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# Locus of Control and Saving: The role of Saving Motives\*

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## Abstract

Using data from a longitudinal survey representative of the Dutch population, we analyze the relationship between saving and locus of control, and we study the underlying mechanisms. Locus of control measures the extent to which individuals perceive their life outcomes to be determined by their own actions, as opposed to external factors. Those who believe to be in control of future outcomes turn out to save more, both at the extensive (decision to save) and intensive margins (amount saved). We investigate the mechanisms behind this relationship. We implement a mediation analysis to examine the role of saving motives, distinguishing between specific and non-specific purposes. The effect of external locus of control is direct, while the effect of internal locus of control is indirect, largely driven by (non-specific) saving motives.

**JEL codes:** D14; D91.

**PsycINFO codes:** 3920.

**Keywords:** Locus of control; Saving; Saving motives; Mediation analysis.

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# 1 Introduction

Population ageing and pension reforms implemented in many countries over the last decades make the accumulation of savings increasingly important for individuals and households (Van Rooij et al., 2011, 2012; van Schie et al., 2012). As a consequence, researchers and policymakers have been devoting growing attention to the determinants of saving choices. Analyzing why people save may help to understand individual economic behavior and to address policy interventions targeted to household savings.

In this paper, we study the relationship between saving and psychological traits by focusing on the effect of *locus of control* and by examining the mechanisms behind this link. Locus of control can be described as "a generalised attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences" which "might affect a variety of behavioral choices in a broad band of life situations" (Rotter, 1966). Individuals with an *internal locus of control* perceive life events to be contingent upon their behavior. In contrast, those with an *external locus of control* view them as the result of external factors, such as luck, chance, or fate.

The first part of the analysis examines the link between locus of control and saving using longitudinal data from the DNB Household Survey (DHS), a sample representative of the Dutch population. In our analysis, locus of control is represented by two distinct factors: internal and external locus of control, which are correlated but capture different facets. Internal locus of control measures the impact of individual actions on future outcomes, while external locus of control indicates the role of chance in determining future events. We develop our analysis exploiting the longitudinal dimension of our dataset and applying the Mundlak approach to relax the assumption of zero correlation between observed and unobserved variables. In line with the literature (Cobb-Clark et al., 2016), our results show that individuals with an external locus of control save less, both at the extensive (decision to save) and the intensive margin (amount saved). The effect of external locus is larger and more significant with respect to the internal one. The response of saving to locus of control is quantitatively relevant, also in comparison to other factors, such as income. Our estimates are robust to selection on unobservables (Oster, 2019).

The main contribution of this paper is to investigate, for the first time, the mechanisms linking locus of control and saving behavior. We examine the extent to which this association is determined by differences in saving motives

related to locus of control. Psychological literature shows that the perception of control is strictly intertwined with other control aspects, and it is a key driver of self-control (Kapteyn and Teppa, 2011). Individuals endowed with internal rather than external locus of control may be better able to cope with contingencies, set personal goals, avoid individual temptation and compulsive spending. Therefore, locus of control may *directly* influence savings inasmuch it reflects different degrees of self-control. Moreover, locus of control may *indirectly* affect saving behavior through saving motives. In this study, we distinguish between *specific motives*, such as buying a house or other goods, and *non-specific motives*, such as being financially independent, sustaining retirement or covering unexpected expenses.

Why should locus of control be related to specific and non-specific saving motives? First, since individuals with internal locus of control believe that their life's outcomes stem from their own actions, they may save more to build up resources to achieve their goals. Thus, we expect internal locus of control to be positively correlated with specific saving motives. Moreover, a strong internal locus of control may promote the accumulation of resources to cope with future events, showing its positive association with non-specific motives. This is in line with psychological literature indicating that internal locus of control is positively linked with problem-focused coping strategies (Anderson, 1977) and with the ability to cope with change (Judge et al., 1999). On the other hand, individuals with an internal locus of control believe to be in control of future outcomes and, thus, to be less exposed to future adverse events. As a result, they may save less for precautionary reasons.<sup>1</sup>

We use a measure of the importance attributed to different saving motives to empirically address the role of saving motives in explaining the linkage between locus of control and saving. We construct two indicators which act as "mediators", based on information collected by the DHS survey. These factors measure the average importance of, respectively, specific and non-specific saving motives.<sup>2</sup> We use them to perform a mediation analysis (Baron and Kenny, 1986), a method designed to decompose the *total effect* of locus of control on saving into its *direct* and *indirect* components – where the latter goes through saving motives.

As expected, the importance of non-specific motives, particularly financial

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<sup>1</sup>This is in line with findings showing a positive association between internal locus of control and risky exposure in the financial domain (Kesavayuth et al., 2018; Salamanca et al., 2016).

<sup>2</sup>We also check alternative clustering of saving motives, which is discussed in Section 2.

independence, turns out to significantly boost saving. Results show that external locus of control has a direct impact on saving, while the effect of internal locus passes through higher saving motives. The main findings do not exhibit substantial heterogeneity across income and wealth groups.

