the coefficients are evident in Figure 2, which shows that the 95% confidence intervals do not overlap when comparing corresponding financial asset and income quartiles.

The value of using the lagged dependent variable is evident in Table 4. The coefficients for income and components of wealth are always lower in column (2) compared to column (1). This is reasonable, since the lagged dependent variable in column (2) controls for some otherwise unobserved heterogeneity, leaving less variation to be explained by the other coefficients.

Demographic and health variables also have impacts on health spending, as shown in Table 4. Relative to the reference category for households with a respondent who smokes every day, every other type of household (e.g. never smoked) has higher health spending. This is reasonable since smoking every day likely relates to lower concern with health outcomes, and lower health spending. It is important to note that this result is found while holding other variables constant, such as health changes and age. Column (2) shows positive and significant coefficients for two categories of health changes of the responding person. When health has become worse or much worse over the preceding year, spending on health is significantly higher. Households with an older respondent also spend more on health practitioners.

The robustness of these results is evident in numerous ways. Results are similar when using more detailed locational controls for 13 regions instead of states/territories; this is useful because health-service access may differ across geographical regions. Also, variance inflation factors are low, with a mean value of 1.8. This suggests that multicollinearity is not an issue, even though there is some correlation between explanatory variables such as health outcomes and income.

Table 5 explains spending on private health insurance (with the IHS transformation). There are similar patterns, including that being in a higher quartile for income or assets is associated with higher health spending. The financial asset and income coefficients are again statistically different to each other at the 1% level for column (1). Figure 3 shows that the confidence intervals for the income and financial asset coefficients do not overlap. However, when including the lagged dependent variable in column (2), only the quartile 3 coefficients (0.580 versus 0.307) are statistically different to each other, and this is only at the 5% level. While the results in Table 5 again suggest that financial assets are better than income at identifying variation in health spending, the evidence for spending on private health insurance is not as strong as for spending on health practitioners.

The economic and other control variables explain a large proportion of the variation in Table 5 for spending on private health insurance. This is particularly evident with an *R*-squared value of 0.75 in column (2). It is reasonable that economic resources are more useful in explaining variation in private health insurance expenditure compared to other health spending, as insurance has the weakest link with actual health outcomes of the spending variables in this paper. Private health insurance involves upfront payments to help reduce future payments for health conditions which often do not even exist at the time of insurance-premium payment. In contrast, spending on health practitioners would generally relate to specific health conditions, even if some spending relates to general diagnostic discussions. The following results for medicines/prescriptions/pharmaceuticals (MPP) are tied closely to actual health issues. Control variable coefficients are not shown to save space but can be seen through the available Stata code.

Table 6 investigates spending on medicines, prescriptions, and pharmaceuticals (IHS transformation). Similar patterns are observed, such that having more economic resources (income or assets) is associated with greater health spending. A key difference from results in the other tables is that income coefficients are sometimes higher than corresponding coefficients for financial assets in Table 6. This is also shown in Figure 4, where the confidence intervals overlap for the corresponding income and financial-asset coefficients. The greater relative importance of income is consistent with intuition since spending on medicines/prescriptions/pharmaceuticals (MPP) is often a somewhat regular occurrence. Some individuals may have a behavioural tendency to associate regular spending on MPP with regular flows of income. In contrast, investment-related health spending, such as for private health insurance which is an investment to lower future expenses or spending on health practitioners which may involve irregular diagnostic testing, can be perceived by some as less closely related to regular income flows.

Another difference in Table 6 is the positive and significant coefficients for debt. Households with debt above the median spend more on MPP. This can be interpreted as households who have the capacity to take on larger debts, also having the capacity to spend more on essential health care, such as on MPP. The available Stata code can be used to show results which are robust to using a dependent variable two years later (in 2020 rather than 2018). This helps to lessen concerns over reverse causation, as health expenditure in 2020 does not cause changes in wealth or income in 2018. One of the drawbacks of 2020 data is a lower sample size, as some households have left the sample after the most recently available wealth data in 2018. The lagged dependent variables also reduce concerns on reverse causation, as the explanatory variables then give an impact on the change in the dependent variable (not the level). An instrumental variable approach where 2014 net wealth is an instrument for 2018 net wealth is a further robustness test in the Stata code which shows similar results.

