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Buying control? 'Locus of control' and the uptake of supplementary health insurance ☆

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ABSTRACT

This paper examines the relationship between locus of control (LOC) and the demand for supplementary health insurance (SUPP). Drawing on longitudinal data from Germany, we document robust evidence that individuals internal LOC increases the take up of supplementary private health insurance (SUPP). We find that the effect of one standard deviation increase in the measure of internal LOC on the probability of SUPP purchase is equivalent to a 14 percent increase in household income. Second, we find that the positive association between self-reported health and SUPP becomes small and insignificant when we control for LOC These results suggests that LOC might be an unobserved individual trait that can partly explain previously documented evidence of advantageous selection into SUPP. Third, we find comparable results using data from Australia, which enhances the external validity of our results.

1. Introduction

Even in comprehensive health systems, individuals spend both income and search effort to secure a better access to quality health care. However, not all individuals are equally sensitive to the future cost and quality of care in the event of need. Among individual psychological traits explaining differences in the demand for health care it is possible to identify an individual's locus of control (LOC) as an important behavioural construct mediating peoples choices. LOC refers to the extent to which an individual believes to be in control of its own life (Rotter, 1954).[1] Individuals can be classified on a scale ranging between *external LOC* – those who believe that external factors drive their life (e.g., fate and luck) – and *internal LOC* – those who believe that they are in control over their own life, and that the main outcomes of their life are determined by

☆ This article uses data from the German Socio-Economic Panel Study (GSOEP). The data were made available to us by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin. This paper also uses unit record data from the Household, Income and Labour Dynamics in Australia Survey (HILDA) conducted by the Australian Government Department of Social Services (DSS). The findings and views reported in this paper, however, are those of the authors and should not be attributed to the Australian Government, DSS, or any of DSS' contractors or partners.

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[1] Personality traits have been identified as important drivers of health care choices (Flynn et al, 2007).

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their own actions. Individuals with an internal LOC, might be more likely to anticipate their future needs ,including the use of private health care, and their desired quality of care, and arguably mightinvest more effort in securing better access to health care. In settings where there is a mainstream public health insurer, we hypothesize that LOC could therefore explain the purchase of supplementary private health insurance (SUPP).

This paper investigates two questions. First, we examine whether internal LOC predicts the uptake of SUPP. More specifically, given that SUPP reduces the financial uncertainty resulting from private health care use, and provides access to higher health care quality (Costa and Garcia, 2003), individuals with an internal LOC are hypothesized to exhibit a higher ex-ante valuation of additional health care quality, and to experience an reduced utility resulting from the financial uncertainty without SUPP (compared to individuals with an external LOC). Indeed, given that SUPP *"buys control" over the future use of private health care*, we hypothesize that the utility of SUPP is higher among individuals with an internal LOC.[2] This hypothesis is consistent with previous research showing that individuals with an internal LOC are more likely to engage in preventative health behaviors (Cobb-Clark et al., 2014).[3] Given that it is uimpossible to fully prevent using health care, not least because available health information is largely incomplete (Murray et al., 2003), we expect individuals with an internal LOC to be aware of such future health care needs, which might prompt individuals to purchase SUPP. This is the first claim that we test in this paper.

Our second claim is that an internal LOC provides a behavioural explanation for previous evidence that suggest the presence of advantageous selection into supplementary insurance (Buchmueller et al., 2013; Schmitz, 2011). That is healthy (lower risk) individuals being more likely to purchase SUPP.[4] One explanation we test here is that individuals with an internal LOC are more likely to value SUPP as mentioned above, but at the same time they exhibit better health and lower health care utilisation (Kesavayuth et al. 2020). Hence, we contend that LOC appears to be a behavioral parameter that can help reconciling evidence of "advantageous selection" into supplementary health insurance which otherwise is in stark constrast to standard theoretical models predicting adverse selection into insurance. Once we document that LOC predicts the uptake of SUPP, a second important question is to examine whether an individual's internal LOC can explain why healthy individuals are more likely to purchase SUPP (Fang et al., 2008, Buchmueller et al., 2013; Schmitz, 2011).[5]

We test our empirical claims using longitudinal survey data from Germany. In Germany, statutory public health insurance (SHI) is typically paid through both employee and employer contributions (even when unemployed or retired) as well as their dependents.[6] Individuals benefiting from the SHI can also purchase additional supplementary insurance (SUPP). SUPP extends health care coverage beyond that of SHI, and its premium is mainly adjusted based on age and, when observable, chronic conditions. Finally, those individuals above a certain income threshold can choose to have substitutive insurance (SUBST) rather than SHI and SUPP as described below.

One potential reason for the influence of LOC on SUPP in Germany is the presence of insurance underwriting. That is, pre-existing health conditions (which are less common among individuals with a higher internal LOC individuals) can influence both he premium individuals face and condition of access to SUPP. To address this point, we also replicate our analysis with Australian data, where a universal health insurance scheme, *Medicare,* provides health care to the entire population, but where individuals can have access to SUPP and face a community premium, which is not affected by insurance underwritting.[7] If we observe similar results to those observed in Germany, we argue that it strengthens the hypothesis that LOC is an important driver of insurance choices, rather than a predictor of insurance underwriting.

This paper extends the literature in different ways. First, we contribute to the analysis of the demand of SUPP by focusing on the effect of LOC, an important behavioral trait unobserved by the insurer, and neglected by the litertaure so far.[8]

[2] Consistent with this hypothesis, previous studies have already documented that an internal LOC is associated with precautionary measures with regards to natural disasters (Antwi-Boasiako, 2017) and increased resilience against personal shocks (Buddelmeyer and Powdthavee, 2016).

[3] Cobb-Clark et al. (2014) for example show that an internal LOC is associated with preventive health measures such as eating healthy and exercising. This is consistent with findings in the psychology literature showing that self-regulation increases the likelihood of healthy behaviors (Saffer, 2014), and that future orientation and self-efficacy negatively reduce drinking and increase exercising (Chiteji, 2010).