Our paper contributes to the literature studying the relevance of locus of control on several dimensions of individual behavior. Previous research finds that internal locus of control is related to higher marital satisfaction (Lee and McKinnish, 2019), which may have implications on marital duration, individual and family economic decisions. A key dimension for locus of control is human capital investment. Those who believe that what happens in life stems mainly from their own actions expect higher returns of human capital investment, which reflects into youths' educational choices (Coleman and DeLeire, 2003) and parental investment on their children's early skill formation (Lekfuangfu et al., 2018). Similarly, the extent to which individuals believe that their actions determine their outcome fosters their health investment and engagement in health-promoting activities (Cobb-Clark et al., 2014; Kesavayuth et al., 2020; Steptoe and Wardle, 2001). Locus of control affects job search strategies, inasmuch it determines subjective belief about the impact of job search effort on the likelihood of receiving a job offer (Caliendo et al., 2015). On a similar note, those with an internal locus of control are more likely to get better-paid jobs, or to move from low-paid jobs to higher-paid jobs (Schnitzlein and Stephani, 2016). Internal locus of control is positively related to the probability of starting a new business, but only for men (Wijbenga and van Witteloostuijn, 2007) and associated to unconventional business strategies (e.g. pursuing product innovation in a stable industry sector) that may eventually lead to business failure (Wijbenga and van Witteloostuijn, 2007). Locus of control also influences financial decisions, such as housing and mortgage choices (Wang et al., 2008), and portfolio management. An internal locus of control is positively associated with willingness to take financial risks (Kesavayuth et al., 2018), investment in risky assets (Salamanca et al., 2016), and asset accumulation (Cobb-Clark et al., 2016).

The paper most closely related to our work is Cobb-Clark et al. (2016), who examine the relationship between locus of control and wealth accumulation in Australia. The first part of our analysis, investigating the link between locus of control and savings, departs from this study along two dimensions, related to data quality. First, we improve the measurement of the dependent variable, which is self-reported saving. On the contrary, Cobb-Clark et al. (2016) mea-

sure active and passive saving as the change in a broad measure of wealth over a four-year window. Second, we exploit the longitudinal component of our sample to address endogeneity and relax the assumption of zero correlation between the observed and the unobserved variables. Our main contribution with respect to the literature is the analysis of the channels behind the locus of control and saving link, which is out of the scope of [Cobb-Clark et al. \(2016\)](#). On the other hand, [Cobb-Clark et al. \(2016\)](#) extend the analysis to portfolio composition, which goes beyond the purpose of our study, and extensively examine the heterogeneity of their findings across the wealth distribution. We also explore this aspect, but we devote less emphasis on it.

Locus of control is related to other non-cognitive attitudes, which have been shown to affect economic outcomes. First, the so-called "big-five" personality traits seem to affect risky decision making ([Almlund et al., 2011](#); [Rustichini et al., 2012](#)) and stock market participation ([Buccioli and Zarri, 2017](#); [Conlin et al., 2015](#)). Personality is also significantly related to wealth accumulation. [Brown and Taylor \(2014\)](#) and [Nyhus and Webley \(2001\)](#) find, on survey data representative of the Dutch and British population respectively, that savings are lower with lower levels of extraversion and agreeableness; [Mosca and McCrory \(2016\)](#) show that savings correlate positively with extraversion and negatively with neuroticism in a sample of older Irish couples. Even if locus of control does not belong to the "big-five" personality traits, it turns out to be associated with neuroticism ([Almlund et al., 2011](#)). Locus of control is also related to the literature analyzing how perceptions about the determinants of a specific outcome – luck as opposed to merit – may affect preferences and behavior ([Cappelen et al., 2013](#); [Cetre et al., 2019](#)).

The remainder of the paper is organized as follows. Section 2 illustrates the dataset and the main variables of interest. Section 3 describes the empirical strategy and summarizes the results. Section 4 concludes.

## 2 Data

The empirical analysis is based on data from the DNB Household Survey (DHS), a longitudinal survey representative of the Dutch population. Data are collected annually, but our dataset includes only the eight waves in the period 2005-2017 (about one wave every two years) that gathered information on locus of control.<sup>3</sup>

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<sup>3</sup>More precisely, the sample includes waves 2005, 2006, 2007, 2009, 2011, 2013, 2015, and 2017.

Since information on saving is collected at the household level, we restrict the sample to household heads (defined in DHS as the main income earners). The final dataset includes 6,694 observations (2,419 respondents; on average 2.8 observations per respondent). Descriptive statistics are reported in Table 1; all monetary values are converted in 2015 levels, after correcting for inflation using the Dutch CPI index.

Our two outcome variables are the extensive and intensive margins of saving. The first indicator is a dummy variable capturing whether the household put any money aside in the twelve months prior to the interview (see the Supplementary Material for details). Table 1 shows that about 70% of respondents in our sample have positive saving. The second outcome variable is the (inverse hyperbolic sine of) the amount saved in the calendar year before the interview.<sup>4</sup>

The key regressor in our analysis is locus of control. DHS respondents are asked to indicate on a Likert-scale (from 1 to 7) whether they agree on 13 statements, aimed to measure internal and external locus of control. The statements come from [Furnham \(1986\)](#) and refer to the financial domain (e.g. preventing poverty, being wealthy). Our approach is close to [Lekfuangfu et al. \(2018\)](#), who exploit domain-specific questions. More precisely, some of the questions used by [Lekfuangfu et al. \(2018\)](#) to study the determinants of parental investment in offspring’s human capital elicit locus of control in the framework of family and school outcomes. A common approach in the literature is based, instead, on non-domain specific measures, which are designed to capture beliefs about the extent to which life’s outcomes are under one’s own control (in the context of financial choices see [Cobb-Clark et al., 2016](#); [Kesavayuth et al., 2018](#)) These questions relate to no particular domain but refer to general concepts, such as success, future, problems or opportunities in life.<sup>5</sup> Even if we expect a positive correlation among different domains of locus of control, individuals may perceive the importance of internal and external factors to vary across domains. On the one hand, the measure we use, which is specific to the financial domain, has

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<sup>4</sup>Answers in the original dataset are reported in ranges of values; we impute the central value for each bracket and the boundary for the extreme brackets. See the Supplementary Material for details.