Table 7 has results for a logit model for a binary dependent variable which equals one when households report being unable to afford required medical treatment. Since this important form of deprivation is restricted to around 1% of Australian households, the explanatory variables are also modified to focus more on the bottom of the distributions for income and wealth. There is a positive and significant coefficient for being in the bottom decile for net wealth in explaining the deprivation in Table 7. The magnitude for the wealth coefficient shows that being in the bottom decile for wealth makes it more likely by one percentage point that a household will report being unable to afford medication. This is a large impact when considering that the mean value for this variable is one percent. In contrast, the coefficient for being in the bottom income decile is not significant. The greater importance of wealth compared to income is also evident when splitting the explanatory variables into components and quartiles, as in prior tables.

Additional robustness tests for all dependent variables, as included in available Stata code, use the ratio of income to wealth, instead of separate explanatory variables for income and wealth. There are negative and significant coefficients for this ratio in explaining each of the health-expenditure dependent variables. That is, higher ratios of income to wealth are associated with lower healthcare expenditure. This implies that wealth is more important than income since the wealth influence from the denominator is outweighing the income influence from the numerator. This supports our main analysis where wealth coefficients are often statistically different to income coefficients. It is consistent with our focus on comparing wealth and income impacts to inform health policy reform. It contrasts with current health policy approaches focusing on income. While our policy-relevant analysis aims to extend beyond a purely academic focus on causal identification of the magnitude of wealth or income effects in isolation, the following paragraph further implies robustness of our practical identification strategy.

Our results are robust across many different methods and robustness tests. This includes inclusion of a lagged dependent variable in a cross-sectional context, to account for unobservable confounders, and a first differences model. Our results have addressed potential reverse causation from health to wealth in several ways. One way is noting that our dependent variables are on health expenditure rather than health status. While it is likely that health status has a two-way relationship with wealth accumulation, this correlation is not a problem for our model which includes both elements as explanatory variables and then ensures that multicollinearity is not excessive. We also use wealth variables that are temporally prior to the health expenditure in some regressions. In addition, we use an instrumental variable approach with lagged wealth from 2014 to confirm the robust influence of wealth. Further, there is no clear theoretical expectation of health expenditure influencing the ratio of income to wealth, which is one of our explanatory variables in a robustness test.

7. Conclusion

This study finds that wealth is more influential than income in explaining a range of health-expenditure variables. Households in the bottom quartile for financial assets have significantly lower spending on health practitioners, private health insurance, and medicines/prescriptions/pharmaceuticals. While this pattern is also evident for income, the financial asset impacts are more pronounced than for income for a range of outcomes related to health expenditure. This is particularly the case for spending on health practitioners and for the experience of deprivation from being unable to afford required medical spending. Relying on assets for health spending is a viable approach for most households, as spending on health divided by assets has been below 0.5 percent per year in Australia (Australian Institute of Health and Welfare, 2020), although population subgroups with low asset balances likely require additional government assistance.

The paper contributes through extensive analysis of four different dependent variables related to health expenditure, presenting broad understanding across different health contexts. This is useful to allow for generalized findings that are not subject to idiosyncratic features of particular variables, such as different subsidization across services. The three different methodological approaches and numerous robustness tests enable confidence in the findings. They show that one way of dealing with potentially overstated coefficients in a cross-sectional context is the use of a lagged dependent variable. This can be a more feasible approach than a full panel approach which requires time series data for all explanatory variables. The paper also seeks to contribute to the sparse literature on wealth impacts (Kendall et al., 2019; Pinilla and López-Valcárcel, 2020). The few papers on wealth impacts have tended to concentrate on health outcomes or one type of health expenditure rather than extensive understanding across multiple health-expenditure contexts. Our study also contrasts with the more common assessments of income impacts. The results are crucial in directly supporting two novel policy suggestions, as described below.

Two novel policy suggestions include introducing an asset test when determining private health insurance rebate eligibility and escalating the focus on asset testing for general welfare payments. The introduction of an asset test for private health insurance is justified by financial assets tending to have a larger influence on private health insurance spending compared to income. For the second policy suggestion, while general welfare payments currently include an asset test in Australia, eligibility is more often determined by an income test based on the details of the thresholds (Chomik and Piggott, 2016). Since assets are more influential in identifying which households are more likely to experience deprivation related to being unable to afford medical expenses, there is scope for greater assistance for households with low levels of assets.