[4] Against the backdrop of the hypothesis of individuals self-selecting into insurance based on their objective risk (Rothschild and Stiglitz, 1976), several studies document puzzling evidence of either "no evidence of selection" (Chiappori and Salanié, 2000), or in some cases, the presence of "advantageous selection" into insurance (de Meza and Webb, 2001, Einav and Finkelstein, 2011), meaning that people buying insurance have actually lower risks of facing the insured loss. Throughout the paper, we use the terms *positive health selection, positive selection,* or *advantageous selection* interchangeably to refer to a situation where healthier people (people with poor health) are more (less) likely to take up an insurance policy, in contrast to adverse selection where healthy people (people with poor health) are less likely to take up insurance.

[5] The solid arrows in Figure A1 illustrate hypothesized causal effects and dashed lines indicate the correlations with the unobserved confounder (U). If U is not correlated with health*, LOC* and SUPP, we could easily test the role of LOC* in explaining the positive correlation between Health and SUPP by looking whether the association between health and SUPP changes when LOC is included as additional explanatory variable. In order to address this issue, the model includes a rich set of potential confounders in order to minimize the potential influence of U. We further minimize the influence of U by including individual fixed effects that accounts for time-invariant unobserved heterogeneity.

[6] Individuals can also opt out of the statutory public health insurance scheme and take up substitutive health insurance if they qualify for it based on an income threshold of €56,000 in 2017. More specifically, employees and pensioners earning less than €57,600, and their non-earning dependents have mandatory SHI (and individuals with a gross income above the threshold or self-employed can purchase substitutive private health insurance). A significant share of the population purchases SUPP to ensure access to private health care in the event of need.

[7] Community rating means that a given health insurance policy must be offered to all consumers at the same price thereby prohibiting insurers from charging premiums on observable risks.

[8] Furthermore, in the context of Handel and Kolstad (2015), it is a welfare relevant preference factor, that is a parameter of the utility function that affects how individuals make evaluations.

Second, we add to the existing literature on the influence of LOC on important life outcomes. Today there is robust evidence of an effect on education (Coleman and DeLeire, 2003); earnings (Cebi, 2007); preventive health behaviors (Cobb-Clark et al., 2014); and savings (Cobb-Clark et al., 2016). More specifically, we examine the influence of LOC in predicting future health care financing decisions, and more specifically the uptake of supplementary private insurance (SUPP). Unlike previous research, this study adds to the literature on behavioral household finance , and more specifically it suggests that individuals have ex-ante preferences for the financing health care. Third, this is the first paper that exploits the panel dimension of the LOC data allowing to control for unobserved time-invariant heterogeneity to estimate the role of LOC on economic outcomes. Previous evidence assumed LOC to be a fix trait, but we show that it does indeed vary over the life course of an individual. Fourth, we examine whether LOC plays a role in explaining previous evidence of positive health selection into SUPP, however our study refer to the uptake of supplementary private insurance by publicly insured individuals.[9] Finally, to enhance the external validity and economic significance of our estimates, we report evidence from two large countries with substantial SUPP markets that complement the coverage of a mainstream insurer: Germany and Australia. However, both markets differ in the design of their insurance contracts. Consistent evidence between the two countries would suggest that the influence of LOC is robust to differences in institutional designs (such as the presence of community rated premiums in Australia).

Our results suggest evidence that as hypothesised, an invididual's internal LOC predicts the uptake of SUPP. This finding is robust to several relevant controls for risk attitudes, time preferences, wealth, income, personality traits, as well as other potential observed confounders and time invariant unobserved heterogeneity. Although previous literature documents that an internal LOC increases the probability of an individual to engage in preventative health behaviors (Cobb-Clark et al, 2014) which could in turn reduce the need of health care, we find that, an internal LOC can help anticipating the expected financial costs and the better quality care that results from using private health care . This is an important contribution to the paper. Finally, we show that LOC is a confounding variable that partly explains the observed positive association between health and the uptake of SUPP, suggestive of advantageous selection into SUPP.

Section 2 describes the German institutional , including an institutional background on the market for SUPP and the role of LOC. Section 3 describes the data and our empirical strategy. Section 4 displays the main results, and Section 5 analyses the role of LOC in the positive health selection into purchasing SUPP, finally Section 6 shows a comparable analysis using Australian data to strengthen the validity of our finding. Section 7 contains our concluding remarks.

2. The German supplementary health insurance (SUPP)

The German market for SUPP offers additional (supplementary) insurance to those covered by the statutory health insurance (SHI) funded from employment-based payroll contributions namely 90% of the German population (Lange et al, 2017). Individuals in the statutory system have the option of purchasing SUPP. SUPP provides access to additional health care services excluded from the SHI and can also cover care at a higher quality than healthcare delivered by SHI. However, it entails paying an insurance premium, which are risk-based , though mainly based on age and the disability status of the individual.

The main reason for individuals to purchase SUPP lies in attaining better health care quality service than delivered by the social health insurance (Lungen et al., 2008) and better access to rationed care (Costa and Garcia, 2003, Costa-Font and Jofre-Bonet, 2008), which individuals expect to consume out-of-pocket otherwise (Gruber and Kiesel, 2010; Grunow and Nusheler, 2013). Hence, the purchase of SUPP provides individuals with better quality and reduces out-of-pocket expenses (Costa-Font and García-Villar, 2009). Lange et al. (2017) estimate that whilst 8.24% of individuals received SUPP in 1999, its uptake increased to 22.68% in 2008.

Finally, a unique feature of the German system is that those whose income exceeds a given threshold[10] (in addition to civil servants and self-employed individuals) have the choice of either remaining in the statutory system,[11] and additionally purchasing SUPP or, opting out completely and purchasing SUBST (Hullegie and Klein, 2010). However, the majority remain in the system, and SUBST funds less than 10% of the population.[12]

3. Data and empirical strategy

3.1. Data

In the main part of the analysis, we use data from the German Socio-Economic Panel (SOEP, 2019). The SOEP is a longitudinal household survey that began in West Germany in 1984 and in East Germany in 1990. It collects information on a

[9] We report the characteristics of the privately insured individuals compared to the publicly insured individuals in the Appendix.

[10] The threshold varies from year to year and was €57,600 per year in 2017.

[11] Furthermore, premiums are front-loaded so that older individuals have a shorter time-horizon to build up old-age provisions. However, the premium is considerably lower than the public premium. This is particularly relevant for civil servants.