<sup>5</sup>As an example, we list the statements used to elicit locus of control in the Australian HILDA dataset ([Cobb-Clark et al., 2016, 2014](#); [Kesavayuth et al., 2020](#); [Lee and McKinnish, 2019](#)). Respondents indicate how much they agree with the following statements: (1) I have little control over the things that happen to me; (2) There is really no way I can solve some of the problems I have; (3) There is little I can do to change many of the important things in my life; (4) I often feel helpless in dealing with the problems of life; (5) Sometimes I feel that I am being pushed around in life; (6) What happens to me in the future mostly depends on me; and (7) I can do just about anything I really set my mind to do.

Table 1: Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.
Decision to save	0.698	0.459	0	1
Amount saved (IHS)	6.367	4.241	0	12.082
Internal locus	0	1	-4.184	3.079
External locus	0	1	-2.115	3.723
Saving motive: Specific	3.923	1.155	1	7
Saving motive: Non-specific	4.861	1.009	1	7
Saving motive: Children	3.496	1.630	1	7
Saving motive: Retirement	4.857	1.621	1	7
Saving motive: Independence	5.354	0.968	1	7
Saving motive: Investments	2.748	1.426	1	7
Motivation to save	0.454	0.498	0	1
Age/10	5.737	1.472	2	9.4
(Age/10) <sup>2</sup>	35.075	16.736	4	88.360
Female	0.236	0.425	0	1
Living with partner	0.655	0.475	0	1
Household size	1.175	1.164	0	7
Children in household	0.254	0.435	0	1
High school education	0.592	0.491	0	1
College education	0.152	0.359	0	1
Employee	0.490	0.500	0	1
Self-employed	0.041	0.198	0	1
Retired	0.357	0.479	0	1
Income (IHS)	10.976	0.564	6.747	15.449
Financial assets (IHS)	9.265	4.063	-12.327	15.882
Homeowner	0.696	0.460	0	1
Risk aversion	0	1	-3.799	1.762
Orientation to future	0	1	-3.571	3.030
Good health	0.235	0.424	0	1
Financial advise: professionals	0.228	0.420	0	1
Financial advise: media	0.403	0.491	0	1
Income unusually low	0.059	0.235	0	1
Income unusually high	0.016	0.125	0	1
Wave 2006	0.094	0.292	0	1
Wave 2007	0.096	0.295	0	1
Wave 2009	0.088	0.284	0	1
Wave 2011	0.084	0.277	0	1
Wave 2013	0.149	0.356	0	1
Wave 2015	0.191	0.393	0	1
Wave 2017	0.195	0.396	0	1

Notes: 6,694 observations for all the variables, except for *Saving Motive: Children/Retirement/Independence/Investments* (5,684 observations) and *Motivation to save* (6,631 observations). Amount saved, income and financial assets are transformed into inverse hyperbolic sine (IHS).

the advantage of being salient with respect to saving. On the other hand, non-domain-specific measures allow to assess the effect of a more general perception of locus of control on economic decisions.

There are different ways to construct locus of control variables. A common approach in the literature consists in adding scores from questions eliciting locus of control (Cobb-Clark and Schurer, 2013; Kesavayuth et al., 2020; Lee and McKinnish, 2019; Wijbenga and van Witteloostuijn, 2007), their standardized values (Coleman and DeLeire, 2003) or computing their average (Schnitzlein and Stephani, 2016). Some studies use this aggregate measure and identify respondents with internal rather than external locus of control depending on their relative position in the distribution, e.g. above or below the median, top/bottom quartile (Caliendo et al., 2015; Lekfuangfu et al., 2018). Schnitzlein and Stephani (2016) also use a categorical variable with three levels capturing, respectively, internal, medium and external locus of control. Another method used in literature is to identify locus of control using a factor analysis (Cobb-Clark et al., 2016, 2014; Preuss and Hennecke, 2018). As suggested by Cobb-Clark et al. (2014), this approach has the advantage that the weights assigned to each item in the overall index are determined by the data, eliminating the need to assume equal weights.

In the benchmark case, we perform two factor analyses with polychoric correlation, separately on the 8 items regarding internal locus and the 5 items regarding external locus. The analysis is run separately for each wave of the dataset. From each factor analysis, we generate one factor, that we call internal or external locus of control, respectively<sup>6</sup> (see the Supplementary Material for details). Internal locus of control concerns the importance of individual actions and captures the role of personal control over future outcomes. In this line, the framing of items loading on this factor stresses the role of individual behavior and its consequences. In contrast, external locus of control indicates the extent to which uncontrollable luck or chance affect future events. Hence, the statements used to elicit this measure mainly refer to external factors. This setting is in line with findings in Furnham (1986), who develops a scale of locus of control and performs a factor analysis to determine its key elements. The two most important factors in explaining the variance turn out to be the “internal”

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<sup>6</sup>An exploratory factor analysis on the whole set of 13 items showed that there are at most five factors. The two factors with the highest eigenvalues (2.598 and 1.291) account for 99% of the total variance, and are more highly correlated with the items associated with either internal or external locus of control.

and the “chance” factors, which are almost overlapped with our measures for internal and external locus of control, respectively.<sup>7</sup> As robustness checks, we consider two alternative definitions: either one single common factor from all the 13 items or two separate factors taken as the sample average of the items denoting internal or external locus of control. We comment on these analyses in Sub-section 3.2.

The two factors used in the baseline analysis show a negative but small correlation (-0.18), which indicates that they are not necessarily one the reverse of the other.<sup>8</sup> Individuals may indeed consider future outcomes to depend both on luck and on their own actions. In this case, they may agree with statements claiming the importance of individual behavior and with those positing a key role of chance, also depending on how statements are framed. On the contrary, individuals may attribute relatively low importance both to luck and to their own actions. In this case they may, for instance, value the role of others’ actions and consider changes in future outcomes as unlikely.