Future research can further progress to assess impacts of policy changes and use more extensive and detailed data, if available. If the two novel policy suggestions above are implemented in the future, the impact of these policy changes on health spending can be assessed. In addition, the availability of wealth variables in every year, rather than every four years, could allow for more extensive analysis. More detailed categories of health spending could also allow for analysis of impacts on different areas of general health spending. Data on notional spending on free health services that are funded through bulk billing could also allow for more detailed comparisons of healthcare utilisation. Differences across states and territories are substantial, motivating future studies to investigate the reasons for these differences.

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Tables

Table 1: Variable descriptions

Variable	Description
Dependent	
Expenditure on health practitioners	Household annual expenditure on fees paid to health practitioners; Australian dollars; for a small number of values, imputation is used by the survey provider (Melbourne Institute, Applied Economic & Social Research; The University of Melbourne) for missing data using a longitudinal imputation approach or a nearest neighbour approach for households without sufficient data across waves. Values are imputed for less than 15% of households. The survey provider recommends using the imputed data rather than introducing sample selection bias by dropping households.
Private health insurance spending	Household annual expenditure - private health insurance; dollars; imputed
Expenditure on MPP	Household annual expenditure - medicines, prescriptions, pharmaceuticals (MPP) and alternative medicines; dollars; imputed
Can't afford medical treatment	Can't afford to get medical treatment when needed: a binary variable = 1 if this material deprivation = Yes
Wealth	
Net wealth	Net worth for the household. This equals financial assets plus non-financial assets less household debt, in Australian dollars.
Financial assets	Household financial assets; dollars; imputed; weighted top-code. Top-coding means that average values for households above a threshold are used instead of the actual value. The substituted value is the average for the households subject to top-coding, so the sample mean is unchanged. All financial assets are included such as equity, bank accounts, and superannuation (private pensions).
Non-financial assets	Household non-financial assets; dollars; imputed; weighted top-code. Residential housing is the primary contributor.
Household debt	Household debt; dollars; imputed; weighted top-code
Financial asset quartiles	4 quantiles of financial assets; the 25% of households with the lowest financial assets are in quartile 1. This is the reference category.
Non-financial asset quartiles	4 quantiles of non-financial assets: quartile 1 is the lowest
Debt above median	2 quantiles of household debt: quantile 1 is the lowest. Quartiles are not feasible as more than 25% of households have zero debt. Debts include all types such as credit card debt, student loans, and home debt.
Decile 1 of net wealth	A binary variable = 1 if net worth is in the bottom decile.
Income	
Household income	Gross annual (financial year) regular household income; dollars; imputed; weighted top-code
Income quartiles	4 quantiles of household income: quartile 1 is the lowest
Decile 1 of income	A binary variable = 1 if income is in the bottom decile.
Controls	
Hospitalisation	A binary variable = 1 if "during the last 12 months, have you ever been a patient in a hospital overnight?" = Yes. This variable is from the 2017 survey as it was not available in 2018. It is based on person 1 of the household. The 0 values include those not responding.
Smoking	Binary variables for smoking cigarettes/tobacco products based on a categorical variable with these categories: no valid response, "I have never smoked", "I no longer smoke", "I smoke daily", "I smoke at least weekly (but not daily)", "I smoke less often than weekly". This variable is based on the response of person 1 of the household.
Self-assessed health change	Binary variables based on a categorical variable for health compared to one year ago with these categories: no valid response, "much better than a year ago", "somewhat better", "about the same as one year

	ago", "somewhat worse than one year ago", "much worse". This variable is based on person 1.
Change in the number of people	The change in the number of people in the household.
Age	Age last birthday at June 30 2018: person 1
Domestic birth	A binary variable = 1 if "Country of birth" = Australia. The 0 values include those not responding. This is based on person 1.
State/territory of residence	State of residence: binary variables for 8 states/territories (one omitted as a reference category)

Notes: variables are generally used as at 2018 in Section 6, unless otherwise specified.