[12] Upon choosing SUBST, switching back to the SHI is restricted to cases where an individual's income falls below the threshold. Individuals aged 55 years and older however are generally not allowed to switch back to the statutory health insurance. Unemployed spouses and dependents under 25 years are co-insured at no additional cost. Civil servants have a strong financial incentive to purchase SUBST as they are entitled by law to a 50% subsidy ("*Beihilfe*"), whilst self-employed people bear the full cost of insurance coverage.

wide range of factors including the purchase of supplementary health insurance, alongside a rich set of individual records including LOC as well as related concepts such as willingness to take risks and other personality traits. We use all waves of SOEP from 1999 to 2016, except the 2009 and 2015 waves because it did not collect information on SUPP for those years. We exploit the data only from 1999 because it was the first time that LOC was measured.

Our sample is restricted to individuals who are between 25 and 90 years old.[13] After dropping observations with missing values for the variables , our final sample includes 24,274 individuals, constituting an unbalanced panel including 231,784 observations. On average, individuals were observed 9.5 times.

3.1.1. Private health insurance uptake

Insurance records in the SOEP include information for both SUPP and SUBST and SUPP since 1996. Specifically, the question is as follows: *"How are you insured for sickness: Do you have state health insurance or are you almost exclusively privately insured?"* From this, we generate a binary variable indicating whether individuals have SUBST. However, insofar as not everyone is eligible to make the SUBST insurance choice, our main focus in on SUPP.

More specifically, individuals who report to have a SHI are asked whether they additionally have private health insurance, which we define as *SUPP*. If the answer is positive, they are then asked how much they pay for their insurance policy each month, and what does it cover (e.g., hospital stays, dentures, corrective devices, coverage abroad, or other), which we also use in the analysis. It is important to note that both SUBST and SUPP serve very different purposes. While SUBST is purchased at lower premiums, it allows the choice of plans , it provides more flexibility with regards to cost-sharing arrangements as well as lower waiting times even though at times it implies higher out-of-pocket spending. SUPP is primarily an "add-on" for services that the SHI in Germany does not cover, such as dental care, glasses, alternative medicine, travel insurance, or own rooms after hospitalized.

3.1.2. LOC and other non-cognitive skills

Our main explanatory variable of interest is LOC, which is measured in 1999, 2005, 2010 and 2015 . Respondents state on a seven-point scale the extent to which they agreed or disagreed with several statements referring to perceptions about fate and control.[14] The items are based on the Psychological Coping Resources Component of the Mastery Module developed by Pearlin and Schooler (1978). We follow the recent economic literature and predict the first factor using factor analysis, which produces a continuous measure of internal LOC (see Piatek and Pinger, 2016; Cobb-Clark et al., 2014; Cobb-Clark et al., 2016; Cobb-Clark and Schurer, 2013). We also follow Cobb-Clark et al. (2014) and calculate individual-specific averages of LOC over time to minimize measurement error and attach those values to each wave. We then standardize LOC so that its mean is equal to zero and its standard deviation is equal to one.

We also control for individuals' non-cognitive skills which are measured by the Big Five personality traits inventory based on Saucier (1994) in wave 2005, 2009 and 2013 in the SOEP. The Big Five personality traits are extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. To construct a summary measure for each trait, we use the 15 items in the SOEP in a factor analysis (see Cobb-Clark and Schurer, 2012). In line with our procedure for LOC, we calculate individual-specific averages and standardize each measure.

We additionally control for individuals' willingness to take risks.[15] In the SOEP, risk attitude has been asked every year since 2004, except in 2005 and 2007, using the following question: *"How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks? Please tick a box on the scale, where the value 0 means: 'risk averse' and the value 10 means: 'fully prepared to take risks. You can use the values in between to make your estimate."* We calculate an individual-specific average and attach this value for each year.[16]

3.1.3. Control variables

We also consider a series of control variables that capture potential confounders that may be correlated with LOC and the uptake of SUPP. We control for wealth that was measured in 2002, 2007 and 2012 , and we calculated individual-specific average wealth over the three waves, and we created a categorical variable for the quintiles of wealth.[17]

[13] Our sample definition aims at making sure that we are examining a sample of individuals who are making health insurance choices. Accordingly, we selected individuals over the age of 25 years to minimize the number of individuals who are covered by a supplementary health insurance whose choice has been made by the parents rather than themselves. Similarly, we restricted the sample to individuals below 90-year-old as individuals above that age (0.16% of the total sample) are less likely to make health insurance choices. Nevertheless, removing this selection does not affect our main estimates.

[14] The questions aimed at measuring LOC were measured on a four-point scale in 1999 in SOEP. We rescaled those variables from 1999 accordingly. As a robustness check, we discarded the 1999 measure to calculate the individual specific average, but we found very similar results.

[15] In previous analysis, we also include two proxies for time preference that are available in 2008 and 2013. The first measure is based on the following question: *"Would you describe yourself as an impatient or a patient person in general? Please answer on a scale from 0 to 10, where 0 means very impatient and 10 means very patient."* The second question is: *"Do you generally think things over for a long time before acting – in other words, are you not impulsive at all? Or do you generally act without thinking things over for long, in other words, are you very impulsive? Please answer on a scale from 0 to 10, where 0 means 'not at all impulsive' and 10 means 'very impulsive'."* It turned out that neither of these two measures were significantly associated with the ownership of SUBST or SUPP once all the other control variables were included. We therefore do not include these variables in our main model, however estimation results based on models that include these variables are available upon request.

[16] As a robustness check, we also re-estimated the models using the actual measure of risk attitudes and thus restricted the sample to the waves of SOEP for which this measure is available, and we found very similar results.

[17] As a robustness check, we also used the actual measure of wealth and thus restricted the sample to the waves of SOEP for which this measure is available, and we found very similar results.

Table 1
Descriptive statistics by ownership of private substitutive insurance and supplementary private health insurance ownership, Germany.