The mediation analysis relies on measures for the importance of saving motives. Respondents are asked to evaluate the importance of 16 possible motives to save money on a 7-point Likert scale. In our baseline specification, we group these motives into specific and non-specific ones.<sup>9</sup> We use the average importance of motives in each group to measure the importance attached to these two categories. Table 1 shows that, on average, non-specific saving motives are valued more than specific ones. These two variables are used to capture the importance of saving motives in the mediation analysis. We also explore the robustness of our findings to alternative mediators. First, we use narrower groups. We classify saving motives into four categories – related to children, retirement, independence and investments – and we use all the 16 saving motives separately. Second, we use “motivation to save”, which is a dummy variable capturing whether the respondent thinks that saving makes sense in the current economic situation. We rely on this indicator to capture the general attitude to

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<sup>7</sup>The two factors in [Furnham \(1986\)](#) stem from the raw items used in our analysis. [Furnham \(1986\)](#) also relies on other items (not considered in the DHS questionnaire) which capture two residual factors: “external denial”, reflecting political beliefs and the perception that poverty does not exist, and “powerful others”, capturing the power of others on one’s outcomes. The latter two factors may play a role in our framework as well, particularly for individuals with relatively low levels of both internal and external locus of control.

<sup>8</sup>This is also evident from Figure B.1 in the Supplementary Material, which compares the distribution of internal and external locus in our sample. From the figure we observe individuals with relatively low or high levels in both dimensions.

<sup>9</sup>The full list of motives and details on how they are grouped are illustrated in the Supplementary Material.

save for general purposes.<sup>10</sup>

We turn to the descriptive analysis of the correlation between our main variables of interest. The amount saved exhibits a clear correlation with locus of control (internal locus: 0.11; external locus: -0.19). This is complemented by descriptive evidence in Table 2. The first two columns report average locus of control and saving for respondents who value saving motives more or less than the median in the sample, respectively. The last column shows the t-test on the comparison between the first and second columns. The top and bottom panels consider, respectively, specific and non-specific saving motives. Internal locus of control is significantly higher in the top distribution of both saving motives, the difference being larger when considering non-specific motives. On the contrary, external locus of control does not exhibit significant differences depending on the strength of saving motives. As expected, respondents who give more importance to saving motives save more, both at the extensive and the intensive margin.

A set of control variables is included in our specifications to capture the impact of other relevant factors on saving choices. First, we include individual characteristics, namely gender, education, job status and a second-order polynomial in age, which proxies the life-cycle path of savings. We control for family composition (whether the respondent lives with a partner, the household size excluding the respondent and the number of children), and for the financial situation of the household (homeownership status, inverse hyperbolic sine of family income and financial assets). The average respondent is 57 years old, male, lives with a partner, but without other people, has high school education, is employee and homeowner. The set of regressors includes some further variables: health status, which could affect household expenditure, and sources of advice consulted to make financial decisions; two dummies indicating whether household income in the year of the interview was unusually high or low with respect to a "regular" year, to capture whether the household experienced an income shock. Finally, we add two measures for individual preferences, namely risk aversion

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<sup>10</sup>The positive relationship between the propensity to save and general saving goals is in line with previous studies showing a positive association between cognitive abstraction and propensity to save. "Any action can be construed at varying levels of cognitive abstraction. Events and objects can be represented at either a higher, more abstract level, involving consideration of superordinate goals [...] or a lower, more concrete level, involving consideration of subordinate goals" (Rudzinska-Wojciechowska, 2017, p. 2). The experiments run by Rudzinska-Wojciechowska (2017) exploit changes in participants' levels of construal in the actual decision-making moment to evaluate their impact on the decision to save. Her findings show that individuals with an abstract mindset turn out to be more prone to save than those with a concrete mindset.

Table 2: Locus, saving and saving motives

	Below median	Above median	t-test
<i>Saving motive: Specific</i>			
Internal locus	-0.100	0.113	-8.768***
External locus	0.015	-0.016	1.263
Decision to save	0.679	0.719	-3.520***
Amount saved	6.198	6.558	-3.471***
<i>Saving motive: Non-specific</i>			
Internal locus	-0.133	0.138	-11.199***
External locus	0.022	-0.023	1.833
Decision to save	0.679	0.717	-3.402***
Amount saved	6.182	6.560	-3.648***

Notes: The last column reports the results of a t-test on the comparison between the first and second columns. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .

and orientation to the future, which would affect saving and portfolio choices and could be correlated with the locus of control measure. The Supplementary Material provides details on how these variables are measured.

### 3 Analysis

We study the relationship between the extensive and intensive margins of saving and locus of control, also taking into account a number of socio-demographic and other control variables. Specifically, our models for individual  $i$  at time  $t$  estimate the  $\beta$  parameters from this equation:

$$S_{it} = f(\beta_0 + \beta_1 L_{it} + \beta_2 P_{it} + \beta_3 D_{it} + \beta_4 C_{it} + \beta_5 T_{it}) + \epsilon_{it}. \quad (1)$$

Here  $S_{it}$  is saving (decision to save or amount saved),  $L_{it}$  is locus of control (two factors for internal and external locus),  $P_{it}$  describes preferences (risk aversion and orientation to future),  $D_{it}$  denotes socio-demographic variables (age, gender, family composition, education, occupation, income and wealth),  $C_{it}$  collects further control variables (health status, use of financial advisors, whether the last income was unusually low or high) and  $T_{it}$  is a set of year dummy variables. Finally,  $\epsilon_{it}$  is the error term. The link  $f$  between dependent

and explanatory variables changes with the dependent variable, and is a non-linear normal function for the extensive margin (decision to save) and a simple linear function for the intensive margin (amount saved). Baseline estimates for the amount saved, which rely on OLS, are robust to the use of a random-effect Tobit model (see Table B.4 in the Supplementary Material). We choose the normal function for the decision to save as it is better suited to deal with binary variables. In particular, by construction, it generates predictions in the 0-1 range that are appropriate to measure probabilities.