Table 2: Descriptive statistics

Variable	Mean
Dependent	
Spending on health practitioners	901.61
Spending on private health insurance	1,409.39
Spending on MPP	431.17
Can't afford medical treatment	0.01
Wealth	
Net wealth	875,784.50
Financial assets	372,290.50
Non-financial assets	690,201.70
Household debt	185,641.00
Financial asset quartile	2.50
Non-financial asset quartile	2.49
Debt relative to median	1.50
Decile 1 for net wealth	0.10
Income	
Household income	107,959.50
Income quartile	2.50
Decile 1 for income	0.10
Controls	
Hospitalisation	0.14
Smoking	n/a
Health change	n/a
Change in the number of people	-0.05
Age	49.75
Domestic birth	0.78
State/territory of residence	n/a

Notes: There are 9,508 observations (households) for each variable, except there are 9,370 observations for the change in the number of people (in each household). The mean for the non-financial asset quartile is less than 2.50 as $20,000 is reported for 114 households for non-financial assets, which is the upper threshold for quartile 1, meaning that quartile 1 has just over 114 more households than quartile 2.

Table 3: First differences model, explaining spending on health practitioners

	(1)	(2)	(3)
Income	0.051	0.033	0.043*
	(0.037)	(0.037)	(0.024)
Net wealth	0.039***		
	(0.010)		
Financial assets		0.099***	0.101***
		(0.028)	(0.019)
Non-financial assets		0.077***	0.072***
		(0.028)	(0.013)
Debt		-0.005	0.011
		(0.012)	(0.007)
Probability weights	Yes	Yes	No
Observations	9,054	9,054	9,054
R^2	0.035	0.038	0.047

Notes: ***, **, * show statistical significance at the 1, 5, and 10% levels respectively. The change in the number of people is also an explanatory variable. Other controls in Table 2 are not included as there is little or no variation. These controls are useful in the cross-sectional model in levels.

Table 4: Results explaining annual expenditure for health practitioners (IHS)

	(1)	(2)
Reference: Quartile 1		
Income quartile 2	0.353***	0.126
	(0.097)	(0.082)
Income quartile 3	0.729***	0.399***
	(0.110)	(0.095)
Income quartile 4	1.119***	0.581***
	(0.118)	(0.101)
Reference: Quartile 1		
Financial assets quartile 2	1.008***	0.567***
	(0.104)	(0.089)
Financial assets quartile 3	1.638***	0.861***
	(0.111)	(0.097)
Financial assets quartile 4	1.956***	1.011***
	(0.118)	(0.102)
Reference: Quartile 1		
Non-financial assets quartile 2	0.424***	0.284***
	(0.103)	(0.088)
Non-financial assets quartile 3	0.911***	0.498***
	(0.111)	(0.095)
Non-financial assets quartile 4	1.263***	0.669***
	(0.117)	(0.103)
Reference: below median		
Debt: above median	0.140*	0.056
	(0.076)	(0.066)
Hospitalisation	0.060	-0.085
	(0.087)	(0.074)
Reference: smoke every day		
Smoke: never	1.333***	0.737***
	(0.102)	(0.091)
Smoke: no longer	1.094***	0.628***
	(0.109)	(0.096)
Smoke: weekly	0.873***	0.590***
	(0.252)	(0.222)
Smoke: less than weekly	1.006***	0.605**
	(0.312)	(0.282)
Reference: Health unchanged		
Health much better	-0.027	0.012
	(0.162)	(0.142)
Health better	0.257***	0.127
	-0.027	0.012
Health worse	0.380***	0.256***
	(0.087)	(0.074)
Health much worse	0.507**	0.438**
	(0.252)	(0.222)
Age	0.020***	0.010***
	(0.002)	(0.002)
Country of birth	0.164**	0.049
	(0.075)	(0.064)
Lagged dependent		0.494***
		(0.011)
Observations	9,370	9,370
R^2	0.251	0.441

Notes: ***, **, * show statistical significance at the 1, 5, and 10% levels respectively. The smoking and health-change variables also have a level for 'no valid response'. Further explanatory variables for the change in the number of people and the state of residence are available through the Stata code.