	Private substitutive health insurance (SUBST)		Supplementary private health insurance (SUPP)	
	No	Yes	No	Yes
Locus of control	-0.071	0.427	-0.125	0.187
Sex (woman=1)	54.9%	39.6%	54.2%	58.0%
Age	51.4	52.0	51.5	50.8
Years of education	11.6	14.5	11.4	12.6
Labour force status:				
Working	58.5%	71.1%	56.4%	68.5%
Unemployed	5.4%	0.4%	6.1%	2.0%
Other	36.2%	28.4%	37.6%	29.5%
Married/ partnership	76.2%	81.7%	75.5%	79.5%
Monthly net household income	2848	4879	2695	3580
#adult in the household	2.1	2.1	2.1	2.1
#children in the household	0.5	0.5	0.5	0.5
Bad/poor health	19.4%	12.1%	20.3%	15.6%
General risk attitudes	4.26	4.79	4.20	4.54
The Big Five:				
Extraversion	-0.014	0.085	-0.036	0.090
Agreeableness	0.016	-0.097	0.026	-0.032
Emotional stability	-0.040	0.242	-0.055	0.028
Conscientiousness	0.008	-0.048	0.004	0.025
Openness	-0.037	0.224	-0.080	0.166
Wealth:				
1st quintile	22.4%	5.8%	24.6%	11.7%
2nd quintile	21.7%	9.6%	22.4%	18.3%
3rd quintile	20.7%	15.9%	20.7%	20.9%
4th quintile	19.2%	25.3%	18.7%	21.5%
5th quintile	16.0%	43.4%	13.6%	27.6%
Number of observations	198,712	33,072	164,322	34,390

Note: GSOEP 1999-2016 (except 2009 and 2015). This table reports the characteristics of individuals having and not having private health insurance (both substitutive and supplementary) in Germany.

We furthermore control for gender, age (using a third-order polynomial of age to take into account potential nonlinearities in the relationship between age and insurance ownership), years of education, labor force status (working, unemployed or other), after-tax net household income,[18] partnership status (a dummy equal to one if the individual is married or partnered), the number of children and adults in the household, and a dummy variable equal to one if the individual reports being in poor or bad health.

3.2. Descriptive statistics

Table 1 provides descriptive statistics by insurance status. It shows a higher level of internal LOC for individuals who take up SUPP (and similarly for SUBST).[19] We also find that SUPP and SUBST subscribers exhibit a higher household income . Men are found to be more likely to have SUBST, whilst women are more likely to have SUPP. However, we do not observe any meaningful difference in average age between those with and without SUPP.

3.3. Correlates of LOC

Before further analysis, an important question that emerges is what correlates with internal LOC. We explore this in Table A1 in the Appendix. For this analysis, we only focus on observations for which LOC is measured at the time of the interview. We estimate the equation using ordinary least squares (OLS) and use cluster-robust standard errors (at the individual level) to allow for the possibility that the error term is correlated among observations for the same individual. We find that years of education, income and wealth are positively associated with an internal LOC. Unemployed individuals exhibit a lower internal LOC than employed individuals, and individuals living in larger households, and reporting poor or bad health exhibit a lower internal LOC. Consistently with Kesavayuth et al. (2018), we find a positive association between LOC and the willingness to take risks, which might be influenced by unobservables. Personality, and more specifically, extraversion,

[18] Alternatively, we could use individual earnings instead of household income, but we believe that household income is a better proxy for the ability to pay for SUPP and thus follow the previous literature on the determinants of supplementary health insurance (See e.g., Buchmueller et al. 2013; Lange et al. 2017).

[19] Appendix B shows the results of the association between SUBST and LOC.

conscientiousness, agreeableness, and emotional stability are positively correlated with LOC while openness is negatively associated with it. Finally, Table A10 in the appendix provides evidence of the partial correlation matrix of LOC and several non-cognitive skills. It is worth noting that the two measures of time preferences existing in the survey exhibit the lower correlation with LOC among all the non-cognitive skills.

3.4. Isolating the effect of LOC on SUPP

Before describing the empirical strategy, we focus on identifying the factors that have been commonly associated with SUPP and LOC. We are particularly interested in estimating the of LOC on SUPP controlling for other covariates. LOC is associated with risk attitudes (Kesavayuth et al, 2018), income (Cobb-Clark et al, 2016) and health (Landau, 1995), which could also have a direct effect on the uptake of SUPP[20]. To isolate the effect of LOC, we control for these observed confounding factors in the regression analysis as explained in Section 3.5. Our estimates of the effect of LOC are biased if there are any other unobservable variables influencing both SUPP and LOC. Finally, it is worth noting that there might be some measurement error in the measurement of LOC, risk attitudes, health and income. That is, we observe 'LOC*', 'Health*' and 'Risk attitudes*' and 'Income*', rather than the true underlying variables 'LOC', 'Health' and 'Risk attitudes and 'Income'[21]. Such measurement error, if it is systematically related between these variables, could lead to falsely concluding that LOC explains advantageous selection into SUPP . However, as displayed in Fig. 1, we assume that all the proxy variables measured with error depend on a common unobserved trait U, such as the tendency to be optimistic, or to be overconfident which influence the way individuals self-report such variables. However, these effects are picked up by individual fixed effects, which we expect to absorb such individual specific measurement error.

3.5. Empirical Strategy

3.5.1. The Effect of LOC on SUPP

Our empirical strategy begins with estimating the following equation by Ordinary Least Squares (OLS):

$$SUPP_{it} = \beta_1 + \beta_2\ LOC_i + \beta_3 X_{it} + \varepsilon_{it} \tag{1}$$

where our dependent variable refers to the uptake of SUPP ($SUPP_{it}$) by an individual i at time t is a function of LOC (LOC_i), as well as several relevant confounders (X_{it}). To consistently estimate β_2, the error term (ε_{it}) in Eq. (1) needs to be mean independent from LOC. In a first step, to mitigate the potential for omitted variable bias and thus reinforce the conditional independence assumption between ϵ_{it} and LOC, we include in the vector X_{it} a rich set of covariates that are likely to be correlated with both LOC and SUPP[22]. Given that our estimates might be biased by the presence of time invariant unobservables not captured by individual fixed effects (time invariant), we use a language of association rather than causality.