Since we have multiple observations per individual, we run random-effect panel regression models. We use random- rather than fixed- effects because fixed-effect models exploit for identification only the changes across observations of the same individuals, while our key variables of interest – internal and external locus of control – are relatively stable over time,<sup>11</sup> in line with common evidence (Cebi, 2007; Cobb-Clark and Schurer, 2013).<sup>12</sup> However, we follow common practice and incorporate in the main specification Mundlak controls (Mundlak, 1978). More precisely, we include the individual-specific average of the explanatory variables, excluding locus of control only, as a proxy for individual unobserved heterogeneity. This allows us to relax the assumption of zero correlation between the observed variables and the unobserved heterogeneity, which is required by the random-effect model. In the end, we implement a random-effect probit model with Mundlak controls for the decision to save and a random-effect GLS model with Mundlak controls for the amount saved. This approach mitigates the endogeneity issue in Cobb-Clark et al. (2016). However, more general sources of endogeneity can be at work beyond Mundlak controls in presence of unobserved confounders, which may be correlated with locus of control and saving. To evaluate the possible degree of omitted variable bias, we exploit the method developed by Oster (2019). Results, discussed in Appendix C of the Supplementary Material, support the robustness of our findings to the selection on unobservables.

This analysis aims to investigate the direct and indirect correlation between

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<sup>11</sup>The within-individual variability is about 25.1 and 24.5% of the total variability, respectively for the first and second factors of locus of control. Indeed, a fixed-effect model would find it difficult to isolate the contribution of locus of control. See Table B.4 in the Supplementary Material.

<sup>12</sup>Preuss and Hennecke (2018) show that extremely adverse life events, such as unemployment, may temporarily affect locus of control. However, this effect vanishes as soon as the unemployed find a new job, supporting the common assumption of stability of locus of control. On a similar note, the occurrence of adverse events seems to have only temporary consequences on risk taking and trust (Hetschko and Preuss, 2020; Friehe and Marcus, 2021).

locus of control and saving, with the indirect one mediated by the saving motives. To assess the relevance of both the direct and indirect components, we run a mediation analysis. More precisely, we compare the coefficients  $\beta_1$  associated to locus of control in Equation (1) with the corresponding coefficients from the same equation enriched with the inclusion of a dummy variable  $SM_{it}$  on saving motives:

$$S_{it} = f(\beta_0 + \beta_1 L_{it} + \beta_2 SM_{it} + \beta_3 P_{it} + \beta_4 D_{it} + \beta_5 C_{it} + \beta_6 T_{it}) + \epsilon_{it} \quad (2)$$

While the coefficients  $\beta_1$  from Equation (1), or  $\beta_1^1$ , measure the total (direct and indirect) effect of locus of control, the coefficients  $\beta_1$  from Equation (2), or  $\beta_1^2$ , measure its direct effect only. The indirect effect, that is, the effect of locus of control on saving mediated by the saving motives, in general, is the difference  $\beta_1^1 - \beta_1^2$ .

In the context of non-linear models, the approach behind mediation analysis does not work because it is not possible to disentangle the true parameters from the variance of the error term, and what is estimated is actually the ratio between the two. Standard mediation analysis would then measure the indirect component as

$$\frac{\beta_1^1}{\sigma_1^2} - \frac{\beta_1^2}{\sigma_2^2} \quad (3)$$

where  $\sigma_1^2$  and  $\sigma_2^2$  are the variance of the error term in the models of Equations (1) and (2), respectively. The problem is that in general  $\sigma_2^2 \leq \sigma_1^2$  because the model of Equation (1) is nested in the model of Equation (2), which inflates the indirect channel. [Karlson et al. \(2012\)](#) and [Kohler et al. \(2011\)](#) propose to measure the indirect effect from a mediation analysis where the specification in Equation (1) is augmented to include the residual of the dependent variable on the mediating factor (in our case, saving and saving motives, respectively). This new model generates the same variance of the error term as Equation (2), which is ininfluent for linear models but allows to remove the problem of inflating the indirect channel in non-linear models. Monte Carlo studies show that this approach, that we label KHB method, is efficient and performs better than alternative approaches when applied to non-linear models ([Kohler et al., 2011](#)).

### 3.1 Results

Table 3 reports the average marginal effects from our benchmark regression output. Columns (1) and (2) estimate Equation (1) while Columns (3) and (4) estimate Equation (2). All the columns highlight a significant correlation between external locus of control and saving decisions, both at the extensive and intensive margins. We first pay attention to Columns (1) and (2) measuring the total effect of locus of control. We learn that respondents with an external locus of control are less likely to save (Column (1)), and they save less (Column (2)). One standard deviation rise in external locus of control reduces the probability to save by 3% and the amount saved by 23.5%. These findings are in line with the correlation between locus of control and saving illustrated by [Cobb-Clark et al. \(2016\)](#).