Table 5: Results explaining annual expenditure on private health insurance (IHS)

	(1)	(2)
Reference: Quartile 1		
Income quartile 2	0.310***	0.095
	(0.108)	(0.068)
Income quartile 3	0.807***	0.307***
	(0.129)	(0.082)
Income quartile 4	1.760***	0.588***
	(0.141)	(0.091)
Reference: Quartile 1		
Financial assets quartile 2	0.888***	0.255***
	(0.115)	(0.076)
Financial assets quartile 3	2.110***	0.580***
	(0.132)	(0.082)
Financial assets quartile 4	2.923***	0.719***
	(0.143)	(0.090)
Reference: Quartile 1		
Non-financial assets quartile 2	0.118	0.040
	(0.116)	(0.072)
Non-financial assets quartile 3	1.198***	0.278***
	(0.133)	(0.081)
Non-financial assets quartile 4	1.714***	0.331***
	(0.144)	(0.089)
Reference: below median		
Debt: above median	0.073	0.001
	(0.090)	(0.057)
Lagged dependent		0.776***
		(0.008)
Observations	9,370	9,370
R^2	0.328	0.745

Notes: ***, **, * show statistical significance at the 1, 5, and 10% levels respectively. Coefficients for further explanatory variables for smoking, health change, hospitalisation in the previous year, age, country of birth, the change in the number of people, and the state of residence are available through the Stata code.

Table 6: Annual expenditure on medicines, prescriptions, pharmaceuticals (IHS)

	(1)	(2)
Reference: Quartile 1		
Income quartile 2	0.266***	0.161***
	(0.072)	(0.061)
Income quartile 3	0.618***	0.401***
	(0.082)	(0.071)
Income quartile 4	0.800***	0.471***
	(0.089)	(0.076)
Reference: Quartile 1		
Financial assets quartile 2	0.284***	0.205***
	(0.073)	(0.064)
Financial assets quartile 3	0.458***	0.269***
	(0.078)	(0.067)
Financial assets quartile 4	0.579***	0.329***
	(0.083)	(0.072)
Reference: Quartile 1		
Non-financial assets quartile 2	0.128*	0.067
	(0.073)	(0.063)
Non-financial assets quartile 3	0.248***	0.144**
	(0.077)	(0.066)
Non-financial assets quartile 4	0.280***	0.142**
	(0.084)	(0.072)
Reference: below median		
Debt: above median	0.174***	0.098**
	(0.057)	(0.049)
Lagged dependent		0.483***
		(0.012)
Observations	9,370	9,370
R^2	0.163	0.372

Notes: ***, **, * show statistical significance at the 1, 5, and 10% levels respectively. Coefficients for further explanatory variables for smoking, health change, hospitalisation in the previous year, age, country of birth, the change in the number of people, and the state of residence are available through the Stata code.

Table 7: Marginal effects on deprivation – unable to afford medical treatment

	Marginal effect	Standard error
Reference: Decile 2-10		
Income decile 1	0.004	0.003
Reference: Decile 2-10		
Net wealth decile 1	0.010***	0.003

Notes: ***, **, * show statistical significance at the 1, 5, and 10% levels respectively. There are 9,300 observations since one state/territory had zero of 70 households reporting being unable to afford medication. The pseudo *R*-squared for the logit model (binary dependent variable) is 0.073. Coefficients for further explanatory variables for smoking, health change, hospitalisation in the previous year, age, country of birth, the change in the number of people, and the state of residence are available through the Stata code.