. Furthermore, we assess the robustness of our results by exploiting the panel dimension of the data over a long period (more than 15 years) and by estimating our model by using the fixed effects estimator (at the individual level) and thus by relaxing the assumption of independence between the explanatory variables and time-invariant unobserved heterogeneity. For this analysis, the equation estimated is the following:

$$SUPP_{it} = \beta_1 + \beta_2\ LOC_{it} + \beta_3 X_{it} + \alpha_i + \nu_{it} \tag{2}$$

where α_i represents the time-invariant unobserved heterogeneity and ν_{it} is the time-varying error term that is assumed to be mean independent from LOC_{it}, H_{it}, and X_{it}. The estimation of this model is based on the data from the waves that include a measure of LOC, i.e. 1999, 2005, 2010, and 2015[23]. Given that childhood circumstances and family background are likely to influence an individual's internal LOC and adult outcomes that are related to the take-up of SUPP (Xue et al., 2020), fixed effects estimator allows to mitigate this potential source of omitted variable bias. A related question discussed in the next section refers to self-selection into SUPP (Lange et al., 2017; Buchmueller et al., 2013; Schmitz, 2011; Fang et al., 2008). The test will consist in examining the effect of including LOC or not on the estimate of β_3 in Eq. (1) (and γ_3 in Eq. (2)).

3.5.2. The effect on health status on SUPP after controlling for LOC

In examining the effect of including LOC in explaining how supplementary insurance (SUPP) is driven by poor self-reported health, we consider different potential pathways using a *simple* Directed Acyclic Graph (DAG) in Fig. 1, which is only intended to help to transparently describe the different pathways of influence that LOC can exert on individual

[20] For example, following a standard demand for insurance model, risk attitudes (risk aversion) increase the expected utility gain from insurance purchase, and hence should increase the take up of SUPP. Other studies have examined the influence of controls acting as confounders such as income and health on SUPP (Lange et al., 2017; Buchmueller et al., 2013; Schmitz, 2011; Fang et al., 2008).

[21] There might be measurement error in other variables, but we focus on the variables that we have shown to be correlated with LOC and where there is literature suggesting that they influence SUPP.

[22] Following the literature in the field of LOC and health (Cobb-Clark et al., 2014), we include regional and year fixed effects, the gender and the age of the respondent, the number of years of education, labor force status, marital status, household composition, monthly disposable household income, wealth, risk attitude, and personality traits.

[23] The control variables in this model only include those that vary (and are observed) over time (region and year fixed effects, age, income, labor force status, marital status, household composition, and health status).

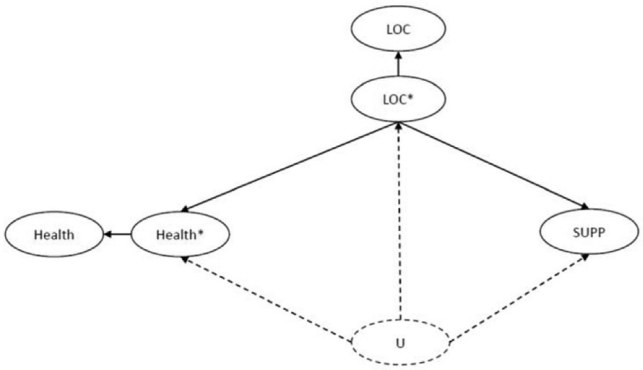

Figure 1. Directed Acyclic Graph of the effect of Locus of Control (LOC) on the uptake of Supplementary Health Insurance (SUPP) and Health Status (Health Selection).

behavior, all influencing the uptake of SUPP. As described in Fig. 1, the second purpose of this paper is to examine how including LOC influences the effect of health status or the probability of sickness (H_{it}), affect the uptake of supplementary insurance (SUPP) as below:

$$SUPP_{it} = \gamma_1 + \gamma_2\ LOC_{it} + \gamma_3 H_{it} + \gamma_4 X_{it} + \alpha_i + \nu_{it} \tag{3}$$

Our description considers the sum of all pathways that include both direct effects, and the effect of confounders such as income and health. The graph shows several nodes reflecting the relevant parameters influencing the uptake of SUPP[24]. We are interested in examining advantageous selection into SUPP, which is captured by Fig. 1, e.g., whether health status influences the uptake of SUPP and whether LOC can explain this selection. To investigate such effects, we examine how the regression coefficent of poor health on SUPP changes when we exclude LOC, and when we include it (which cancels path a), as well as when we control for income which closes that path. Now, LOC is a pathway for the effect of health on SUPP. Hence, the coefficient of poor health captures the effect of health in addition to the LOC effect on health when omitted. This approach follows the standard criteria set out in Huber (2019) yet we do not specifically separate mediators or confounders from other effects. In addition, our regressions also control for the standard set of control variables (which are not reflected in Fig. 1: regional and year fixed effects, gender, age, education, labor force status, marital status, household composition, wealth, other personality traits) and, in additional specifications, for unobserved time-invariant heterogeneity.

Certainly, we cannot rule out for the possibility that some other unobserved confounders could bias our results. For example, preference for health could be a component of U , which could turn out to be positively correlated with health and SUPP, but also with LOC. By including LOC in the model, we would also observe a change in the association between health and SUPP, although the positive selection into SUPP would not be explained by LOC but by a preference for health. Moreover, Fig. 1 also acknowledges that we do not observe the actual locus of control and health status of individuals, LOC* and Health*, but some noisy measures of them, LOC and Health. Assuming that the mis-measurements are not correlated with SUPP, LOC* and Health*, it would be consistent with evidence of an underestimation of the association of health and SUPP , but it would also imply that the inclusion of the noisy measure of LOC in the model would imperfectly identify the influence of LOC in explaining the correlation between health and SUPP.

4. Results

4.1. Uptake of Supplementary Insurance (SUPP)

Table 2 displays the linear probability estimates for SUPP uptake.[25] As expected, the coefficient estimate of LOC is positive and statistically significant in all estimates (estimates with the full set of controls are included in Table A2 in the Appendix), although the effects size declines with the inclusion of the different covariates such as income, risk attitudes, health, and to a lesser extent when we control for several other controls, such as employment status, household characteristics, and individual personality traits (the so called 'Big Five'). Comparing the coefficient estimate of LOC with the coefficient estimate of the logarithm of household income (estimate: 0.131; standard error: 0.005) on SUPP uptake, our estimates suggest that

[24] However, given the simplicity of the model, we do not distinguish between different types of paths (directed, backdoor).

[25] We also estimated the equation using a probit model and we found very similar results. We also investigate whether there are non-linearities in the association between LOC and the uptake of private health insurance. In general, we found that the coefficients are larger for the higher deciles of LOC. Results are available upon request.