Table B.1 in the Supplementary Material reports estimates of the main coefficients of interest across different specifications. Results from the most parsimonious specification, with no controls, is shown in the first panel. We divide the set of further explanatory variables into three groups: “demographic”, “socio-economic” and “further” control variables. The other panels in Table B.1 report results when only one or a combination of these groups are taken as explanatory variables. Internal locus of control fosters both margins of savings, albeit its statistical significance and its magnitude decline when we enrich the set of control variables. External locus, instead, has a negative effect, which remains significant at the 0.1% level across specifications. Looking at saving motives, we consistently find that non-specific ones boost saving, while specific motives are not significant at conventional levels. Compared to Table B.1, in our benchmark Table 3, we find that the coefficients of internal locus are no longer significant. With respect to the last specification of Table B.1, the only difference is the inclusion of the Mundlak variables to control for potential time-invariant omitted variables. It then seems that there are unobservable factors explaining the effect we otherwise associate to internal locus of control.

Among the other variables considered in Table 3, those showing effects significant at the 5% level are income and financial assets, and the use of a professional advisor (all positively). Importantly, the impact of locus of control is quantitatively similar to income, a key variable for savings. As a reference, one standard deviation increase of income raises the probability to save by  $0.564 \cdot 0.046 = 2.6\%$  and the amount saved by  $0.564 \cdot 0.467 = 26.3\%$ . Interestingly we also find significant effects of deviations from typical income: unusually high (low) income

is positively (negatively) correlated with the decision to save and the amount saved. This evidence is consistent with a consumption smoothing motive: positive and negative income shocks will, respectively, foster and hamper savings. The impact is symmetric: unusually high income increases the probability to save by 13.3%, while extraordinarily low income decreases the likelihood by 14.1%. We find similar evidence regarding the amount saved.

To shed light on the mechanisms behind the relationship between locus of control and saving, we aim to disentangle the effect of locus of control in its direct and indirect components. We, therefore, estimate Equation (2), which includes saving motives as additional control variables. Results are reported in Columns (3) and (4) of Table 3. Non-specific motives have a significant impact on the amount saved. One point increase in the Likert scale of the importance of non-specific motives boosts the amount of savings by 17%. The total effect on the decision to save is, however, not significant at 5% level. All in all, generic saving motives turn out to be the main mediation factor. Our previous evidence is qualitatively confirmed in these new regressions. In particular, the effect of external locus of control remains significantly negative, while the effect of internal locus of control is not significantly different from zero. Still, the magnitude of the effect falls, indicating that part of its effect is mediated by the saving motives.

We use the KHB method illustrated above to decompose the overall total impact of locus of control into its direct and indirect components. Coefficient estimates are reported at the end of Table 3.<sup>13</sup> The first line shows the total effect of locus of control, estimated by the reduced form equation. The direct effect, obtained through the full model, and the indirect one, capturing the role of saving motives, are reported below. The indirect effect of internal locus of control, i.e. mediated by (non-specific) saving motives, is statistically different from zero at the 1% level. This result supports the role of internal locus through saving motives. This channel is diluted by the direct effect, which is not statistically different from zero. For this reason, the total effect of internal locus of control is significant at the 5% only, and just for the amount saved. Here the indirect component is  $0.041/0.110=37.27\%$  of the total effect. Looking at external locus, we observe a large negative direct effect. The indirect effect has the opposite sign, albeit it is less significant and its magnitude is relatively small.

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<sup>13</sup>Coefficients for the total effect are different from those estimated in Columns (1)-(2) because they are based on the specification augmented with the residuals of saving on the motivation to save.

Table 3: Locus of control and savings

VARIABLES	(1)	(2)	(3)	(4)
	Decision	Amount	Decision	Amount
	Average marginal effects			
Internal locus	0.012 (0.007)	0.101 (0.053)	0.008 (0.007)	0.069 (0.054)
External locus	-0.030*** (0.007)	-0.235*** (0.054)	-0.031*** (0.007)	-0.241*** (0.054)
Saving motive: Specific			0.007 (0.007)	0.026 (0.057)
Saving motive: Non-specific			0.017 (0.009)	0.174** (0.067)
Age/10	-0.024 (0.182)	-0.112 (1.381)	-0.006 (0.182)	-0.034 (1.381)
(Age/10) <sup>2</sup>	0.003 (0.006)	-0.010 (0.050)	0.003 (0.006)	-0.011 (0.050)
Female	0.022 (0.024)	0.121 (0.178)	0.015 (0.024)	0.072 (0.178)
Living with partner	0.040 (0.032)	0.433 (0.246)	0.039 (0.031)	0.424 (0.246)
Household size	-0.002 (0.020)	-0.038 (0.156)	-0.003 (0.020)	-0.044 (0.156)
Children in household	-0.021 (0.040)	-0.164 (0.308)	-0.020 (0.040)	-0.167 (0.308)
High school education	-0.053 (0.076)	-0.357 (0.540)	-0.050 (0.075)	-0.327 (0.540)
College education	0.077 (0.142)	0.934 (1.123)	0.071 (0.141)	0.909 (1.122)
Employee	0.053 (0.035)	0.458 (0.277)	0.054 (0.035)	0.465 (0.277)
Self-employed	0.097 (0.066)	1.055* (0.531)	0.096 (0.066)	1.044* (0.531)
Retired	-0.030 (0.038)	-0.190 (0.305)	-0.032 (0.038)	-0.196 (0.305)
Income	0.046*** (0.014)	0.467*** (0.110)	0.047*** (0.014)	0.467*** (0.110)
Financial assets	0.004* (0.002)	0.030* (0.013)	0.003* (0.002)	0.030* (0.013)
Homeowner	-0.032 (0.027)	-0.298 (0.207)	-0.032 (0.027)	-0.301 (0.207)

Table 3: Locus of control and savings (Continued)