Figures

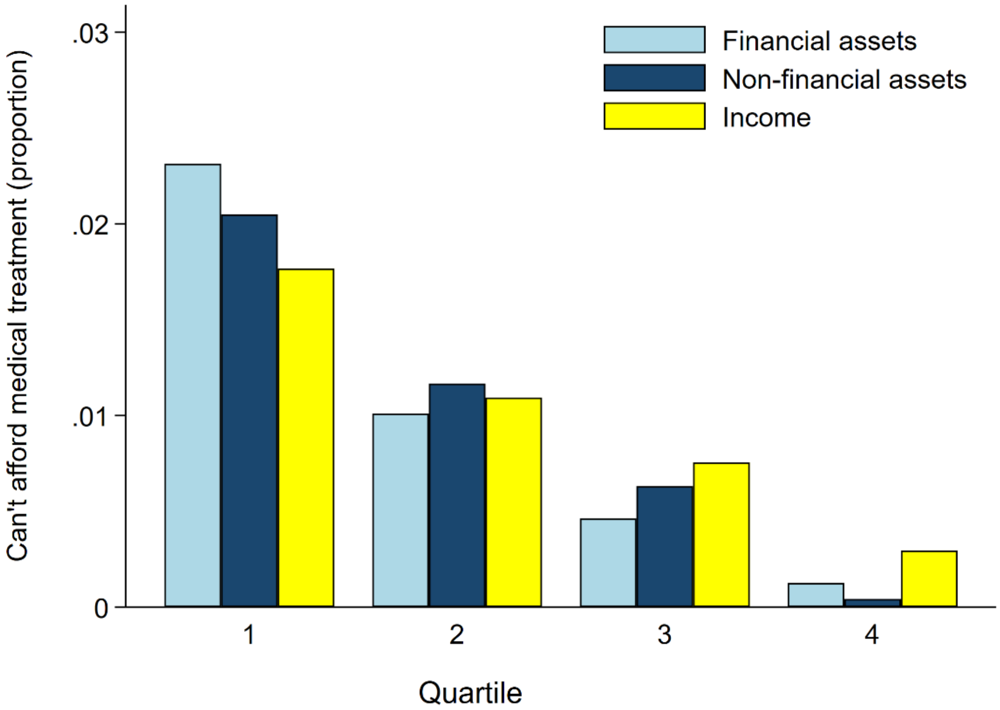

Figure 1. Proportion of households unable to afford medical treatment, split into quartiles according to either financial assets, non-financial assets, or income. Data: HILDA (2021).

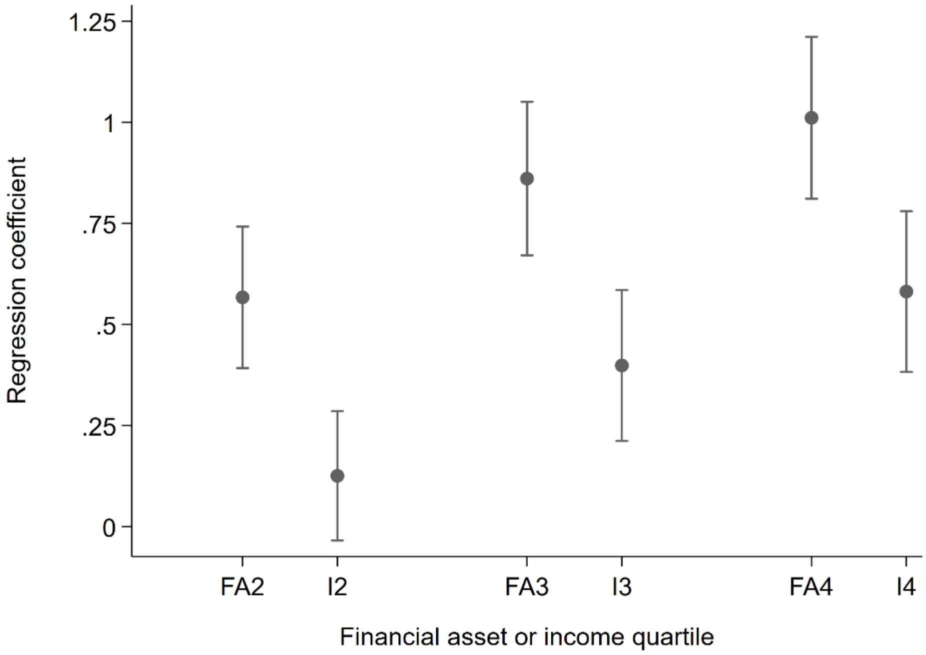

Figure 2. Financial asset (FA) and income (I) coefficients for quartiles compared to the reference groups for quartile one, with 95% confidence intervals, from column (2) of Table 4 which explains spending on health practitioners. Sources: author calculation; HILDA (2021).