Table 2
Supplementary health insurance (SUPP), Germany.

	Supplementary private health insurance (SUPP)		
	(1)	(2)	(3)
Locus of control	0.041***	0.018***	0.017***
	(0.002)	(0.002)	(0.002)
Age and sex	Yes	Yes	Yes
Education, income and wealth	No	Yes	Yes
Labour force status	No	No	Yes
Household characteristics	No	No	Yes
Bad/poor health	No	No	Yes
Big 5	No	No	Yes
Region fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R^2	0.060	0.105	0.116
N	198,712	198,712	198,712

Note. GSOEP 1999-2016 (except 2009 and 2015). Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See Table A2 in the Appendix for full set of controls.

Table 3
Age Heterogeneity of Supplementary Private Health Insurance (SUPP), Germany.

	Supplementary private health insurance (SUPP)		
Age group:	25-40	41-64	65+
	(4)	(5)	(6)
Locus of control	0.021***	0.014***	0.016***
	(0.004)	(0.003)	(0.004)
Age and sex	Yes	Yes	Yes
Education, income and wealth	Yes	Yes	Yes
Labour force status	Yes	Yes	Yes
Household characteristics	Yes	Yes	Yes
Bad/poor health	Yes	Yes	Yes
Risk attitude	Yes	Yes	Yes
Big 5	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R^2	0.083	0.116	0.179
N	52,803	99,607	46,302

Note. GSOEP 1999-2016 (except 2009 and 2015). Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See Table A3 in the Appendix for a full set of controls.

the effect of a one standard deviation increase in LOC on the probability to have a SUPP is equal to an estimated 13% increase in household income.[26]

4.2. Heterogeneity

Given that we cannot discard the hypothesis of heterogeneous effects, we next investigate whether the association between LOC and SUPP differs by age groups, gender and types of health insurance coverage. Table 3 shows that the association between LOC and SUPP is slightly larger for the younger individuals (25–39-year-old) compared to the older respondents. Nevertheless, the positive association remains highly significant for all age groups. Similarly, Table 4 shows that the association is similar for men and women.[27]

Given that insurance coverage can differ across insurance contract types, Table 5 investigates the association between LOC and different types of health insurance coverage.[28] We show evidence of a positive association between LOC and SUPP for all types of coverage, although the association is larger for insurance contracts covering hospital and dental care, compared

[26] Wealth is positively associated with the ownership of SUPP while household size reduces the probability of having insurance, and some of the coefficients for the personality traits (emotional stability, conscientiousness, and openness) are significantly different from zero.

[27] Table A3 and A4 in Appendix display the results for all covariates.

[28] Full results are available in Table A5 in Appendix.

Table 4
Heterogeneity by Gender, Germany.

	Supplementary private health insurance (SUPP)	
	Male	Female
	(3)	(4)
Locus of control	0.016***	0.017***
	(0.003)	(0.003)
Full controls	Yes	Yes
Region fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R^2	0.107	0.126
N	89,707	109,005

Note. GSOEP 1999-2016(except 2009 and 2015). Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Table A4 in the Appendix for full set of controls.

Table 5
Coverage Type of the supplementary health insurance (SUPP), Germany.

	Coverage of the supplementary private health insurance (1=covered; 0=not covered or no supplementary private insurance)				
	Hospital	Dental care	Eye care	Care Abroad	Other
Locus of control	0.012***	0.009***	0.006***	0.004***	0.002***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Full controls	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	0.090	0.085	0.036	0.040	0.010
N	198,712	198,712	198,712	198,712	198,712

Note. GSOEP 1999–2016 (except 2009 and 2015). Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1 See Table A5 in the Appendix for full set of controls.

to those covering eye care or care abroad, for example. We interpret this finding as suggesting that LOC exerts a particularly stronger influence on the uptake of insurance against more costly risks.[29]

4.3. Results from the fixed effects estimator

Next, we then take advantage of the panel dimension of the data, which allows us to control for time invariant individual heterogeneity,[30] though it reduces the sample to the years for which a current measure of SUPP and a current measure of LOC is available.[31] We also control for all time-varying covariates from the main model: year fixed effects, regional fixed effects, a third order polynomial in age, the logarithm of net monthly household income, employment status (working, unemployed or other), partnership status, the number of adults and children in the household, and health status.

Against the backdrop that LOC is time-invariant (Cobb-Clark and Schurer, 2013), we find that LOC varies over time given that our sample is long as we observe individuals for 16 years. It should also be stressed that our fixed effects estimates are likely downward biased due to measurement error in the measure of LOC, which is likely to produce attenuation bias (if the measurement error is classical). Hence, they should be interpreted as a lower bound of the effect size.

Table 6 retrieves the estimates using our main specification with fixed effect as well as with OLS which might be affected by unobserved confounders or omitted variable bias. Consistently, we find that the association between the uptake of SUPP and LOC remains positive and highly significant in both specifications.[32]

4.4. Effects of LOC on health care use

One potential explanation for our results is that LOC increases the use of health care. Accordingly, Table 7 examines whether we find a higher intensity of health care use among individuals with an more internal LOC . An effect of LOC on

[29] As additional analysis, we have estimated the effect of LOC on the number of types of health care spending that are covered, conditional on having a SUPP. The estimated coefficient is not significantly different from zero at any conventional significance level.

[30] We estimated the equations by using the linear fixed effects estimator. Our results are robust to alternative estimation methods such as the fixed effects logit model or the correlated random effects probit based on the Mundlak correction approach (Mundlak 1978).

[31] Note, however, that the information about supplementary insurance is not available in 2015. We thus impute the supplementary insurance information from 2016 to 2015. We also did a robustness check by discarding the observations from 2015 and the results are robust to this exclusion.

[32] Full results are available in Table A6.

Table 6
Private supplementary health insurance (SUPP). OLS and individual fixed effects (FE) models, Germany.

	OLS		FE	
	(1)	(2)	(3)	(4)
Locus of control	0.036***	0.008***	0.007***	0.007***
	(0.002)	(0.003)	(0.003)	(0.003)
Age	Yes	Yes	Yes	Yes
Income	No	No	Yes	Yes
Labour force status	No	No	No	Yes
Household characteristics	No	No	No	Yes
Bad/poor health	No	No	No	Yes
Region fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
R^2	0.056	0.047	0.048	0.049
Number of observations	39,794	39,794	39,794	39,794
Number of individuals	19,413	19,413	19,413	19,413

Note. GSOEP 1999, 2005, 2010, 2015. Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See Table A6 in the Appendix for full set of controls.