VARIABLES	(1) Decision	(2) Amount	(3) Decision	(4) Amount
Risk aversion	0.007 (0.007)	0.058 (0.056)	0.007 (0.007)	0.051 (0.056)
Orientation to future	0.013 (0.007)	0.101 (0.056)	0.010 (0.007)	0.079 (0.057)
Good health	-0.002 (0.020)	0.013 (0.159)	-0.003 (0.020)	0.004 (0.159)
Financial advise: professionals	0.041* (0.019)	0.331* (0.145)	0.040* (0.019)	0.328* (0.145)
Financial advise: media	0.016 (0.017)	0.162 (0.130)	0.016 (0.017)	0.160 (0.130)
Income unusually low	-0.141*** (0.027)	-1.358*** (0.218)	-0.140*** (0.026)	-1.363*** (0.218)
Income unusually high	0.133* (0.053)	1.239*** (0.360)	0.130* (0.053)	1.207*** (0.360)
Constant		-4.938** (2.286)		-5.950*** (2.307)
Year controls	YES	YES	YES	YES
Mundlak controls	YES	YES	YES	YES
Mediation on Internal locus (coefficients)				
Total (reduced)			0.057 (0.031)	0.110* (0.053)
Direct (full)			0.036 (0.032)	0.069 (0.054)
Indirect			0.022** (0.007)	0.041*** (0.012)
Mediation on External locus (coefficients)				
Total (reduced)			-0.134*** (0.032)	-0.231*** (0.054)
Direct (full)			-0.140*** (0.032)	-0.241*** (0.054)
Indirect			0.005* (0.002)	0.009* (0.004)
Individuals	2,419	2,419	2,419	2,419
Observations	6,694	6,694	6,694	6,694

Notes: Standard errors in parentheses. Amount saved, income and financial assets are transformed into inverse hyperbolic sine (IHS). Locus of control, risk aversion, and orientation to future are standardized values. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .

We then learn that both direct and indirect channels contribute to explain the link between locus of control and saving. Internal locus fosters saving through saving motives. Individuals who believe that future events stem from their own actions value more non-specific saving motives, which reflect into saving choices. The indirect effect of external locus – mediated by (non-specific) saving motives – is also positive, albeit smaller in size. External locus of control may increase concerns about future events, which are believed to be unaffected by individual actions. This reflects into higher saving. The main effect of external locus is, however, the direct component, which captures factors beyond saving motives. As pointed out by previous literature (Cobb-Clark et al., 2016; Rosenbaum, 1980) locus of control can be viewed as a component of self-control. In other words, individuals must believe that their future outcome stems from their own actions and/or that it is not fully determined by chance in order to apply any self-control. Therefore, a high external locus of control or a low internal one reflect into a lack of self-control which, in turn, may reduce savings. This mechanism explains the direct effect of locus of control on savings.

### 3.2 Robustness checks

We run a set of robustness checks, whose output is reported in the Supplementary Material. First, we take alternative definitions of the variables measuring locus of control. In one case (Table B.2), we consider one factor obtained from a factor analysis on all the 13 raw items, with no distinction between internal and external locus. The coefficient associated with this factor is always significantly positive, and the direct effect accounts for about 90% of the total effect. In another case (Table B.3), we use two indicators, for internal and external locus respectively, obtained as sample average of the corresponding raw items. Results are similar to the benchmark scenario described in Table 3.

We then look at different regression models (Table B.4): fixed-effect regression (panel a) and random-effect tobit regression for the amount saved (panel b). Estimates from the fixed-effect regression show no significant effect of locus of control. Our explanation is that this type of model is not appropriate to capture the effect of locus of control, which is relatively stable within individuals. Estimates from the random-effect tobit model again reveal a significantly negative effect of external locus.

We also change the benchmark specification, examining whether the response of savings to income shocks varies with locus of control. More precisely, we

estimate Equation (2) augmented with the interaction between the two locus of control factors and the dummies capturing whether income was exceptionally high or low in the year of the interview. The regression output is reported in Table B.5. We find no significant difference in the locus of control effect conditional on income shocks, while the negative effect of external locus holds true also in this setting.

As a further check, in line with [Cobb-Clark et al. \(2016\)](#) we explore the heterogeneity of our estimates with respect to wealth and income. Specifically, we replicate the benchmark analysis of Table 3 in four subsamples of data: below and above median income (Tables B.6 and B.7), and below- and above-median financial assets (Tables B.8 and B.9). In so doing, each subsample includes half the observations of the full sample. Our main findings are in line with the benchmark case for all the sub-samples.

### 3.3 Further mediators

In this subsection, we further explore the role of saving motives in driving the link between locus of control and saving, using alternative mediators. First, we exploit the information about saving motives and we classify them into narrower groups. Specifically, i) we create four categories and ii) we use all the 16 motives separately. Second, we use as a mediator the indicator for *motivation to save* discussed in Section 2. Importantly, the motivation to save regards the importance of saving at the present moment rather than in general (as the other mediators).

We start grouping the 16 motives in fewer categories: for children, for retirement, for independence, and for investments. Estimate results are shown in Table 4. Once more, external locus of control prevails when describing saving. Among mediators, the only relevant one is saving for independence (positively). The main results from Table 3 about the direct and indirect components are confirmed. All in all, these results suggest that, among non-specific purposes, financial independence is the most relevant saving motive.

Looking at saving motives more granularly, in Table B.10 of the Supplementary Material we use all the 16 motives separately. Among non-specific purposes, saving for future expenses has a significant positive effect, while saving to set up a business activity reduces saving. The fact that individuals who value more this motive may also be in the process of starting a new business can explain the latter evidence. Looking at specific motives, the purchase of durable goods

significantly fosters saving, at both margins. The main results of the mediation analysis are robust.