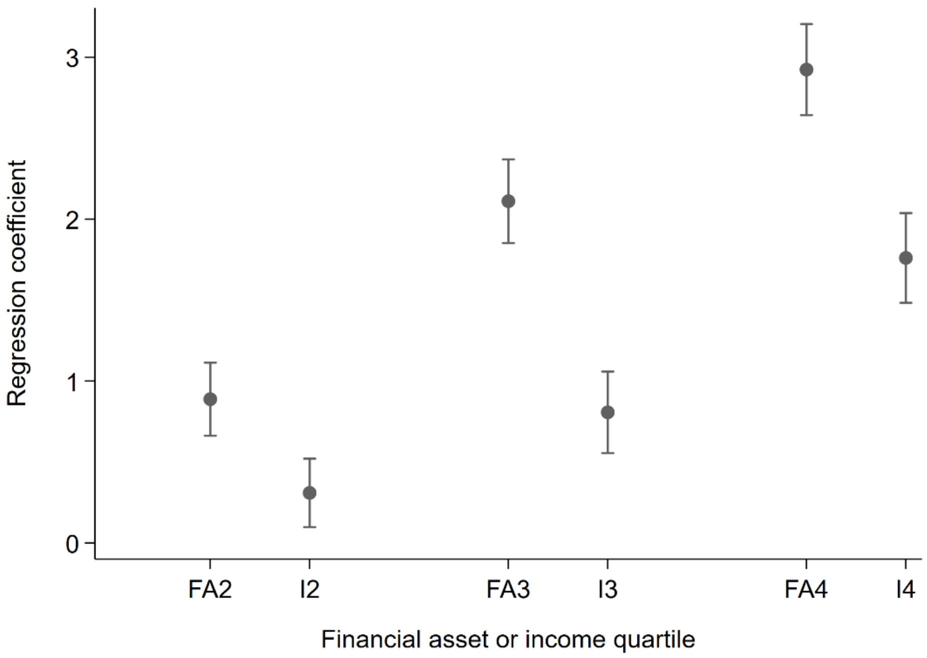

Figure 3. Financial asset and income coefficients for quartiles compared to the reference groups for quartile one, with 95% confidence intervals, from column (1) of Table 5 which explains spending on private health insurance. Sources: author calculation; HILDA (2021).

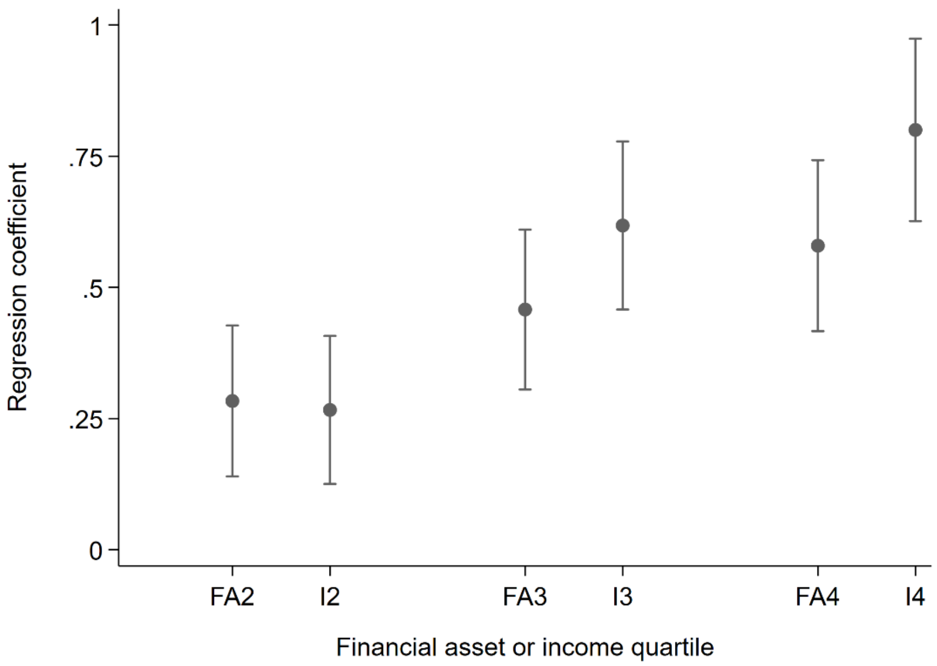

Figure 4. Financial asset and income coefficients for quartiles compared to the reference groups for quartile one, with 95% confidence intervals, from column (1) of Table 6 which explains spending on medicines, prescriptions, and pharmaceuticals. Data: HILDA (2021).