Table 7
Health care utilization, Germany.

	Number of doctor visits per year (1)	Hospital stays (2)
Locus of control	-0.119*	-0.000
	(0.072)	(0.001)
Full controls	Yes	Yes
Region FE	Yes	Yes
Year FE	Yes	Yes
R^2	0.148	0.056
N	198,222	198,484

Note. GSOEP 1999-2016 (except 2009 and 2015). Cluster-robust standard errors (at the individual level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1. See Table A7 in the Appendix for full set of controls.

health care use could either reflect the fact that individuals are sicker, or that one simply reflect a truly more intense health care use as a preventive measure. Table 7 shows that LOC is not meaningfully associated with the number of doctor visits or the probability of having been hospitalized in the last twelve months.[33] This suggests that more frequent use of health care utilization by individuals with a higher internal locus is unlikely to be a significant driver in their uptake of SUPP.

5. LOC and health selection into SUPP

Once we establish that LOC influences the uptake of SUPP, a second important question is whether LOC can explain the existence of positive selection into SUPP, which has been consistently shown in previous studies (Fang et al., 2008, Buchmueller et al., 2013; Schmitz, 2011).[34] Table A9 reports an estimate of the effect of LOC on health, income and risk attitudes in the appendix. As expected, the effect sizes of the cumulative effect correspond to the sum of partial effects.[35]

Table 8 reports the association between poor health and SUPP when LOC is included or not as additional control variable.[36] The estimates show that when LOC is excluded from the specification, poor self-reported health is negatively associated with SUPP uptake. This is consistent with the presence of positive selection into insurance. In contrast, the association between poor self-reported health is no longer significant at any conventional level once LOC is controlled for (Columns 4 and 6). This result is consistent with the presence of omitted variable bias when ignoring LOC as described in Fig. 1. We have also estimated these associations by using a fixed effects estimator and we document similar results.[37]

[33] If any, we find a negative association between LOC and the number of doctor visits, that is only significantly different from zero at the 10%-level. Full results are available in Table A7 in the Appendix.

[34] As already shown previously, Figure 1 describes the potential pathways of the effect of LOC alongside other variables on the uptake of SUPP

[35] For instance the cumulative average effect of LOC on SUPP is 0.024 in the first column is about the sum of 0.017 (partial effect LOC) + 0.131 *0.048 (partial effect of average household income)+ 0.04*0.123 (partial effect of a unit change in risk attitudes). Table A1 in the appendix suggests that LOC is negatively associated with poor health and positively associated with the willingness to take risks.

[36] The full results are displayed in Tabe A8 in Appendix.

[37] The estimates are available upon request.

Table 8
Locus of Control and Positive Selection GSOEP 1999-2016. Linear probability models – Germany: Private supplementary health insurance.

	Supplementary private health insurance (SUPP)					
	(1)	(2)	(3)	(4)	(5)	(6)
Locus of control		0.040***		0.018***		0.017***
		(0.002)		(0.002)		(0.002)
Poor/bad health	-0.042***	-0.024***	-0.010***	-0.003	-0.008**	-0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Age and gender	Yes	Yes	Yes	Yes	Yes	Yes
Income, wealth and education	No	No	Yes	Yes	Yes	Yes
Employment	No	No	Yes	Yes	Yes	Yes
Household characteristics	No	No	No	No	Yes	Yes
Personality	No	No	No	No	Yes	Yes
Risk Attitudes	No	No	No	No	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.050	0.061	0.103	0.105	0.115	0.116
N	198,712	198,712	198,712	198,712	198,712	198,712

Note. Cluster-robust (at the individual-level) standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

6. LOC and SUPP in Australia

To assess the external validity of our results, and our overall claim, we perform a similar set of analysis with Australian data. Below we briefly describe the setting for the Australian SUPP, provide a description of the Australian dataset, and report the main results of estimating Eqs. (1) and (2) with Australian data.

6.1. Australian private health insurance

In Australia, private health insurance plays a complementary role to a universal public insurer (*Medicare*) in granting access to extra services that are not included in its public catalogue. Hence, it compares to what we have labelled as 'supplementary health insurance' (SUPP) in the German system as it provides speedier access to private health care for elective procedures that mostly take place in hospitals (Buchmueller et al, 2013). The uptake of a private hospital health insurance plan is incentivized by income and age specific rebates ranging between 0%–36%. Furthermore, individuals who have an income above $90,000 ($180,000 for families) and no private hospital insurance are liable to pay the *Medicare Levy Surcharge*. A unique feature of the Australian system is that it relies on a regulated gatekeeper model, whereby private health insurance cannot cover outpatient services which are already financed by both Medicare and out-of-pocket payments. Like other complementary insurance schemes in Europe, Medicare-listed prescription drugs are not covered by private insurance plans. More generally, having private health care improves quality of care as it provides access to a wider choice of providers and additional health care amenities, which is similar to Germany. Again, those quality dimensions are more likely to be anticipated, and hence valued, among those individuals that have a higher internal LOC.

6.2. Data

We employ data from the Household, Income and Labour Dynamics in Australia (HILDA) survey. The HILDA survey collects longitudinal information from a large nationally representative sample of Australian households since 2001 and contains information on LOC, willingness to take risks and other personality traits. We employ all waves from 2005 to 2014 from the HILDA survey when information on annual household expenditures on private health insurance coverage is available.

For Australia, out of the 120,185 observations (19,597 individuals) in 2005 to 2014 aged between 25 and 90 years old, we lose six percent due to missing information on LOC and other eight percent due to missing information in any of the other control variables. This leaves us with a final sample of 103,448 observations (10,406 individuals).