Finally, in Table 5, we use as mediator the broad measure of motivation to save described in Section 2. As expected, motivation to save is associated with both a higher likelihood of putting money aside and a higher amount of saving. We still see that external rather than internal locus of control is relevant to describe savings. Also, the effect of internal locus is mediated by the motivation to save, and the direct effect of external locus of control is largely direct.

## 4 Conclusion

Saving decisions have relevant implications on individual welfare inasmuch they determine the ability to cope with income and health shocks and prompt adequacy of resources to sustain consumption during retirement. For this reason, understanding the determinants of saving behavior attracted the interest of researchers and policy-makers.

This paper contributes to the literature investigating the role of psychological factors in shaping saving behavior and exploring the mechanisms behind this link. We analyze the effect of internal and external locus of control on saving, and we examine the role of saving motives in driving this relationship. Our results point out a significant role of locus of control, in particular of external locus, on saving which is robust to the existence of unobserved heterogeneity. Respondents with an internal (external) locus of control save more (less), both at the extensive and at the intensive margin. These effects are generally sizeable. The main contribution to the literature is the analysis of the channels which can explain this result. We perform a mediation analysis to test the extent to which saving motives mediate the overall role of locus of control. We find that the effect of external locus of control is direct, while the effect of internal locus of control is mediated by saving motives.

This work has at least two limitations that can also be seen as avenues for future research. First, locus of control is measured through self-assessed responses to survey questions. Although we are confident that responses reflect actual personality ([Van Daalen et al., 2008](#)), it would be interesting to compare our current results with those coming from an analysis where the locus of control is inferred from actual behavior through a lab experiment. Second, we consider saving motives as the only channels to explain the indirect effect of locus of

Table 4: Four saving motives as mediators

VARIABLES	(1) Decision	(2) Amount	(3) Decision	(4) Amount
Average marginal effects				
Internal locus	0.013 (0.008)	0.108 (0.060)	0.006 (0.008)	0.051 (0.061)
External locus	-0.031*** (0.008)	-0.247*** (0.060)	-0.030*** (0.008)	-0.244*** (0.060)
Saving motive: Children			-0.010 (0.006)	-0.075 (0.042)
Saving motive: Retirement			-0.001 (0.005)	0.021 (0.041)
Saving motive: Independence			0.049*** (0.009)	0.376*** (0.068)
Saving motive: Investments			-0.008 (0.006)	-0.071 (0.044)
Demographic controls	YES	YES	YES	YES
Socio-economic controls	YES	YES	YES	YES
Further controls	YES	YES	YES	YES
Year controls	YES	YES	YES	YES
Mundlak controls	YES	YES	YES	YES
Mediation on Internal locus (coefficients)				
Total (reduced)			0.069* (0.035)	0.124* (0.060)
Direct (full)			0.028 (0.035)	0.051 (0.061)
Indirect			0.041*** (0.010)	0.073*** (0.017)
Mediation on External locus (coefficients)				
Total (reduced)			-0.137*** (0.035)	-0.247*** (0.060)
Direct (full)			-0.133*** (0.035)	-0.244*** (0.060)
Indirect			-0.003 (0.005)	-0.003 (0.008)
Individuals	2,132	2,132	2,132	2,132
Observations	5,684	5,684	5,684	5,684

Notes: Standard errors in parentheses. Amount saved, income and financial assets are transformed into inverse hyperbolic sine (IHS). Locus of control, risk aversion, and orientation to future are standardized values. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .

Table 5: Motivation to save as mediator

VARIABLES	(1)	(2)	(3)	(4)
	Decision	Amount	Decision	Amount
	Average marginal effects			
Internal locus	0.012 (0.007)	0.101 (0.053)	0.003 (0.007)	0.041 (0.052)
External locus	-0.030*** (0.007)	-0.235*** (0.054)	-0.023*** (0.007)	-0.179*** (0.053)
Motivation to save			0.195*** (0.013)	1.547*** (0.098)
Demographic controls	YES	YES	YES	YES
Socio-economic controls	YES	YES	YES	YES
Further controls	YES	YES	YES	YES
Year controls	YES	YES	YES	YES
Mundlak controls	YES	YES	YES	YES
	Mediation on Internal locus (coefficients)			
Total (reduced)			0.049 (0.031)	0.100 (0.052)
Direct (full)			0.015 (0.031)	0.041 (0.052)
Indirect			0.034*** (0.008)	0.059*** (0.014)
	Mediation on External locus (coefficients)			
Total (reduced)			-0.153*** (0.031)	-0.269*** (0.053)
Direct (full)			-0.102*** (0.031)	-0.179*** (0.053)
Indirect			-0.051*** (0.009)	-0.090*** (0.015)
Individuals	2,403	2,403	2,403	2,403
Observations	6,631	6,631	6,631	6,631

Notes: Standard errors in parentheses. Amount saved, income and financial assets are transformed into inverse hyperbolic sine (IHS). Locus of control, risk aversion, and orientation to future are standardized values. \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$ .

control on saving. However, locus of control could influence other dimensions (e.g. risk perception) that, in turn, are likely to affect saving. A thorough assessment of this link is a direction for future empirical works.

All in all, these findings have relevant policy implications. In particular, policy interventions aimed to prompt saving may have a heterogeneous effect across individuals, depending not only on their socio-economic conditions and on their cognitive abilities but also on their psychological traits, including locus of control. Individuals with more external locus of control may represent a sensible target group for interventions promoting savings, such as the "*SMarT* - *Save More Tomorrow*" program implemented by [Thaler and Benartzi \(2004\)](#). This is especially important nowadays, with external locus of control being more relevant as a consequence of the Covid-19 health emergency (e.g. [Sigurvinsdottir et al., 2020](#)).

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