In the HILDA survey, individuals report on their annual household expenditures on SUPP. More specifically, we generate a binary variable indicating whether households have SUPP if they report any expenditure for private health insurance. Therefore, SUPP is measured at the household level rather than the individual level. Our measure for LOC is measured at the individual level and based on seven questions in the HILDA survey as described in Cobb-Clark et al. (2014). We follow Cobb-Clark et al. (2014) and calculate individual-specific averages of LOC over time to minimize measurement error and attach those values to each wave. The HILDA survey allows us to control for the same variables as in SOEP, such as the Big Five personality traits as well as risk attitudes. All relevant questions in the HILDA survey are directly comparable to the SOEP except for the risk measure. Instead of self-assessed general willingness to take risks in the SOEP, the HILDA survey asks about financial risk taking. We generate a binary variable indicating whether someone is an above-average financial risk taker based on a question designed to gather information on the extent to which individuals are willing to take financial

Table 9
Supplementary private health insurance, linear probability model, Australia.

	Supplementary private health insurance		
	(1)	(2)	(3)
Locus of control	0.0707***	0.0159***	0.0095**
	(0.0040)	(0.0036)	(0.0039)
Age and sex	Yes	Yes	Yes
Education, income and wealth	No	Yes	Yes
Labour force status	No	No	Yes
Household characteristics	No	No	Yes
Bad/poor health	No	No	Yes
Risk attitudes (above average financial risk taking)	No	No	Yes
Big 5	No	No	Yes
Region fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
R^2	0.043	0.265	0.273
N	103,448	103,448	103,448

Note. HILDA 2005–2014. Cluster-robust standard errors (at the individual level) in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

risks (substantial, above-average, average, no risk). Furthermore, given that the variable was not asked in 2005, 2007 and 2009, we impute information for these years from previous waves.

6.3. Results

Table C1 provides the descriptive statistics for the Australian sample by above median LOC, and Table C2 displays the correlates of LOC in the HILDA survey.[38] Consistently with the evidence from Germany, we find that men exhibit a higher internal LOC, and that years of education, income and wealth are also positively associated with an internal LOC. The association between income, wealth and internal LOC in Australia is slightly weaker. As for the German sample, a more internal LOC is associated with better health. Similarly, as in the German sample, we identify small associations with risk attitudes and personality traits.

We examine the association between LOC and the decision to have a SUPP in Australia. Results are reported in Table 9[39] and reveal that an internal LOC exhibits a positive and significant coefficient across all models: a more internal LOC is associated with SUPP uptake consistently with evidence from Germany. Other controls exhibit the expected signs.[40] More specifically, risk attitudes exhibit a significant coefficient consistent with the results for Germany.

In Tables C3 and C4 in the appendix we examine the extent to which the results hold when we examine a set of different subsamples by age group and gender. The results by age groups for Australia are comparable to the ones for Germany, however the relationship between LOC and SUPP is stronger for males than females in Australia.

We next examine in Table C5 whether the association between LOC and insurance uptake varies by type of insurance coverage. Since information on coverage is only available in 2004, 2009 and 2013 in the HILDA survey, we re-estimate in column (1) the association between LOC and insurance uptake overall for this smaller sample. In line with Table 9, the association is positive and significant. Splitting the sample by coverage types in Australia reveals that LOC is only significantly associated with the uptake of insurance coverage for hospitals and extra services; whilst it is not significant for partial hospital or extra services alone.[41] This is somewhat in line with the German results which suggestthat an internal LOC increases the likelihood of comprehensive insure coverage . Table C7 in the appendix shows that in Australia LOC is associated with a reduced number of doctor visits. This suggests that consistently with Germany, the association between internal LOC and SUPP uptake is not driven by higher health care use, but rather it seems likely that LOC directly influences the utility value of SUPP. Finally, Table C8 shows consistent evidence of positive selection (poor health is associated with reduced insurance uptake and spending) but controlling for LOC reduces and eventually renders the effect of poor health insignificant.

7. Conclusion

This paper examines whether individuals' uptake of supplementary health insurance (SUPP) varies with an individuals internal LOC, measuring the extent to which individuals believe they can control their future (in this case, the quality and

[38] In all regression models using the HILDA survey data, standard errors are clustered at the individual and household-year level using the STATA ado *cgmreg.ado* by A. Colin Cameron, Jonah B. Gelbach and Douglas L. Miller (Cameron, 2021).

[39] The equation is estimated using a linear probability model. The results from a probit model are very similar.

[40] Wealth is positively associated with the probability of having SUPP and household size is negatively associated with the probability of SUPP. Some personality traits (agreeableness and conscientiousness) exhibit positively significant coefficients.

[41] Because wealth is not measured in the years that coverage type is available for Australia (2009 and 2013), we attach individual specific average wealth from the years 2002, 2006 and 2010 to this smaller sample. Table C6 in the appendix shows that our results for Australia are robust to attaching wealth from the previously available year to the data (year 2006 wealth to the year 2009 data and wealth from the year 2010 to the year 2013 data).

costs of health care use).We document robust evidence that *individuals' LOC predicts the purchase of SUPP* in Germany, where statutory social insurance is available to the entire population, and in Australia, where there is a similar institutional setting, but where SUPP is community rated.

We also find that the inclusion of LOC in our specification for SUPP choice partly explains previous evidence of positive (health) selection into insurance. That is, the inclusion of LOC renders the negative association between poor self-reported health and SUPP uptake insignificant. Finally, we document consistent evidence for Australia, a country which presents a similar institutional setting and where longitudinal data for both LOC and SUPP is available.

The positive association between LOC and SUPP is not driven by individuals with an internal LOC having increased health care use. Instead, our results suggest that individuals with a more internal LOC are more likely to undertake preventive measures (Cobb-Clark et al, 2014), and therefore they are more likely to be healthy and less likely to face health shocks. Thus, we find that individuals' LOC can partly explain advantageous selection into SUPP (Cutler et al, 2008).

Our main results carry important implications for policy. More specifically, they suggest that when designing incentives for insurance uptake, we should take into consideration that individuals with a strong internal LOC are more likely to purchase SUPP, whilst those with an external LOC might need extra incentives to reach similar insurance uptake goals. While we cannot claim causality from our estimates, a causal interpretation of our findings would suggest that LOC exerts an independent effect on SUPP.. Hence, all else equal, tax exemptions, rebates, and other financial incentives to purchase SUPP might exhibit different effects based on an individual's LOC.

Declaration of Competing Interest

The authors of this paper have no conflict of interest not have received any funding to carry out this research.

Data Availability

Data will be made available on request.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jebo.2022.10.035.

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